SYSmark® 2002 Performance Benchmark: Analysis Presentation

Benchmarks & Athlon XP Performance

AMD

- Benchmarks are currently the only way for business and home consumers to clearly measure the real-world performance of PCs. Benchmarks must accurately and objectively represent real-world application performance relevant to the end-user.

- BAPCo® is a non-profit consortium, originally founded in 1995 by Intel, IBM, Dell and NCR. SYSmark® is BAPCo's flagship application benchmark.

- The AMD Athlon™ XP processor routinely outperformed comparable Intel Pentium® 4 processors using the SYSmark 2001 benchmark.

- On January 31, 2002, BAPCo released SYSmark 2002.

SYSmark 2001 & 2002 Similarities

AMD

Both SYSmark 2001 & SYSmark 2002 are application-based benchmarks that attempt to reflect usage patterns for end users in the areas of Internet Content Creation and Office Productivity.
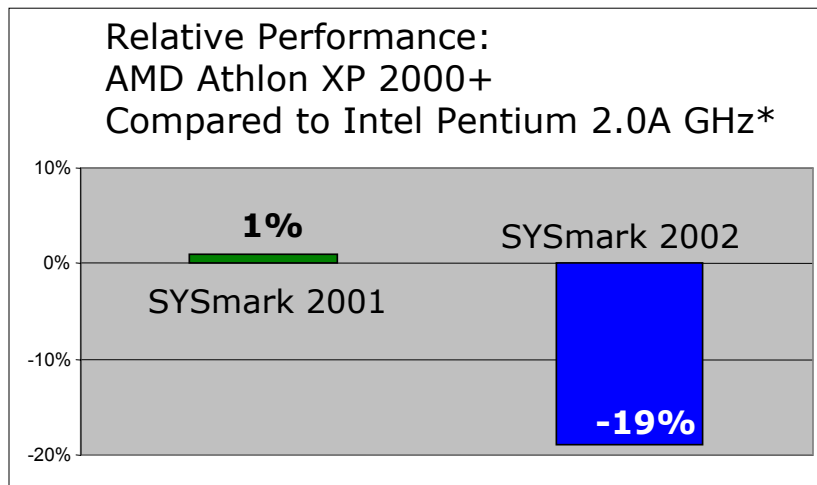
The chart on the right explains that SYSmark 2002 uses the same applications as SYSmark 2001 with updated versions where applicable.

Internet Content Creation	SYSmark 2002 Version
Adobe Photoshop	v6.0.1
Adobe Premier	Same
Macromedia Dreamweaver	Same
Macromedia Flash	Same
Windows Media Encoder	v7.01

Office Productivity	SYSmark 2002 Version
Microsoft Word	v2002
Microsoft Excel	v2002
Microsoft Power Point	v2002
Microsoft Outlook	v2002
Microsoft Access	v2002
Dragon Naturally Speaking	Same
McAfee VirusScan	Same
Netscape Communicator	Same
WinZip Computing	Same

SYSmark 2002 Inconsistencies

AMD tested SYSmark 2001 and 2002 on similarly configured systems based on the AMD Athlon XP 2000+ and the Intel Pentium 4 2.0A processors. When compared to the SYSmark 2001 benchmark results, the SYSmark 2002 benchmark results suggested a significant performance decline in the AMD Athlon XP 2000+ processor's performance and a significant increase in Intel Pentium 4 2.0A processor's performance. This prompted AMD to contact BAPCo to better understand the methodology generating the unusual results of SYSmark 2002.

Internet Content Creation

Relative Performance:
AMD Athlon XP 2000+
Compared to Intel Pentium 2.0A GHz*

1% SYSmark 2001	SYSmark 2002 -19%

Office Productivity

Relative Performance:
AMD Athlon XP 2000+
Compared to Intel Pentium 2.0A GHz*

6% SYSmark 2001	SYSmark 2002 -4%
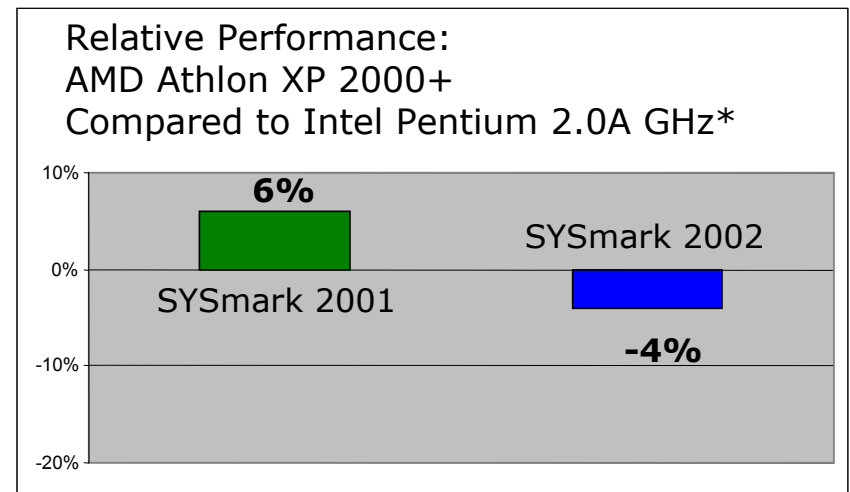
See backup slides 15 & 16 for software patch information and configuration details

AMD

After AMD contacted BAPCo for a detailed explanation regarding the changes to SYSmark 2002, AMD received the SYSmark 2002 white paper which included the following information:

- The application workload changed between SYSmark 2001 and SYSmark 2002. In other words, the contribution of each application to the overall score changed.

- BAPCo explains the methodology used to derive their SYSmark performance "ratings:"
    "The overall response time for a category (Office Productivity or Internet Content Creation) is the average of all the operation response times in all of the applications that make up that category. The average response time for each of the two scenarios is then converted to a performance "rating…" The overall SYSmark 2002 rating is derived from the geometric mean of the two category ratings."

- The only application changes were version updates to Microsoft Word, Excel, PowerPoint, Outlook and Access and PhotoShop and Windows Media Encoder.
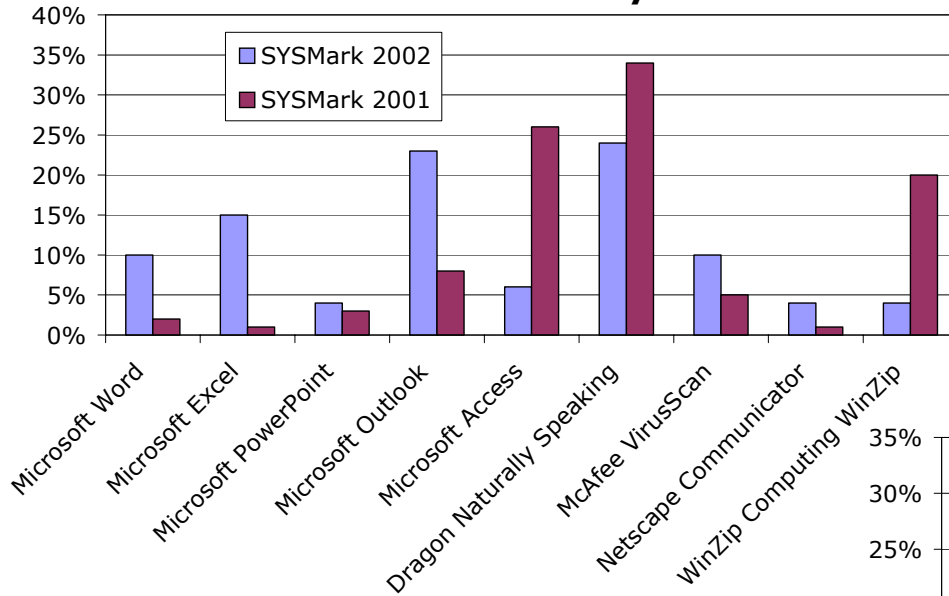
However:

- BAPCo's white paper explanation didn't satisfactorily address AMD's concerns. The white paper only addressed the application-level details and ignored the crucial task-level details and relative contributions of those tasks to the final score. So AMD investigated further…
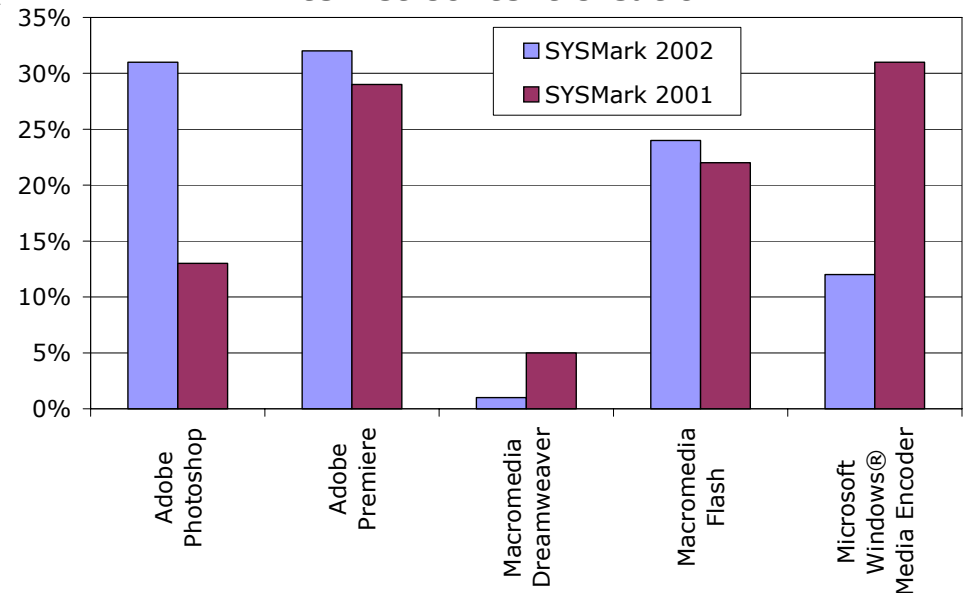
Bapco Application Weighting Changes

AMD

Office Productivity

Internet Content Creation

Source: Bapco Whitepaper: An Overview of SYSmark 2002 – www.bapco.com

SYSmark 2002 Methodology:
Example numbers for illustration only

AMD

Application	Task	Time (sec)	Application Contribution
Dreamweaver 4	App loading	5.5	
Dreamweaver 4	Add product – Slider Pro	3	10%
Dreamweaver 4	Add radio button #2	1.5	
Flash 5	Group	9	
Flash 5	Deselect	12	24%
Flash 5	Rotate	3	
PhotoShop 6.01	Filter SmartBlur	14	
PhotoShop 6.01	Filter GaussianBlur	7.5	
PhotoShop 6.01	ImageSizePercent	3	25%
PhotoShop 6.01	Color Balance	0.5	
Premiere	App loading	7.5	
Premiere	Open file	2.5	10%
Media Encoder 7.1	Encoding	30	
Media Encoder 7.1	App loading	1	31%
Totals		100	100%

The chart on the left is a simplified summary of the SYSmark methodology. These are not actual times or percentages. Rather the numbers are used to demonstrate the methodology:

1. The methodology selects a number of tasks to be performed by each application

2. The time spent on each task is its contribution to the total time

3. The sum of the task times for each application is the application's contribution to the total time

4. Finally, the total time is converted to a performance "rating"

For example, the sum of the PhotoShop task times is 25 seconds. Because the total task time is 100 seconds, PhotoShop's workload contribution to SYSmark 2002 Internet Content Creation is 25%. Similarly, the workload contribution of Filter SmartBlur to SYSmark 2002 is 14% of the total time (and 56% of the Photoshop application time).

AMD's Findings:
SYSmark 2002 Task-Level Patterns

After further comparing SYSmark 2001 to SYSmark 2002 at the task-level, AMD found the following patterns:

- Removing tasks that favor AMD
- Adding tasks that favor Intel
- Inflating workload contributions by repeating tasks that favor Intel

The BAPCo white paper explanation of AMD's SYSmark 2002 concerns ignored the task-level details and related contribution at the heart of the unusual results.

This pattern was found across applications in both Internet Content Creation and Office Productivity.

SYSmark 2001 Filters

8	**FilterEmboss_Fade**
	FilterOther_MaximumValue
	FilterRender_LightingEffects…
	FilterSharpen_SharpenEdges
	FilterSketch_WaterPaper
	FilterStylize+WindStagger…
	FilterWaterPaper_Fade
	FilterWind_Fade
	Filter Artistic_Underpainting
	FilterBlur_GaussianBlur
	FilterSketch_Charcoal
	FilterSharpen_UnsharpMask
5	**FilterStylise_Emboss**

AMD Athlon XP advantage

Intel Pentium 4 advantage

SYSmark 2001 used 13 different filters, one time each. The AMD Athlon XP 2000+ outperforms the Pentium 4 2.0A on 8 of those 13 filters.

SYSmark 2002 Filters

	Filter Artistic_Underpainting
	Filter Artistic_Underpainting
	Filter Artistic_Underpainting
	Filter Artistic_Underpainting
	FilterBlur_GaussianBlur
	FilterBlur_GaussianBlur
	FilterBlur_GaussianBlur
	FilterBlur_GaussianBlur
	FilterBlur_GaussianBlur
	FilterSketch_Charcoal
	FilterSketch_Charcoal
12	**FilterSketch_Charcoal**
	FilterBlur_SmartBlur
	FilterBlur_SmartBlur
	FilterBlur_SmartBlur
	FilterBlur_SmartBlur
	FilterBlur_SmartBlur
	FilterRender_LensFlare
	FilterRender_LensFlare
20	**FilterOther_HighPass**

SYSmark 2002 uses 3 filters from SYSmark 2001 and 3 new filters, multiple times for a total of 20 runs. All 8 of the AMD Athlon XP 2000+ advantaged filters from SYSmark 2001 were removed from SYSmark 2002, resulting in the Intel Pentium 4 2.0A GHz outscoring the AMD Athlon XP on all SYSmark 2002 filters.

BAPCO selected only 3 of the original 13 filters from SYSmark 2001 to use in 2002. Those 3 filters favored the Intel Pentium 4 2.0A GHz and are repeated to account for 12 of the 20 times that a filter is run in Sysmark 2002.
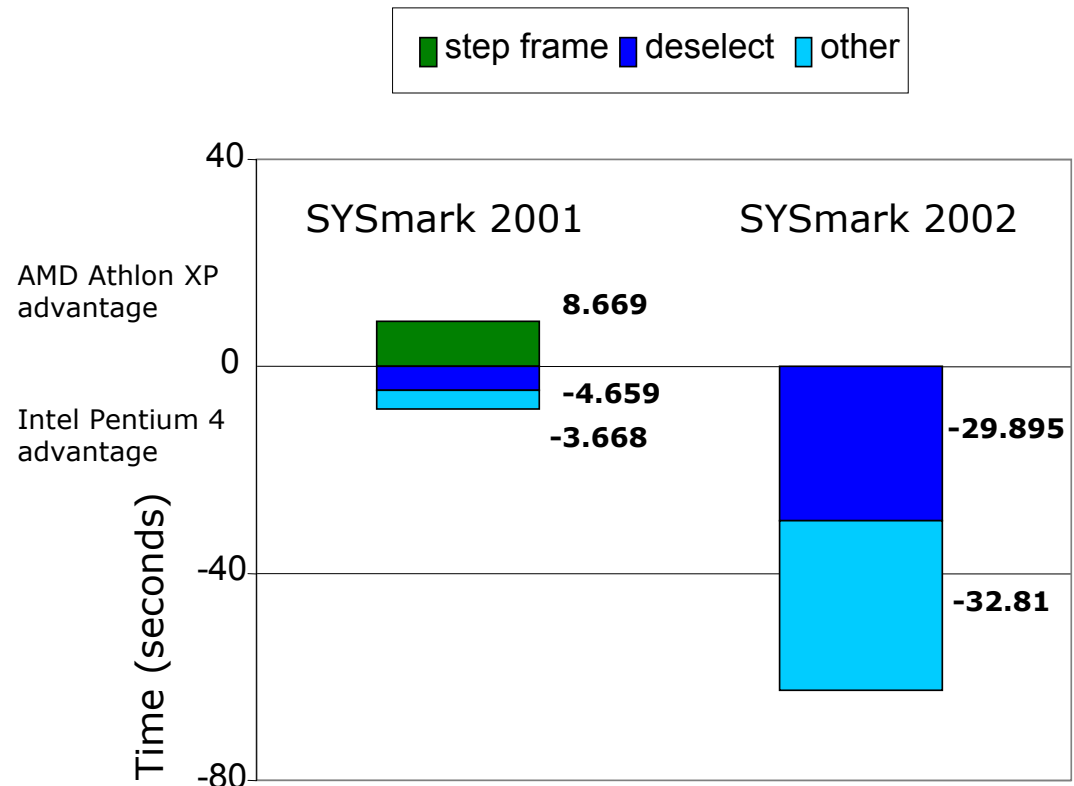
AMD

In SYSmark 2001, "Step Frame," which the AMD Athlon XP excelled at, accounted for 211 of 241 flash tasks (88%), but was completely removed in SYSmark 2002.

In SYSmark 2002, the tested file size greatly increased from 118 kb to 2.662 MB.

Task Time Difference between AMD Athlon XP 2000+ and Intel Pentium 4 2.0AGHz

Legend: ■ step frame ■ deselect ■ other

Chart data:
- SYSmark 2001: 8.669 (step frame), -4.659 (deselect), -3.668 (other)
- SYSmark 2002: -29.895 (deselect), -32.81 (other)

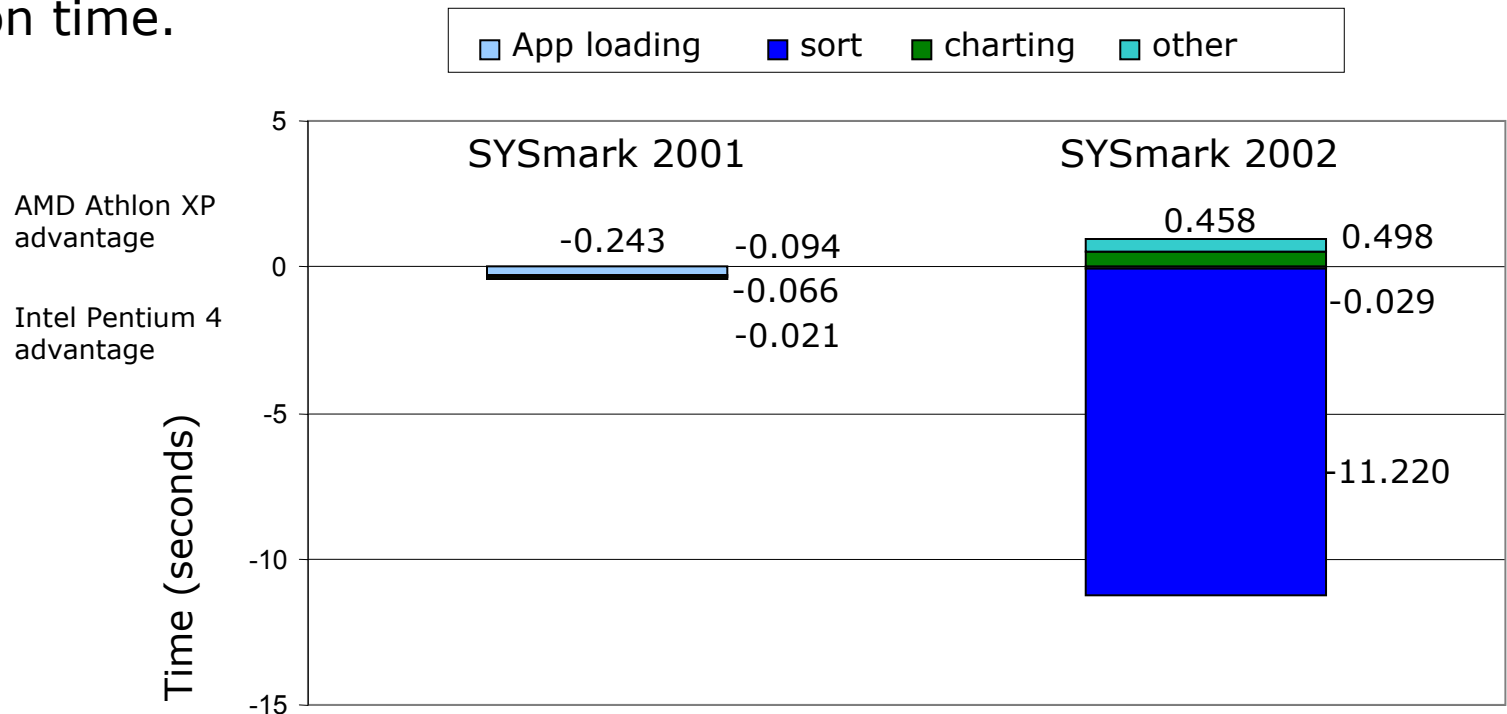AMD Athlon XP advantage / Intel Pentium 4 advantage

Y-axis: Time (seconds), range 40 to -80

AMD

In SYSmark 2002, sort is now responsible for over 90% of the application time.

Task Time Difference between AMD Athlon XP 2000+ and Intel Pentium 4 2.0AGHz
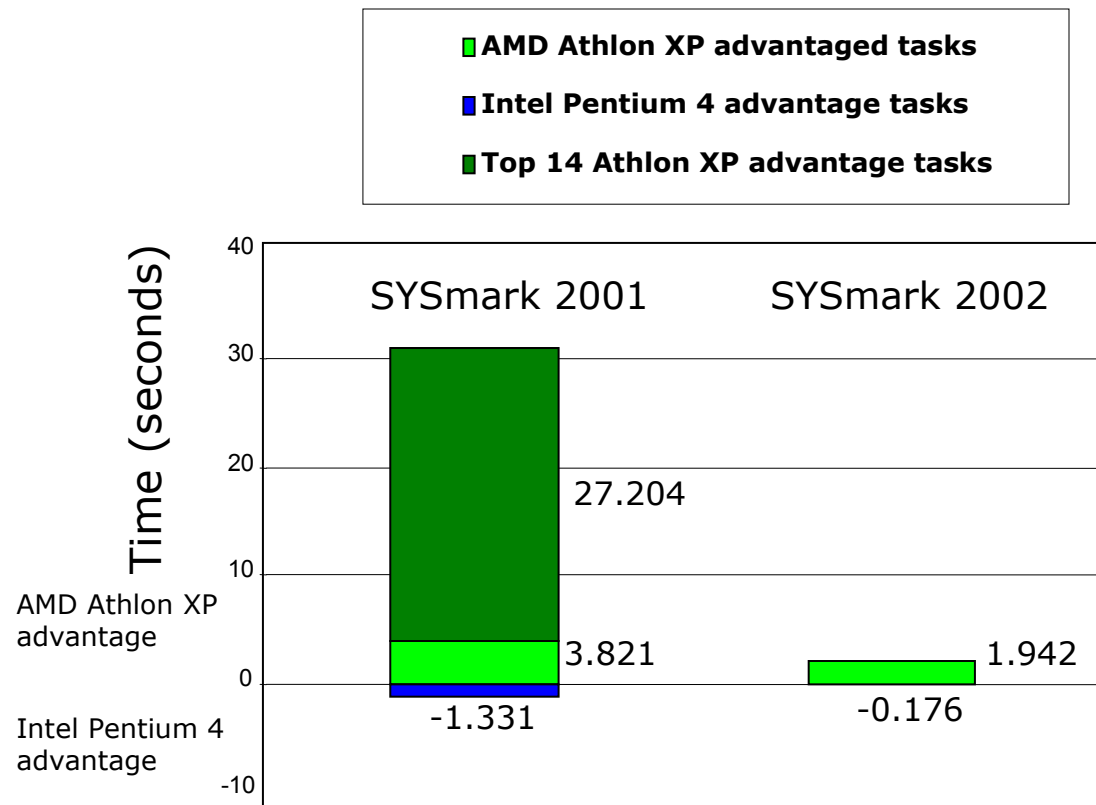

Legend: ☐ App loading ■ sort ■ charting ☐ other

SYSmark 2001
- AMD Athlon XP advantage
- Intel Pentium 4 advantage
- -0.243
- -0.094
- -0.066
- -0.021

SYSmark 2002
- 0.458
- 0.498
- -0.029
- -11.220

Time (seconds)

The 14 Access tasks where the AMD Athlon XP 2000+ achieved the biggest advantage over the Intel Pentium 4 2.0A GHz in SYSmark 2001 were completely removed in SYSmark 2002.

Those 14 tasks represented over 75% of the application time and 90% of the advantage the AMD Athlon XP 2000+ held over the Pentium 4 2.0A GHz.

Task Time Difference between AMD Athlon XP 2000+ and Intel Pentium 4 2.0AGHz

□ AMD Athlon XP advantaged tasks

■ Intel Pentium 4 advantage tasks

■ Top 14 Athlon XP advantage tasks

Time (seconds)

SYSmark 2001   SYSmark 2002

40
30
20
10
0
-10

27.204

AMD Athlon XP advantage

3.821

1.942

Intel Pentium 4 advantage

-1.331

-0.176

AMD Decisions

AMD's analysis raises serious questions regarding changes to the selection of tasks and application contribution in the methodology. BAPCo's white paper response to AMD did not resolve the task-level questions raised by our analysis. Therefore, AMD plans to:

- Join BAPCo in order to more fully understand the methodology of SYSmark 2002 and to work collaboratively with the consortium.

- Present our results internally to BAPCo to resolve concerns regarding SYSmark 2002, and ensure that future SYSmark benchmarks objectively reflect end-user benefits.

- Continue to use SYSmark 2001 until our concerns regarding SYSmark 2002 are resolved to our satisfaction.

Backup

AMD Athlon™ XP Processor
Benchmark System Configurations – DDR

AMD

Operating System & Software	Windows® XP	Microsoft Windows XP Professional RTM, no service packs / updates installed Build# 2600, DirectX version 8.1 (4.08.01.0810)
	Windows Media Encoder	Updated Windows® Media Encoder Results contain a software update which enables 3DNow!(tm) Professional technology in version 7.0 of Microsoft Windows® Media Encoder. This software patch is not publicly available; however the current version of Microsoft Windows Media Encoder 8 properly enables support for 3DNow! Professional technology.
Hardware	Processor	AMD Athlon XP processor 2000+, QuantiSpeed architecture operates at 1.67GHz
	Motherboard	Asus A7V266-E Rev. 1.07
	Memory	Corsair XMS2400 CM64SD256-2400C2, Qty (1) 256MB DIMM Module (256MB total)
	Hard Drive	IBM 41.0GB UDMA 100 (IC35L040AVER07-0)
	Network Card	Allied Telesyn AT2700TX 10/100
	Sound Card	Sound Blaster Live! Model CT4670
	Video Card	Leadtek Winfast GeForce3 Titanium 500 64MB DDR
Drivers	AGP Miniport	Publisher Name: Provided by Operating System
	EIDE Drivers	Publisher Name: Provided by Operating System
	Network Card	Publisher Name: Provided by Operating System
	Sound Card	Publisher Name: Provided by Operating System
	Video Card	NVIDIA Version: 5.13.01. 2183

Intel Pentium® 4 Processor
Benchmark System Configurations - RDRAM

AMD

Operating System	Windows® XP	Microsoft Windows XP Professional RTM, no service packs / updates installed Build# 2600, DirectX version 8.1 (4.08.01.0810)
Hardware	Processor	Intel Pentium® 4 processor 2.0A GHz
	Motherboard	Intel D850MD , i850 Chipset, BIOS version MV85010A.86A.0011.P05.0111141737
	Memory	PC-800 (RDRAM®), Qty. (2), 128MB RIMM Modules (256MB total)
	Hard Drive	IBM 41.0GB UDMA 100 model(IC35L040AVER07-0)
	Network Card	Allied Telesyn AT2700TX 10/100
	Sound Card	Sound Blaster Live! Model CT4670
	Video Card	Leadtek Winfast GeForce3 Titanium 500 64MB DDR
Drivers	AGP Miniport	Publisher Name: Provided by Operating System
	EIDE Drivers	Publisher Name: Provided by Operating System
	Network Card	Publisher Name: Provided by Operating System
	Sound Card	Publisher Name: Provided by Operating System
	Video Card	NVIDIA Version: 5.13.01. 2183