



NVIDIA GeForce FX 5900 GPUs: Powering a New Generation of Graphics

NVIDIA® GeForce™ FX graphics processing units (GPUs) have firmly established themselves as the solution of choice for gaming enthusiasts, delivering unprecedented 3D graphics performance and cinematic-quality for the most complex immersive environments. The newest offerings, the NVIDIA GeForce FX 5900 Ultra and GeForce FX 5900, further ignite the world of gaming. Building on revolutionary technologies, these GPUs are powered by the second-generation NVIDIA CineFX™ 2.0 engine and the NVIDIA Intellisample™ high-resolution compression technology (HCT) and provide:

- ❑ The power of 256 bits for higher memory throughput.
- ❑ The latest silicon processes for increased stability at high speeds.
- ❑ Visual quality enhancements.
- ❑ Advanced pixel shader capabilities that double the floating-point pixel shader power of previous platforms.

The introduction of GeForce FX represents a major leap forward in real-time cinematic effects, and allows users to experience games the way they were meant to be played.

Doubling Path Widths

In the graphics industry, memory has always been a bottleneck. Increasingly complex textures, higher resolutions, and antialiasing continually place more stress on memory connections. With a 256-bit wide memory interface, the GeForce FX 5900 GPUs double the path to and from memory and enable twice the amount of data to be transferred per cycle. The wider path of this new memory interface and controller increases overall performance and efficiency for memory transfers and allocations.

The power of 256 bits is enhanced with the latest 0.13 micron fabrication process technology. The wide memory path can be clocked faster without compromising stability. The combination of speed and stability underscores the NVIDIA commitment to delivering high-quality solutions that give users the best PC experience.



Cinematic Effects

Latest-generation games introduce more shaders, which require more complex and processing-intensive computations at the pixel level. The NVIDIA CineFX 2.0 engine optimizes all stages of the pixel pipeline, doubling the floating-point pixel shader power of its predecessor. This major jump forward translates directly to a 2× increase in floating-point shader power, and a visible performance boost from the faster, more efficient execution of pixel shader programs.

Shaders are also used to create sophisticated shadows for enhanced realism. The new NVIDIA UltraShadow™ technology accelerates the complex computations for lighting source and object interactions. For details on this patent-pending NVIDIA innovation, please refer to the *NVIDIA GeForce FX: UltraShadow Technology* paper at www.nvidia.com.

All NVIDIA GeForce FX GPUs deliver the industry's only true 128-bit precision computation, matching the precision levels applied by the major motion picture studios. Game developers can easily get access to this power and precision since NVIDIA delivers the most complete support for high-level shader languages like Cg and Microsoft® high-level shader language (HLSL). Programmers have the flexibility of writing high-performance shaders that comply with the Microsoft DirectX® 9.0 or OpenGL® 1.4 interfaces.

Antialiasing and Compression

NVIDIA Intellisample HCT delivers the next step in performance and visual quality, compressing color, texture, and z data. Performance gains can be seen in all applications, especially at high resolutions with antialiasing. This new technology allows for up to a 50-percent increase in compression efficiency in these modes, and delivers unprecedented visual quality for resolutions up to 1600 × 1200.

Anisotropic Filtering

Texture filtering—the process of sampling pixel attributes—can be complicated since the spatial and texture coordinates of an object can vary independently. A simple, straight-on, or isotropic view of space simplifies texture sampling and generation. But when dealing with a distorted footprint that appears long and thin on the display (for example, the portion of the display representing a distant spot on the horizon or the end of a long tunnel), sampling and adjusting textures requires functions tailored to these conditions.



Figure 1. This wall, from a scene in *Serious Sam: The Second Encounter*, illustrates the dramatic effect that anisotropic filtering can have on image quality.

NVIDIA Intellisample HCT includes a “quality” mode that delivers true anisotropic filtering and that allows programmers to achieve unmatched visual clarity for every portion of the scene, even difficult areas representing surfaces viewed from a sharp angle or from a distance.

In “balanced” and “performance” modes, anisotropic filtering is limited to the areas that require it, and when multiple textures are involved, filtering is applied to the texture that will most benefit. Trilinear filtering is also implemented to optimize performance, with the engine applying this technique only when it does not degrade performance.

The NVIDIA anisotropic engine lets programmers apply textures realistically, improving overall image quality and achieving stunning cinematic effects. The NVIDIA approach takes into account the performance demands of today’s leading-edge games, with filtering techniques implemented to facilitate complex textures in real time.

Summary

The NVIDIA GeForce FX 5900 GPUs deliver the performance, power, accuracy, and programming required to achieve unmatched realism in visual effects that will drive a new generation of games. For more information on the NVIDIA CineFX engine and Intellisample technology, please visit the NVIDIA Web site at www.nvidia.com.

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