White Paper

Clustering Solutions for Achieving High Availability for Diversifying Platforms: The Future in Advanced Best Practices

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IDC OPINION

Companies and organizations consider improving the availability of the IT systems that support their businesses and services to be a crucial task that they must undertake. The use of clustering solutions that employ availability and clustering software is one of the most effective measures for increasing system uptime. NEC intends to provide a high degree of reliability to companies and organizations through the promotion of clustering solutions that use its EXPRESSCLUSTER products (called CLUSTERPRO in Japan). The major points of this white paper are as follows:

- In the Asia/Pacific (APAC) region, the market for availability and clustering software has continued to gain strong growth, and there is an increasing demand for high availability. In 2014, NEC retained its position as the number 1 vendor in terms of revenue share for the sixth year in a row, the company first having achieved that distinction in 2009.

- Availability and clustering software is being increasingly installed on x86 server platforms running Linux and Windows. NEC has firmly established its position as the leader in this niche in the APAC marketplace — for both Linux and Windows systems. The company's lead in 2014 in terms of revenue share among vendors, from Linux systems in particular, was considerable, with NEC taking 33.8% of the market segment.

- Going forward, improving the availability for IT systems built on new platforms such as virtualization and the cloud will be a crucial problem to solve. NEC has already begun work on tackling that problem, and has already succeeded in using availability and clustering software to improve the core database managed by a drugstore with over one thousand locations and the availability of its virtual platform; and to improve the reliability of mission-critical systems based on public cloud services and open source software used by a sushi delivery chain.

- NEC is accelerating its global strategy. The company is focusing in particular on offering clustering solutions in newly emerging countries that are adopting IT at a rapid pace. This report analyses three NEC business cases: improving the reliability for ERP systems in the manufacturing industry in India, and implementing disaster recovery (DR) solutions for both banks in Nepal and insurance firms in Saudi Arabia.

- NEC's strategy for the EXPRESSCLUSTER line is succeeding in expanding the horizon of possibilities for clustering solutions, largely through three major moves: quickly supporting a variety of platforms; improving reliability by upgrading core functions; and expanding the scope of application for systems like EXPRESSCLUSTER to more areas, including DR and the cloud.

- To foster more trust among their customers, partners, and employees, companies and organizations must make adequate investments to ensure the high availability of their IT systems. Furthermore, IDC believes that such companies and organizations would do well to select vendors that can flexibly support their needs and have highly reliable clustering solutions.

IMPROVING THE IT SYSTEM'S AVAILABILITY — A CRITICAL TASK

IT plays a crucial role in a wide range of activities in which companies and organizations engage. Much work is underpinned by IT systems, and nowadays it is almost taken as given that service will be available 24 hours a day, 365 days a year, across regional and national borders. In other words, companies and organizations depend on IT systems to the extent that they underpin operations on them. Consequently, the level of reliability demanded of IT systems increases with each passing day, and the high availability for IT systems can be said to be one of the most critical problems within IT strategy.

The single thing on which IT managers must focus the most is unforeseen system downtime. Clearly, system outages can cause loss of business opportunities because companies may have to halt doing business or offering services. Furthermore, there are various unquantifiable effects, including loss of trust among stakeholders such as customers, business partners, and owners of company stock. In part to avoid such situations, IT managers must protect data and application resources that are critical to doing business and providing services from sudden faults in hardware, OSs, and applications, as well as from disasters, such as earthquakes and fires. It is particularly essential to ensure high availability for mission-critical systems, such as those required for companies' core business (financial accounting, sales management, and so forth) and those for Web services aimed at customers (electronic commerce sites, online transactions, among others).

There are various means of increasing IT system availability. What is crucial, however, is the ability to transfer workloads to another hardware without stoppages to business or services when faults occur. This can be achieved through the use of clustering software. Such solutions are diversifying into different areas including failover solutions that transfer systems from operations servers to standby servers, as well as data mirroring and disaster recovery (DR). Moreover, virtualization and the cloud have quickly become fixtures of the IT world, and the improvement of availability for new platforms such as these will be an even more crucial task in the future.

IDC defines software that has features that increase system availability, including clustering software as *availability and clustering software*. This white paper presents an overview of trends in the APAC availability and clustering software market and considers the future for NEC's strategy for using its clustering software EXPRESSCLUSTER in clustering solutions. Specific NEC user case studies will also be analyzed.

CURRENT CONDITIONS FOR CLUSTERING SOLUTIONS IN APAC

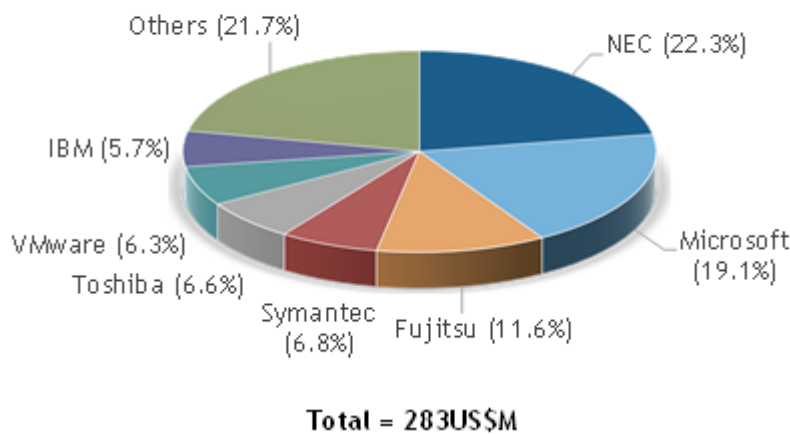## Trends in the APAC Availability and Clustering Software Market

In 2014, the size of the availability and clustering software market in APAC was US$282.52 million. The breakdown was US$194.52 million for the Japan market and US$88 million for the APAC market excluding Japan. Server virtualization has become common throughout the region, and there is an increasing trend of trying to achieve high availability for virtual infrastructure using availability and clustering software. Furthermore, those companies that are on the forefront of their industries have developed virtualization to move toward the use of private clouds, and there have been some cases of companies adopting availability and clustering software to improve the reliability of those clouds. APAC is also a region prone to disasters such as earthquakes, and there are an increasing number of companies making use of availability and clustering software to implement DR systems to ensure business continuity.

Revenue shares by vendor in the APAC availability and clustering software market in 2014 are shown in Figure 1. NEC, which developed and now sells EXPRESSCLUSTER, has the top share

in the market, at 22.3%. This is the sixth year in a row (since 2009) that the company has held that position.

APAC Availability and Clustering Software Market Revenue Shares by Vendor, 2014

Note: APAC includes Australia, China (the People's Republic of China), Hong Kong, India, Indonesia, Japan, South Korea, Malaysia, New Zealand, the Philippines, Singapore, Taiwan, Vietnam, Thailand, and others.

Source: IDC, November 2015

Clustering Solutions in the Major APAC Countries

Japan

Japan made up approximately 70% of the entire APAC market in 2014 at US$194.52 million. Because more companies are implementing mission-critical systems, including databases and enterprise resource planning (ERP), in virtual environments, high-availability solutions for virtualized environments that use availability and clustering software are the subject of much interest. These solutions are becoming absolutely indispensable to financial institutions in particular in which availability is desperately needed. In recent years, their application in social infrastructure systems such as traffic systems has also been increasing. Furthermore, Japan is a country with a high frequency of natural disasters, and as a result there have been an increasing number of cases of companies using availability and clustering software in DR solutions.

China

The size of the market in China in 2014 was $17.03 million, making the country the third largest market in APAC, after Japan and Australia. Major companies — including banks and firms in the securities, communications, and manufacturing industries — have continued to implement large-scale mission-critical systems. Demand for high-availability solutions that use availability and clustering software is thus increasing. In addition, a large number of companies have made progress in datacenter virtualization and the implementation of private clouds, adding to the

number of projects undertaken to achieve high availability for mission-critical applications in virtual environments.

India

The size of the market in India in 2014 was US$14.71 million — quite close to the scale of the market in China. The sectors driving the market are finance, communications, government, and IT services. In India, there are frequent power outages due to insufficient supplies of electricity, so high availability has become essential for IT systems. Windows-based servers are mainstream in India, but in recent years, there has been increased adoption of Linux-based servers, particularly among small and medium-sized businesses (SMBs). Because of this, clustering solutions for Linux systems are now receiving considerable attention. India is somewhat behind other major countries in terms of implementing virtualization, but it is expected that virtualization deployment will accelerate in the near future. Therefore, IDC believes that the demand for high availability in virtual environments will increase. The market is forecast to grow at a compound annual growth rate (CAGR) of 5.0% from 2014 to 2019. This is the highest rate among the major APAC countries, and a considerable market growth is predicted in the future.

Advanced Economies of Asia and Oceania

In 2014, the size of the market in the advanced economies of Asia and Oceania (Australia, Hong Kong, South Korea, New Zealand, and Taiwan) was US$41.95 million. Virtualization has become extremely widespread in Australia — which is the second largest market in APAC, after Japan — and there is an increasing demand for high-availability solutions for virtual environments. In South Korea, where the Internet content industry is growing rapidly, high-availability solutions have been increasingly implemented as a result of datacenter expansion. In the advanced economies of Asia and Oceania, IDC forecasts a CAGR of 3.0% from 2014 to 2019, anticipating strong growth.

Five Major ASEAN Countries

The size of the combined market in the five leading ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore, and Thailand) was US$13.62 million in 2014. Singapore, with a share of 62%, was the main driver of the market in the ASEAN Big 5. Numerous global firms have a presence in Singapore, and many datacenters have been constructed there. In particular, there are now more cloud-oriented datacenters in the said region. Awareness of high availability is extremely high, and the need for clustering solutions has been growing rapidly. In the Philippines — where numerous major firms have a presence — more companies are striving to implement DR measures.

Newly Emerging Countries in Asia/Other Countries in APAC

The newly emerging countries of Asia include Myanmar (where more major manufacturers are entering) and Laos, have had impressive economic growth. There are high expectations that these nations will be new growth countries within the APAC market in the future. Although the availability and clustering software market in these countries are still small, IT is being implemented at an extremely rapid pace, and as a result, demand for high availability in IT systems should grow.

Clustering Solutions for x86 Server Platforms: Increased Demand for Linux and Windows

In 2014, the size of the market for availability and clustering software for Linux in APAC was US$112.73 million. The market for Linux-based software constitutes 39.9% of the availability and clustering software market. The market for software that runs on Linux has grown because Linux is taking over the role formerly played by UNIX in mission-critical systems that require high availability. For example, the New York, London, and Tokyo stock exchanges have all adopted Linux as the platform for their trading systems. These are the examples that are most famous

globally, but companies and organizations in general are increasingly adopting Linux for mission-critical systems, and availability and clustering software solutions have been developed to increase availability when deployed on these systems.

In 2014, the size of the market for availability and clustering software for Windows was US$114.93 million. Virtualization is increasingly being used on x86 servers, and many of these servers run Windows and applications via hypervisors. High availability has become a requirement for such systems, and there are increasing opportunities to use availability and clustering software that runs on Windows.
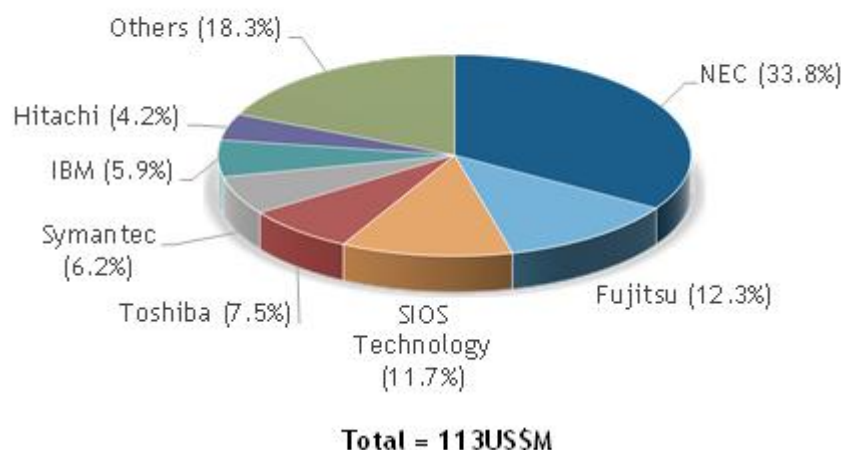
The growth of the market for availability and clustering software for Windows and Linux combined can be understood as the result of increasing needs for high availability on x86 servers. Servers with x86 architecture continue to be used more and more for systems in which downtime is unacceptable — including companies' mission-critical systems, online systems for financial and electronic commerce (EC) sites, and platforms for social networking services. Thus high availability is now required in more cases, and demand for availability and clustering software will increase to an even greater extent than before.

Shares of the Market for Linux-based Availability and Clustering Software

Figure 2 presents 2014 revenue shares by vendor in the APAC market for Linux-based availability and clustering software. NEC, which has the highest share of the overall market that includes non-Linux–based software, captured a 33.8% share of the Linux segment to become the market leader. The company turned its attention to the growth potential of the Linux market at an early stage and strove to launch and then enhance products that run on Linux before other vendors could, such as by making efforts to support a variety of Linux distributions. NEC has gained a diverse customer base that includes communications companies, government agencies, and manufacturers, as well as financial firms that have increasingly adopted Linux for mission-critical systems and for which NEC has performed large-scale implementations with 100 nodes or more. In addition to holding the top share for Linux-based solutions, NEC had the second-highest revenue share among vendors of Windows-based availability and clustering software in APAC, capturing 21.6% of the market. Thus NEC has established itself as the leader of the market in APAC for availability and clustering software for use on x86 server platforms.

FIGURE 2

APAC Linux-Based Availability and Clustering Software Market Revenue Shares by Vendor, 2014

Note: APAC includes Australia, China (the People's Republic of China), Hong Kong, India, Indonesia, Japan, South Korea, Malaysia, New Zealand, the Philippines, Singapore, Taiwan, Vietnam, Thailand, and others.

Source: IDC, November 2015

DEMAND FOR HIGH AVAILABILITY ON NEW PLATFORMS

The Importance of High Availability in Virtualized Server Environments

The adoption of server virtualization that uses virtual machine software — notably hypervisors — is currently becoming more prevalent at a rapid pace. The rapid rise in deployments of virtualized servers brings the benefit of greatly reducing the costs of hardware, operations, and maintenance that can be gained by consolidating physical servers. However, there is a corresponding rise in the level of risk associated with any given system because multiple applications are consolidated into a single physical server. For instance, when a physical server goes down, so do all the virtual machines running on it. The risk increases in step with the extent of server virtualization, which means that high availability will be sought to an even greater extent than previously.

Virtualization software packages that include hypervisors and modules with features for managing virtual environments sometimes also come with modules with features intended to provide high availability. However, there are many aspects in which such packages are inadequate in terms of high-availability features: among other shortcomings, they may have insufficient features for dealing with sudden failures, and they may be unable to monitor applications running on guest OSs. Therefore, it is crucial to use a third-party availability and clustering software to ensure high availability at every layer from the physical machine to the virtual machine and the application.

There are currently multiple options for hypervisors including VMware vSphere, Windows Server 2008 Hyper-V, and Windows Server 2012 Hyper-V, as well as open source software such as Xen

and KVM. Each option differs from its competitors in such terms as functionality, performance, and price. Users are beginning to adopt different hypervisors based on the intended use of the system or on other criteria, so mixed hypervisor environments are likely to become more common. If that happens, then vendors will need to contemplate ways of comprehensively managing the availability of virtualized environments that are deployed using different hypervisors.

Improving the Reliability for IT Systems in the Cloud Is Essential

There has been a notable increase in the use of public cloud services in recent years. According to IDC, the global public cloud service market grew by 27% YoY in 2014. Growth in newly emerging regions was particularly striking: the APAC region excluding Japan grew by 35%. An area in which there is rapidly increasing use of public cloud services is infrastructure as a service (IaaS), in which server and storage resources are provided as services. Notable examples of IaaS include Amazon Web Services, Microsoft Azure, and Google Cloud Platform.

The overall use of IaaS has increased because there has been an accelerating trend toward building corporate IT systems on IaaS. Benefits of IaaS from companies' perspectives are that they can build IT systems while only paying for the IT resources that they actually use — rather than paying to own these resources in-house — and that there is greater freedom to run different applications relative to software as a service (SaaS) in which the service provided is the direct use of specific applications. There are increasing numbers of cases of companies building and running mission-critical systems, such as ERP systems, on top of IaaS.

With IaaS, the level of service is guaranteed for the infrastructure, but not for the applications running on it. That is, users must take personal responsibility to respond to faults or problems that occur in applications. Furthermore, virtual machines and OSs running on IaaS also sometimes have problems, depending on the resource usage environment. To handle such situations, it is necessary to improve the availability of software running on IaaS. In addition, there is a need to properly ensure backup, mirroring, and other services for data stored on the cloud. The adoption of availability and clustering software that improves the reliability of IT systems on IaaS is one of the leading solutions for achieving this.

It is necessary to pay attention to the IaaS platforms on which a given piece of availability and clustering software is guaranteed to work. There are still few availability and clustering software packages that are explicitly guaranteed to work with IaaS, so it is necessary to confirm the available software options when selecting cloud services. Further, it must not be forgotten to confirm not only that the packages include not only guaranteed operation, but also management functions for cloud environments.

The public cloud service market will continue to grow in the future. IDC predicts that the 2014–2019 CAGR in the Japan market will be 20.5%, while that in the rest of APAC, excluding Japan, will be 22.7%. Both these growth rates exceed the global market forecast, which is 20.1%. Given these conditions, it is likely that demand for clustering solutions will increase as a large number of mission-critical IT systems are built on IaaS.

DR Delivered at Low Cost

Major disasters such as earthquakes always have at least some chance of occurring anywhere in APAC or in any other region worldwide. When companies are doing business, they must be aware of the many risks they face simultaneously, including earthquakes and other natural disasters, terrorism, riots, and wars. Asia in particular is a region that is prone to frequent earthquakes. It is necessary to consider both the primary risk of buildings collapsing and the risk of secondary damage, such as the disruption of the electrical grid or other essential infrastructure. To mitigate

risks from disasters of all kinds, companies' information systems must build DR systems at their datacenters.

The most important task when implementing DR systems is to minimize downtime during disasters. This is because it is pointless to prevent data loss by transferring data and applications to other datacenters via backups or other means if it takes time to restore systems to the point in which business as usual is again possible; lost opportunities during the time before systems are restored cannot be regained. Means of continuing operations at other datacenters without any downtime are required.

High-availability solutions that use availability and clustering software can be used to build such DR mechanisms. It is possible to build production environments that are run at primary datacenters by implementing clustering systems that use remotely located datacenters and failover capabilities. There are various solutions for DR, but this method is a solution that delivers a high degree of reliability at a low cost, and an increasing number of companies are implementing it. In addition, lately the number of companies that are considering the use of DR sites as IaaS as a powerful option is increasing.

NEC'S CLUSTERING SOLUTIONS

The Leading Company for Availability and Clustering Software

NEC boasts the top share of the Japan x86 server market. According to an April 2015 IDC report, NEC had the number 1 share of x86 server unit shipments in Japan: 23.9%.[1]

As mentioned previously, NEC — the developer and vendor of EXPRESSCLUSTER clustering software — had the largest 2014 revenue share in APAC of any vendor in the availability and clustering software market. The company has an especially strong track record in Japan, having captured top shares domestically for both Windows-based systems and for Linux-based systems, as well as in the market overall.[2]

1. *Japan Server 2015-2019 Forecast and 2014 Analysis* (IDC #J1573113X, June 2015)
2. *Japan System Software 2015-2019 Forecast and 2014 Analysis* (IDC #J1677111X, August 2015)

EXPRESSCLUSTER: The Core of NEC's Clustering Solutions

As NEC plays out its clustering solution strategy globally, it is developing its core product EXPRESSCLUSTER primarily in the following three directions:

- **Expanding the number of supported platforms in anticipation of mixed OS and virtual infrastructure environments.** It is likely that companies' and organizations' IT systems will increasingly consist of mixes of different types of OS — such as Linux and Windows — or mixes of different OS versions — such as the 2003, 2008, and 2012 releases of Windows Server. Another reason that the management of IT systems may grow more complex is that virtual environments could be implemented using different hypervisors. To meet the needs of platform environments in which there are complex mixes of OSs and virtual infrastructure, NEC is expanding the number of platforms that EXPRESSCLUSTER supports. It is currently unclear which cloud computing platform will become predominant, but NEC will be able to support any option that its customers might choose.

- **Improving reliability in mission-critical areas.** There are a wide variety of causes of system failures. It is crucial to monitor every part of the system to determine if any failure that might occur originates from a hardware, an OS, or an application problem and to ensure that failures are detected in the first place. It is not possible to maintain system availability

until failover capabilities that work both reliably and swiftly in the event of a failure have been implemented. With EXPRESSCLUSTER MC (HA Series), NEC offers a highly reliable clustering solution for mission-critical Windows- and Linux-based systems that require high availability, which have become more common in recent years. The solution dramatically reduces downtime and improves reliability to the maximal extent by predicting, detecting, and preventing failures.

- **Expanding the areas in which clustering is used.** NEC aims to develop high value-added, software-based clustering solutions. In particular, the company is focusing on DR. EXPRESSCLUSTER that comes with features for creating clusters that contain sites located far away from the primary site and for restoring both data and applications after a disaster has struck. Furthermore, it has become much more common in recent years for companies to use cloud services such as IaaS, and NEC has made it possible to offer EXPRESSCLUSTER-based clustering solutions for systems built in the cloud. NEC is continuously developing new products and technologies aimed at increasing the scope of applications for clustering. It strives to supply clustering solutions with even more value added than it does now.

Fourth-Generation EXPRESSCLUSTER (D Series)

NEC is continuously attempting to add to the EXPRESSCLUSTER lineup and to upgrade the series' features. In 2015, NEC added the new fourth-generation of EXPRESSCLUSTER D Series to its lineup of products. Owing to the increasing need for high-availability in newly expanding infrastructure environments such as cloud and DR, NEC is bolstering the compatibility of its products with clouds, and has completely redone its architecture in order to achieve further improvements in DR availability. The main advantages of the EXPRESSCLUSTER D Series are summarized below.

- **Clustering in cloud environments using object storage.** Products in this series enable clustering that stores data in-house, in on-premises environments to object storage in cloud environments, allowing the data to be obtained from standby servers on the cloud environment in which it was stored, in the event of a disaster. This eliminates the need for standby servers on the cloud environment to be running at all times, reducing operating costs.

- **The adoption of intelligent mirroring formulas.** In addition to a synced mode that mirrors data immediately on adjacent servers, and a non-synced mode that allows continuous mirroring of data to a remotely located server, NEC has also added a snapshot mode that mirrors data by creating restore points at specified regular intervals. Further, the system can switch over to any of these three modes automatically based on the communication status between the mirroring servers.

- **Achieving data mirroring on multiple standby servers.** The new product series makes it possible to mirror data on multiple servers, and even allows users to build multilevel configurations like 1:N, 1:M:N, and so on. This enables users to achieve clustered mirroring using a wide variety of configurations.

- **Achieving high operability.** The graphical user interface (GUI) for these products allows for lightweight and quick usability. They are also compatible with Chef, the open source automatic configuration management tool, making it possible to automatically configure clustering environments in cloud environments.

NEC plans to continue to add even more to the functionality of the EXPRESSCLUSTER D series. The vendor aims to make constant availability a reality for users, regardless of whether they are working in an on-premises environment or a cloud environment.

Global Strategy

NEC is expanding its offerings of clustering solutions by releasing products under the EXPRESSCLUSTER brand name in North America, Europe, and in other regions around the world. The company is able to achieve this because of its existing track record within Japan. Recently, NEC has considered APAC to be one of its areas of focus and has had growing sales results in the region, particularly in the large-scale markets of China and India. The company also does sales in newly emerging Asian countries — including Nepal and Myanmar — from which NEC has begun to see results. In addition, NEC has established a menu of implementation support services for English-speaking markets using an India-based support team, helping to improve the company's worldwide support network. NEC also makes use of its global network to support Japan firms entering overseas markets in regions around the world. Descriptions of NEC's strategies in major countries and regions are provided below.

Asia/Pacific Region

- **China.** NEC has developed clustering solutions primarily for communications carriers, financial firms, government, the medical industry, and education. It has racked up considerable results from these areas. The company has also started to have good results among retailers and other types of businesses. NEC aims to establish a 24-hour support system, to offer packages designed for SMBs, and to increase the number of regions within the country in which it does business and offers support. These attempts are improving NEC's already strong business structure in China. NEC is also focusing on joint ventures with local partners in the vast country that is China. The company is also striving to bolster existing partnerships with local solutions vendors — including hardware vendors, software vendors, and systems integrators — as well as to establish a larger number of new partnerships.

- **India.** NEC has established a 24-hour maintenance system with an India-based support team that serves EXPRESSCLUSTER users throughout the English-speaking world. Sales in this market are made through NEC's local sales company, but NEC is able to offer its India customers' cohesive solutions that include everything from sales to support in a manner that is tailored to the India market because of the partnership between the sales company and the support team. In addition, NEC has developed solutions for the India market that pair EXPRESSCLUSTER with products from independent software vendors (ISVs) and local partners.

- **Newly emerging Asian countries.** NEC has joined with ISV partners with strong presence in local industries to develop solutions for the newly emerging Asian countries that have recently experienced remarkable growth and are rapidly implementing IT. One example of this is NEC's work in the Nepalese banking industry, which will be explained in more detail in a later section. NEC also supplies low-cost appliances with EXPRESSCLUSTER installed for configuring clusters in Bangladesh and Sri Lanka. Otherwise, NEC has launched EXPRESSCLUSTER in various newly emerging Asian countries, including Myanmar, Laos, Cambodia, and Mongolia.

Europe/Middle East Region

- **Europe.** In Europe, NEC is aggressively marketing a total solution called Smart Enterprise to enterprise customers. With this solution, NEC is putting its energies into ensuring availability, as well as into the EXPRESSCLUSTER software itself, among other efforts.

- **Middle East.** NEC is proceeding with expansion into the Middle East region with a focus on Saudi Arabia. The company will improve particularly its DR solution offerings because the Saudi government has mandated the implementation of measures to handle climate change–related disasters — such as flooding — that the country is not used to dealing with and for which it is unprepared. A user case study will be provided in a later section.

The Americas

- ▪ **North America.** NEC is strengthening its ties with local ISV partners in North America. For example, NEC has developed DR solutions that combine EXPRESSCLUSTER with applications provided by physical security vendors. These solutions are often delivered to customers requesting high availability. It is also putting energy into solutions for managed service providers.

USER CASE STUDIES

This section presents case studies of user companies that have implemented clustering solutions that employ NEC's EXPRESSCLUSTER (known as CLUSTERPRO in Japan).

Achieving High Availability for Mission-Critical Databases for Management of a Drugstore Chain with over 1,000 Locations: Fuji Yakuhin

Fuji Yakuhin Co., Ltd.is a major household drug distributor in Japan. The company has opened over 1,000 drug store locations, including Drug Seims. The group is also focused on developing prescription medical products.

Problem: Database Limits Revealed through Business Expansion

In the course of expanding its drugstore business and increasing the number of drugstores Fuji Yakuhin operates through mergers and acquisitions (M&A), the company began to approach its upper limit in terms of the performance of its mission-critical database, which it uses for product master management, as well as sales and inventory management and more. The company decided to completely renew its database platform to enable smooth mergers and acquisitions, stable operations of store systems, and increase the efficiency of ordering business at roughly another 1,200 stores.

Availability Equivalent to an FT Server or Better

After reviewing the proposals of several different companies, Fuji Yakuhin adopted the NEC EXPRESSCLUSTER and Express5800/Scalable HA server as its new database platform, VMware vSphere as its virtualization platform, and the InterSystems Cache high-speed DB as its database. In preliminary evaluations, processing performance with the NEC database server was proven to be dramatically superior to the company's former systems, with sufficient scalability to handle future business expansion. In terms of ensuring availability, Fuji Yakuhin evaluated the new systems highly, judging them equivalent or better than the fault tolerant (FT) servers their system had been using previously.

Solution: Achieve a Robust System through HA Servers and Clustering

The scalable NEC HA server that the company adopted as its database server divides the CPU, memory, and other resources inside the case into two physical servers and allows them to operate separately as a dual server. In Fuji Yakuhin's case, the dual server is located within the headquarter premises where one server runs the OS systems for the directly operated stores, whereas the other acts as the virtual servers for its group companies. In addition, the company prepared a standby scalable HA server with identical specifications for clustering using EXPRESSCLUSTER. Considering the possibility of a case failure of the HA server, one of the advantages of this is using a clustering configuration between two cases to increase the availability of the system as a whole. By doing so, the company now has a robust database system that will reliably allow it to carry on work no matter what sort of failure occurs. In addition, thanks to the

adoption of EXPRESSCLUSTER SingleServerSafe in this virtual platform, failures in the virtual machine or databases running on it can be detected and restored.

Effects of Implementation: Doubling Availability with Hardware and Software

The new mission-critical database systems have already been put into actual use and are running smoothly. The performance of the database, which was an issue before, has improved greatly, and the batch processing of sales management data which took 20 hours with the company's previous system can be completed in around two hours. The person in charge of the information systems department at Fuji Yakuhin said, "The monthly accounting processing for the entire group, including all subsidiaries, has been sped up significantly, meaning that we can now make accurate management decisions more quickly." The high availability achieved through doubling the hardware and software levels is what supports this high level of performance. All of this is made possible through the diverse clustering solutions of EXPRESSCLUSTER, which is compatible with all platforms. Going forward, Fuji Yakuhin will be considering improvements in work efficiency through automation of ordering work for each store location and sales promotion using sales analysis and CRM. IDC's analysis is that NEC has been able to give Fuji Yakuhin a business platform that will allow it to promote its drugstore business without worry, having built a database system with high levels of reliability and robustness by combining high-availability servers and clustering software with virtualization technologies.

Successfully Improving the Reliability of its Production Line while Taking Advantage of the Benefits of FileMaker Server: Ushio Inc. (Japan)

Ushio Inc. deals globally in products that employ optics, including industrial light sources, based on the company's core activity of developing new light sources and optical technologies. Many of Ushio's products in the areas of optical equipment and discharge lamps have the largest shares worldwide.

Problem: Improved Efficiency through the Use of a Database System Comes with Concerns about 24-Hour Operations

Ushio's Third Manufacturing Division implemented a manufacturing process management support system for its specialized industrial lamp production line using FileMaker Server. This allowed the division to check instructions and diagrams using tablets and improved efficiency. The fact that a system meeting the actual conditions on the ground could be built — even by those outside the IT department who were not particularly well versed in such a system at a specialist level — was very well received in the division generally. The IT department, however, grew concerned because, as the system came to be used more frequently, the risks of a system halt grew more severe. Without adequate mitigation measures, it was feared that the effects of a stoppage might spread to other production lines. In response, the IT department noted that the system needed to be made redundant.

The Best Choice for Increasing Availability While Still Enjoying Ease-of-Use

Systems implemented using FileMaker Server are easy to use and provide the benefit that they can be rapidly updated to reflect requests for improvements from the people who manage the system. However, because someone with little specialist IT knowledge was in charge of developing the system, it had the drawback of possible low reliability. The production line ran 24 hours a day in three shifts. Therefore, there was a considerable risk that, if the system went down early in the morning or in the middle of the night, production would remain halted until the person in charge of the system could get to it to fix it. Because of this risk, Ushio turned its attention to EXPRESSCLUSTER, which is partner-certified to work with FileMaker Server.

EXPRESSCLUSTER was the best choice for Ushio because it allowed the company to duplicate its FileMaker Server system at low cost and enabled automatic recovery — all while still leaving Ushio to enjoy the benefits of FileMaker Server in terms of ease-of-use.

Solution: Continue Work Without Stopping the Production Line When Faults Occur

Ushio duplicated its FileMaker Server-based manufacturing process management support system using EXPRESSCLUSTER and two NEC Express5800 x86 servers. During normal operations, one server is active while the other is on standby. EXPRESSCLUSTER automatically detects when a fault has occurred in the server, network, or OS — as well as when FileMaker Server has thrown an exception or the system has halted. Using the solution's failover feature, the standby server is able to take over processing and data when EXPRESSCLUSTER has detected one of these issues. Thus the company was able to continue work without stopping the production line, and the reliability of the overall system was increased significantly.

Effects of Implementation: Workers on the Line and the IT Department Assured and the Scope of System Implementation Expanded

Because EXPRESSCLUSTER reduced the risks associated with 24-hour operations, Ushio was able to roll out the same manufacturing process management support system to multiple other production lines. Currently, the system has been expanded to cover more than 70% of processes at the company's Third Manufacturing Division. In addition, previously the production department managed the FileMaker Server system, but with the installation of EXPRESSCLUSTER, the IT department now handles server administration. This has reduced the management burden on the line. Furthermore, multiple people — including the person in charge from the IT department — are now always able to monitor the system, increasing reliability. A person responsible for the Ushio production line commented, "We have been freed from our worries about the system going down, and we can now go on to implement the same system on more production lines, including in other departments." This solution pairing EXPRESSCLUSTER and FileMaker Server delivered an easy-to-use system that reassures both those on the ground and those in the IT department without harming productivity.

Increased Availability for Mission-Critical Systems Built on the Cloud Supporting a 24-hour Sushi Delivery Business: Ride On Express (Japan)

Ride On Express Co., Ltd. (REX) has launched a variety of catering businesses that deliver meals to customers' homes, including the sushi delivery chain Gin no Sara — which has more than 350 locations throughout Japan — and Kamatora — whose over 150 locations deliver *gozen*, or upscale, traditional Japanese meals.

Problem: Improving Scalability and Reliability

In the delivery business, future marketing strategies that companies adopt are strongly influenced by trends in daily revenue and in customer data. Therefore, REX needed to analyze and to utilize large volumes of data and sought to upgrade to a database system that would let the company understand its customers more easily. REX had launched numerous types of food delivery chains — offering fried pork cutlets, curry, and other types of cuisine — in addition to its sushi and gozen chains. As a result, REX's business systems were highly complex and intricate, and it was not an easy task to add new systems when launching more types of delivery service. Thus REX required a system that combined, on one hand, flexibility and scalability so that new systems could be added easily, and on the other, a level of reliability that could ensure that the system would operate 24 hours a day, 365 days a year without stopping — an essential requirement in the home delivery business.

Making Use of the Cloud and Open Source Software

REX considered using an IaaS cloud service as a new platform that would provide extensibility, and the company eventually decided to use IDC Frontier's NOAH Platform Service. Building the system in the cloud was intended to rein in costs, so REX opted for an open source software (OSS)-based system with Linux as the OS and MySQL as the database.

Solution: Build a System with Something as Essential and as Unobtrusive as Oxygen

To achieve its other goal of high reliability, REX adopted a clustering solution that uses EXPRESSCLUSTER. REX was drawn to EXPRESSCLUSTER because of its proven track record of being run with OSS, such as Linux and MySQL, and being verified to work with numerous cloud environments. Furthermore, REX could not shut down its systems during the busy seasons when there are influxes of orders — including around New Year — so NEC's 24-hour support system was another major reason why REX went with EXPRESSCLUSTER. There were concerns that the switchover from the clustering functions of Oracle Database, which REX was using at the time, to clustering based on a combination of MySQL and EXPRESSCLUSTER would complicate operations. In such an event, however, operability was dramatically improved. A person involved in the development of REX's system, which was done by Universal Solution Systems Inc., commented, "EXPRESSCLUSTER is as essential to developing clustering solutions as oxygen is to life — and just as unobtrusive."

Effects of Implementation: Combination of the Cloud and EXPRESSCLUSTER Highly Effective

Compared with the cost of building REX's previous clustering system with Oracle Database on UNIX, the EXPRESSCLUSTER-based system was about one-tenth as expensive. By using cloud, REX was able to cut hardware costs considerably, including those for storage. In addition, EXPRESSCLUSTER made it possible to change the settings for all virtual machines in the cloud at once. Moreover, the software has features for importing and exporting settings files, so REX was able to save multiple different settings and switch among them at will. Implementing a combination of the cloud and EXPRESSCLUSTER provided significant positive effects in terms of both cost and operations management.

Cloud-Based DR Solution for the Banking Industry: Mercantile (Nepal)

Mercantile Group does all kinds of business in Nepal — notably IT but also housing, finance, media, publishing, and environmental engineering, among others. The group's oldest business, Mercantile Office Systems Pvt. Ltd. (MOS), offers the application solution Pumori for banking.

DR Mandated in the Banking Industry

Nepal companies have been rapidly adopting IT in recent years. The banking industry, in particular, is heavily reliant on IT systems for managing operations and data. Because of this dependency, there are considerable risks if IT systems stop because of system faults, natural disasters, or other contingencies. Despite the risks, using IT systems for data and applications is particularly crucial for banks. Furthermore, banks require availability 24 hours per day, 365 days per year, so the Nepal Rastra Bank (the country's central bank) has mandated that all Nepal banks implement adequate DR solutions.

Problem: Banks Must Break Free from Old DR Methods

The majority of Nepal banks used simple measures such as traditional backups as their DR method, backed up data being stored in the banks' vaults. However, server failures often continue for hours or days, so the methods the banks were using at the time were hardly effective. Nepal

banks were thus unable to fully comply with the mandate, and improving this situation became an extremely critical task for the banks.

Solution: Offer DR via the Cloud with a Datacenter 300 Kilometers Away

Mercantile, which was the IT solutions vendor with the majority of Nepal's banks as its customers, was in search of a superior DR solution to offer to banks. After evaluating multiple DR products, Mercantile opted to use NEC's EXPRESSCLUSTER. With EXPRESSCLUSTER, Mercantile could provide its customers failover capabilities that would rapidly switch operations over to cloud-based systems located in a Mercantile datacenter 300 kilometers away in the event of a system failure. Furthermore, the software made operations extremely seamless and allowed Mercantile to improve the operational efficiency of its cloud. Thus Mercantile could offer its customers a cloud solution that allowed them to run banking applications 24 hours per day, 365 days per year.

Effects of Implementation: Availability of Banking Services Maximized

Mercantile implemented highly reliable banking cloud solutions for several banks using EXPRESSCLUSTER and MOS's banking applications. ACE Development Bank aimed to maximize the availability of its services, that is, minimize the length of service outages. This cloud solution allowed ACE to reach that goal. During blackouts that caused the bank's systems to stop, the cloud hosted in Mercantile's datacenter located 300 kilometers away now takes over the system's tasks. Pradip Nepal, who is in charge of IT for ACE Development Bank, commented, "Server failures are inevitable for us. But we can recoup all of our investments because EXPRESSCLUSTER prevents business losses." The IT manager at NMB Bank, which implemented the same solution, offered a positive evaluation: "EXPRESSCLUSTER is extremely effective as a DR product. Moreover, it is easy to use despite its high functionality, and it can be implemented in a short amount of time." Finally, a developer at Mercantile commented, "It would be a good DR solution for banks of any kind," demonstrating considerable expectations.

DR for an Insurance System that Cannot Have Downtime: United Cooperative Assurance Company (Saudi Arabia)

United Cooperative Assurance Company (UCA) is a leading Saudi Arabia insurance company that is listed on the Saudi Stock Exchange (Tadawul). Since UCA's establishment in 1974, it has offered a variety of insurance services, including asset, damage, liability, cargo, hull, aviation, life, health, and credit insurance.

Problem: Achieving Zero Downtime

Because of the particularities of the insurance business in which UCA is involved, it cannot stop operations in any situation; indeed, the primary role that insurance plays comes to the fore when disasters occur. Furthermore, the various personal information and data that UCA retains regarding its customers must be treated carefully — loss of data is unacceptable. To achieve zero downtime for UCA's system — which was implemented using Oracle applications and which supports the firm's approximately 200 insurance dealers — the company needed to find a clustering solution that came with DR features. That solution also needed to provide the high availability that the Saudi government demanded while still making operational management simple at both the primary site and the secondary site (the site for recovery).

Solution: Implement a Clustering Solution Equipped with DR

UCA was about to upgrade to new versions of Oracle Database, which it was using as its main database, and of Windows, and it looked into deploying a clustering solution at the same time that it migrated to the new server. In response, NEC teamed up with its local partner, NajTech, and combined EXPRESSCLUSTER with a fault-tolerant server (no-downtime server) to propose a robust and low-cost clustering solution that was simple to manage. UCA was very pleased with this

proposal and also evaluated NajTech's support highly, so UCA accepted NEC's proposal. The system was set up in just three months with the help of four of NajTech's NEC-certified engineers and two of NEC's engineers in charge of the Middle East region. UCA was able to successfully complete the project with only three of its own staff members, an IT department manager, and two senior engineers.

A fault-tolerant server equipped with EXPRESSCLUSTER and storage in the form of storage area network (SAN) was used to implement the insurance system. A branch of the company located 30 kilometers away from the head office was used for the DR site, and both sites were connected via the corporate WAN. Failover would be conducted in the event of a problem at the working site, and operations could be resumed within 20 minutes. The DR site was also used for other purposes, including as a file server, for email, as a database, and for backup.

Effects of Implementation: Effectiveness of NEC's Clustering Solution Proven by Flood

UCA gained the following benefits by adopting NEC's DR-ready clustering solution:

- A 15% increase in the productivity of operating staff
- A 90% reduction in downtime for the main database
- A 20% increase in user satisfaction

When Jeddah, a city that is a major center of commerce in Saudi Arabia, was hit by a flood in 2011, the company was able to switch back over to online mode via the DR site in a matter of minutes. Labib Assaf, manager of UCA's IT department, stated, "It was really a wise decision to select NEC and NajTech as technology partners. Our choice proved to be right even given the sad occurrence of the Jeddah floods of 2011."

Improving the Reliability of the ERP Underpinning an Automotive Component Manufacturer's Quickly Growing Business: Nipman Fastener Industries Pvt (India)

Nipman Fastener Industries Pvt (Nipman) is a manufacturer headquartered in India that develops fastening parts (bolts, lock nuts, screws, and so forth) for automobiles. Nipman possesses world-class technologies and best practices and is rapidly growing within the automotive industry.

Problem: Reliability for Highly Risky ERP Must Be Improved

Nipman's ERP manages customer orders, so it is accessed from the company's four manufacturing plants in India. Because of this, any downtime for the ERP system would mean serious risks, as it would cause delays in transactions, affect customers significantly, and harm Nipman in terms of both revenue and corporate trust. Thus, to continue to provide its customers high-quality service, Nipman looked ahead to the future and sought a high-availability solution for ERP and related databases.

An Easy-to-Use Interface and Automatic Failover for Databases

To improve business continuity for its core applications, Nipman opted for EXPRESSCLUSTER, a solution that fulfilled the requirements of the company's IT department. Nipman was impressed by the fact that EXPRESSCLUSTER came with an easy-to-use interface for operational management, as well as that it could offer rapid, automatic failover and recovery of the various data the company stored in its databases — including those for sales, customers, and orders — during any failure in the hardware, OS, or application. Another aspect of the solution that was well received by Nipman was that it could minimize downtime not just after faults but also during IT infrastructure maintenance.

Solution: Provide Recovery within Two Minutes at the DR Site

NEC delivered a DR solution using EXPRESSCLUSTER for both the Microsoft Dynamics ERP system and the Microsoft SQL Server database software at the main site, which were accessed by users at Nipman's manufacturing plants. Microsoft Dynamics is an ERP application that is rapidly growing in popularity worldwide. With the new system implemented, Nipman could rest assured that when a fault occurred, its ERP and databases would automatically fail over via WAN to the DR site located 25 km away. Furthermore, it became possible to recover within two minutes from the server going down. Nipman's data were also replicated, providing business continuity 24 hours per day, 365 days per year.

Effects of Implementation: Service Level of 99.99% for Mission-Critical Systems Achieved at Low Cost

Now that Nipman had installed EXPRESSCLUSTER, it could run its ERP and databases — for which it had worried about downtime — at peak capacity. In addition, downtime after failures was dramatically reduced, regardless of whether the fault was in the server, the application, the database, or the network. Nipman's IT department successfully achieved a service level of 99.99% for the company's mission-critical systems at an extremely low cost.

FUTURE OUTLOOK

Availability and Clustering Software Market Forecast

IDC forecasts that the APAC availability and clustering software market will expand at a CAGR of 1.6% from 2014 to 2019. IDC forecasts a CAGR of 2.5% for APAC excluding Japan from 2014 to 2019. Demand for high availability for IT systems through the use of availability and clustering software is high, and an accelerating number of implementations are expected in China, India, and emerging Asian economies. This region is prone to natural disasters, so the use of DR systems is also likely to increase. In Japan, where the market is mature, growth looks set to continue at a robust pace; IDC forecasts a CAGR of 1.2%. IDC believes that the market for x86 server-based Linux and Windows platforms will continue to register high growth, in general, throughout APAC.

The Future of Clustering Solutions

Growing Possibilities for Clustering Solutions

Unscheduled system downtime due to hardware and software failures, natural disasters, terrorism, and other such unexpected events is an ever-present challenge faced by enterprises and organizations. It is no exaggeration to say that the reliability of IT systems that serve as service infrastructure to cater to customers, business partners, and employees is now a performance indicator for enterprises and organizations. In this context, high-availability solutions based on availability and clustering software will play an even more important role in the future.

The greatest advantage of availability and clustering software is that it can be used flexibly to implement diverse clustering solutions. This software is able to meet diverse needs, from one-to-one failover to DR via a remote site. It is able to offer many options for solutions tailored to varied user budgets, system configurations, uses, operations to be conducted after deployment, and other criteria. It can guarantee high reliability in addition to providing flexibility.

Availability and Clustering Software That Supports Mission-Critical Systems

This report introduced the case of Fuji Yakuhin in Japan, which was able to achieve high availability by using availability and clustering software in the mission-critical database systems that manage its sales and revenue data for more than 1,000 drugstore locations. In the cases of Ushio (Japan) and Nipman (India) as well, both companies succeeded in improving the reliability of

the mission-critical systems underpinning their manufacturing business by using availability and clustering software. Supply chains continue to globalize, and mission-critical business systems are now required to operate 24 hours per day, 365 days per year. For such systems, high availability is essential.

The two user case studies of DR in the financial services industries of Mercantile (Nepal) and UCA (Saudi Arabia) proved that high levels of reliability can be achieved with availability and clustering software. Finance requires higher degrees of availability for its IT systems than so do other industries, so best practices here can surely be applied in many other fields.

Availability and clustering software offers a flexible means of addressing increasingly diverse needs for high availability and is expected to play a significant role in improving availability and providing DR for IT systems in countries and regions with vastly disparate geographies, cultures, and business practices.

Improving the Reliability of Virtual Environments

The environments in which IT systems operate are undergoing continuous changes as technology evolves. Virtualization plays a significant role in this and is greatly changing the nature of platforms. As a result, improving availability in virtual environments is now an important challenge that organizations must undertake. Virtualization has begun to be introduced into mission-critical domains as well, and this is increasing the importance of improving availability in virtual environments.

Increased mixing of virtualization infrastructure, such as hypervisors as well as guest OSs, would continue to make the management of availability more complex. If this happens, then the use of only the functions built into the OS or virtualization software will often not result in sufficient reliability or efficiency. IDC believes that this would further serve to highlight the value of a third-party availability and clustering software compatible with cross-platform environments. In the case of Fuji Yakuhin, it is a fact that the availability of the virtual platforms used by the company was improved through the use of availability and clustering software.

Improving Reliability in a Wide Range of Cloud Environments

Cloud services are making rapid inroads in the corporate world. According to an IDC study, the global public cloud service market was worth US$57.8 billion in 2014 and has a forecast CAGR of 20.1% from 2014 to 2019, which should result in a market size of $144.7 billion in 2019. High levels of growth are expected for all regions, with particularly significant expansion in emerging economies, such as those of Asia and South America.

In such an environment, a growing number of companies are turning to cloud service platforms for their core corporate systems, as the REX case demonstrated. There will likely be more such cases as the use of cloud services expands. One of the most important challenges will be ensuring the availability of applications running in the cloud, including on IaaS. Although minimum levels of availability are guaranteed by cloud services, it is nevertheless important for users themselves to increase availability in order to enhance reliability.

The case of REX demonstrates the best practice of combining public cloud services with availability and clustering software to cut costs and improve reliability simultaneously, even if these two goals might seem at odds with one another. Increasing availability also has a large role to play in private clouds implemented in corporate datacenters. Finally, in the future, clustering solutions will likely be an essential component of a wide array of hybrid cloud environments, including those consisting of different public clouds or of both public clouds and private clouds.

CONCLUSION

To conclude this whitepaper, we will summarize NEC's market opportunities and challenges in the clustering solutions business and provide recommendations for users.

NEC's Market Opportunities and Challenges

Market Opportunities

- NEC is already entrenched as the leader of the APAC market for availability and clustering software for Windows and Linux — a market set to grow even more in the future — and NEC's clustering solutions business is expected to continue growing. NEC's clustering solutions, which are based on the abundant experience and know-how it has gained in Japan — where availability requirements are high — appear able to gain the trust of countless customers around the globe.

- Demand for DR is on the rise in countries prone to natural disasters, regardless whether their economies are advanced or emerging. The threat of human-made disasters including terrorism grows every year, making DR an absolute necessity everywhere, regardless if natural disasters occur or not. NEC's DR offerings, which are low-cost and easy to implement, should prove to be attractive solutions for many clients.

- There has been a rapid increase in the use of virtualization and the cloud in countries around the world, and system environments will be increasingly cross-platform (combinations of various environments). NEC develops clustering solutions for the cloud and a wide range of other platforms, and these solutions should offer significant positive effects for clients.

Challenges

- High availability features added to OSs and virtualization software packages, as well as clustering solutions integrated into cloud services, could pose threats to a third-party availability and clustering software. NEC will need to offer users higher-value clustering solutions by supplementing or linking with these features.

Recommendations to Users

- **Invest in reliability.** The level of availability required of IT systems depends on the industry of the enterprise, as well as its size, business tasks, and services. In systems requiring a high level of availability, users must not, under any circumstances, compromise on high availability. A small compromise can often lead to a large loss. To increase reliability, it is imperative to invest sufficiently in high availability, including by investing in availability and clustering software.

- **Make effective use of diversifying clustering solutions.** No one knows when disasters might occur. Users must always be prepared for all sorts of unexpected events. The scope of application for availability and clustering software is expanding, including into DR. Various possibilities should be explored and tried, as there are many clustering solutions available that can be implemented at low cost and without decreasing reliability as compared with other methods.

- **Improve reliability in virtualized and cloud environments.** Applications running in virtual environments or in the cloud are exposed to very significant risks in terms of reliability. Going forward, it will be necessary to adequately consider high availability in virtualized and cloud environments when future platforms are being planned out. Among the key questions to be addressed are the kinds of applications to which virtualization should be extended and the kinds of systems that should be implemented using cloud services.

Vendor Shares of the Global Availability and Clustering Software Market

TABLE 1

Global Availability and Clustering Software Market Vendor Revenues, 2013–2014 (US$M dollars)

	2013	2014	2014 Share (%)
Microsoft	535	546	30.4
IBM	271	233	13.0
Symantec	220	217	12.1
VMware	194	148	8.2
HP	149	139	7.7
NEC	75	66	3.7
Fujitsu	39	39	2.2
Red Hat	33	38	2.1
EMC	47	31	1.7
Oracle	25	24	1.3
Others	399	317	17.6
Total	1,988	1,798	100.0

Note: From IDC Worldwide Semiannual Software Tracker

Source: IDC, November 2015

About IDC

International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications and consumer technology markets. IDC helps IT professionals, business executives, and the investment community make fact-based decisions on technology purchases and business strategy. More than 1,100 IDC analysts provide global, regional, and local expertise on technology and industry opportunities and trends in over 110 countries worldwide. For 50 years, IDC has provided strategic insights to help our clients achieve their key business objectives. IDC is a subsidiary of IDG, the world's leading technology media, research, and events company.

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