Matrox in the New Millennium: Parhelia Reviewed

By Brian Neal – July 2002

Introduction

For some time following the introduction of the Matrox G400 and later the G450, we heard rumors about a "G800" project. About a year and a month ago, Matrox introduced the world to the G550. But the G550 lacked the performance and features of its competitors, and was relegated mostly to 2D work.

The G550 was more an evolution of the G450 than anything else, but this time, things are different. Matrox's new Parhelia is an all-new design, incorporating modern features such as Direct X 8.1-compliant pixel and vertex shaders. The G550's 166 MHz 64-bit DDR SDRAM memory interface has been replaced with a far more robust 275 MHz (250 MHz OEM/bulk) 256-bit DDR SDRAM interface capable of 17.6 GB/s. This combined with some interesting and innovative features like hardware displacement-mapping, triple-head surround gaming, and the prospects for Matrox's next-generation product are looking quite good.

The Matrox Parhelia

But not everything is looking so bright for Parhelia. Manufactured on a 0.15µ process, the 80 million transistor GPU is quite large and also quite hot. Consequently, it currently clocks in at only 220 MHz. To contrast, compare the GeForce 4 Ti4400's 300 MHz clockrate. The low clockrate is compounded by a lack of hardware occlusion culling, which means the quad-pipeline renderer is significantly less efficient than many other contemporary designs when it comes to overdraw.

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Let's overview the specifications of the Parhelia, as well as those of its competitors:

	Matrox Parhelia (Retail)	ATI Radeon 8500	NVIDIA GeForce 4 Ti4600	NVIDIA GeForce 4 Ti4400	NVIDIA GeForce 4 Ti4200	NVIDIA GeForce 4 MX440
Transistors	80M	60M	63M	63M	63M	29M
Core Clockrate	220 MHz	275 MHz	300 MHz	275 MHz	225 MHz	270 MHz
Pixel Pipelines	4	4	4	4	4	2
Fillrate (MPixels/s)	880	1100	1200	1100	900	540
Texture Units / Pipeline	4	2	2	2	2	2
Texel Fillrate (MTexels/s)	3520	2200	2400	2200	1800	1060
Vertex Pipelines	4	2	2	2	2	0*
Memory Clockrate	275 MHz DDR	275 MHz DDR	325 MHz DDR	275 MHz	250 MHz	200 MHz
Memory Bus Width	256-bit	128-bit	128-bit	128-bit	128-bit	128-bit
Peak Bandwidth (GB/s)	17.6	8.8	10.4	8.8	8	6.4

* The GeForce 4 MX / NV17 lacks DirectX 8-compliant vertex and pixel shaders

As you can see, the Parhelia is comprised of significantly more transistors than the Radeon 8500 and GeForce 4. This is likely because, in addition to Parhelia's new features like displacement-mapping, it also has twice as many vertex shader pipelines as its competitors and twice as many texture units per pixel pipeline.

Parhelia has been billed as a "brute-force" approach, largely due to its 256-bit 17.6 GB/s memory interface. Will the approach work? To find out, we've benchmarked a total of seven different games, including four first-person shooters, one racing simulation, one RPG, and one RTS. We've benchmarked professional applications too, including AutoCAD 2002, and the applications from the SPEC ViewPerf 7.0 test suite. Other 3D benchmarks, like CodeCreatures and FableMark have also been included, and we've also performed our benchmarks at a variety of different resolutions and settings. You'll also find a complete FSAA performance comparision, as well as an anisotropic filtering comparison.

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The Cards

Let's take a moment to look over some of the cards featured in this review. First, the Matrox Parhelia:

Matrox Parhelia

The Matrox Parhelia and Cables

The Parhelia sports a robust feature set, including the following:

- Dual Digital Flat Panel Display Support (2 x DVI)
- Triple-Head Surround Gaming (2 x Analog + 1 x DVI)
- TV-Out
- 30-bit GigaColor: 10-bit per component
- Glyph (Font) Anti-Aliasing
- 16x Fragment Anti-Aliasing (FAA)
- Displacement Mapping
- 128 MB DDR SDRAM

The Parhelia features a very silent fan, though we have not had a chance to try and overclock it yet. The card has dual 400 MHz RAMDACs and, as such, the output quality is crystal clear. In addition to multiple monitors, output to TV is also possible with the top cable as pictured above. As you can see, it has connectors for both composite and S-Video output. Below the TV output adapter, you can see the dual-monitor cable that's used to drive two analog HD15 monitors.

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ASUS V8840: GeForce 4 Ti4400

The ASUS V8840: GeForce 4 Ti4400

Like the Parhelia, the V8840 also has a very silent fan, and though it is a bit more expensive than some other GeForce 4 offerings, it is an excellent overclocker. We've been able to overclock the V8840 to 310 MHz core and 310 MHz memory, quite an increase from the stock 275/275 settings! The package also features two games bundled on DVD, Midnight GT and Aquanox, as well as a demo CD.

MSI G4Ti4200-TD64: GeForce 4 Ti4200

The MSI G4Ti4200-TD64: GeForce 4 Ti4200

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The MSI G4Ti4200-TD64 has a fan that is somewhat noisy, but it is rather inexpensive compared to other GeForce 4 Ti4200 solutions. This is the 64 MB version, which includes both digital output (DVI) and TV output, as you can see in the picture with the bundled cables above (notice the 6' S-Video cable in particular).

Benchmarked Configuration

Hardware

- 2.4 GHz Northwood Pentium 4
  - 533 MHz FSB
- MSI 845G-MAX
  - i845-G Chipset
  - BIOS Version 1.2
- 512 MB Corsair PC2700 XMS DDR SDRAM, CAS 2.5
- Seagate Barracuda ATA III ST320414A Model ST320414A (7200 RPM, ATA-100)
- AT 2700 10/100MBit Ethernet Adapter
- Sound Blaster Live!

Software

- Windows 2000: Service Pack 2
- DirectX 8.1
- Intel Chipset INF Update 4.09.1011

Video Drivers

- Matrox Parhelia Driver Version: 1.00.03.226
- NVIDIA Detonator Driver Version: 29.42
- ATI Radeon CATALYST 02.1 Driver Version: 6.13.10.6094

Special Thanks

I'd like to take a moment to thank the following people for making this review possible:

- Andrea Jackson of **Matrox** for getting the Matrox Parhelia to us
- Jurgen Eymberts (**Intel**) and Marieke Leenhouts (**MCS**) for making sure we could test the 2.4 GHz Pentium 4
- Angelique Berden and Saskia Verhappen (**MSI**) provided us with the MSI 845G-MAX
- Augustine Chen, Carol Chang (**ASUS**) and Sharon Tan (**BAS computers Netherlands** for the ASUS GeForce 4 Ti4400
- Extra special thanks to Johan for running the benchmarks, even the ones I asked for ;)

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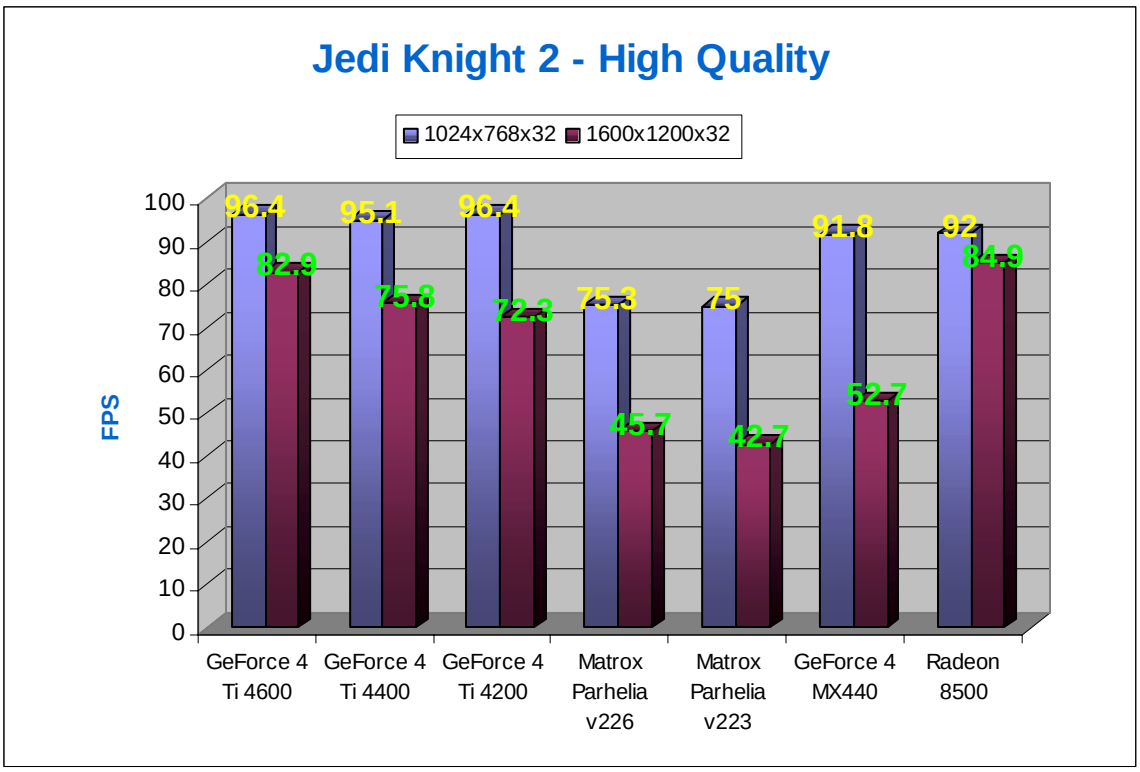
Gaming Benchmarks: Jedi Knight 2

We'll start our comparison with Jedi Knight 2. Like several other first-person shooters (including Medal of Honor: Allied Assault and Return to Castle Wolfenstein), Jedi Knight 2 uses the OpenGL-based Quake 3 engine. The game was benchmarked with "High Quality" settings at 1024x768 and 1600x1200, with 32-bit color. Additionally, the game was also benchmarked with anti-aliasing enabled. In the case of the Matrox Parhelia, the 16-sample Fragment Anti-Aliasing (FAA) mode and the 4-sample supersampling mode were both tested. The Parhelia results are highlighted in blue.



Though quite playable at 1024x768, the Parhelia's performance leaves a lot to be desired in Jedi Knight 2. It's disappointing to see a next-generation GPU with a 256-bit memory interface pushed around by a budget GeForce 4 MX440. The GeForce 4 Ti4600 leads at 1024x768, but the Radeon 8500 pulls ahead at 1600x1200.

You'll notice there are two results here, one for the v223 drivers and one for the v226 drivers. The more recently released v228 drivers were also tested, but we found that the performance actually decreased relative to our v226 results. With the v228 drivers, Parhelia delivered 61.5 FPS at 1024x768 and 42.5 FPS at 1600x1200. Due to the performance drop, we have decided to stick with version 226, and therefore, all Parhelia benchmarks in this review use this version unless specifically indicated otherwise.

In an effort to isolate the performance limiter for this benchmark and others, we have benchmarked a lesser-equipped system to see what kind of impact the lower CPU performance and memory bandwidth has on the results. Specifically, this system is a 2 GHz Willamette Pentium 4 (256 KB L2, 400 MHz FSB) with PC2100 DDR SDRAM.

In the case of Jedi Knight 2, we found that the CPU was a bottleneck at lower resolutions. Our 2 GHz benchmarks produced very similar results at 1600x1200 to those presented here, benchmarked on the 2.4 GHz Northwood machine.

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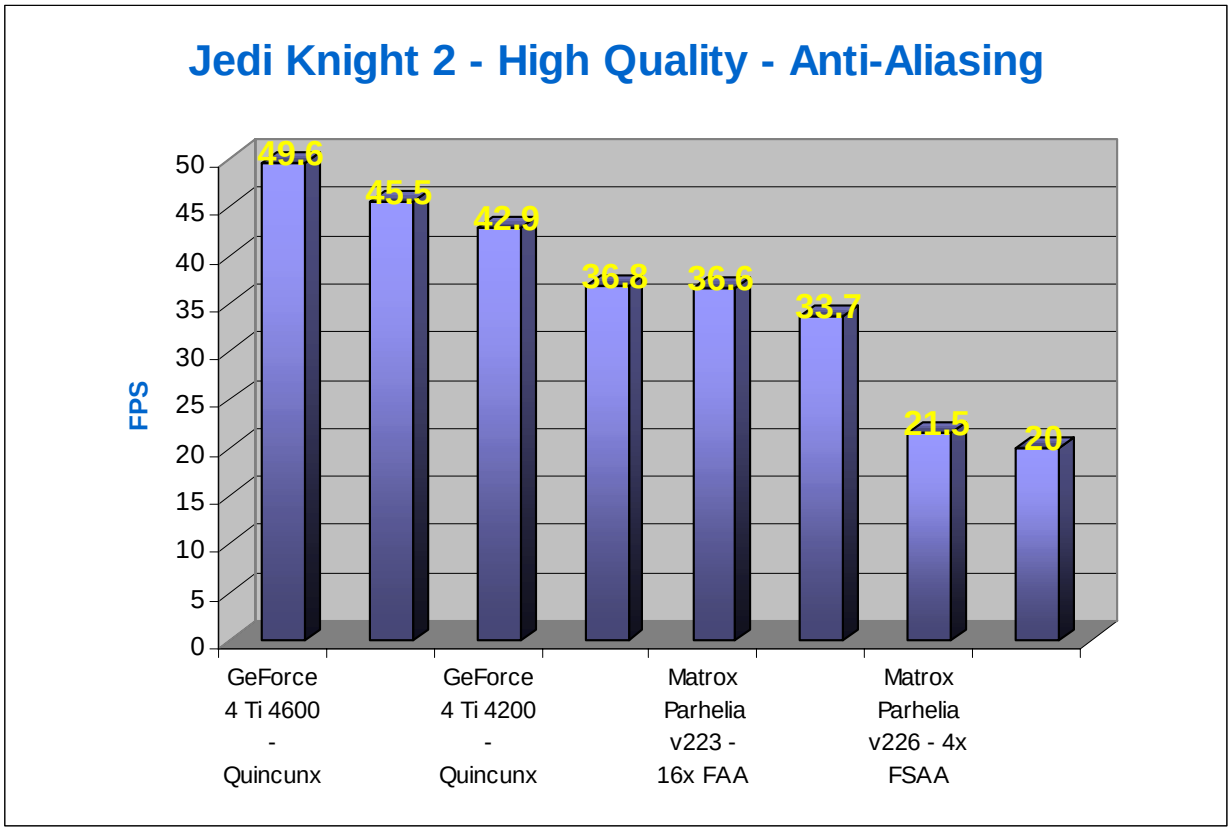
Matrox's 16-sample FAA (edge anti-aliasing) is said to be highly efficient while also delivering very high quality. Let's now take a look at the performance of the Parhelia with anti-aliasing:



For this test, we've compared the highest-performance anti-aliasing methods for each card. This includes Matrox's 16-sample FAA and NVIDIA's Quincunx. Also included are 4-sample multisampling results for the GF4 Ti4400 and 4-sample supersampling results for the Parhelia. Unfortunately, as our Radeon 8500 is only a 64 MB version, we were unable to include it in this test. However, all the others were included.

The Parhelia is doing quite a bit better for itself here, as it does not take nearly the hit when enabling AA that the GeForce 4 does. The visual quality of 16-sample FAA is also considerably superior to that of Quincunx, and the Parhelia actually manages to outperform the GF4 Ti4400 when the GF4 is using 4-sample mode.

Take a close look at the Parhelia 4-sample supersampling results, however, as this is the only fallback mode available should 16x FAA not do the trick, as would be in the case where stencil buffers are used. At 21.5 FPS, 4x supersampling is basically unusable. From a performance standpoint, Parhelia users really have a choice between 16x FAA and no AA at all.

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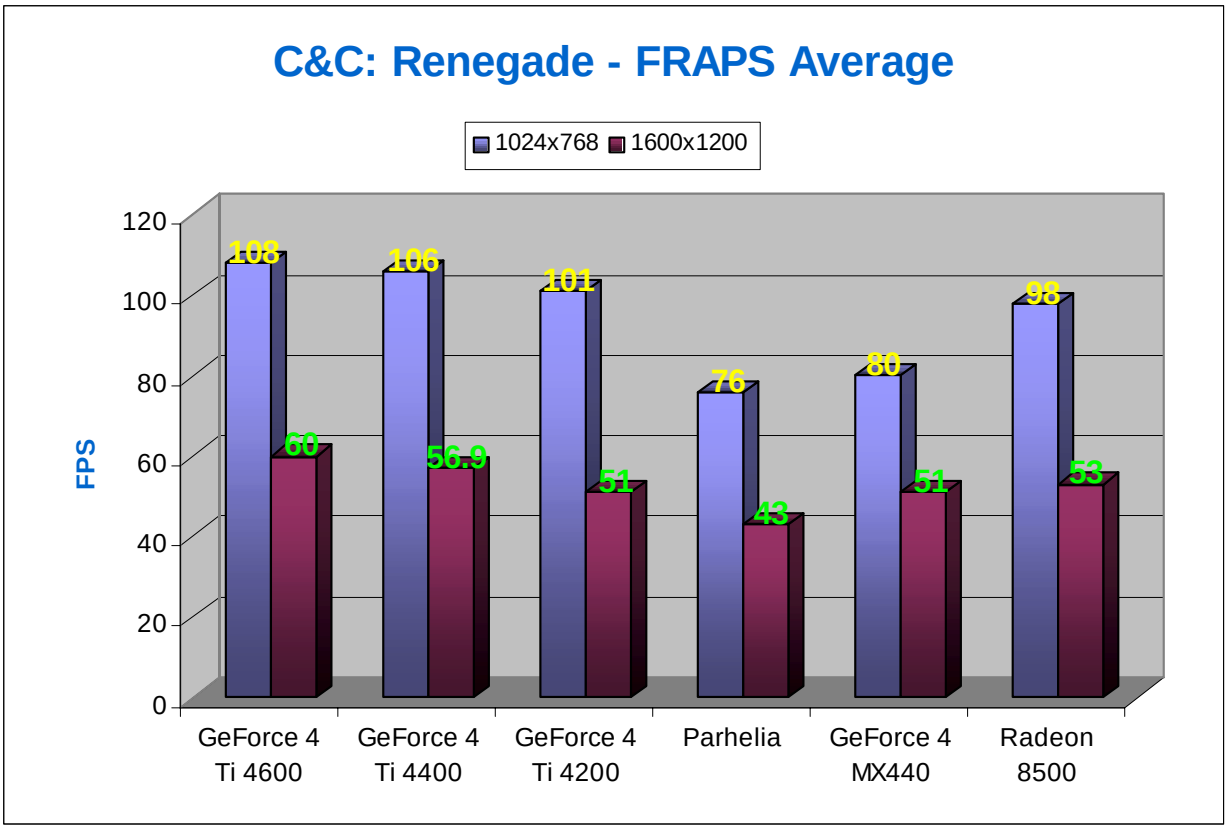
Command & Conquer: Renegade

Now let's take a look at another FPS, C&C Renegade. Here, the game has been benchmarked using FRAPS V1.8 to obtain the average framerate during a repeating demo. The accuracy of FRAPS is not the greatest, but we have found our results to be generally reproducible with an error rate of 1 FPS or less. Renegade was benchmarked at both 1024x768 and 1600x1200 using 32-bit color.



From these results, we can see that C&C Renegade performs much like Jedi Knight 2 does. The Parhelia still trails the pack, and the GeForce 4 Ti4600 still leads it. At 1600x1200, the Radeon 8500 bumps the GeForce 4 Ti4200 from third place.

When benchmarking C&C Renegade on our 2 GHz Willamette Pentium 4 (400 MHz FSB with PC2100 DDR), the performance remained almost identical to the results shown above (benchmarked on the 2.4 GHz Northwood Pentium 4 with a 533 MHz FSB and PC2700 DDR). This indicates that C&C Renegade is really not CPU limited at all.

Moving on, let's take a look at the 1600x1200 performance with 2-tap anisotropic filtering enabled:

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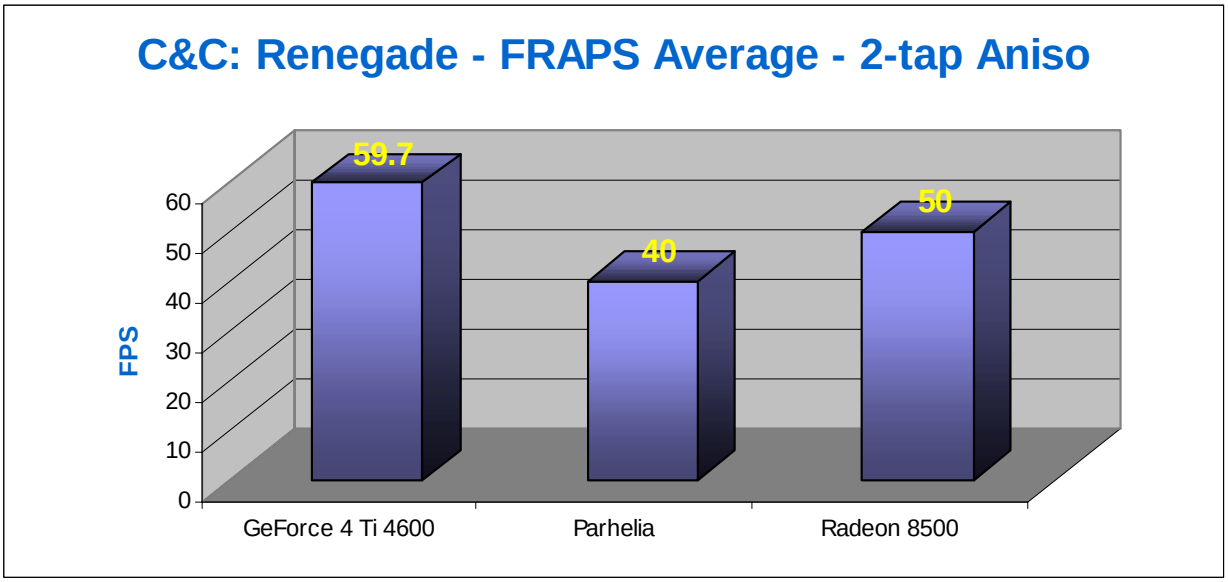
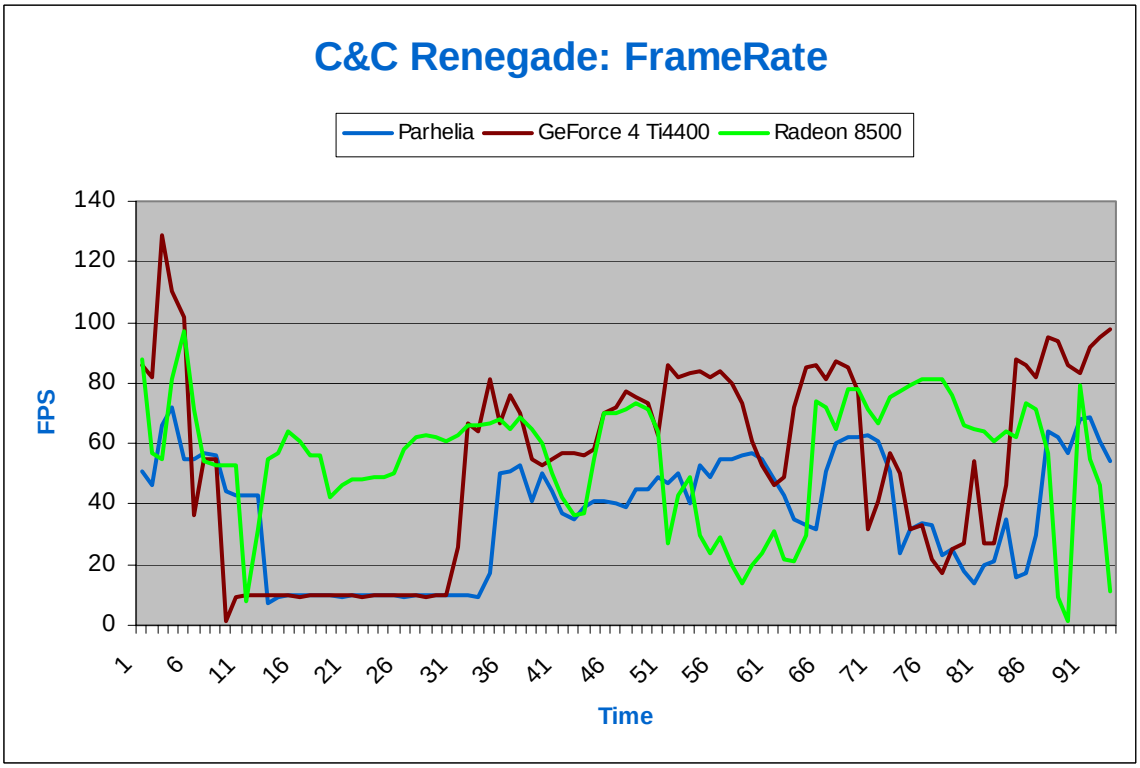


The performance hit from enabling 2-tap anisotropic filtering is not very significant for any of the three cards -- a few FPS. Since this is an average, however, we may be able to get a better picture of the game's overall performance if we look at a graph of the framerate over the duration of the test.



This graph reflects the performance with the same settings, 1600x1200x32bpp with 2-tap aniso. The results are set slightly at an offset to one another, however, the difference in performance between the three cards is still clearly visible. The graph really helps to exemplify just how volatile the framerate can be, as all three cards dip into unplayable framerates for a second or two at one point or another.

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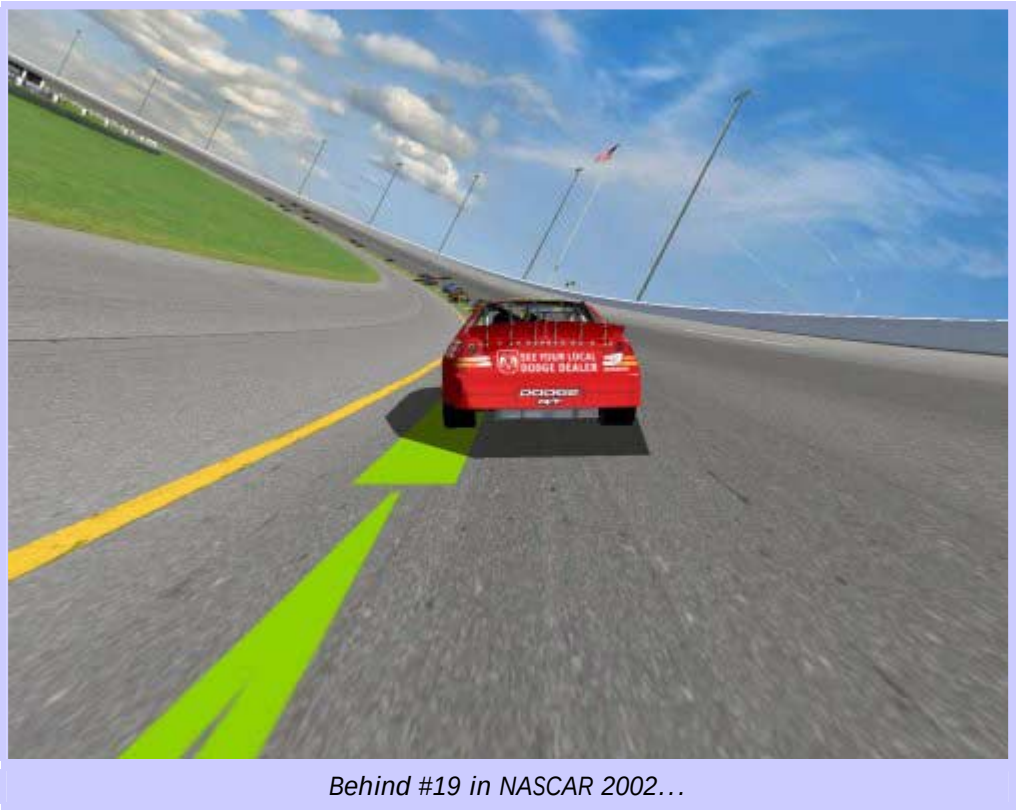
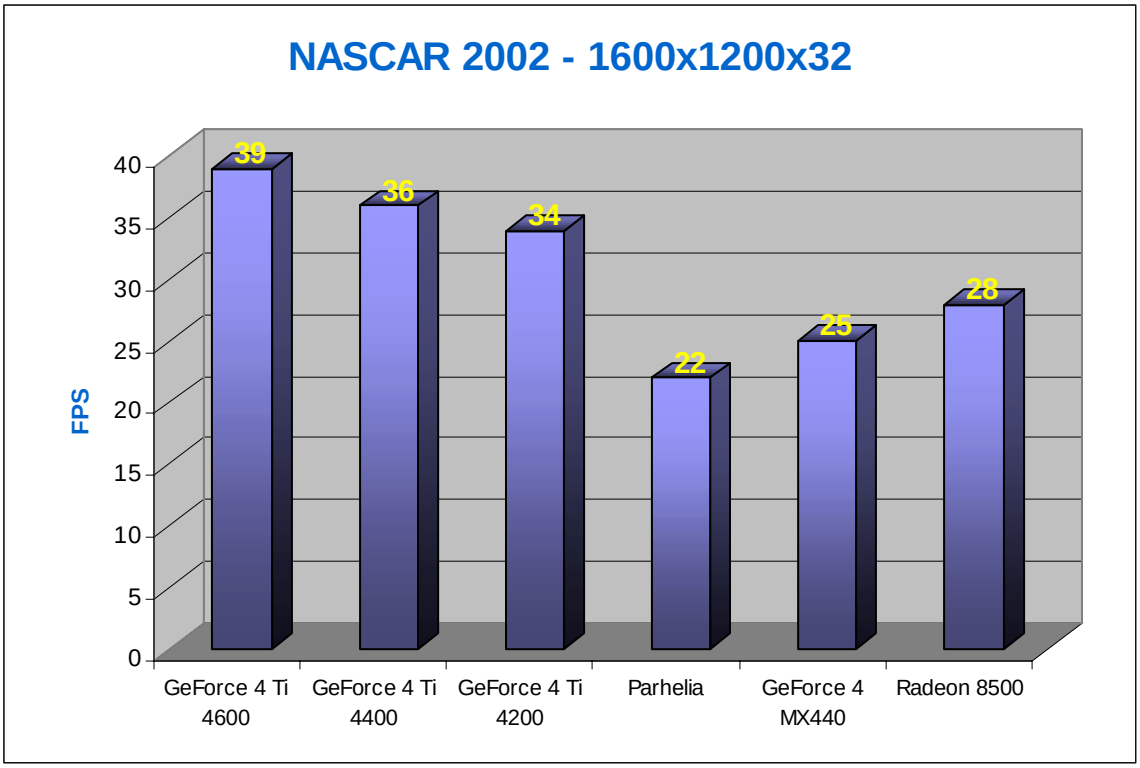
NASCAR 2002

Changing gears from FPS benchmarking, we take a look at the Parhelia's performance in NASCAR 2002. This is another game benchmarked with FRAPS. For the benchmark, we ran the game in simulation mode, as opposed to arcade.



Behind #19 in NASCAR 2002…



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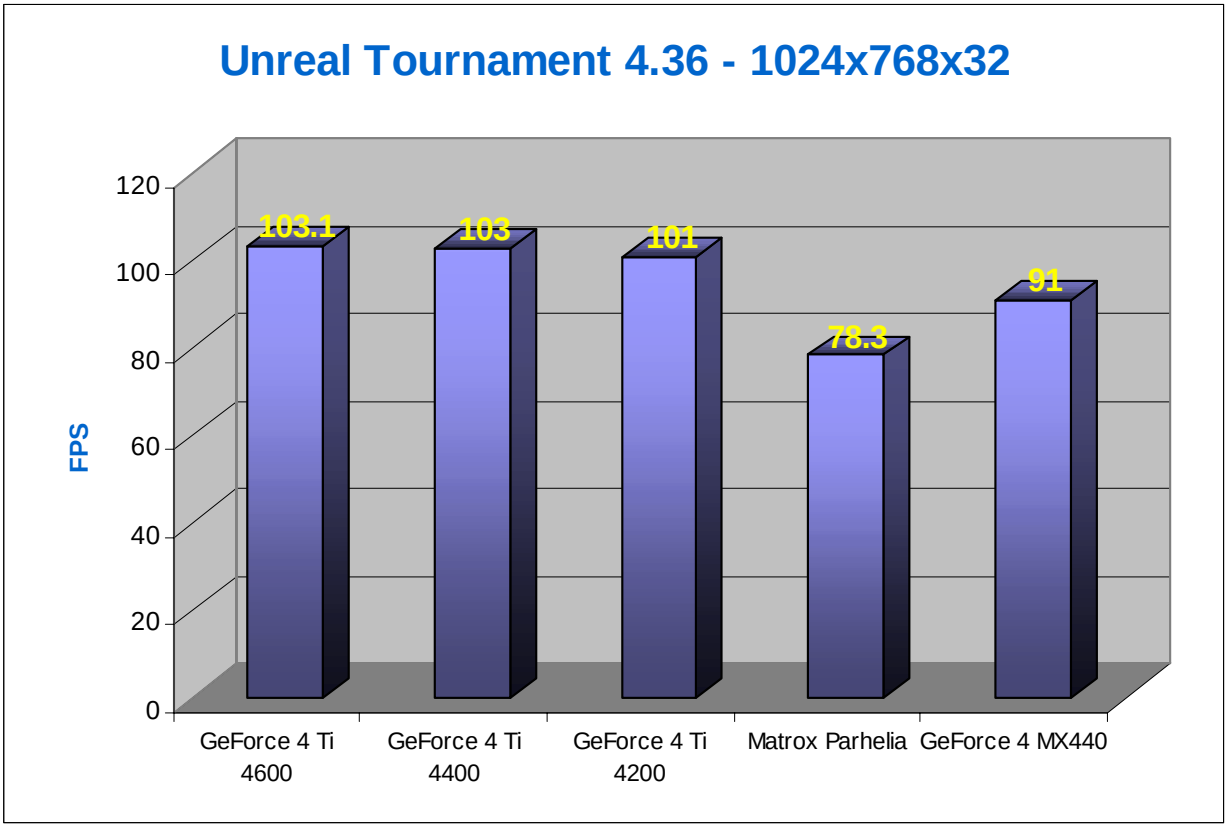
From Parhelia's perspective, #19 is the GeForce 4 MX440. The GeForce 4's are the only cards to break 30 FPS here, though the Radeon 8500 is trying. It's a different genre, but we see the same pattern: the GF4 Ti series leads, followed by the Radeon 8500, GF4 MX440, and finally, the Matrox Parhelia.

The GeForce 4 Ti4400 barely managed 20 FPS at 1600x1200x32bpp with the 2 GHz system, below what the Parhelia is delivering here. Clearly, CPU performance makes a big difference in this game, along with the video card.

Unreal Tournament 4.36

Next up is another first person shooter, the old (but still popular online) Unreal Tournament. The game was benchmarked at 1024x768 with 32-bit color.



Once again, Parhelia trails the pack. 78.3 FPS is respectable in its own right and quite playable, but it is simply not $400 performance. Even the GeForce 4 MX440 outperforms it here, despite the fact that Parhelia has almost three times the bandwidth. In the case of the GeForce 4 cards, Unreal Tournament is essentially bottlenecked by the CPU at this resolution, and all three cards perform more or less identically.

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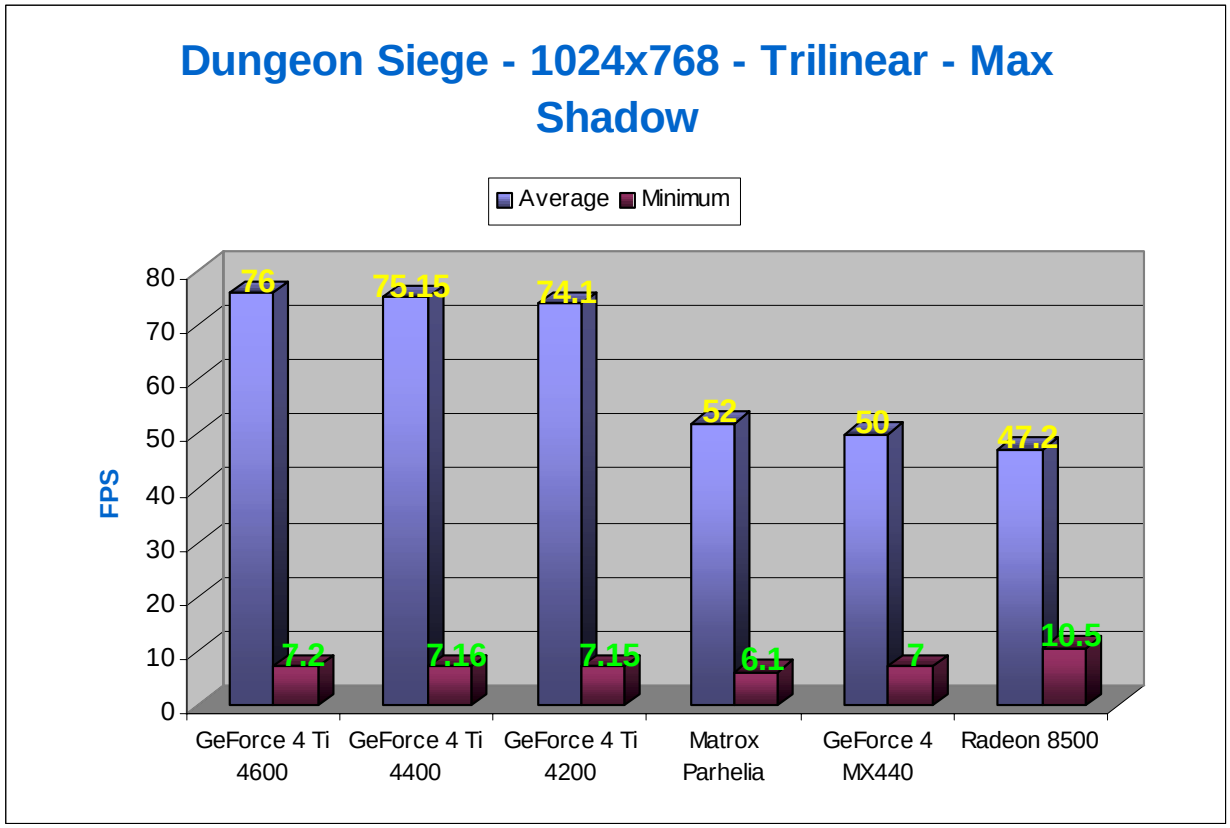
Dungeon Siege

Back in early 2000, we started benchmarking a sequel to a Chris Taylor game, Total Annihilation: Kingdoms (an RTS). Now we'll benchmark Chris Taylor's latest effort, the action-RPG, Dungeon Siege. As with C&C Renegade, the framerates indicated here are an average, so keep this in mind when looking at the results. The resolution was set to 1024x768 with 32-bit color. Trilinear filtering was used, and shadows were set to maximum.



Here, the Parhelia moves directly behind the GF4 Ti-series, pulling slightly ahead of both the GF4 MX440 and Radeon 8500. 52 FPS is quite playable for Dungeon Siege. It's still significantly lower than the GeForce 4 Ti 4xxx, but certainly playable. Interestingly, the Radeon 8500's performance is a bit of a paradox here. On one hand, the average framerate is unexpectedly poor. But conversely, the Radeon 8500 has the highest minimum framerate by far.

Performance in Dungeon Siege seems to be quite dependent upon the CPU. When moving to the 2 GHz Willamette, we noticed the average framerate drop to 50 FPS with the GeForce 4 Ti4400. Improvements to Parhelia's drivers may be able to help boost framerates in situations like this.

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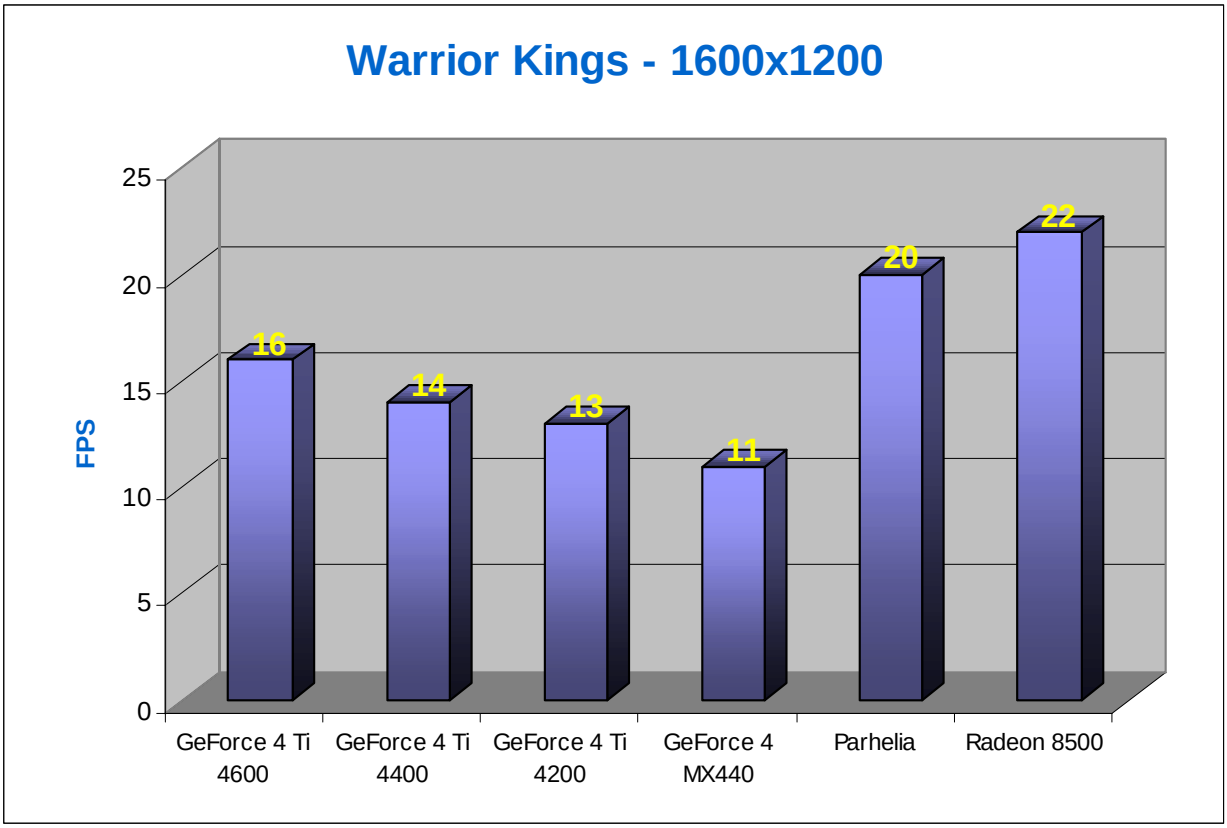
Warrior Kings

Now we'll follow up our RPG benchmark with an RTS, Warrior Kings. From a visual and interface standpoint, it is much like Black and White, where you can zoom in/out and pan a full 3D landscape. This game is our last FRAPS result for today. The results will surprise you...

A Battle Ensues in Warrior Kings...



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Given all the other results we've seen so far, this is quite unexpected. The Parhelia has at last outperformed NVIDIA's GeForce 4 Ti-series, and by quite a margin! Only the Radeon 8500 manages to stay ahead here. As you can imagine, we reran this benchmark several times to verify these results, but the same numbers were reproduced every time.

So, what could be causing these results? Well, there are a couple of possible factors. First of all, there have been reports of performance issues with NVIDIA cards using anything other than older NVIDIA drivers in Warrior Kings. Given that the only two non-NVIDIA cards in the line-up also happen to be the best performers, this seems to be a very likely possibility.

The game also uses an interesting LOD algorithm whereby geometric complexity/detail is scaled in relationship to the resolution or size of an object on the screen. This feature works in concert with the zoom function to provide greater detail the further you zoom in. Since the Parhelia has twice as many vertex shader pipelines as its competitors, this could prove to be an advantage in a game with lots of geometry. However, this does not explain the Radeon 8500's performance, as it only has two vertex shader pipelines. Overall, it's probably a combination of both, i.e. drivers may be slowing the NVIDIA cards down while the Parhelia's extra vertex shaders give it a boost. Additionally, Warrior Kings also seems to be a rather CPU-dependent game, as our framerate dropped to 11 FPS on the 2 GHz system using the GeForce 4 Ti4400.

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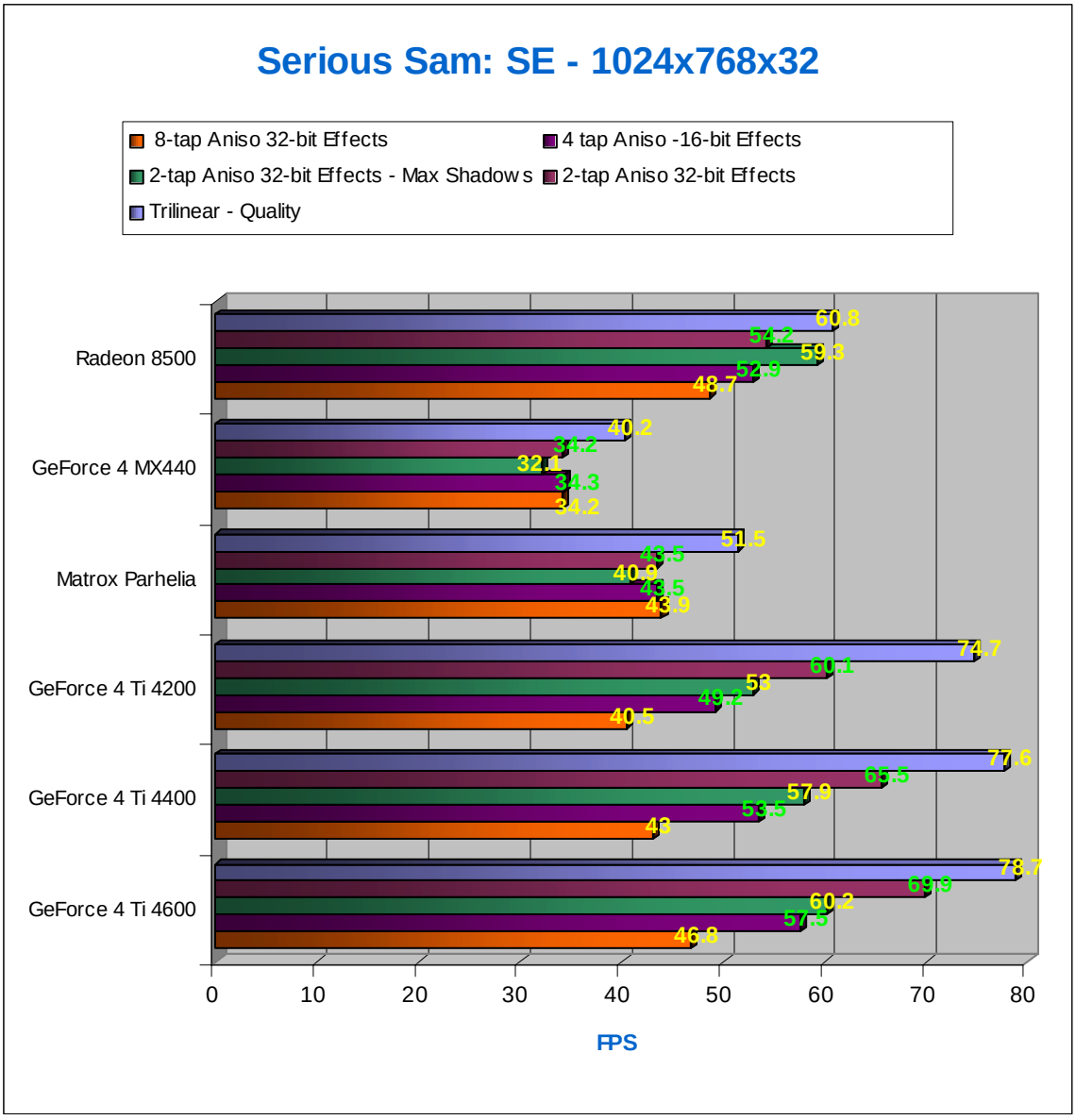
Serious Sam: SE

This is our final FPS for the day and one of our favorites. We've Serious Sam: SE with a variety of different quality and texture filtering settings. The resolution was set to 1024x768x32bpp and the texture filtering varies from trilinear to 8-tap anisotropic, as indicated. Serious Sam: SE is really only constrained by the CPU at 1024x768 with trilinear filtering enabled (the first result in the chart -- blue bar).



* 4/8-tap aniso configured in Serious Sam: SE "Advanced Rendering Options," but drivers automatically fallback to 2-tap aniso.

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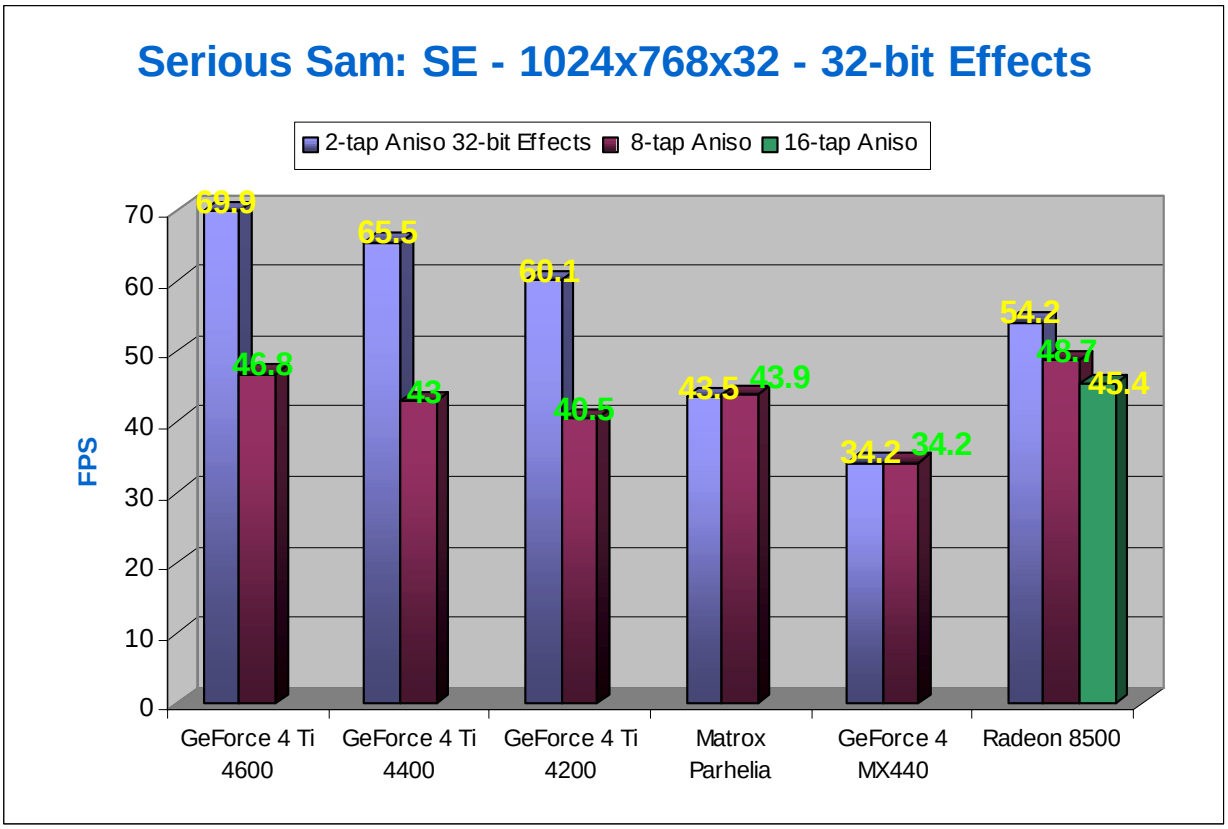
As there are a great deal of results presented here, let me take a moment to explain them. There are five different results per card, each using different quality and filtering settings:

1. The first set of results (blue) was generated with trilinear filtering and the general video settings configured to "Quality."
2. The second set of tests (dark red) ran with 2-tap anisotropic filtering and 32-bit effects.
3. The third set (green) is configured much like the second, with 2-tap aniso and 32-bit effects, but the LOD settings have been set to maximum, as have the shadows (multiple lights).
4. The forth set (purple) increases the degree of anisotropy (4-tap), but uses 16-bit effects.
5. The fifth set (orange) is the same as the second set, but uses 8-tap aniso.

The effects settings are varied to see whether or not they have a significant impact on performance. Let's break out the anisotropic filtering results for a straight comparison:



* 4/8-tap aniso configured in Serious Sam: SE "Advanced Rendering Options," but drivers automatically fallback to 2-tap aniso.

The 16-tap results shown here were not included in the main table because this setting is only supported by the Radeon 8500. As you can see, the Radeon takes only a very small hit going from 8-tap aniso to 16-tap. The Radeon 8500 uses an adaptive filtering algorithm that applies the highest degree of anisotropic filtering only where necessary. The result is that this very high quality filtering is applied in a very efficient manner. However, there are some instances in which minimal filtering will be applied by the algorithm, producing some fairly poor looking results in those cases. Overall, the results still turn out very well (particularly at 16-tap), as you will see in our visual comparison below. It's interesting to note that the Radeon 8500 actually manages to outperform the Parhelia (just barely) at 16-tap, despite the fact that the degree of anisotropy is far lower in the case of Parhelia.

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Pay close attention to the Parhelia's results when anisotropic filtering is enabled. You'll notice that the Parhelia's results for 2-tap, 4-tap, and 8-tap anisotropic filtering are all nearly identical. This is because Matrox's current drivers automatically throttle back to 2-tap aniso whenever a higher setting is selected. Due to this artificial limitation, the card takes quite a hit in terms of image quality relative to other cards that are actually rendering with 4 or 8-tap anisotropic filtering. Let's compare:

Parhelia: 2-tap Anisotropic Filtering

GeForce 4 Ti4600: 2-tap Anisotropic Filtering

GeForce 4 Ti4600: 8-tap Anisotropic Filtering

Radeon 8500: 8-tap Anisotropic Filtering

Radeon 8500: 16-tap Anisotropic Filtering

Click on the labels for the full size screenshots

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The capture for the GeForce 4 Ti4600 using 2-tap aniso is at a slightly different, closer position compared to the rest, as you can see in the full sized images. Nevertheless, the difference between the Parhelia's 2-tap aniso and the GeForce 4 and Radeon 8500's 8-tap aniso is practically night and day. The gap between 8-tap and 16-tap is not nearly so significant, as it seems we have reached a point of diminishing returns after 8-tap.

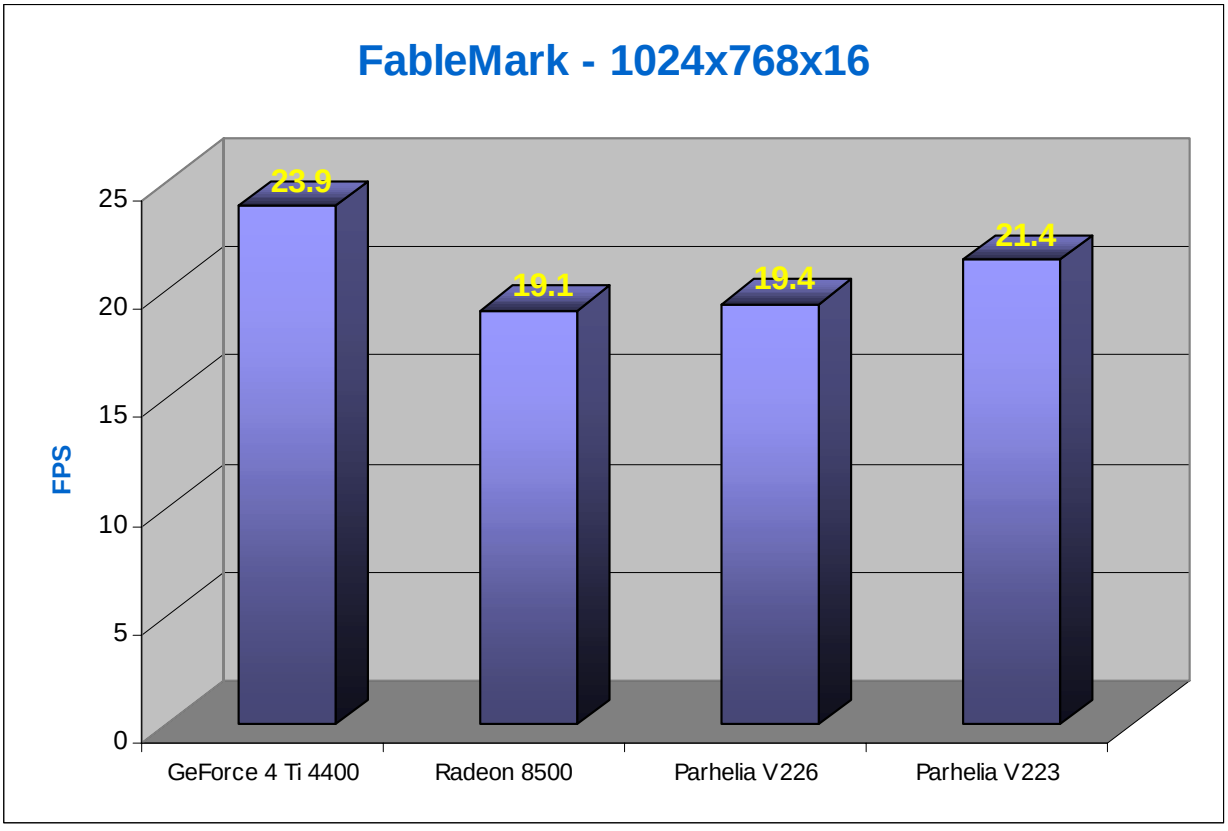
It's very unfortunate that the Parhelia drivers force 2-tap anisotropic filtering when 4 or 8-tap modes have been selected, as there really is quite a difference in quality. Given Matrox's emphasis on image quality, one would not expect such a crippling limitation as this.

FableMark

FableMark is an interesting and relatively new Direct3D benchmark produced by PowerVR illustrating the use of the stencil buffer to render soft shadows. From the documentation:

> D3DFableMark is a benchmark program featuring a puppet theatre in which a well-known fable, "The Hare and the Tortoise", is performed. Every object in the scene has soft-edged shadows projected onto the stage background and the rendering of these accurate shadows form the basis of this benchmark.
>
> All shadows in D3DFableMark are soft-edged, and are rendered using the hardware stencil buffer. The CPU uses the light position and the model for each object to calculate multiple shadow volumes. The scene is rendered in multiple passes; first the scene is rendered using ambient lighting, which also prepares the depth buffer for stencil lighting. Then the shadow volumes are submitted and the contribution from each light source to each soft-edge volume is summed into the scene. Finally, the scene is rendered once again, this time modulating the textures by the results of the previous passes. The final result is a relatively high polygon count scene with approximately 95% of the polygons being translucent.

FableMark can be downloaded **here**.



The top performer here is the GeForce 4 Ti4400, followed closely by the Radeon 8500, and then by Parhelia. You'll notice a slight performance improvement with the v226 drivers over v223. It should also be noted that we experienced some flickering with Radeon 8500 when running this benchmark.

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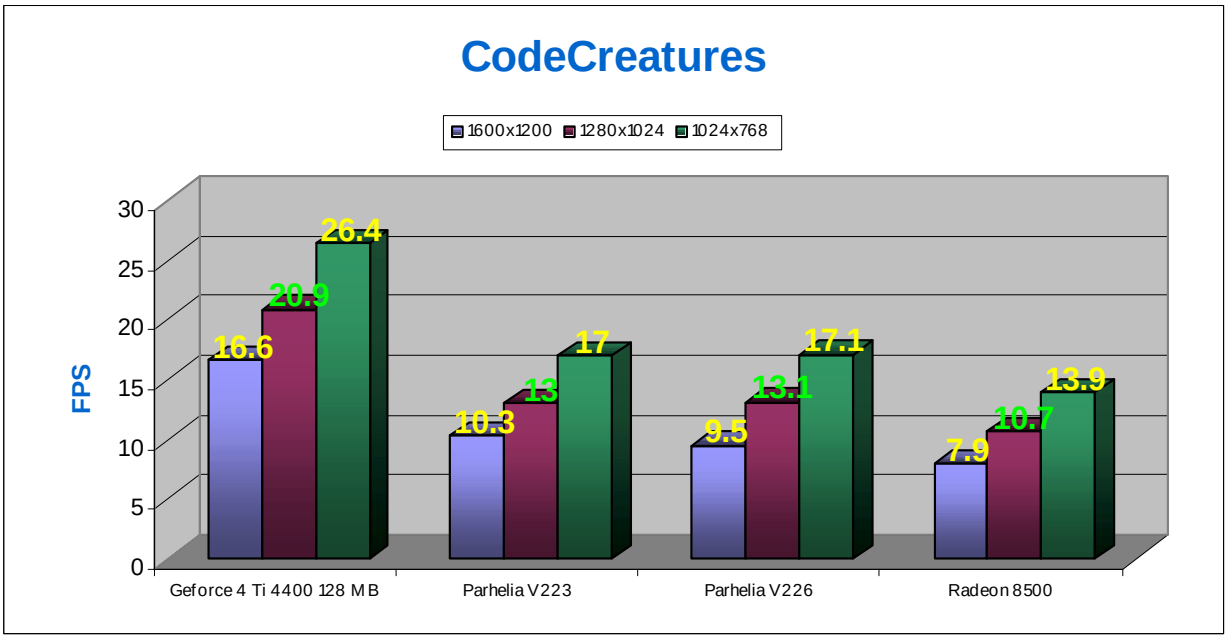
CodeCreatures

The CodeCreatures benchmark, based on **CodeCult's** game engine, has developed quite a reputation for its stunning visuals that, more often than not, also put the stun on today's high-end 3D accelerators. It's a DirectX 8.1 benchmark, making full use of vertex and pixel shaders:

Code Creatures

The benchmark runs at three resolutions, 1024x768, 1280x1024, and 1600x1200:



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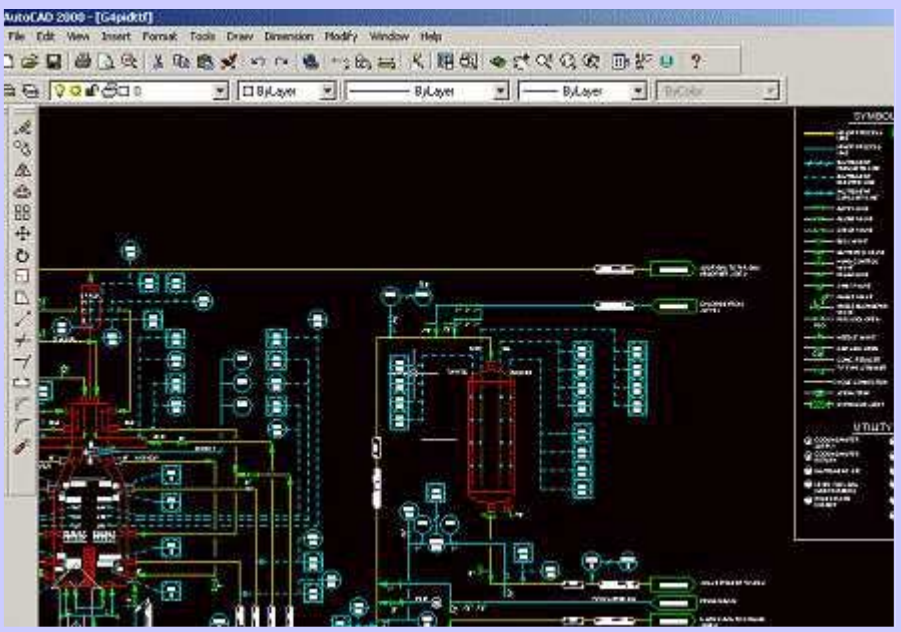
One thing you'll notice right off the bat is just how demanding CodeCreatures really is. The Radeon 8500, in particular, is showing especially low performance. This is because it is a 64 MB board, and we suspect a 128 MB version would perform considerably better. The v226 drivers are marginally better in 1024x768 and 1280x1024, but interestingly enough, the v223 drivers deliver better performance at the highest resolution.

None of these cards perform particularly well here, so perhaps it's fortunate that there aren't too many games available at present that push the visuals and thus also the performance this hard. It's difficult to say just how representative of upcoming games CodeCreatures really is, at least for the near term, though it is based on a game engine. For the moment, it's a very impressive benchmark that demonstrates just how much is possible with the latest hardware.

AutoCAD 2002

Matrox has billed the Parhelia as a product designed for demanding professional and business users, and with high quality 2D and the ability to drive up to three displays, it's not hard to see why. AutoCAD is perhaps the most popular CAD application in use today, so it's a perfect candidate to evaluate the Parhelia's professional 2D CAD performance.



AutoCAD: Detailed 2D Drawing

To do this, we used the AUGI Gauge benchmark from **Autodesk Users Group International**. From the AUGI Gauge site:

> The AUGI Gauge is a performance-testing tool that can be used to develop benchmark scripts for testing different operations and different drawings. The testing tool comprises a Visual Basic front end and an AutoLISP testing engine. The AUGI Gauge prints completion times for each test operation to a text file, which can be imported into a spreadsheet for data manipulation. The original AUGI Gauge testing tool was designed to work with AutoCAD Release 12 (DOS), Release 13 (Windows) and Release 14. The current version works with AutoCAD Release 14 and AutoCAD 2000.

The benchmark itself consists of two sections, a real-world test that performs various file, edit, and display operations (totaling 30) on a series of 15 drawings that each average 2 MB in size. The synthetic test works from a blank drawing and performs a total of 80 operations, including the following:

- Drawing (PLINE, HATCH, MTEXT, TEXT, dimensions)
- Display (VPORTS, SHADE, RENDER)
- Raster image manipulation (IMAGE, IMAGECLIP, DRAWORDER)
- XREF scenarios (XREF Attach and Load with various system variable settings)

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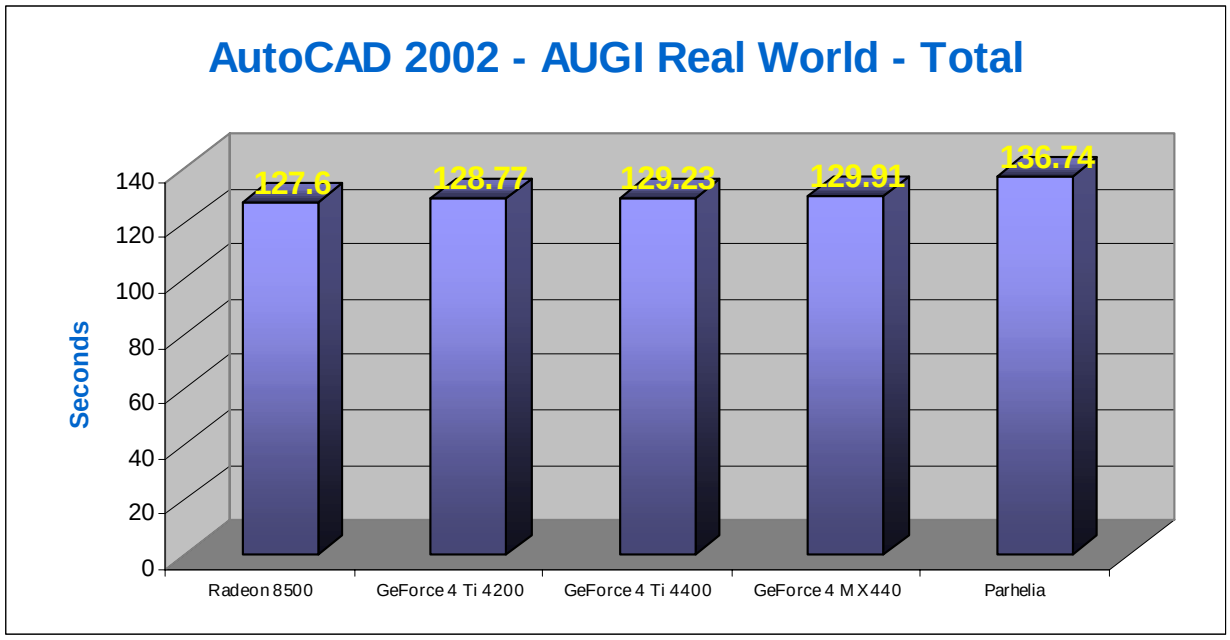
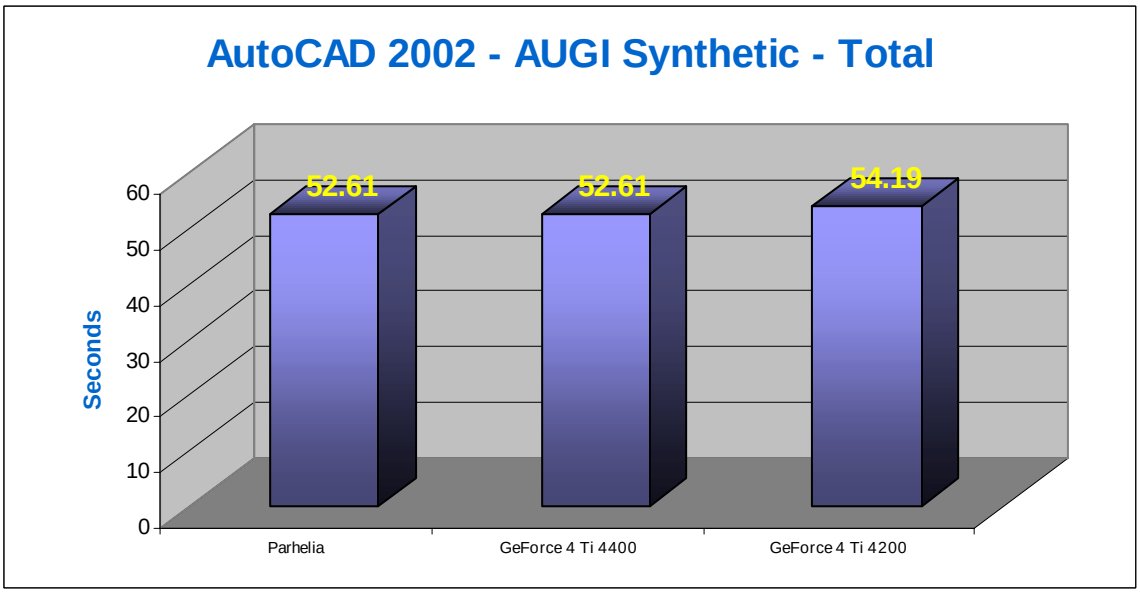
As there are a tremendous number of results for each card, the individual results we have provided below are a subset of the total benchmark. Total runtimes have also been provided for the entire suite of tests. Keep in mind while looking at these results that everything is in seconds, so lower is better.



This table shows the total runtime for the real-world benchmark, across all 15 drawings. The Radeon 8500 is the best performer overall, with the GeForce 4 Ti family trailing closely behind. Interestingly enough, the GeForce 4 Ti4200 narrowly edges out the GeForce 4 Ti4400, though, as we will see, it is not universally faster in all operations. The top four cards are all very close, performing within 2.5 seconds of each other, but the Parhelia lags further behind. The Parhelia is 9 seconds behind the leader, which is the most significant gap in the graph by far. 9 seconds is still less than 10%, though.



The synthetic test tells a different story, as the Parhelia performs identically to the GeForce 4 Ti4400. The GeForce 4 Ti4200 trails both here by a little over 2 seconds. Unfortunately, we were unable to test the Radeon 8500 in the synthetic benchmark due to time constraints.

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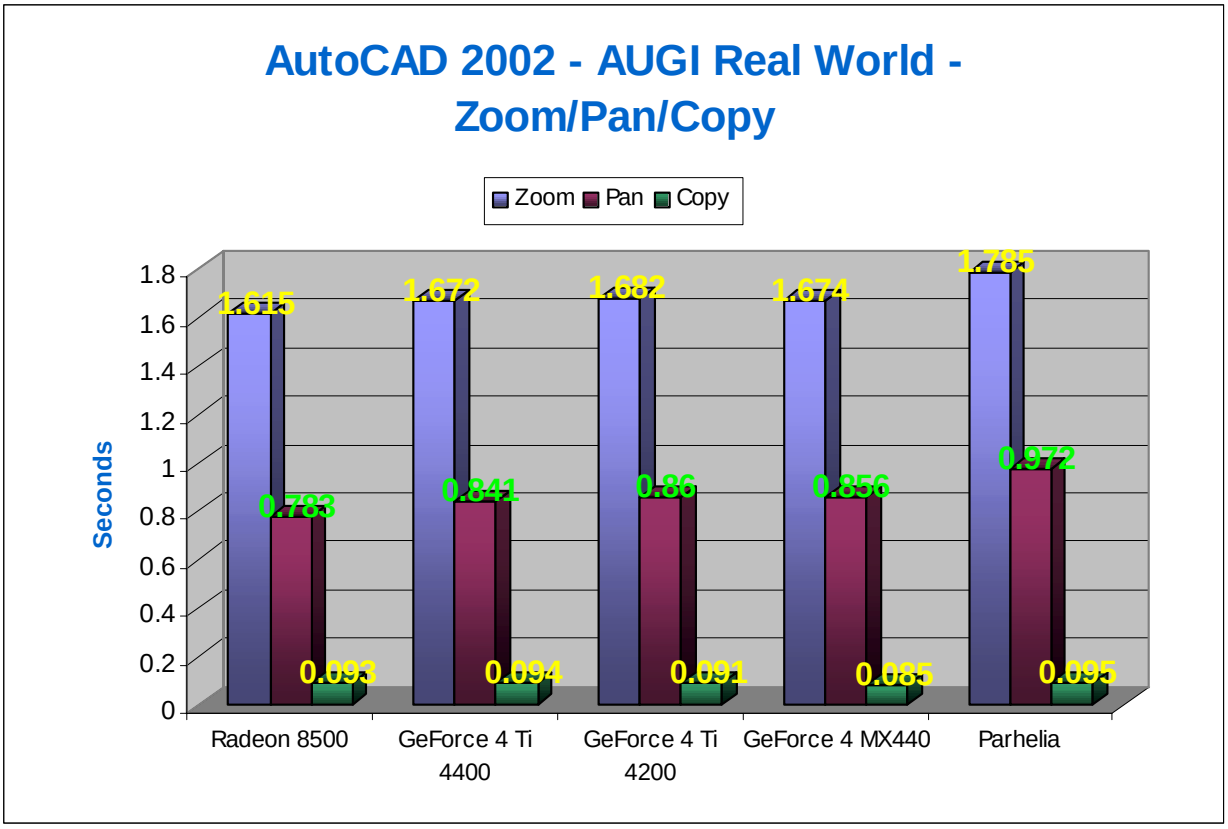

Here we can see each card's performance on the zoom, pan, and copy operations in the real-world benchmark, averaged across all 15 drawings. Picking up from where it left off, the Radeon 8500 maintains the lead, with the GeForce 4 Ti series again close behind. The GeForce 4 Ti4400 has a very small lead over the GeForce 4 Ti4200. The Parhelia is almost two tenths of a second slower than the Radeon 8500 in the zoom and pan operations. It is again the largest difference, though the scale is much smaller this time.

Overall, the Parhelia is definitely slower than the rest of the pack in AutoCAD. The real question is whether or not the difference is significant enough that users will notice it during daily use. For the real-world test, it's a little over 7% slower than the fastest card, the Radeon 8500. It may be the case that the Parhelia's extra features are more important than the performance difference for 2D CAD users.

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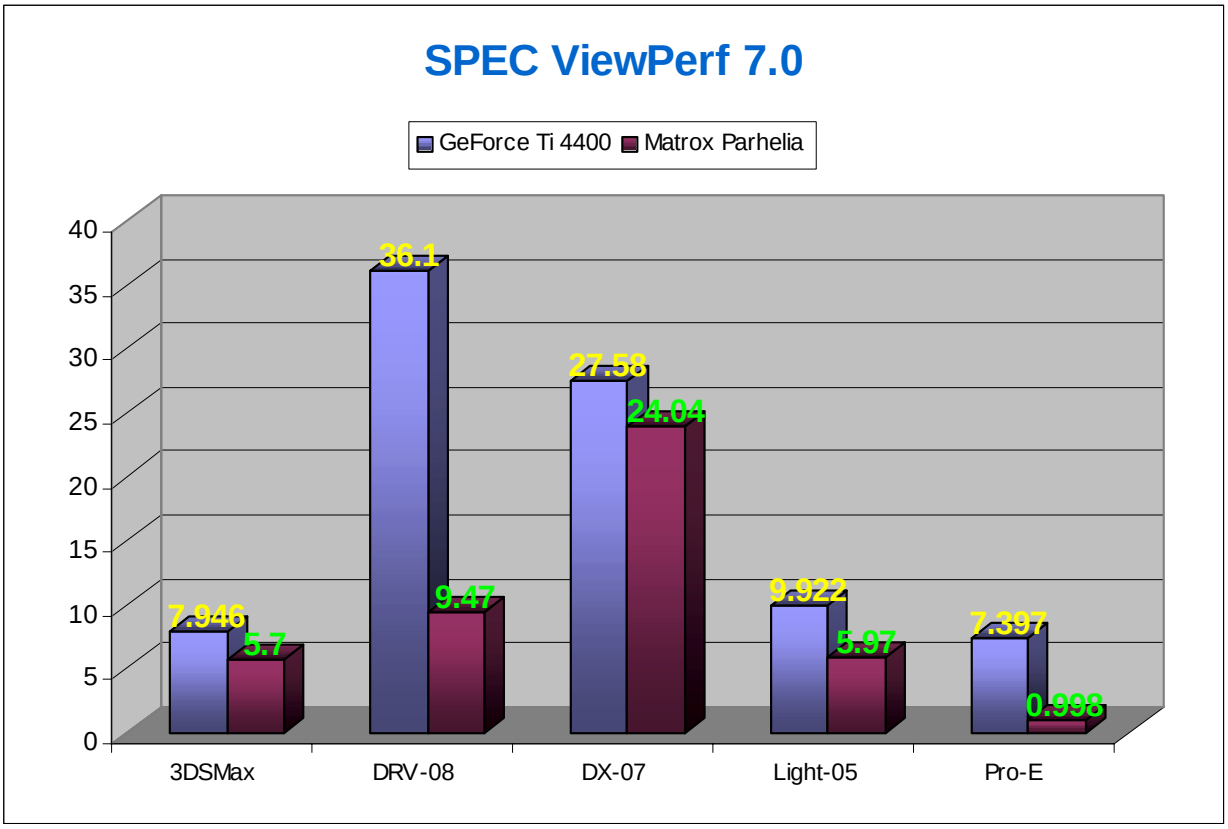
SPEC ViewPerf 7.0

Now that we've taken a look at Parhelia's 2D CAD performance, let's see how it holds up in professional 3D applications like 3D Studio Max and Pro/ENGINEER. The **SPEC ViewPerf 7.0** benchmark represents these applications among several others.

The GeForce 4 Ti4400 was tested with the standard 29.42 drivers, just as in the rest of the review. NVIDIA's optimized Quadro drivers were not used. The Parhelia used the v226 driver.



The performance disadvantage for Parhelia here is unfortunately far more significant than what we saw in AutoCAD. It's important to keep in mind, however, that the current Parhelia drivers are neither optimized nor certified for 3D CAD. This will change in the future, but for the present, while the Parhelia manages to perform only slightly slower than the GeForce 4 Ti4400 in Data Explorer (DX-07) and perhaps 3D Studio Max, it is seriously outperformed in the rest of the benchmarks -- particularly in Pro/ENGINEER.

Matrox has indicated to us that there are no plans to introduce a product specifically for the professional OpenGL market, like NVIDIA's Quadro line. However, Matrox will introduce more and more optimizations for such applications as time passes. Currently, the v226 drivers include optimizations for 2D and 3D operations in AutoCAD. If future drivers can bring the Parhelia within the same range of performance in professional OpenGL applications that it currently occupies in AutoCAD, it will be a considerable improvement.

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Final Thoughts

When the G550 was introduced, it was far less competitive than the Parhelia is today. Because of this and its placement as a budget multi-head 2D solution, the G550 was somewhat shielded from the kind of direct comparisons in gaming and high-end professional applications found in this review. But the Parhelia is not a budget multi-head 2D solution. As you can tell from our review, it's not exactly a great solution for gamers or professionals working with high-end 3D applications, either. So, the question is, what exactly is it? Ultimately, that's a question to be answered by you, the reader, but let me see if I can make a few observations that may help you come up with an answer.

Gaming

Performance

The Parhelia ranks last in 5 of our 10 gaming benchmarks, including Jedi Knight 2 (No AA), C&C Renegade (with and without 2-tap anisotropic filtering), NASCAR 2002, and Unreal Tournament. The closest it comes to the top is in second place in Warrior Kings. It does rather well in Warrior Kings, comparatively speaking, but a Radeon 8500 would do better.

Features and Quality

Parhelia has a robust feature set, including full support for DirectX 8.1 vertex and pixel shaders. It also sports very good-looking 16-sample Fragment Anti-Aliasing (FAA) that incurs only a marginal performance hit. In the case of Jedi Knight 2, the Parhelia takes a 24% performance hit when enabling 16x FAA at 1600x1200, dropping from 45.7 FPS to 36.8 FPS. Comparatively, the GeForce 4 Ti4600 takes a 67% performance hit when enabling Quincunx (which doesn't look nearly as good as Matrox's 16x FAA), dropping from 82.9 FPS to 49.6 FPS. When enabling 4X FSAA on the GeForce 4 Ti4600, the performance drops even more.

Unfortunately, while the anti-aliasing is rather good, the texture filtering is not. The Parhelia is restricted to 2-tap anisotropic filtering by its current drivers, producing textures that are far blurrier than competitors running with 4, 8, or even 16-tap anisotropic filtering. This restriction has got to be the biggest disappointment coming from a company with such a long-standing reputation for image quality. One would hope that future driver revisions will fix this problem, but at the same time, you have to wonder whether or not Parhelia could really deliver playable framerates at higher levels of anisotropic filtering. You will recall from our Serious Sam: SE filtering comparison that both the GeForce 4 Ti4600 and Radeon 8500 delivered higher framerates with 8-tap anisotropic filtering enabled than Parhelia did with 2-tap anisotropic filtering (43.9 FPS versus 46.8 FPS and 48.7 FPS, respectively).

Price

Despite its performance shortcomings, Parhelia would be quite a competitor in the gaming sector if its price wasn't so high in relation to the many other cards that outperform it. The 128 MB retail card is priced at US$399. The least expensive Parhelia listed on PriceWatch at the moment is the slower OEM version, priced at US$335. Meanwhile, the 128 MB Radeon 8500 lists a full $100 cheaper than the retail Parhelia, at US$199. The cheapest GeForce 4 Ti4600 currently on PriceWatch runs for US$270 before shipping. Perhaps more significant, however, is the fact that the Radeon 9700 (R300) will carry the same US$399 price tag as Parhelia. Preliminary benchmark results published online have shown the Radeon 9700 to deliver 2 to 2.5 times the performance Parhelia is capable of in some games. With the Radeon 9700 looming off on the horizon, it's very difficult to make a recommendation to a gamer for the Parhelia, given its current price.

Image quality is an important element to consider, as well. After all, performance isn't everything, but the difference in performance and price between the Parhelia and the GeForce 4 Ti4600 and Radeon is greater than the difference in image quality between them in gaming situations (unless you consider Parhelia's 2-tap aniso limitation). Features like triple-head surround gaming could make it appealing to some gamers, however.

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Professional Applications

Performance

The Matrox Parhelia was the slowest performer in our AutoCAD 2002 2D real-world benchmark, though the difference in performance is not tremendous. In the synthetic benchmark, it tied the GeForce 4 Ti4400 for the top score. In our 3D tests, however, the Parhelia was seriously outperformed in Design Review and Pro/ENGINEER. It also under performed in the rest of the applications included in the SPEC ViewPerf 7.0 suite, including 3D Studio Max.

Features and Quality

As is typical of Matrox products, the Parhelia has very high quality 2D. It supports 10-bit per component color (30-bit "GigaColor") throughout the entire graphics pipeline. This combined with its multi-display support makes it appealing to 2D professionals who may need to do a little 3D work or gaming from time to time. The Parhelia can support either dual digital flat panel displays (DVI) or two analog monitors (HD15) and one flat panel. It also features glyph anti-aliasing to provide hardware anti-aliased fonts. The multi-monitor zoom function is quite good as well. All these features are likely to be very compelling to users of desktop publishing, image/photo editing, and 2D CAD.

Price

As mentioned above, the Parhelia has very high quality 2D output and flexible multi-display support. The performance should be rather good in most 2D applications, although our AutoCAD results did indicate the Parhelia was somewhat slower than the competition. According to Matrox, the Parhelia is up to 50% faster than the competition in some intensive operations in Photoshop, though we have not found a way to test this.

Most professional users should be less sensitive to the Parhelia's higher price, as most cards are sold into this space at a premium. The real x-factor is how the Parhelia performs in these applications compared to the G550, since the Millennium G550 Dual-DVI supports up to two digital flat panel displays and is priced at only US$150 direct from Matrox. For those who need to drive more than three displays, the G200 MMS may be an interesting option as well, though it is considerably more expensive.

Conclusion

Overall, the Matrox Parhelia is a mediocre gaming solution, but perhaps the best option for 2D professionals with some requirement for 3D applications. There is room for improvement in the form of more optimized drivers, particularly for professional 3D applications. We hope Matrox can bring its performance up to par on those applications to make the Parhelia a good all-around professional solution.

For serious gamers with money to spend, you might be able to make a case for image quality, but with the performance as it is, I suspect it would be a hopeless endeavor once the Radeon 9700 and NV30 hit the shelves. To really compete in the gaming market, Parhelia needs performance, and the only way to really do that is to boost the clockrate and perhaps add some hardware occlusion culling. The clockrate will be increased with the move to 0.13µ, but at that point, the competition will be far beyond it. The best way for Matrox to make it competitive in this space would probably be to knock $100 off the pricetag. But, with its placement as a professional solution, this may not happen anytime soon.

In closing, it's good to see Matrox re-emerge as a competitor in the 3D market. A new entry is always welcome, even if it is rather disappointing considering the pricetag. The Parhelia represents quite a technological leap for Matrox, to go from a DirectX 6-level part to one implementing a DirectX 8.1 feature set along with elements of DirectX 9.

Related Articles

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