



## Windows Advanced Server Limited Edition Overview

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### **Abstract**

This article provides an overview of the features and benefits of Microsoft® Windows® Advanced Server Limited Edition. It describes common user scenarios, system requirements, and the differences between 32-bit and 64-bit systems.

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## Introduction

The Microsoft® Windows® Advanced Server Limited Edition operating system, designed specifically for the Intel Itanium 64-bit chip, is the most powerful server operating system ever developed by Microsoft Corp. It further extends the enterprise capabilities of the Windows family of servers by building on the performance and scalability of the Windows 2000 server family x86 architecture.

Specifically, it increases scalability and reliability for memory-intensive applications such as those for data warehousing, business intelligence and Web hosting. This will enable developers and independent software vendors (ISVs) to develop a new generation of business solutions that will better assist organizations attain a real competitive advantage. Microsoft's vision is to provide its customers with an extensive suite of applications. That vision also includes providing Microsoft applications on 64-bit Windows. To achieve those goals, Microsoft will provide a rich set of development tools that will make it easier to create new applications and migrate existing 32-bit applications.

The Windows Advanced Server Limited Edition operating system represents a key milestone in 64-bit technology development. In keeping with the vision to deliver a higher-performing, scalable more feature-rich operating system to the market, Microsoft has made the Windows 2000 code base 64-bit ready. A fully featured 64-bit server operating system is scheduled to be available in 2001 and will be compatible with most existing 32-bit applications.

Some customers want to move to 64-bit Windows-based servers as soon as possible. In response, Microsoft intends to release an Itanium-based product, Windows Advanced Server Limited Edition, in summer 2001. It is expected that the majority of its sales will be primarily for development and testing efforts in migrating 32-bit applications to the 64-bit Windows Advanced Server Limited Edition environment.

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## Target Customers

The ever-expanding data needs of business, academic, engineering and scientific organizations significantly stress the limits and the capabilities of existing information technology platforms. Today, gigabytes (or even terabytes) of data need to be accessed in real time by millions of users worldwide, which requires considerable technological enhancements.

Overall, 64-bit Windows-based servers represent the best platform for 64-bit applications and provide a solid choice for any high-end server needs. Significant advancements in scalability for large databases and e-business applications are easily attainable because 64-bit Windows-based servers fully integrate into existing IT infrastructures. This provides a strategy for coexistence and preserves the customer's investment in 32-bit architectures and applications. Furthermore, there is virtually no loss in productivity attributed to developers', system administrators' and end users' having to learn new skill sets. Windows Advanced Server Limited Edition provides the same familiar Windows environment and tool set.

Microsoft worked closely with its customers to better understand their high-end computing needs. The result is Windows Advanced Server Limited Edition, which addresses key customer needs such as the following:

- Greater scalability for large databases and e-business applications
- Application performance improvements
- High availability and reliability for mission critical computing
- Interoperability with systems based on existing 32-bit architectures
- Preserving the investment in 32-bit applications
- Leveraging existing developer skill sets
- Taking advantage of existing Windows general skill sets

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## User Scenarios

64-bit Windows-based servers provide broader application availability to the Windows environment. Data-intensive tasks that are impossible today on low-cost server platforms can now be accomplished with 64-bit Windows. 64-bit Windows-based servers allow faster data access because more data can be stored and manipulated in physical memory, thus reducing or eliminating disk reads. New applications can be designed without the barriers imposed by 32-bit Windows. New graphics applications will make work easier and be more enjoyable to use.

64-bit Windows-based servers represent an attractive option to businesses hosting large databases, whether they represent traditional data, Web pages or scientific computing. A few 64-bit Windows-based server business scenarios are listed below:

### Scientific Computing

Scientific computing involves the processing of large amounts of data. The most effective means to speed up this processing is with large virtual memory support. Applications running on 64-bit Windows-based servers can manipulate large amounts of data easily and more reliably. Modeling for scientific and financial applications will benefit greatly from memory-resident data structures that are not possible on 32-bit systems.

Almost any system that can be quantitatively described using equations and/or rules can be simulated. A simulation is the process of creating a *model* (i.e., an abstract representation or facsimile) of an existing or proposed *system* (e.g., a project, a business, a mine, a watershed, a forest or the organs in your body) to identify and understand those factors that control the system and/or to predict (forecast) the future behavior of the system.

Simulation is a powerful and important tool because it provides a way to evaluate alternative designs, plans and/or policies without having to experiment on a real system, which may be prohibitively costly, time-consuming or simply impractical to do. That is, it allows you to ask "What if?" questions about a system without having to experiment on the actual system itself (and hence incur the costs of field tests, prototypes, etc.).

Although today's 32-bit computing systems are powerful enough to simulate many models, 10 percent of the simulations are pushing the limits of 32-bit capabilities. Larger, more complete models such as nuclear waste management are stressing the 32-bit limits of addressable virtual memory for calculating and storing results. In these situations, the scientist must adjust the analysis by either simplifying the model or saving fewer results; both are unattractive work-a-rounds. Windows has provided a very accessible platform for probabilistic simulation and decision analysis. Windows Advanced Server Limited Edition allows a solution to simulate models hitting 32-bit limits and will facilitate even greater dynamic simulation modeling and prediction scenarios. Dynamic modeling of geographic-based simulations will be possible with Windows Advanced Server Limited Edition. One example is the ability to map millions of data points on what happens in space and time as a storm passes over a land mass.

## **Database**

The increased physical memory includes the following benefits for database applications:

- Each application can support more users. All or part of each application must be replicated for each user, which requires additional memory.
- Each application has more memory for data storage and manipulation. Databases can store more of their data in the physical memory of the system. Data access is faster because disk reads are not necessary.
- Applications can manipulate large amounts of data easily and more reliably. Video composition for motion-picture work requires 64-bit Windows for that reason. Modeling for scientific and financial applications benefits greatly from memory-resident data structures that are not possible on 32-bit Windows.

Greater scalability also results in lower cost of ownership. Each Windows Advanced Server Limited Edition can support larger numbers of users and applications, so a business will require fewer servers to support the same number of users.

## **Web Services**

The demands of today's online, digital economy are ideally suited to 64-bit Windows-based servers. Web servers benefit from increased physical memory support to deliver performance improvements through greater in-memory caching of Web content. Security conscious and e-commerce sites will also realize performance improvements in Secure Sockets Layer (SSL) encryption and decryption processes accelerated by the floating-point, computational abilities of the Intel Itanium processor.

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## Benefits of 64-Bit Windows

The benefits of running 64-bit Windows-based servers in your enterprise give real value to your high-demand computing needs.

### **Greater Scalability for Large Databases and e-Business Applications**

Both servers running the 64-bit Windows operating system and the Itanium Processor Family are designed to address the most demanding business needs — such as e-commerce, data mining, online transaction-processing, memory-intensive high-end graphics, complex mathematics and high-performance multimedia applications — of today's Internet-based world. 64-bit Windows-based servers on Itanium provide significantly higher support for physical memory than 32-bit operating systems. For example, 32-bit Windows supports 4 gigabytes of virtual memory, while 64-bit Windows supports 16 terabytes of memory, which is 4,000 times greater than 32-bit Windows.

Scale-up system features include faster floating point processing, increased I/O throughput, more main memory (RAM) for more processes and less paging.

As described earlier in the database section, the increase in physical memory provides the following benefits for applications:

- There are an increased number of applications and concurrent users.
- Increased memory for data storage and manipulation allows faster data access by eliminating the need for disk reads.
- Applications can manipulate large amounts of data easily and more reliably.

Increased scalability also creates the business benefit of lower cost of ownership. The support in Windows Advanced Server Limited Edition for larger numbers of users and applications means organizations will be able to take advantage of server consolidation. This lowers administrative overhead, which is one of the highest costs in any computing environment.

### **Application Performance Improvements**

The 64-bit Windows server platform will provide a scalable, high-performance solution. Applications capable of exploiting the large memory provided by 64-bit addressing or those requiring increased floating point accuracy (such as SSL) will see considerable performance gains.

As mentioned earlier, increased physical memory allows more applications to run simultaneously and remain completely resident in the system's main memory thus reducing or eliminating the performance penalty of swapping pages to and from disk. Consequently, 64-bit applications will provide greater performance than 32-bit applications.

The architecture of Windows Advanced Server Limited Edition allows more efficient processing of extremely large amounts of data. Applications can preload substantially more data into virtual memory to enable rapid access by the Itanium processor. This reduces the time for loading data into virtual memory or seeking, reading and writing to data storage devices. This allows applications to run faster and more efficiently.

Improvements in application performance will provide knowledge workers with unprecedented gains in productivity. Knowledge workers will be able to better maximize their time more efficiently by analyzing data and producing information, rather than spending time waiting for applications to complete their processing.

### **High Availability and Reliability for Mission Critical Computing**

Hardware failures on Windows NT<sup>®</sup> 4.0 or Windows 2000-based systems require a developer to review a memory dump to figure out what failed. Windows Advanced Server Limited Edition enables error prediction, error logging and error recovery. New enhancements to error recovery will also be included in future releases of 64-bit Windows-based servers on Itanium.

Windows Advanced Server Limited Edition will have greater reliability than Windows 2000 due to Machine Check Architecture (MCA). Correctable errors are corrected and logged in the Windows Event Log. Non-correctable errors are logged in the Windows Event Log at reboot. Complete error logs mean no more guessing about the cause of a hardware failure. Analysis of error logs enables hardware-error prediction. System administrators can be remotely notified of errors and monitor the Windows Event Log to spot hardware-error trends and take action.

### **Interoperability with Systems Based on Existing 32-bit Architectures**

64-bit Windows-based servers are not intended to replace 32-bit Windows-based servers. Windows Advanced Server Limited Edition will have a transparent integration with Windows-based clients and servers on Itanium as well as with Windows-based clients and servers not on Itanium.

Win32<sup>®</sup>-based applications will also run on 64-bit Windows using an emulation layer. WOW64 is the x86 emulator that allows Win32-based applications to run on 64-bit Windows-based servers. Although 64-bit hardware will be compatible with many 32-bit applications, it is recommended that 32-bit applications not be run on 64-bit servers. Performance for 32-bit applications will be greater on 32-bit hardware. In general, only those applications that require the increased power of 64-bit technology should be run in a Windows on Itanium platform and they should be 64-bit applications. WOW64 is designed to run 32-bit personal productivity applications needed by software developers and administrators, not to run 32-bit server applications for the end user.

WOW64 launches and runs 32-bit applications seamlessly. The system isolates 32-bit applications from 64-bit applications and will prevent file and registry collisions. Console and GUI apps are both supported as well as service applications. The system provides interoperability across the 32-64 boundary for scenarios such as cut and paste and COM. However, 32-bit processes cannot load 64-bit DLLs, and 64-bit processes cannot load 32-bit DLLs.

### **Preserving the Investment in 32-bit Applications**

Microsoft understands the need for technology managers and users to take advantage of their investments in earlier versions of Windows. As mentioned above, investments in 32-bit applications will be preserved. API-level compatibility between the Win64<sup>™</sup> API and the Win32 API is provided in the platform suite.

Microsoft is working with third-party application vendors in conjunction with the 64-bit product development programs to ensure that their software will run unmodified on 64-bit Windows-based computers. This will give companies the ability to add 64-bit Windows-based systems to existing networks without changing the 32-bit applications currently in use.

As organizations begin their deployment of the 64-bit platform, most of the applications they will run on 64-bit Windows-based computers will need to be migrated from a 32-bit environment. Doing so is necessary to allow those applications to fully exploit the new benefits of the 64-bit platform. SDKs and DDKs will provide the tools needed to easily migrate applications to the new Itanium Processor Family systems as soon as they become commercially available. Microsoft supports migrating those applications using the 64-bit Windows data model. This data model provides the capability to write a single-source code that can run on both 32-bit and 64-bit computers.

### **Leveraging Existing Developer Skill Sets**

Developers with 32-bit skills will find the development environment virtually identical to the development environment for 32-bit Windows; the Win64 API is the same as the Win32 API. They should find the development environment familiar, which should help keep productivity high. The existing APIs have been modified where necessary to reflect the precision of the platform on which they are running. The business benefit here is in simplicity and cost. A minimal learning curve for the developer allows organizations to preserve their investment in IT staff while minimizing training costs and maximizing productivity; writing code for 64-bit Windows is just like writing code for 32-bit Windows.

The 64-bit Windows development environment supports the same feature set as 32-bit Windows, including user interface and programming models, networking, security, graphics, multimedia, directory service, Plug and Play, and tools. Many of the functions have been modified to reflect the computational precision of the platform on which an application is run.

Microsoft is currently engaged in assisting ISVs with their development process to accelerate application development on the 64-bit Windows platform. To help ISVs and application developers get a jump-start today, Microsoft provides 64-bit platform development tools in the 64-bit Windows programming development guide, *Getting Ready for 64-bit Windows*.

As mentioned earlier, Microsoft is fully committed to helping developers with Win32-based to Win64-based application migration as well as new 64-bit application design.

### **Taking Advantage of Existing General Skill Set for Windows**

In addition to developers, other teams within the IT organization will also be able to take advantage of their 32-bit Windows 2000 skill set in the 64-bit Windows-based server environment. System administrators and help desk staff will see the same user interface. Setup, configuration and administration will also be essentially the same. In short, Windows Advanced Server Limited Editions one operating system with one code base and one user interface.

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## Differences Between 32-Bit and 64-Bit Windows

The major differentiator between 32-bit and 64-bit Windows-based servers is in memory support. Currently, 32-bit Windows is capable of supporting up to 64 GB of system memory on Windows 2000 Datacenter Server, with up to 2 GB of dedicated memory per process. Windows Advanced Server Limited Edition will currently support up to 64 GB of RAM, with the potential to support up to 16 terabytes of virtual memory as hardware capabilities and memory sizes grow.

Selected additional features specific to the 64-bit server are listed in the table below.

| FEATURE   | BENEFIT  |
|---|--|
| Group policy: Support for 64-bit software deployment          | <p>This feature provides support for 64-bit software deployment with group policy. New options in the Application Deployment Editor (ADE) will help determine if 32-bit applications should be deployed to 64-bit clients. The ADE will also allow existing Windows 2000 deployments to be managed with the same level of functionality provided by Windows Advanced Server Limited Edition.</p> <p>For example, an IT administrator is planning to deploy a Windows Installer package to a group of users. The Windows Installer package is for 32-bit operating systems and applications but some of the users have 64-bit computers and operating systems. The IT administrator knows the 32-bit package works correctly on 64-bit computers and operating systems and uses the new Make 32-bit x86 Windows Installer Application Available to IA64 machines option in ADE, and the package is deployed to all users.</p> |
| Printing: 32-bit and 64-bit interoperability                  | <p>This feature allows 32-bit applications to print via a 64-bit print server.</p> <ul style="list-style-type: none"><li>• An IT administrator running a 32-bit management application on a computer with 32-bit operating system can add, delete and configure ports of a 64-bit print server.</li><li>• A user changes from a 32-bit application on a 32-bit operating system to a 64-bit operating system. This ability to display driver pages, query device capabilities and print is still available.</li><li>• A user with a 32-bit application on a 64-bit operating system can add or delete printer connections.</li></ul>   |
| Driver installation for 64-bit                                | <p>To allow for the installation of device drivers on both 32-bit and 64-bit computers, the INF file definition supports the new .NTIA64 platform extension, which is used to designate a driver for installation only on 64-bit computers. Thus, a developer can create an INF file that installs a 64-bit driver only on 64-bit computers.</p>   |
| Windows installer: Support for installing 64-bit applications | <p>This feature enables 64-bit Windows Installer packages to include both 32-bit and 64-bit components. The installer will correctly install and register 32-bit components with the WOW64 subsystem when they are installed.</p>  |
| Cluster services: 64-bit support                              | <p>This feature provides 64-bit support of clustering services on Windows Advanced Server Limited Edition.</p>   |



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## **ISV Commitment**

Microsoft, Intel Corp. and OEM partners have engaged with key ISVs supporting our target user scenarios. Through Microsoft's technical beta program, pilot systems from Intel, and the use of several remote 64-bit development labs, hundreds of ISVs are well underway with their development process. This helps Microsoft realize its vision, mentioned at the beginning of this white paper, to provide customers with an extensive suite of applications, including providing leading Microsoft applications on 64-bit Windows.

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## System Requirements

Windows Advanced Server Limited Edition requires a 64-bit motherboard and chipset, available through Intel and several OEMs.

|                  | <b>Minimum</b>        | <b>Recommended</b>                             |
|------------------|-----------------------|--|
| <b>Processor</b> | 733 MHz Intel Itanium | 800 MHz Intel Itanium                          |
| <b>Memory</b>    | 1 GB RAM              | 1 GB RAM or greater depending upon application |
| <b>Video</b>     | VGA                   | VGA  |

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## **Distribution**

Windows Advanced Server Limited Edition is scheduled to be available with new Itanium systems from several OEMs at the time of Itanium-based server availability. The Windows Advanced Server Limited Edition release will be supported for 90 days after the RTM of the final, 64-bit Windows Advanced Server product. In order to continue to receive support, the customer must upgrade to the RTM version available from their OEM.

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## **The Future of 64-bit Computing**

Windows Advanced Server Limited Edition is the first step in 64-bit server computing from Microsoft. As data sets and memory requirements continue to grow, there will be an increasing demand for the capabilities of 64-bit Windows on Intel Itanium.

32-bit and 64-bit version of the Windows Advanced Server Limited Edition operating system will be developed in tandem, providing customers with a full range of computing environments from which to choose.

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## Summary

The ever-expanding data needs of business, academic, engineering, and scientific organizations push the limits and the capabilities of existing information technology (IT) platforms. Today, gigabytes or even terabytes of data need to be accessed in real time by millions of users worldwide, and new technology is needed to meet this demand.

Designed to exploit the power and efficiency of the new Intel Itanium 64-bit (IA-64) processor, Microsoft Windows Advanced Server Limited Edition provides high availability, advanced scalability, and large memory support.