Microsoft Windows 2000

System Performance Comparison

ZDLABS

November, 1999

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Origin of report

ZD Labs prepared this report under contract from Microsoft Corporation.

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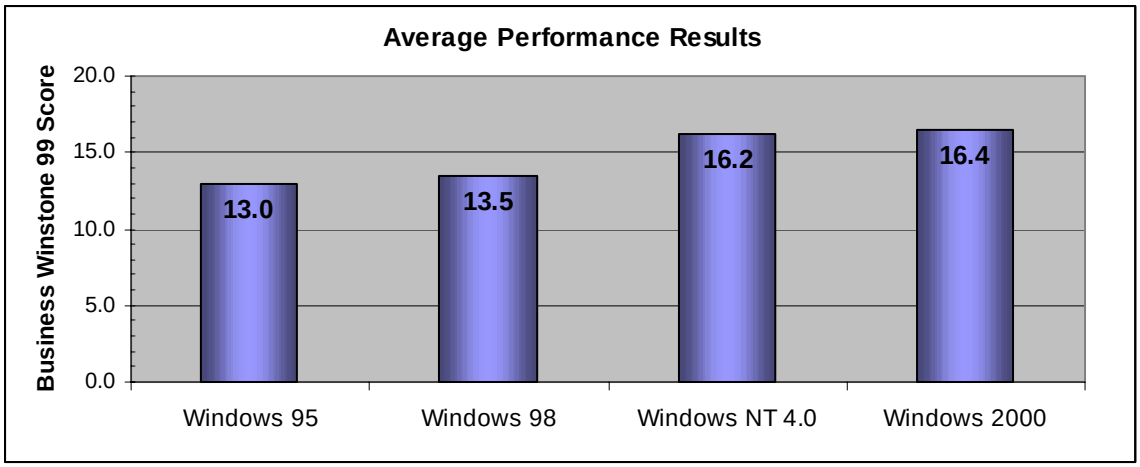
1.0 Executive Summary

Microsoft Corporation commissioned ZD Labs to compare the performance of Windows 2000 Professional Release Candidate 2 (RC2) operating system with Windows 95 OEM service release 2.1 (OSR2.1), Windows 98 Second Edition (SE) and Windows NT Workstation 4.0 with Service Pack 5 (SP5). Microsoft asked that we compare the performance of typical business systems running each of the four operating systems at three memory sizes: 32 MB, 64 MB, and 128 MB. We used ZD's Business Winstone 99 to measure the system performance of five desktop systems and two notebook computers. We tested systems that included a range of manufacturers, processor types and speeds, hard disk models and sizes, and video adapters.

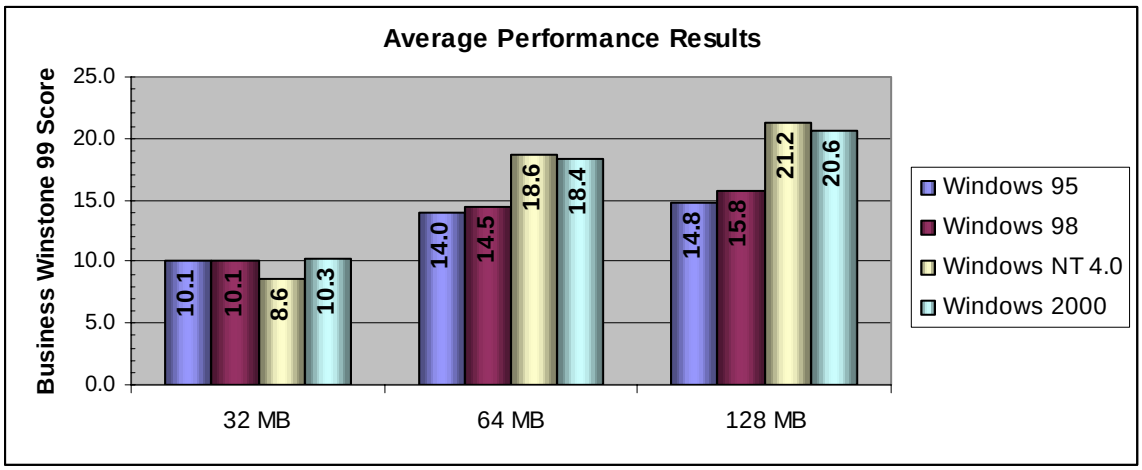
We found that, on average, the performance of Windows 2000 was significantly better than Windows 95 and Windows 98, and comparable to Windows NT 4.0. The graph below shows the average performance that we measured for each operating system. We computed the average across all test systems and memory sizes.



When broken down by memory size, the Business Winstone 99 results demonstrate that, on average:

- Windows 2000 is significantly faster than Windows 95 and 98 on systems with 64 MB or more of memory (in excess of 25 percent); and comparable to Windows 95 and 98 with 32 MB (within 2 percent).
- Windows 2000 is significantly faster than Windows NT 4.0 (in excess of 15 percent) on configurations with 32 MB; and comparable to the performance of Windows NT 4.0 (within 3 percent) on configurations with 64 MB and 128 MB of memory.

The graph below shows the average performance of each operating system based on memory size. We computed average performance across all test systems.



2.0 Test Methodology

We used ZD's Business Winstone 99 v1.2 to measure overall system performance. Winstone 99 is a system-level, application-based benchmark that measures a PC's overall performance when running top-selling Windows-based 32-bit applications. Business Winstone 99 tests with the most popular office suites in the marketplace: Corel WordPerfect Suite 8, Lotus SmartSuite, and Microsoft Office 97.

To further enhance the real-world nature of this test, Microsoft had us install additional business applications (Lotus Notes 4.52, Microsoft® FrontPage® 2000 website creation and management tool, Microsoft Project 98, Norton AntiVirus 2000, and WinZip 7.0) on the system before running the tests.

We performed the following test methodology for all systems in our performance comparison test.

2.1 Windows 95 OSR2.1

- Created and formatted a 2-gigabyte (GB) FAT16 boot partition.
- Installed Windows 95 OSR2.1.
- We used the default video drivers supplied with Windows, except in the case when Windows installed the default VGA video drivers. In this case, we installed the latest Windows Hardware Quality Lab (WHQL) drivers available from the appropriate vendor's Web site.
- Installed DirectX 6.1.
- Enabled direct memory access (DMA) when available.
- Installed the following five business applications: Microsoft FrontPage 2000, Microsoft Project 98, Norton AntiVirus 2000, Lotus Notes 4.52, and WinZip 7.0.
- Launched each of the five applications to properly initialize them.
- Installed Winstone 99 v1.2
- Disabled all startup tasks using ZD's Startup Manager.

- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

- Adjusted the amount of system memory to 64 MB by adding "MaxPhysPage=4000" to the "386Enh" section of SYSTEM.INI.
- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

- Adjusted the amount of system memory to 32 MB by adjusting "MaxPhysPage=2000" in the "386Enh" section of SYSTEM.INI.
- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

2.2 Windows 98 SE

- Created and formatted a 2-gigabyte (GB) FAT16 boot partition.
- Installed Windows 98 Second Edition.
- We used the default video drivers supplied with Windows, except in the case when Windows installed the default VGA video drivers. In this case, we installed the latest WHQL drivers available from the appropriate vendor's Web site.
- Enabled DMA when available.
- Installed the following five business applications: Microsoft FrontPage 2000, Microsoft Project 98, Norton AntiVirus 2000, Lotus Notes 4.52, and WinZip 7.0.
- Launched each of the five applications to properly initialize them.
- Installed Winstone 99 v1.2
- Disabled all startup tasks using ZD's Startup Manager.

- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

- Adjusted the amount of system memory to 64 MB by adding "MaxPhysPage=4000" to the "386Enh" section of SYSTEM.INI.
- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

- Adjusted the amount of system memory to 32 MB by adjusting "MaxPhysPage=2000" in the "386Enh" section of SYSTEM.INI.
- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Defragmented the hard disk and restarted Windows.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

2.3 Windows NT Workstation 4.0

- Created and formatted a 2-gigabyte (GB) FAT16 boot partition.
- Installed Windows NT Workstation 4.0.
- We used the default video drivers supplied with Windows NT 4.0, except in the case when the default driver provided only VGA support. In this case, we installed the latest WHQL driver available from the vendor's Web site.
- Installed Service Pack 5 for Windows NT Workstation 4.0.
- Installed audio drivers.
- Installed the following five business applications: Microsoft FrontPage 2000, Microsoft Project 98, Norton AntiVirus 2000, Lotus Notes 4.52, and WinZip 7.0.
- Launched each of the five applications to properly initialize them.
- Installed Winstone 99 v1.2
- Disabled all startup tasks using ZD's Startup Manager.

- Restarted the system.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Restarted the system.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

- Adjusted the amount of system memory to 64 MB by adding "/maxmem=64" to the default boot option in "BOOT.INI."
- Restarted the system.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Restarted the system.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

- Adjusted the amount of system memory to 32 MB by adding "/maxmem=32" to the default boot option in "BOOT.INI."
- Restarted the system.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Restarted the system.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

2.4 Windows 2000 Professional

- Created and formatted a 2-gigabyte (GB) FAT16 boot partition.
- Installed Windows 2000 RC2.
- We used the video drivers supplied with Windows 2000, except on System 3 and System 4, where we used more up-to-date drivers (see section 3.1).
- Installed the following five business applications: Microsoft FrontPage 2000, Microsoft Project 98, Norton AntiVirus 2000, Lotus Notes 4.52, and WinZip 7.0.
- Launched each of the five applications to properly initialize them.
- Installed Winstone 99 v1.2
- Disabled all startup tasks using ZD's Startup Manager.

- Defragmented the hard disk and restarted the system.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Defragmented the hard disk and restarted the system.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

- Adjusted the amount of system memory to 64 MB by adding "/maxmem=64" to the default boot option in "BOOT.INI."
- Defragmented the hard disk and restarted the system.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Defragmented the hard disk and restarted the system.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

- Adjusted the amount of system memory to 32 MB by adding "/maxmem=32" to the default boot option in "BOOT.INI."
- Defragmented the hard disk and restarted the system.
- Ran Business Winstone 99 v1.2 and saved the results in a database.
- Defragmented the hard disk and restarted the system.
- Ran Business Winstone 99 v1.2 a second time to verify the results of the first run.

3.0 Winstone Performance Results

We tested the performance of Windows 2000 Professional RC2, Windows 95 OSR2.1, Windows 98 SE and Windows NT Workstation 4.0 SP5 running on seven system configurations at three memory sizes: 32 MB, 64 MB, and 128 MB of RAM. We used Business Winstone 99 v1.2 to measure system performance and recorded two Business Winstone 99 scores for each test configuration. We averaged the two scores to produce a single result.

Although Microsoft recommends at least 64 MB of memory, 32 MB systems are still supported. By running Business Winstone 99 on configurations with 32 MB of memory, results demonstrate the performance capabilities of each operating system in a memory-pressured environment. Workloads that require more memory than is available will respond similarly.

3.1 All Performance Results

System names followed by a letter indicate that we performed multiple sets of tests on those systems, using a different video adapter for each set of tests. Microsoft requested that we test some systems with different video adapters. Refer to Appendix A for full system disclosures.

We installed DirectX 6.1 for all our Windows 95 tests. System 2 used a 3D sound card that required DirectX 6.1. Therefore, to be consistent, we installed DirectX 6.1 on all systems.

System 3 and System 4 both used updated ATI video drivers rather than the ones on the Windows 2000 RC2 CD.

32 MB Systems	Windows 95	Windows 98	Windows NT	Windows 2000
System 1	6.2	6.2	**7.0**	6.6
System 2a	**10.3**	**10.3**	7.4	9.2
System 2b	9.6	9.9	5.7	**10.0**
System 3	13.4	13.6	12.2	**13.8**
System 4	11.8	11.6	10.3	**14.2**
System 5	8.0	**8.5**	8.0	7.6
System 6	**11.4**	10.7	9.7	10.6

Figure 3. Business Winstone 99 Results with 32 MB of RAM.

64 MB Systems	Windows 95	Windows 98	Windows NT	Windows 2000
System 1	7.4	7.7	**10.0**	9.5
System 2a	14.0	14.4	**17.2**	15.0
System 2b	13.5	14.3	17.8	**19.3**
System 3	17.7	18.5	**23.3**	23.0
System 4	18.2	19.0	**26.7**	**26.7**
System 5	10.9	12.1	**15.4**	15.1
System 6	16.2	15.7	20.1	**20.6**

Figure 4. Business Winstone 99 Results with 64 MB of RAM.

128 MB Systems	Windows 95	Windows 98	Windows NT	Windows 2000
System 1	6.9	6.9	**8.5**	**8.5**
System 2a	14.4	15.2	**20.7**	20.3
System 2b	14.7	16.4	21.3	**21.5**
System 3	18.4	20.0	**26.0**	24.8
System 4	21.1	22.4	**32.7**	29.8
System 5	11.6	13.2	**17.1**	16.6
System 6	16.7	16.7	22.5	**22.8**

Figure 5. Business Winstone 99 Results with 128 MB of RAM.

System 1, an older Pentium model, ran slower with 128 MB of RAM than with 64 MB of RAM. This is not unusual with older systems. The external L2 cache in System 1 did not support the full 128 MB address range. When System 1 was manufactured, 32 MB of RAM exceeded the recommended amount of memory for most business applications. With 32 MB, or even 64 MB of RAM, the L2 cache presented no danger of bottlenecking. But, when upgraded to 128 MB of RAM, the efficiency of the L2 cache degraded. As a result, system performance suffered.

3.2 Average Performance Results

The table below lists the average performance of the seven systems we tested.

System RAM	Windows 95	Windows 98	Windows NT	Windows 2000
32 MB	10.1	10.1	8.6	**10.3**
64 MB	14.0	14.5	**18.6**	18.5
128 MB	14.8	15.8	**21.3**	20.6

Figure 6. Average Business Winstone 99 Performance.

We used the average performance results to compute the performance of Windows 2000 relative to the other operating systems. The table below lists the performance of Windows 2000, at each memory configuration, relative to the other operating systems.

System RAM	Windows 95	Windows 98	Windows NT
32 MB	102%	102%	119%
64 MB	132%	127%	99%
128 MB	139%	130%	97%

Figure 7. Relative Windows 2000 Performance

With 32 MB of RAM, we found that Windows 2000 provided significantly better performance, on average, than Windows NT 4.0. On average, Windows 2000 was 19 percent faster than Windows NT 4.0. With 32 MB of RAM, Windows 2000 offered comparable performance to both Windows 95 and Windows 98.

When we increased system RAM to 64 MB, Windows 2000 performed significantly faster than Windows 95 and Windows 98. With 64 MB of RAM, Windows 2000 was 32 percent faster than Windows 95 and 27 percent faster than Windows 98.

Going from 64 MB to 128 MB of RAM, the performance advantage of Windows 2000 over Windows 95 and Windows 98 grew larger. With 128 MB of RAM, Windows 2000 was 39 percent faster than Windows 95 and 30 percent faster than Windows 98.

On average, however, we found that Windows NT 4.0 provided slightly better performance than Windows 2000 when running with 64 MB and 128 MB of RAM. Although the performance difference at 64 MB was small, we found that the performance difference between the two operating systems grew when we added more memory. With 128 MB of RAM, Windows 2000 was 3 percent slower than Windows NT 4.0.

3.3 Performance Gains With Increased RAM

The following table illustrates the average Business Winstone 99 performance gain measured for each operating system when more system RAM was added.

Increased RAM	Windows 95	Windows 98	Windows NT	Windows 2000
32 MB to 64 MB	39%	44%	**116%**	79%
64 MB to 128 MB	6%	9%	**14%**	12%

Figure 8. Business Winstone 99 Performance Gains with Increased RAM.

Windows NT 4.0, because of its poor 32-MB performance, experienced the largest performance gain, 116 percent, when going from 32 MB to 64 MB of RAM. Windows 2000 experienced the next largest performance gain, 79 percent, when going from 32 MB to 64 MB of RAM. Although Windows 95 and Windows 98 both experienced significant performance gains when upgraded from 32 MB to 64 MB of RAM, their gains were about half that of Windows 2000.

The 14 percent performance gain experienced by Windows NT 4.0 was the largest we measured when going from 64 MB to 128 MB of RAM. The 12 percent performance gain for Windows 2000 was comparable to that of Windows NT 4.0.

3.4 Performance Charts

The results of our testing differed noticeably at the different RAM amounts. With 32 MB of RAM, representing a system that is under memory pressure, Windows 2000 ran faster than Windows NT 4.0 on five of seven systems. On the other two systems, the performance of Windows NT 4.0 and Windows 2000 was within 6 percent. With 32 MB of RAM, Windows 2000 performance was comparable to that of Windows 95 and Windows 98, with Windows 2000 faster on four of seven systems.

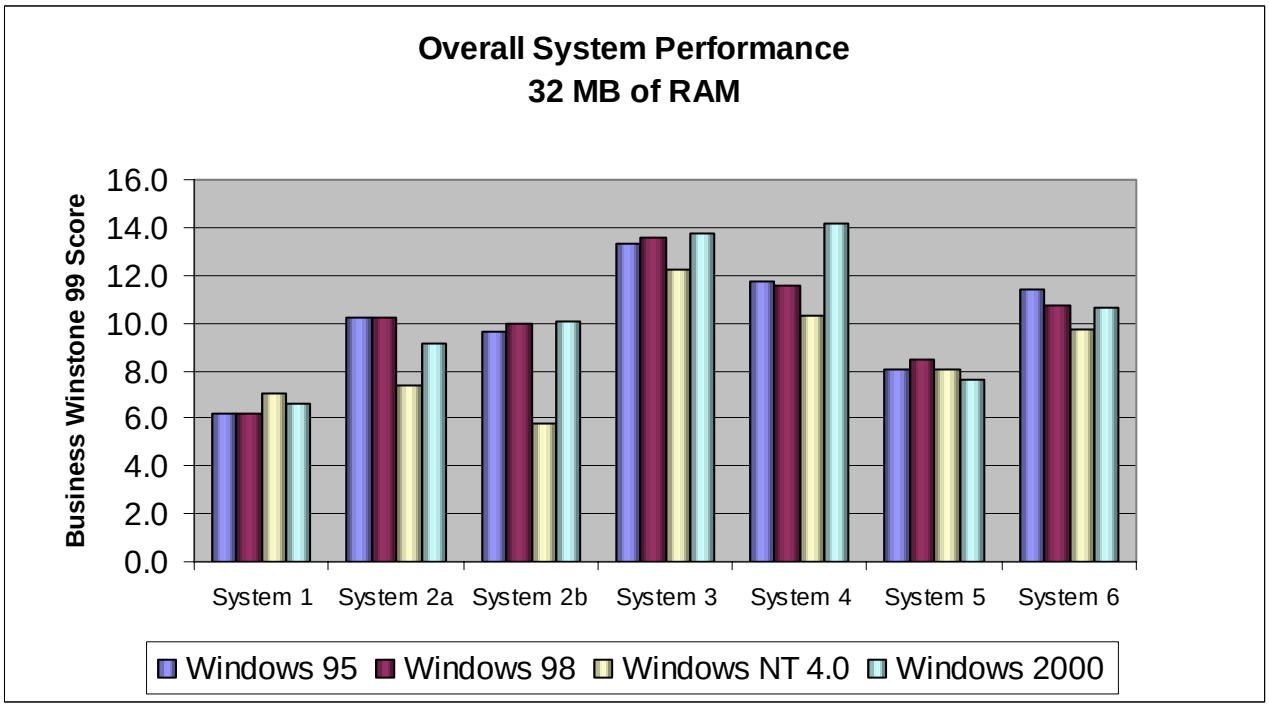


Figure 9. Business Winstone 99 Performance with 32 MB of RAM

Systems 2a and 2b showed exceptionally low numbers for Windows NT 4.0 at 32 MB. The Turtle Beach Montego I sound drivers appeared to be the culprit. While we found that other sound drivers had little effect on Windows NT 4.0 system performance, this was not the case with the Turtle Beach Montego I. Disabling the drivers resulted in a marked improvement in Windows NT 4.0 system performance. As we ran all four operating systems with sound enabled on all of the systems, we went with sound-enabled results on Systems 2a and 2b as well.

With 64 MB of RAM, both Windows 2000 and Windows NT 4.0 significantly outperformed Windows 95 and Windows 98. On average, Windows 2000 was 32 percent faster than Windows 95 and 27 percent faster than Windows 98, while Windows NT 4.0 was 33 percent faster than Windows 95 and 28 percent faster than Windows 98.

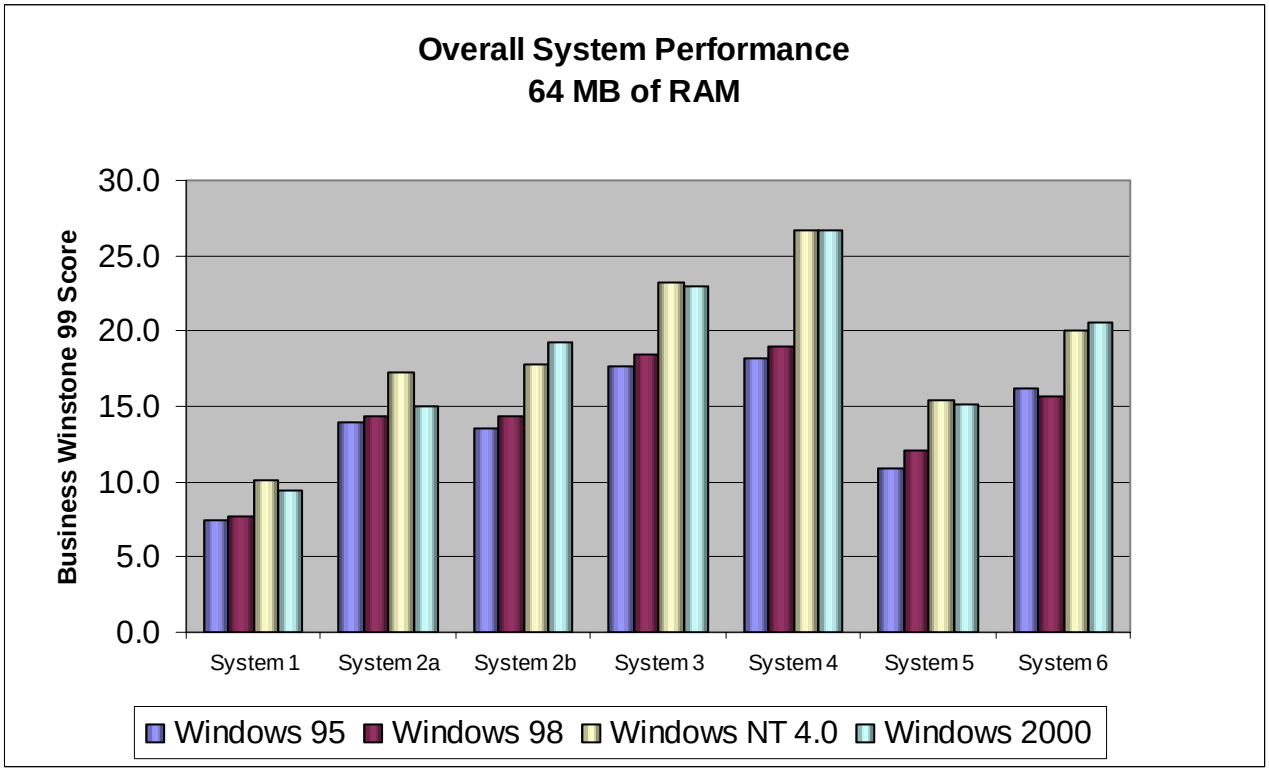


Figure 10. Business Winstone 99 Performance with 64 MB of RAM

With 64 MB of RAM, Windows 2000 performed comparably to Windows NT 4.0 (within 9 percent) on six of seven systems we tested. On the other system, System 2a, Windows NT 4.0 was 15 percent faster than Windows 2000. We investigated to determine why Windows 2000 was so much slower on this one system. The STB Velocity 128 video driver supplied by Windows 2000 appeared to be the culprit.

We tested System 2 with both an STB Velocity 128 (System 2a) and a Matrox Millennium G200 (System 2b). The chart below shows the difference in Business Winstone 99 scores between the STB Velocity 128 and Matrox Millennium G200 video adapters with 64 MB of system RAM.

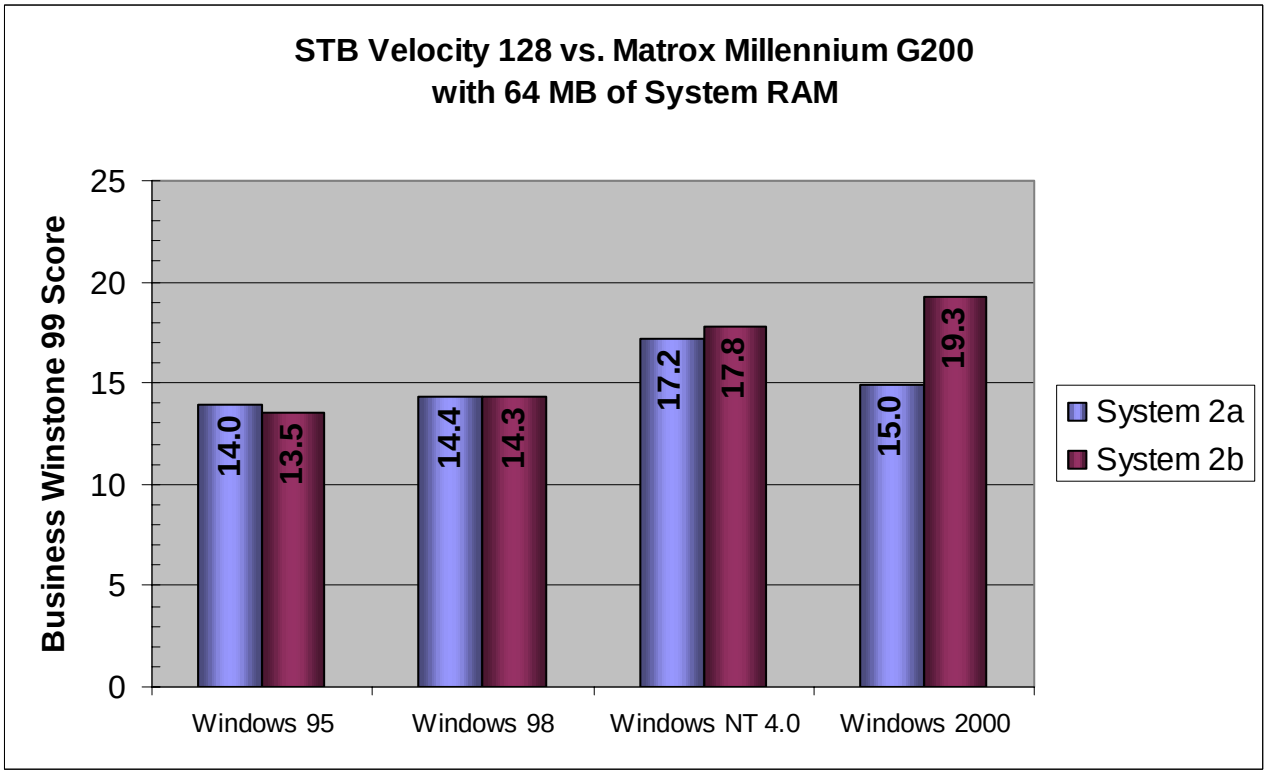


Figure 11. STB Velocity 128 vs. Matrox Millennium G200 with 64 MB of System RAM

Our results revealed little performance difference between the STB Velocity 128 and the Matrox Millennium G200 when running on Windows 95, Windows 98, and Windows NT 4.0, providing evidence that both video adapters were capable of relatively the same Business Winstone 99 performance. Our results did, however, uncover a significant performance difference between the two video adapters when running on Windows 2000. Noting that the performance difference shows up only on Windows 2000, we concluded that the STB Velocity 128 video driver supplied by Windows 2000 (RC2) might not be fully optimized.

With 128 MB of RAM, Windows 2000 and Windows NT 4.0 performed comparably (within 10 percent) on all seven systems we tested. Both Windows 2000 and Windows NT 4.0 were significantly faster than Windows 95 and Windows 98. On average, Windows 2000 was 39 percent faster than Windows 95 and 30 percent faster than Windows 98, while Windows NT 4.0 was 43 percent faster than Windows 95 and 35 percent faster than Windows 98.

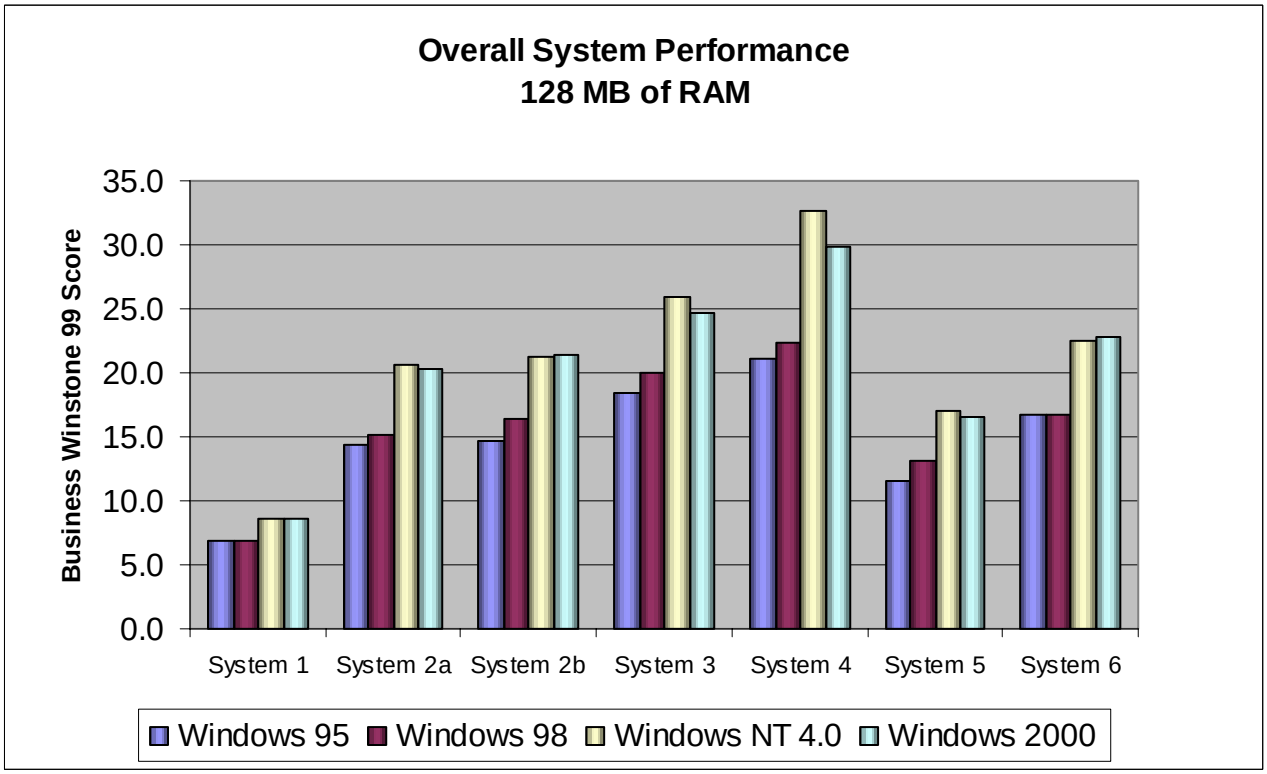


Figure 12. Business Winstone 99 Performance with 128 MB of RAM

Appendix

A. Disclosure Information

System 1	
Machine ID	5101
Machine Description	Dell OptiPlex GXi
Notebook or Desktop	D
Processor	Pentium
Number of Processors	1
Processor Speed	133 MHz
L1 Cache	16 KB
L2 Cache	512 KB (not fully addressable)
System RAM	32 MB, 64 MB, 128 MB
BIOS	Phoenix ROM BIOS PLUS Version 1.10 A03
HD Model	Western Digital Caviar 33100 WDAC33100-18H
HD Size	3.1GB
HD Controller	Intel 82371SB PCI Bus Master IDE Controller
HD Buffer Size	128K DRAM
File Format	FAT16
File Transfer Mode	Windows 2000: DMA Windows 98: DMA Windows NT 4.0: PIO
Video Adapter	S3 Trio64V+ PCI (765)
Video Memory	2 MB
Windows 2000 Video Driver	s3legacy.sys v5.00.2112.01 ;s3legacy.dll v5.00.2115.01
Windows 98 Video Driver	S3MM.SYS v4.10.00.1715
Windows NT 4.0 Video Driver	S3.SYS v4.00.1381.89; S3.DLL v4.00.1381.89
Video Resolution Assigned	800 x 600
Color Depth Assigned	16 bpp
Refresh Rate	60 Hz
Sound Board	Crystal Sound (integrated on system board)
NIC	3Com Fast Etherlink XL PCI 10/100 (3C905)
CD-ROM Drive Manufacturer	NEC
CD-ROM Speed	40x
Windows Version	Windows 2000, Build 2128
	Windows 95, OSR2.1
	Windows 98, Build 2222
	Windows NT 4.0, Build 1381, Service Pack 5

Figure 13. Disclosure Information for System 1

System 2a	
Machine ID	5731
Machine Description	Dimension XPS D266
Notebook or Desktop	Desktop
Processor	Pentium II
Number of Processors	1
Processor Speed	266 MHz
L1 Cache	32 KB
L2 Cache	512 KB
System RAM	32 MB, 64 MB, 128 MB
L1 Cache	16 KB
L2 Cache	512 KB
BIOS	Phoenix BIOS 4.0 Release 6.0
HD Model	Quantum Fireball ST6.4A 3.5 series
HD Size	6.4 GB
HD Controller	Intel 82371AB/EB PCI Bus Master IDE Controller
HD Buffer Size	128 KB
File Format	FAT16
File Transfer Mode	Windows 2000: DMA Windows 95: DMA Windows 98: DMA Windows NT 4.0: PIO
Video Adapter	STB Velocity 128 3D AGP
Video Memory	4 MB
Windows 2000 Video Driver	Nv3.sys v5.00.2083.343; nv3.dll v5.00.2083.343
Windows 98 Video Driver	Nv3dd32.DLL v4.10.00.1713
Windows NT Video Driver	Stbv128m.sys v4.00.1381.1222; Stbv128m.sys v4.00.1381.1222
Video Resolution Assigned	1024 x 768
Color Depth Assigned	16 bpp
Refresh Rate	60 Hz
Sound Board	Turtle Beach Montego I (Aureal Vortex 8820)
NIC (Driver)	3com Etherlink XL Combo 10MB Ethernet Adapter
DVD-ROM Manufacturer	Hitachi
DVD-ROM Speed	(20x CD Read)
Windows Version	Windows 2000, Build 2128
	Windows 95, OSR2.1
	Windows 98, Build 2222
	Windows NT 4.0, Build 1381, Service Pack 5

Figure 14. Disclosure Information for System 2a

System 2b	
Machine ID	5731
Machine Description	Dimension XPS D266
Notebook or Desktop	Desktop
Processor	Pentium II
Number of Processors	1
Processor Speed	266 MHz
L1 Cache	32 KB
L2 Cache	512 KB
System RAM	32 MB, 64 MB, 128 MB
L1 Cache	16 KB
L2 Cache	512 KB
BIOS	Phoenix BIOS 4.0 Release 6.0
HD Model	Quantum Fireball ST6.4A 3.5 series
HD Size	6.4 GB
HD Controller	Intel 82371AB/EB PCI Bus Master IDE Controller
HD Buffer Size	128 KB
File Format	FAT16
File Transfer Mode	Windows 2000: DMA Windows 95: DMA Windows 98: DMA Windows NT 4.0: PIO
Video Adapter	Matrox Millennium G200 AGP
Video Memory	8 MB
Windows 2000 Video Driver	Mga64.sys v5.00.2124.3711; mga64.dll v5.00.2124.3711
Windows 98 Video Driver	G200DD32.DLL v4.11.01.2200
Windows NT 4.0 Video Driver	Mga64.sys v4.00.1381.4210; mga64.dll v4.00.1381
Video Resolution Assigned	1024 x 768
Color Depth Assigned	16 bpp
Refresh Rate	60 Hz
Sound Board	Turtle Beach Montego I (Aureal Vortex 8820)
NIC (Driver)	3com Etherlink XL Combo 10MB Ethernet Adapter
DVD-ROM Manufacturer	Hitachi
DVD-ROM Speed	(20x CD Read)
Windows Version	Windows 2000, Build 2128
	Windows 95, OSR2.1
	Windows 98, Build 2222
	Windows NT 4.0, Build 1381, Service Pack 5

Figure 15. Disclosure Information for System 2b

System 3	
Machine ID	6822
Machine Description	Gateway E-1200
Notebook or Desktop	Desktop
Processor	Celeron
Number of Processors	1
Processor Speed	433 MB
L1 Cache	32 KB
L2 Cache	128 KB
System RAM	32 MB, 64 MB, 128 MB
BIOS	Phoenix BIOS 4.0 Release 6.0
HD Model	Quantum Fireball CR4.3A-(PM)7
HD Size	4.3 GB
HD Controller	Intel 82371AB/EB PCI Bus Master IDE
HD Buffer Size	512 KB
File Format	FAT16
File Transfer Mode	Windows 2000: DMA Windows 95: DMA Windows 98: DMA Windows NT 4.0: PIO
Video Adapter	ATI 3D Rage IIC AGP
Video Memory	4096 KB
Windows 2000 Video Driver	Atirage.sys v5.00.2051.01; atirage.dll v5.00.2056.01
Windows 98 Video Driver	Macxdd32.dll v4.11.01.5033
Windows NT 4.0 Video Driver	Atirage.sys v4.00.1381.01; atirage.dll v4.00.1381.01
Video Resolution Assigned	1024 x 768
Color Depth Assigned	16 bpp
Refresh Rate	60 Hz
Sound Board	Crystal PnP Audio System (Integrated on system board)
NIC (Driver)	Intel EtherExpress PRO/100+ Management Adapter
CD-ROM Drive Manufacturer	Toshiba
Windows Version	Windows 2000, Build 2128
	Windows 95, OSR2.1
	Windows 98, Build 2222
	Windows NT 4.0, Build 1381, Service Pack 5

Figure 16. Disclosure Information for System 3

System 4	
Machine ID	6586
Machine Description	NEC PowerMate VT
Notebook or Desktop	Desktop
Processor	Pentium III
Number of Processors	1
Processor Speed	500 MHz
L1 Cache	32 KB
L2 Cache	512 KB
System RAM	32 MB, 64 MB, 128 MB
BIOS	American Megatrends AMIBIOS Ver 2.1
HD Model	GAS54112 Maxtor 91303D6
HD Size	12425 MB
HD Controller	Intel 82371AB/EB PCI Bus Master IDE
File Format	FAT16
File Transfer Mode	Windows 2000: DMA Windows 95: DMA Windows 98: DMA Windows NT 4.0: PIO
Video Adapter	Matrox Millennium G200 AGP
Video Memory	8 MB
Windows 2000 Video Driver	Mga64.sys v5.00.2124.3711; mga64.dll v5.00.2124.3711
Windows 98 Video Driver	G200DD32.DLL v4.11.01.2200
Windows NT 4.0 Video Driver	Mga64.sys v4.00.1381.4210; mga64.dll v4.00.1381
Video Resolution Assigned	1024 x 768
Color Depth Assigned	16 bpp
Refresh Rate	60 Hz
Sound Board	SoundBlaster AWE64 (integrated on the system board.)
NIC (Driver)	3Com Fast Etherlink XL (3C905B-TX)
DVD-ROM Manufacturer	Hitachi
Windows Version	Windows 2000, Build 2128
	Windows 95, OSR2.1
	Windows 98, Build 2222
	Windows NT 4.0, Build 1381, Service Pack 5

Figure 17. Disclosure Information for System 4

System 5	
Machine ID	5907
Machine Description	Gateway Solo 2500
Notebook or Desktop	Notebook
Processor	Pentium II
Number of Processors	1
Processor Speed	233 MHz
L1 Cache	32
L2 Cache	512
System RAM	32 MB, 64 MB, 128 MB
BIOS	PhoenixBIOS NoteBIOS 4.0 v10.11
HD Model	Hitachi DK227A-41
HD Size	4.1 GB
HD Controller	IDE
File Format	FAT16
File Transfer Mode	Windows 2000: DMA Windows 95: DMA Windows 98: DMA Windows NT 4.0: PIO
Video Adapter	NeoMagic MagicGraph 128XD
Video Memory	2 MB
Windows 2000 Video Driver	neo20xx.sys v5.29.00.00; neo20xx.dll v5.29.00.00
Windows 98 Video Driver	nmgcdd.dll 4.10.01.0009
Windows NT 4.0 Video Driver	Neo20xx.sys v1.00.01.01; neo20xx.dll 4.00.1381.01
Video Resolution Assigned	800 x 600
Color Depth Assigned	16 bpp
Refresh Rate	60 Hz
Sound Board	NeoMagic MagicWave 3DX
NIC (Driver)	None
DVD-ROM Manufacturer	Gateway
Windows Version	Windows 2000, Build 2128
	Windows 95, OSR2.1
	Windows 98, Build 2222
	Windows NT 4.0, Build 1381, Service Pack 5

Figure 18. Disclosure Information for System 5

System 6	
Machine ID	6559
Machine Description	Compaq Armada 7800
Notebook or Desktop	Notebook
Processor	Pentium II Enhanced
Number of Processors	1
Processor Speed	366 MHz
L1 Cache	32
L2 Cache	256
System RAM	32 MB, 64 MB, 128 MB
BIOS	PhoenixBIOS 4.0 Release 5.1
HD Model	Compaq
HD Size	13 GB
HD Controller	IDE
File Format	FAT16
File Transfer Mode	Windows 2000: DMA Windows 95: DMA Windows 98: DMA Windows NT 4.0: PIO
Video Adapter	S3 Virge/MX
Video Memory	4 MB
Windows 2000 Video Driver	s3m.sys v5.1024.329.02; s3mvirge.dll v5.1024.329.02
Windows 98 Video Driver	s3vmx32.dll v4.10.01.3601
Windows NT 4.0 Video Driver	s3mini.sys v4.1024.325.22; s3virge.dll v4.1024.325.22
Video Resolution Assigned	1024 x 768
Color Depth Assigned	16 bpp
Refresh Rate	60 Hz
Sound Board	ES1879 AudioDrive 2.01.20
NIC (Driver)	None
DVD-ROM Manufacturer	Compaq
Windows Version	Windows 2000, Build 2128
	Windows 95, OSR2.1
	Windows 98, Build 2222
	Windows NT 4.0, Build 1381, Service Pack 5

Figure 19. Disclosure Information for System 6

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