



NEC Express5800/ft Offers “5-9s” Platform to the Intel Server Market

An IDC White Paper

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Executive Summary

The NEC Express5800/ft 320La is a fully fault-tolerant, Intel-based server that brings 5-9s (99.999%) reliability to Windows 2000 applications. Its dual-redundant hardware design runs Windows 2000 applications and related databases on twinned Intel-based server platforms. Mission-critical and business applications will continue to run, even in the event that one of the NEC system's onboard server boards fails. This approach prevents user downtime associated with failures of hardware and system software components, since no failover time is associated with the failed component.

The fault-tolerant server is a more stable platform for mission-critical applications than a server that is not fully fault-tolerant. Furthermore, the fault-tolerant server improves system data integrity, since its redundant hardware provides active checking of all of the data transactions, stopping transient hardware errors. IDC believes the NEC system is in the first wave of fault-tolerant Windows 2000 systems to be marketed worldwide, giving customers the opportunity to not only avoid failures but also recover from them.

The Pressing Need for Highly Available Data

The forces of globalization, 24 x 7 business operations, and the need for an “always-on” computing infrastructure mean that no time for downtime exists in business-critical and mission-critical applications. Unplanned downtime and planned downtime (for maintenance and upgrades) are costly, in terms of both lost revenue and lost time. In today's global economy, planned downtime in one time zone has a direct impact on the business hours of another time zone. So, if downtime is planned in Chicago or New York corporate headquarters, it will affect end users in Europe or Asia.

The overnight data-processing cycle that was once so useful for applying software changes and for upgrading hardware systems in the main-frame data center has disappeared. Any process that eliminates the need for planned outages and that meets ever-growing demands for capacity is a win-win-win proposition for vendors, IT customers, and

end users alike. On those occasions when data services are not available, outages become extremely disruptive to ongoing business — since transactions cannot proceed. In the case of Internet-enabled ecommerce between companies and customers and ebusiness that links companies with suppliers and partners, outages in Internet services are similarly disruptive.

Proliferation of Windows NT and Windows 2000 Servers

From 1996 to 2000, more than 1 million Windows NT licenses were shipped per year, as can be seen in Table 1.

Table 1
Worldwide Server Unit Shipments by Operating System, 1996–2000

OS	1996		1997		1998		1999		2000		1996–2000 CAGR (%)
	Shipments	Share	Shipments	Share	Shipments	Share	Shipments	Share	Shipments	Share	
NT/W2K	392,902	21.5%	725,536	30.8%	1,205,054	40.2%	1,789,558	47.6%	2,379,413	54.3%	56.9%
Unix	434,921	23.8%	508,316	21.6%	611,785	20.4%	693,921	18.5%	785,624	17.9%	15.9%
NetWare	617,966	33.8%	782,843	33.2%	860,037	28.7%	887,404	23.6%	629,674	14.4%	0.5%
Linux	–	–	–	–	66,204	2.2%	173,159	4.6%	442,068	10.1%	n/a
Other	382,876	20.9%	342,078	14.5%	251,990	8.4%	212,328	5.7%	144,862	3.3%	-21.6%
Total	1,828,665	100.0%	2,358,773	100.0%	2,995,068	100.0%	3,756,370	100.0%	4,381,641	100.0%	24.4%

Source: IDC, 2001

Most of these installed servers, particularly those shipped in 1996, 1997, and 1998, were relatively small, with just two to four processors, according to IDC research. That proliferation of small servers led to the idea of “dedicated” servers, with each Windows NT Server system running one major application, email package, or database product. Many customers found that they were managing dozens of servers at their site, and many have experienced reliability problems on some fraction of the total systems that were deployed. This created the need for careful systems management, and some sites installed clustering software to improve high availability. However, the need for specific IT skill sets and programming “scripts” to make applications cluster-aware were often drawbacks to this approach.

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Business-Critical Data and Applications

Over time, the Windows NT servers and the servers running Windows 2000 — which began shipping in February 2000 — took on increasingly important data-processing tasks. Some ran the Microsoft Exchange email system, while others ran the Microsoft SQL Server relational database, and others ran a variety of line-of-business (LOB) applications (such as enterprise resource planning [ERP] and customer relationship management [CRM]).

In a three-tiered client-server world, end users' PCs would access Windows servers and back-end servers, such as Unix servers or mainframes. But Windows servers have become more capable in recent years, running Microsoft's Exchange electronic mail system, Microsoft's SQL Server database, and such LOB applications as those from SAP, Siebel, and PeopleSoft. Thus, more business-critical data and mission-critical data are being maintained on Windows servers than was the case in the mid-1990s.

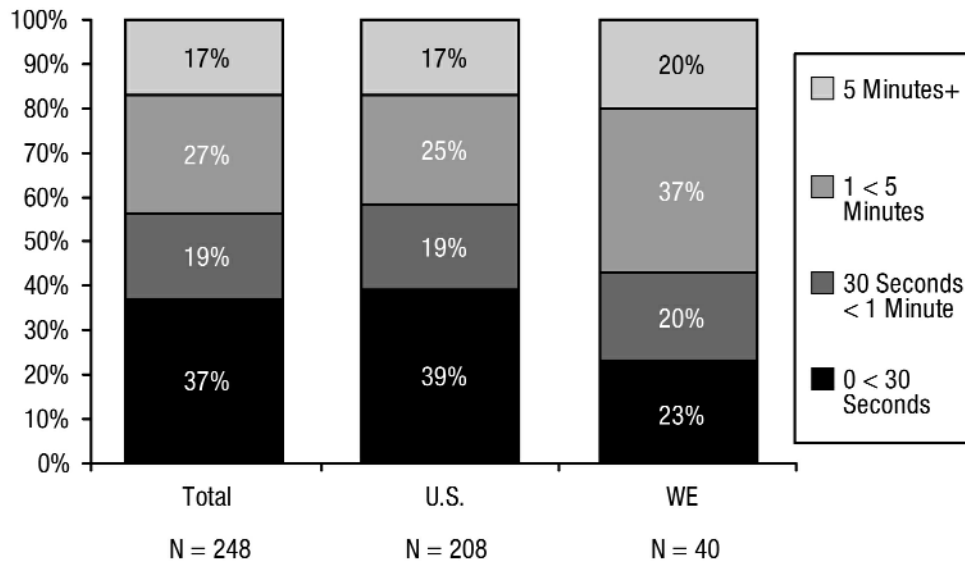
Interrupted processing for these kinds of workloads would be noticed immediately by end users, IT managers, and end customers who access a company's corporate servers. This pattern is also true for ecommerce and Internet-enabled applications, which make a company's servers highly visible to customers and to business partners accessing the data on those systems.

In an attempt to minimize downtime, IT managers have accelerated their deployment of high-availability clustering software. By linking two servers, both of them running Windows NT or Windows 2000, to shared disk resources, business-critical applications and data can be "failed-over" and restarted on a second server, if a failure occurs on the first one.

However, the failovers associated with clustering software take time: anywhere between 30 seconds atop several minutes. So, clustering — which may provide 3-9s (99.9% or about nine hours of downtime a year) of uptime rather than the fabled 5-9s (99.999% or about five minutes of downtime a year) of uptime — may be inadequate for extremely mission-critical work.

A recent IDC survey of more than 240 IT sites with clustered servers found that many respondents felt that downtime of five minutes or more was unacceptable for their business applications (see Figure 1 for a summary of the findings on acceptable levels of downtime, as reported by respondents).

Figure 1
Acceptable Failover Time



Source: IDC, 2001

IDC's high-availability systems research divides all systems into four categories:

- **AL1 for limited high availability, in which work stops due to an uncontrolled shutdown of the system.** Techniques such as disk mirroring, the use of RAID devices, or journaling file systems may be used, but lost transactions must be restarted from stored media.
- **AL2 for high availability through failover of applications.** Here, the user's work is interrupted, although users can log on again and later re-run transactions that were stored in a journaling file system.
- **AL3 for high availability through failover of applications.** Here, the user stays online, but the most recent transactions may need to be restarted for work to proceed.
- **AL4 for fully fault-tolerant.** Any hardware failure is transparent to the user. Work is not interrupted, and no transactions are lost.

Generally, clustered systems with high-availability failover software fall into categories AL2 and AL3. However, the NEC Express5800/ft 320La server falls into category AL4. That is, work is not interrupted, and no transactions are lost due to hardware-component failure or a software problem on one of the dual system boards. This kind of high availability provides more than 99.999% uptime for the server system.

5-9s means just five minutes — or less — of downtime per year, while 3-9s means 8.75 hours of downtime per year. That is why some customers are now looking for truly fault-tolerant server solutions. They

want to ensure hardware platforms that continue to operate, even in the face of a hardware-component failure.

NEC's Fault-Tolerant Windows 2000 System

The NEC system is fault-tolerant, since it runs a single copy of Microsoft Windows 2000 on dual system boards. There is no need to restart the applications if any given hardware component fails. Instead, the applications continue running without interruption. Importantly, only one copy of the application is required, in sharp contrast to the need to maintain multiple copies of an application when using failover clustering software.

The Express5800/ft 320La system, which ranges in price from \$20,000–35,000, supports standard Windows 2000 Server applications. It can be expected to find a high level of acceptance in those market segments that require continuous access to applications and to data, including retail and health care applications, and a variety of telecom applications, including messaging, ATM, and telephony services. In addition, it will be an attractive platform for offices and for small businesses, which typically have few on-site IT personnel — or none at all — to resolve operational problems that result in service downtime.

How the NEC System Achieves Fault Tolerance

The system's fault tolerance results from a dual-redundant design that maintains the same Windows 2000 Advanced Server operating system image on two system boards, each outfitted with its processing, I/O, storage, and power. NEC's approach to the Express 5800/ft 320La's hardware design eliminates any single point of failure from taking the entire system offline.

Its "hardened" operating system is a version of the off-the-shelf Windows 2000 Advanced Server that has been licensed to run once — but to do so by running across two independent modular systems.

Thus, customers do not need to purchase two Windows 2000 Advanced Server licenses, ensuring that application software costs are kept in check. In addition, NEC will provide the ESMPRO software management framework that allows remote monitoring of the systems via LAN, WAN, or telephone dial-up connections. This allows customers to quickly identify and isolate problems and to replace any hardware components that fail, or are starting to fail.

Fault detection and fault isolation logic embedded within the system identify any point of failure in the overall system and immediately take them offline. The faulty components can be replaced at the user's convenience. Meanwhile, work continues on the remaining system components.

NEC has also designed the system so that all components are delivered as hot-swappable modules. Any module in the server can be serviced

by nontechnical staff, through the use of clearly identifiable status indicators and active-state thumbscrew microswitches. All of the servicing, including replacement of components, is done while the system is still performing at 100% of capacity. Once a module has been replaced, the new module is transparently restored into lockstep (in a fault-tolerant computing model) operation while users are unaware of any service activity. Thus, continuous computing is preserved, even in the event that specific components need to be replaced.

IDC believes that NEC's approach to fault tolerance will provide 5-9s of uptime, competing with Windows 2000 clustered-server configurations that assume a limited amount of failover time in case one server, or one hardware component, goes offline. These clusters typically have failover times that range from 30 seconds up to many minutes, depending on the amount of data that must be "failed over" to a second server to achieve application restart. Their uptime is generally in the 3-9s uptime range. Typically, cluster-aware software scripts must be written and maintained that specify exactly how clustering failover is to occur.

For many years, "fault-tolerant" has implied high cost — in which customers paid a premium for the fault-tolerant capability — and, therefore, was not considered a viable option for many customers. This is changing with the introduction of Intel-based fault-tolerant systems, like the Express5800/ft servers from NEC. The NEC server systems are competitively priced, which positions the systems squarely within the highest-growth price bands in the worldwide server market. IDC research shows that systems priced below \$50,000 will have the highest compound annual growth rates (CAGRs) between now and 2005. They also represent the highest rate of increase in units expected to be shipped during the same forecast period, CY00–CY05.

Armed with market and solutions data, the company is targeting government, retail, and health care applications, branch-office and small-business applications, and a variety of telecom applications, including messaging, ATM, and telephony services. The NEC server and associated independent software vendor (ISV) software products are positioned toward solution selling, which is another key attribute for success in the indirect channel.

Benefits of the Fault-Tolerant Approach

The business benefits of NEC's approach to fault tolerance are clear: hardware failures are "transparent" to the end user; no transaction data is lost; applications and data remain available at all times; and demands on IT staffers are reduced. High availability can be simplified, compared with clustered servers and their associated software scripts, through use of NEC's fault-tolerant server for Windows 2000 applications and databases.

The server can be located anywhere, since the system is totally modular and has remote management software. No IT resource is required to replace a module or to monitor its performance, allowing customers to place the NEC server in remote offices, retail stores, branch banks, or kiosk locations.

The competitive price point for these fault-tolerant systems means that a new threshold for high availability is now available for high-volume, low-cost Intel-based servers running Windows 2000. This functionality will be widely available, distributed through indirect channel partners worldwide.

Target Applications

The NEC Express5800/ft 320La system will run a variety of applications, as there is no restriction on the type of packaged Windows 2000 applications that run on the system. The fault tolerance is a consequence of the hardware system design, and the Windows operating system runs on both of the dual system boards. However, customers are charged for only one Windows license, since the same copy of Windows is running “once,” with one workload, on the redundant boards.

NEC anticipates that customers will find the fault-tolerant features to be most useful in the areas of retail and health care applications, branch-office and small-business applications, and a variety of telecom applications, including messaging, ATM, and telephony services. For applications that are not inherently cluster-aware, the NEC Express5800/ft 320La system provides a compelling alternative for users who are seeking high availability. That is because these solutions access business-critical data and mission-critical data. Interrupted access to this kind of data will likely result in a reduction of user productivity — and in lost revenue and profits in the event of an extended outage.

Application developers who need to improve the availability of their software solution will find that the NEC Express5800/ft 320La server provides a compelling alternative to clustered server systems. Developers can continue to enrich the functionality of an application instead of writing custom scripts to make their application “cluster-aware,” so that it can failover to other clustered servers.

Distribution Model

Virtually separating these products from the rest of the company’s portfolio, the product solution, Express 5800, has its own unique channel program and distribution partners. The company has already signed a distribution agreement with Avnet Computer Marketing, Hall-Mark Division.

As part of the solution sales rollout of the Express 5800 products, NEC intends to work with only those distributors and partners that have exhibited the ability to provide value-based solutions, using an integrated supply chain that eliminates inventory and leverages existing

infrastructure, which provides a competitive pricing advantage. In addition to this, the value-added reseller (VAR) program for these products will be selective and not one that appeals to the masses.

The NEC channel program will be rolled out in steps, and partners brought on initially will be provided the opportunity to grow their relationship over time in a phased approach. Those willing to make the investment and commitment to the fault-tolerant solutions will be considered for this program. Eligibility is predicated on sales and technical certification as well as a proven track record of solutions-based sales. Partners that meet these eligibility requirements will benefit from exclusivity agreements based on territory and expertise to ensure against overdistribution. Exclusivity is not guaranteed; rather, NEC has established metrics on which it will provide coverage based on application, vertical, or workload. Those partners with the ability to provide a unique solution set will be provided with the rights to that particular solution within a geographic region. The goal is to make sure that the product has appropriate coverage with a balance to prevent overdistribution.

Rigid certification and single-sourcing are not common characteristics in the broader NT market. As the market changes, channel programs will evolve, but savvy partners will look beyond these programs and see the value of other elements, such as exclusivity.

The NEC program also offers the opportunity for incremental revenue and growth into the services arena, one of the areas of highest interest and growth for many partners. This is not an area to be taken lightly, as the service requirements for fault-tolerant systems are necessary, and the opportunity to provide them is an integral part of the NEC channel partner program. As part of the enterprise-ready Continuous Availability Solution offering, eligible partners will have the opportunity to provide value-based services related to the fault-tolerant systems. This solution set is also an entry into the data center for many partners migrating up from a Windows 2000/NT base. The NEC product provides a foundation from which this class of partners can start to expand into the data center.

This channel program and the NEC fault-tolerant products also offer a road map to solutions for those partners interested in migrating to more of a solution-based offering. Partners should also be aware that those that sign on early would likely be the benefactors of a broader scope of offerings. The initial focus is on the Express 5800, but a full family of products is expected to be rolled out, all of which will utilize partners as a primary route to market.

While the partner program is comprehensive and the groundwork has been laid to create a complete solutions coverage model through the channel, success is not guaranteed. The company will have to work with the partners in helping to articulate and outline the return on

investment for those interested in exploring the opportunity. Challenges will be evident in clearly differentiating the fault-tolerant solutions from clusters, an area that is well understood by many customers and partners alike.

In addition, the company will have to make a significant investment in helping the existing value-based channel realize the opportunity for similar value-added solutions on an Intel platform. Many of these partners are familiar with the NT-based solution but did not consider it part of the value solution, as many believed that these higher-volume, NT-based systems would undercut their ability to stay competitive in the higher-value solution sets. However, these solutions have a clear value proposition, and if NEC is able to drive market acceptance of the value of fault-tolerant, NT-based solutions, the company and its partners will gain significant returns.

To further enhance the NEC offering, Microsoft has partnered with NEC to ensure that its software is able to take advantage of the fault-tolerant architecture. The fault-tolerant version of Microsoft programs will allow for features such as the service packages and the applications packages to be upgradeable without taking the system down.

The product offers a model with a value statement and differentiation for those not currently selling Intel-based products. Conversely, those focused on Intel architecture now have the potential to migrate upward toward more complex systems without hefty reallocation of resources. The fault-tolerance solutions also provide a road map for extended solution sales for partners currently involved with clusters. For many of these partners, fault tolerance is actually a natural extension of their solution offerings.

Challenges and Opportunities

The business benefits of NEC's approach to fault tolerance are clear: hardware failures are "transparent" to the end user; no transaction data is lost; applications and data remain available at all times; and its modular design and remote management software mean reduced demands on IT staffers. High availability can be simplified, compared with clustered servers and their associated software scripts, through use of NEC's fault-tolerant server for Windows 2000 applications and databases. The business benefits to the partners are also clear. Not only do these systems offer additional opportunity for value-added solutions, but their fault-tolerant technology also creates a path for extending the customer base that is available to them.

However, NEC's strategy to leverage its technology investment to enter into what today is considered a niche market poses a considerable opportunity in the future. IDC notes that a few other vendors are already in the market space for fault-tolerant Windows 2000 servers, and that there are likely to be more of them over time. For example, NEC's channel sales in the United States will be competing, to some

extent, with sales of other vendors' fault-tolerant Windows 2000 systems at prices ranging from \$20,000 to \$60,000, through both the direct and indirect channels. Further, other fault-tolerant entries may soon be shipped by other smaller, start-up companies that are planning to ship products in specific vertical markets later this year and early next year.

With a commitment to the channel and no plans to sell the systems via alternative direct channels, it is clear that NEC is driving a solution, not a product sale. Recognizing that the channel can be an effective partner in selling this solution, NEC is positioning this product squarely within the crosshairs of the value-based channel. Those that choose to join in should find high return, as the IT markets have shown no sign of relenting in the need for continuous availability. By offering these solutions with an Intel-based solution, NEC has broadened the available market, which, in turn, translates to opportunity for those ready to participate.

Conclusion

NEC is bringing a fully fault-tolerant server to the Windows 2000 marketplace. The Express5800/ft 320La server system is competitively priced, yet it confers 99.999% uptime on the applications that run on it. This means that a truly fault-tolerant hardware platform is available for Windows 2000 business applications at price points that rival those of cluster systems.

NEC needs to deliver on its promise of providing fault-tolerant Windows 2000 solutions to business customers, and to assist its channel partners in providing solutions and service to those accounts. If it does so proactively, then IDC believes that NEC will be able to ride the fault-tolerant server wave to success in the mission-critical Windows 2000 server space.

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