

*N*VIDIA®

The NVIDIA Quadro Advantage

NVIDIA Professional Solutions

NVIDIA Quadro



The Definition of Performance.
The Standard for Quality.

● The Professional Graphics Standard

● Brand Leadership

● Recognized Quality





NVIDIA Quadro Product Lines



NVIDIA Quadro NVS

Performance 2D
/ Corporate
/ Server

NVIDIA Quadro FX

Core Technical 3D
WS Applications
(WS & Mobile WS)

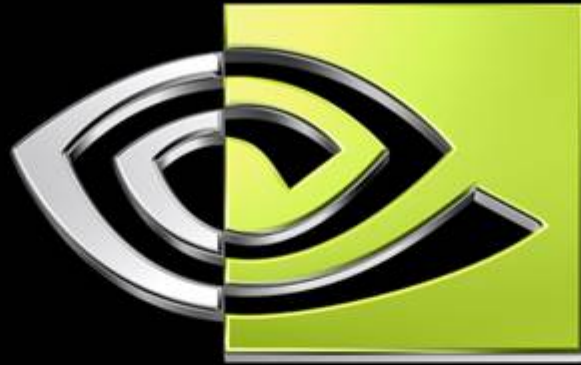
Specialty Solutions

NVIDIA Quadro FX 4000SD
NVIDIA Quadro G-Sync



NVIDIA Quadro Advantages

- **Hardware accelerated processing for professional applications**
- **NVIDIA® SLI™**
- **ISV certification**
- **Industry leading LINUX and Windows 64 bit support**
- **NVIDIA design and manufacturing**
- **Guaranteed longevity for enterprise deployments**
- **Stability and support**



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**NVIDIA Quadro Quality and
Performance Advantages**

NVIDIA Quadro FX

Next Generation Specifications

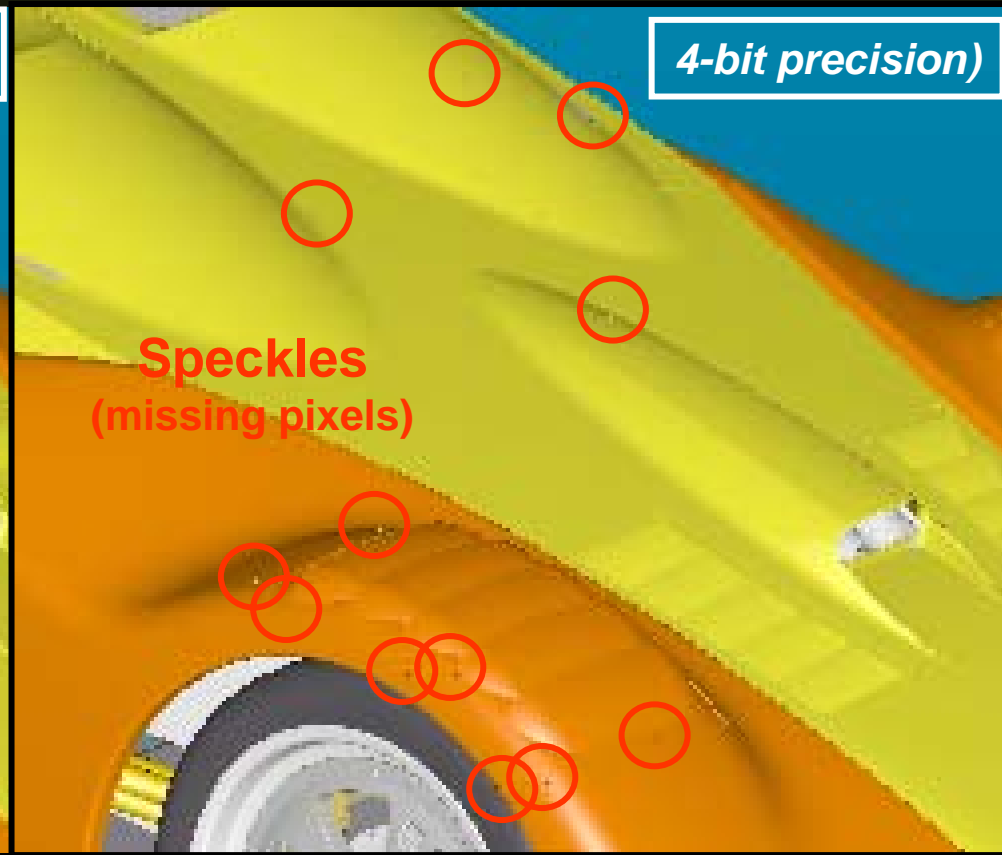


	NVIDIA Quadro FX
Performance	Up to 181 Million Triangles / Sec Up to 10.8 Billion Texels / Sec
Memory Bandwidth	Up to 256-bit, 33.6GB/sec
Pixel Read-Back	Up to 2GB/Sec
Precision	128-bit Color Precision Industry's only 12-bit Sub-Pixel Precision
OpenGL	2.0
DirectX™ / HLSL	Shader Model 3
HPDR (64-bitFP)	Yes
Rotated Grid FSAA	Yes
Programmable Video Processor	PureVideo™ Technology
Power Management	PowerMizer™ 6.0
Host Interface	PCI Express

12-bit Sub-Pixel Precision



- Workstation applications take advantage of numerous sub-pixel effects to generate realistic images when working with lines, triangles, wire mesh, or realistic 3D textures
- The NVIDIA Quadro solutions increase the level of precision for sub-pixel effects to 12 bits
- The geometric accuracy afforded by 12-bit precision raises the success rate for correctly mapping objects to pixel values, and reduces the number of artifacts and visual anomalies (speckles)



Extended Programmability



Shader Model 3.0 – Real Results for Real Applications

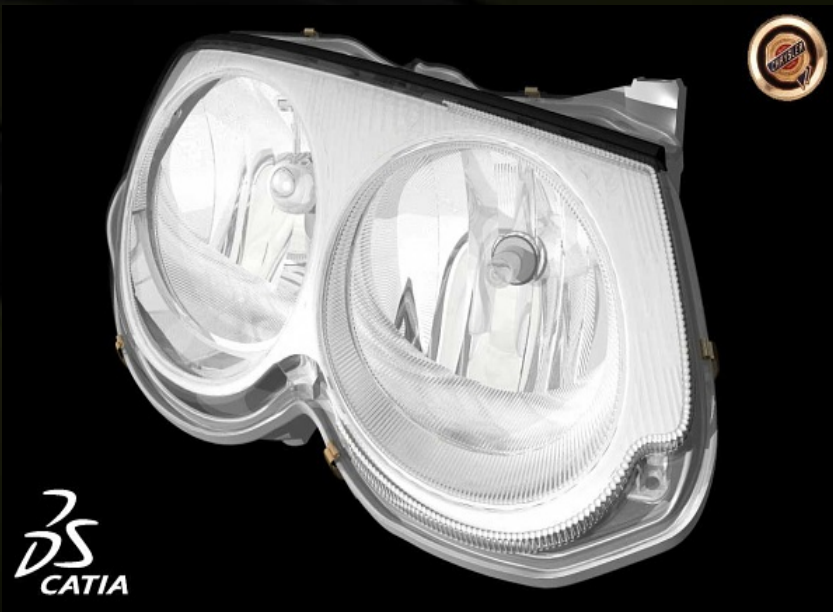
	Shader Model 2.0	Shader Model 3.0
Vertex Shader Ops	65,000	65,000
Displacement Mapping	-	✓
Vertex Texture Fetch	-	✓
Vertex Stream Divider	-	✓
Dynamic Flow Control	-	✓
Pixel Shader Ops	2,000	65,000
Subroutines	-	✓
Loops & Branches	-	✓
Dynamic Flow Control	-	✓
Frame Buffer		
IEEE fp 32-bit	-	✓



Shader Model 3.0 programmability and Precision enables more complex and realist shaders to be applied on models in real time.

Extended Programmability

Shader Model 3.0 – Real Results for Real Applications



Shader Model 3.0 FP-32 precision enables Mental Images to dramatically accelerate photorealistic rendering of complex visual effects. Mental Image is the high quality renderer for Maya, SolidWorks, 3dsmax, and more.

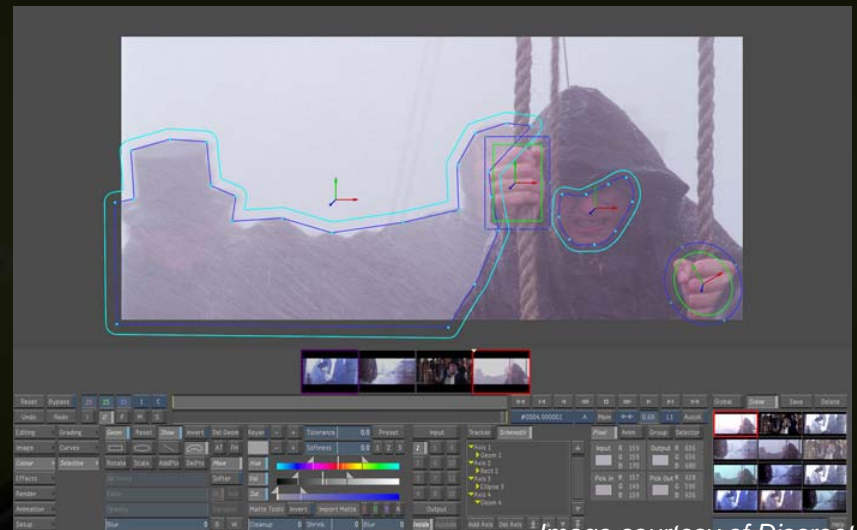


Image courtesy of Discreet

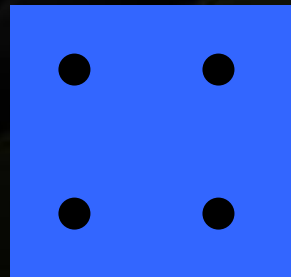
Shader Model 3.0 programmability and Precision enables Autodesk to re-scale high resolution images in real time, accelerating the film editing/mastering workflow

NVIDIA Quadro RG-FSAA

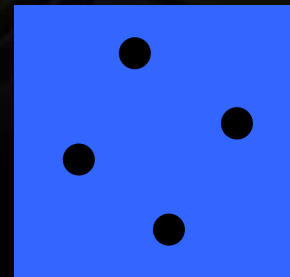
A New Era of Image Quality



- **Rotated Grid Sampling**
- **Unprecedented Performance & Quality**
- **Solves what Had Been a Compromise Situation**



4X FSAA

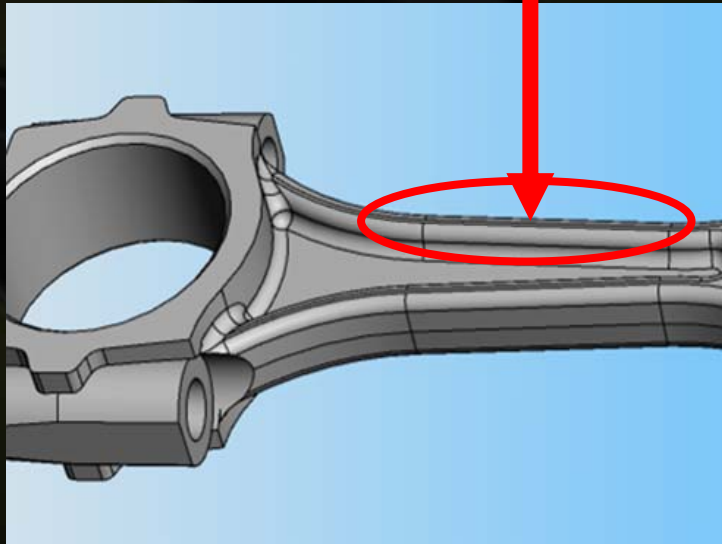


**Quadro FX 1500M
RG-FSAA**

RG FSAA - MCAD

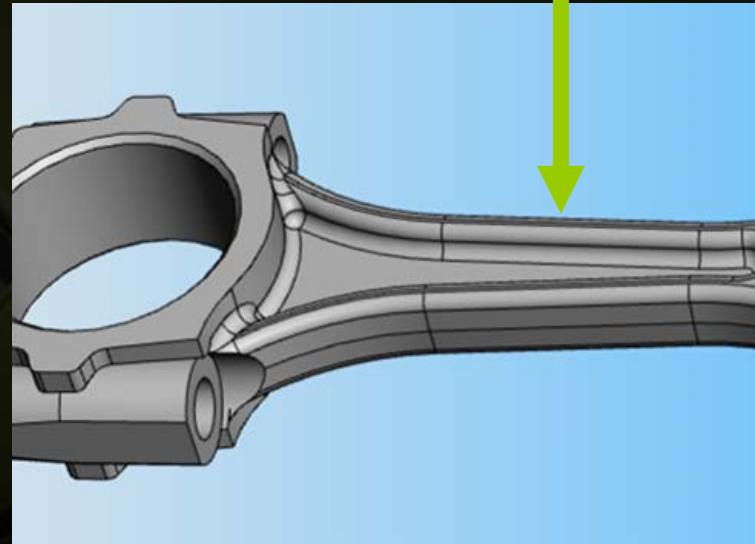


“Jaggies”



8X FSAA

Smooth Lines



**NVIDIA Quadro FX
RG-FSAA**

RG FSAA – Styling & Design



4X FSAA



**NVIDIA Quadro FX
RG-FSAA**

NVIDIA Quadro FX:



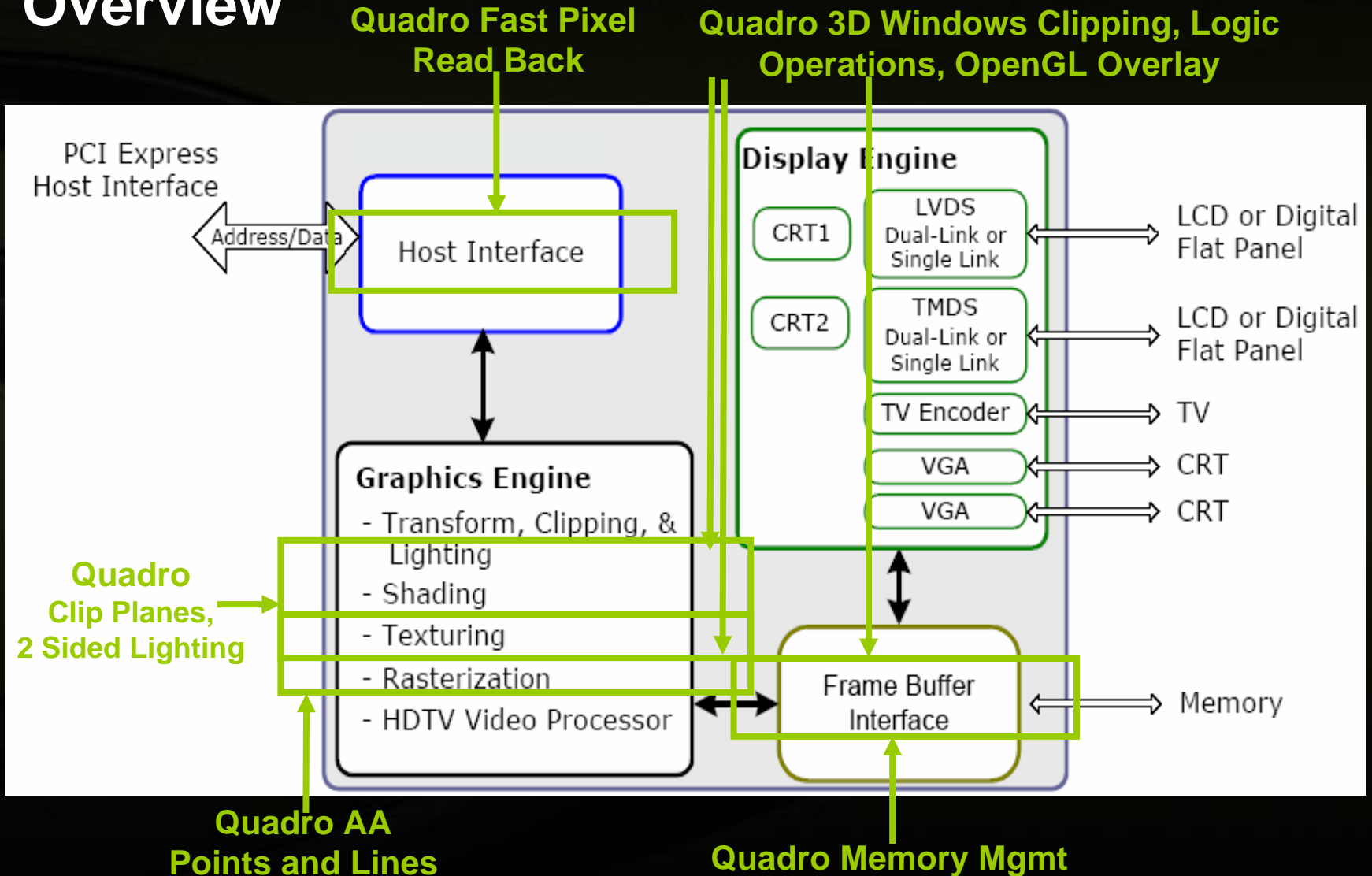
Architected for Workstation Performance

	NVIDIA Quadro	Geforce™
OpenGL Performance Leadership	Up to 5X	1x
Fast Pixel Readback	Up to 2GB/Sec	Up to 800MB/Sec
Hardware Stippled Lines	Yes	-
Hardware 2-sided Lighting	Yes	-
3D Window Clipping	Yes	-
Hardware Anti-Aliased lines	Yes	-
Hardware OpenGL Overlay	Yes	-
8 User Clip Planes	Yes	-
Logic Operations	Yes	-
Quadro Memory Architecture	Yes	-
Quad-Buffered Stereo	Yes	-
Quadro Application Utilities	Yes	-
Application Certifications	Yes	-
Reliability and Support	Yes	-
Sales Support	Yes	-

NVIDIA Quadro FX Architecture



Overview

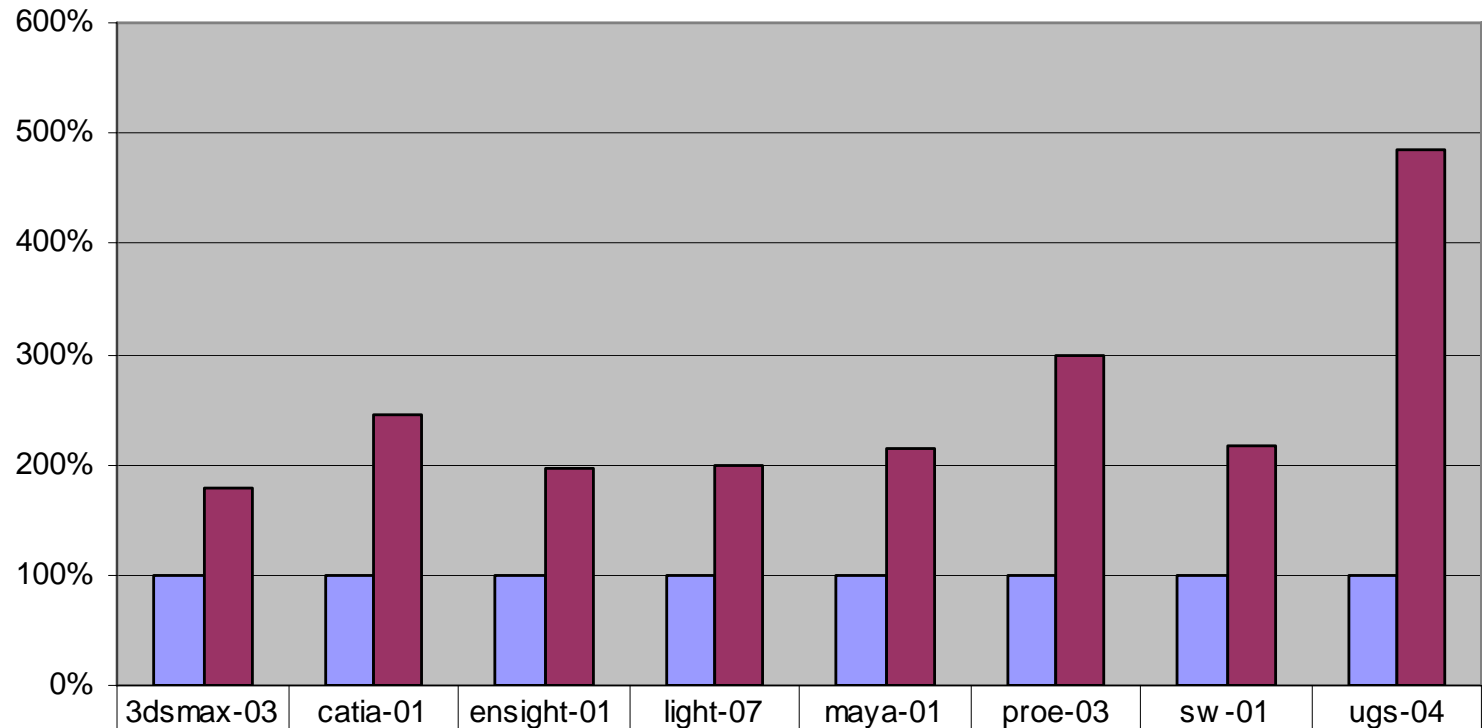


NVIDIA Quadro FX:



Architected for Workstation Performance

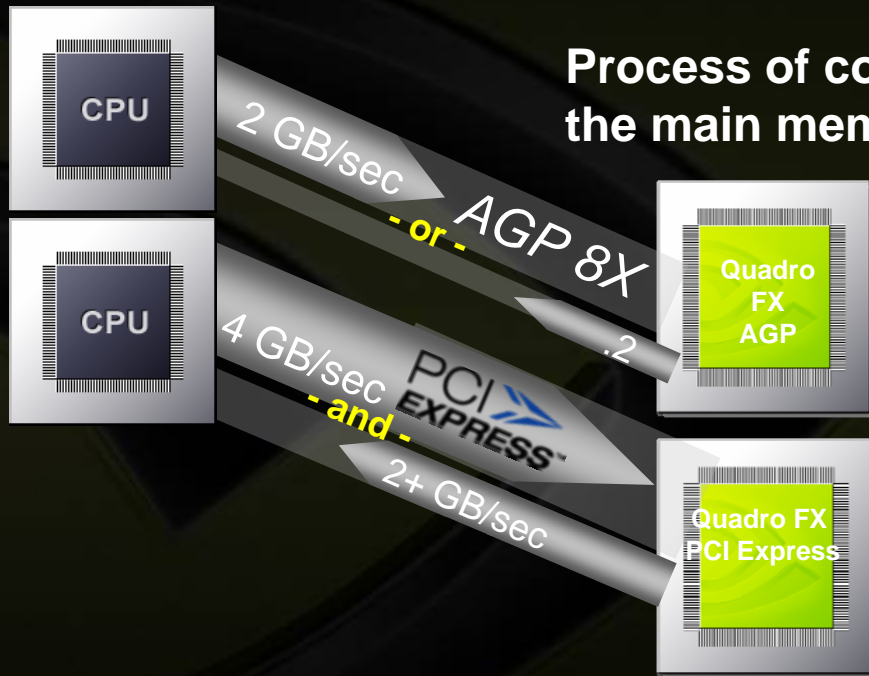
Relative Performances of NVIDIA Quadro FX vs Geforce equivalent
(at same clock/power budget)



GeForce equivalent	100%	100%	100%	100%	100%	100%	100%	100%
Quadro FX	178%	246%	196%	200%	214%	298%	216%	484%

Quadro FX Architecture Benefits

Fast Pixel Read Back Performance



Process of copying back part of the frame buffer in the main memory for further processing or storing

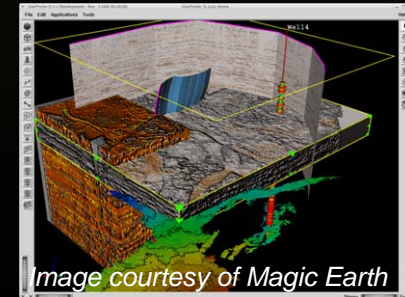
On AGP 8X/GeForce, this was limited to 200MB/sec

On PCI Express, it is now up to 2GB/sec, 10 times faster

Video, Broadcast



Scientific Visualization



Typical Applications:

Quadro FX Architecture Benefits



Light sources / 2-Sided Lighting

- Enhances representation of object with multiple sources of light
- Enhances performance when both the front and back sides of polygons are lit.

Ambient Light



Does not depend on the angle of nor the light source nor the viewer

+

Diffuse Light



Depends on the position of the light source but not the viewer.

+

Specular Light



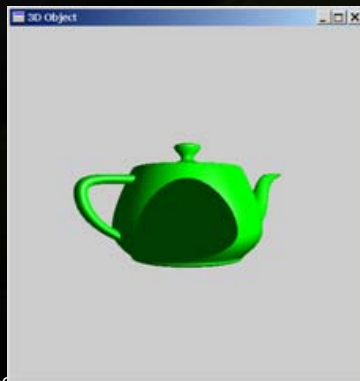
Depends on the position of the light source and the viewer.

=

Final Image



No Two-Sided Lighting



Two-Sided Lighting



Quadro FX Architecture Benefits

Antialiased Points and Lines



NVIDIA Quadro accelerates in hardware the antialiasing (smoothing) of points and lines, providing additional image quality in real time without performance penalty. This benefits all users dealing with wireframe models, such as MCAD, 3D modeling, etc.

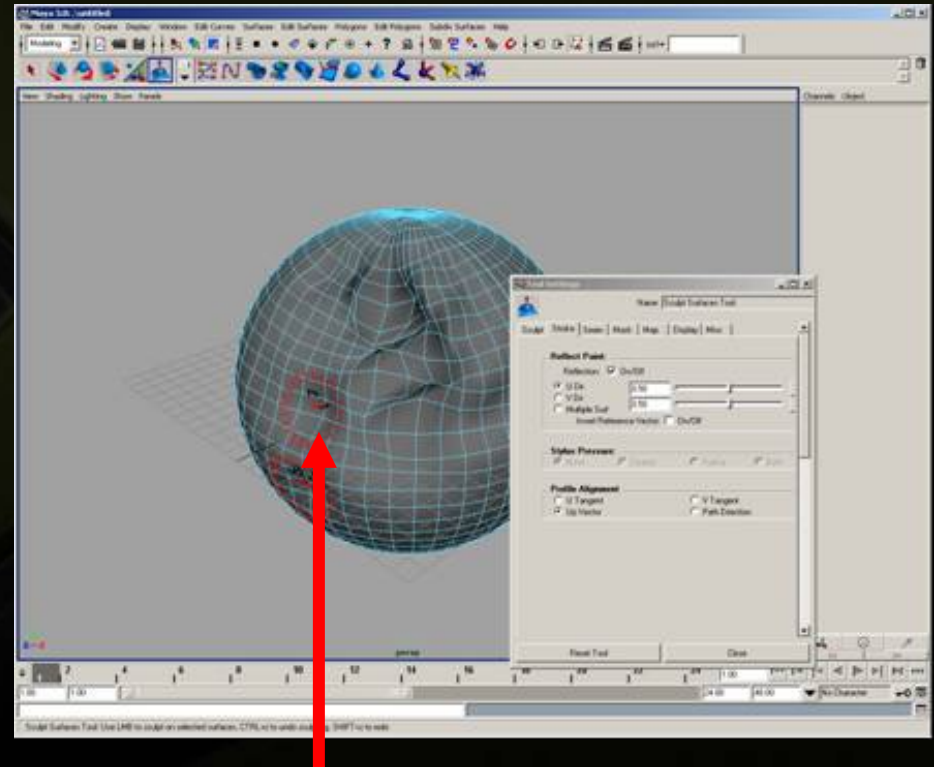
	GeForce Non-Antialiased	Quadro Line Antialiased
CATIA V5 Turn on Line Antialiasing: Tools/Options/Display/ Visualization	<p>Pocket.1 Sketch.2</p>	<p>Pocket.1 Sketch.2</p>
Pro/ENGINEER 2000i2 Turn on Line Antialiasing: View/Model Display		
EDS Unigraphics Version 17 Turn on Line Antialiasing: Preferences/Visualization/ Visual	<p>XC ZC</p>	<p>XC ZC</p>

Quadro FX Architecture Benefits

Hardware OpenGL Overlay Planes



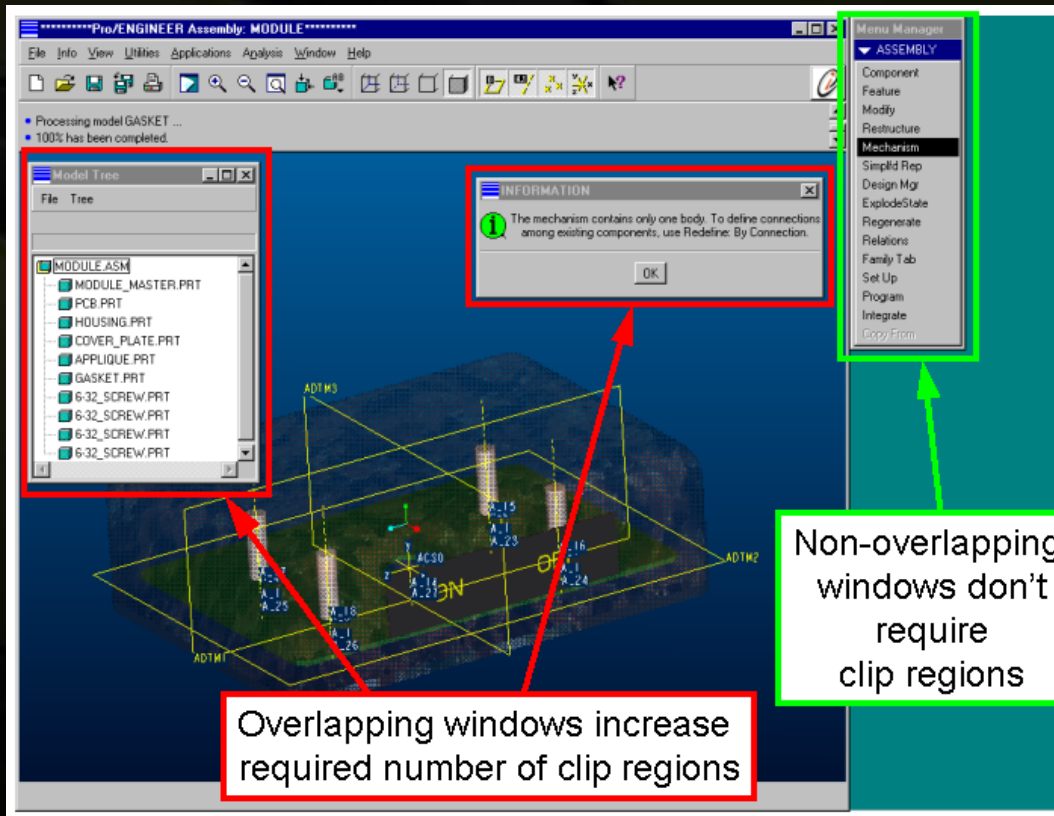
- Animated user-interface components can be drawn over 3D models or scenes
- Clearing and redrawing only the overlaid window is significantly faster than redrawing the main graphics window
- Only NVIDIA Quadro supports in hardware OpenGL overlay planes enabling better interactivity



A good example of this user interface component is the brush outline in Alias' Maya application. In this example, the red lines of the brush are drawn in overlay planes.

Quadro FX Architecture Benefits

3D Window Clipping



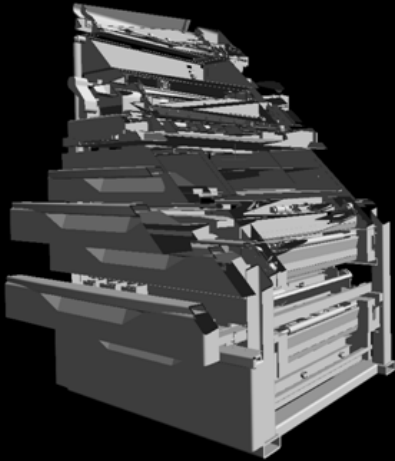
Professional Applications across all markets heavily use additional windows for tools, color pallet, parameters settings, etc. that overlap the workspace

NVIDIA Quadro accelerates in hardware the window clipping process thus providing interactivity in real time

Quadro FX Architecture Benefits



User Clip Planes



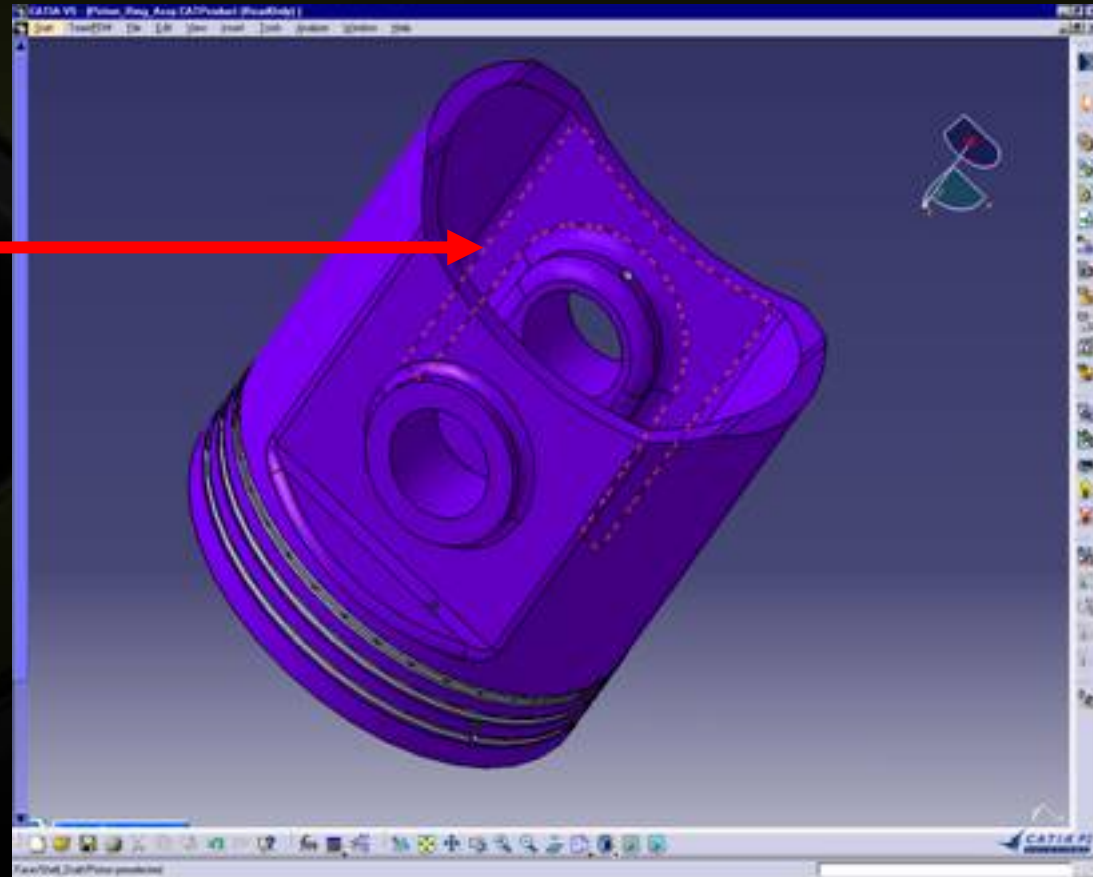
- Enables design engineers, 3D modelers, and geophysicists to interactively visualize the insides of assemblies, datasets, etc.
- NVIDIA Quadro enables applications to use up to 8 clip planes without affecting performance

Quadro FX Architecture Benefits

Logic Operations



- Logic operations are often used by workstation applications in MCAD, DCC markets
- Draw on top of a 3D scene to make specific features visible without significantly changing or complicating the existing drawing functions or adversely affecting performance.

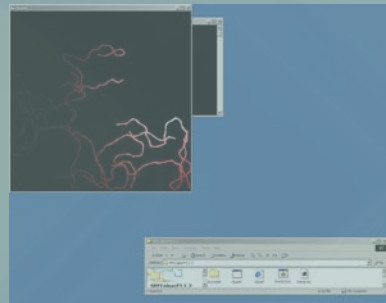


Quadro FX Architecture Benefits

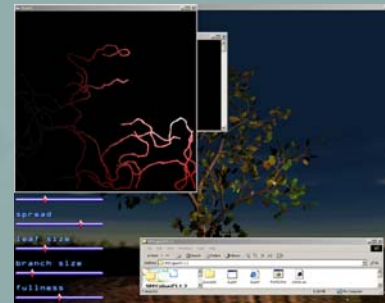
Memory Management



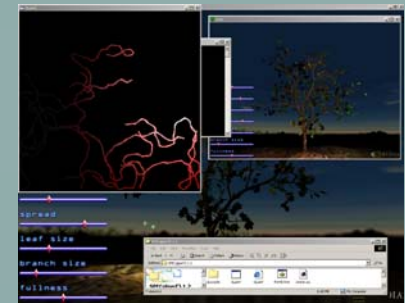
Enables multiple professional applications and windows to simultaneously run on the same desktop without adverse impact on performance



Scenario 1: Single instance of GLperf application



Scenario 2: GLperf running concurrently with full screen Tree demo



Scenario 3: GLperf running concurrently with full screen Tree demo and additional tree demo running

GeForce 1600x1200

100%

32%

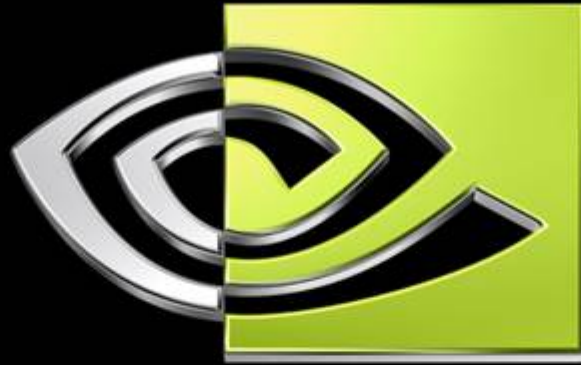
16%

Quadro 1600x1200

100%

100%

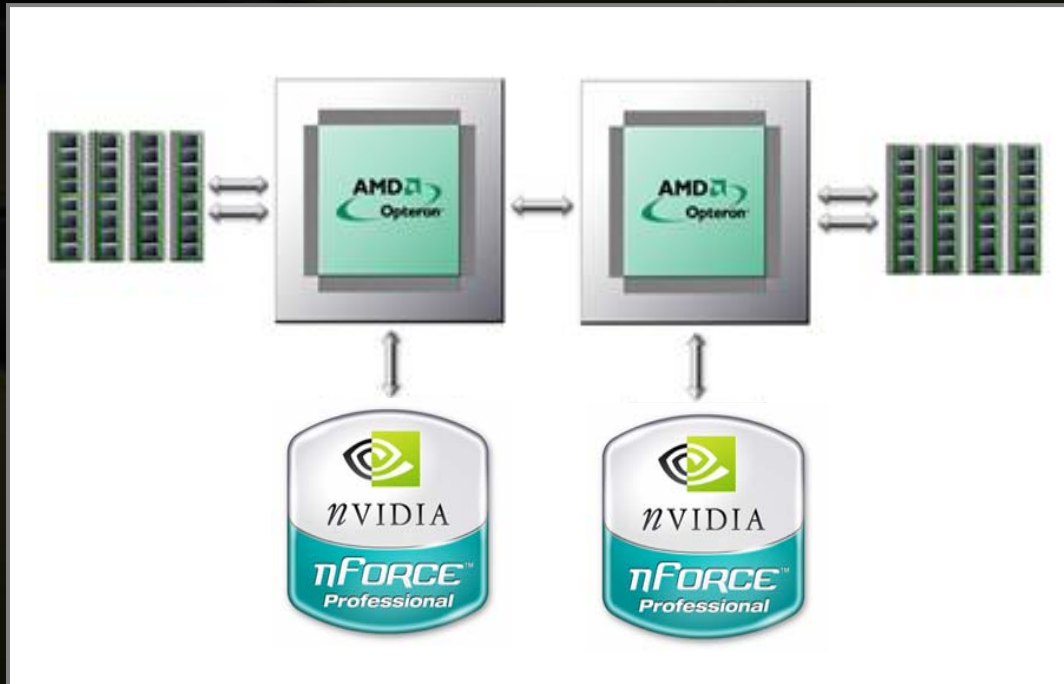
100%



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NVIDIA® SLI™ & NVIDIA Quadro®

SLI Core Technology



Dual AMD Opteron
(high performance 64 bit platform)

2x PCI Express x16

NVIDIA nForce Professional chipset
(2 chips, each supporting 20 PCI Express lanes)

NVIDIA SLI Multi-GPU technology

SATA II 3GB/s storage support



NVIDIA Quadro SLI Definitions

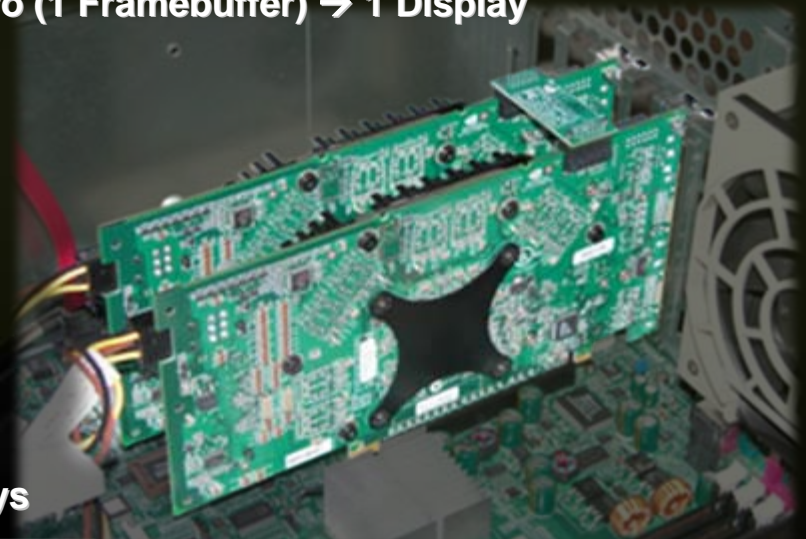


Traditional Mode:
1x Quadro (1 Framebuffer) → 2 Displays
Dual Output Graphics

Mode 1: SLI FRAME RENDERING MODE
2x Quadro (1 Framebuffer) → 1 Display



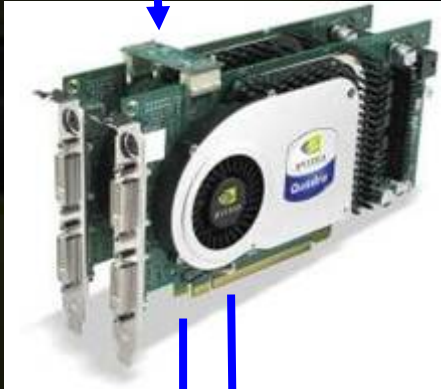
Mode 2: SLI MULTIVIEW MODE
2 Quadro (2 Framebuffer) → 4 Displays



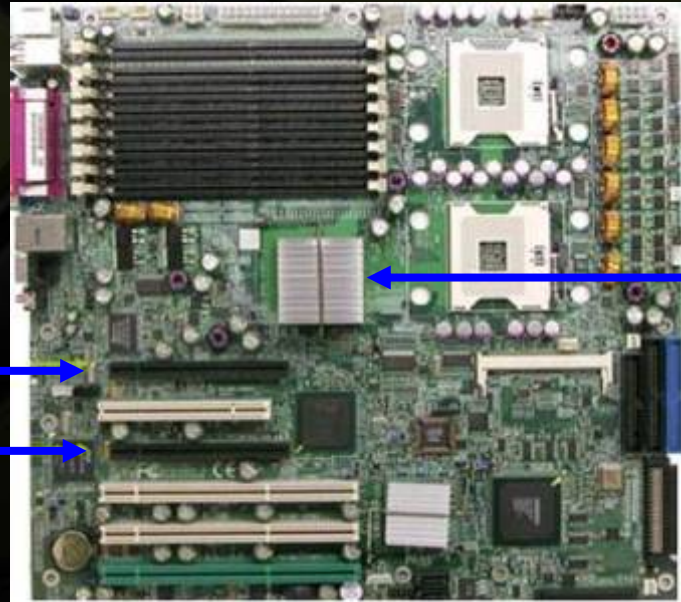
SLI Technology Components needed



NVIDIA SLI bridge



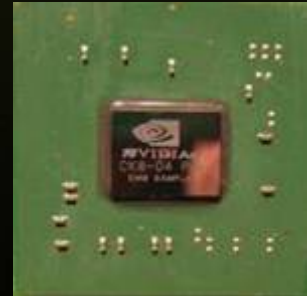
Two NVIDIA SLI ready graphic cards
Quadro FX1400, FX3400, (FX4400)



SLI ready system board
(Dual PCI-Express x16)



NVIDIA driver
supporting SLI



NVIDIA nForce Pro
chipset (2050+2200)

NVIDIA Quadro FX 3400/4400 SLI Performance

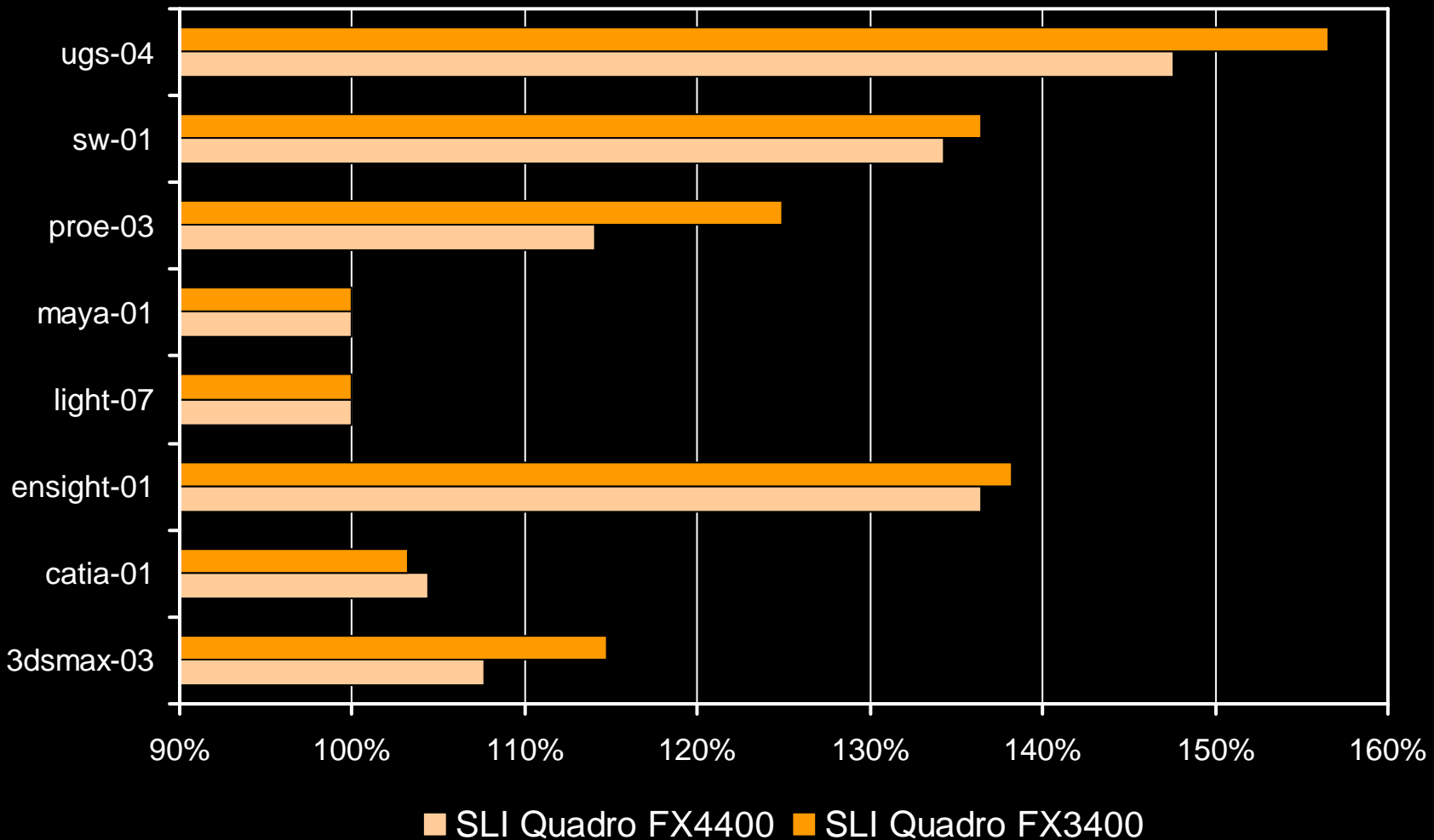
Relative to Single GPU

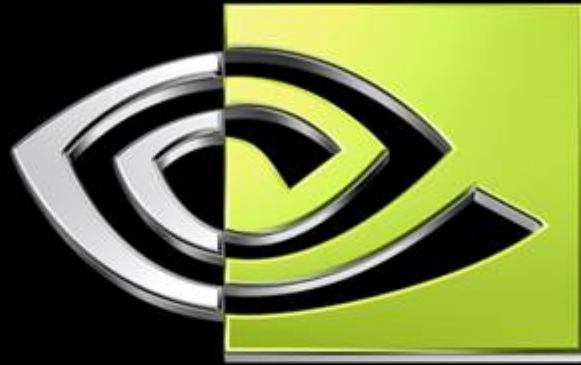


Average SLI Performance Improvement

CAD Average	26.3%	Viewperf
DCC Average	1.2%	Viewperf
Sci Viz Average	18.5%	Viewperf
Viz Sim Average	95%	Aechelon Flight Sim

NVIDIA Quadro FX 3400/4400 SLI Viewperf 8.0.1 *
(normalized to single Quadro FX 3400/4400)





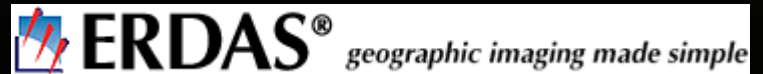
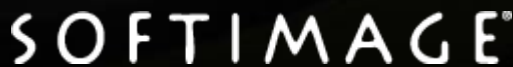
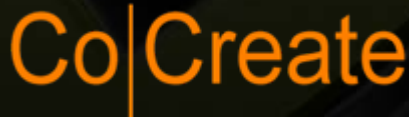
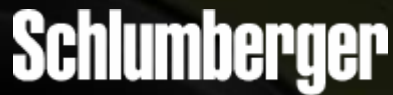
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NVIDIA Quadro ISV Certification

64-bit Support

Linux Support

NVIDIA Quadro FX ISV Certification Leadership



64-bit Graphics Leadership



● Industry's Best 64-bit Graphics:

- HP IPF Itanium
- Intel EM64T
- AMD Opteron



● Full OpenGL and Quadro FX features support:

- Windows XP 64-bit Edition x64
- Linux AMD64/Intel Xeon64
- Linux IA64
- Windows Server 2003 SP1 x64

● Tuned Shading Environments and Applications

● Application Performance Optimizations & Certifications

LINUX Graphics Leadership



- **Proven LINUX Driver Robustness**
- **LINUX is a first class citizen at NVIDIA:**
 - **Same Rigorous Release Process as Windows**
 - **Full driver support and testing for:**
 - **RedHat**
 - **Suse**
 - **Mandrake**
 - **Follow-up on reported issues with other distributions**
- ➔ **All Major LINUX Customers and Software Partners select and recommend NVIDIA graphics**

LINUX Graphics Leadership



- **NVIDIA supports Linux certifications on a variety of vendors including:**
 - **Alias**
 - **Softimage**
 - **CoCreate**
 - **SideFX**
 - **Magic Earth/Landmark**
 - **PTC**
 - **Apple (Shake)**
- **More vendors are moving to offering Linux ports, (e.g. CAD)**
- **Certifications are no different than on Windows side, fully supported for released boards & GPUs.**





***N*VIDIA®**

**NVIDIA Design, Manufacturing and
Support**

NVIDIA Quadro vs. NVIDIA GeForce



- 3 year availability
- Manufactured by NVIDIA to NVIDIA BOM and standards
- NVIDIA reference BIOS
- ISV Certification
- Tested against professional applications and desktop (office) applications



- <12 month availability
- Manufactured by contract manufacturers
- BOM and design subject to change
- Custom BIOS
- Tested against games and desktop (office) applications

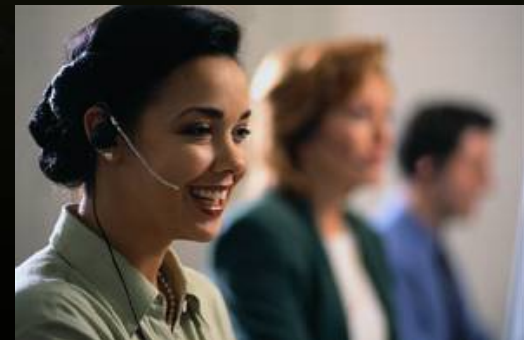
Enterprise Support



General Overview

- **Dedicated team at NVIDIA for Enterprise Customers in Software Engineer Group**
 - Help customers quickly resolve problems
 - High priority response rate (sub-10 minute average)
 - Help drive customer requests through engineering processes
 - ESupport tailored for personal service with immediate access to engineering resources
 - Facilitate Major Rollouts
 - Support IT specific tools such as NVManagement
 - Available (7:00 am to 5:00 pm PST and 9:00 am to 5:00 pm Central Europe)

- **Basic services offered**
 - Driver drops
 - Case and bug submission
 - Issue escalation
 - Enterprise Customer extranet sites
 - Release notes, tech docs and videos
 - **Early adopter hardware/software programs**



NVIDIA Quadro NVS

Application Compatibility Testing



Compatibility testing for Tier 1 apps and
sanity check for Tier 2 applications

Tier 1 Apps

- Reuters (Proposed)
- Bloomberg (Proposed)
- Hummingbird
- FEDESSA (Front End)
- In house Java application
(based on customer code)

Tier 2 Apps

- Thompson Financial
- Moneyline
- Sungard
- Cisco IPTV
- Hauppage





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