

# Enterprise Solutions

*Microsoft*<sup>®</sup>

**NEC**

## From Microsoft and NEC

connection



COLLABORATION



Integration



# Contents

Executive Summary . . . . .	3
An Open Letter from Microsoft and NEC . . . . .	4
NEC Company Overview . . . . .	5
Doing More with Less . . . . .	6
Windows Server 2003 SQL Server 2000 Enterprise Edition (64-bit) . . . . .	7
Active Directory . . . . .	8
NEC Express5800 Servers . . . . .	9
NEC 64-bit Architecture . . . . .	10
NEC Fault Tolerant Architecture . . . . .	11
Key Scenarios . . . . .	12
Real World Scenarios . . . . .	13
Frequently Asked Questions . . . . .	14
Where To Learn More . . . . .	15

INTEGRATION  
SO-HOW  
CONNECTION

“We are excited to see that NEC is leveraging the Intel® Itanium® 2 processor in 32-way designs to demonstrate the scalability and raw horsepower of the Windows Server 2003 Datacenter platform and SQL Server 2000 Enterprise Edition (64-bit). These recent TPC-C benchmark results demonstrate that our customers can scale on the Windows platform and SQL Server just as much as on alternative platforms and at phenomenally aggressive price/performance ratios.”

*Jim Allchin*

*Group Vice President*

*Microsoft*

“NEC has enjoyed a great relationship with Microsoft for many years. Our collaboration for 64-bit enterprise computing is a great example of our alliance. While NEC provides outstanding hardware, Microsoft develops a software platform that reduces total cost of ownership. The combination gives customers record-breaking performance without high costs. NEC looks forward to continued collaboration with Microsoft for enterprise computing.”

*Kazuhiko Kobayashi*

*Senior Vice President*

*NEC Corporation*

“For several years, Intel and NEC have collaborated on servers based on the Intel® Itanium® 2 processor family. With the addition of Windows Server 2003 support, increasing numbers of enterprise IT customers will deploy these servers. Whether they require the industry-leading performance enabled by the Itanium® 2 processor, the flexibility provided by the NEC system, or the competitive price/performance advantage of the combined Microsoft/NEC/Intel enterprise solutions, users can be confident that they are getting a reliable platform for their mission-critical applications.”

*Mike Fister*

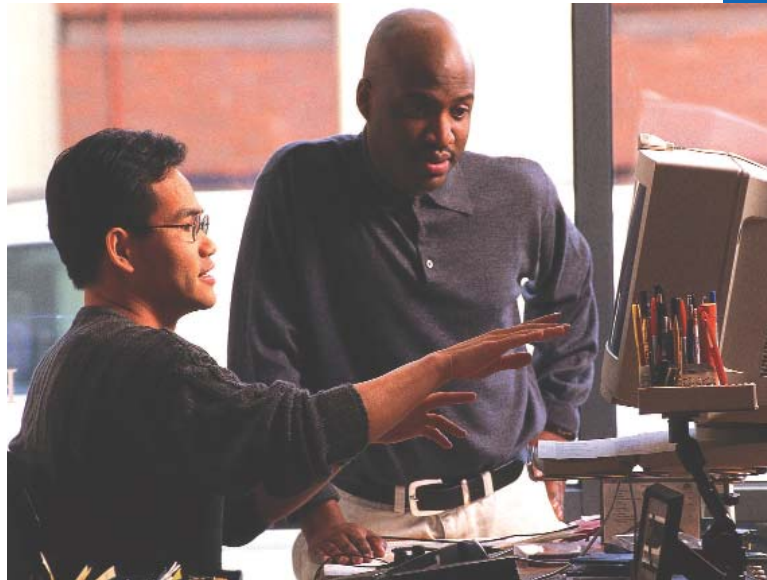
*Senior Vice President*

*General Manager, Enterprise Platforms Group*

*Intel Corporation*

Connection, collaboration, and integration are major themes that define the strategic relationship between Microsoft and NEC.

NEC and Microsoft have been working together since the mid-1980s. In August of 1997 the two companies announced plans to establish a worldwide, comprehensive technology alliance to offer solutions to enterprise customers. In October of 2001 they aligned their strategic direction further by partnering to test and develop continuous availability, 32-bit fault-tolerant, and scalable 64-bit servers for the Windows® platform, based on Intel® Itanium® 2 processors.



In addition to server development, the two companies also agreed to team up on systems integration support and Internet services. The alliance's product development goal was a server platform featuring superior availability and performance, integrated with Microsoft's .NET vision. The companies' efforts resulted in the introduction of the Express5800/300 fault tolerant IA-32 servers and the Express5800/1000 series of scalable (up to 32-way) IA-64 servers, which, in combination with Microsoft® Windows Server™ 2003 and SQL Server™ 2000 Enterprise Edition (64-bit), deliver a revolution in enterprise computing. That revolution will drastically lower the cost of high-end computing in the enterprise while at the same time offering high reliability.

In the following pages we will show you how the Microsoft and NEC collaboration allows you to do more with less by providing the best economics for today's agile business. The key lies in technologies like 64-bit computing and fault tolerant architecture, as well as in the part Windows Server 2003 plays in enabling those technologies. You will see the key scenarios (including migration from UNIX, high performance computing, server consolidation, and infrastructure buildout) in which the combination of NEC hardware with the Windows Server 2003 operating system brings the best return on investment as well as a low total cost of ownership, followed by two hypothetical case studies we created to show these scenarios in a real-world context.

You will also hear about NEC's ongoing commitment to the North American market. NEC is the largest computer vendor in Japan, with a long history in supercomputing and enterprise computing on mainframe, UNIX, and Windows-based servers. Both NEC and Microsoft bring technology and technology leadership to the table, integrating leading server hardware from NEC with the industry-standard Windows platform from Microsoft.

Integration  
Collaboration  
Connection

# An Open Letter from Microsoft and NEC

INTEGRATION  
FOR  
SOFTWARE  
CONNECTION

Today's business environment makes constant demands on enterprise data centers. Mission critical systems must be available 24x7 without compromising airtight security. Response times to customers, partners, and in-house knowledge workers must be competitive. Current IT structures need enough headroom for the business to grow and remain competitive today and tomorrow. Above all, IT departments must achieve all these goals and more with fewer people, smaller budgets, and fewer resources.

Microsoft and NEC have listened closely to enterprise business needs and are combining their strengths to provide solutions. For more than 35 years, NEC has supplied Japan's largest enterprises with supercomputers, mainframe systems, Windows-based servers, PCs, and mobile devices. NEC's customers rank among the top Fortune/Global 500 firms. Microsoft has continuously improved and extended the scalability and reliability of the Windows server operating systems for use with enterprise-class servers.

Joining customer focus with technology leadership, Microsoft and NEC have unveiled the state of the art NEC Express5800/1000 servers, running the best-ever Windows operating system--Windows Server 2003. World-record TPC-C benchmark results--including one of the lowest per transaction costs ever--clearly demonstrate both the performance and value of this combination. Enterprise customers also benefit from other collaborative offerings, such as NEC's fault tolerant Windows-based servers, and NEC's Versa LitePad Tablet PC.

We invite you to take a closer look at Microsoft and NEC's solutions for your mission-critical computing needs, such as database, CRM, ERP, and other line of business applications. Review the exciting capabilities of Windows Server 2003. Examine NEC's extraordinary Express5800/1000 series of 64-bit servers. Consider how you can take advantage of the continuous hardware availability of NEC's fault tolerant servers. Together we are ready to help you address your pressing business requirements for reliable, scalable, and well-connected information technology.



Bill Veghte  
Corporate Vice President  
Windows Server Group  
Microsoft Corporation



Kozo Yoshimatsu  
Group Vice President  
NEC Solutions America

# NEC

## Company Overview

A Global Fortune 500 company with close to 130,000 employees worldwide and 2002 revenues of \$38.4 billion, NEC Corporation (NEC) has a history of more than 100 years of leadership and innovation in high technology. NEC is positioning itself as a technology leader ready to meet the explosive demand for e-commerce and other Internet-based solutions in the twenty-first century. NEC is a provider of technologies integral to the development of a networked world, from advanced semiconductors and device solutions to high-speed optical communications, servers, systems integration, and e-commerce software applications.

NEC is the number one supplier of servers in Japan and throughout Asia, and among the top five server manufacturers worldwide. As an affiliate of NEC Corporation, NEC Solutions (America), Inc., is committed to bringing the company's expertise to bear in solving the problems of enterprises based in North America. Two server product lines—fault tolerant and 64-bit—address this market by offering high performance Windows-based systems that are scalable, easy to manage, and affordable.

NEC designed and manufactured the world's fastest supercomputer, the Earth Simulator. With the power of 5,120 vector processors, the Earth Simulator models global environmental

changes at a scale thousands of times more detailed than any previous supercomputer. Drawing on knowledge and experience gained from such high-end solutions, NEC has created the Express5800/1000 series of high performance, multi-processor servers. Windows Server 2003 was the inevitable choice for the operating system, not only because of its scalability and reliability, but because of the demand from NEC's customers for enterprise-class servers running Windows.

NEC Solutions America offers additional Windows-based products designed to bring unique value to customers. These products include the Versa LitePad—at its release, the industry's thinnest and lightest Tablet PC—as well as the fault tolerant Express5800/320 servers. Based on Intel® Xeon™ processors, the Express5800/320Lb server is the industry's first Intel-based fault tolerant rack mount server. The Express5800/320Lb-R server delivers 99.999% hardware reliability for applications running on Windows Server 2003, showing NEC's dedication to the Windows and Intel platform.



## NEC Solutions America

Integration  
for  
convergence

# Doing More With Less

NEC hardware solutions, running the Windows Server 2003 family of operating systems, help enterprises do more with less by providing the best economics for today's agile businesses. The proof is in the numbers: Windows Server 2003 has enabled some businesses to run their server infrastructures with 30 percent greater efficiency. The productivity benefits extend to application development and information worker groups as well, reducing administrative overhead and allowing users to connect, collaborate, and integrate.

Today's IT professionals must cope with a host of needs: to control server sprawl and manage complexities; to provide security and availability; to meet service level requirements, assure disaster recovery, accommodate mushrooming storage needs, and more. They need solutions to all these problems that still leave enough headroom for further growth—solutions with great performance, simplicity, manageability, and a low total cost of ownership (TCO).

It sounds like too much to ask for, yet the combination of Windows Server 2003 and NEC servers can help meet all these needs and more.

## A Dependable IT Infrastructure with the Best Economics

With Windows Server 2003, IT professionals can increase operational efficiency while improving essential services—better security, reliability, manageability, and performance.

Windows Server 2003 running on NEC servers helps deliver:

- A more secure foundation for systems, resources, and users.
- Anywhere, anytime network access.
- Better, easier identity management.
- A platform for server consolidation. The 64-bit versions running on NEC Express5800 servers offer an ideal platform to consolidate databases and line of business applications.

With Windows Server 2003, organizations create a more efficient IT infrastructure with a 20 to 30 percent reduction in servers, up to 20 percent reduction in overall costs, and significantly better performance across all major workloads.

## An Application Platform Built for Increasing Business Value

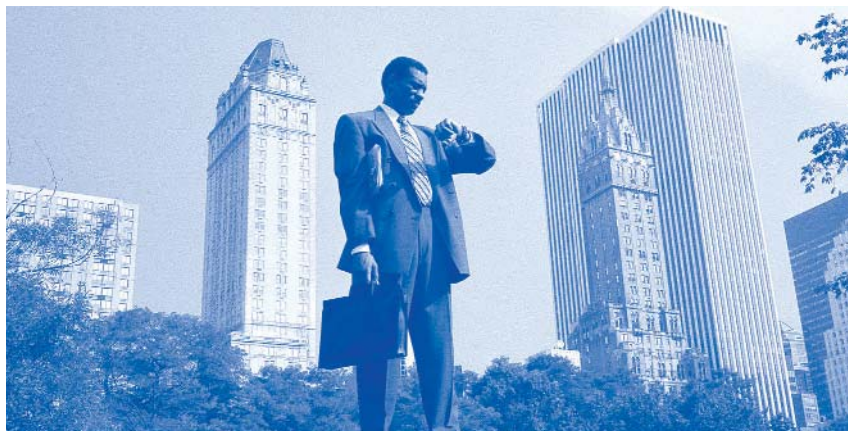
Time-to-market pressures and shrinking budgets often

constrain the productivity of application development teams. Windows Server 2003 works with Microsoft Visual Studio® .NET to provide an end-to-end platform that helps enterprises design, develop, deploy, and manage their solutions more efficiently while building on existing resources. Visual Studio .NET makes it easy to build solutions quickly, while Windows Server 2003 provides an application platform that ensures applications are manageable and easy to deploy.

Windows Server 2003 and Visual Studio .NET allow developers to:

- Build new solutions from the ground up.
- Integrate legacy and line-of-business application.
- Deliver high-performance, reliable solutions that are easy to install and maintain.

Early adopters of the application platform report a 60-percent reduction in application development time as well as vastly increased application performance.



## A Collaborative Information Worker Infrastructure

Information workers—and the IT professionals who support them—need a broad and well-run infrastructure that supports business functions while easing people's daily work. Windows Server 2003, running on NEC servers, provides a connected, collaborative infrastructure that boosts enterprise efficiency by:

- Helping protect information and making it easier to find.
- Delivering intelligent tools for effective team collaboration and communication.
- Integrating with Microsoft Office, Microsoft Exchange, and other enterprise server-based applications.

## The Bottom Line

NEC's proven track record in enterprise computing, together with its understanding of large enterprise system requirements, has allowed it to build high availability and reliability into its server designs. Windows Server 2003's integration with Microsoft's .NET framework (which will eventually support 64-bit computing as well) translates to a high degree of connectivity for applications and users, enabling the reliability, scalability, and low TCO enterprise customers demand. The combined solutions empower the customers to do more with less hardware, lower cost, and less worry.

# Microsoft Windows Server 2003

Microsoft's new Windows Server 2003 family of operating systems supports both 32-bit and 64-bit servers. Users in search of higher performance and scalability will look to the 64-bit versions of the operating system, which take advantage of the larger address space as well as a higher number of processors.

The table below lists the features of the four editions of Windows Server 2003.

Windows Server 2003 offers significant performance and scalability gains when compared to Windows 2000. Using tests measuring Web and file server performance as just one example, Windows Server 2003 shows gains from 60 to 300 percent compared to Windows 2000.

Windows Server 2003 also offers enhanced security. With the introduction of a basic firewall (Internet Connection Firewall) and new network-access security capabilities using IEEE 802.1X (Extensible Authentication Protocol over LAN) for clients, Windows Server 2003 helps secure access to, and helps protect, both wired and wireless networks. In addition, many services that were on by default in previous Windows operating systems are now disabled by default, significantly enhancing security.

Windows Server 2003 offers rapid application development by integrating the Microsoft .NET Framework. As the 64-bit version of .NET Framework becomes available, developers will be able to easily write high performance Web applications, or port existing applications to the new platform.

Microsoft's newly improved Datacenter High Availability Program will help support the Windows Server 2003 release. This program, expanded to meet the growing demands of Microsoft's Datacenter customers, strengthens the support and services model, expands the range of support providers, and merges the Joint Support Queue (JSQ) with the new Microsoft High Availability Resolution Queue (HARQ), enabling vendors to act in a unified, consistent way. This new model ensures NEC's and Microsoft's mutual customers can achieve high levels of reliability and availability from the Datacenter server platform.

Microsoft chose NEC's 64-bit servers, both a developmental version (code-name Azusa), installed in Redmond in November 1999, and the Express5800/1000 server, to develop and test Windows Server 2003. This long-standing relationship helps ensure that operating system and hardware fit like hand and glove.

Features	Datacenter Edition	Enterprise Edition	Standard Edition	Web Edition
32-bit Max Processors	32	8	4	2
32-bit Max RAM	64GB	32GB	4GB	2GB
64-bit Max Processors	64	8	No Support	No
64-bit Max RAM	512GB	64GB	No Support	No
File Sharing Connections	Unlimited	Unlimited	Unlimited	Limited to 10; No CALs
Print Server	Yes	Yes	Yes	No
Active Directory®	Domain Controller or Member Server	Domain Controller or Member Server	Domain Controller or Member Server	No
Terminal Services	App and Admin Mode	App and Admin Mode	App and Admin Mode	Admin Mode Only
Terminal Services Session Directory	Yes	Yes	No	No
UDDI	Yes	Yes	Local DB Only	No
Fail-over Clustering	8-Node	8-Node	No	No
Windows Media Server	Enterprise	Enterprise	Basic	No
VPN Connections	Unlimited	Unlimited	1,000 Maximum	1 Per Media Type
Internet Authentication Service (IAS)	Yes	Yes	Limited to 50 Devices	No
Certificate Server	Yes	Yes	Windows 2000 Level	No
Windows System Resource Manger	Yes	Yes	No	No
Datacenter High Availability Program	Yes	No	No	No

## SQL Server 2000 Enterprise Edition (64-bit)

SQL Server 2000 Enterprise Edition (64-bit) is a complete database management and data analysis platform that meets the scalability and reliability requirements of the most demanding enterprises. It scales to the performance levels required to support the largest Web sites and enterprise online transaction processing (OLTP) and data warehousing systems. Its support for failover clustering also makes it ideal for any mission critical line-of-business application.

With the availability of a 64-bit address space, SQL Server 2000 Enterprise Edition (64-bit) can quickly access and manipulate a vastly larger amount of data than 32-bit databases. Previous versions of SQL Server running on 32-bit operating systems were limited to a 4GB address space in memory—beyond that, SQL Server had to use disk cache. Now, users with databases larger than 4GB can still keep the entire database in memory for access and processing.

In addition, the 64-bit platform may result in input/output savings due to larger memory buffer pools. For low-end implementations (maximum 4-processor servers), users will see a reasonable performance improvement on a 64-bit implementation over a 32-bit implementation. Higher performance gains will come for higher-scale implementations (8- to 32-processor servers). And with the ability to install up to 16 database engine instances on a single server, Microsoft offers

the best economics of managing multiple high-end applications.

There are four main areas in which the enhanced features of SQL Server 2000 Enterprise Edition (64-bit) are most evident:

- Scalability
- Availability
- Performance
- Advanced analysis

These features will provide the greatest benefits for customers in scenarios similar to the following:

- Large scale e-commerce applications with high levels of concurrent users
- Large data warehouses and analysis applications
- Global Web services that drive a high OLTP workload
- Database and application server consolidations
- Hosting services

As they did with Windows Server 2003, Microsoft developers used NEC 64-bit servers for over three years as they created the 64-bit version of SQL Server 2000. The message is clear: The combination of NEC servers with Windows Server 2003 and SQL Server 2000 is not new, untested technology. Both companies developed these products in collaboration for maximum benefit to the customer. The outstanding TPC-C benchmark results (see page 9) confirm the power of this combination.

## Active Directory

The Active Directory service provides single log-on capability to users and a central information repository for their entire Windows infrastructure. This vastly simplifies user and computer management and provides superior access to networked resources. Windows Server 2003 brings many new features and improvements to Active Directory, increasing the ease of deployment and management, improving its security and dependability, and helping it perform faster. These features and improvements yield strategic benefits for the enterprise, enabling greater administrator and user productivity with enhanced flexibility and lower TCO.

Windows Server 2003 enhances the administrator's ability to efficiently configure and manage Active Directory even in very large enterprises with multiple forests, domains, and sites. Improved migration and management tools, along with the ability to rename Active Directory domains, make deploying Active Directory significantly easier than ever. Better tools bring drag-and-drop capabilities, multi-object selection, and the ability to save and reuse queries. Plus, improvements in Group Policy make it easier and more efficient to manage groups of users and computers.

New cross-forest trust features make it easier to manage multiple Active Directory forests. Cross-forest trust means that users can more securely access resources in other forests without sacrificing the single sign-on and administrative benefits of having only one user ID and password. This allows some divisions or areas to have their own forests, yet maintain the benefits of Active Directory. In addition, a new credential manager provides a store of user credentials and X.509 certificates. Software restriction policies let administrators avoid installing unwanted programs on computers throughout the network.

Windows Server 2003 more efficiently manages the replication and synchronization of Active Directory information. Administrators can better control the types of information that are replicated and synchronized between domain controllers both within a domain as well as across domains. In addition, Active Directory provides more features to intelligently select only changed information for replication—no longer requiring the update of entire portions of the directory.

# Premier Platforms for the Microsoft Windows Server 2003 Operating System

## NEC Express5800 Servers

The NEC Express5800 line of servers provides an optimal environment for the Windows Server 2003 operating system. Designed from the ground up to utilize NEC-developed technology with Intel processors, this family brings the Windows Server 2003 operating system to new levels of performance and availability.

To satisfy the growing need for affordable high-performance computing in the data center, the Express5800/1000 series fully exploits the inherent power of the 64-bit Intel® Itanium® 2 processor. Utilizing NEC's innovative crossbar and high-speed memory access technology, NEC has defined the next generation of scalable high-performance servers. With up to 512GB of shared main memory, as well as the option of 8, 16, or 32 CPUs, the 1000 series provides massive, affordable power and scalability.

NEC currently offers three models in the 1000 series:

- **Express5800/1320Xc**, 8-32 CPUs, up to 512GB RAM, and 112 I/O slots.
- **Express5800/1160Xc**, 8-16 CPUs, up to 256GB RAM, and 56 I/O slots.
- **Express5800/1080Rc**, 8 CPUs, up to 32GB RAM and 26 I/O slots.

All of the servers are based around the Intel® Itanium® 2 running at 1GHz or 900MHz, with 3MB or 1.5MB L3 cache respectively, in addition to 256KB of L2 cache.

To satisfy the growing need for continuous availability in the enterprise, the Express5800/300 series has been designed to bring fault tolerant hardware technology to the 32-bit Intel® Xeon™ processor. Being the first to bring lockstep technology to the Intel® Architecture, NEC has defined the next level of availability in state-based computing. Utilizing innovative design, the 300 series provides the densest packaging available for hardware fault tolerance.

Currently, two models in the 300 series are available:

- **Express5800/320La**, 2 Intel® Pentium® III processors, up to 2GB RAM in 8U Rack or Tower
- **Express5800/320Lb**, 2 Intel® Xeon™ processors, up to 3GB RAM in 4U Rack or Tower

Historically, UNIX running on mainframe hardware has been considered the ultimate scenario for ultra-high performance and reliability, but the combination of NEC and Windows has surpassed UNIX in absolute performance and pure reliability. The real advantage to the NEC and Windows solution is lower cost. Industry standard Intel processor-based hardware coupled with the industry standard Windows operating system translates into lower costs with superior performance.

### How Superior Is the Performance?

In TPC-C\* benchmark tests submitted on April 23, 2003, an NEC Express5800/1320Xc 32-processor server, based on the future Intel® Itanium® 2 processor 6M (code-named "Madison"), running Microsoft Windows Server 2003 Datacenter Edition, 64-bit, and Microsoft SQL Server 2000 Enterprise Edition (64-bit), has achieved the world's best TPC-C benchmark result for a non-clustered, 32-processor SMP server. The 514,034.72 transactions per minute (tpmC) benchmark scores achieved by the NEC Express5800/1320Xc system top the performance of the best published results for 32-processor RISC-based systems.

In addition to posting the fastest performance metrics, the NEC Express5800/1320Xc server delivered one of the best price/performance values among the top ten non-clustered high performance computing systems (\$11.50/tpmC). These results show that customers are able to deploy high-performance applications at the low cost of ownership they have come to expect in a Windows environment.

\*TPC-C is one of the Transaction Processing Performance Council's standard benchmarks for measuring computer system performance. Performance is evaluated based on a model of enterprise transaction processing. Benchmark results are expressed in terms of how many transactions are performed per minute (tpmC). NEC Express5800/1320Xc, 514,034.72 tpmC, \$11.50/tpmC, with thirty two (32) Intel® Itanium® 2 processor 6M at 1.5 GHz, each with 6MB iL3 cache, running Microsoft Windows Server 2003 Datacenter Edition 64-bit and Microsoft SQL Server 2000 Enterprise Edition 64-bit, with 512 GB RAM; Available: 10/22/2003.

# NEC 64-bit Architecture

The Intel® Itanium® 2 was designed specifically for high-end enterprise and technical computing. The Intel® Itanium® 2 provides not only a 64-bit architecture, meaning more memory address space, but also larger processor cache and greater parallelism than that available with previous processors. The Intel® Itanium® 2 architecture's advanced Explicitly Parallel Instruction Computing (EPIC) greatly increases processing capacity. Compared to the first generation Itanium® processors, Intel® Itanium® 2 offers improved operation frequency, reduced latency, and enlarged on-chip cache. All of these features contribute to increased speed and performance for the customer.

To maximize the performance of the Intel® Itanium® 2, NEC has drawn on its mainframe and supercomputing experience to develop a high-performance chipset and crossbar switch technology. The Express5800/1000 series demonstrates not only high performance, but also high scalability and high reliability because of the NEC architecture.

NEC has also collaborated with Intel to ensure that future generations of Itanium® 2 processors will be pin-compatible with the current models. This means customers will be able to upgrade their NEC Express5800/1000 series servers to the next Intel technology as it becomes available without having to buy all new hardware.

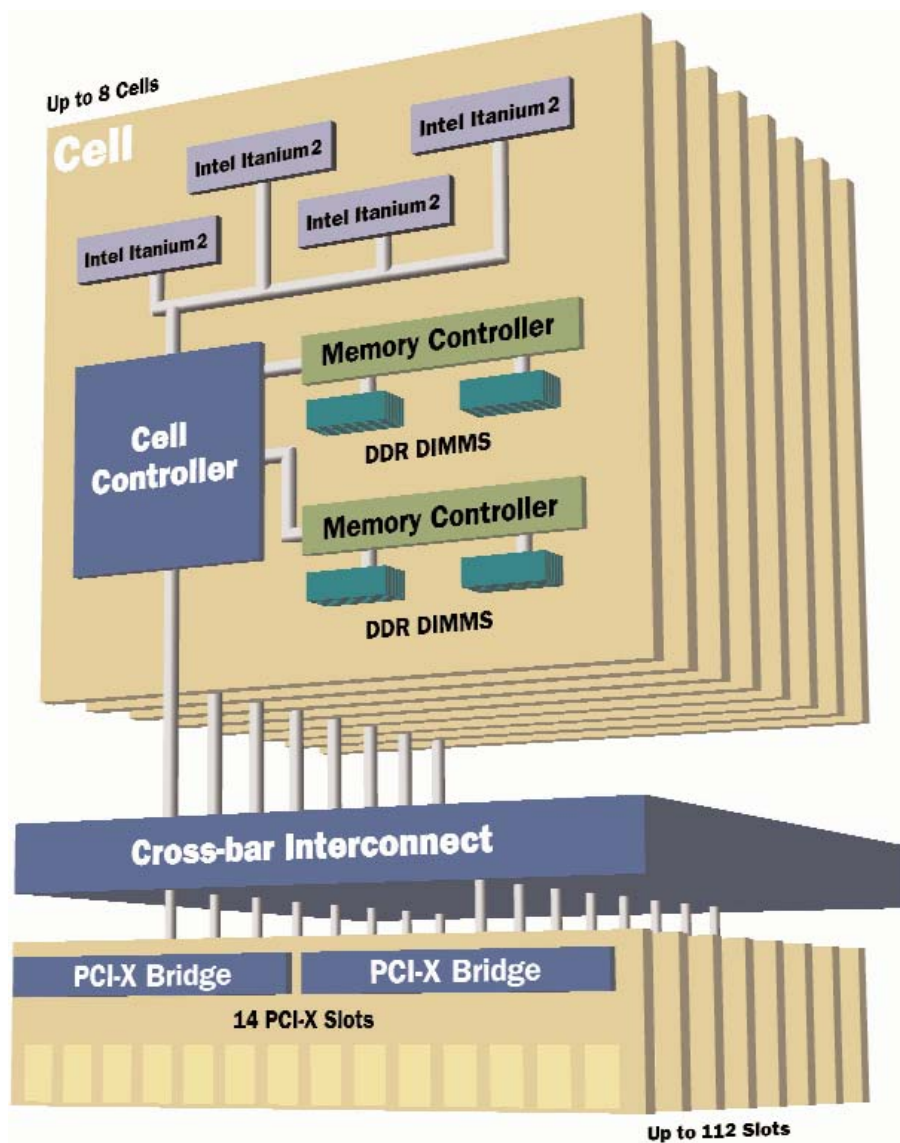
What makes 64-bit computing so revolutionary? For one thing, a computer with a 32-bit address space can only access 4GB of memory at once. By migrating to a 64-bit machine, the amount of memory the system can map increases exponentially. The Intel® Itanium® 2 processor, for example, supports up to 50-bit addresses, and can therefore access up to 1 petabyte (1,024 terabytes) of memory. This provides the ability to put today's largest known database into memory all at once, instead of having to resort to reading from disk.

The benefits of holding entire objects in memory are well known; memory access is measured in nanoseconds while disk access is in

milliseconds. That kind of scale is hard to appreciate, however, so an analogy might be helpful: Using the same ratio, if memory access took one second, disk access would take eleven days.

Future generations of 64-bit processors may be able to access even greater amounts of memory. Reserving the Most Significant Bit for a physical addressing attribute still leaves a theoretical 63-bit physical address space possible. Such a processor could address an almost unimaginable 8 exabytes of data (1 exabyte = 1,024 petabytes).

The Intel® Itanium® 2 processors also define a Machine Check Architecture (MCA) that provides notification of hardware errors that the processor detects, either within the CPU itself, or through its pin connections. The Windows Server 2003 Windows Management Instrumentation (WMI), a management infrastructure and interface, provides some support for MCA events, as do a number of other utilities. Thanks to MCA, these utilities can actually correct some



classes of hardware failure without crashing the system, vastly increasing the performance, scalability, availability, and reliability of these 64-bit systems.

## Performance

The 1000 series maximizes performance with high-speed memory access, enabled by the high bandwidth crossbar switch and the low latency and dual paths of NEC's chipset. In addition, the I/O subsystem uses the advanced PCI-X bus, supporting high-speed input and output capability to meet current and future connectivity demands of peripherals and network devices. Up to 112 PCI-X slots can be configured on the 1000 series servers.

## Scalability

The overall architecture is cell-based, with four CPUs in

each cell, allowing for 8-, 16-, or 32-way servers. The cells are interconnected with a high-speed crossbar switch, so that memory access times between cells are comparable to memory access times within a given cell. With up to 32 CPUs, the 1000 series meets the need of large-scale applications.

## Reliability

Each data bus has error detection and single-bit error correction. In addition, many hardware components such as power supplies and fans offer redundancy, so that if one component fails, the system stays up and running. The CPU memory boards and I/O cards are hot-swappable. System recovery is possible even at the time of failure, achieving extremely high levels of reliability and availability.

## Software Integrity

Working in concert with the lockstep technology, the NEC Express5800/300 series system management software protects operating system and application availability. Transient and permanent hardware errors are handled transparently, ensuring the integrity of the Windows operating system and associated applications from system crash and data corruption. Through "hardened" device drivers, additional software integrity is ensured. Microsoft and NEC test fault tolerant device drivers to new levels

ensuring compatibility and continuous operation.

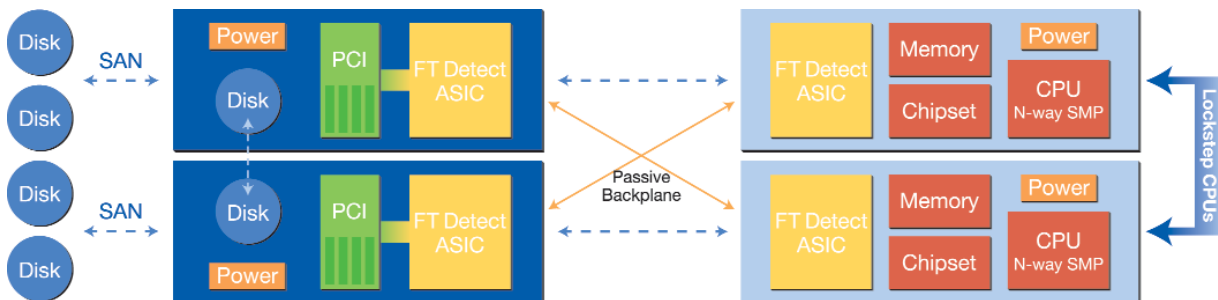
## Serviceability

NEC has enhanced its ESMPRO suite of server management tools to monitor and control the 300 Series fault tolerant server.

Supporting lights-out operation, NEC embeds redundant service processors, allowing the system to be managed in remote environments with minimal IT resources. In the event of a hardware failure, system modules are replaced without system outage. The advanced synchronization software implemented by Microsoft for fault tolerant systems restores lockstep operation without loss of processing resources.

# NEC Fault Tolerant Architecture

Fault tolerant system architecture replicates all system components and utilizes lockstep technology to maintain synchronous operation within the processing elements. Through close collaboration with NEC, Intel has made significant enhancements to the Intel® Pentium® III and Intel® Xeon™ families of 32-bit processors to support this lockstep processor technology. With the additional collaboration of Microsoft, the Express5800/300 series and Windows Server 2003 32-bit operating system maximize these enhancements to deliver a continuously available system.



## Lockstep Technology

Lockstep technology enables two processing elements (each containing CPU, memory, and chipset) to execute the same instructions simultaneously, then ensure data integrity through comparison. This means that processing can continue without loss of operating system or application state in the event of a hardware problem within the server. The fault tolerant architecture handles hardware faults with no failover delay or data loss. This level of fully replicated server components delivers continuous availability to the enterprise.

# Key Scenarios

## Migration from UNIX

Enterprises, universities, and other high-end computing users who may never have considered migrating from UNIX now have compelling reasons to consider the combined Express5800 server and Windows Server 2003 solution. The scalability and availability requirements that have caused customers to rely on proprietary UNIX servers in the past are now available on an affordable Windows Server platform.

It is one thing to have the large address space available with a 64-bit operating system, but the OS also must provide the high performance that enterprises need from large multiprocessor configurations. Windows Server 2003 running on the NEC Express5800 server with SQL Server 2000 Enterprise Edition (64-bit) is a complete solution for high-performance large database and line of business applications.

## High Performance Computing

The Express5800/1000 server provides an ideal high performance computing solution for computationally intensive workloads that require special server characteristics—64 bit addressing, floating-point calculations, cache performance, and high memory bandwidths—commonly found in academic research, supercomputing facilities and R&D groups. All of the scalability and throughput requirements that have caused customers to rely on expensive proprietary UNIX servers in the past are now available on an affordable Windows Server based platform.

In a high-performance computing environment, the OS must unleash massive amounts of computational power—power that enables trillions of calculations to occur within a second, and achieves the peak performance and productivity needed to run these increasingly complex scientific and engineering applications. NEC's Express5800/1000 server with Windows 2003 delivers the environment to make that happen.

## Server Consolidation

The need to slash costs and simplify management has made server consolidation one of the top concerns of IT and business leaders attempting to do more with less in a tough economy. The process aligns IT resources to business goals, ensuring that IT can meet the needs of the business through tight controls, appropriately sized resources, and a process for keeping key applications up and running.

To this end, Microsoft and NEC realize that

server consolidation is an ongoing process that not only includes servers, but also storage, applications, and services, and ties all of them to management best practices. In addition to reducing servers, consolidation represents an opportunity to reduce complexity of platforms, improve overall management of infrastructure, and provide the processes and services to maintain consolidation as enterprises roll out new deployments of servers.

The Express5800 server running 64-bit Windows Server 2003, Datacenter Edition, is also an ideal platform for database consolidation. All three major databases—SQL Server 2000, IBM DB2®, and Oracle9i™ Database—provide native support for 64-bit architecture and can therefore take advantage of the platform's increased memory and CPU power. That translates into three major benefits:

- Faster response time, because of the capability of directly addressing more memory for processing, allowing users to avoid the penalties associated with swapping data out to disk.
- More concurrent users, because of the ability to allocate large amounts of memory for system data structures and individual database connection context objects.
- Sufficient headroom and flexibility for future business growth. By migrating old databases off expensive mainframe or UNIX platforms to the Microsoft-NEC 64-bit platform, enterprises can build further scalability and flexibility into their data centers as well as enjoying savings in management and maintenance costs.

In the case of SQL Server, combining the 64-bit database running on Windows 64-bit with existing 32-bit applications running on 32-bit Windows is seamless, and users see performance gains due to reduced I/O for some workloads. In addition, the upgrade from SQL Server 32-bit to SQL Server 64-bit can be accomplished in a matter of seconds by a simple detach/attach operation.

## Infrastructure build-out

Active Directory allows management of the enterprise-wide information infrastructure, and Windows Server 2003 brings many new features and improvements. In particular, the larger memory space of the 64-bit edition of Windows Server 2003 means that more cache memory is available to Active Directory. Active Directory stores its indices for searching in memory, so moving to a 64-bit architecture means that for large directory implementations, users can cache more directory indices. This accelerates search and response times, as does the increased CPU horsepower available from additional processors. The vastly improved performance and scalability, as well as the ease of deployment and administration, make Active Directory on 64-bit Windows Server 2003 an attractive scenario.



# Real World Scenarios

## Health Club Chain Buffs Up IT

In this health club scenario, a chain with gyms across the Western US uses the 32-bit version of SQL Server 2000 to track and analyze customer usage data. Because of customer tracking, a server at each gym has WAN access to the server located at corporate headquarters. Customers entering the gym swipe magnetically striped ID cards, and the associated data (demographics and date/time/location) goes into the database at that location. Access to “Customer Club” data is increasingly critical to the operation of the chain. Outages have prevented customers from redeeming coupons or registering usage at other than their “home” location.

The company’s management team wants to improve customer satisfaction and, most importantly, increase the system availability at the locations. Along the way they’d like to get a better handle on exactly how people use the club—which customers use one club frequently, how many customers are “New Year’s Resolution” and “bikini season” customers only, and what the travel habits of the customers are. All of this data would be useful to determine overall pricing and marketing strategies, but currently it’s locked up in servers scattered up and down the coast rather than in a single central repository. In some of the larger states they’re using 8-way 32-bit systems, but even those servers don’t have the performance to track all of the gym customers.

The CIO wants to deploy fault tolerant platforms in each gym to improve reliability and remote management and to centralize transactions of this database, but the memory size of a 32-bit machine is a severe constraint. She decides to purchase an NEC Express5800/1000 server running Windows Server 2003 and SQL Server Enterprise Edition (64-bit). This system, with memory expandable to 256GB, will allow the company to replicate their data into one large database covering all of their properties up and down the west coast.



## Banking On Reliability

A large regional bank based in Texas currently utilizes a combination of RISC-based systems running UNIX in a main data center and general purpose servers in outlying offices to provide branch services. On a nightly basis, the bank performs risk management of their \$10 billion credit portfolio by retrieving data from all servers in the branch offices and executing the batch process. The design had served them well through the nineties, but processing time is now taking longer than a night shift, threatening to encroach on their “banker’s hours.” Additionally, outages in the branches have impacted the collection of data as well as hurting operations and customer satisfaction within the branch.

They want to upgrade to a reliable, scalable solution, but their system vendor no longer supports the hardware or operating system they’re running—an upgrade from that vendor would mean a different version of UNIX running on a different CPU, as well as placing clustered based solutions into the branch offices. The IT director decides to move to the industry-standard combination of Windows Server 2003 running on NEC Express5800/1000 and 300 series servers. After migrating their application to the new platform, the bank drastically reduced processing time, as well as improving the availability within the branch offices for services and nightly data collection. They project a rapid ROI, and the new systems give them the agility to scale up as needed.

# Frequently Asked Questions

*Q: Can I combine 32-bit application servers with 64-bit database servers?*

A: Yes, it's absolutely seamless to combine a 64-bit database server with your 32-bit application servers in the same environment. Without having to migrate your application servers, you can just migrate your database server and collectively you'll see performance gains. Your business applications are still 32-bit applications on servers running a 32-bit operating system, now connected to a 64-bit server running the 64-bit version of your database software.

If you're currently a 32-bit Windows customer running a 32-bit database application and your business is growing, odds are that your database is going to get steadily bigger as you collect more customer or transactional data. Though Microsoft will continue to invest in and improve the performance and scalability of the 32-bit platform, you may have reached the point at which you can realize a significant return on investment by upgrading to the 64-bit platform.

Customers with a large number of 32-bit servers running SQL Server distributed over a large geographical area may wish to consolidate the database to one large 64-bit NEC server. The advantages this brings depend on the goals for the consolidation, but could include vastly increased performance as well as reduced management costs.

*Q: How difficult is it to migrate existing 32-bit SQL Server databases to the 64-bit version?*

A: Users can move SQL Server databases to a 64-bit machine by a simple detach/attach operation. You don't have to touch the database in terms of any kind of coding. The whole process can be done in a matter of seconds. Once you've moved the data, you can immediately take advantage of the greater memory space and better scalability.

*Q: I'm running a custom medical research application on an IBM mainframe. Why should I undertake the expense of migrating to Windows?*

A: While there is an initial up-front cost to migrate, you are moving to an environment that gives you industry standard hardware—an Intel-based server—and an industry standard operating system. That combination provides much lower TCO over the long haul because of efficiencies unavailable in proprietary mainframes. The sales volume of Intel-based computers ensures that chip costs will stay low. The Windows platform provides TCO wins in a number of ways—the ease of finding skilled IT professionals and consultants, the familiarity of the interface, development environment, and toolset. All of these allow you to deploy solutions more quickly and inexpensively. Instead of hiring a pricey consultant for six weeks, you can generate solutions in a matter of days.

*Q: Do I need to have applications that are "FT Aware" to take advantage of the 300 series servers?*

A: No, standard applications will run on the 300 series fault tolerant architecture.

*Q: Can the FT Systems support scheduled Quick Fix, Service Pack, and Application updates without being removed from service?*

A: Yes, the FT Server can support Microsoft Quick Fixes without removing the system from service (rebooting). In order to maintain hardware fault tolerance, however, NEC recommends that the user to verify the QFE has been certified for fault tolerant operation. For environments that cannot sustain planned down time, NEC recommends a second system be available since Service Pack and Application updates require operating system reboot.

## Contact info

Microsoft Corporation  
1 Microsoft Way  
Redmond, WA 98052  
425-882-8080

[www.microsoft.com](http://www.microsoft.com)

NEC Solutions (America), Inc.  
10850 Gold Center Drive, Suite 200  
Rancho Cordova, CA 95670  
866-632-3226

[servers@necsam.com](mailto:servers@necsam.com)

[www.necsolutions-am.com](http://www.necsolutions-am.com)

## Microsoft links

**Windows Server 2003, Datacenter Edition:**

[www.microsoft.com/windowsserver2003/evaluation/overview/datacenter.mspix](http://www.microsoft.com/windowsserver2003/evaluation/overview/datacenter.mspix)

**Windows System Resource Manager:**

[www.microsoft.com/windowsserver2003/downloads/wsrmfacts.mspix](http://www.microsoft.com/windowsserver2003/downloads/wsrmfacts.mspix)

**Windows clustering technology:**

[www.microsoft.com/windowsserver2003/technologies/clustering/default.mspix](http://www.microsoft.com/windowsserver2003/technologies/clustering/default.mspix)

**SQL Server 2000:**

[www.microsoft.com/sql](http://www.microsoft.com/sql)

**SQL Server 2000 (64-bit):**

[www.microsoft.com/sql/64bit](http://www.microsoft.com/sql/64bit)

**Exchange Server:**

[www.microsoft.com/exchange](http://www.microsoft.com/exchange)

**Intel and Windows Server 2003:**

[www.intel.com/ad/server2003](http://www.intel.com/ad/server2003)

**ISV applications supporting 64-bit Windows:**

[www.microsoft.com/windowsserver2003/partners/isvs/64bitisvs.mspix](http://www.microsoft.com/windowsserver2003/partners/isvs/64bitisvs.mspix)

## NEC links

**NEC Solutions America:**

[www.necsolutions-am.com](http://www.necsolutions-am.com)

**Express5800/1000 series:**

[www.nec64.com](http://www.nec64.com)

**Express5800/300 series:**

[www.necft.com/win](http://www.necft.com/win)



Where  
To  
Learn  
More

Integration  
for  
Microsoft  
SQL  
Server  
2003

© 2003 Microsoft Corporation and NEC Solutions (America), Inc. All rights reserved. Microsoft, Active Directory, Visual Studio, Windows, and Windows Server are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. NEC is a registered trademark of NEC Corporation and/or one or more of its subsidiaries. Intel, Xeon, Pentium, and Itanium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries. TPC, TPC-C, and tpmC are trademarks of the Transaction Processing Performance Council. IBM and DB2 are registered trademarks of IBM in the United States. Oracle is a registered trademark, and Oracle9i is a trademark, of Oracle Corporation. The names of actual companies and products mentioned herein may be the trademarks of their respective owners.

**Part no. 098-97236**