WHITE PAPER

The Importance of High Availability Solutions Increases with the Changes in Next-Generation Platforms

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IDC OPINION

It is an important task for any company or organization to enhance the availability of the IT systems enabling its operations or services. One of the most effective methods to make such enhancements is to implement high availability (HA) solutions using availability and clustering software. NEC offers one such HA software called EXPRESSCLUSTER (known as CLUSTERPRO in the Japan market) to promote an HA strategy that increases the reliability of a company or organization.

The main points of this White Paper are listed below:

☑ The market for APAC availability and clustering software continues to show strong growth and the demand for HA is on the rise. NEC ranked first in terms of market share by vendor in 2009, and achieved growth of more than 50% year over year (YoY).

☑ The use of Linux in mission-critical systems increases continuously, and installations of a number of further availability and clustering software packages are becoming evident. The NEC product was an early entrant to the Linux market and has shown solid growth by focusing on the financial, communications, and government sectors. It secured the leading position for HA solutions in the Linux environment.

☑ As server virtualization increases, improving availability in a virtual environment has become a major challenge. With that said, it has become essential to ensure that each layer of the applications executed on the physical and virtual machines is sufficient and highly available.

☑ The HA strategy promoted by NEC's EXPRESSCLUSTER provides rapid support for multiple platforms, enhances and expands core functions to make these more reliable, as well as enables disaster recovery; thereby expanding the scope of usage. This strategy has widened the benefits of HA solutions based on these three major axes.

☑ The APAC availability and clustering software market will grow at high levels. The growth of APAC outside Japan will be particularly very high and the market looks extremely promising.

☑ In mixed OS and virtual-based environments, securing and managing integrated availability will be the focus for HA solutions for cloud computing at present. This is NEC's major advantage as it is capable to provide these solutions to users without delay.

HIGH AVAILABILITY: THE CORE ISSUE

IT plays a very important role in the various activities of any company or organization. Most projects are supported by IT systems and it is now a necessity to provide services in different countries or regions 24 x 7 x 365. In other words, any company or organization operations are to a large extent continuously dependent on their IT systems. Consequently, a higher level of reliability is increasingly being required of IT systems and one of the most important issues facing IT strategy is ensuring the systems are never disrupted.

A sudden systems breakdown is of major concern to IT managers. System breakdowns disrupt operations and services, causing a loss not only in terms of business opportunities but also in terms of invaluable confidence from stakeholders such as customers, clients, and shareholders. IT managers who want to avoid such losses must protect data and application assets critical to businesses or services from sudden hardware, OS, or application failures or from natural disasters such as earthquakes or fire. It is vital to maintain a high availability for mission-critical systems such as key operations for the financial, accounting, and sales management sectors, as well as customer-oriented Web services such as e-commerce sites and online transactions.

IT system availability can be increased in various ways, but the important fact is that the workload should be transferrable to other hardware without halting operations and service in the event of a breakdown. This can be done by using HA clustering software. The failover function first transfers the system from the operating server to a standby server, where a range of solutions are provided, such as disaster recovery and an HA virtual environment.

IDC defines software that incorporates HA clustering software and has the ability to increase the availability of a system as availability and clustering software. The trends in the availability and clustering market in APAC are well laid out, and this white paper discusses future HA strategy based on NEC's HA clustering software EXPRESSCLUSTER.

AVAILABILITY AND CLUSTERING SOFTWARE MARKET TRENDS

In 2009, the APAC availability and clustering software market grew to US$300 million, a 5.4% YoY increase. In 2009, the Lehman's collapse in the United States led to a global recession and the IT market slumped in all regions including APAC. In 2009, the software market as a whole slumped by 1.1% in APAC, but the market for availability and clustering software recorded growth of more than 5% and investment in HA systems have been prioritized.

The 2009 sales volumes by vendor of availability and clustering software in APAC are shown in Figure 1. NEC, the developer and marketer of EXPRESSCLUSTER, leads the market with a 17.4% share. NEC has achieved tremendous growth with a 53.8% YoY increase in sales in 2009.

APAC Availability and Clustering Software Market Revenue
Share by Vendor, 2009
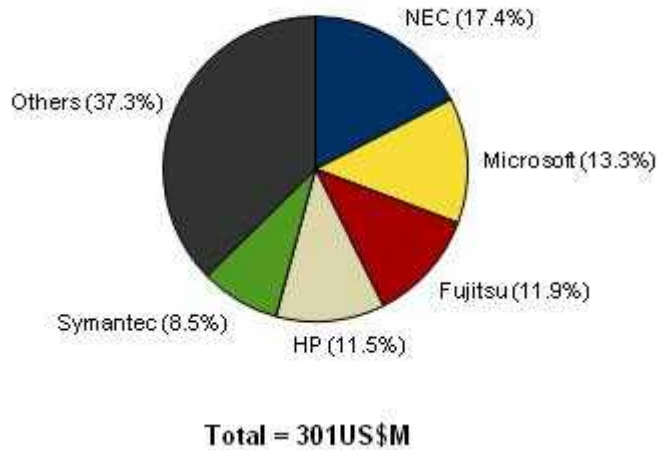
Total = 301US$M

Note: APAC includes Australia, China (PRC), Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Taiwan, Vietnam, and Thailand.
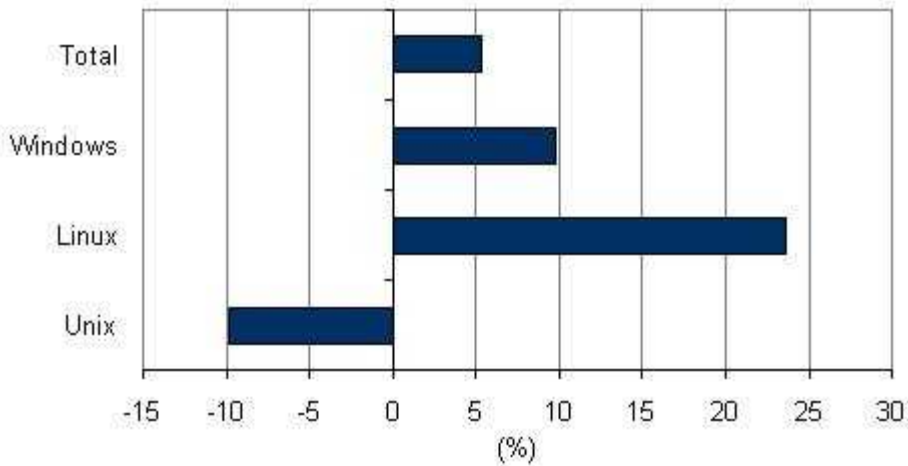
Source: IDC, September 2010

Growth of High Availability Solutions for Linux

Figure 2 shows the growth rate of the APAC availability and clustering market by OS in 2008–2009. Linux grew by 23.7%, and, when compared with Windows or UNIX, its growth rate has increased markedly. The growth rate for Linux across the entire availability and clustering market was 26.8%, which was close to the 29.6% for UNIX.

Earlier, the trend was to use UNIX due to its high availability in mission-critical systems, but it is now evident that Linux is more commonly used. For example, Linux is used in the trading system platforms in the New York and Tokyo Stock Exchanges, and even the London Stock Exchange has started to use Linux. These are the most popular global cases, increasing numbers of companies and organizations are now using Linux in mission-critical systems and have installed availability and clustering software in these systems to deploy HA solutions.

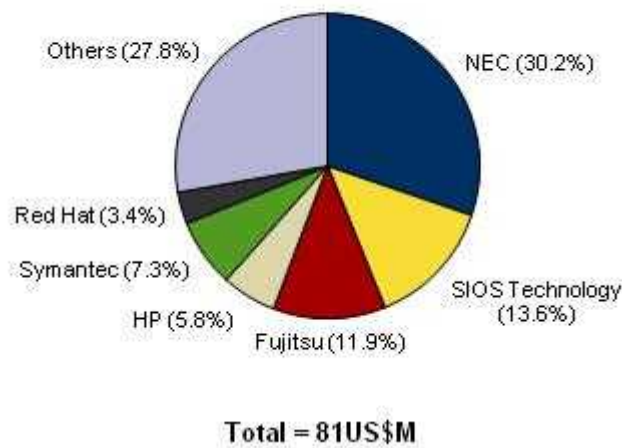APAC Availability and Clustering Market Growth Rate by OS, 2008-2009

Note: APAC includes Australia, China (PRC), Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Taiwan, Vietnam, and Thailand.

Source: IDC, September 2010

Figure 3 shows Linux's share of sales of APAC availability and clustering software in 2009. NEC is in the top position of the market as a whole and is also the leader in the Linux market with a 30.2% share. NEC launched its product focusing on the growth of the Linux market early on, and has seen good results with large installations of more than 100 nodes in the financial, communications, or government sectors.

APAC Availability and Clustering Software for Linux Market Revenue Share by Vendor, 2009

Total = 81US$M

Note: APAC includes Australia, China (PRC), Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Taiwan, Vietnam, and Thailand.
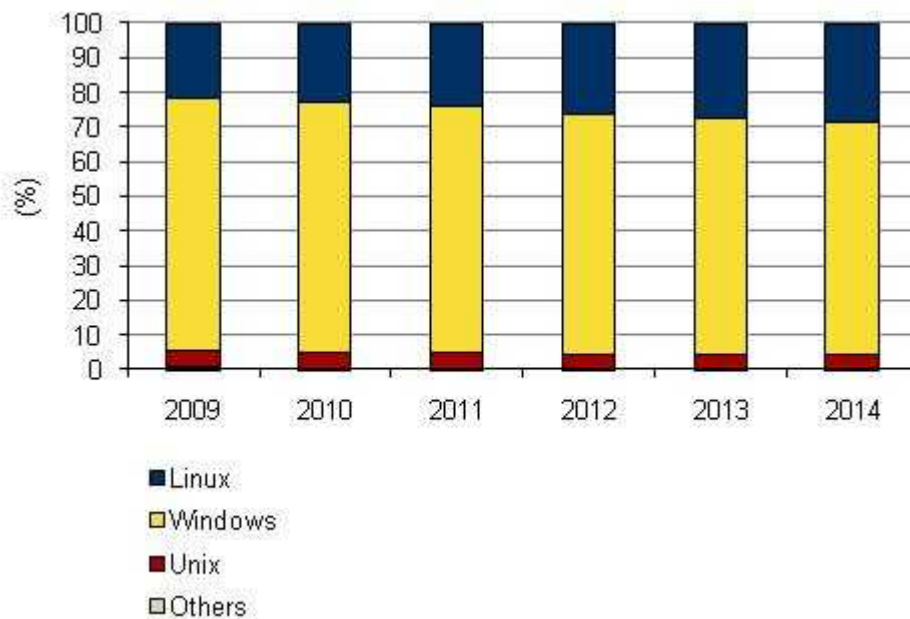
Source: IDC, September 2010

Figure 4 shows the estimated APAC server shipments by OS between 2009 and 2014. IDC estimates that the Linux server percentage will increase in the coming years. This will lead to an increase in mission-critical applications operating on Linux servers, and demand for HA solutions in a Linux environment is also expected to rise.

In many cases, we are already seeing requirements for a combination of installation bases such as Windows and Linux environments. Numerous companies and organizations adopting x86 servers are using both Windows and Linux. Even if a company only currently operates Windows servers, when considering cost or expandability factors, they will in the future probably need to use Linux servers in new systems. In that case, it will not be effective to individually manage Windows and Linux availability on the same hardware platform; these will have to be managed together for greater efficiency.

FIGURE 4

APAC Estimated Number of Server Shipments by OS, 2009–2014

Note: APAC includes Australia, China (PRC), Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Taiwan, Vietnam, and Thailand.
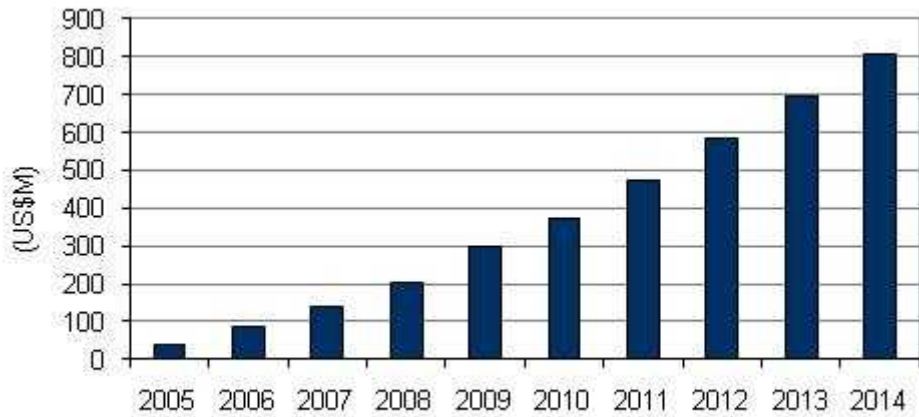
Source: IDC, September 2010

Growing Importance of High Availability Solutions in the Expansion of Virtual Environment

There is currently a sharp growth in server virtualization using hypervisor virtual machine software. Figure 5 shows the estimated virtual machine software market in APAC. The market in 2009 has grown phenomenally, 7.4 times that in 2005. The 2009–2014 compound annual growth rate (CAGR) will be 21.9% and the market is expected to expand in the future, with a steady rise in the numbers of systems constructed in a virtual environment.

FIGURE 5

APAC Virtual Machine Software Market Forecast, 2005–2014

Note: APAC includes Australia, China (PRC), Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Taiwan, Vietnam, and Thailand.

Source: IDC, September 2010

The background to the rapid rise in virtual servers installation is the advantage brought about by sharp reduction in the cost of hardware, operations, and maintenance — integrating such servers with physical servers. However, since several applications are installed in one physical server, a physical server faces a large number of risks. For example, in the event of the breakdown of a physical server, all virtual machines running on it will also stop. This increased risk has generated unprecedented demand for HA, even following server virtualization.

A virtualization software package containing hypervisor may also incorporate HA function but typically provides insufficient HA as it still cannot sufficiently support sudden failures or monitor applications on a guest OS and so forth. Consequently, it is very important to implement HA in each application layer of physical and virtual machines by using best-of-breed third-party availability and clustering software.

Several hypervisors are currently available, such as ESX, Hyper-V, or Xen VMware. Systems are being developed for the users with different features in terms of functions, performance, price, and so forth depending on their purpose. Similar to an environment with both Windows and Linux, the use of multiple hypervisors in one environment is also growing. The availability of a virtual environment in which there are different hypervisors requires integrated management.

NEC'S HIGH AVAILABILITY SOLUTION STRATEGY TO EXPAND EASE OF USE

Leading Company in Availability and Clustering Software

NEC is an integrated IT vendor providing hardware, software, and IT services. In particular, it holds the highest market share for x86 servers in Japan and, in IDC's report issued in April 2010, it ranked first in terms of the number of x86 server deliveries in Japan with a 29.1% share. Please refer to *Japan Server 2010–2014 Forecast and 2009 Analysis* (IDC #JP1573109S, July 2010).

As mentioned earlier, NEC, which has developed and marketed HA clustering software EXPRESSCLUSTER, led sales in the APAC availability and clustering software market in 2009. It recorded particularly impressive results in Japan and has risen to take the top position in the entire Windows and Linux market. Please refer to *Japan Systems Software 2010–2014 Forecast and 2009 Analysis* (IDC #JP1677103S, September 2010).

Based on its performance in Japan, NEC has launched its product under the name of EXPRESSCLUSTER in other areas worldwide, including North America and Europe. In recent years, it has focused its product marketing in the APAC region, expanding sales in China and Southeast Asia, and it has even made forays into the India market. It will also venture into Latin America, the Middle East and Africa in the coming years as the market is expected to grow in these countries.

NEC's High Availability Solutions Strategy

NEC has launched its HA solutions strategy globally and is developing EXPRESSCLUSTER, its core product revolving around the following three axes:

- ☑ **Expansion of supported platforms.** Supporting rapidly growing new OS, new virtual base, and cloud infrastructure.

- ☑ **Enhanced core functions.** Enhanced failure detection and short switchover times.

- ☑ **Expansion of cluster usage area.** Disaster recovery operations and network device support, compatibility with application products, and so forth.

Expansion of Supporting Platforms

Increasing numbers of corporate and organization IT systems operate in a mixed environment comprising different types of OS such as Linux or Windows or a combination of different versions of OS such as Windows Server 2003 and 2008, and so forth. Thus, IT systems management will become more complex as the virtual environment will also comprise of different hypervisors. NEC is expanding the platforms supported by EXPRESSCLUSTER to support a mixed and complex platform environment that is composed of OS and virtual infrastructures. At present, it is still unclear which of the cloud computing platforms will become mainstream, but NEC will be able to support all of the options.

Enhanced Core Functions

A system can break down because of various reasons. Normally, it is very important to monitor the systems extensively and check whether the source of such failures is hardware, OS, or any application so as to be able to prevent and detect breakdowns. In case of a breakdown, failover is thus effectively and promptly implemented so as to

be able to maintain systems availability. NEC has enhanced core functions such as breakdown detection and failover to provide a highly reliable HA function. Its effectiveness can in particular to a great extent be seen in mission-critical areas.

Expansion of Cluster Usage Area

NEC has used the HA clustering software to develop its high value-added HA solutions. These in particular focus on disaster recovery. EXPRESSCLUSTER forms clusters between distant sites and has functions to recover both the data and applications in the event of a disaster. NEC has enhanced the scope of application of clustering to provide a high value-added HA solution.

Advantages of EXPRESSCLUSTER

This section discusses the market predominance of EXPRESSCLUSTER, NEC's HA clustering software.

Quick Multiplatform Support

One of the greatest features of EXPRESSCLUSTER is its compatibility with different platform environments. It supports the following OS:

☑ **Windows environment.** Windows Server 2008 R2, Windows Server 2008, and Windows Server 2003 (supports both Standard Edition/Enterprise Edition).

☑ **Linux environment.** Red Hat Enterprise Linux 5.5-5.1, Red Hat Enterprise Linux AS/ES 4, Novell SUSE LINUX Enterprise Server 11/10, Asianux Server 3, MIRACLE LINUX V4.0, Turbolinux 11 Server, Turbolinux Appliance Server 3.0, and CentOS 5.5-5.1/4.8-4.5.

☑ **UNIX environment.** Solaris10 10/08

NEC has been quick to respond to customer requests or market transitions. For example, relatively few official software products are compatible with CentOS, the currently popular Linux system, which is also said to be a free OS. NEC has quickly enhanced its product to support this OS due to increasing numbers of customer inquiries and forecasts of CentOS' growth in the future.

NEC is also focusing on the virtual environment. It supports the following virtual environments:

☑ VMware ESX, Windows Server 2008 Hyper-V, XenServer, Xen, KVM, Solaris Containers, and PowerVM

Hyper-V in particular will eventually become the mainstream in the virtual Windows environment. Many IT managers implementing HA are faced with virtual environments built with Hyper-V. KVM is the virtualization function of the standard Linux kernel, and Red Hat Enterprise Linux forms the major share in Linux. This is expected to be installed as the major open source hypervisor from now on.

NEC provides an integrated management function through EXPRESSCLUSTER Integrated Manager in a mixed OS or virtual infrastructure environment. The management of availability is thus unified, reducing the burden on IT managers.

Reliable Promotion of the High Availability Function in Mission-Critical Areas

In recent years, we can see that a lot of the OS or virtualization software packages come with HA function. They limit the scope of monitoring targets; hence, the service is stopped for longer hours during failover and cannot be managed centrally, so a lot of the parts are poorer in terms of function or performance than the software products made by a third party. Such bundled HA function, which can be installed at a low cost, are appealing but not really reliable. Reliability is the most important point especially in systems in which mission-critical databases or applications are operated.

NEC has expanded and enhanced the core function of EXPRESSCLUSTER in its continuous efforts to improve the reliability of HA in mission-critical areas. The character points are given below.

☑ **Reliably detects a large variety of faults.** It monitors a wide range of areas including the server, network, OS and applications to detect various errors and faults. It also normally monitors the standby server which makes it more reliable.

☑ **Surefire quick failover.** Since it uses an independent method without resorting to the SCSI reservation to control access to shared storage, this prevents failover failures. In the event that it detects an empty user store when the load is very high, various independent devices ensure the success of failover, such as by soft-resetting the OS and rebooting without fail.

☑ **Various split-brain mitigation measures.** NEC has several solutions to split-brain issues which are of great concern to many IT managers, such as different heartbeat path settings or automatic identification of heartbeat wireless routes, and so forth.

> Split-brain is a defect where all network communication links between production (active) and standby servers are disrupted and it is judged that production (active) server has stopped by mistake, triggering a failover to the standby system. Because of this, the same operation is ran on several servers at the same time.

Flexible Disaster Recovery Solutions

The major issue for a company or organization in an emergency situation such as a disaster or terrorist attack is to be able to continue their operations. Countermeasures for disaster recovery of IT systems that support their operations or services are in particular mandatory.

Disaster recovery using storage technology often becomes very costly and becomes an impediment to disaster recovery. This is why disaster recovery solutions using HA clustering software have become mainstream, and NEC sales of disaster recovery solutions using EXPRESSCLUSTER have grown considerably.

For example, in the event of a disaster, the system performs failover between sites beyond the scope of LAN, and mirrors the storage data successfully. Applications also automatically continue to operate during this time. Thus, this kind of configuration reduces the operating recovery time objectives (RTO), and the recovery point objectives (RPO) of data are also within easy reach. EXPRESSCLUSTER provides all of this in one package to enable disaster recovery at a low cost.

FUTURE OUTLOOK

Availability and Clustering Software Market Forecast

The APAC availability and clustering software market will continue to exhibit major growth. IDC forecasts that between 2009 and 2014, the CAGR will be 6.1%. Figure 6 shows the forecast market growth rate between 2010 and 2014. This shows not only the growth rate in Japan but also that for APAC (excluding Japan).

We can see tremendous growth in the coming years for APAC (excluding Japan). IDC forecasts indicate that from 2011 onward, the growth rate will be approximately 10%, and the 2009–2014 CAGR will be 9.1%. The requirements for HA using availability and clustering software will rise and installations will increase hereafter. Japan continues to show strong, steady growth. The market for UNIX is weakening, but the Linux and Windows markets will continue to grow at a rapid rate.

FIGURE 6

APAC Availability and Clustering Software Market Growth Rate Forecast, 2010–2014
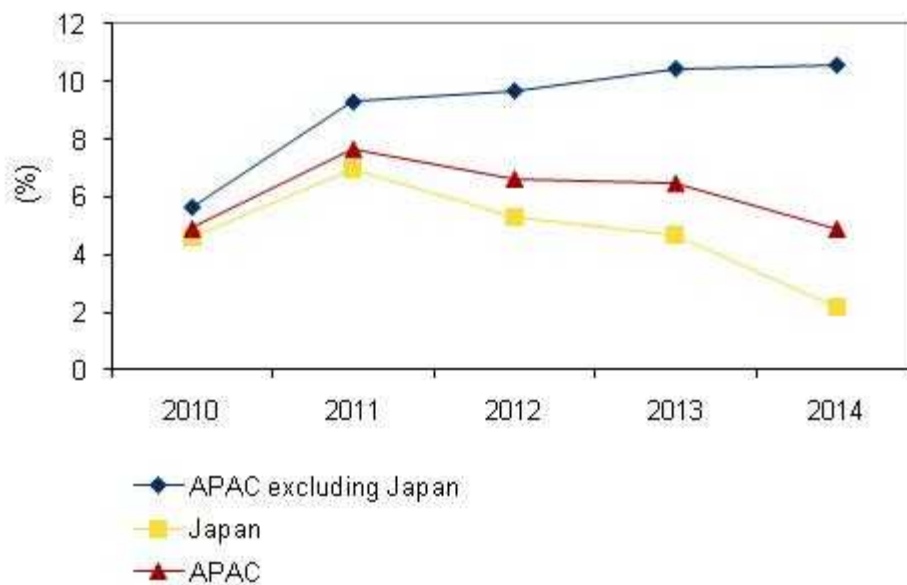
Note: APAC includes Australia, China (PRC), Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Taiwan, Vietnam, and Thailand.

Source: IDC, September 2010

Future High Availability Solutions

When a system stops in a company or organization due to unexpected phenomena such as hardware or software failure, natural calamity or terrorist act, and so forth, a solution to the problem must be found. At present, it is not an exaggeration to say that the reliability of an IT system, which is the base of the service provided to customers, clients, and employees, is a powerful indicator of company or organization performance. In this state of affairs, HA using availability and clustering software will play a very important role from now on.

On the other hand, the environment surrounding the IT system usually changes with the advancement of technology. Among these technologies, virtualization is causing a major impact and altering the nature of the platforms. At the same time, the major issue to be addressed is how to improve availability in a virtual environment. The virtual environment will also expand to mission-critical areas, and the importance of HA will become greater. With the advent of a mixed virtual infrastructure environment including hypervisors or guest OS, management of availability will become more complex. In these cases, HA reliability and management effectiveness deployed by OS or virtualization software package function are very often insufficient, and the value of third-party availability and clustering software supporting cross-platform functions will probably become very high.

The same can be said for global cloud computing. Currently, the format of various cloud computing solutions, such as public or private clouds, is subject to trial and error. However, in either case, the availability of the cloud platform will become a major issue. It is believed that HA using availability and clustering software will play a major role. Various procedures are being studied to identify the OS or hypervisor which the platform on cloud should be constructed with, as well as to cater to the various needs of the users; the possibility of constructing diverse platforms on cloud is very high. Consequently, supporting a cloud computing platform is associated with the ability to support a cross platform with a mixed OS or virtual infrastructure.

CONCLUSION

The market opportunities and issues faced by NEC relating to HA solution business and their recommendations to users are given in the conclusion of this white paper.

Market Opportunities and Issues of NEC

Market Opportunities

☑ NEC has already become a strong leader in the Linux environment for availability and clustering software, which is expected to grow tremendously in the coming years in APAC, and NEC's HA solutions will take its business to greater heights. HA solutions are expected to win over many more customers based on the know-how and impressive results shown in Japan, which has a high requirement level of availability in global terms.

☑ Virtual and cloud environments will lead to a cross platform consisting of mixed OS or virtual infrastructures. With the advent of the cloud generation, the NEC's rapid support for different platforms will have a major impact.

Challenges

☑ HA functions, which are incidental to the OS or virtualization software package, may bring down the market for third-party availability and clustering software. These functions are complementary in NEC or are linked to provide high value-added HA solutions to users.

Recommendations to Users

☑ **HA measures in a virtual environment:** HA reliability faces many risks depending on the applications running in the virtual environment. It is therefore necessary to thoroughly review the plan for platforms, including which applications will be virtualized in the future or the options for the virtual infrastructure or a guest OS, which can be mixed, as well as the HA of a virtual environment.

☑ **Investment in reliability:** The level of availability required in an IT system differs according to the company's scale, operations, and services. Among these, HA should never be compromised in a system that highly requires accessibility. A small compromise can lead to major losses. To improve reliability, it is important to ensure sufficient investment in HA, including availability and clustering software.

☑ **Effective utilization of diverse HA solutions.** The application scope of availability and clustering software such as in disaster recovery is very wide. Since there are many different HA solutions that can be implemented at a lower cost than other methods without losing reliability, it is essential to try out the different possibilities.

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