

**NVIDIA**®

**NVIDIA Quadro Plex VCS**

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**Ian Williams and Mark Harris**  
**Graphics Hardware 2006**

# NVIDIA's Businesses

## Multiple Growth Engines



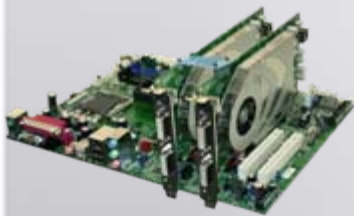
### GPU

Graphics  
Processing Units



### MCP

Media and  
Communications  
Processors



### PSG

Professional  
Solutions  
Group



### Consumer Electronics



### Handheld GPU



# NVIDIA Quadro Professional Solutions



## PSG

Professional  
Solutions  
Group



- Dominant brand of professional graphics solutions
- Powering the most advanced solutions in the world
  - Visualization – Boeing, Porsche, BMW
  - Medical Imaging – Massachusetts General
  - Scientific Computing – Los Alamos, Sandia
  - Film Production – Disney, ILM, Dreamworks
  - Broadcast Graphics – ESPN, CNBC, CNN
- System solutions with NVIDIA technology

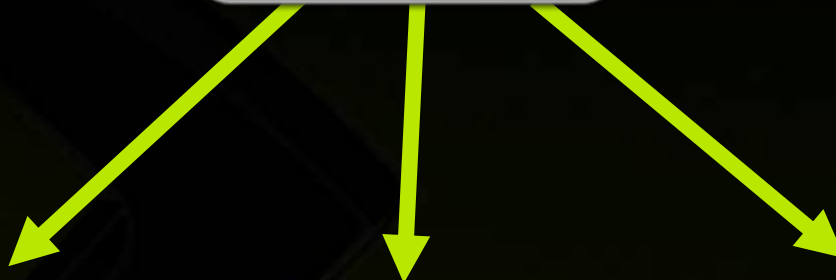


# NVIDIA Quadro Customers





# 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 4000SDI  
NVIDIA Quadro G-Sync

**NVIDIA**  
**QUADRO PLEX** A New Category of Visual Computing Systems



# NVIDIA Quadro<sup>®</sup> Plex



- External Dedicated *Visual Computing System*
- Massive Visual Computation Density
- Discontinuity in Desktop Graphics Power
- Complete, configurable, scalable



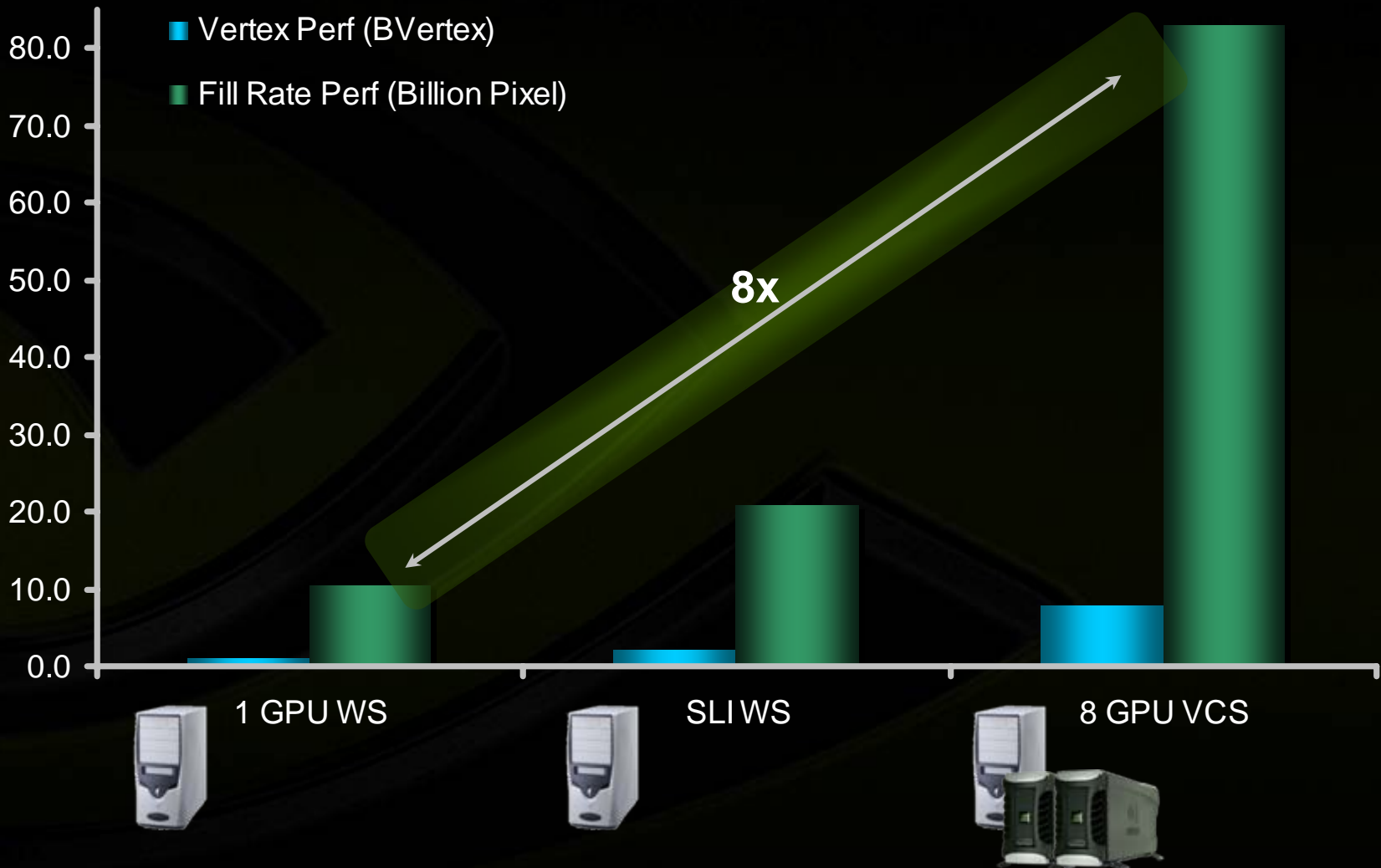
# Massive Visual Compute Density



- **Up to 8 NVIDIA Quadro GPUs in a single *VCS node***
  - 2 NVIDIA Quadro Plex attached to a SLI-capable system
- **Easily deployed in a wide range of environments**
  - Compact, ultra-quiet design fits in any desktop workspace
  - Fits into any standard 19" rack mount environment

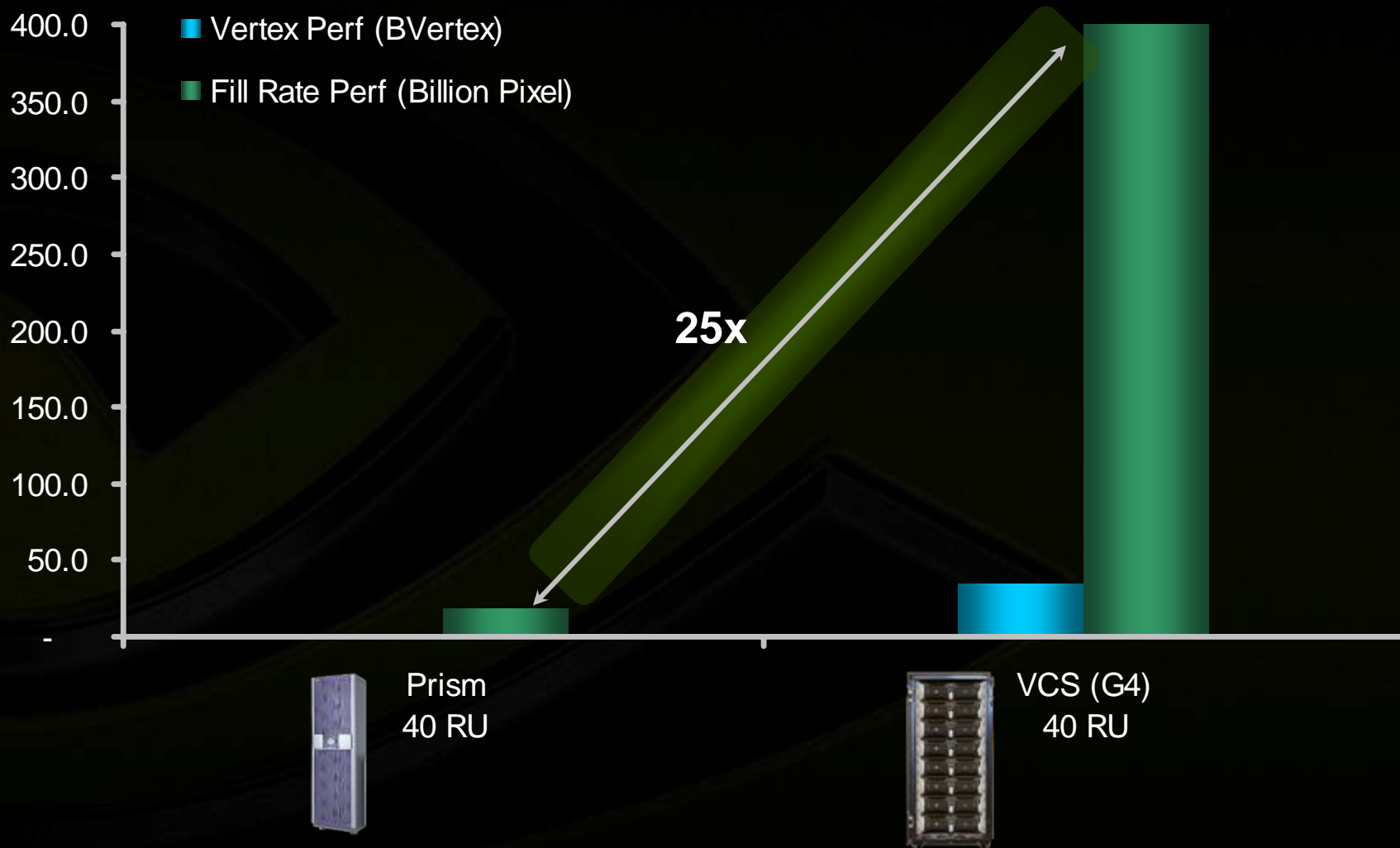


# Record Desktop Graphics Power



# Server Room Discontinuity

## 25X Visual Compute Density!

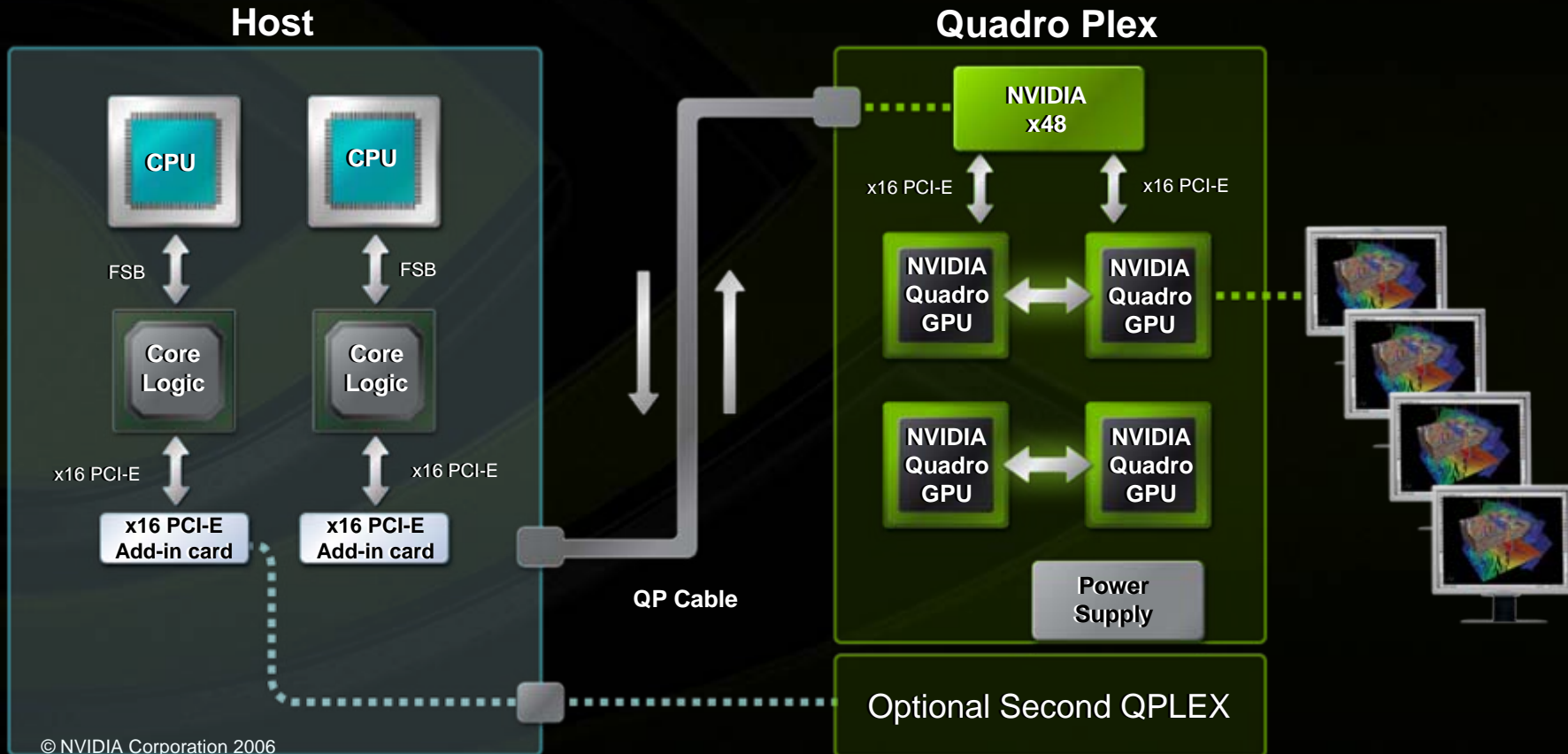


# NVIDIA Quadro<sup>®</sup> Plex

## Product Definition



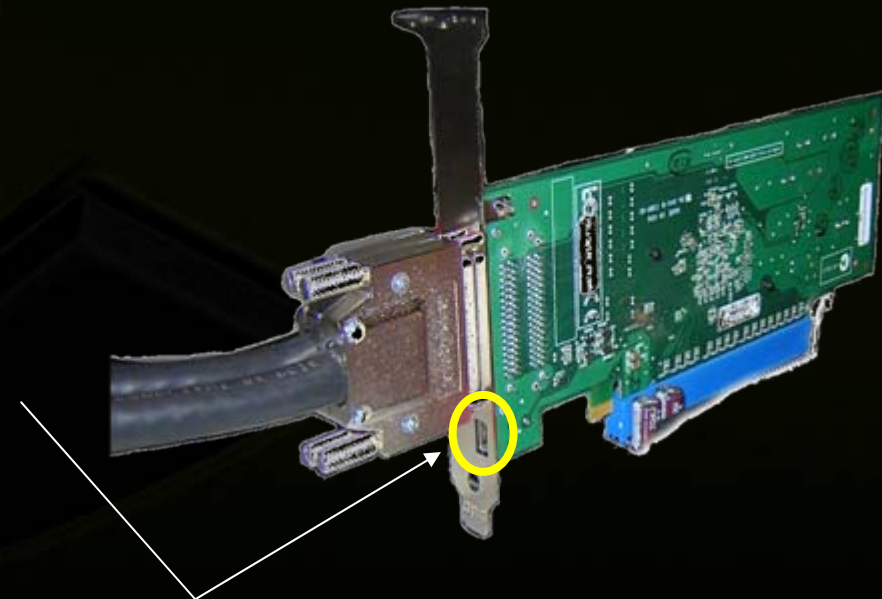
- Compatible with any certified PCI Express x16 system or platform
  - (x8 coming soon)
- NVIDIA Quadro GPUs and option boards
- NVIDIA SLI Multi-GPU technology



# NVIDIA Quadro<sup>®</sup> Plex Interface



- Quadro Plex Interface Card (QPIC)
  - Designed to Fit any Host
  - PCI Express x16
  - <10W Total Power / Passive Cooling
  - Lo-Profile (bracket ships with system)
- Dual Interconnect Cables (Host → Quadro Plex)
  - Length : 2m ( 6.5ft )
  - Bend radius: 18cm ( 7 in)
- USB
  - Signal from host through QP cables
  - 2 USB 2.0 ports on front of QP
    - USB is FULL SPEED ( 12Mbit/sec ) not Hi-Speed ( 480 Mbit/sec )
    - i.e. for hardware dongles, etc.



# NVIDIA Quadro<sup>®</sup> Plex



Available in 3 Models:



NVIDIA Quadro Plex 1000

Model I



NVIDIA Quadro Plex 1000

Model II



NVIDIA Quadro Plex 1000

Model III



# NVIDIA Quadro<sup>®</sup> Plex 1000 – Model I



- 2 NVIDIA Quadro FX 5500 GPUs
  - G71, 1GB VRAM
- 1 NVIDIA Quadro G-Sync option boards
- 1 to 4 Channels
- 32X SLI FSAA (max on single channel)
- “Power Desktop” System



# NVIDIA Quadro<sup>®</sup> Plex 1000 – Model II



- 2 NVIDIA Quadro FX 4500 X2 GPUs
  - G71, 512MB VRAM x2
- 2 NVIDIA Quadro G-Sync option boards
- 1 to 8 channels
- 64X SLI FSAA (max on single channel)
- “Viz Center” System



# NVIDIA Quadro<sup>®</sup> Plex 1000 – Model III



- 2 NVIDIA Quadro FX 5500 GPUs
  - G71, 1GB VRAM
- 2 NVIDIA Quadro SDI option boards
- 1 to 4 channels
  - 2 dual-link DVI + 4 single-link HD SDI  
or
  - 2 dual-link DVI + 2 dual-link HD SDI
- 32X SLI FSAA (max on single channel)
- “HD Broadcast” System



# NVIDIA Quadro<sup>®</sup> Plex



## *Rack Mounting*

- Quadro Plex Rackmount Kit
  - Orderable as Optional Kit
  - 1 Kit PER Quadro Plex
  - ~ 15 minute operation
- Rack 2 Quadro Plex per 3U
  - Enables 8 GPU per 3U
  - 16 Display Channels per 3U





# NVIDIA Quadro<sup>®</sup> Plex

## *Target Markets*



- **Power Desktop**

- Oil and Gas, CAE/CFD, High-end MCAD, ....

- **Viz Center**

- Styling and Design Review, Oil and Gas, ....

- **HD**

- Broadcast graphics, NLE, Film, ....

- **SuperCluster**

- Flight Simulation, Visualization Clusters, ....



# NVIDIA Quadro<sup>®</sup> Plex Power Desktop



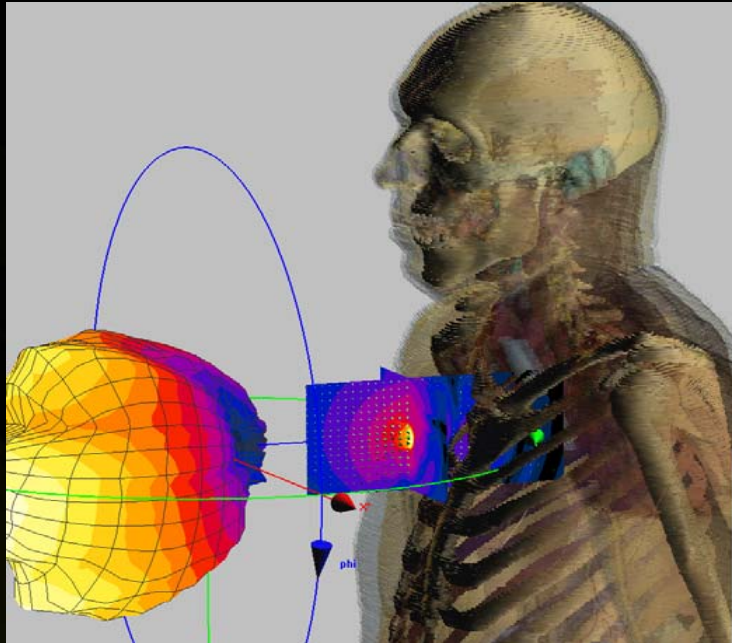
- 1 GB Volumetric Data
- 5k x 3k Personal Workspace



Image courtesy of IBM



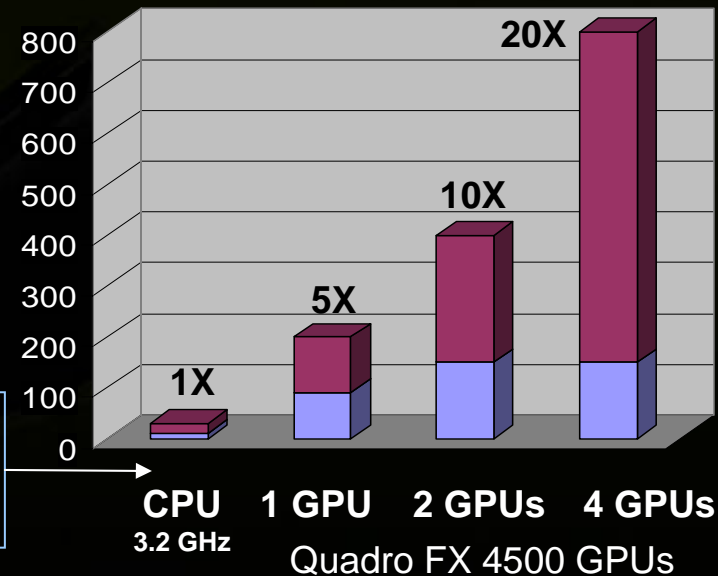
# Electromagnetic Simulation



Pacemaker with Transmit Antenna

- 3D Finite-Difference and Finite-Element
- Modeling of:
  - Cell phone irradiation
  - MRI Design / Modeling
  - Printed Circuit Boards
  - Radar Cross Section (Military)
- Large speedups with Quadro GPUs

Performance (Mcells/s)



Commercial, Optimized,  
Mature Software  
Single CPU, 3.2 GHz

# NVIDIA Quadro® Plex Viz Center



- Massive rendering power
- Breakthrough Image Quality
  - 32x, 64x SLI FSAA
- Continuous Canvas



Image courtesy of PSA Peugeot Citroen



# NVIDIA Quadro® Plex HD



- Quad HD SDI
- Native Sony SXRD 4K at 12-bit
- Deployable in back-room & mobile broadcast trucks



Image courtesy of Sportvision





# NVIDIA Quadro<sup>®</sup> Plex SuperCluster



- Cluster “*n*” Quadro Plex Nodes for Massive Visual Compute Density
- Up to 148 MPixel per system
- Massive Simultaneous rendering and computing

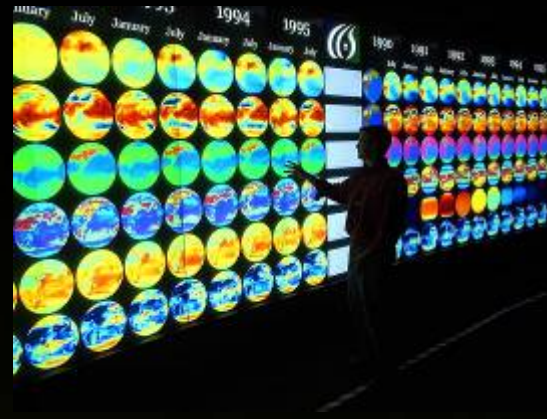


Image courtesy of Oak Ridge National Labs







# **NVIDIA Quadro® Plex**

## **Classifying Usage Scenarios**

- **Scenario 1 - Multiple Channels/Pipelines**
- **Scenario 2 - Multiple GPUs/Cores**
- **Combinations of Scenario 1 & 2**
- **All Driven by need for scalability and high GPU density**

# NVIDIA Quadro<sup>®</sup> Plex

## Example Usage Scenarios

### Multi-Channel Capability

- **Single System Image –reduced programming complexity**
- **Synchronized scan out and swap buffers via G-sync**
- **“Cluster in a box”**
- **Different levels of transparency/complexity:**
  - **Single “stretched” Application Window**
  - **Multi-threaded application, multiple contexts**

# NVIDIA Quadro<sup>®</sup> Plex

## Example Usage Scenarios

### Multi-Channel – Sony SXRD 4K Projector

- Total resolution 4096x2160 @ 60Hz
  - ~531 M Pix/s
- Four separate input channels
  - DVI - 2048x1080@60Hz per input
  - SDI –1920x1080@48Hz per input
- 10bit support
- NVIDIA Quadro<sup>®</sup> Plex is unique solution to drive all four channels at full resolution



# NVIDIA Quadro® Plex & Sony SXRD 4K Projector



- Demonstrated driving all four channels at native 4096x2160 resolution and synchronized SIGGRAPH 2006





# NVIDIA Quadro<sup>®</sup> Plex

## Example Usage Scenarios

### Visual Compute Density

- Multiple GPUs/Core per hosts/CPU(s)
- Off-screen rendering
- Access to additional GPUs combined with Graphics
- GPGPU Clusters



# NVIDIA Quadro<sup>®</sup> Plex Example Usage Scenarios



## *The “GPU Super Computer”*

- VCS Node forms the building block
- Massive Computational Density
  - 5U = 4 CPU / 8GPU (3U VCS / 2U server)
  - 7U = 8 CPU / 8GPU (SUN G4 server)
- **1.5 Teraflops / 3U**
  - Only counting pixel shader MAD units
  - Quadro FX 4500 X2



# NVIDIA Quadro® Plex Summary



- **Defines a new category – Visual Computing System**
- **Represents a massive discontinuity in visual quality, performance and scalability**
- **Uniquely addresses a wide range of high-GPU density applications**
- **A significant step forward for the multi-channel advanced visualization market**