

Motherboard testing: Ease of integration

Executive summary

Intel® Corporation (Intel) commissioned Principled Technologies® (PT) to evaluate the following Intel chipset-based motherboards:

- Asus® P5Q-VM
- Gigabyte® GA-EG45M-DS2H
- Intel DG45ID
- MSI® G45M-FIDR

The goal of the testing was to determine which of these motherboards, in their out-of-box states, would be easiest and fastest for small computer vendors to integrate. PT developed the test methodology and then executed the resulting tests.

Each motherboard came with a support CD/DVD with a set of system utilities. (See Appendix A.) As Figure 1 shows, the Intel utility let us perform a wide range of integration and customization tasks from within Windows, while the Asus and Gigabyte utilities let us only update the BIOS and the BIOS splash screen and the MSI utility let us only update the BIOS. To perform other tasks on the Asus, Gigabyte, and MSI systems required us to manually enter the BIOS.

We timed changing the splash screen on the three systems with motherboards that supported this process. As Figure 2 shows, changing the BIOS splash screen using the Intel utility took 29 seconds, 52.5 percent less time than the 61 seconds for the Asus and 37.0 percent less time than the 46 seconds for the Gigabyte. (Note: The MSI utilities did not support changing the BIOS splash screen.)

KEY FINDINGS

- The Intel integration utility let us perform a wide range of integration and customization tasks from within Windows, while the Asus and Gigabyte utilities let us only update the BIOS and the BIOS splash screen and the MSI utility let us only update the BIOS. (See Figure 1.)
- Changing the BIOS splash screen using the Intel Integrator Assistant took 29 seconds, 52.5 percent less time than the 61 seconds for the Asus Update and 37.0 percent less time than the 46 seconds for the Gigabyte Face-Wizard. (See Figure 2.) The Intel DG45ID also supported both JPEG and bitmap file types, higher resolutions, and more colors. (See Figure 3.)
- Changing the boot order using the Intel Integrator Assistant took 15 seconds, 59.5 percent less time than the 37 seconds for the Asus system, 71.7 percent less time than the 53 seconds for the Gigabyte system, and 50.0 percent less time than the 30 seconds for the MSI system. (See Figure 4.)
- In addition to possessing a more robust set of features, the Intel Integrator Assistant was as intuitive and easy to work with as the tools for the other three motherboards.

Integration tasks the utilities let you perform from within Windows	Asus P5Q-VM	Gigabyte GA-EG45M-DS2H	Intel DG45ID	MSI G45M-FIDR
Update BIOS	✓	✓	✓	✓
Update BIOS splash screen	✓	✓	✓	
Customize boot order settings			✓	
Customize device management settings			✓	
Customize power settings			✓	
Customize security settings			✓	
Assign asset management values			✓	
Brand system information with custom logo and text			✓	
Share custom configuration file among similar customized systems			✓	

Figure 1: Tasks that the vendor utilities for the four motherboards we tested let you perform from within Windows.

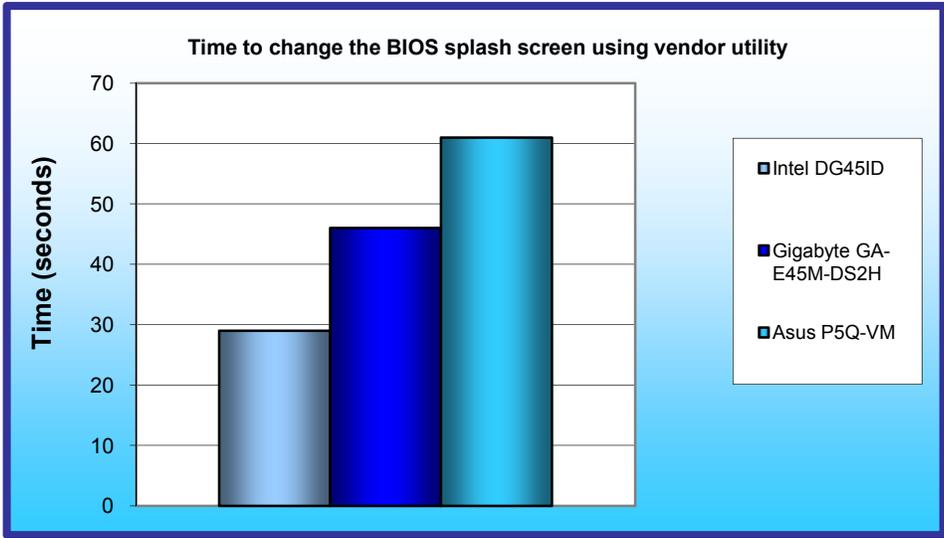


Figure 2: Median time to change the BIOS splash screen using the vendor utility for the three motherboards we tested that support this feature. (Note: The MSI utilities did not support this feature.) Lower numbers, indicating shorter times, are better.

The Intel utility also provided greater flexibility regarding the kind of image we could use. As Figure 3 shows in detail, the Intel product also supported both JPEG and bitmap file types, higher resolutions, and more colors. Because the Asus and Gigabyte offerings supported only bitmap images, replacing the splash screen on the systems with these motherboards required the extra step of converting our JPEG image to a bitmap. The MSI utilities did not support replacing the BIOS splash screen.

As Figure 4 shows, changing the boot order using the Intel

		Asus P5Q-VM	Gigabyte GA-EG45M-DS2H	Intel DG45ID	MSI G45M-FIDR
JPEG	Resolution	NA	NA	1,024 x 768	NA
	Color	NA	NA	32-bit	NA
Bitmap	Resolution	640 x 480	640 x 480	800 x 600	NA
	Color	256 colors	16-bit color	8- or 24-bit color	NA

Figure 3: Splash screen image support for the four motherboards we tested. Note: The MSI motherboard did not come with an application that allowed us to alter the BIOS splash screen.

utility took 15 seconds, 59.5 percent less time than the 37 seconds for the Asus, 71.7 percent less time than the 53 seconds for the Gigabyte, and 50.0 percent less time than the 30 seconds for the MSI. The Intel utility is the only one that let us change the boot order from within Windows. For the other motherboards, we had to manually enter the BIOS to change the boot order.

We had originally planned to time the process of hiding the XD Technology BIOS option on each of the four systems; the advantage of hiding this security feature is that if users are unaware of it, they will not accidentally disable it. However, the Intel system was the only one that permitted us to perform this task. (Note: Doing so



Figure 4: Median time to change the boot order for the four motherboards we tested. Lower numbers, indicating shorter times, are better.

took us 16 seconds.) The other motherboards allowed us only to manually enable or disable this feature in the BIOS, and not to hide it.

In addition to possessing a more robust set of features, the Intel Integrator Assistant was as intuitive and easy to work with as the utilities for the other three motherboards. (We provide representative screen shots of the utilities in Appendix B.)

Test methodology

PT built each system as identically as possible, with the only difference being the motherboards. Each system consisted of the following:

- Intel Core 2 Duo[®] Processor E8600 (3.33GHz, 1333MHz FSB, 6MB L2 cache)
- Corsair* XMS2 2GB 240-pin DDR2 PC2-6400 CL=5
- Seagate* ST3320620AS Barracuda 320 NCQ SATA2 7200RPM
- Lite-On* SATA DVD-ROM DH-16D3S-04
- Linkworld* 536-09-c2228u ATX Mid Tower Computer Case with 430W power supply

We performed all tests three times; we report the median score.

Methodology

Asus P5Q-VM

Setting up the system

1. Reset the system to the base test image.
2. Copy the BIOS splash screen image to the C: drive.
3. Copy the BIOS update file to the C: drive.
4. Insert the Asus Support DVD into the system.
5. Click the Utilities tab.
6. Click Asus Install.
7. Check the box next to Asus Update, and click Go to install the applications.

Customizing the boot order

NOTE: You cannot perform this procedure from within Windows.

1. Boot the system, and allow the system to idle for two minutes.
2. Start the stopwatch and reboot the system.
3. Press the Delete key to enter the BIOS.
4. Select the Boot tab, and press Enter.
5. Select Boot Device Priority, and press Enter.
6. Select First Boot Device, and press Enter. Set to CDROM, and press Enter.
7. Select Second Boot Device, and press Enter. Set to 1st Floppy Drive, and press Enter.
8. Select Third Boot Device, and press Enter. Set to HDD, and press Enter.
9. Press F10 to bring up the saved BIOS changes.
10. Press Yes and stop the stopwatch at the same time the changes are saved.

Customizing the BIOS splash screen

1. Boot the system, and allow the system to idle for two minutes.
2. Start the stopwatch and launch ASUS Update by opening All programs→Asus→ASUS Update→ASUSUpdate.
3. From the drop-down menu, select Options, and click Next.
4. Check Launch MyLogo application to replace system boot logo, and click Next.
5. Select Update BIOS from a file, and click Next.
6. Browse to the new BIOS file, and click Next.
7. Select the desired splash screen image, and click Next.
8. At the Preview screen, click Next.
9. Click OK.

10. Stop the stopwatch when the flash utility appears.

Hiding XD Technology BIOS Option

NOTE: You cannot perform this procedure. The only option is to enable/disable.

Gigabyte GA-EG45M-DS2H

Setting up the system

1. Reset the system to the base test image.
2. Copy the BIOS splash screen image to the C: drive.
3. Insert the Gigabyte Support DVD into the system.
4. Choose Application Software from the left panel.
5. Scroll down to the Face-Wizard utility, and click Install.
6. Click Next at the Face-Wizard Welcome screen, and click Install.
7. Click Finish when installation completes.

Customizing the boot order

NOTE: You cannot perform this procedure from within Windows.

1. Boot the system, and allow the system to idle for two minutes.
2. Start the stopwatch, and reboot the system.
3. Press the Delete key to enter the BIOS.
4. Select Advanced BIOS Features, and press Enter.
5. Select First Boot Device, and press Enter. Set to CDROM, and press Enter.
6. Select Second Boot Device, and press Enter. Set to Floppy, and press Enter.
7. Select Third Boot Device, and press Enter. Set to Hard Disk, and press Enter.
8. Press F10 to bring up the saved BIOS changes.
9. Press Yes, and stop the stopwatch at the same time the changes are saved.

Customizing the BIOS splash screen

1. Boot the system, and allow the system to idle for two minutes.
2. Start the stopwatch, and launch Face-Wizard.
3. Select On Board BIOS.
4. Click Load Image, and browse to the bitmap location.
5. Click Auto.
6. Stop the stopwatch when the process is finished, and close Face-Wizard.

Hiding the XD Technology BIOS option

NOTE: You cannot perform this procedure. The only option is to enable/disable.

Intel DG45ID

Setting up the system

1. Reset the system to the base test image.
2. Copy the BIOS splash screen image to the C: drive.
3. Copy the BIOS update file to the C: drive.
4. Insert the Intel Support DVD into the system.
5. Choose Install Applications.
6. On the list of applications, check Intel Integrator Assistant, and uncheck all other applications.
7. Click Install Now.
8. At the Automatic Logon dialog, enter the username and password, and click OK.
9. At the License Agreement screen, click Accept.
The system restarts automatically.
10. At the Installation successful screen, click Close.
11. Double-click the Download Intel Integrator Assistant icon.
12. At the Microsoft Phishing Filter, click Turn off automatic Phishing Filter, and click OK.
13. Click the link to download the Intel Integrator Assistant.
14. Save the Intel Integrator Assistant zip file to the desktop.
15. Extract the zip file to the desktop.

Customizing the boot order

1. Boot the system, and allow the system to idle for two minutes.
2. Start the stopwatch, and launch the Intel Integrator Assistant by double-clicking iassist.exe.
3. Click Configure BIOS Settings.
4. Click Boot.
5. Change the Boot Order to boot off CD/DVD, Floppy, and Hard Disk.
6. Click Apply All Changes.
7. Click Continue to apply new settings.
8. Stop the stopwatch when the changes are in place.

Customizing the BIOS splash screen

1. Boot the system, and allow the system to idle for two minutes.
2. Start the stopwatch, and launch the Intel Integrator Assistant by double-clicking iassist.exe.
3. Click Update System BIOS and BIOS Image.
4. Under Choose BIOS file, browse to the BIOS update file located on the C: drive, and click Open.
5. Under BIOS splash image file, browse to the desired splash screen image, and click Open.
6. Select the top left corner to display the Intel logo.
7. Click Apply All Changes.
8. Click Continue to apply new settings.
9. Stop the stopwatch when the changes are in place.

Hiding XD Technology BIOS option

1. Boot the system and allow the system to idle for two minutes.
2. Start the stopwatch and launch the Intel Integrator Assistant by double-clicking iassist.exe.
3. Click Configure BIOS Settings.
4. Click Security.
5. Click the “lock” box icon, until the “glasses” icon appears in the box.
6. Click Apply All Changes.
7. Click Continue to apply new settings.
8. Stop the stopwatch when the changes are in place.

MSI G45M-FIDR

Setting up the system

NOTE: The MSI G45M-FIDR motherboard came with two utilities: Live Update 3 and Dual Core Center. Neither allows the user to customize the system as we desired.

1. Reset the system to the base test image.

Customizing the boot order

NOTE: You cannot perform this procedure from within Windows.

1. Boot the system and allow the system to idle for two minutes.
2. Start the stopwatch and reboot the system.
3. Press the Delete key to enter the BIOS.
4. Select the Advanced BIOS Features, and press Enter.
5. Select Boot Sequence, and press Enter.
6. Select First Boot Device, and press Enter. Set to CD/DVD, and press Enter.
7. Select Second Boot Device, and press Enter. Set to 1st Floppy Drive, and press Enter.
8. Select Third Boot Device, and press Enter. Set to HDD, and press Enter.
9. Press F10 to bring up the saved BIOS changes.
10. Press Yes and stop the stopwatch at the same time the changes are saved.

Customizing the BIOS splash screen

NOTE: You cannot perform this procedure. The motherboard did not come with a BIOS splash screen application.

Hiding XD Technology BIOS option

NOTE: You cannot perform this procedure. The only option is to enable/disable.

Appendix A – Utilities and motherboard box contents

Each motherboard came with a support CD/DVD with a wide range of system utilities. Below we list the system utilities each manufacturer bundled with its motherboard, along with descriptions of each that we have taken from the manufacturers' Web sites.

Asus P5Q-VM

- **Asus Update**—Helps user download and flash BIOS
- **Asus MyLogo2**—Utility for changing the BIOS splash screen
- **Asus AI Suite**—An innovative application to do overclocking, fan control, power saving, and quiet thermal control
- **Asus PC Probe II**—Monitors fan speed, voltage, and CPU temperature

Gigabyte GA-EG45M-DS2H

- **EasyTune 6**—An easy to use Windows based system enhancement utility allowing quick access to a variety of performance features
- **DMI Viewer**—View motherboard hardware information
- **Face-Wizard**—Utility for changing the BIOS splash screen
- **@BIOS**—Utility for updating the BIOS
- **Q-Share**—Data sharing tool that enables users to share data with computers on the same network, making full use of Internet resources
- **Time Repair**—Allows a user to quickly backup and restore system data
- **Update Manager**—Internet update utility

Intel DG45ID

- **Integrator Assistant**—Makes it easy to customize and configure Intel Desktop Boards through an easy to use Microsoft Windows interface.
 - Intel Smart Search Technology automatically locates and downloads the latest BIOS for Intel Desktop Boards
 - Customize BIOS settings without rebooting the system first
 - Configure BIOS settings and then lock/hide critical settings, reducing downtime and support costs
 - Add a custom logo to the BIOS splash screen
 - Customize SMBIOS information with serial numbers and asset tag information
 - Display custom logo and contact information in the Windows System Control Panel

MSI G45M-FIDR

- **MSI Live Update 3**—A powerful and useful application for updating latest BIOS and Drivers, which can save your time for searching and lower the risk while updating
- **MSI Dual Core Center**—Monitor your whole system status and control your motherboard hardware at your request. Performance, Silence, Sound and temperature smart control, users can also create their own overclocked profile or your own silent and cool system profile with underclock, voltage, and lower FAN speed.

Manufacturers also included cables and other items along with the motherboards. Figure 5 presents the items the manufacturers included in the box.

System	Asus P5Q-VM	Gigabyte GA-EG45M- DS2H	Intel DG45ID	MSI G45M-FIDR
				
Motherboard	1	1	1	1
Number of SATA cables	2	2	2	1
Number of IDE cables	1	1	0	1
Number of floppy disk cables	1	1	0	0
Number of SATA power extension cables	1	0	0	1
Driver/Utility CD	1	1	1	1
User's Manual	1	1	1 (on DVD)	1
Hardware Installation Guide	0	1	0	0
Quick Start Guide	0	0	1	1
I/O Shield	1	1	1	1
Intel RAID/AHCI driver floppy disk	0	0	1	0
Chassis label	0	0	1	0

Figure 5: Items the manufacturers included in the box along with the motherboard.

Appendix B – Representative screen shots from the motherboard utilities

Figures 6 through 13 provide representative screen shots of the utilities we tested.

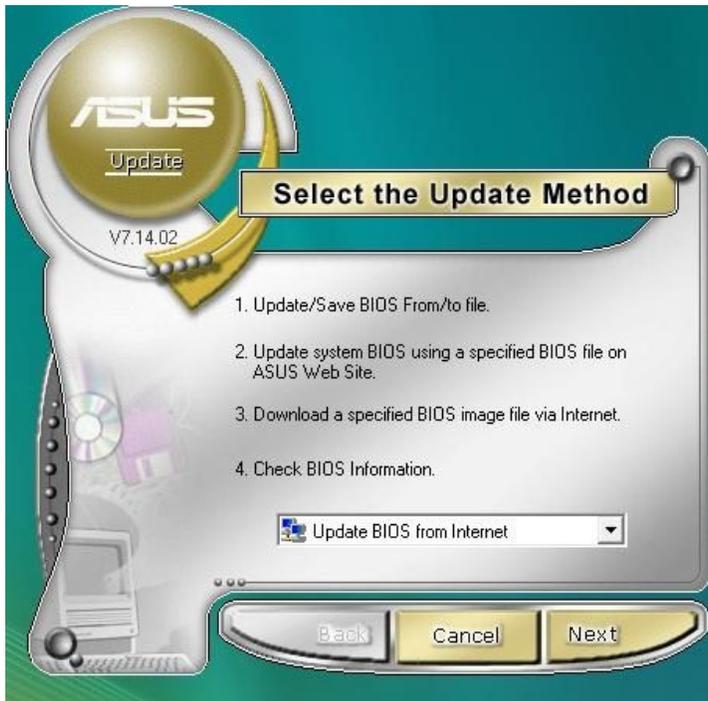


Figure 6: Representative screen shot from the Asus Update utility.

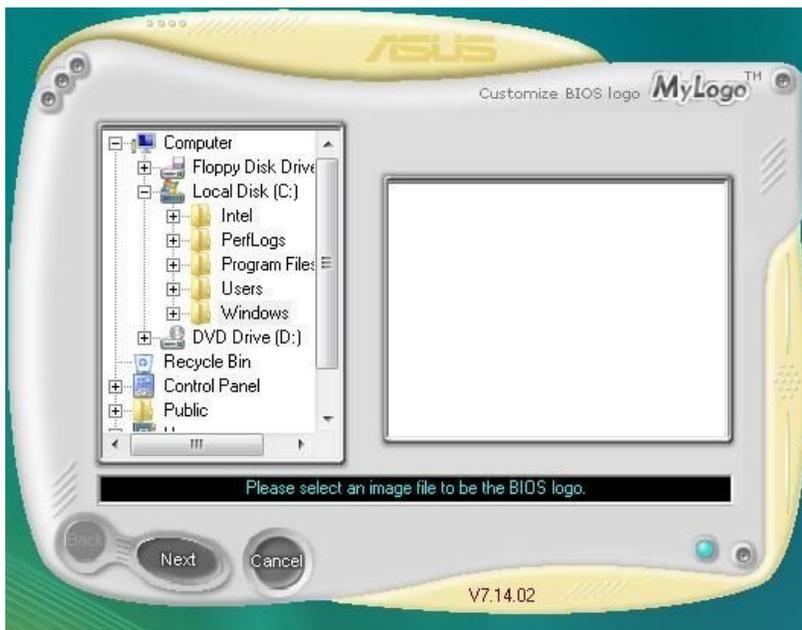


Figure 7: Representative screen shot from the Asus MyLogo2 utility.



Figure 8: Representative screen shot from the Gigabyte @BIOS utility.



Figure 9: Representative screen shot from the Gigabyte Face-Wizard utility.



Figure 10: Representative screen shot from the Intel Integrator Assistant utility.

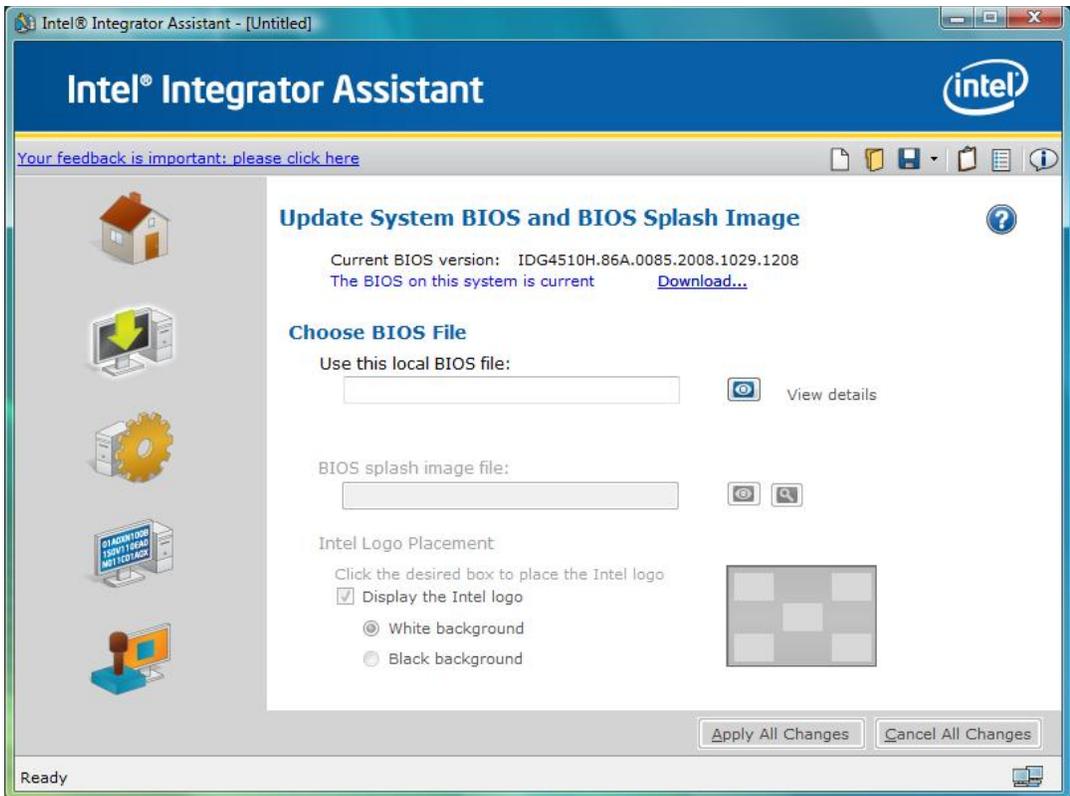


Figure 11: Representative screen shot from the Intel Integrator Assistant utility.

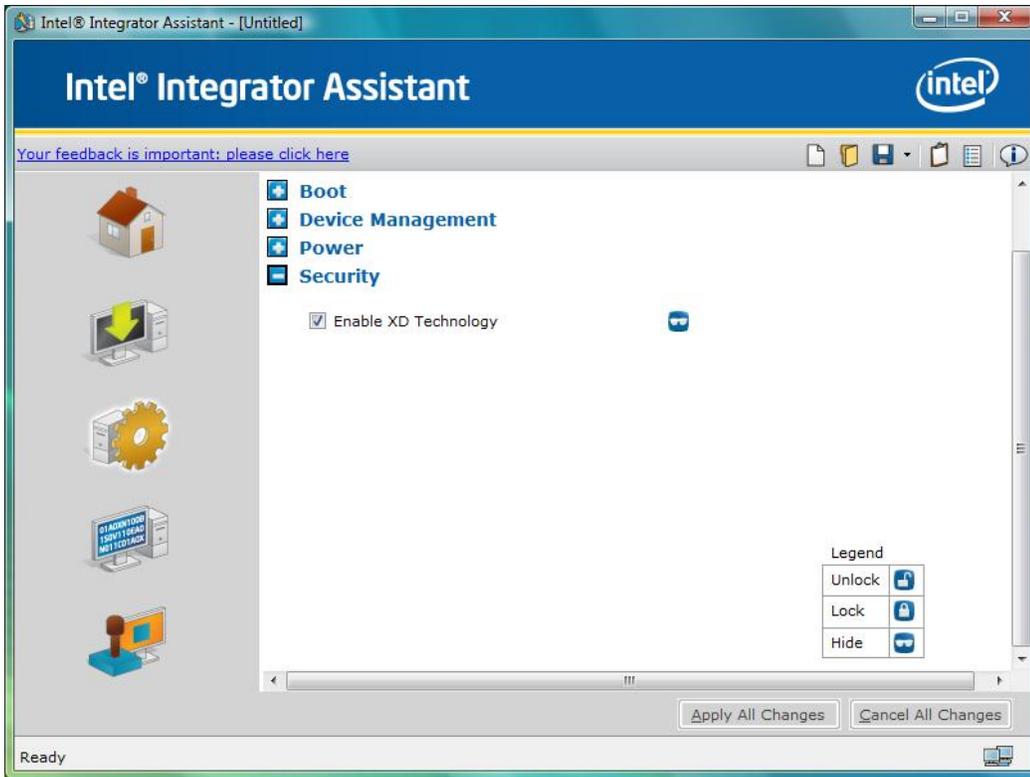


Figure 12: Representative screen shot from the Intel Integrator Assistant utility.

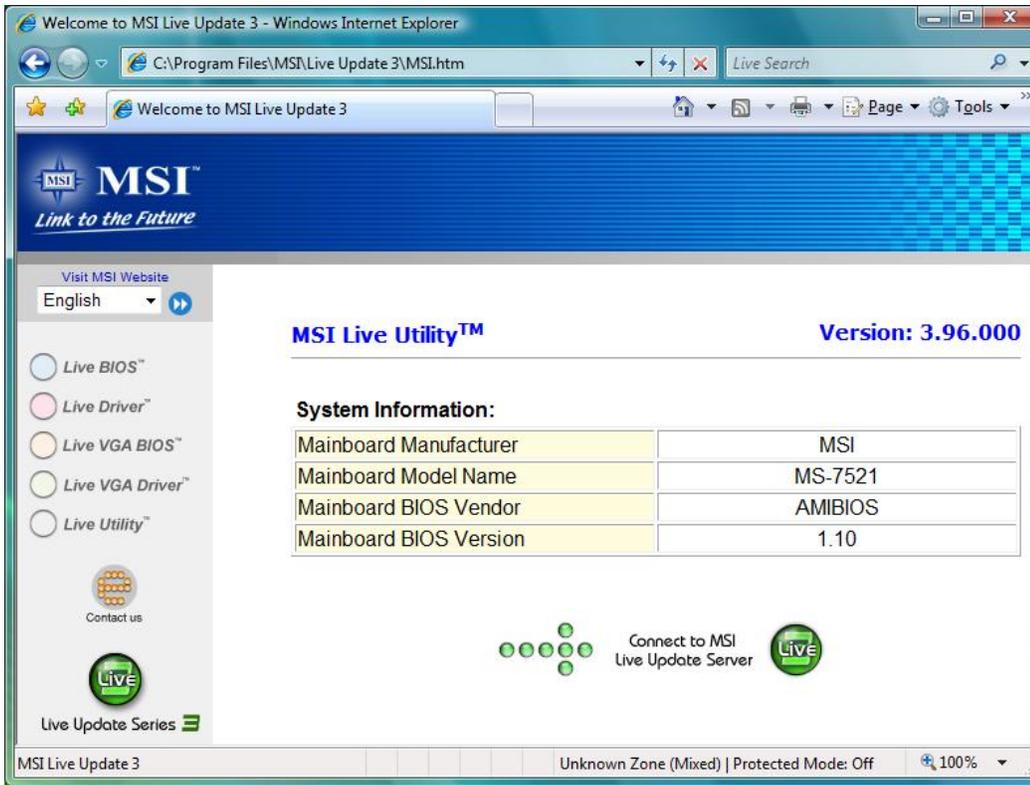


Figure 13: Representative screen shot from the MSI Live Update 3 utility.

Appendix C – Test system configuration information

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

System	Asus P5Q-VM	Gigabyte GA-EG45M-DS2H	Intel DG45ID	MSI G45M-FIDR
				
General				
Processor and OS kernel: (physical, core, logical)/(UP, MP)	1P2C2L/MP	1P2C2L/MP	1P2C2L/MP	1P2C2L/MP
Number of physical processors	1	1	1	1
Single/dual core processors	Dual	Dual	Dual	Dual
System power management policy	Balanced	Balanced	Balanced	Balanced
Processor power-saving option	Enhanced Intel SpeedStep Technology	Enhanced Intel SpeedStep Technology	Enhanced Intel SpeedStep Technology	Enhanced Intel SpeedStep Technology
CPU				
Vendor	Intel	Intel	Intel	Intel
Name	Core 2 Duo	Core 2 Duo	Core 2 Duo	Core 2 Duo
Model number	E8600	E8600	E8600	E8600
Stepping	A	A	A	A
Socket type and number of pins	LGA 775	LGA 775	LGA 775	LGA 775
Core frequency (GHz)	3.33	3.33	3.33	3.33
Front-side bus frequency (MHz)	1,333	1,333	1,333	1,333
L1 cache	2 x 32 KB + 2 x 32 KB	2 x 32 KB + 2 x 32 KB	2 x 32 KB + 2 x 32 KB	2 x 32 KB + 2 x 32 KB
L2 cache	6 MB	6 MB	6 MB	6 MB
Platform				
Vendor	Asus	Gigabyte	Intel	MSI
Motherboard model number	P5Q-VM	EG45M-DS2H	DG45ID	MS-7521
Motherboard chipset	Intel G45	Intel G45	Intel G45	Intel G45
Motherboard revision number	1.xx	xx	AAE27729-307	1.0
Bios name and version	AMI v1406	Award vF3d	Intel v0085	AMI v1.1
BIOS settings	AHCI enabled	AHCI enabled	AHCI enabled	AHCI enabled
Memory module(s)				
Vendor and model number	Corsair CM2X1024-6400C5DHX	Corsair CM2X1024-6400C5DHX	Corsair CM2X1024-6400C5DHX	Corsair CM2X1024-6400C5DHX
Type	PC2-6400	PC2-6400	PC2-6400	PC2-6400
Speed (MHz)	800	800	800	800
Speed running in the system (MHz)	800	800	800	800
Timing/Latency (tCL-tRCD-tRP-tRASmin)	5-5-5-18	5-5-5-18	5-5-5-18	5-5-5-18
Size	2,048 GB	2,048 GB	2,048 GB	2,048 GB

System	Asus P5Q-VM	Gigabyte GA-EG45M- DS2H	Intel DG45ID	MSI G45M-FIDR
Number of memory module(s)	2 x 1,024 MB	2 x 1,024 MB	2 x 1,024 MB	2 x 1,024 MB
Chip organization (single-sided, double-sided)	Double-sided	Double-sided	Double-sided	Double-sided
Channel (single/dual)	Dual	Dual	Dual	Dual
Hard disk				
Vendor and model number	Seagate ST3320620AS	Seagate ST3320620AS	Seagate ST3320620AS	Seagate ST3320620AS
Size	320 GB	320 GB	320 GB	320 GB
Buffer size	16 MB	16 MB	16 MB	16 MB
RPM	7,200	7,200	7,200	7,200
Type	SATA 3.0Gb/s	SATA 3.0Gb/s	SATA 3.0Gb/s	SATA 3.0Gb/s
Controller	Intel 82801JR (ICH10R)	Intel 82801JR (ICH10R)	Intel 82801JR (ICH10R)	Intel 82801JR (ICH10R)
Driver	Intel 7.0.0.1000 (02/25/2008)	Intel 8.5.0.1032 (07/20/2008)	Intel 8.6.0.1007 (09/12/2008)	Intel 8.2.0.1001 (05/07/2008)
Operating system				
Name	Windows Vista Ultimate	Windows Vista Ultimate	Windows Vista Ultimate	Windows Vista Ultimate
Build number	6001	6001	6001	6001
Service Pack	1	1	1	1
File system	NTFS	NTFS	NTFS	NTFS
Kernel	ACPI x86-based PC	ACPI x86-based PC	ACPI x86-based PC	ACPI x86-based PC
Language	English	English	English	English
Microsoft DirectX version	10	10	10	10
Graphics				
Vendor and model number	Intel GMA X4500HD	Intel GMA X4500HD	Intel GMA X4500HD	Intel GMA X4500HD
Type	Integrated	Integrated	Integrated	Integrated
Chipset	Intel G45 Express Chipset	Intel G45 Express Chipset	Intel G45 Express Chipset	Intel G45 Express Chipset
BIOS version	1666	1666	1659	1666
Total available graphics memory	782 MB	782 MB	765 MB	781 MB
Dedicated video memory	32 MB	32 MB	32 MB	32 MB
System video memory	96 MB	96 MB	96 MB	96 MB
Shared system memory	654 MB	654 MB	637 MB	653 MB
Resolution	1,920 x 1,200	1,920 x 1,200	1,920 x 1,200	1,920 x 1,200
Driver	Intel 7.15.10.1508 (06/20/2008)	Intel 7.15.10.1554 (09/02/2008)	Intel 7.15.10.1576 (10/07/2008)	Intel 7.15.10.1527 (07/11/2008)
Sound card/subsystem				
Vendor and model number	Realtek High Definition Audio	Realtek High Definition Audio	IDT High Definition Audio	Realtek High Definition Audio
Driver	Realtek 6.0.1.5628 (05/20/2008)	Realtek 6.0.1.5672 (07/24/2008)	IDT 6.10.6033.2 (07/02/2008)	Realtek 6.0.1.5657 (07/03/2008)

System	Asus P5Q-VM	Gigabyte GA-EG45M-DS2H	Intel DG45ID	MSI G45M-FIDR
Ethernet				
Vendor and model number	Realtek RTL8168C PCI-E Gigabit	Realtek RTL8168B PCI-E Gigabit	Intel 82567LF-2 Gigabit	Realtek RTL8168C PCI-E Gigabit
Driver	Realtek 6.208.729.2008 (07/29/2008)	Realtek 6.195.625.2007 (06/25/2007)	Intel 9.52.9.0 (06/13/2008)	Realtek 6.203.214.2008 (02/14/2008)
Optical drive(s)				
Vendor and model number	Lite-On DH16D3S	Lite-On DH16D3S	Lite-On DH16D3S	Lite-On DH16D3S
Type	DVD-ROM	DVD-ROM	DVD-ROM	DVD-ROM
Interface	SATA	SATA	SATA	SATA
Dual/single layer	Dual	Dual	Dual	Dual
USB ports				
Number	12	12	12	10
Type	USB 2.0	USB 2.0	USB 2.0	USB 2.0
IEEE 1394 ports				
Number	0	2	2	2
Monitor				
LCD type	Dell 2405FPW	Dell 2405FPW	Dell 2405FPW	Dell 2405FPW
Screen size	24"	24"	24"	24"
Refresh rate	60 Hz	60 Hz	60 Hz	60 Hz

Figure 14: Detailed configuration information for the four test systems.



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