Out-of-box comparison between Dell, HP, and IBM blade servers

Executive summary

Dell Inc. (Dell) commissioned Principled Technologies (PT) to compare the out-of-box experience of the following three blade systems:

- Dell PowerEdge M600 Blade System
- HP BladeSystem c-Class
- IBM BladeCenter H

We received each chassis and set of blades in the manufacturer's original packaging. We then compared the amount of time it took us to set up each system. Due to differences in packaging and design, there was a considerable difference in setup times for the three systems.

Figures 1A, 1B, and 1C show the components of the three server arrays after we unpacked them. These photographs illustrate the difference in the time and effort required to set up the three blade servers. The Dell blades arrived preconfigured and all necessary components were up and running as soon as we plugged in the enclosure and inserted the blades. HP and IBM shipped the second processor, extra RAM, and hard drives separately; the total of 78 and 62 boxes, respectively, made the unpacking and setup time for the HP and IBM blade servers much longer than that for the Dell blade servers.

KEY FINDINGS

- The 16-blade Dell PowerEdge M600 Blade System took 14 minutes, 13 seconds to assemble; the 16-blade HP BladeSystem c-Class took 3 hours, 13 minutes, 15 seconds to assemble, while the IBM BladeCenter H took 1 hour, 56 minutes, 24 seconds to assemble.

- The Dell PowerEdge M600 Blade System shipped with the blades already assembled and installed in the enclosure; the HP BladeSystem c-Class and IBM BladeCenter H chassis arrived unassembled and required us to install a processor, memory, and hard disk in each blade.

- The Dell PowerEdge M600 Blade System arrived in one box, the HP BladeSystem c-Class arrived in 78 boxes, and the IBM arrived in 62 boxes.

Figure 1A: The Dell equipment immediately after we unpacked it.

Figure 1B: The HP equipment immediately after we unpacked it.

Figure 1C: The IBM equipment immediately after we unpacked it.

Figure 2 summarizes the amount of time we spent unpacking each system and installing it in the server rack. Compared to the process for the Dell system, the process for the HP system took more than 12 times as long and the process for the IBM system took more than seven times as long.

	Dell PowerEdge M600 Blade System	HP BladeSystem c-Class	IBM BladeCenter H
Task executed			
Removing items from shipping boxes	00:06:22	01:00:45	00:49:42
Installing the server in the rack	00:07:51	02:12:30	01:06:02
Total time required	**00:14:13**	**03:13:15**	**01:56:24**

Figure 2: Time to unpack and install the three systems. Times are in hours: minutes: seconds. Shorter times are better.

Test results

In this section, we detail our experience setting up the Dell PowerEdge M600 Blade System, HP BladeSystem c-Class enclosures, and IBM BladeCenter H chassis, from the time each system arrived through our installation of all of its blades in the chassis and the chassis in a server rack. We discuss this process in the following stages:

- Receiving the system
- Removing system components from their packaging
  - Opening and removing parts from shipping boxes
  - Removing components and server from outer shipping box
  - Removing plastic wrap and foam pieces from server
  - Removing chassis from pallet
- Installing the system in the server rack
  - Installing rails and mounting chassis into server rack
  - Installing blades into chassis

For each stage and sub-stage after we received the systems, we enumerate the steps we executed, note the amount of time (hours:minutes:seconds) each step took, and provide representative photographs.

Receiving the system

Dell
As Figure 3A shows, the Dell shipment consisted of one large box strapped to a pallet.

The shipping service delivered the box to our second-floor lab.

HP
As Figure 3B shows, the HP shipment consisted of 78 boxes. Upon arrival at our building, the large box was strapped to a pallet and the 77 smaller boxes were attached to a large pallet with plastic wrap.

Because the large pallet could not fit into the elevator to our second-floor lab, we had to unwrap the pallet in the lobby and make multiple elevator trips to bring the smaller boxes up to our lab. (Note: We did not time the process of transporting the 77 smaller boxes.)

IBM
The IBM shipment consisted of one large box on a pallet and 3 smaller boxes, which were not on a pallet.

The smaller boxes contained additional boxes inside. After unpacking these boxes, we had counted 62 total boxes for the IBM installation. Figure 3C shows these 62 boxes.

Figure 3A: The Dell box upon delivery in our lab.

Figure 3B: The HP boxes after we brought them up to our lab.

Figure 3B: The IBM boxes after we unpacked them from the shipping boxes.

Removing the system components from their packaging

Opening and removing parts from shipping boxes

Dell

1. Cut off the straps, and then cut through the tape to open the top of the box. (00:00:22)

HP

1. Opened the hard disk boxes and placed them on the table. (00:17:00)
2. Opened the blade server boxes and placed the blade servers on the table. (00:10:30)
3. Opened the blade kit boxes and placed the processors and heat sinks on the table. (00:15:00)
4. Opened the RAM box and placed the RAM on the table. (00:01:45)
5. Opened the Ethernet switch box and placed the switch on the table. (00:02:00)
6. Opened the fan boxes and placed the fans on the table. (00:06:00)
7. Opened the PDU boxes and placed items on the table. (00:03:00)
8. Cut off the straps, and then cut through the tape to open the top of the box. (00:00:30)

IBM

1. Opened the hard disk boxes and placed them on the table. (00:13:10)
2. Opened the processor boxes and placed the processors and heat sinks on the table. (00:13:35)
3. Opened the IBM BladeCenter Copper Pass-thru Module boxes and placed the modules and cables on the table. (00:02:35)
4. Opened the IBM BladeCenter blade server boxes and placed the blade servers on the table. (00:12:27)
5. Opened the 2900W AC power module box and placed the modules on the table. (00:01:02)
6. Removed the white box locks from the bottom of the box. (00:00:45)
7. Read the outside of the box to determine unpacking steps. (00:00:30)
8. Cut off the straps, and then cut through the tape to open the top of the box. (00:00:22)

Total time: 22 seconds

Total time: 55 minutes, 45 seconds

Total time: 44 minutes, 26 seconds

Figure 4A: Opening the Dell server box.

Figure 4B: Opening the HP server box.

Figure 4C: Opening the IBM server box.

Removing components and server from outer shipping box

Dell

1. Removed the topmost box and set it aside. (00:00:12)
2. Removed the outermost cardboard covering. (00:00:08)

HP

1. Removed the topmost boxes and the template for inserting the enclosure onto the rack and set them aside. (00:01:15)
2. Removed the foam padding from the top of the server. (00:00:30)
3. Removed the outermost cardboard covering. (00:00:30)

IBM

1. Removed the topmost cardboard inserts and the direction pack and set them aside. (00:000:15)
2. Read instructions and user guide to look for quick start guide (finding none). (00:00:45)
3. Removed the outermost cardboard covering. (00:00:09)

Total time: 20 seconds

Total time: 2 minutes, 15 seconds

Total time: 1 minute, 9 seconds

Figure 5A: The Dell server with outer cardboard covering removed.

Figure 5B: The HP server with outer cardboard covering removed.

Figure 5C: The IBM server with outer cardboard covering removed.

Removing plastic wrap and foam pieces from server

Dell

1. Removed and opened the second box and set it aside. (00:00:18)
2. Removed the foam pieces from the Dell blade system. (00:00:57)

HP

1. Removed the corner pieces and set them aside. (00:00:15)
2. Removed the plastic wrap around the server. (00:00:30)

IBM

1. Removed the foam corner pieces and set them aside. (00:00:15)
2. Removed the box of rack rails and set them aside. (00:00:04)
3. Removed the plastic wrap strap around the base of the server. (00:00:06)
4. Removed the cardboard insert (it had a 3 on it) from the end of server. (00:00:04)
5. Opened the top pieces of foam from the server bottom and set them aside. (00:00:14)
6. Removed the plastic wrap from around the server. (00:00:30)
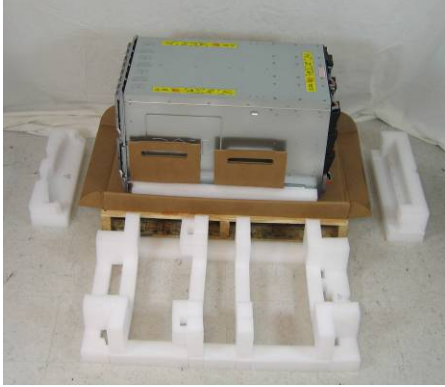
Total time: 1 minute, 15 seconds

Total time: 45 seconds

Total time: 1 minute, 13 seconds

Figure 6A: The Dell server with foam pieces removed.

Figure 6B: The HP server with plastic wrap removed.

Figure 6C: The IBM server with foam pieces removed.

Removing chassis from pallet

Dell
1. Removed the blades and set them onto a table. (00:02:44) (Note: Step no. 2 on the server chassis mentions the use of anti-static sheets. These sheets did not arrive with the server.)
2. Removed the power supplies. (00:01:32)
3. Lifted the chassis off the pallet. (00:00:09)

HP
1. Lifted the chassis from the pallet. (00:02:00)

IBM
1. Read the yellow instruction tabs on the top of the enclosure. (00:00:10)
2. Removed all items from the front of the enclosure to lessen the weight as per the yellow instructions and set the items to the side. (00:02:09)
3. Removed the two fan assemblies from the back of the enclosure to lessen the weight as per the yellow instructions and set the items to the side. (00:00:17)
4. Lifted the chassis from the pallet. (00:00:18)

Total time: 4 minutes, 25 seconds

Total time: 2 minutes, 0 seconds

Total time: 2 minutes, 54 seconds

Installing the system in the server rack

Installing rails and mounting the chassis in the server rack

Dell
Note: We followed the Getting Started with your System guide to install the chassis in the rack.

1. Open and unpack the rails box and read the instructions. (00:00:48)
2. Read the rail installation guide and installed the rails into the rack. (00:01:31)

HP
Note: We followed the instructions on the template that was in the chassis box.

1. Removed the template and placed it on the rack. (00:01:00)
2. Opened the power supply boxes and placed the power supplies on the table. (00:06:00)

IBM
Note: We followed the instructions on the rack template and BladeCenter H Rack Installation Guide.

1. Opened the rail box (00:00:05)
2. Removed the rail parts from the box. (00:00:28)
3. Removed the rail parts from the plastic bags. (00:00:36)
4. Examined the rack template

3. Read the chassis installation instructions and installed the chassis onto the rails. (00:01:02)

3. Installed screw holders into the rack. (00:00:45)
4. Installed the rails into the rack. (00:06:30)
5. Installed the chassis onto the rails. (00:03:45)

and BladeCenter H Rack Installation Guide (00:00:32)
5. Removed the template and placed it in the rack to determine front nut placement. Installed nuts as indicated in the BladeCenter H Rack Installation Guide steps 1 and 2. (00:01:53)
6. Placed template in the back of the rack to determine back nut placement. Installed nuts as above. (00:00:43)
7. Examined the BladeCenter H Rack Installation Guide and installed rails. Note: We had to remove the nuts from the step above in order to install the rails. (00:09:32)
8. Removed the two blue shipping screws from each side of the BladeCenter unit. (0:14)
9. Slid the BladeCenter unit into the rack. (00:00:25)
10. Inserted one M6 screw in the center hole of each rail on the front and back of the unit for a total of six screws. (00:01:11)
11. Reinstalled the fans in front the unit (which we had removed to lessen the weight earlier). (00:01:47)
12. Reinstalled the fan assemblies in the back of the unit (which we had removed to lessen the weight earlier). (00:00:58)

Total time: 3 minutes, 21 seconds

Total time: 18 minutes, 0 seconds

Total time: 18 minutes, 24 seconds

Figure 7A: The Dell chassis installed on the rails.

Figure 7B: The HP chassis installed on the rails.

Figure 7C: The IBM chassis installed on the rails.

Installing blades and power supplies in the chassis

Dell

Returned to reading the instructions and installed the blades and power supplies. (00:04:30)

HP

1. Removed the power supply fillers from the chassis. (00:00:30)
2. Inserted the power supplies into the chassis. (00:01:45)
3. Referred to the installation poster for the next step. (00:01:30)
4. Removed the fan fillers from the chassis. (00:00:45)
5. Installed the fans into the chassis. (00:01:00)
6. Removed the module filler from the chassis. (00:00:15)
7. Inserted the onboard administrator module into the chassis. (00:00:30)
8. Installed the processor, RAM, and hard disks in the first blade server. (00:10:30)
9. Inserted the first blade server into the enclosure. (00:00:30)
10. Installed system 2 in the chassis. (00:08:15)
11. Installed system 3 in the chassis. (00:07:00)
12. Installed system 4 in the chassis. (00:06:45)
13. Installed system 5 in the chassis. (00:06:30)
14. Installed system 6 in the chassis. (00:07:30)
15. Installed system 7 in the chassis. (00:08:00)
16. Installed system 8 in the chassis. (00:07:30)
17. Installed system 9 in the chassis. (00:06:45)
18. Installed system 10 in the chassis. (00:06:15)
19. Installed system 11 in the chassis. (00:05:45)
20. Installed system 12 in the chassis. (00:05:15)
21. Installed system 13 in the chassis. (00:04:30)
22. Installed system 14 in the chassis. (00:06:00)
23. Installed system 15 in the chassis. (00:05:45)
24. Installed system 16 in the chassis. (00:05:30)

IBM

1. Removed the power supply fillers from the chassis. (00:00:30)
2. Inserted the power supplies into the chassis. (00:01:45)
3. Referred to the installation poster for the next step. (00:01:30)
4. Removed the fan fillers from the chassis. (00:00:45)
5. Installed the fans into the chassis. (00:01:00)
6. Removed the module filler from the chassis. (00:00:15)
7. Inserted the onboard administrator module into the chassis. (00:00:30)
8. Installed the processor, RAM, and hard disks in the first blade server. (00:05:53)
9. Inserted the first blade server into the enclosure. (00:00:12)
10. Installed system 2 in the chassis. (00:03:21)
11. Installed system 3 in the chassis. (00:02:42)
12. Installed system 4 in the chassis. (00:02:36)
13. Installed system 5 in the chassis. (00:02:44)
14. Installed system 6 in the chassis. (00:02:46)
15. Installed system 7 in the chassis. (00:02:48)
16. Installed system 8 in the chassis. (00:02:14)
17. Installed system 9 in the chassis. (00:02:15)
18. Installed system 10 in the chassis. (00:02:23)
19. Installed system 11 in the chassis. (00:02:38)
20. Installed system 12 in the chassis. (00:02:04)
21. Installed system 13 in the chassis. (00:02:24)
22. Installed system 14 in the chassis. (00:02:32)
23. Unpacked and installed copper pass-thru cables. (00:02:31)

Total time: 4 minutes, 30 seconds

Total time: 1 hour, 54 minutes, 30 seconds

Total time: 48 minutes, 18 seconds

Figure 8A: The Dell blades and power supplies installed in the chassis. (Power supplies in back are not visible.)

Figure 8B: The HP blades and power supplies installed in the chassis.

Figure 8C: The IBM blades and power supplies installed in the chassis. (Power supplies in back are not visible.)

Test methodology

We attempted to recreate the way a typical buyer would set up a chassis of blade servers. We generally followed the instructions the vendors provided in their packaging. Occasionally, such as when we were opening the boxes, we had to use our own judgment, but whenever possible, we followed the vendors' instructions.

As one person executed the tasks, another person documented the process by recording the steps, timing each step, and photographing as many steps as reasonably possible.

Appendix A – Enclosure configuration information

This appendix provides detailed configuration information about the enclosures, which we present in alphabetical order.

Enclosure	Dell PowerEdge M1000e	HP BladeSystem c-Class	IBM BladeCenter H Type 8852
General dimension information			
Height (inches)	17.5	17.5	15.75
Width (inches)	19	19	19
Depth (inches)	30,5	31.0	28.0
U size in server rack	10	10	9
Number of blades	16	16	14
Power supplies			
Total number	6	6	2
Wattage of each	2,360	2,250	2,900
Cooling fans			
Total number	9	10	2 blowers
Dimensions (H x W) of each	3.5 x 3	3.5 x 3	4.5x11.5
Voltage	12 volts	12 volts	200-240 volts
Amps	7 amps	16.5 amps	5.5 amps

Figure 9: Detailed configuration information about the enclosures.

Appendix B – Blade system configuration information

This appendix provides detailed configuration information about the blade server systems, which we present in alphabetical order.

Servers	Dell PowerEdge M1000e	HP ProLiant BL460c	IBM BladeCenter H Type 8852
General processor setup			
Number of processor packages	2	2	2
Number of cores per processor package	4	4	4
Number of hardware threads per core	1	1	1
System Power Management Policy	Always on	Always on	Always on
CPU			
Vendor	Intel	Intel	Intel
Name	Quad-Core Intel Xeon processor E5345	Quad-Core Intel Xeon processor E5345	Quad-Core Intel Xeon processor E5345
Stepping	B	7	7
Socket type	LGA 771	LGA 771	LGA 771
Core frequency (GHz)	2.33 GHz	2.33 GHz	2.33 GHz
Front-side bus frequency (MHz)	1,333 MHz	1,333 MHz	1,333 MHz
L1 cache	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)
L2 cache	2 x 4 MB (each 4 MB shared by two cores)	2 x 4 MB (each 4 MB shared by two cores)	2 x 4 MB (each 4 MB shared by two cores)
Platform			
Vendor and model number	Dell PowerEdge M600	HP ProLiant BL460c	BladeCenter HS21
Motherboard model number	Dell 0MY736	HP 435458-B21	IBM 8853C2U
Motherboard chipset	Intel 5000P	Intel 5000P	Intel 5000P
Motherboard revision number	X31	91	B1
BIOS name and version	Dell 0.2.11	HP I15 12/26/2006	IBM 1.07 10/26/2007
BIOS settings	Disabled Hardware Prefetcher and Adjacent Cache Line Prefetch	Disabled Hardware Prefetcher and Adjacent Cache Line Prefetch	Disabled Hardware Prefetcher and Adjacent Cache Line Prefetch
Chipset INF driver	Intel 7.4.1005	HP 2.1.8	Intel 7.4.1005
Memory module(s)			
Vendor and model number	Samsung M395T2953EZ4-CE65	Micron MT18HTF12872FDY	Hynix HYMP512F72CP8D2-Y5
Type	PC2-5300	PC2-5300	PC2-5300
Speed (MHz)	667 MHz	667 MHz	667 MHz
Speed in the system currently running @ (MHz)	667 MHz	667 MHz	667 MHz
Timing/Latency (tCL-tRCD-iRP-tRASmin)	5-5-5-15	5-5-5-15	5-5-5-15
Size	4 GB (4 x 1 GB)	4 GB (4 x 1 GB)	4 GB (4 x 1 GB)
Number of RAM modules	4	4	4
Chip organization	Dual side	Dual side	Dual side

Servers	Dell PowerEdge M1000e	HP ProLiant BL460c	IBM BladeCenter H Type 8852
Hard disk			
Vendor and model number	Fujitsu may2073rc	Seagate St973402SS	IBM 26K5777
Number of disks in system	2	2	2
Size	73 GB	72 GB	73.4 GB
Buffer size	16 MB	16 MB	8 MB
RPM	10,000	10,000	10,000
Type	SAS	SAS	SAS
Controller	Dell SAS 6/iR Integrated Blades Controller	Smart Array E200I controller	LSI Adapter, SAS 3000 series
Controller driver	Dell 1.24.4.0	HP 6.6.0.64	LSI 1.21.28.0
Operating system			
Name	Microsoft Windows server 2003, Enterprise x64 Edition	Microsoft Windows server 2003, Enterprise x64 Edition	Microsoft Windows server 2003, Enterprise x64 Edition
Build number	3790	3790	3790
Service Pack	SP 2	SP 2	SP 2
Microsoft Windows update date	SP 2 plus updates through 11/29/07	SP 2 only	SP 2 plus updates through 11/29/07
File system	NTFS	NTFS	NTFS
Kernel	ACPI Multiprocessor x64-based PC	ACPI Multiprocessor x64-based PC	ACPI Multiprocessor x64-based PC
Language	English	English	English
Microsoft DirectX version	9.0c	9.0c	9.0c
Graphics			
Vendor and model number	ATI ES1000	ATI ES1000	ATI ES1000
Chipset	ATI ES1000	ATI ES1000	ATI ES1000
BIOS version	BK-ATI VER008.005.031.000	BK-ATI VER008.005.013.000	BK-ATI VER008.005.031.000
Type	Integrated	Integrated	Integrated
Memory size	32MB	32MB	16MB
Resolution	1024 x 768	1024 x 768	1024 x 768
Driver	ATI 8.240.50.1000	ATI 8.24.3.0	ATI 8.24.3.0
Network card/subsystem			
Vendor and model number	Broadcom BCM5708S NetXtreme II GigE	HP NC373i Multifunction Gigabit Server Adapter	Broadcom BCM5708S NetXtreme II GigE
Type	Integrated	Integrated	Integrated
Driver	Broadcom 3.5.8.0	HP 3.0.5.0	Broadcom 3.0.5.0
Optical drive			
Vendor and model number	None installed	None installed	None installed
USB ports			
Number	2	2 (with adapter attached)	2
Type	USB 2.0	USB 2.0	USB 2.0

Figure 10: Detailed configuration information about the blade server systems.