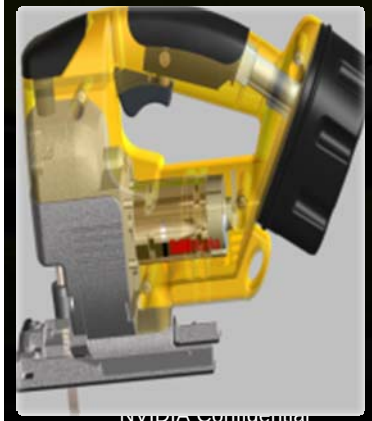
NVIDIA Quadro®
Changing the World One GPU at a Time.

Facts You Didn't Know About NVIDIA

9 out of 10 products you come in contact with every day were designed using NVIDIA Quadro

NVIDIA Confidential

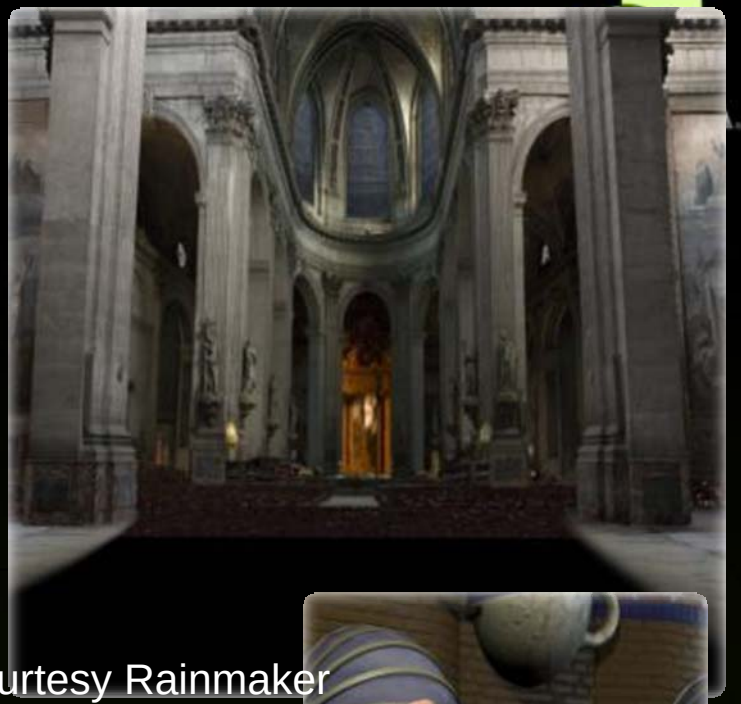


NVIDIA Confidential

NVIDIA Quadro technology was critical in every movie and nearly every TV show you watch.
In several ways.

NVIDIA Confidential

Courtesy Sportvision



Courtesy Rainmaker

Courtesy NVIDIA

NVIDIA Confidential

The world's leading medical treatment and research is being enabled by NVIDIA GPUs.

NVIDIA Confidential

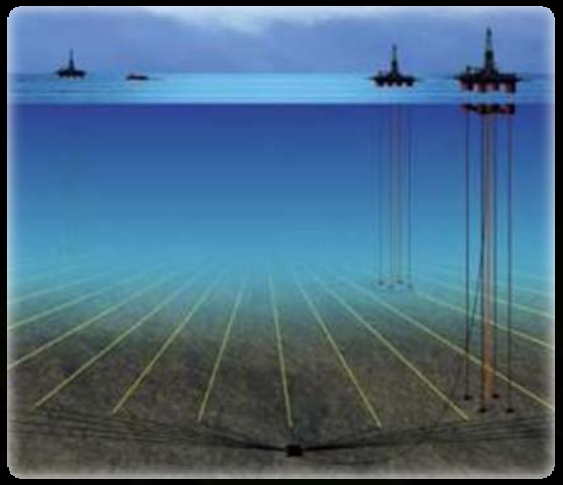
NVIDIA Confidential

Courtesy Philips (iU22 Ultrasound)

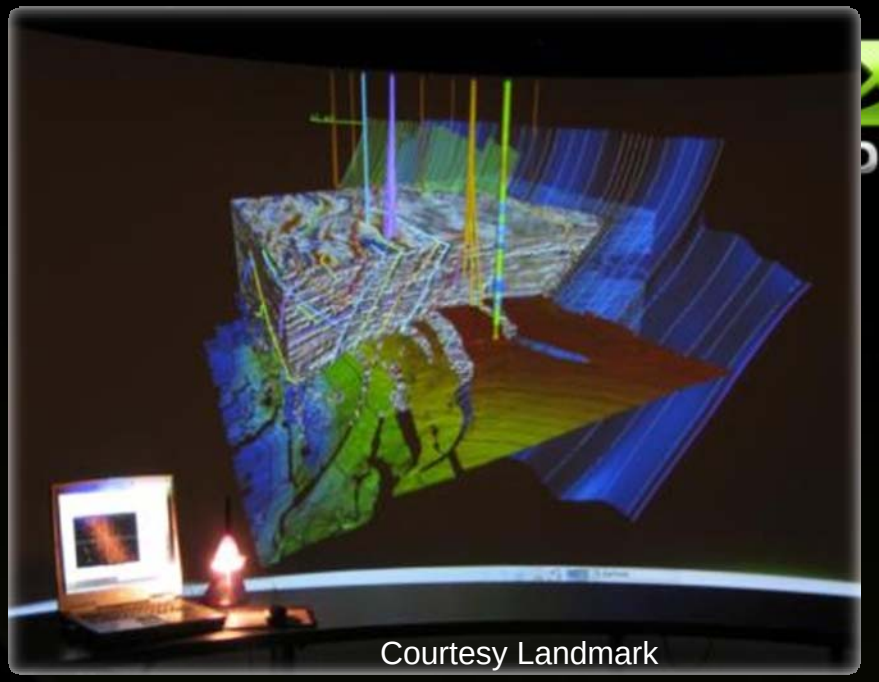
NVIDIA Confidential

Leading geologists will likely find and harvest the future's largest oil reserves using NVIDIA Quadro.

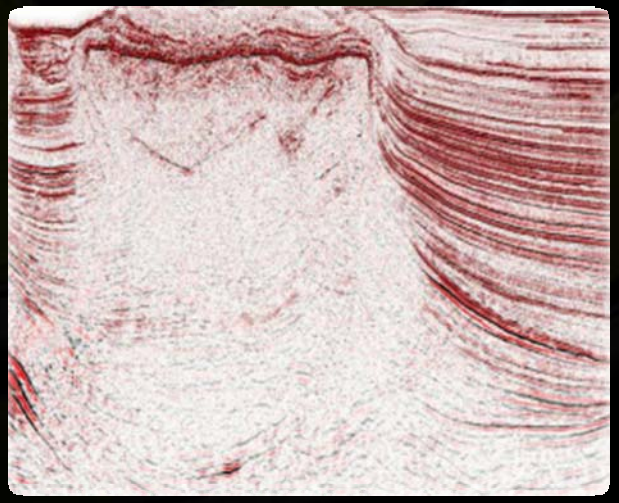
NVIDIA Confidential



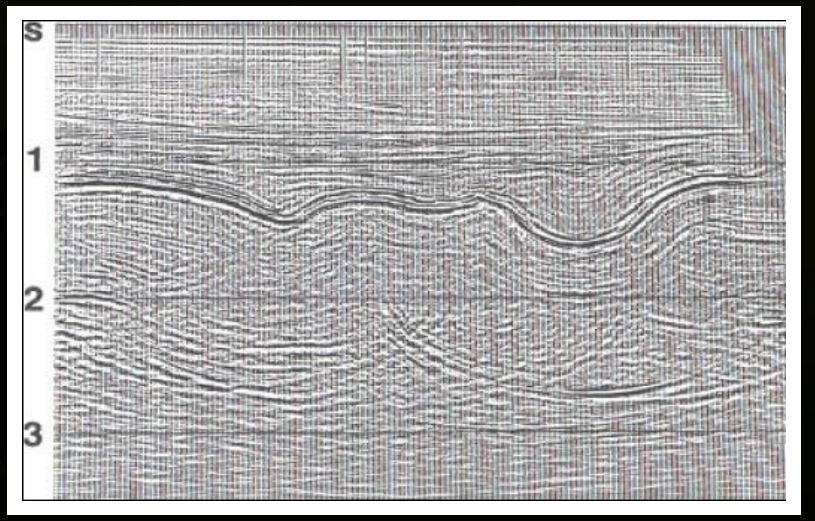
Courtesy Headwave



Courtesy Landmark



Courtesy CGG



Courtesy Acceleware

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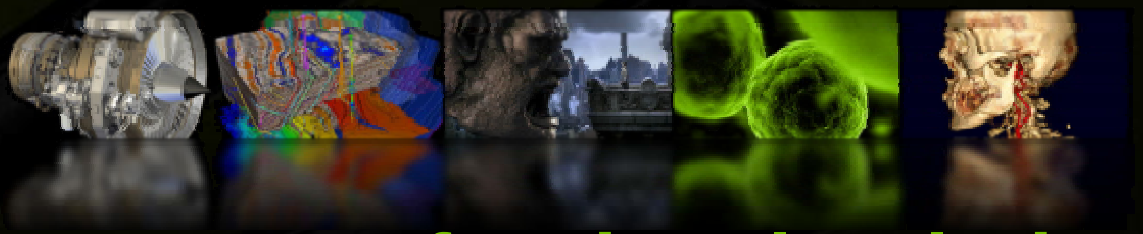
NVIDIA

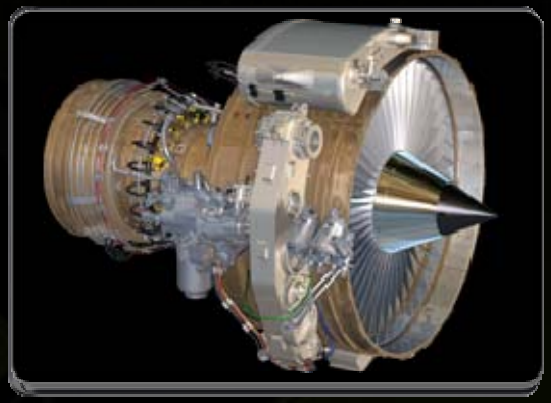


NVIDIA Professional Solutions

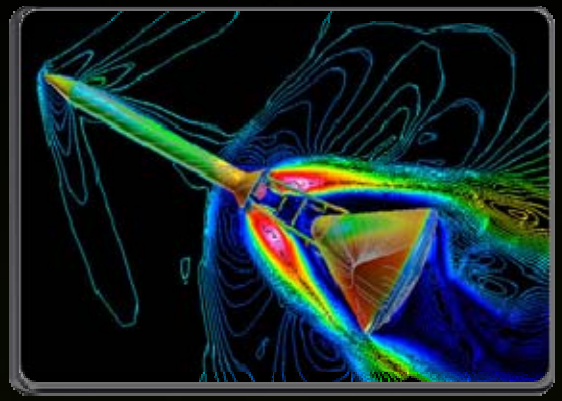
NVIDIA Confidential

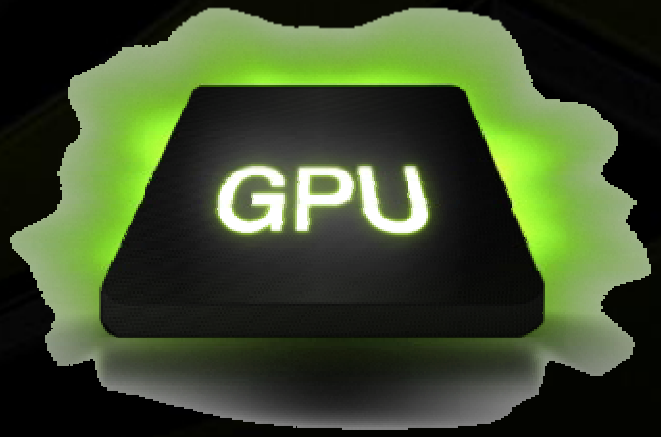
GeForce®
Entertainment

Quadro®
Design & Creation



Tesla™
High Performance Computing

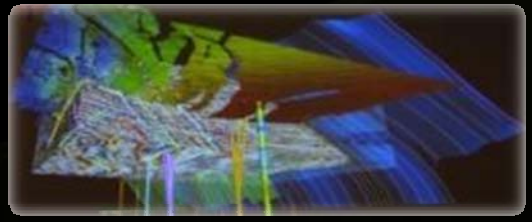




NVIDIA Confidential

The Quadro Story

- 15,000 person years of professional GPU experience
- 11.3 Million Quadro graphics solutions shipped
- $1B invested each year in GPU development
- Quadro – Most advanced processor on earth
- 200 engineers dedicated to applications



NVIDIA Confidential

NVIDIA Quadro & HP Alignment

Uncompromised Range of Professional Graphics Solutions

Mobile

Workstation

Power Desk Side

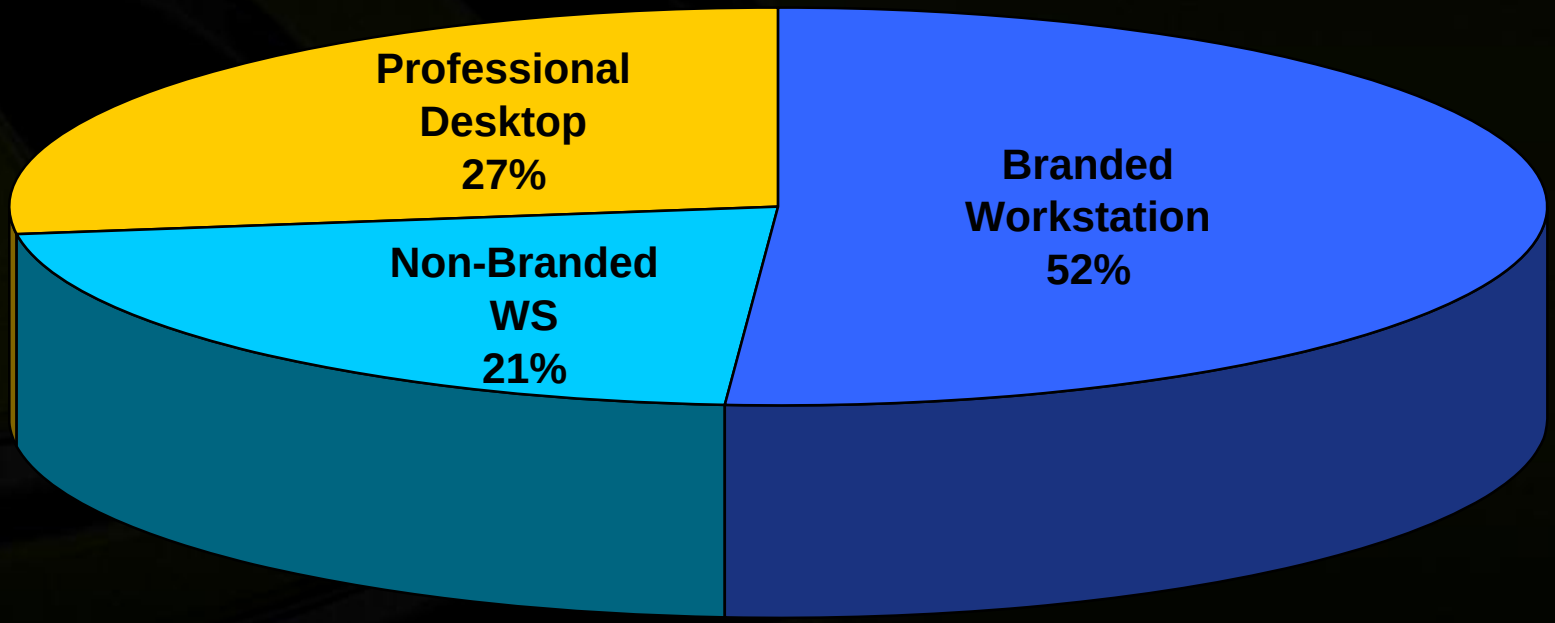
Remote Desktop Blades

Remote Graphics Servers

NVIDIA Confidential

Why Professional Graphics?
The Opportunity: 2008

- Total Professional Available Market: 6.2 Million Units
- Professional Desktop Market: 1.7 Million Units
- Example Market: Volume AutoCAD
  - (40 - 50% of Professional Desktop Market)



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Quadro Professional Graphics Solutions vs. Consumer Solutions

- Professional Application Performance
- NVIDIA Quality
- Maximum Productivity
- Tested & Certified
- Extended Life Cycle
- Professional Market Investment and Product Commitment

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Quadro vs. GeForce Performance

OpenGL Performance	Up to 5x	1x
DirectX Level / Performance	DX10 / 1x	DX10 / 1x
DirectX Pro App Performance	1.3 – 2x	1x
Frame Buffer	Up to 1.5 GB	Up to 768MB
Compute	Yes – DP (fp64)	Yes – SP (fp32)
Stereo Windowed	Yes	-
Read-Back Bandwidth	Up to 1.5GB/sec	Up to 1GB/sec
Industry Options: Quadro Plex / Genlock / SDI	Yes	-

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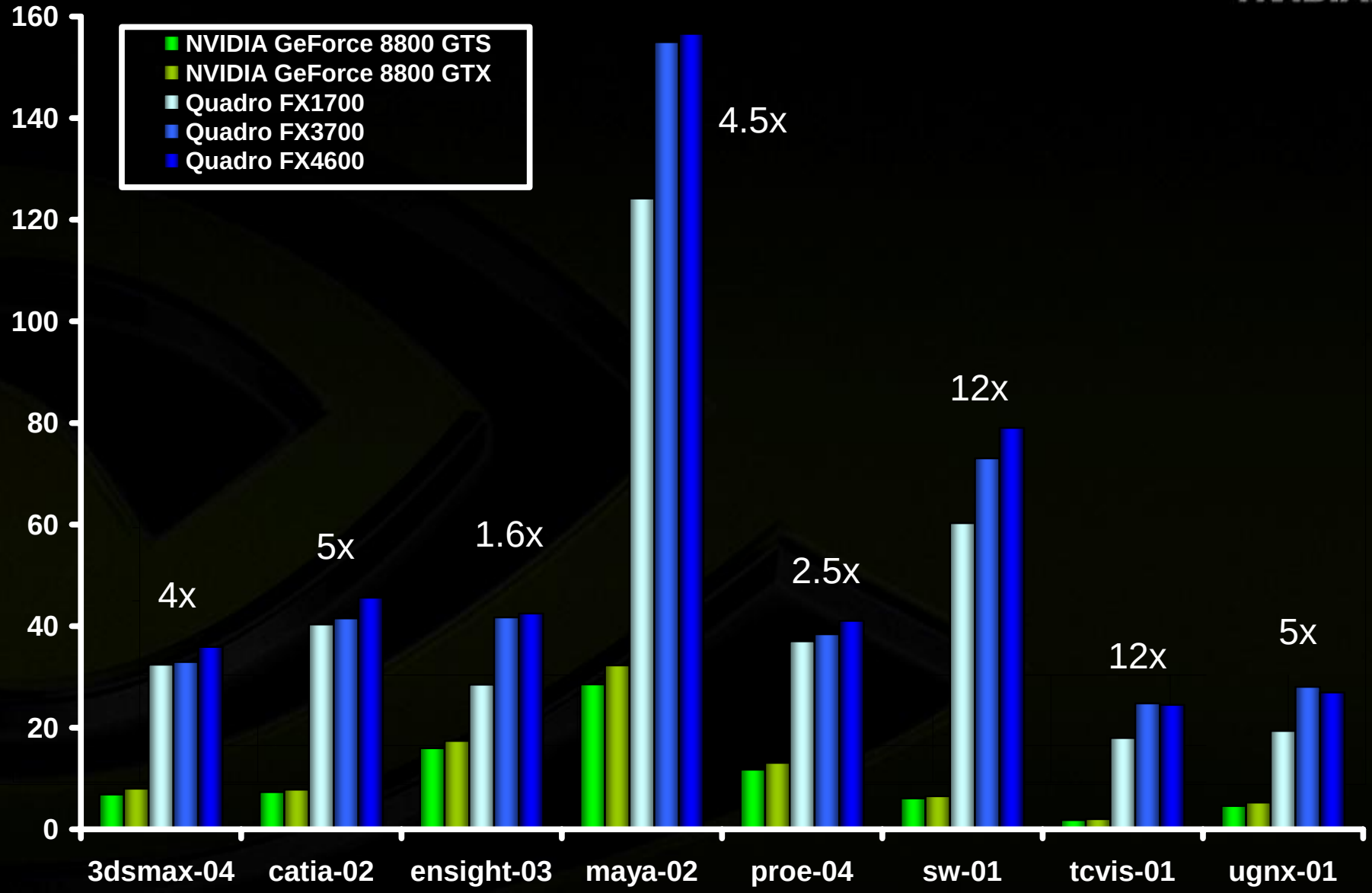
Quadro vs GeForce Performance



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Quadro vs. GeForce Positioning
Quality

Boards Manufacturer	NVIDIA	Add In Card Partner (>30) (AIC)
ECO Control	NVIDIA	AIC
Quality Testing	Professional Software Solutions	Consumer Applications (Games/Video)
Professional ISV Certification	All Industry-Leading Professional Applications	None
Lifecycle	18-36 Months	9-12 Months Varies by board manufacturer
Duty Cycle / MTBF	5 year	N/A - variable

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NVIDIA Quadro FX
ISV Certification Leadership

NVIDIA Confidential

Built for Professional

Leading applications require 3D professional graphics

Unprecedented price/performance

Investment protection

Quadro: Built for Professionals

NVIDIA.
Example AutoCAD

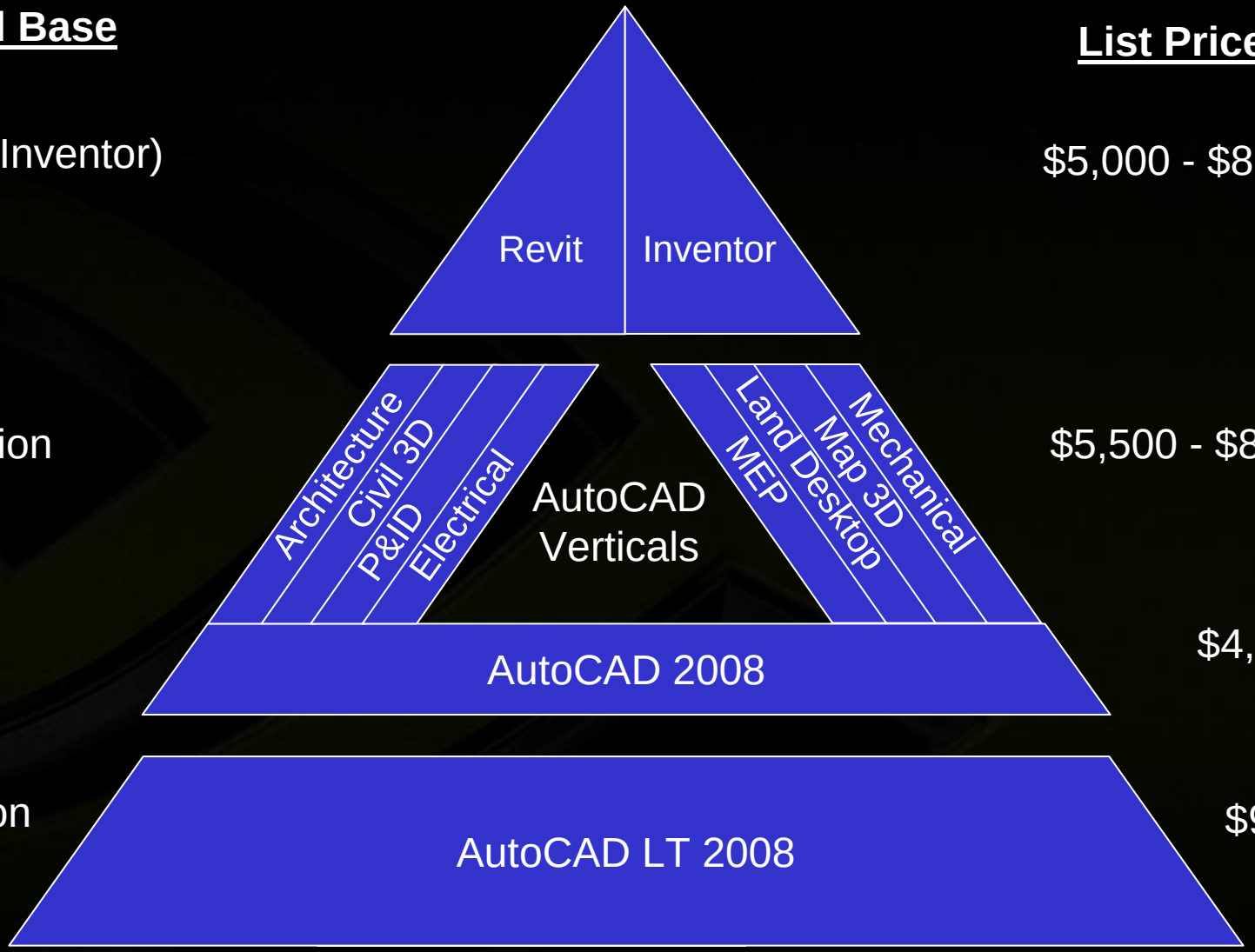
Autodesk Products

Install Base

List Price

700 K (Inventor)

$5,000 - $8,000



4.3 Million

$5,500 - $8000

$4,000

3.5 Million

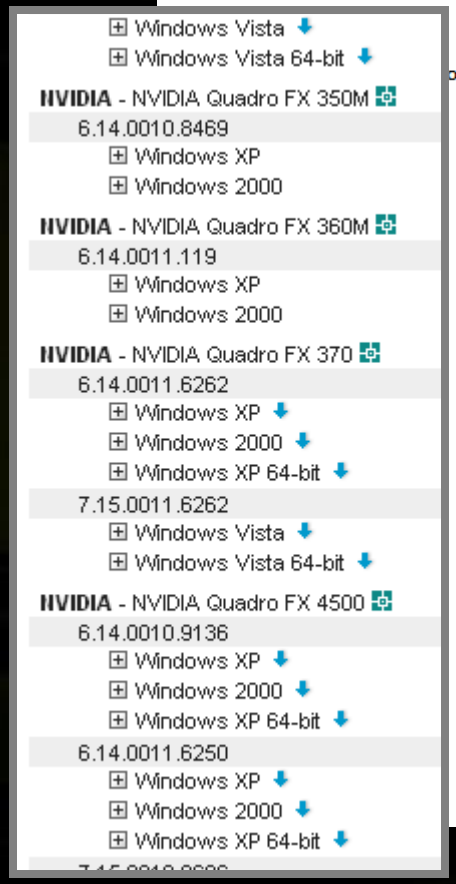
$900

NVIDIA Confidential

The AutoCAD Story

- Autodesk AutoCAD 2008 now has 3D features that require a professional class GPU
- Certified Solution: NVIDIA Quadro
  - Performance Tuner for AutoCAD trials
- Best Price Performance
- Investment Protection

AutoCAD System Requirements: *Professional-Class GPU*



Home › Products › AutoCAD

AutoCAD

Features & Specifications
Features
White Papers
Customer Gallery
Customer Stories

Features & Specifications

Print | Email

Features
AutoCAD 2008 adds new features to help make everyday tasks easier, delivering an unmatched level of aesthetic precision and professionalism.

White Papers
Read white papers on a variety of AutoCAD® software topics and features.

System Requirements
The system requirements for 32-bit AutoCAD:

- Intel® Pentium® 4 processor, 2.2 GHz Recommended
- Microsoft® Windows Vista™, Windows® XP Home and Professional (SP2), Windows® 2000 (SP4)
- 512 MB RAM
- 750 MB free disk space for installation
- 1024x768 VGA with True Color
- Microsoft® Internet Explorer® 6.0 (SP1 or higher)

Available on CD (Worldwide) and DVD (select countries and languages)

Additional System Requirements for 64-bit AutoCAD

- Windows XP Professional x64 Edition and Windows Vista 64-bit
- AMD64 or Intel EM64T processor
- 1GB RAM, 2GB for Windows Vista 64-bit
- 750 MB free disk space for installation

AutoCAD 64-bit cannot be installed on a 32-bit Windows Operating System.

The System requirements for Windows Vista or 3D modeling (32 and 64-bit AutoCAD)

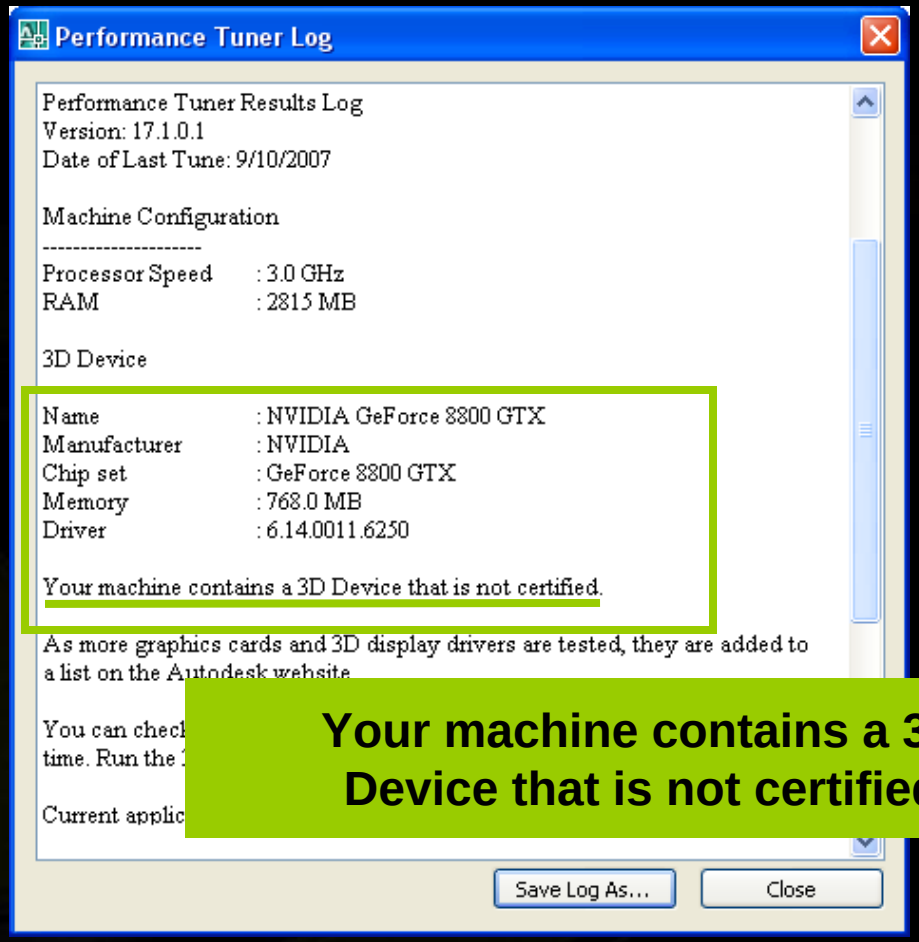
- Intel® 3.0 GHz or greater
- 2 GB RAM or greater
- 2 GB free hard disk available not including installation
- 1280 x 1024 32-bit color video display adapter (True Color) 128 MB or greater, OpenGL®, or Direct3D® capable workstation class graphics card.
- For Windows Vista, a Direct3D capable workstation class graphics card with 128 MB or greater is required.

Get information on graphics hardware certified for use with AutoCAD 2008.

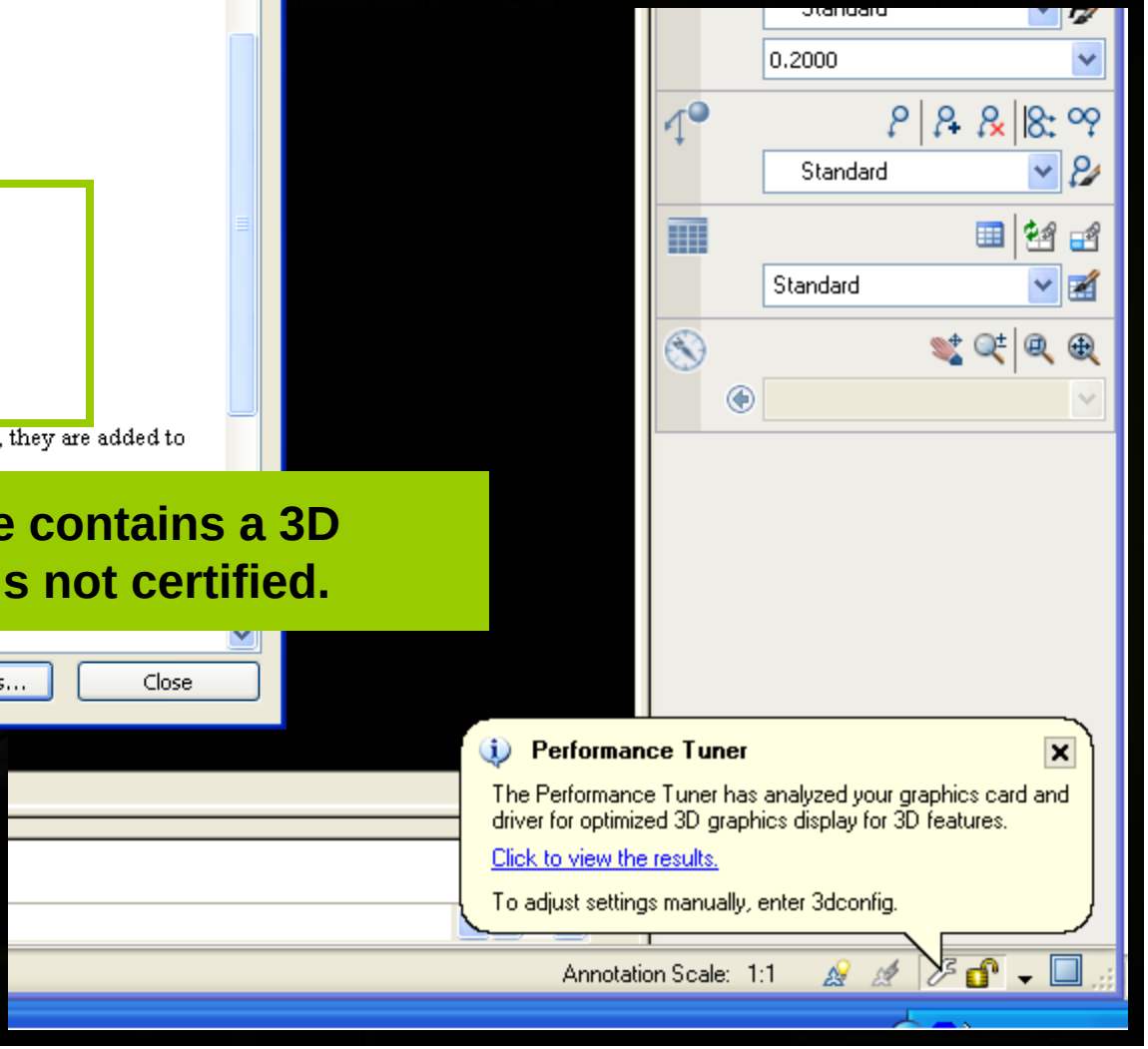
1024x768 VGA Adapter (anything!)

OpenGL or DirectX capable workstation graphics class card (NVIDIA Quadro or AMD FireGL)

AutoCAD System Performance Check



Your machine contains a 3D Device that is not certified.



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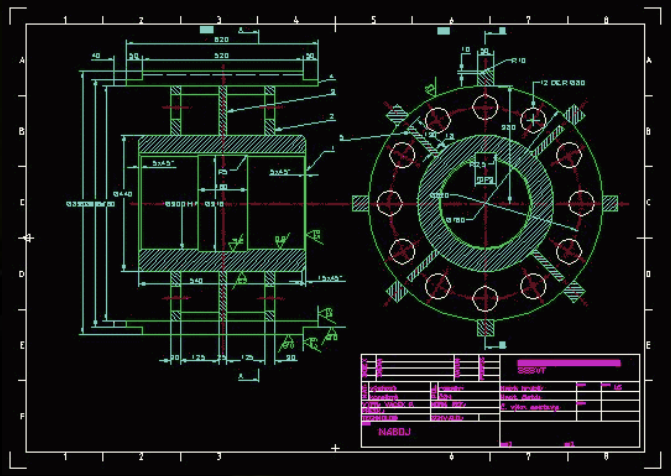
NVIDIA POWERdraft for AutoCAD

- Highly optimized plug-in graphics performance driver
- Only available on Quadro
- Provides value for AutoCAD
  - Hardware Acceleration
    - Geometry
    - AA lines
    - Hidden line rendering
    - Shader
    - Shadow display
    - Texture compression



- Available at www.nvidia.com/drivers

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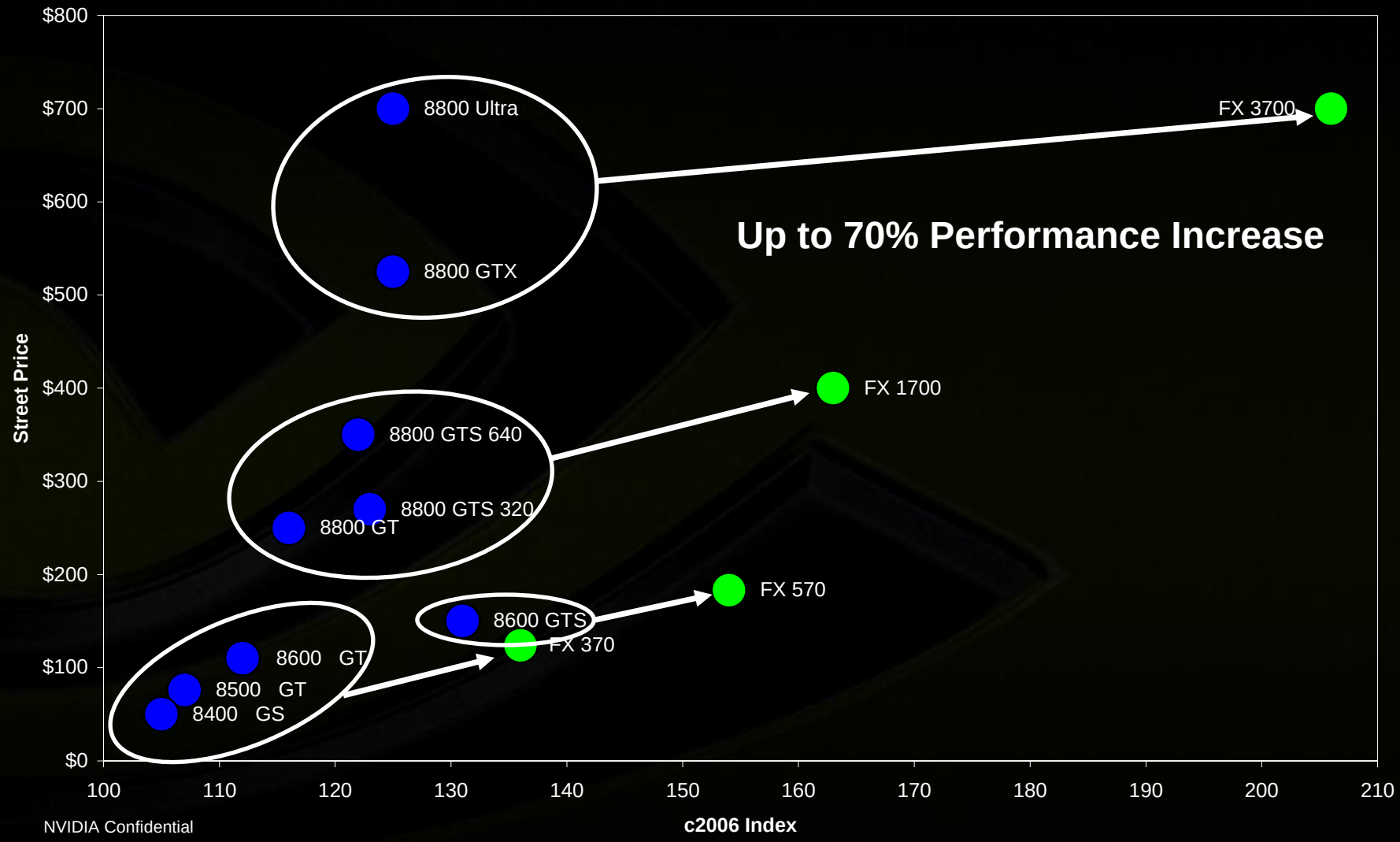
Best Value: NVIDIA Quadro featuring POWERdraft



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Investment Protection

- Maximizing system uptime
  - Ultra-low MTBF rates
- Certified on AutoCAD
- Engineered and built by NVIDIA
  - Higher standards & quality testing
- Longer product life cycle for a stable platform
  - 24-36 months product life cycle
- Reduced ISV Support Calls

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NVIDIA
NVIDIA Professional Solutions

NVIDIA GPU Families

Consumers:
Entertainment

Professionals:
HPC

Professionals:
Design & Creation

NVIDIA Quadro NVS

Professional 2D
Corporate
Server

NVIDIA Quadro FX

Core Technical 3D
WS Applications

Industry Solutions

Quadro SDI
Quadro G-Sync
Quadro Plex
Middleware

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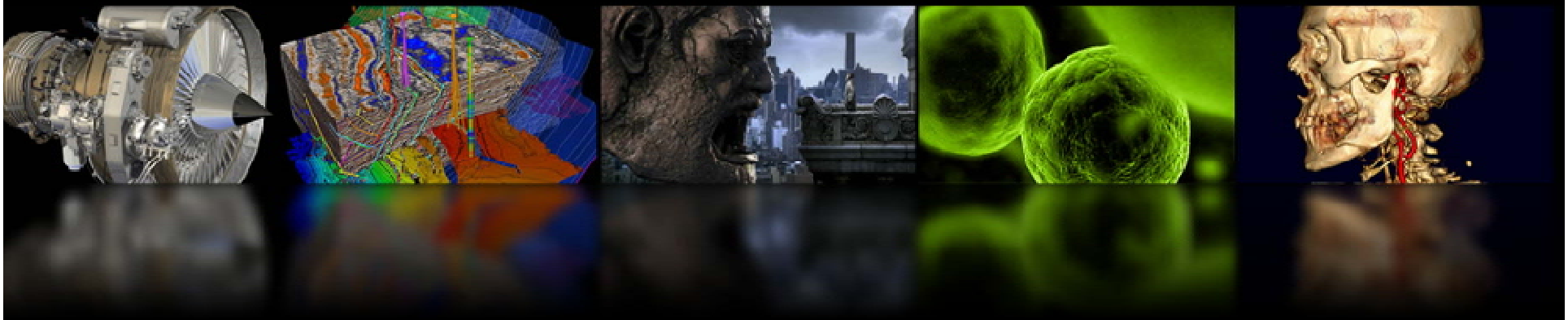
NVIDIA Quadro NVS

The Standard For Multi-Display Business Graphics

Target Markets:

- **Finance**
- **Trading**
- **Insurance**
- **Banks**
- **Digital Signage**
- **911/Emergency Response**
- **Call Centers**
- **Hospitals**
- **Corporate Desktops**
- **Process Control**
- **Video Walls**

Quadro Unified Architecture



- Optimized GPU Performance
- Shader Model 4.0 enables OpenGL and DirectX 10
- NVIDIA® CUDA™ C programming environment
- Certified on All Industry-Leading Applications

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Image Courtesy of: Right Hemisphere, Landmark, a brand of the Halliburton Drilling, Evaluation and Digital Solutions, UVPHACTORY, NVIDIA, Vital Images

Unified Architecture Quadro Family

NVIDIA Quadro FX 5600

+ 2x Frame Buffer – 1.5GB

NVIDIA Quadro FX 4600

+ 1.5x Frame Buffer (768MB)
+ SDI/Genlock/Framelock

NVIDIA Quadro FX 3700
Coming Soon

+ Stereo Connector
+ SLI

NVIDIA Quadro FX 1700

+ 2x Frame Buffer (512MB)
+ HD Video Connector
+ 1.3x Performance

NVIDIA Quadro FX 570

+ Dual Dual Link DVI
+ 1.3x Performance

NVIDIA Quadro FX 370

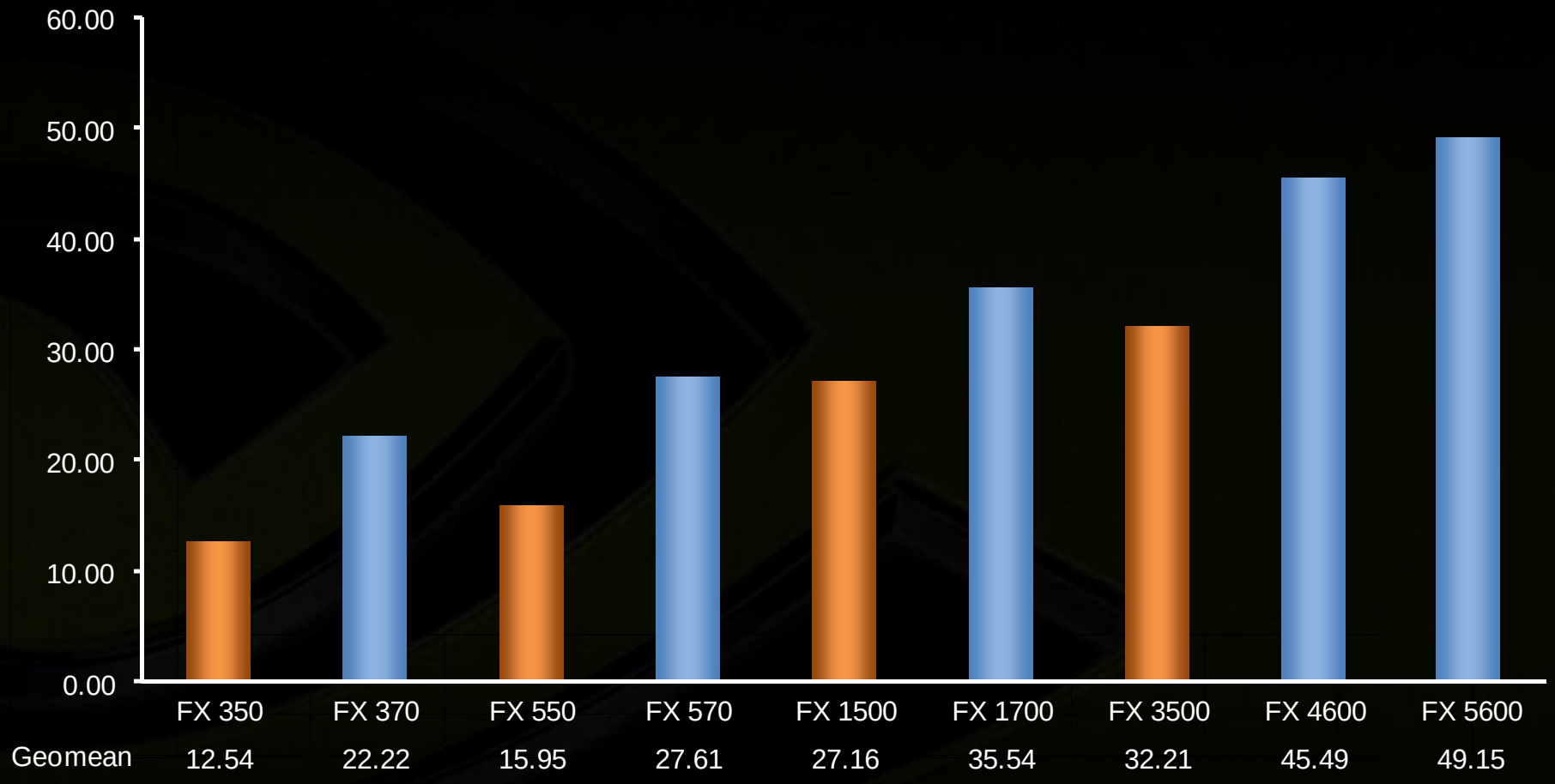
Pro 3D

Pro 2D

NVIDIA Quadro NVS 290

NVIDIA Confidential

Exceptional Performance



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NVIDIA Quadro Mobile Powered Workstations and Notebooks

- **HP Compaq**:
  - 8710w Mobile Workstation, 17", Quadro FX 1600M (512MB)
  - 8510w Mobile Workstation, 15.4", Quadro FX 570M (256MB)
  - 8710p Business Notebook, 17", Quadro NVS 320M (256MB)

- Target Industries for Quadro powered HP Compaq mobile workstations:

  - Quadro FX Mobile Workstations
    - Manufacturing
    - DCC
    - Architecture, Engineering, and Construction
    - Medical
    - Oil and Gas

  - Quadro NVS Mobile Notebooks
    - Finance
    - Corporate/Business

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HP Blade Workstations Standardize on Quadro Graphics Solutions

- **HP Blade Workstations**
  - ProLiant xw25p used the Quadro FX 540M Blade Graphics Board
  - ProLiant xw460c uses Quadro FX 560M and FX 1600M Blade Graphics Boards

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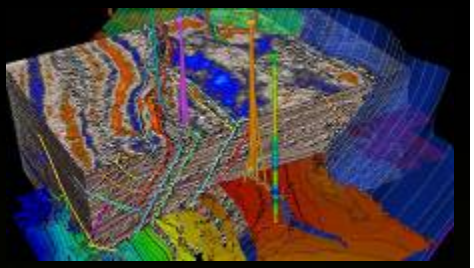
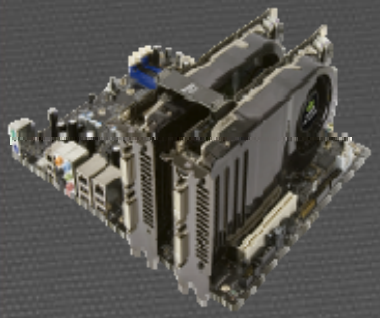
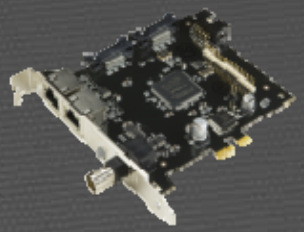
Best-of-class Industry Solutions

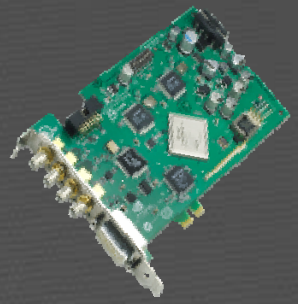




NVIDIA
SLI



NVDIA
G-Sync II



NVIDIA
HD SDI

NVIDIA
Quadro Plex VCS

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Built for Professional

Leading applications require 3D professional graphics

Unprecedented price/performance

Investment protection

Quadro: Built for Professionals

Enterprise Sales Organization

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- **Tel: 408-566-6312**

EMEA

Joerg Krall

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PSG Contact: India

Prasad Phadke

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- **Email: pphadke@nvidia.com**
- **Tel: 91 20 6641 3000**

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NVIDIA®

Back Up Slides

Jon Peddie Research

" Bucking the typical tendency for customers over time to expect to pay less and get more, professional buyers are forking over more dollars to get their hands on a slew of new High End products.

Where the High End segments comprised only about 25% of total add-in card revenue two years ago, in Q2'06 they accounted for roughly 50%.

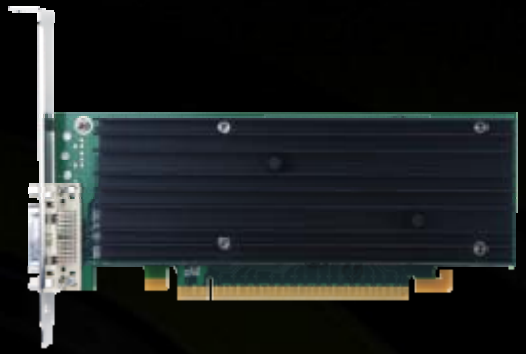
*NVIDIA **(and HP)** is both the instigator and primary beneficiary of this trend. "*

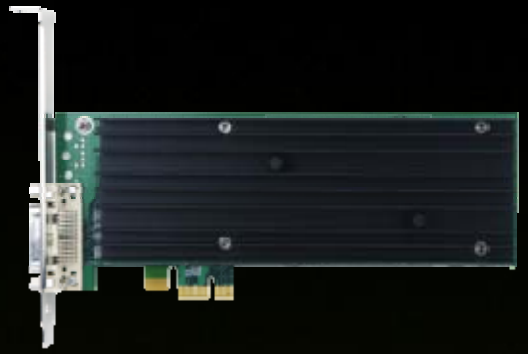
This trend is driven by:

- Scalable Graphics (More GPUs in a single system)
- Increasing time to discovery in Oil & Gas , Medical, Defense Industries
- Digital Prototyping, Increase Time to Market Pressure

NVIDIA Confidential

Quadro NVS 290 - The Standard for Business Graphics





Quadro NVS 290 PCIe x16

PRODUCT SPECS:

Form Factor	ATX, 2.7” (H) x 6.6” (L) Single Slot
Frame Buffer:	256MB DDR2
Board Power:	21 W
Graphics Bus:	PCI-E x16 (2.1GB/s)
Display Connectors	DMS-59 [2 DVI-I]
Thermal Solution:	Passive Heatsink
MSRP:	$149
Availability:	October, 2007

Quadro NVS 290 PCIe x1

PRODUCT SPECS:

Form Factor	ATX, 2.7” (H) x 6.6” (L) Single Slot
Frame Buffer:	256MB DDR2
Board Power:	21 W
Graphics Bus:	PCI-E x1 (250 MB/s)
Display Connectors	DMS-59 [2 DVI-I]
Thermal Solution:	Passive Heatsink
MSRP:	$149
Availability:	October, 2007

NVIDIA Confidential

Driving Uncompromised Performance for the Entry Level Segment

Quadro FX 570

Entry-level professional graphics with uncompromised features

PRODUCT SPECS:

Form Factor	ATX, 4.7” (H) x 6.6” (L) Single Slot
Frame Buffer:	256MB DDR2
Board Power:	38 W
Display Connectors	2x DVI-DL
Thermal Solution:	Active Heatsink
MSRP:	$199
Availability:	October, 2007

Quadro FX 370

Entry-level professional graphics at a breakthrough price

PRODUCT SPECS:

Form Factor	ATX, 4.7” (H) x 6.6” (L) Single Slot
Frame Buffer:	256MB DDR2
Board Power:	33 W
Display Connectors	1x DVI-DL + 1x DVI-SL
Thermal Solution:	Active Heatsink
MSRP:	$149
Availability:	October, 2007

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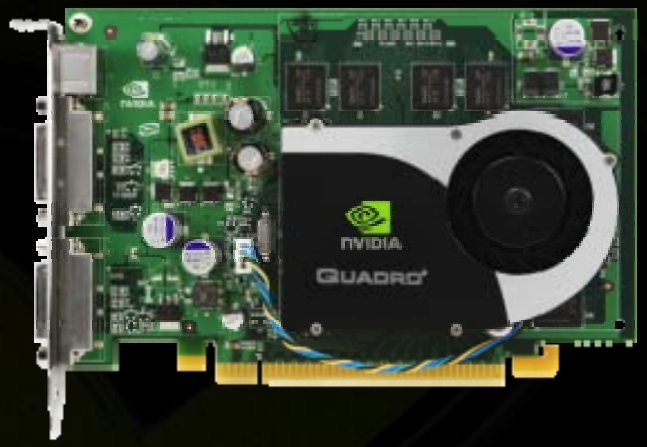
Driving Exceptional Price/Performance for the Professional



Quadro FX 1700

PRODUCT SPECS:

Frame Buffer:	**512MB**
Board Power:	**42 W**
Display Connectors	**2x DVI-DL**
Thermal :	**Active Fansink** **4-pin fan control**
Dimensions	**ATX 4.36” (H) x 6.60” (L)** **Single Slot**
Output	**Dual Dual-Link DVI** **HD-Out**
MSRP:	**$699**
Availability:	**October, 2007**

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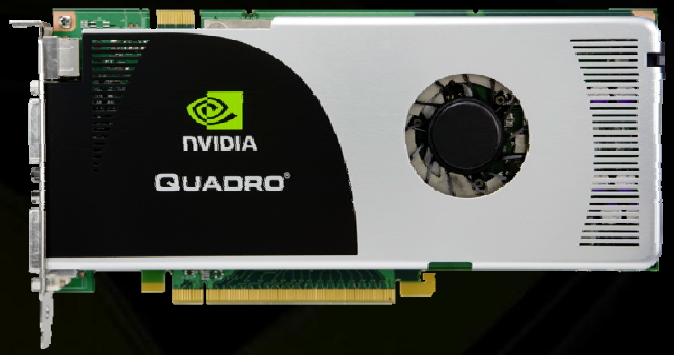
The Ultimate Performance for the Professional



Quadro FX 3700

PRODUCT SPECS:	
Frame Buffer:	**512MB**
Board Power:	**~100w**
Power Connectors	1 x External 2x3
Bus	**PCI Express Gen 2**
Thermal :	**Active Fansink**
Dimensions	**Full ATX** **10-L, 9.0" x 4.375"** **Single slot**
Output	**Dual Dual-Link DVI** **Stereo**
MSRP:	**TBD**
Availability:	**TBD**

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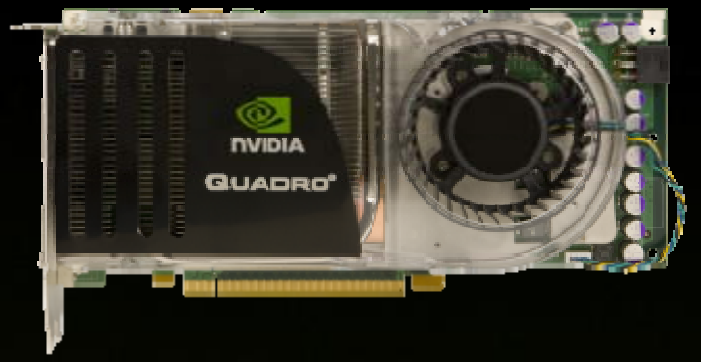
Ultra High End Visual Computing



Quadro FX 5600

CRITICAL SPECS:	
Frame Buffer:	1.5 GB
Memory Bandwidth:	76.8 GB / sec
Board Power:	171 W
Power Connectors:	2 auxiliary (6 pin)
Dimensions:	Dual Slot x 12 inch length
Outputs:	Dual Dual-Link DVI Stereo
Options:	G-Sync II, SDI II, SLI
MSRP:	$ 2,999
Avail:	Now

Quadro FX 4600

CRITICAL SPECS:	
Frame Buffer:	**768 MB**
Memory Bandwidth:	**57.6 GB / sec**
Board Power:	**134 W**
Power Connectors:	**1 auxiliary (6 pin)**
Dimensions:	**Dual Slot x 9 inch length**
Outputs:	Dual Dual-Link DVI Stereo
Options:	G-Sync II, SDII, SLI
MSRP:	$ 1,999
Avail:	Now

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Workstation Features and Benefits

Features	Benefits	Products
Unified Architecture	Higher GPU efficiency resulting in significant performance improvements for all the workflows and application segments	All
GPU Computing	NVIDIA CUDA provides a C language environment and tool suite that unleashes new capabilities to solve complex, visualization challenges such as real-time ray tracing and interactive volume rendering.	All
Shader Model 4.0	• More programmability and advanced features for developers, which translates into faster performances and more photorealistic effects for end users • Future Vista readiness	All
10-bit/color outputs	Larger color ranges – image accuracy	All
HW Accelerated Pixel Read Back	Ultra-fast pixel read-back performance delivers massive host throughput, more than 10x the performance of previous generation graphic systems.	All

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Workstation Features and Benefits

Features	Benefits	Products
Jumbo (8k) textures	Faster & simpler processing of texture resulting in higher performances	All
FP-32 filtering and blending	High quality image processing	All
Fast 3D Textures	Faster volumetric rendering resulting in more interactive visualization	All
NVIDIA SLI Technology	Multi Display, multi GPU processing	Quadro FX 5600, 4600 and 3700
Genlock Option	Multiple synchronized outputs for power walls, simulators, caves and other immersive environments	Quadro FX 5600 and 4600
SDI Option	Broadcast quality output from the graphics card	Quadro FX 5600 and 4600
ISV Certifications	Compatibility/tuning with applications	All

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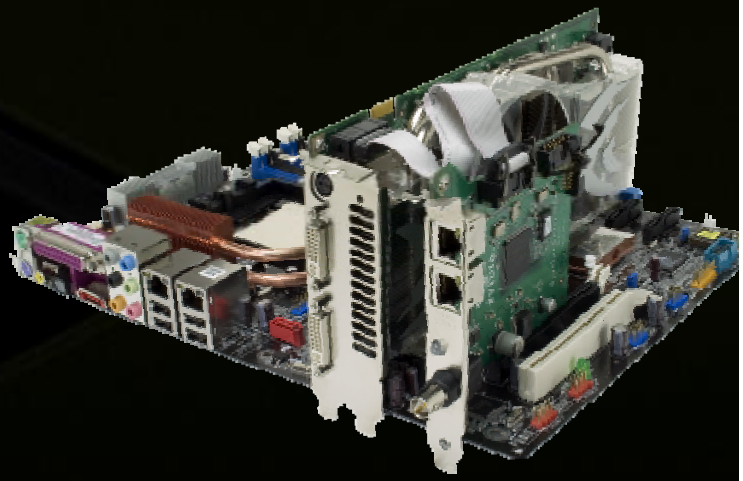
NVIDIA Quadro G-Sync II

Simple and flexible hardware integration

- Enables:
  - Genlock
  - Framelock
  - Single System Power-Wall
- Compatible with New Ultra High End cards:
  - NVIDIA Quadro FX 5600
  - NVIDIA Quadro FX 4600
- Draws power from the graphic card
- ATX Form Factor, Compatible with any PCI-E or PCI slot
  - x1 PCI-E or PCI interface for mechanical stability only
- Connect to graphic card(s) through a 6” ribbon cable
- Standard RJ-45 connectors to daisy-chain systems in a clustered environment
- Not backward compatible with previous generation Quadro (FX 4500, 5500)



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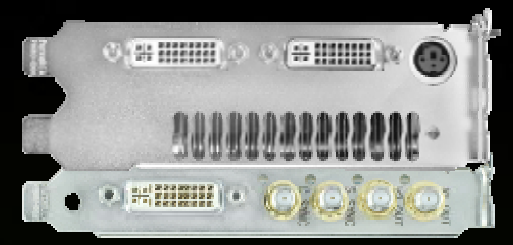
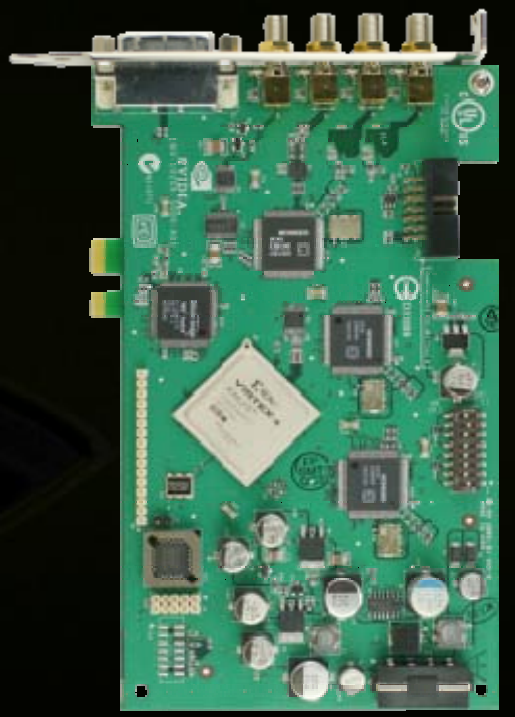
NVIDIA Quadro SDI

The Integrated Graphic to Video Solution

- 2K, HD and SD formats
- uncompressed 8-bit, 10-bit or 12-bit SDI
  - 2 Channels Fill or
  - 1 Fill and 1 Key
- YUV/RGB 4:2:2 or 4:4:4 or 4:4:4:4
- Fully programmable Quadro GPU
- DVI for Previews on CRT/FP
- House Sync external analog or digital
- Windows & Linux Support
- Control Panel or API control
- Works on top of current applications!





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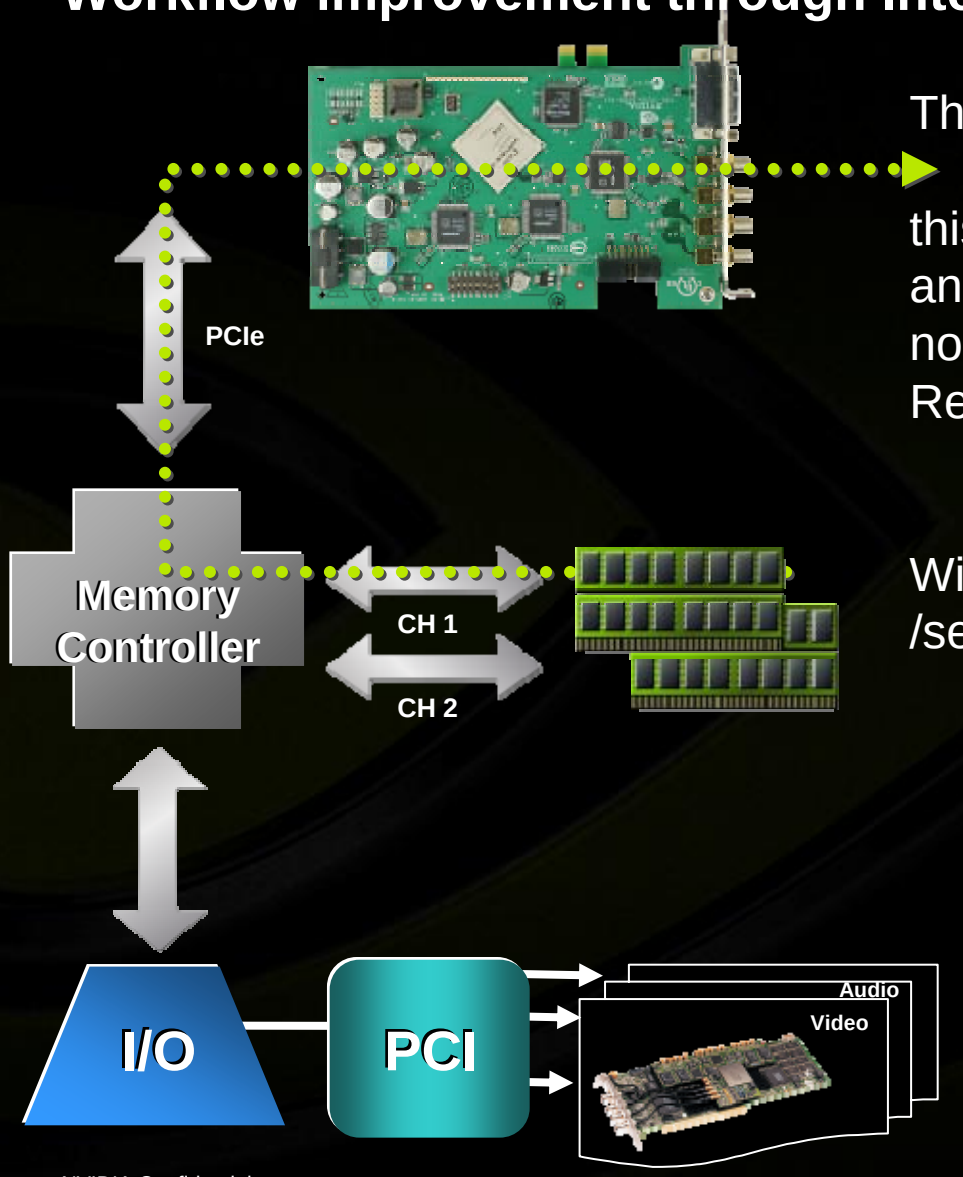
NVIDIA Quadro FX SDI

Workflow improvement through Integrated Design



Theoretical bandwidth requirement for HD
= 2x 250MB/s = 512MB/s
this assumes switching between read back and drawing is 100% efficient and seamless, no dynamic textures, etc.
Reality is more like 1 to 3GB/sec

With NVIDIA Quadro SDI, you free up 2GB /sec and truly enable real time effects on HD!

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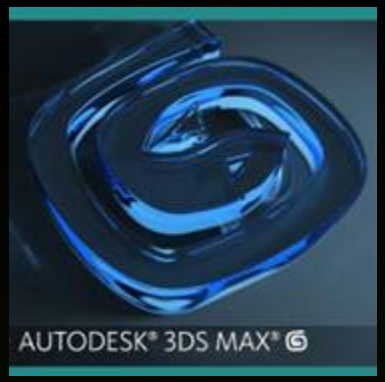
NVIDIA MAXtreme 9 (D3D)

- Application performance driver developed in close collaboration with Autodesk for 3ds Max 9
- up to 103% performance increase
- 3ds Max Installed Base = 60K+ active seats



Sub-Categories	MAXtreme 9 D3D	Default DX Driver	Increase
[1]Particle Test	16.27	228.42	1,400% (14X)
[2]Scene Creation	5.87	2.89	103%
Object Creation/ Editing/Manipulation	6.06	4.68	29%
Shaded Graphics	2.74	2.21	24%

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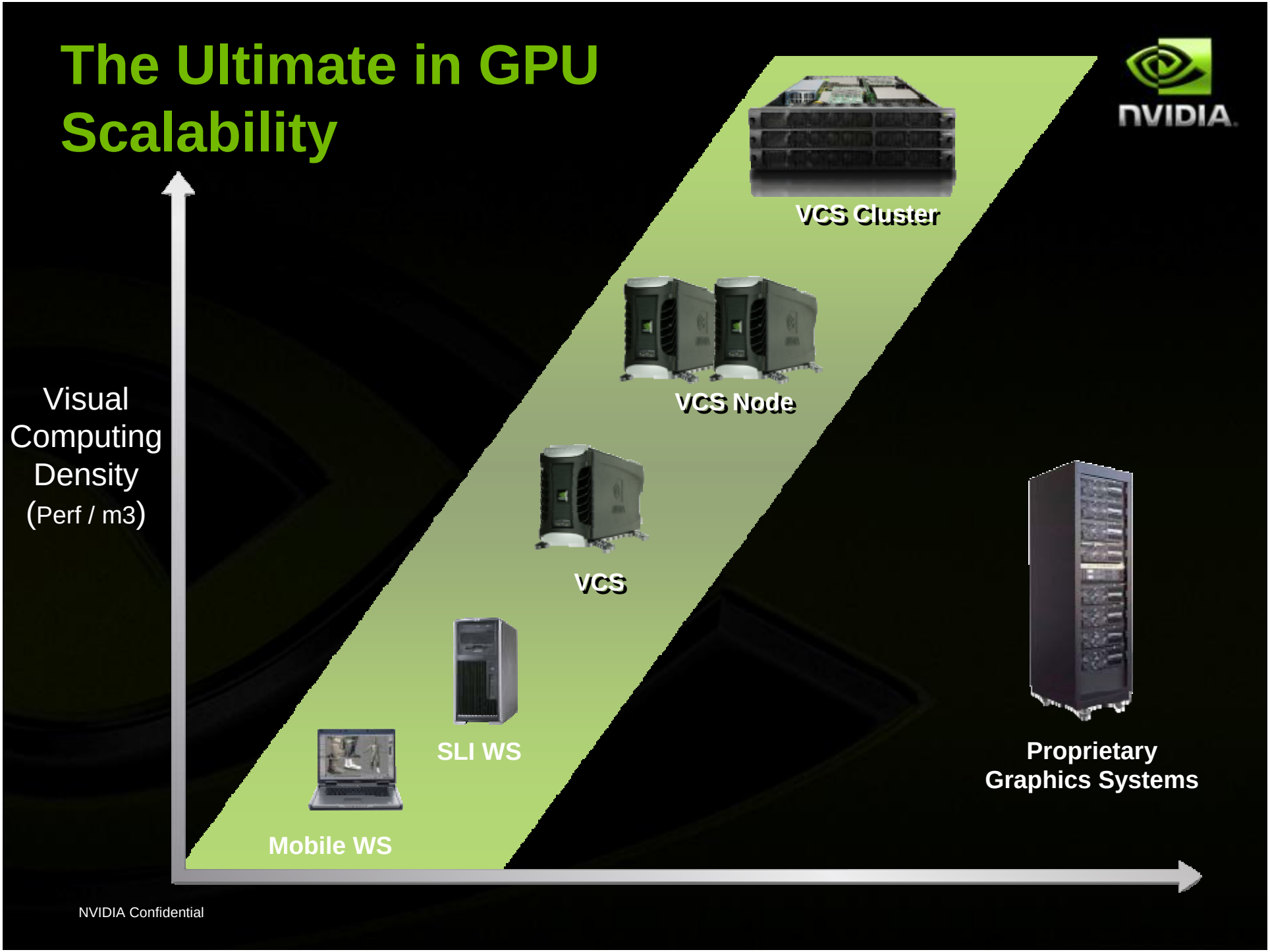
The Ultimate in GPU Scalability



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Typical On-Air Broadcast Applications

- News, Weather and Sports
- Virtual Sets (studios)
- Telop, character generators

- Solution providers:
  - VizRT, Brainstorm, RTSoftware
  - Sportvision, PVI, Traffic.com
  - Accuweather, WSI, Weather Central
    - ALL NVIDIA Customers!

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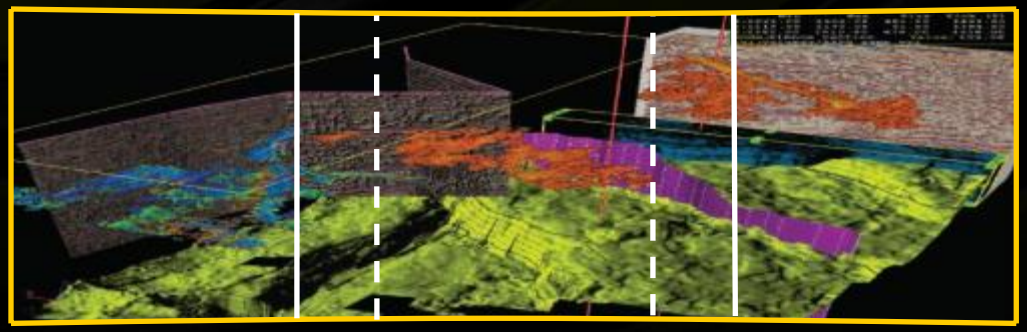
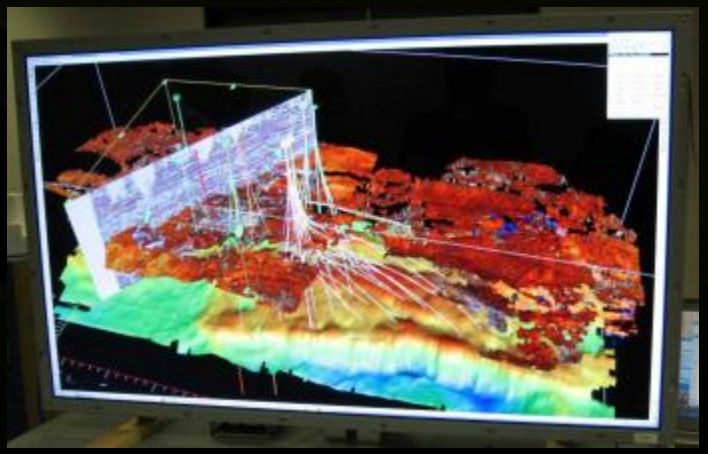
Image courtesy of WSI, Brainstorm and VizRT

NVIDIA Quadro® Plex

- External Dedicated Visual Compute System
- Massive Visual Compute Density
- More scalable, more configurable than any graphics solution ever built
- Remote Visualization

Image courtesy of PSA Peugeot Citroen





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