Principled Technologies®

TEST REPORT
FEBRUARY 2007

WebBench performance on Intel- and AMD-processor-based servers running Red Hat Enterprise Linux v.4.4

Executive summary

Intel Corporation (Intel) commissioned Principled Technologies (PT) to measure the WebBench performance on the following dual-processor servers running Red Hat Enterprise Linux v.4.4:

- Supermicro A+ Server 2021M-T2R+V with dual-core AMD Opteron processor model 2220 SE
- Supermicro SuperServer 6025B-TR+V with Quad-Core Intel Xeon processor X5355

KEY FINDING

- The Supermicro SuperServer 6025B-TR+V with two Quad-Core Intel Xeon processor X5355s delivered almost 68 percent higher peak WebBench performance than the Supermicro A+ Server 2021M-T2R+V with two dual-core AMD Opteron processor model 2220 SEs (see Figure 1).

Figure 1 shows the median WebBench dynamic CGI test suite peak results, in requests per second (rps), of the test servers. To obtain the median results, we performed three runs with each server and selected the middle peak result of each. A higher number of requests per second is better, because the more Web requests a server can handle, the better.

The Supermicro SuperServer 6025B-TR+V with two Quad-Core Intel Xeon processor X5355s produced the highest result, 19,404.8 rps. This result is a 67.7 percent performance increase over the Supermicro A+ Server 2021M-T2R+V with two dual-core AMD Opteron processor model 2220 SEs, which achieved 11,572.5 rps.

Workload

WebBench 5.0 (128-bit US version) is an industry-standard benchmark for Web server software and hardware. It uses PC clients to send Web requests to the server under test. It generates performance results by incrementally increasing the number of clients making HTTP GET requests to the Web server; the result is a curve showing the performance of the server under test. The peak of that curve represents the peak throughput of the server. WebBench reports results in both the total number of requests per second the server handled and total throughput in bytes per second. To be certain that we found the true peak performance in our testing, we measured the processor utilization on the server and made sure that it reached or was extremely close to 100 percent during the test.

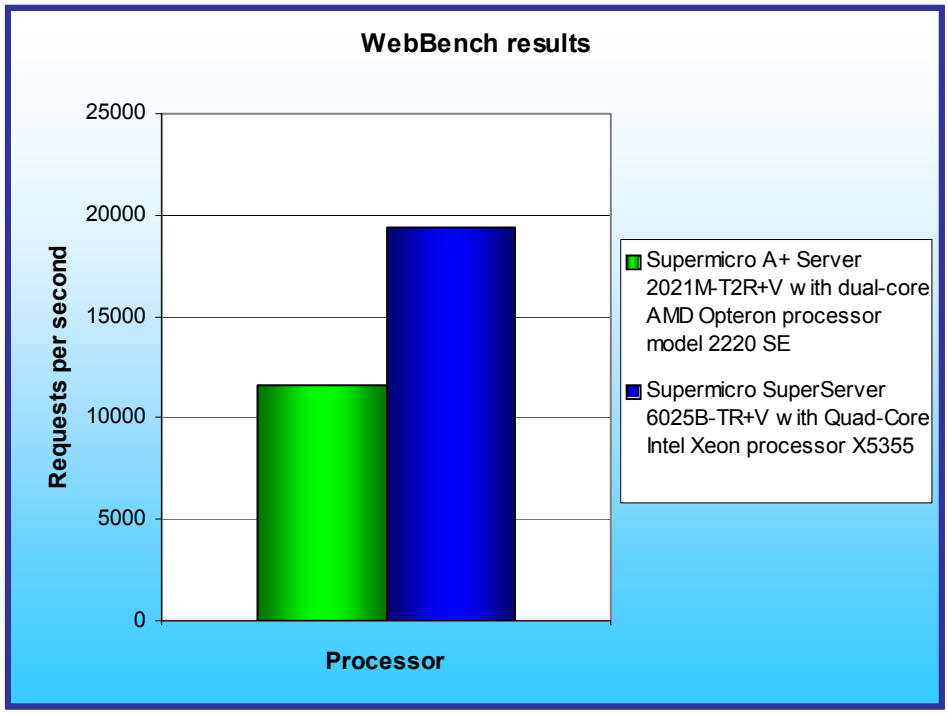

Figure 1: Peak (dual-processor) performance of the test servers running WebBench 5.0. Higher numbers of requests per second are better.

Test results

We ran WebBench's default dynamic CGI test suite, which generates non-secure static and dynamic HTTP 1.0 GET requests. WebBench incrementally increases the number of clients making the GET requests to the Web server. As the workload increases the number of clients, the Web server's processor utilization also increases, until the processors in the Web server are saturated with work. Each workload point with a fixed number of clients is a WebBench "mix." The dynamic CGI test suite begins with a mix that involves one client, then a mix with four clients, and then increases the number of clients by four with each mix to a total of 60 clients. A standard WebBench run thus involves 16 mixes.

A WebBench run reports the total requests per second a server can perform and the total throughput, in bytes per second, that the server delivered. WebBench reports these results for each mix. A graph of these results yields a performance curve with a peak at some number of clients.

Figure 2 shows the WebBench peak results in requests per second and in throughput (bytes per second) of the test servers. Each result is the median of three runs.

Server	Requests per second	Throughput (bytes per second)
Supermicro A+ Server 2021M-T2R+V with dual-core AMD Opteron processor model 2220 SEs	11,572.5	61,878,348.5
Supermicro SuperServer 6025B-TR+V with Quad-Core Intel Xeon processor X5355s	19,404.8	104,617,203.3

Figure 2: Median requests per second and throughput results for the servers running WebBench. Higher numbers are better.

Figure 3 shows a graph of the WebBench requests per second results for both servers. This graph illustrates each server's performance under load for each of the 16 client mixes. As the number of clients increases, so does the load on the server and the number of requests per second the server must perform. During the first couple of mixes, the client count is low, so both servers can handle the load with capacity to spare. As the load increases, however, each server reaches its maximum capacity and the processor utilization becomes 100 percent (or very close to that). The curves in Figure 3 peak and flatten at those points. A higher peak indicates better performance, so the Supermicro SuperServer 6025B-TR+V with two Quad-Core Intel Xeon processor X5355s clearly yielded the better performance.

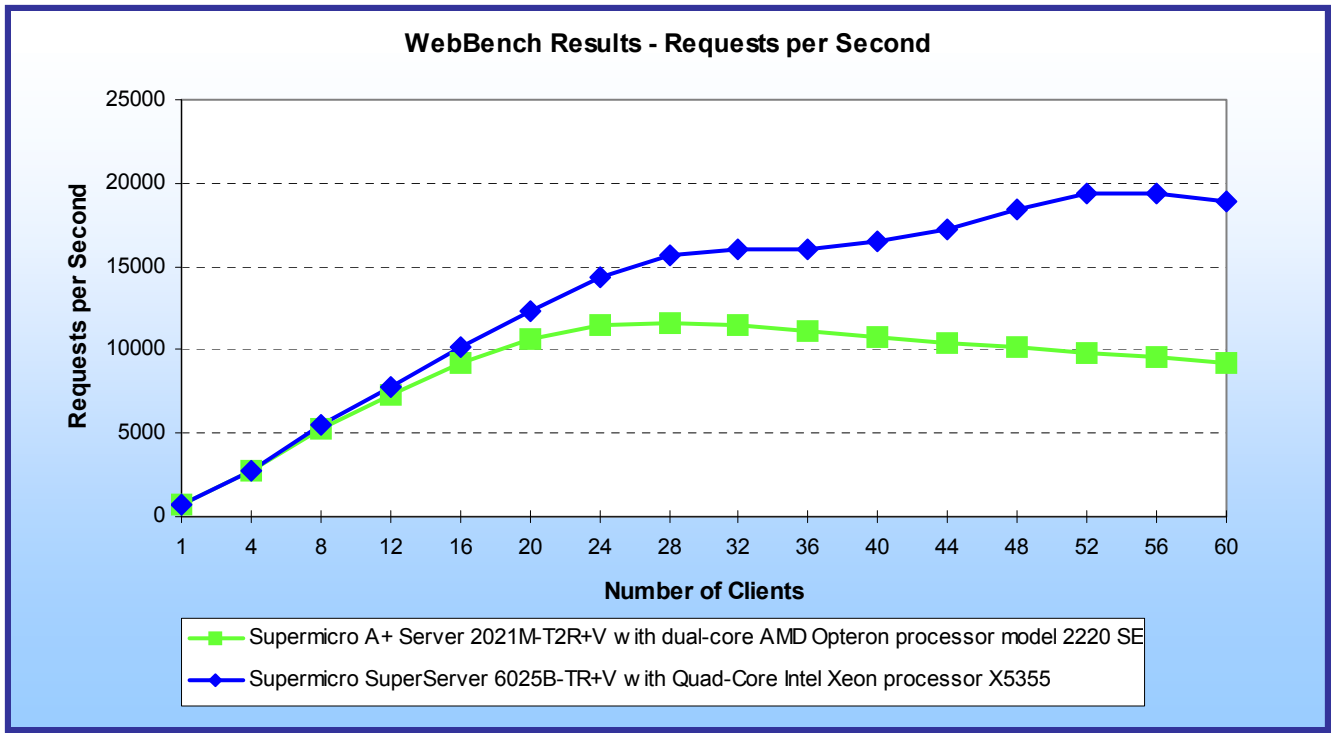

Figure 3: Line graph of the WebBench requests per second results for the test servers. A higher peak indicates better performance.

Figure 4 shows the WebBench throughput results, in bytes per second, for both servers; a higher peak is better. Again, the Supermicro SuperServer 6025B-TR+V with two Quad-Core Intel Xeon processor X5355s clearly yielded the better performance.

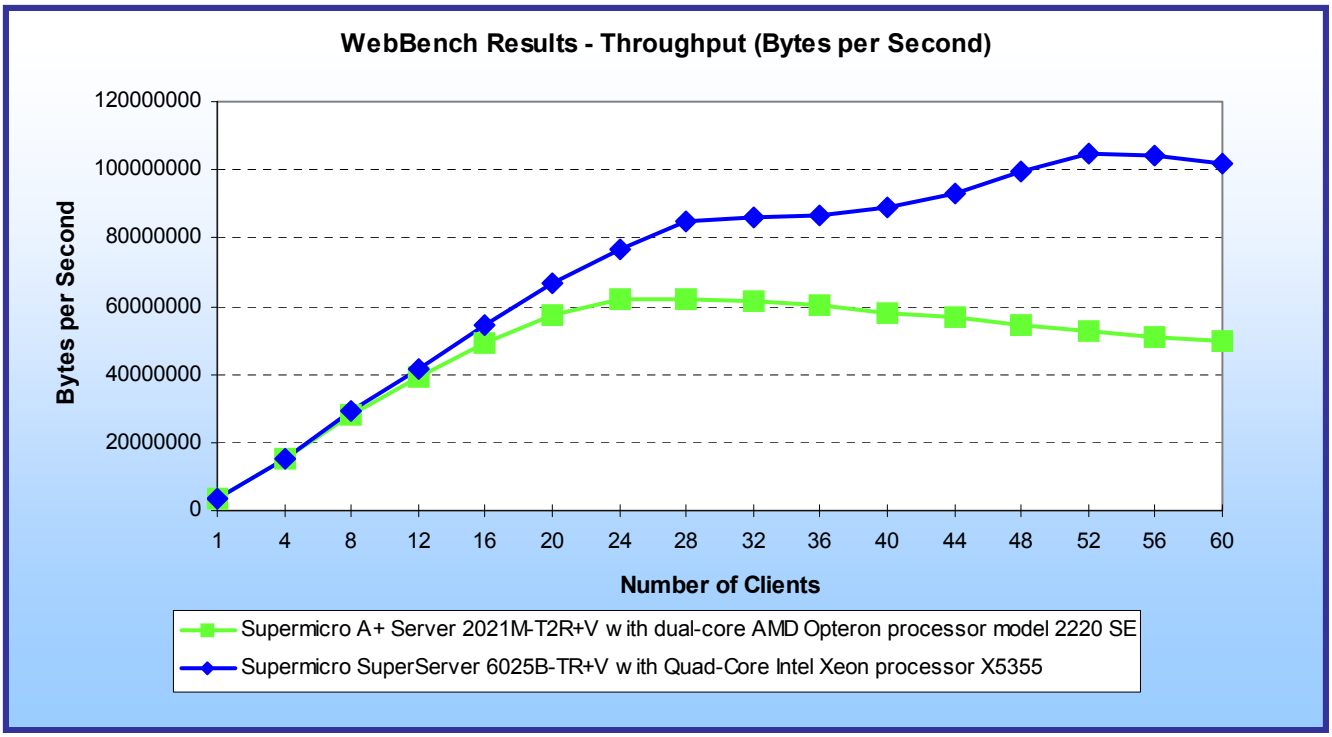

Figure 4: Line graph of the WebBench throughput results for the test servers. A higher peak indicates better performance.

Test methodology

Figure 5 summarizes some key aspects of the configurations of the server systems; Appendix A provides detailed configuration information.

Server	Supermicro A+ Server 2021M-T2R+V with two dual-core AMD Opteron processor model 2220 SEs	Supermicro SuperServer 6025B-TR+V with two Quad-Core Intel Xeon processor X5355s
Processor frequency (GHz)	2.8 GHz	2.66 GHz
System bus	2000 MHz HyperTransport	1333 MHz
Number of processor packages	2	2
Number of cores per processor package	2	4
Number of hardware threads per core	1	1
Motherboard	Super H8DME-2	Supermicro X7DBE+
Chipset	NVIDIA MCP55 Pro	Intel 5000P Chipset
RAM (8GB in each)	PC2-5300	PC2-5300 FBDIMM
Hard Drive	Western Digital WD740ADFD 74 GB 10,000 RPM	Western Digital WD740ADFD 74 GB 10,000 RPM
NICs	NVIDIA MCP55 Pro Chipset Dual-Port Ethernet Controller (integrated) / 2 x Intel PRO/1000 PT Dual Port Server Adapters	Intel PRO/1000 EB Network Dual Port Network Connection (integrated) / 2 x Intel PRO/1000 PT Dual Port Server Adapters

Figure 5: Summary of some key aspects of the server configurations.

Intel configured and provided both servers.

With the following exceptions, we used the default BIOS settings on each server: on the Supermicro A+ Server 2021M-T2R+V with two dual-core AMD Opteron processor model 2220 SEs server we changed the OS installation option to Linux.

We began by installing a fresh copy of Red Hat Enterprise Linux v.4.4 on both servers. We installed each system with the default operating system (OS) installation options.

Installing Zeus Web Server

WebBench requires a Web server, so we installed the Zeus Web Server with the following procedure:

1. Type the following commands:
   a. cd /root/zws
   b. tar -zxvf Zeus_43r3_Linux-x86_64.tgz
   c. cd Zeus_43r3_Linux-x86_64
   d. ./zinstall
2. When the installation software prompts you, type accept, and then press Enter to accept the license agreement.
3. Choose installation option 1, and press Enter.
4. Enter the key filename, "/root/zws/key.txt" or leave it blank for unlicensed mode, then press Enter.
5. When the installation software prompts you to choose a password for the admin server, type "password", and then press Enter.
6. When the installation software prompts you to re-enter your password, again type "password", then press Enter.
7. When the installation software asks if you want to enable SNMP support for the Web package, select "N", then press Enter.
8. Choose a UNIX user for the Web process to run as nobody, then press Enter.
9. Choose a UNIX group for the Web process to run as nobody, then press Enter.
10. When the installation software asks if you would like Zeus to start at system boot, select "Y", then press Enter.

Deploying WebBench data

WebBench includes data that must reside on the server and that the Web server must use. We loaded that data and set the Web server to use it with the following procedure:

Type the following commands:

1. mkdir /var/wwwroot
2. cp wbtree.tar.gz /var/wwwroot/
3. cd /var/wwwroot
4. tar -zxvf wbtree.tar.gz

Compiling the CGI application for WebBench

WebBench includes a "simgic.c" source file that you must compile before you can use it for testing. We compiled it with the following procedure:

Type the following commands:

1. mkdir /var/wwwroot/cgi-bin
2. cp /var/wwwroot/wbtree/simcgi.c /var/wwwroot/cgi-bin/
3. cd /var/wwwroot/cgi-bin
4. cc simcgi.c -o sim.cgi

Configuring Zeus Web Server

We configured the Zeus Web Server as follows:

1. Add 2 options to the config file "/usr/local/zeus/web/global.cfg" by typing the following:
   - tuning!modules!cgi!minuid 98
   - tuning!modules!cgi!mingid 98
2. Set folder permisions by typing the following:
   - chown -R nobody /var/wwwroot/
   - chgrp -R nobody /var/wwwroot/
3. Disable firewall by typing the following:
   - chkconfig iptables off

Setting up Zeus Web Server

Zeus offers a graphical interface to set up the Web Server. We set up the Zeus Web Server using the following steps:

1. Open a Web browser, and navigate to http://server:9090/.
   a. For the username, type “admin”.
   b. For the password, type “password”.
2. At the Zeus Virtual Server page, enter the following information:
   a. Virtual Server Name: WebBench
   b. Host Name and Port: server 80
   c. Document Root: /var/wwwroot
   d. Enabling Customized Error Pages: disabled
   e. Enabling Statistics Gathering: disabled
   f. Bind address: (IP addresses)

Network test bed configuration

To generate the WebBench workload, we used a network with 60 client PCs. Each PC contained an Intel Pentium 4 3.0 GHz with HT Technology (or faster) processor, 512 MB of system memory, a 40 GB hard drive, and a Gigabit Ethernet network adapter. We configured each client with Windows XP Professional with Service Pack 2 and all critical updates available as of January 3, 2006.

We split the 60 clients into four segments, or subnets, of 15 clients each. We connected each segment to the server under test via one NETGEAR GS724T Gigabit Smart Switch. To balance the load on the server and to prevent a network throughput bottleneck, we connected each segment to a separate port of the Intel PRO/1000 PT Dual Gigabit Server adapters. Figure 6 illustrates the test bed configuration.

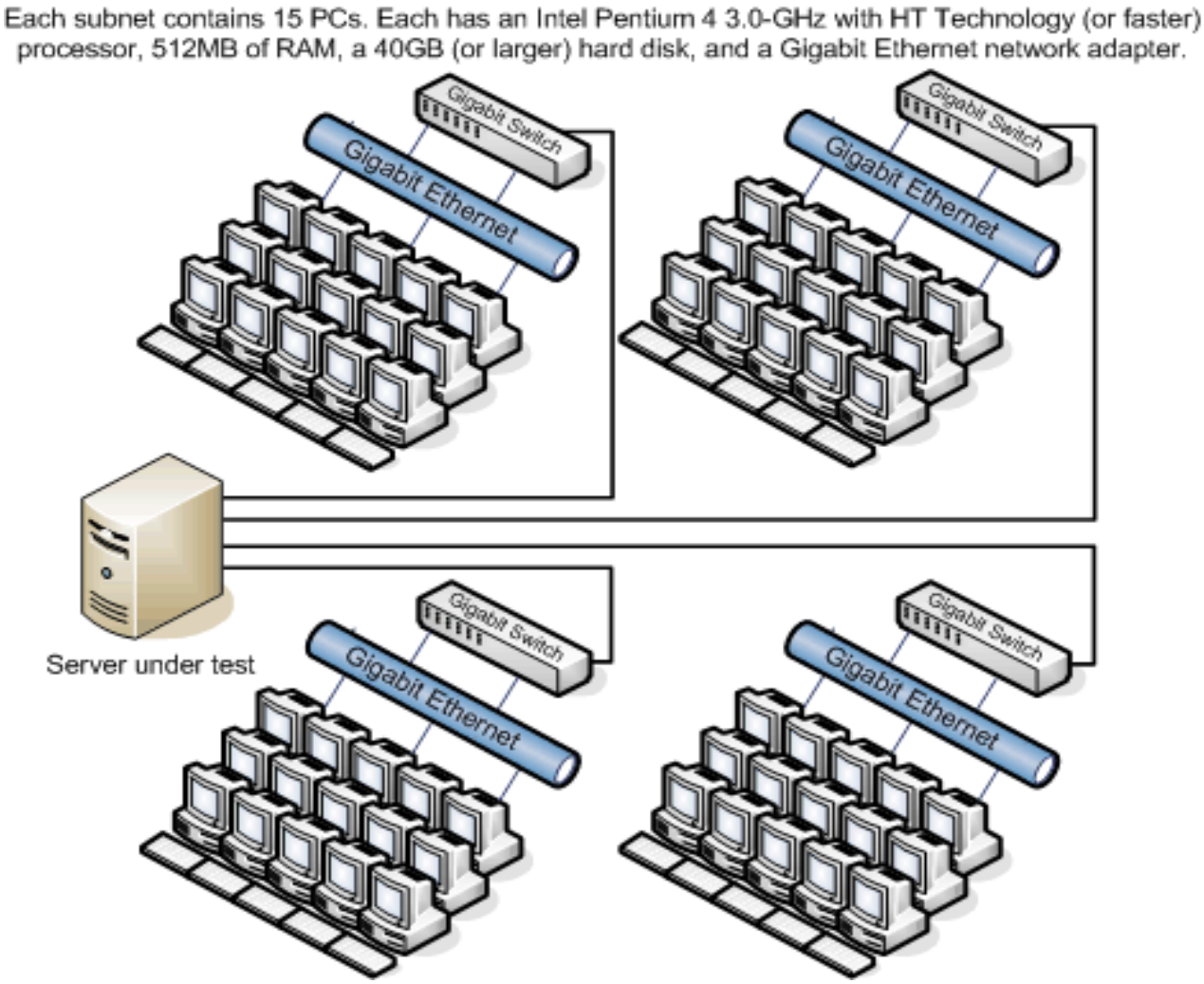

Figure 6: Illustration of the test network we used to generate the WebBench workload.

Appendix A – Test server configuration information

This appendix provides detailed configuration information about each of the test server systems, which we list in alphabetical order.

Systems	Supermicro A+ Server 2021M-T2R+V with two dual-core AMD Opteron processor model 2220 SEs	Supermicro SuperServer 6025B-TR+V with two Quad-Core Intel Xeon processor X5355s
General processor setup		
Number of processor packages	2	2
Number of cores per processor package	2	4
Number of hardware threads per core	1	1
CPU		
Vendor	AMD	Intel
Name	dual-core AMD Opteron processor model 2220 SE	Quad-Core Intel Xeon processor X5355
Stepping	2	7
Socket type	F	LGA 771
Core frequency (GHz)	2.8 GHz	2.66 GHz
Front-side bus frequency (MHz)	2000 MHz HyperTransport	1333 MHz
L1 Cache	64 KB + 64 KB (per core)	32 KB + 32 KB (per core)
L2 Cache	2 x 1 MB	2 x 4MB (each 4MB shared by 2 cores)
Platform		
Vendor and model number	dual-core AMD Opteron processor model 2220 SE-based server	Quad-Core Intel Xeon processor X5355-based server
Motherboard model number	Super H8DME-2	Supermicro X7DBE+
Motherboard chipset	NVIDIA MCP55 Pro	Intel 5000P Chipset
Motherboard revision number	A2	92
Motherboard serial number	Q5785G16010104	TM66S06520
BIOS name and version	American Megatrends Inc. AMIBIOS 08.00.14 11/28/06	Phoenix BIOS DB8A026 Rev 1.1c
BIOS settings	OS installation Linux	Default
Memory module(s)		
Vendor and model number	Hynix HYMP525P72BP4-Y5	Kingston KVR667D2D4F5/2G
Type	PC-5300	PC2-5300 FBDIMM
Speed (MHz)	667 MHz	667 MHz
Speed in the system currently running @ (MHz)	667 MHz	667 MHz
Timing/Latency (tCL-tRCD-iRP-tRASmin)	5-5-5-15	5-5-5-15
Size	8186 MB	8196 MB
Number of RAM modules	4	4
Chip organization	Double-Sided	Double-Sided
Hard disk		
Vendor and model number	Western Digital Raptor WD740ADFD	Western Digital Raptor WD740ADFD
Number of disks in system	1	1
Size	74 GB	74 GB

Buffer Size	8 MB	8 MB
RPM	10,000	10,000
Type	SATA	SATA
Controller	NVIDIA MCP55 Pro SATA2 Controller	Intel 3100 Chipset SATA Controller
Controller driver	sata_nv	Ata_piix
Operating system		
Name	Red Hat Enterprise Linux 4 Advanced Server	Red Hat Enterprise Linux 4 Advanced Server
Build number	v.4.4	v.4.4
File system	Ext3	Ext3
Kernel	2.6.9-42.ELsmp	2.6.9-42.ELsmp
Language	English	English
Graphics		
Vendor and model number	ATI ES1000	ATI ES1000
Chipset	ATI ES1000 PCI	ATI ES1000 PCI
Type	Integrated	Integrated
Resolution	1024 x 768	1024 x 768
Driver	ATI ES1000	ATI ES1000
Network card/subsystem		
Vendor and model number	NVIDIA MCP55 Pro Chipset Dual-Port Ethernet Controller (integrated) / 2 x Intel PRO/1000 PT Dual Port Server Adapters	Intel PRO/1000 EB Network Dual Port Network Connection (integrated) / 2 x Intel PRO/1000 PT Dual Port Server Adapters
Type	Integrated	Integrated
Driver	eth0	eth0
Optical drive		
Vendor and model number	Matshita DVD-ROM SR-8178	Matshita DVD-ROM SR-8178
Type	DVD-ROM	CD/DVD
Interface	Internal	Internal
Dual/Single layer	Single	Single
USB ports		
Number	4	4
Type	USB 2.0	USB 2.0

Figure 7: Detailed configuration information for the test servers.

Appendix B – Test network configuration

This appendix provides configuration information about the test network we used to run WebBench 5.0 against the servers under test.

Client #	Make/Model	Processor Speed	Memory Size/Type
Segment/Subnet 1			
Client 1	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 2	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 3	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 4	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 5	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 6	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 7	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 8	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 9	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 10	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 11	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 12	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 13	Custom built	Intel Pentium 4 3.2GHz w/HT	512MB PC2-5300
Client 14	HP d4100y	Intel Pentium D 3.2GHz (DC)	1GB PC2-4300
Client 15	Dell Optiplex GX280	Intel Pentium 4 3.4GHz w/HT	512MB PC3200
Segment/Subnet 2			
Client 16	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 17	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 18	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 19	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 20	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 21	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 22	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 23	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 24	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 25	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 26	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 27	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 28	Custom built	Intel Pentium 4 3.2GHz w/HT	512MB PC3200
Client 29	HP a750y	Intel Pentium 4 3.2GHz w/HT	512MB DDR2-400
Client 30	Custom built	Intel Pentium 4 3.6GHz w/HT	512MB PC2-4300
Segment/Subnet 3			
Client 31	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 32	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 33	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 34	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 35	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 36	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 37	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 38	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 39	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 40	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 41	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 42	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200

Client 43	HP dc5100mt	Intel Pentium 4 3.2GHz w/HT	512MB PC4200
Client 44	HP m1050Y	Intel Pentium 4 3.2GHz w/HT	1GB PC3200
Client 45	HP Dc7100CMT	Intel Pentium 4 3.4GHz w/HT	512MB PC3200
Segment/Subnet 4			
Client 46	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 47	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 48	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 49	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 50	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 51	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 52	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 53	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 54	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 55	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 56	Intel Desktop Board D915GMH	Intel Pentium 4 3.0GHz w/HT	512MB PC3200
Client 57	Dell Optiplex GX270	Intel Pentium 4 3.2GHz w/HT	512MB PC2700
Client 58	Custom built	Intel Pentium 4 3.0GHz w/HT	1GB PC3200
Client 59	IBM ThinkCentre 842243U	Intel Pentium 4 3.4GHz w/HT	512MB PC3200
Client 60	Custom built	Intel Pentium 4 3.6GHz w/HT	512MB PC2-4300

Figure 8: Configuration information about the test network.

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