



High Definition Experience & Performance Ratings Test

HDXPRT 2011 SCALING WHITE PAPER # 2

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1 HDXPRT 2011 ADDITIONAL SCALING TESTS

This white paper is a continuation of our previous paper on HDXPRT 2011 scaling behavior. The purpose of both is to show how different components influence HDXPRT 2011 scores. In our first paper, we discussed results from our testing with 2nd generation Intel® Core™ processor-based systems. For this paper, we conducted further tests with earlier processors, examining the impact of internal and external graphics. Please refer to our first scaling white paper and to the general benchmark white paper, both available at www.hdxprt.com, for more information on HDXPRT 2011's components and metrics.

In our earlier scaling tests, we observed that on-chip graphics processors delivered better performance than external graphics cards, a result of the specialized graphics processing available in 2nd generation Intel Core processors. Intrigued by this behavior, we decided to test HDXPRT 2011 with an earlier processor without on-processor graphics. We tested an Intel Core 2 Quad processor Q6600 with 4 GB RAM and an Intel 4 Series Express internal graphics chipset, and evaluated its performance scaling behavior when replacing the internal graphics with external NVIDIA® and AMD ATI Radeon™ graphic cards. The rest of this paper presents our test results.

2 SYSTEM CONFIGURATION

Figure 1 presents the detailed configuration of the system we tested for this white paper.

Component	Specification
CPU	Intel Core 2 Quad processor Q6600 (8M Cache, 2.40 GHz, 1066 MHz FSB)
Operating system	Microsoft® Windows® 7 Ultimate Service Pack 1 (64-bit)
Motherboard	
Manufacturer	Hewlett-Packard
Model	3647h
BIOS version	786G7 v01.02 (10/22/2009)
Memory	
Manufacturer	Samsung® M378B5673EH1-CH9
Channels	Dual
Type	DDR3
Size	2 x 2 GB
Speed	1,333 MHz
Latency	9-9-9-25
Graphics	
Manufacturer model / driver	ATI Radeon HD 6970 / ATI 8.861.0.0 (05-24-2011) Intel 4 Series Express Chipset / Intel 8.15.10.2302 (02/11/2011) NVIDIA GeForce® GTX 580 / NVIDIA 8.17.12.7533 (05-20-2011)
Hard drive	
Manufacturer model /	Seagate® Barracuda® ST3320418AS / 320 GB / 7,200 RPM / 32 MB

Component	Specification
size / RPM / cache	Samsung SSD MK0060EAVDR / 60 GB / N/A / N/A
Power supply	
Manufacturer	HP
Model	HP-D3201A0
Power	320 W
Power supply	
Manufacturer	Antec®
Model	TruePower 650
Power	650 W
Other system settings	
Display resolution	1,280 x 1,024; 60 Hz
System restore	Off
Windows Update	Off
Screen saver	Off
Power Management	Off

Figure 1. HDXPRT 2011 older processor scaling machine configuration.

3 RESULTS

Our second set of scaling tests measured the effect of the graphics approach on HDXPRT 2011 scores when running the benchmark on an earlier generation Intel Core 2 Quad processor Q6600

Interestingly, the graphics approach scaling behavior we observed was the opposite of that we observed in our 2nd generation Intel Core processor testing: HDXPRT 2011 performed better with external graphics cards than with the internal graphics processing chipset. Overall HDXPRT results improved up to 37 percent when going from on-board graphics chipsets to a discrete graphics card with the Intel Core 2 Quad processor.

3.1 Internal graphics vs. external graphics cards

Figures 2 and 3 show how scores and use case times changed when we replaced the Intel 4 Series Express internal graphics chipset with discrete graphics cards from ATI and NVIDIA.

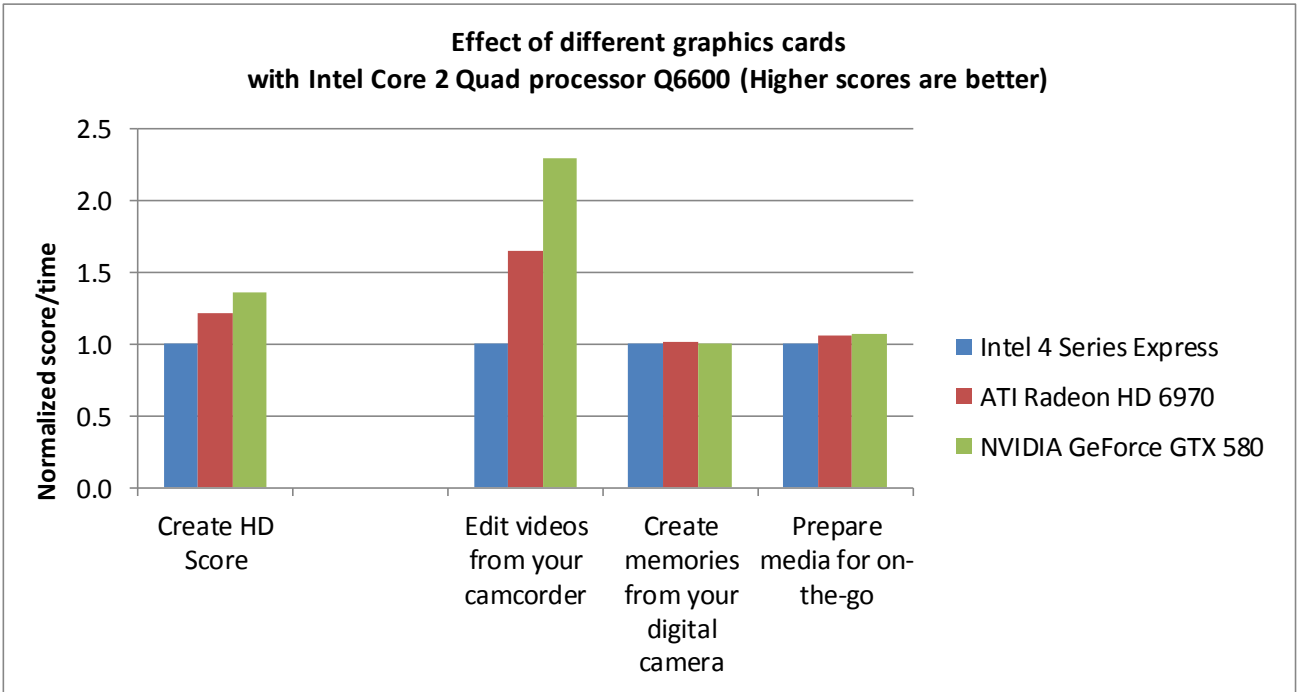


Figure 2. Normalized HDXPRT 2011 scores and times for the system configured with the Intel Core 2 Quad processor Q6600, 4GB RAM, and either an internal graphics chipset or external graphics cards. Higher numbers are better.

Graphics	Intel 4 Series Express (internal)	ATI Radeon HD 6970 (external)	NVIDIA GeForce GTX 580 (external)
Normalized scores			
HDXPRT overall score (higher is better)	1.00	1.21	1.36
Edit videos from your camcorder (higher is better)	1.00	1.65	2.30
Create memories from your digital camera (higher is better)	1.00	1.01	1.00
Prepare media for on-the-go (higher is better)	1.00	1.06	1.08
Raw scores			
HDXPRT overall score (higher is better)	108	131	147
Edit videos from your camcorder (time in minutes—lower is better)	467.1	283.7	202.9
Create memories from your digital camera (time in minutes—lower is better)	103.1	102.0	102.8
Prepare media for on-the-go (time in minutes—lower is better)	127.2	120.2	118.1

Figure 3. Normalized and raw HDXPRT 2011 scores and use case times in minutes for the system configured with the Intel Core 2 Quad processor Q6600, 4GB RAM, and either an internal graphics chipset or external graphics cards. Higher normalized scores and lower times are better.

As Figures 2 and 3 show, the internal graphics chipset delivered the lowest overall score; both external graphics cards caused the overall scores to improve dramatically. The discrete cards were much more efficient at processing video than the internal Intel 4 Series Express chipset graphics. The impact of external graphics cards is evident in the Edit Videos times, where the video stream requires encoding and significant processing. The external cards processed the HXPRT 2011 video stream up to 230 percent more efficiently than the internal graphics chipset. For the Create memories use case, which requires no such encoding or processing, the external graphics provided no substantial improvement. We observed up to 7.7 percent improvement for the Prepare media for on-the-go use case. The NVIDIA GeForce card performed better in overall scores and component run times than the ATI Radeon card. Both discrete cards showed dramatically better performance than the internal graphics chipset. HDXPRT 2011 comparative performance: Intel Core 2 Quad 6600 vs. Intel Core i7-2600K

As we mentioned above, our Intel Core 2 Quad processor Q6600 performance scaling tests show a different benchmark scoring behavior than our 2nd generation Intel Core processor performance scaling tests. Figures 7 and 8 illustrate the behavior of HDXPRT 2011 normalized for both the Intel Core 2 Quad processor Q6600 and Intel Core i7-2600K processor configurations when comparing the use of internal graphics (on-board and on-chip respectively) vs. external graphics card behavior. Figure 7 shows the comparative percentage performance impact of the ATI Radeon and NVIDIA GeForce graphics cards with respect to internal graphics (the X-axis) on both processors.

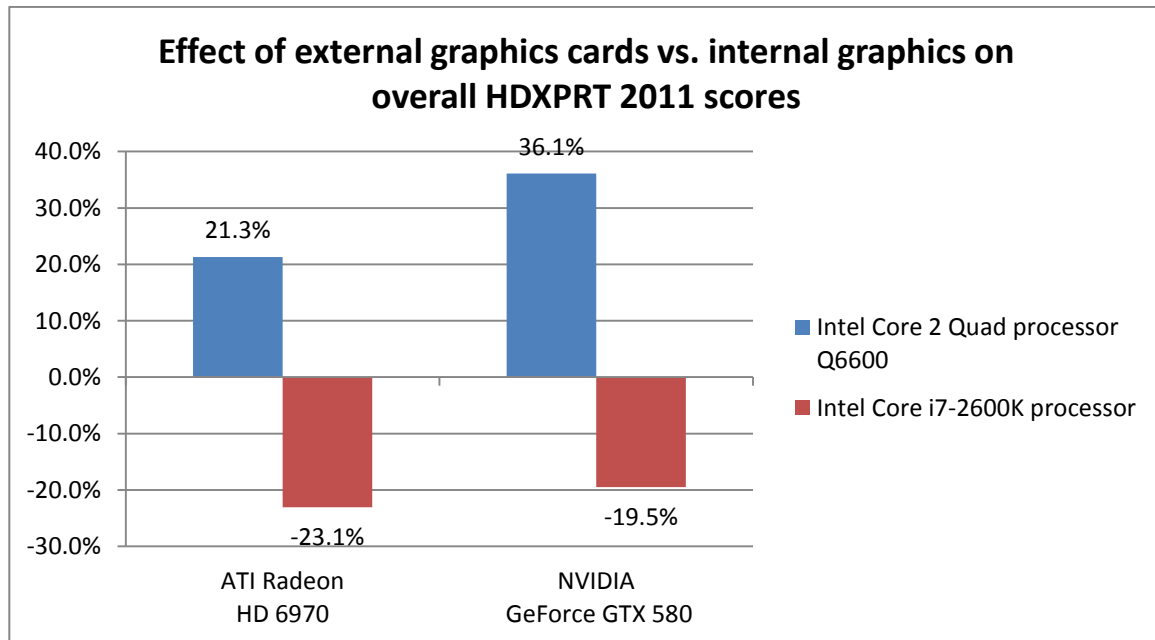


Figure 7. Comparative effect of external graphics cards vs. internal graphics on HDXPRT 2011 overall scores for systems configured with the Intel Core 2 Quad processor Q6600 or Intel Core i7-2600K processor, 4GB RAM. Higher numbers are better.

Graphics performance comparison (HDXPRT 2011 overall scores, higher is better)	Internal graphics (on-chip or on-board)	ATI Radeon HD 6970 (external)	NVIDIA GeForce GTX 580 (external)
Normalized scores			
Intel Core 2 Quad processor Q6600 configuration	1.00	1.213	1.361
Intel Core i7-2600K processor configuration	1.00	0.769	0.805

Figure 8 Normalized HDXPRT 2011 overall scores for systems configured with the Intel Core 2 Quad processor Q6600 or Intel Core i7-2600K processor, 4GB RAM, and either an internal graphics chipset or external graphics cards. Higher numbers are better.

With the Intel Core 2 Quad processor Q6600, the use of an external graphics card improved HDXPRT 2011 performance by 21.3 percent for the ATI Radeon HD 6970 card and by 36.1 percent for the NVIDIA GeForce GTX 580 card over that using an internal on-board graphics chipset (Intel 4 Series Express chipset). With the Intel Core i7-2600K processor, the reverse occurs: HDXPRT 2011 overall performance drops 23.1 percent for the ATI Radeon HD 6970 card and 19.5 percent for the NVIDIA GeForce GTX 580 card. We expected this to be the case, as external cards have much better performance for video encoding than the Intel 4 Series Express chipset in use with the Intel Core 2 Quad processor Q6600, but lower performance than 2nd generation Core on-chip graphics processors, which provide extremely efficient video encoding, being so close to the CPU and the memory.

4 Conclusion

As we have discussed in this paper, the graphics approach has a dramatic impact on overall HDXPRT 2011 scores on the Intel Core 2 Quad processor-based system. Overall HDXPRT results improved as much as 37 percent when going from an internal graphics processing chipset to a discrete graphics card, in contrast with newer processors such as the Intel Core i7-2600K where performance sharply decreases with the use of external graphics cards.