

The Evolution of Windows Servers

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Technology has rapidly evolved over the decades and has become a significant part of our daily lives. From the earliest days of technological inventions to smartphones to computers or laptops, this evolution made communication, research, processing data, and jobs efficient without doing tasks manually. Within these evolutions are generations. Through these numerous generations, each version either share features of previous generations or introduces a concept that impacts technological performance and society as a whole. Although smartphones are the current evolvement, computer software and servers have also evolved. In previous years, servers were often kept in a highly controlled environment to prevent downtime. However, now you can download servers on your computer such as Windows Servers. The evolution of Windows Servers impacted the way businesses and IT operate within the network with their great performance and features.

### **The Developmental History of Windows Servers**

The evolution began with the first three prototypes: Windows Server NT 3.1, Windows Server NT 3.5, and Windows Server NT 4.0. At the beginning of development, NT (short for New Technology) was developed by the NT chief architect, David Cutler. After graduating college, David developed the first operating system RSX-11M at Digital. A few years later, he and other team members developed other operating systems such as VAX and VMS. However, this project was canceled by Digital. In the late 1980s, Microsoft executives noticed his creative development and wanted to hire him. In August, Bill Gates also noticed his creativity and hired

him and adopted NT into the early versions of Windows Servers. The first operating system was named OS/2 NT; however, it was renamed Windows NT after releasing Windows 3.0.

A couple of features that NT had were two execution modes (user and privileged), a security subsystem based on objects with access control lists, performance monitoring, a process manager, a clock-based replacement algorithm, etc. On the other hand, Windows NT features included the ability to coexist with other operating systems via multi-boot capabilities, support of CPU systems with symmetric multiprocessing (SMP), preemptive multitasking and threading operations, and a variety of networking systems (Amy, 2022). The development of NT set the stage for the first server.

Windows NT Server 3.1 was the first server to be released in July 1993. The server included a 32-bit architecture and processor independence. As for its processors, it uses Intel x86, MIPS, and Alpha. Originally, NT versions were meant to have an Intel i860 processor; however, the performance wasn't suitable (Woolsey, 2023). During its development, graphical user interfaces were a new concept in technology and under development itself. For Windows Server NT 3.1, its graphical user interface included a flexible environment by adapting multiple user interfaces and supporting applications for the diversity of other operating systems (Woolsey, 2023). Like its predecessor, its features also included multiprocessing and preemptive multitasking. In addition, other features included kernel threads, an NTFS file system, and multi-user support. This server laid the foundation for other Windows Server operating systems and applications.

A year later in September, Windows released the second update, Windows NT Server 3.5. This was the first operating system to adopt the name Workstation and Server. In addition, it was

also named Daytona in reference to the Daytona International Speedway and because of its high performance (Microsoft Wiki). In businesses, this helped with networking and sharing files. Two networking features this server has are Winsock and TCP/IP support. Winsock or Windows Socket is an application programming interface (API) that allows Windows applications to access the network services through TCP/IP. As for its filing features, users can share files using FTP and line printer remote (LPR) also virtual file allocation table (VFAT). VFAT allows users to write file names up to 255 characters long.

Released in August 1996, Windows NT Server 4.0 was the breaking ground for enterprise computing. Enterprise computing helps businesses or organizations manage large quantities of data and large-scale networks with its complex infrastructure. Compared to the other predecessors, this server improved the user experience by integrating the Windows 95 graphical user interface (Finnerty, 2023). Some features of this server include NT Explorer, a start menu, and desktop updates. NT Explore is an application for users to search files. Other features allowed users to encrypt, build network applications on their sockets, transfer query data, and gain access to modems (The History of Computing, 2022). Not only was Windows Server 4.0 the breaking ground for enterprise computing, this introduced the concept of domain-based networking models (Finnerty, 2023). This allows users to assign permissions to others who collaborate with other departments.

**Features**

<b><u>Windows NT Server 3.1:</u></b>	<b><u>Windows NT Server 3.5 :</u></b>	<b><u>Windows NT Server 4.0 :</u></b>
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<ul style="list-style-type: none"> <li>● 32-bit architecture</li> <li>● Processor independence</li> <li>● Kernal threads</li> <li>● NTFS file system</li> <li>● preemptive multitasking</li> <li>● Multiprocessing/multiuser support</li> </ul>	<ul style="list-style-type: none"> <li>● TCP/IP support</li> <li>● Winsock</li> <li>● sharing files through FTP and printers using LPR</li> <li>● VFAT</li> </ul>	<ul style="list-style-type: none"> <li>● Integrated Windows 95 GUI</li> <li>● NT Explore</li> <li>● Start menu</li> <li>● Desktop updates/task scheduler</li> <li>● DCOM/OLE</li> <li>● Microsoft Transaction Server</li> <li>● TAPI</li> <li>● Crypto API</li> <li>● Microsoft Queuing Message service</li> </ul>
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**The New Era of Window Servers**

In the beginning of the Millenial Age, new technologies and concepts became predominant and flourished throughout society. Some of these technologies included smartphones, Bluetooth, iPods, DVDs, USB drives, etc. Most computers took the form of laptops and continued with the bulky desktops. Graphical user interfaces during this age were still under development; however, the quality has drastically changed compared to the older versions of

older computers from decades ago. In February 2000, Windows released Windows Server 2000 and this began the new era of Windows Servers.

Dropping “NT” from the name, Microsoft wanted this server to be different from the others by emphasizing its new capabilities. A few specifications of this server included a Pentium processor, 128 MB of RAM, and 2 GB of hard disk space. Although this server is no longer included in the NT family, this server shares the same features as Windows Server NT 3.1 such as multiprocessing, multitasking, and NTFS. However, this version can support up to two processors such as x86 32-bit and 64-bit architectures with SMP. As for NTFS, this makes specification of user rights possible for files, directories, file compression, quotas, and others usable (Operating System). This made workgroup filing, printing, and communication efficient. A couple of other features that this server has are system file protection (SFC), backup recovery, Microsoft Management Console, and compatibility with laptops. For network purposes, this version was the first to introduce support for DNS-based naming. In addition, Active Directory was also introduced and became a part of Windows networking management.

In April 2003, Windows Server 2003 was a “leap forward” for Windows in security and performance (Solar Winds). It reduced the need to reboot the system after every update, allowing users to install updates without restarting the whole system. For configuration purposes, it allowed users to customize operating systems for tasks on the servers by defining server roles. This server also improved web serving by introducing Internet Information Services (Finnerty, 2023).

In 2008 and 2012, the future of Windows Servers began with the introduction of virtualization and cloud computing. These concepts were executed in Windows Server 2008 and

2012, followed by their R2 editions. Windows Server 2008 was the first to introduce virtualization with Hyper-V. This software allowed users to create virtual machines. In addition, this improved power management with core parking. In comparison, Windows Server 2012 enhanced cloud computing and Hyper-V with its Hyper-V Virtual Switch and Replica editions. For the R2 versions, these improved network services and enhanced the systems by providing better access to networks and filing systems. For administration and configuration, these two servers improved server management and gave new administration tools such as Event Viewer (Windows Server 2008), Windows Task Management (Windows Server 2012), PowerShell (Windows Server 2012), and Desire State Configuration (Windows Server 2012). Within this period, this also began the new look of Windows Server graphical user interfaces.

Adapting to cloud computing and virtualization, Windows Server 2016 enhanced virtual machines by introducing Nano Server and Docker containers. The Nano Server was a lightweight server with a light interface designed for microservices and cloud applications. With Windows Server 2016 supporting containers, this made it easier for compatibility with Docker. This version also introduced Network Controllers; an admin tool that helps administrators manage both virtual and physical network devices from a single location.

**Features:**

<b><u>Windows Server 2000:</u></b>	<b><u>Windows Server 2003 :</u></b>	<b><u>Windows Server 2008 (R2):</u></b>	<b><u>Windows Server 2012 (R2):</u></b>	<b><u>Windows Server 2016:</u></b>
<ul style="list-style-type: none"> <li>● First to support DNS-based naming</li> <li>● Introduction</li> </ul>	<ul style="list-style-type: none"> <li>● Installation of updates without the need for reboot</li> <li>● Internet</li> </ul>	<ul style="list-style-type: none"> <li>● Hyper-V Cloud computing</li> <li>● Core Parking</li> <li>● Event Viewer</li> </ul>	<ul style="list-style-type: none"> <li>● Hyper-V Virtual Switch/Replica</li> <li>● IP address management role</li> </ul>	<ul style="list-style-type: none"> <li>● Docker compatible containers</li> <li>● Nano Server</li> <li>● <b>Editions:</b></li> </ul>

<p>of Active Directory</p> <ul style="list-style-type: none"> <li>• XMP support</li> <li>• Gives users the ability to create active server pages</li> </ul>	<p>Information Services (IIS)</p> <ul style="list-style-type: none"> <li>• Ability to define server roles</li> </ul>	<ul style="list-style-type: none"> <li>• Server Manager</li> <li>• Gives users the ability to create virtual machines</li> <li>• DirectAccess</li> <li>• BranchCache</li> </ul>	<ul style="list-style-type: none"> <li>• ReFS</li> <li>• Server Core</li> <li>• Introduction of Powershell</li> <li>• Introduction of Desired State Configuration</li> <li>• New interface</li> <li>• <b>Editions:</b> Foundation, Essentials, Standard, and Datacenter</li> </ul>	<p>Standard and Datacenter</p> <ul style="list-style-type: none"> <li>• Adaptation of cloud computing and virtualization</li> <li>• Introduction of Network Controller</li> </ul>
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**The Future of Windows Servers**

The future of technology has rapidly flourished with more technological concepts integrating cloud services and virtualization and the introduction of artificial intelligence.

Mircosoft continued to implement this trend after Windows Server 2008 and 2012 with Windows Server 2019 and 2022. Windows Server 2019 is the current version used today. Like Windows Server 2016, this server also adopted the trends of hybrid capabilities it enhances security, innovation, and integration with Azure Services. This also introduced Microsoft Defender Advanced Threat Protection. This software tracks users’ activity, prevents unauthorized, and investigates attacks in the protection of cyber threats.

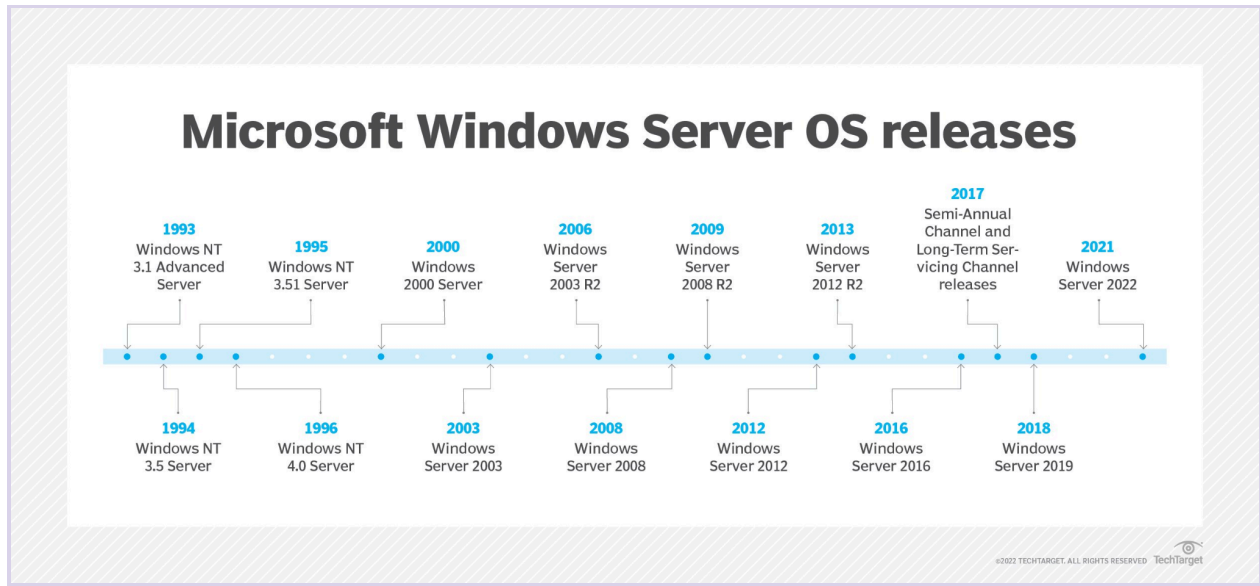
Although Windows Server 2022 is the recent update and not used as much as Windows Server 2019, it was built on the foundations of Windows Server 2019 (Microsoft Learn). By adopting Azure services, Window Server 2022 enhanced the virtualization and cloud services by including additional features such as hotpatching, server message block (SMB) over quick UDP Internet Connections (QUIC), Azure Extended Network, and Azure Stack HCI. Some other

features are IPv6 support, Microsoft Edge Browser, networking performance, remote desktop virtualization, and a variety of other features that make this server great in performance.

In the fall of 2024, Microsoft's innovation for the future of Windows Servers starts with Windows Server 2025. Although this version is currently under development, this server is fully equipped with numerous features for administrators, Azure services, customization, and more. With AI integration being common in technology, Microsoft integrated this into Hyper-V with the introduction of GPU partitioning; users can partition these and assign them to VMs or live migrate VMs with these partitionings between two servers (Microsoft). Another feature this server is going to be introducing is workgroup clusters. Workgroup clusters in this version don't include Active Directory like Windows Server 2022 does, this makes it easier for configuration.

In conclusion, the evolution of technology impacted our daily lives. From earlier technological advancements to computer software and servers, this evolution has made doing tasks efficient instead of manually. In previous years, servers were kept in highly conditioned environments to prevent downtime. However, in today's time, these servers can be downloaded as software such as Windows Server. The evolution of Windows Servers impacted the way IT and businesses operate within the network with its great performance and features. It began with three prototypes such as Windows NT Server 3.1, 3.5, and 4.0 that paved the way for the next generation of Windows Servers. The new era began with Windows Server 2000 and 2003. These two made performance and security fast and efficient for networking and filing. The future began first with Windows Server 2008 and 2012 with the introduction of virtualization and cloud computing. Afterward, it continued throughout the later versions such as Windows Server 2016, 2019, 2022, and 2025, which enhanced networking and administration performance. With

Microsoft continuing to strive for innovation in the future, their servers will continuously impact enterprise computing.



***Image source: Walat, T. (2017, December 28). Microsoft Windows Server OS (operating system). TechTarget. <https://www.techtarget.com/searchwindowsserver/definition/Microsoft-Windows-Server-OS-operating-system>***

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