



Visualization @ SUN

Shared Visualization 1.1 Software
Scalable Visualization 1.1 Solutions

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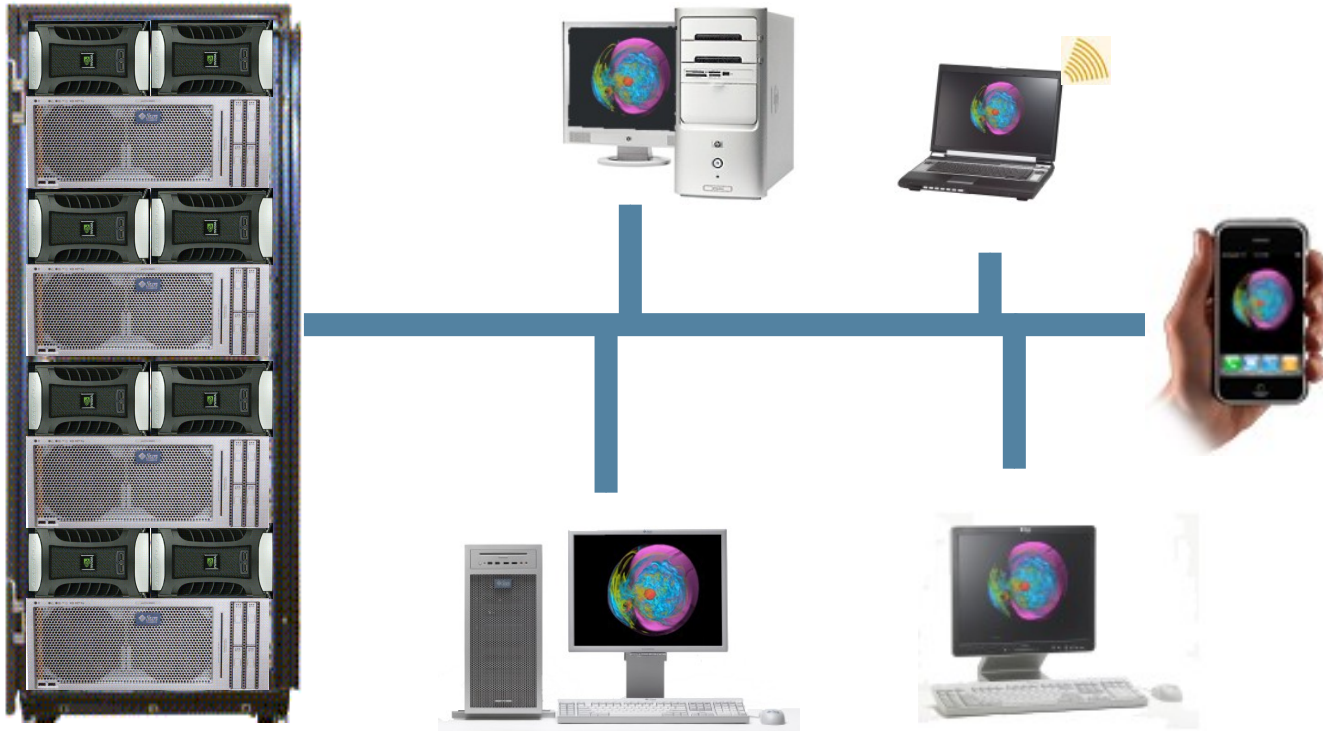


The Data Tsunami

Visualization is needed to
analyze the flood of data
from petascale computers

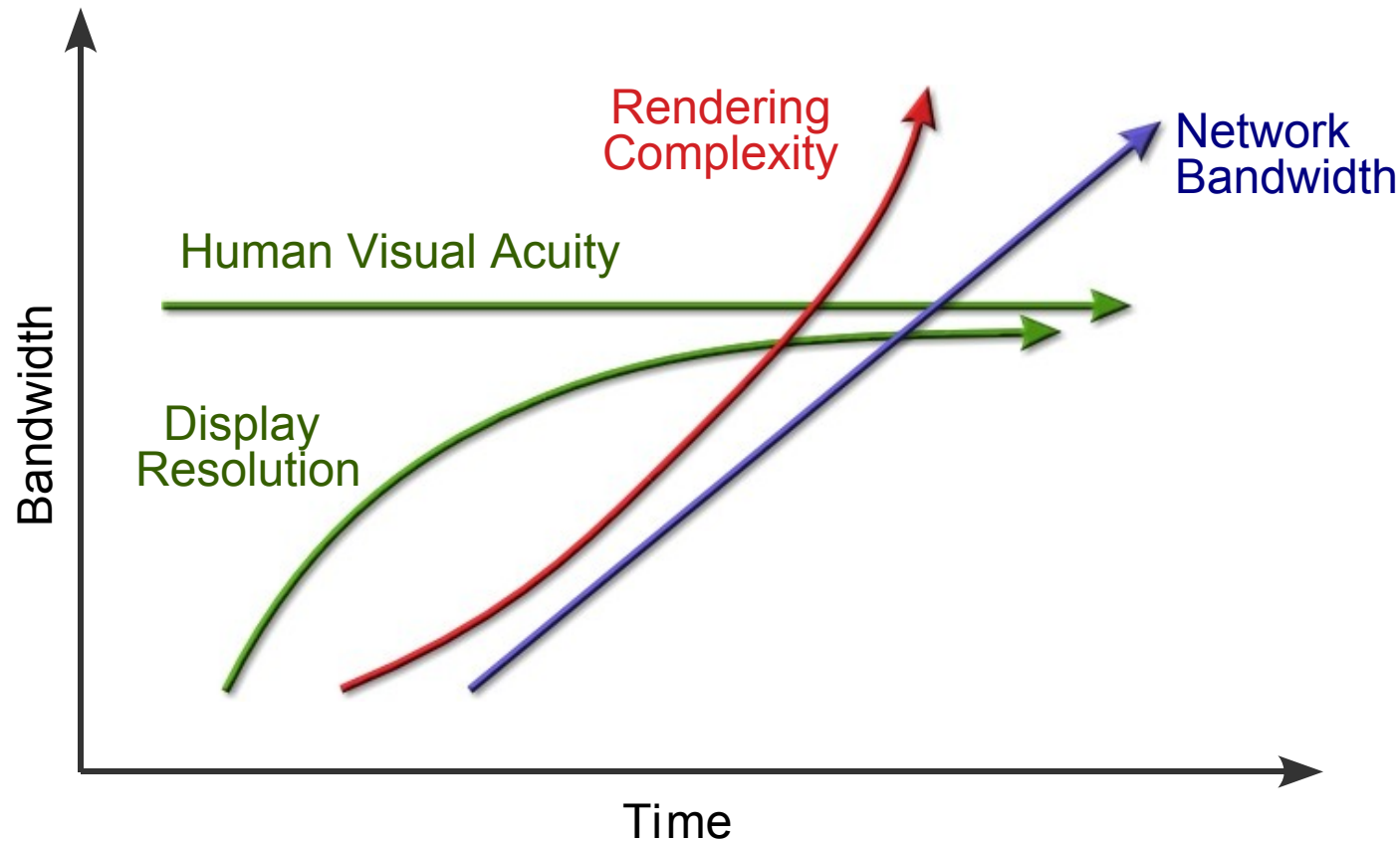
Huge Data Overwhelms Networks (and the Workstations Attached to them)

How do we solve this problem? Change the model!



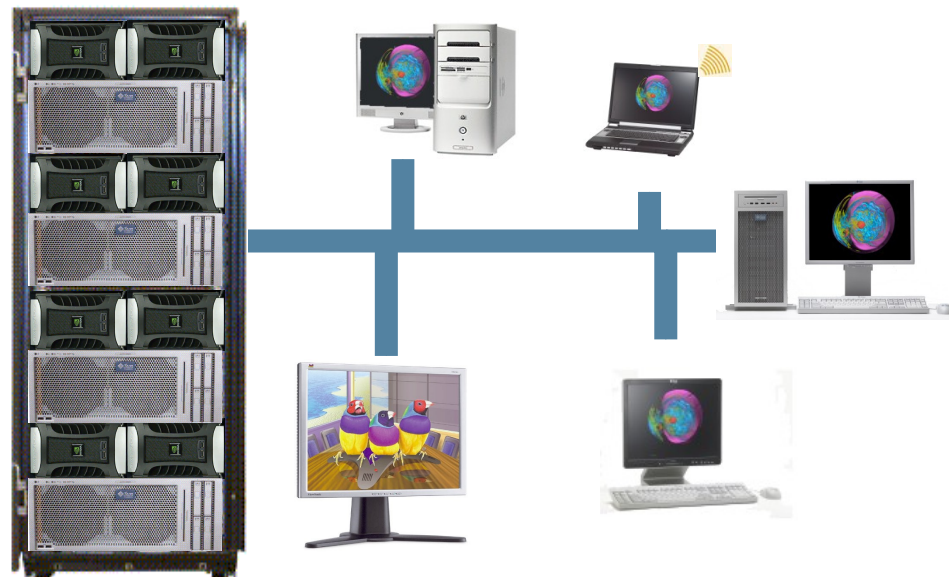
Big Data, Big Memory, Lots of CPU, Lots of Graphics Power
Keep Heat and Noise in the Server Room, Secure

Transition Point Has Been Reached Time to Send Images Rather than Data



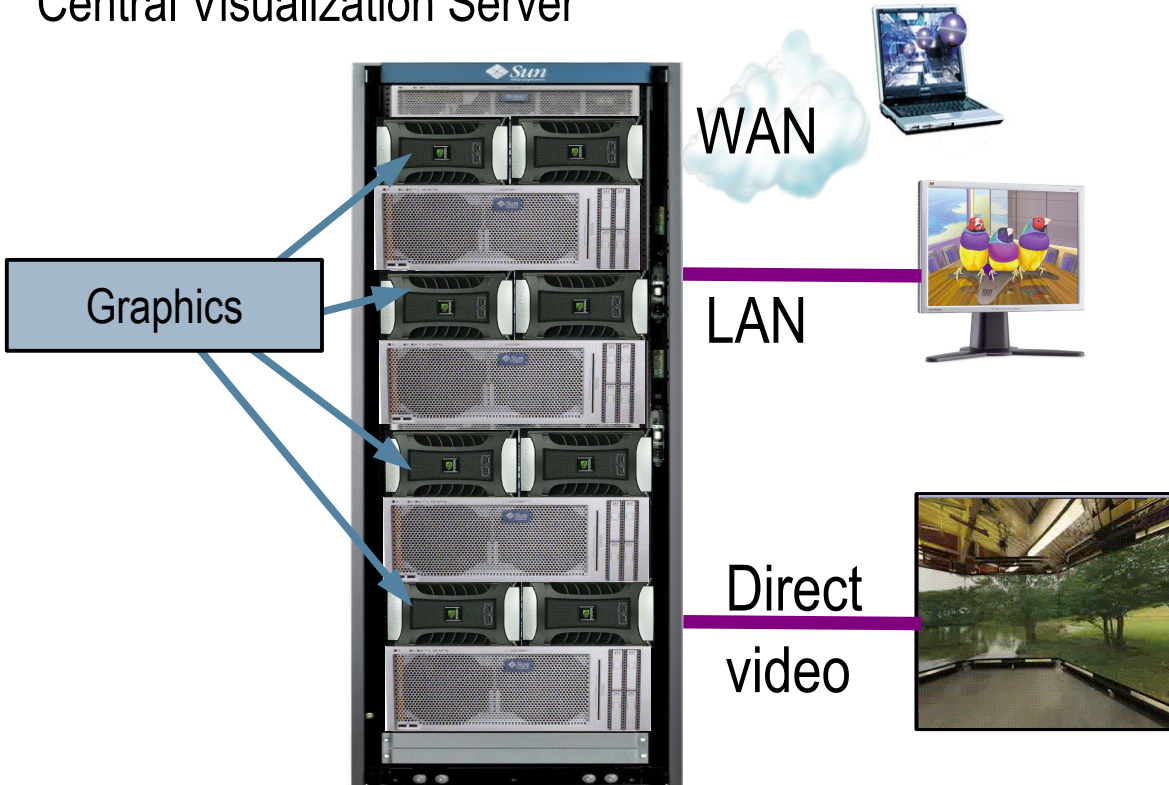
Motivations for Remote Visualization

- Understand and act upon increasing quantity and complexity of data – need to scale up visualization resource
- More and better utilization of resources – cost savings as well as accessibility
- Collaborate with geographically dispersed colleagues
- Secure proprietary data and control access
- Better management



Sun HPC Visualization Solutions

Central Visualization Server



Shared Visualization software provides secure access to 3D apps on a central resource

- > Transparently accessed from a variety of clients
- > Better utilization of resources
- > Access anytime from anywhere
- > Virtualizes Visualization

Scalable Visualization software to combine multiple devices for

- > Higher Performance
- > More resolution
- > Virtual Reality

Sun/UT-TACC Visualization Prototype

Circa 2004

Shared Visualization provides allocation of graphics resources and remote visualization services. Reservation system allows resources to be shared between power wall and remote users.

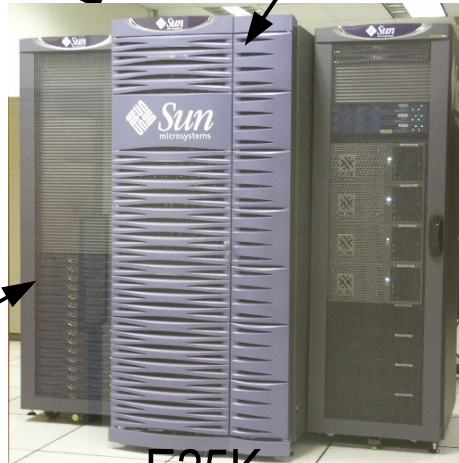


Dedicated IP network

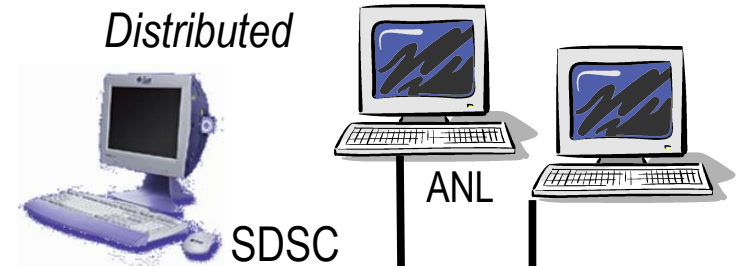
TACC

Prototype GridFB
PCI-E gfx in a box

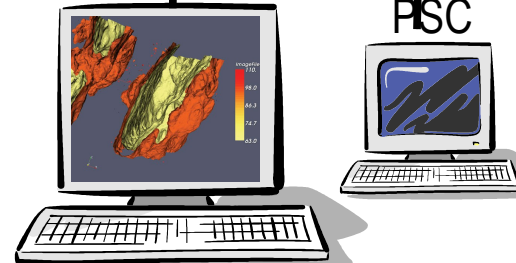
Scalable



E25K



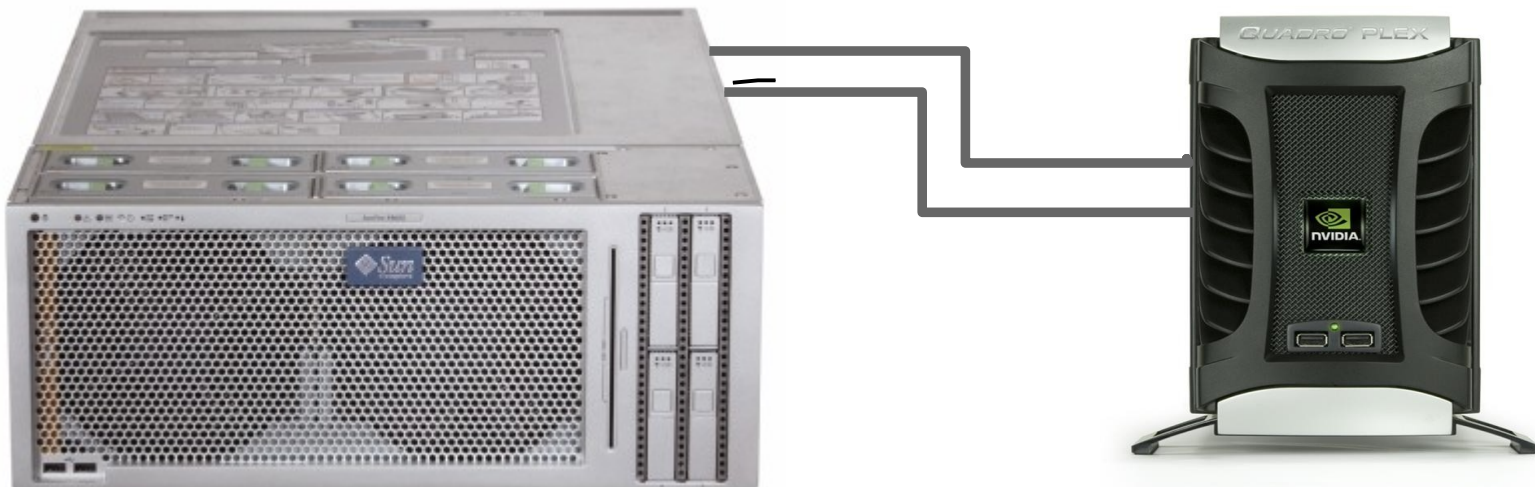
TeraGrid



U Texas Southwestern Medical Center
Chris Gilpin – 3D protein structures

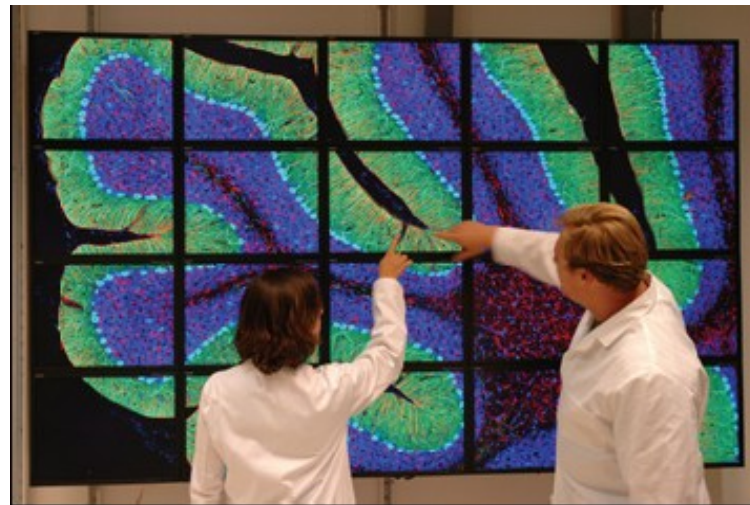
Scalable Solutions

- Problem 1
 - > Data too big for a workstation. Servers (with lots of processors and memory) do not have adequate power or cooling for an ultra-high-performance 3D graphics card
- Solution 1:
 - > Get the graphics card(s) out of the system

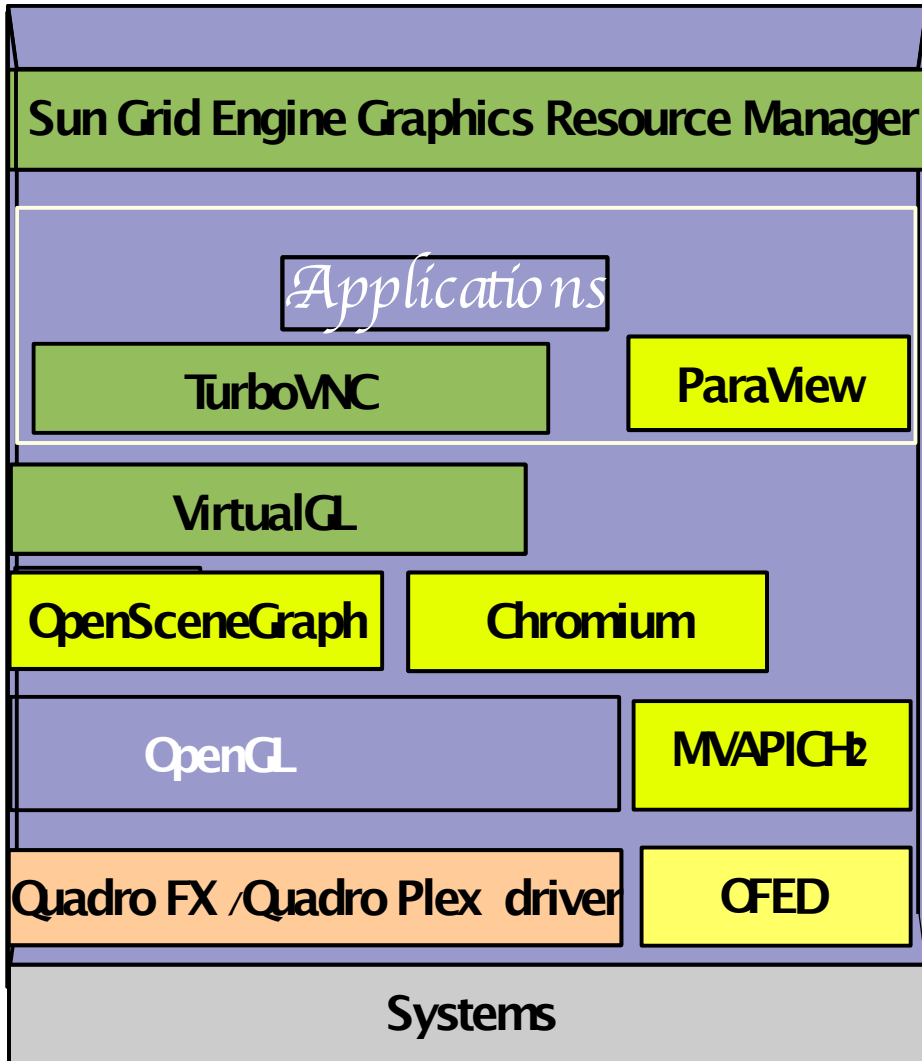


Scalable Solutions

- Problem 2
 - > Need to view data across many screens (more than can be supported in a single system) in order to view adequate detail
- Solution 2
 - > Scalable visualization software to distribute the rendering across many systems clustered with InfiniBand or 10 GigE



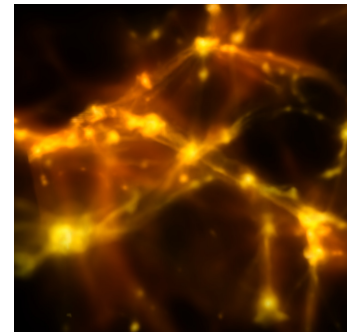
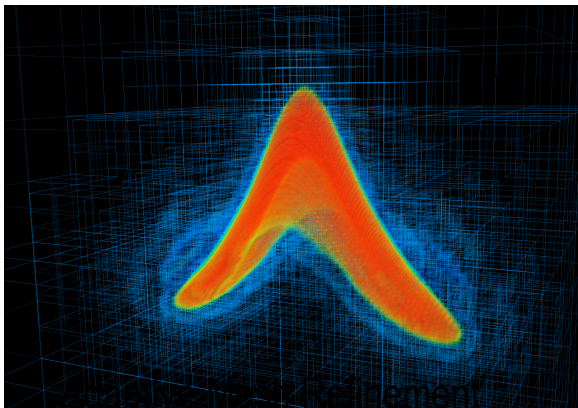
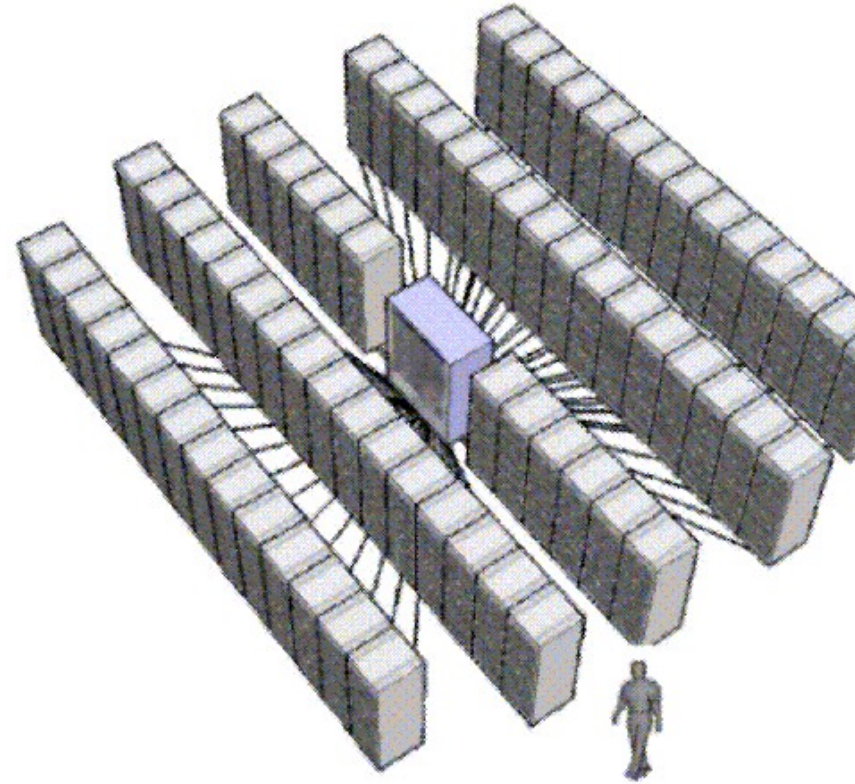
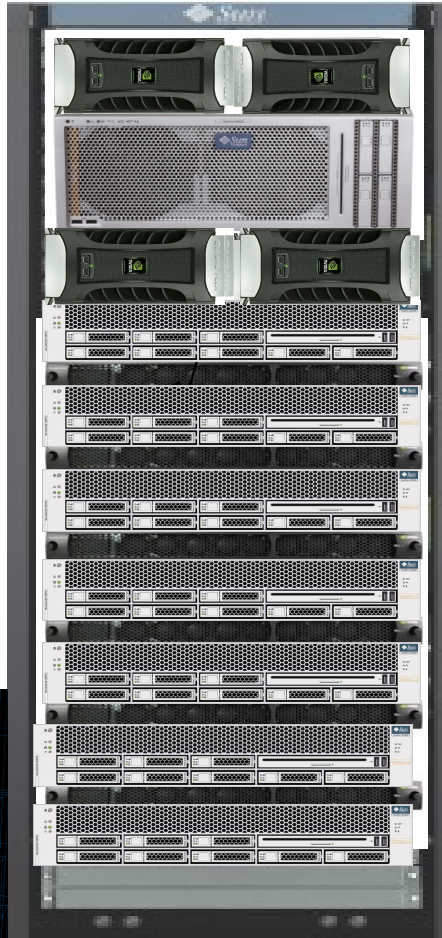
Sun Visualization Stack



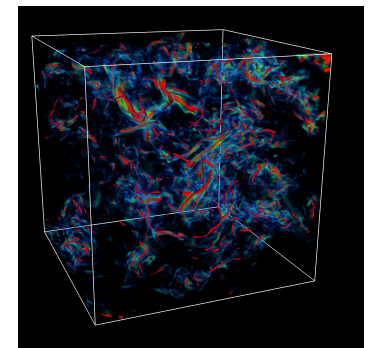
- **Shared Visualization software stack** - visualization services to a variety of remote clients
 - **SGE** – open source scheduler extended for graphics resource management
 - **VirtualGL** – open source remote access to accelerated 3D via any client over standard IP networks
 - **TurboVNC** – open source high-performance vncviewer and vncserver
- **Scalable Visualization software stack**
 - **ParaView** - open-source parallel rendering application optimized for SMPs with multiple graphics.
 - **OpenSceneGraph** - open-source parallel rendering toolkit for building parallel applications.
 - **Chromium** - virtualized graphics devices for Solaris or Linux. Provides transparent parallelization for fill-rate limited applications.
 - **MVAPICH₂/OpenMPI** - MPI for Linux/Solaris
 - **OFED** – IB for Linux (IB support incl in Solaris)
 - **Quadro Plex** - connects graphics devices to Linux or Solaris servers over a PCI-E cable
- **Systems - Sun Fire x64 & SPARC systems provide scalable platforms**

TACC Ranger Viz System

- IB connected thru Magnum switch
- 32 GPUs
- 128 cores
- > 1TB RAM
- Supports up to 128 remote Shared Viz clients



Galaxy Formation



Isotropic Turbulence

Visualization Infrastructure

- scale up hardware
- application-transparent middleware
 - > scale across multiple graphics devices and systems
 - > provide seamless remote access for interactive visualization
- But what about the applications?



THANK YOU.

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Sun Shared Visualization 1.1 Software

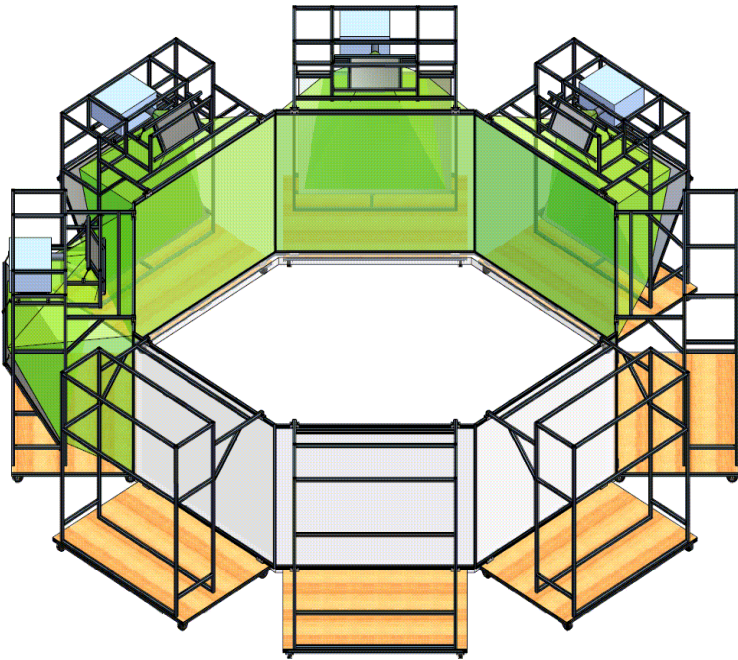
- Application transparent – no need to modify code
 - > Plugs into any Solaris/Linux OpenGL application
- High performance
 - > Redirects 3D rendering into accelerated pixel buffers on the server's graphics hardware
- Increased efficiency and security
 - > Sends only 2D screen images to client with optimized compression
- Supports many kinds of clients
 - > Solaris SPARC, Solaris x64, Linux , Windows, Sun Ray, Apple OS X (Intel)
- Easy access and management
 - > Central graphics resources managed using Sun Grid Engine software
 - > Automates configuration of VGL server
 - > Automates connecting and using VGL image transport
 - > Integration with Scalable Viz 1.1

Scalable Viz 1.1 Software Details

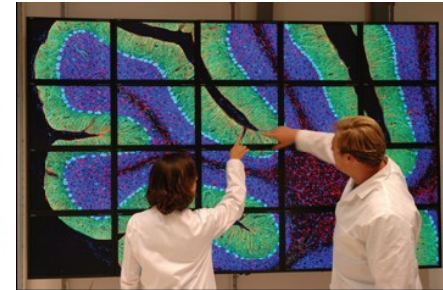
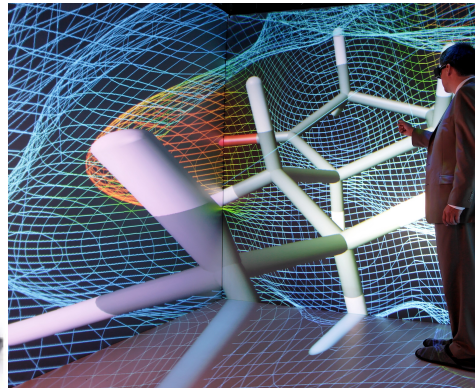
- Scalable Visualization software currently supports:
 - > Red Hat Linux (RHEL4U2 and later)
 - > SLES 10
 - > Solaris 10 U3
- Complete software stack
 - > Based on open source software (Chromium, MVAPICH2, OFED, OpenSceneGraph, Paraview)
 - > Sun added value:
 - > Pre-built binaries
 - > Installation scripts and configuration files
 - > Wrappers for greater ease of use
 - > MPI protocol support added for Chromium interconnect
 - > Supported on Sun hardware

Sun Scalable Visualization 1.1 Solution

- Supports non-coplanar configurations
- First installation: Eight-sided cave (oCtAVE) at Salford University, U K



Visualization servers come in many flavors



x4600/QP driving a cave and serving workstation and laptop clients



Cluster of x4600s driving a powerwall and serving WAN clients



M4000 serving ProE and Catia to Sun Rays