

Advanced Visualization Techniques

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Topics Covered

- Remote and Collaborative Visualization
- EnVision – simplified Interface for Visualization
- Visualizing and Animating a Time Series in Paraview
- VisIt
- Parallel Visualization

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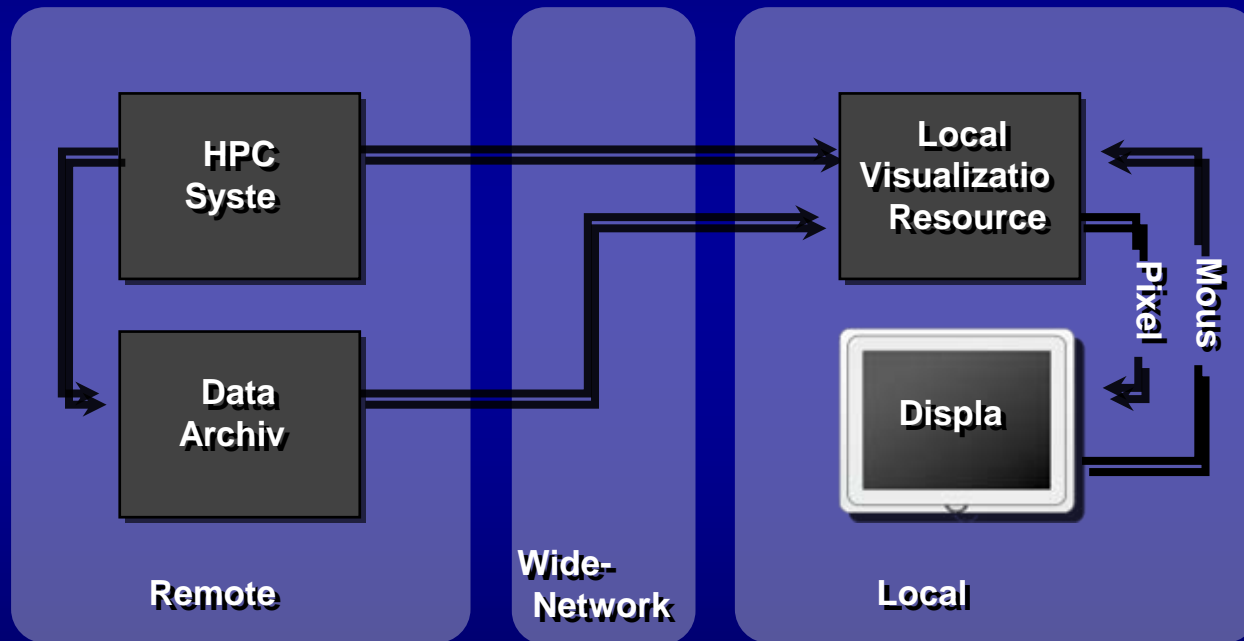
Remote Visualization Motivation

- It is no longer necessarily practical to move tera and peta-scale data from instruments or HPC systems to user's local site
- Certain data is sensitive (e.g. data from industry, government, academia)
- Growth of data has outstripped the graphics capabilities of single GPUs and aggregation of GPUs requires specialized knowledge

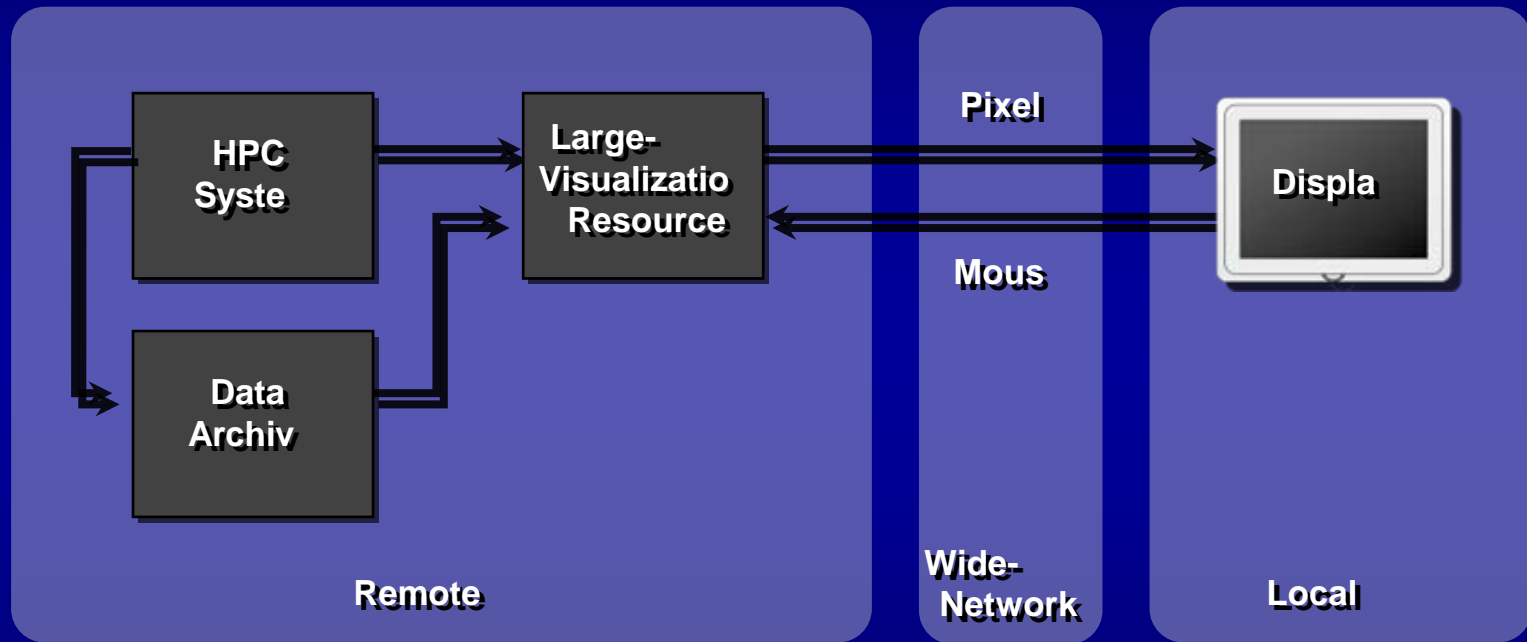
Remote Visualization Challenges

- Latency (wide-area network and GPU read-back)
- Quality of service and the user interface (scheduling, ease of access, and usability)
- Wide-area network bandwidth
($1280 * 1024 * 12 * 24 = 360$ MBps uncompressed)

Old Model (No Remote Capability)

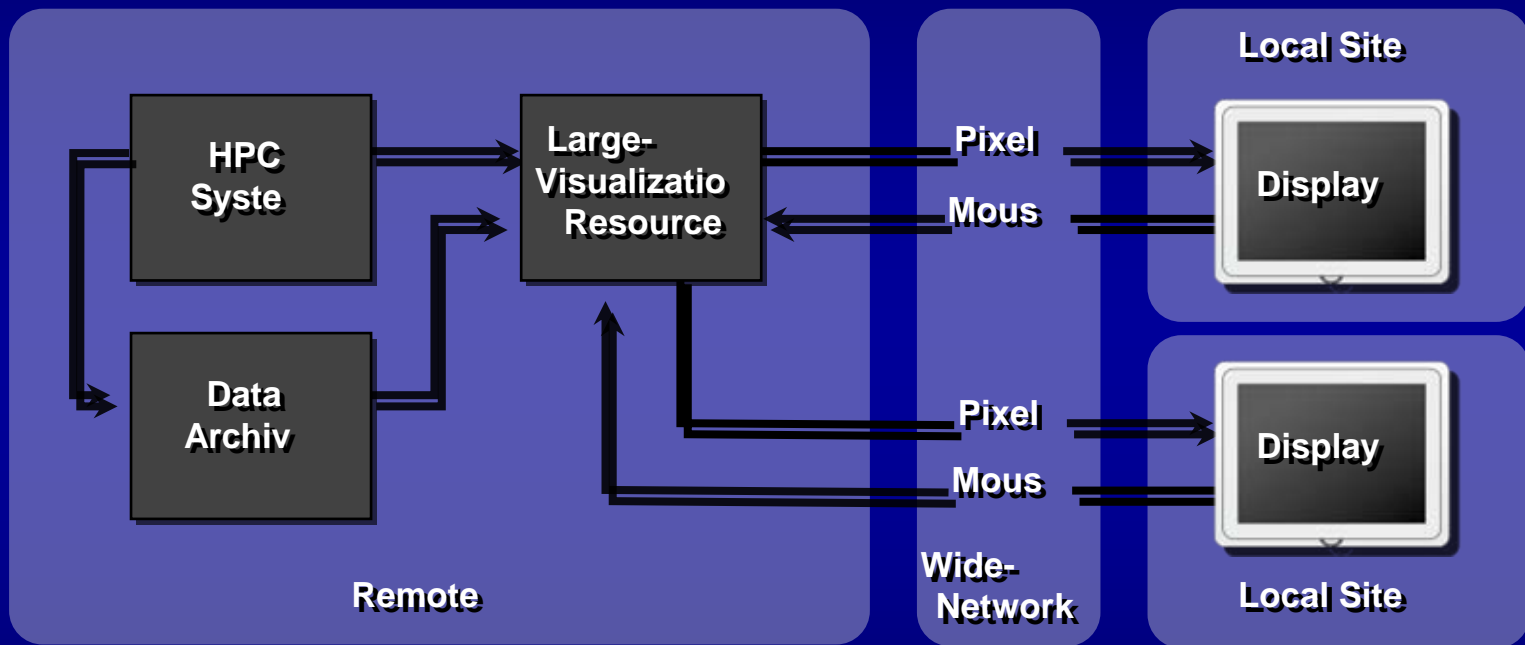


New Model Remote Capability



New Model

Multi-User and Collaborative Capability



Starting a Remote Visualization Job on Maverick (Lab Exercise)

Step 1: Download a vnc client. Recommended option
is TurboVNC which can be downloaded from:

<http://www.virtualgl.org/Downloads/TurboVNC>

Step 2: ssh maverick.tacc.utexas.edu



Starting a Remote Visualization Job on Maverick (Lab Exercise)

Step 3: On maverick, set up your vnc password. This only needs to be done once, but is attached to the machine you are currently logged into.

Type 'vncpasswd' and hit return. This will prompt you for a password. Type in something that you can easily remember and hit enter. You will then be asked to verify the password.

Step 4: type

qsub = Method to submit job to the queue

-l h_rt=1:00:00 sets the job run time to 1 hour

-l gfx=1 requests 1 graphics card

/usr/local/qsub/RUN.vnc is the script to start the vnc session



Starting a Remote Visualization Job on Maverick (Lab Exercise)

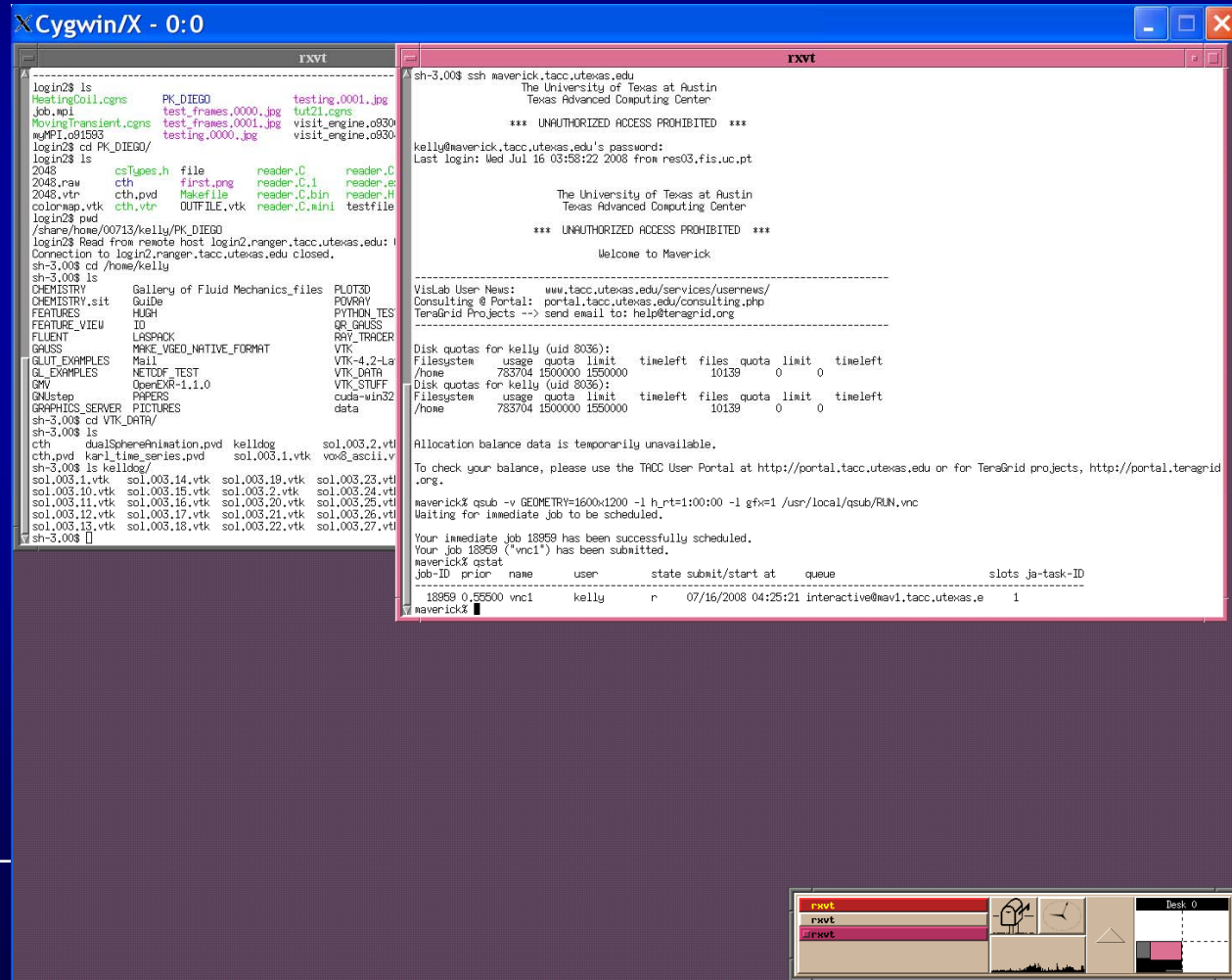
Step 5: type 'qstat' to see the status of your job

q = job is still queued

t = job is still being transferred to the SGE manager

e = job has errored out and possible causes can be found in the file vnc.log in your home directory

r = job is running



```
Cygwin/X - 0:0
login2$ ls
HeatingCoil.cgns      PK_DIEGO      testing.0001.jpg
job.mp1               test_frames.0000.jpg  tut21.cgns
MovingTransient.cgns  test_frames.0001.jpg  visit_engine.0930
myMPI.091593          testing.0000.jpg      visit_engine.0930
login2$ cd PK_DIEGO/
login2$ ls
2048.ctypes.h      file          reader.C      reader.C
2048.raw           cth          first.png    reader.C.1    reader.e
2048.vtr           cth.pvd      Makefile     reader.C.bin  reader.H
colormap.vtk       cth.vtr      OUTFILE.vtk  reader.C.mini testfile
login2$ pwd
/shane/home/00713/kelly/PK_DIEGO
login2$ Read from remote host login2.ranger.tacc.utexas.edu:
Connection to login2.ranger.tacc.utexas.edu closed.
sh-3.00$ cd /home/kelly
sh-3.00$ ls
CHEMISTRY      Gallery of Fluid Mechanics_files  PLOT3D
CHEMISTRY.sit  Guide                             POVRAY
FEATURES       HUGH                              PYTHON.TES
FEATURE_VIEW   ID                               QR_GAUSS
FLUENT         LASPACK                           RAY_TRACER
GAUSS          MAKE_VGED_NATIVE_FORMAT          VTK
GLUT_EXAMPLES  Mail                             VTK-4.2-La
SL_EXAMPLES    NETCDF_TEST                      VTK_DATA
QW            OpenEXR-1.1.0                   VTK_STUFF
QWstep        PAPERS                           cuda-win32
GRAPHICS_SERVER  PICTURES                        data
sh-3.00$ cd VTK_DATA/
sh-3.00$ ls
cth          dualSphereAnimation.pvd  keldog      sol.003.2.vtk
cth.pvd      karl_time_series.pvd    sol.003.1.vtk  vox8_ascii.v
sh-3.00$ ls keldog/
sol.003.1.vtk  sol.003.14.vtk  sol.003.19.vtk  sol.003.23.vtk
sol.003.10.vtk sol.003.15.vtk  sol.003.2.vtk  sol.003.24.vtk
sol.003.11.vtk sol.003.16.vtk  sol.003.20.vtk sol.003.25.vtk
sol.003.12.vtk sol.003.17.vtk  sol.003.21.vtk sol.003.26.vtk
sol.003.13.vtk sol.003.18.vtk  sol.003.22.vtk sol.003.27.vtk
sh-3.00$

sh-3.00$ ssh maverick.tacc.utexas.edu
The University of Texas at Austin
Texas Advanced Computing Center

*** UNAUTHORIZED ACCESS PROHIBITED ***

kelly@maverick.tacc.utexas.edu's password:
Last login: Wed Jul 16 03:58:22 2008 from res03.fis.uc.pt

The University of Texas at Austin
Texas Advanced Computing Center

*** UNAUTHORIZED ACCESS PROHIBITED ***

Welcome to Maverick

-----
VisLab User News:  www.tacc.utexas.edu/services/usernews/
Consulting @ Portal: portal.tacc.utexas.edu/consulting.php
TeraGrid Projects --> send email to: help@teragrid.org
-----

Disk quotas for kelly (uid 8036):
Filesystem            usage quota limit   timeleft files quota limit   timeleft
/home                 783704 1500000 1550000      10139      0      0
Disk quotas for kelly (uid 8036):
Filesystem            usage quota limit   timeleft files quota limit   timeleft
/home                 783704 1500000 1550000      10139      0      0

Allocation balance data is temporarily unavailable.

To check your balance, please use the TACC User Portal at http://portal.tacc.utexas.edu or for TeraGrid projects, http://portal.teragrid.org.

maverick% qsub -v GEOMETRY=1600x1200 -l h_rt=1:00:00 -l gfs=1 /usr/local/qsub/RUN.vnc
Waiting for immediate job to be scheduled.

Your immediate job 18959 has been successfully scheduled.
Your job 18959 ("vnc1") has been submitted.
maverick% qstat
job-ID prior    name     user      state submit/start at   queue                          slots ja-task-ID
-----
18959 0.55500 vnc1     kelly     r    07/16/2008 04:25:21 interactive@mav1.tacc.utexas.e 1
maverick%
```

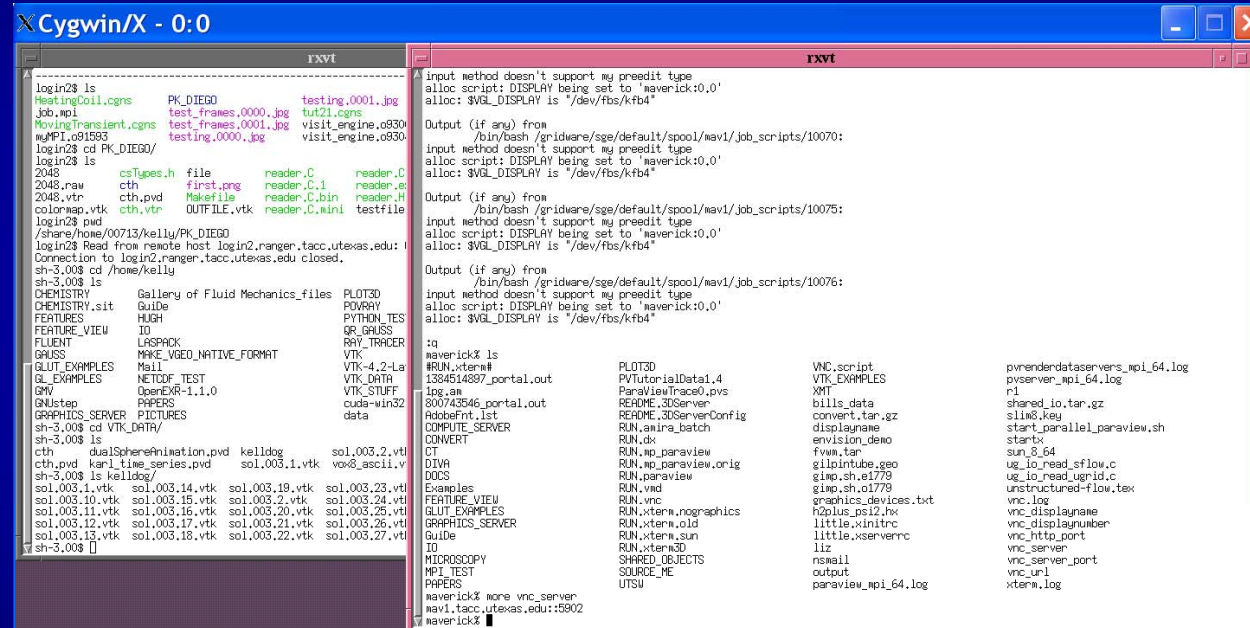
Starting a Remote Visualization Job on Maverick (Lab Exercise)

Step 6: Find the display that your job is running on by looking in the file `vnc_server` in your home directory

You will see a display address, for example:

mav1.tacc.utexas.edu:5902

This tells you to connect to display 2 on **mav1.tacc.utexas.edu**

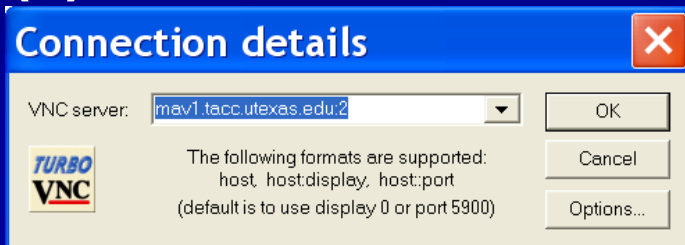


```
Cygwin/X - 0:0
login28 ls
PK_DIEGO      testing.0001.jpg
Job.mpl       test_frames.0000.jpg  tut21.cgs
MovingTransient.cgs  test_frames.0001.jpg  visit_engine.o8300
MPI.o81583    testing.0000.jpg      visit_engine.o8300
login28 cd PK_DIEGO/
login28 ls
csTypes.h  file      reader.C      reader.C
2048.naw   cth       first.png     reader.C.1     reader.C
2048.vtr   cth.pvd   Makefile      reader.C.bin   reader.H
colormap.vtk  cth.vtr  OUTFILE.vtk   reader.C.nini  testfile
login28 pwd
/share/home/00713/kelly/PK_DIEGO
login28 Read from remote host login28.ranger.tacc.utexas.edu:
Connection to login28.ranger.tacc.utexas.edu closed.
sh-3.00$ cd /home/kelly
sh-3.00$ ls
CHEMISTRY      Gallery of Fluid Mechanics_files  PLOT3D
CHEMISTRY.sit  Guide                             PPMV
FEATURES       HUGH                             PYTHON_TES
FEATURE_VIEW   ID                               QR_GAUSS
FLUENT         LASPACK                          RAY_TRACER
GAUSS          MAKE_VISO_NATIVE_FORMAT         VTK
GLUT_EXAMPLES  Mail                             VTK-4.2-La
GLUT_EXAMPLES  NETCDF_TEST                     VTK_DATA
GMV            OpenEXR-1.1.0                  VTK_STUFF
Gnuplot        PAPERS                          cuda-win32
GRAPHICS_SERVER  PICTURES                       data
sh-3.00$ cd VTK_DATA/
sh-3.00$ ls
dualSphereAnimation.pvd  kelldog  sol.003.2.vtk  sol.003.23.vtk
cth.pvd  karl_time_series.pvd  sol.003.1.vtk  vox8_ascii.v
sh-3.00$ ls kelldog/
sol.003.1.vtk  sol.003.14.vtk  sol.003.19.vtk  sol.003.23.vtk
sol.003.10.vtk  sol.003.15.vtk  sol.003.2.vtk  sol.003.24.vtk
sol.003.11.vtk  sol.003.16.vtk  sol.003.20.vtk  sol.003.25.vtk
sol.003.12.vtk  sol.003.17.vtk  sol.003.21.vtk  sol.003.26.vtk
sol.003.13.vtk  sol.003.18.vtk  sol.003.22.vtk  sol.003.27.vtk
sh-3.00$
vnc_server
mav1.tacc.utexas.edu:5902
maverick$
```

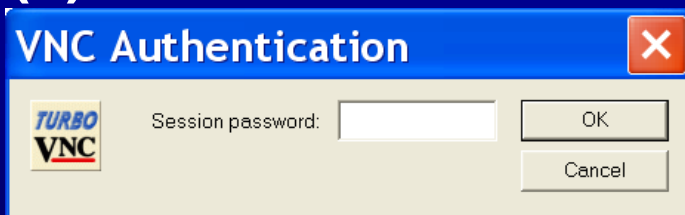
Starting a Remote Visualization Job on Maverick (Lab Exercise)

Step 7: Connect to that display by using a vnc client

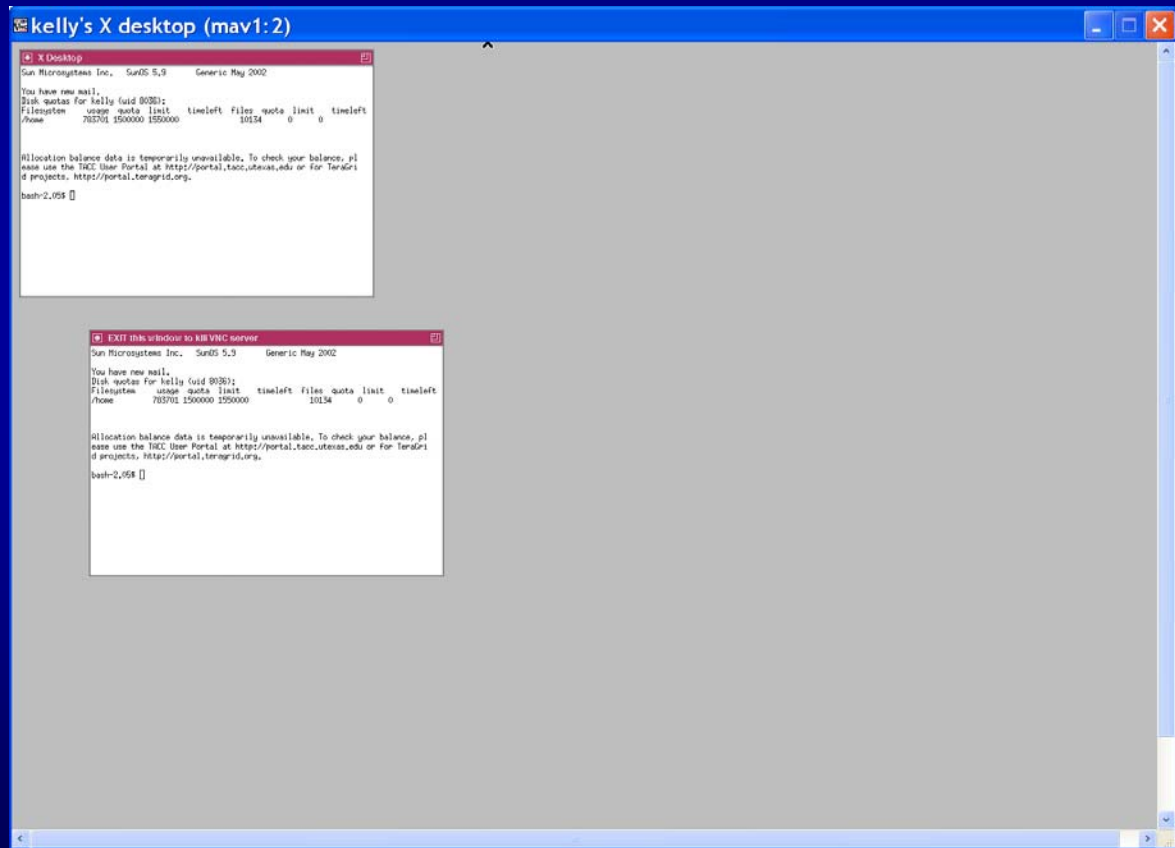
(1)



(2)



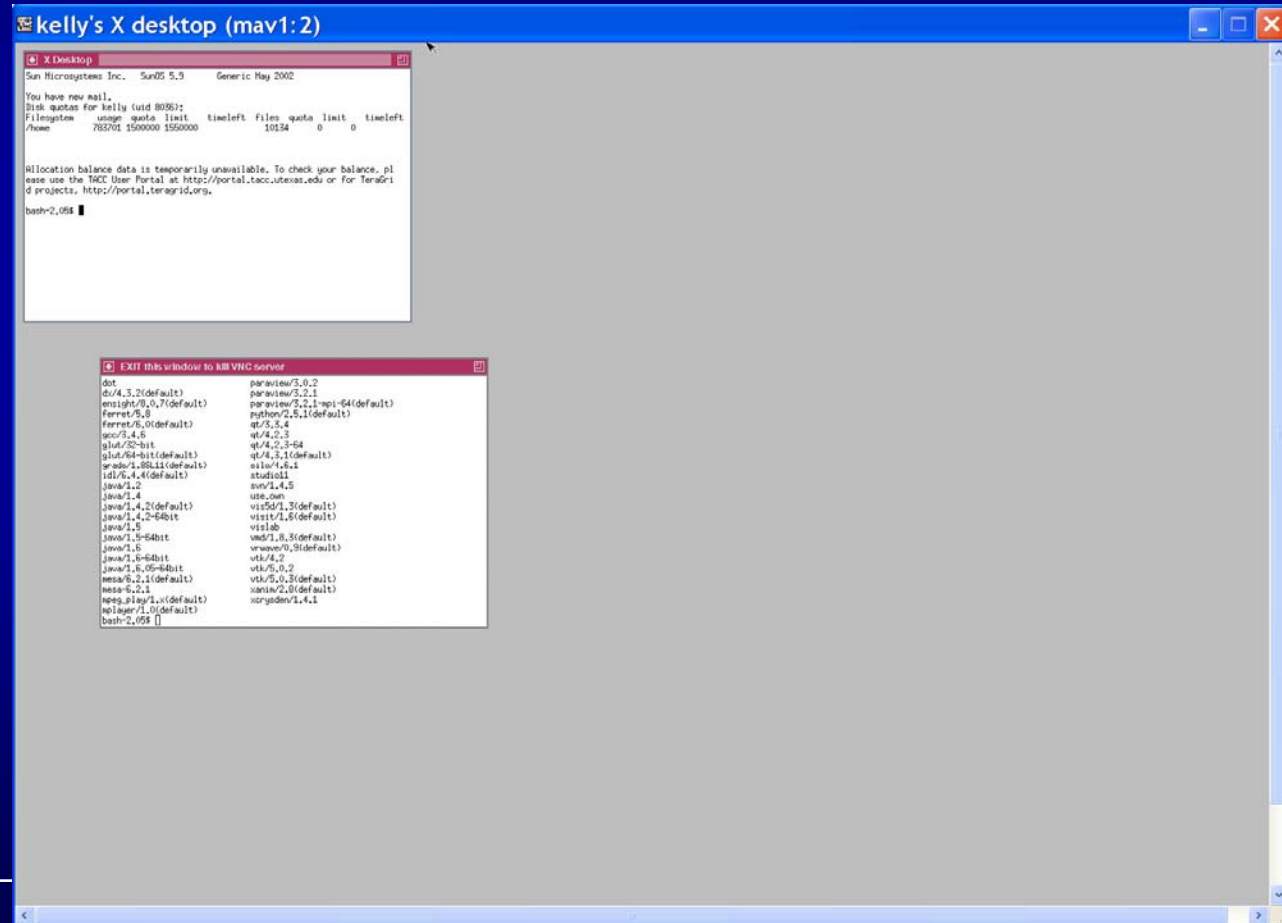
(3)



Starting a Remote Visualization Job on Maverick (Lab Exercise)

Step 8: Type 'module avail' in the xterm.

This will tell you which
programs are available to load
and run.



Starting a Remote Visualization Job on Maverick (Lab Exercise)

Step 9: Type 'module load paraview/3.2.1'

This will load paraview 3.2.1
and make it available for
running.

```
kelly's X desktop (mav1:2)

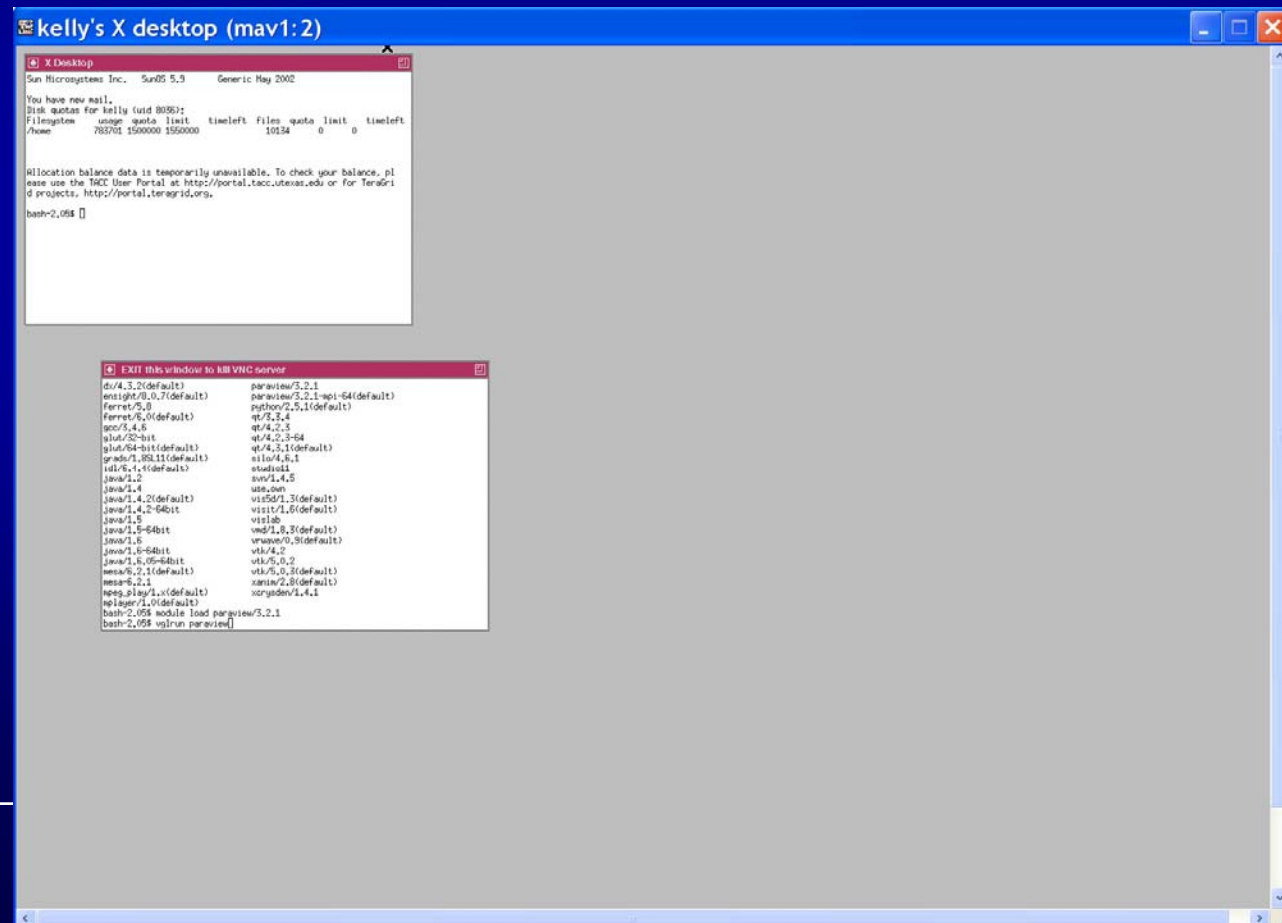
X Desktop
Sun Microsystems Inc. SunOS 5.9 Generic May 2002
You have new mail.
Disk quotas for kelly (uid 8030):
Filesystem            user quota limit   timeleft Files quota limit   timeleft
/home                 703701 1500000 1550000    10134      0      0

Allocation balance data is temporarily unavailable. To check your balance, pl
ease use the UIC User Portal at http://portal.unc.edu/unc/eda or for teragrid
projects, http://portal.teragrid.org.
bash-2.05$

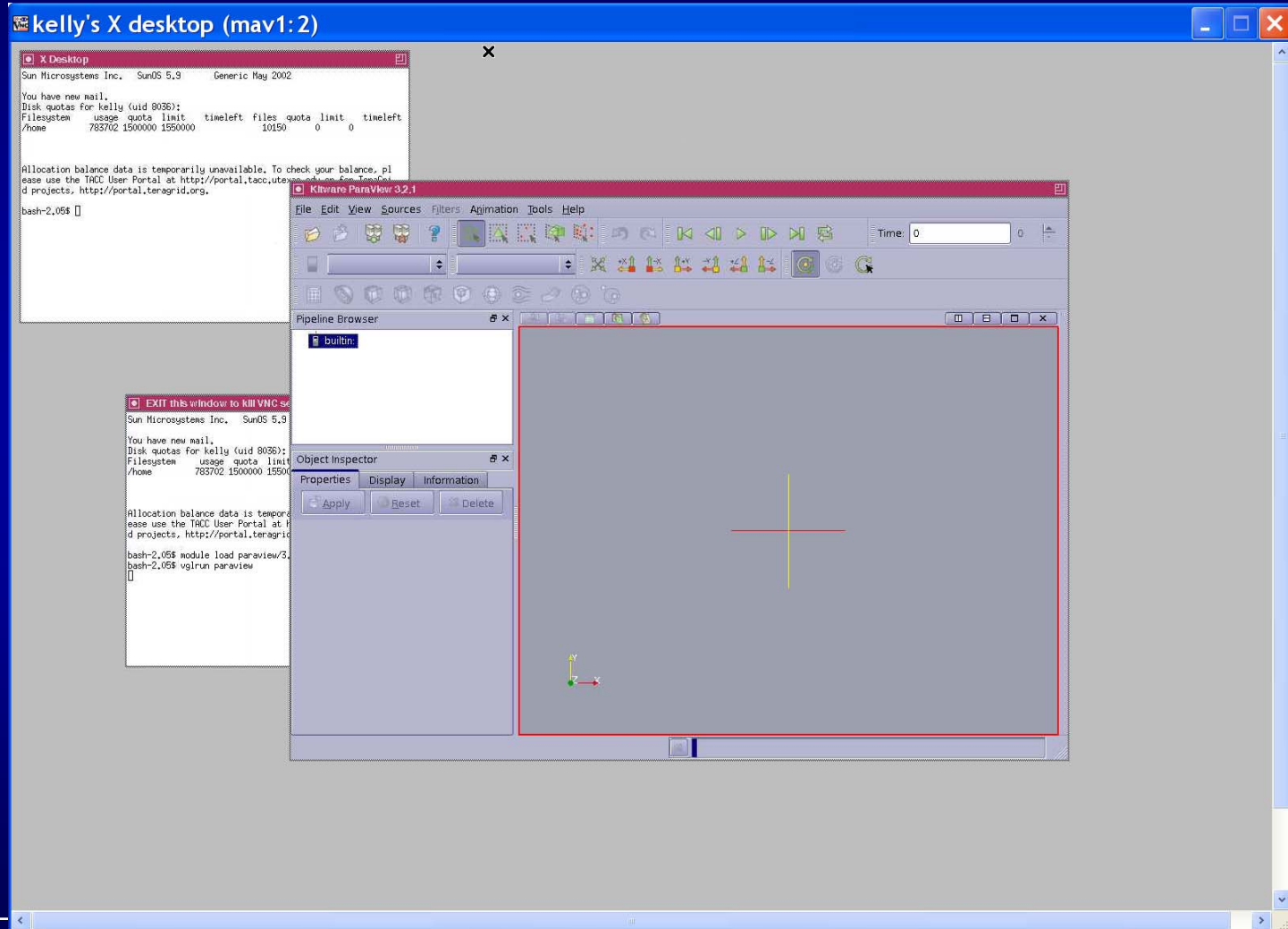
EXIT this window to kill VNC server
dot                paraview/3.0.2
ds/4.3.2(default)  paraview/3.2.1
ensight/8.0.7(default)  paraview/3.2.1-mpi-64(default)
ferret/5.8         python/2.5.1(default)
ferret/6.0(default)  qt/3.3.4
gcc/3.4.8         qt/4.2.3
glut/32-bit       qt/4.2.3-64
glut/64-bit(default)  qt/4.3.1(default)
gsl/1.80.11(default)  sli/4.1.1
idl/6.4.4(default)  stoll
java/1.2          svn/1.4.5
java/1.4          use.com
java/1.4.2(default)  visd/1.3(default)
java/1.4.2-64bit  visir/1.6(default)
java/1.5         visio
java/1.5-64bit   vmd/1.0.3(default)
java/1.6         vwave/0.9(default)
java/1.6-64bit  vtk/4.2
java/1.6.05-64bit  vtk/5.0.2
mesa/6.2.1(default)  vtk/5.0.3(default)
mesa/7.2.1       xarun/2.8(default)
mpeg_play/1.x(default)  xcrispdev/1.4.1
mplayer/1.0(default)
bash-2.05$ module load paraview/3.2.1]
```

Starting a Remote Visualization Job on Maverick (Lab Exercise)

Step 10: Type 'vglrun paraview'. vglrun is necessary to run any OpenGL based applications through the vnc viewer.

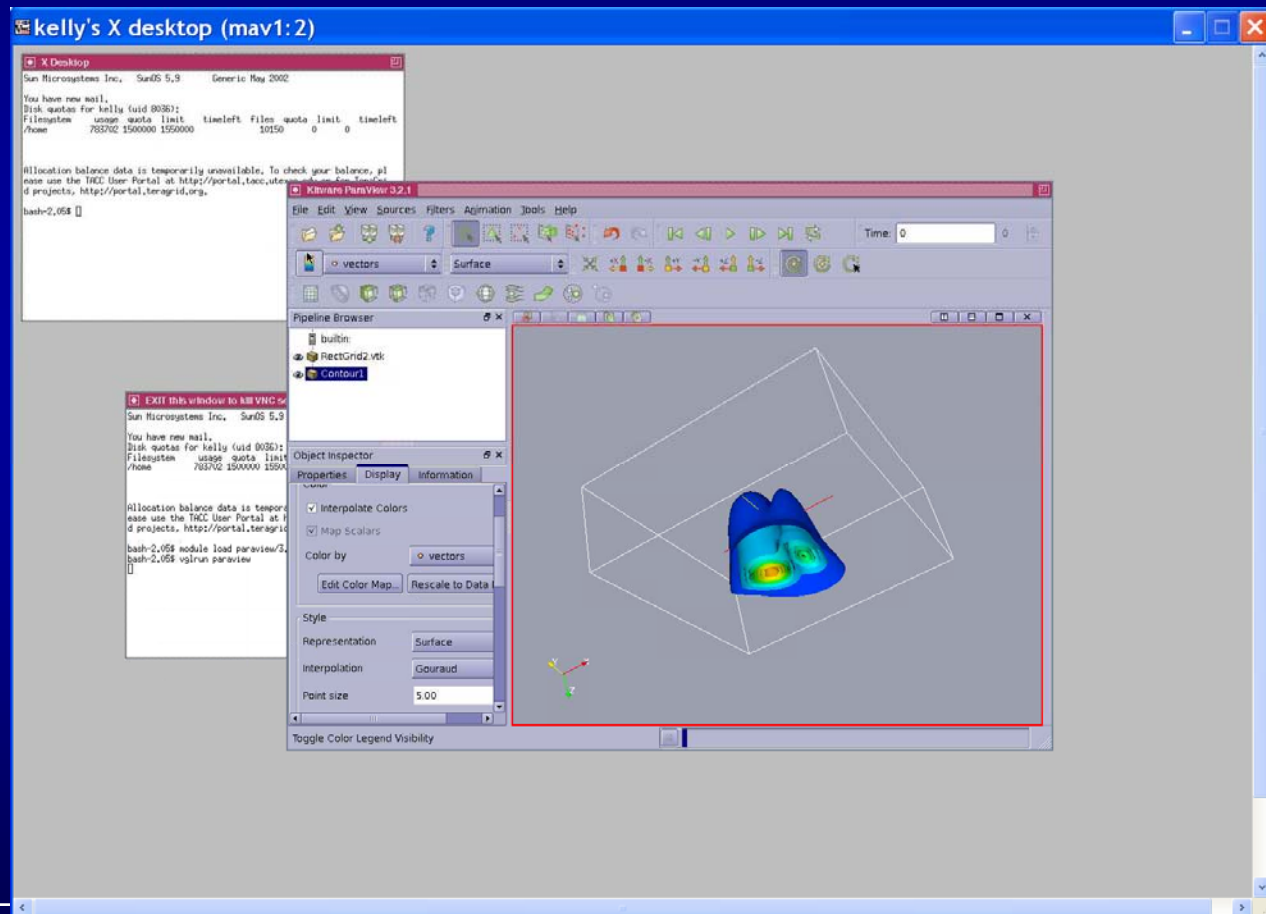


Starting a Remote Visualization Job on Maverick (Lab Exercise)



Starting a Remote Visualization Job on Maverick (Lab Exercise)

Step 11: Load the RectGrid2.vtk dataset. It can be found in /work/utexas/staff/kelly/PORTUGAL



Starting a Remote Visualization Job on Maverick (Lab Exercise)

Step 12: You can also view through a web browser. The web address can be found in `vnc_url` in your home directory.

The screenshot shows a Mozilla Firefox browser window titled "kelly's X desktop (mav1:2) - Mozilla Firefox". The address bar displays `http://mav1.tacc.utexas.edu:5802/`. The browser's toolbar includes various navigation and utility buttons. The main content area shows a terminal window titled "X Desktop" with the following output:

```
Sun Microsystems Inc. SunOS 5.9 Generic May 2002

You have new mail.
Disk quotas for kelly (uid 8036):
Filesystem        usage  quota  limit  timeleft  files  quota  limit  timeleft
/home              783702 1500000 1550000 10150      0      0      0

Allocation balance data is temporarily unavailable. To check your balance, please use the TACC User Portal at http://portal.tacc.utexas.edu for TACC Grid projects, http://portal.teragrid.org.

bash-2.05$
```

Overlaid on the terminal is a Kltware ParaView 3.2.1 window. The ParaView window shows a 3D visualization of a blue and yellow object within a wireframe box. The "Pipeline Browser" on the left lists "builtin", "RectGrid2.vtk", and "Contour1". The "Object Inspector" on the right shows the "Properties" tab with "Interpolate Colors" and "Map Scalars" checked, and "Color by" set to "vectors".

At the bottom of the browser window, a status bar indicates "Applet VncViewer started".

Topics Covered

- Remote and Collaborative Visualization
- **EnVision – simplified Interface for Visualization**
- Visualizing and Animating a Time Series in Paraview
- VisIt
- Parallel Visualization

An abstract visualization featuring a dense network of blue and green lines, possibly representing data or a complex system, set against a background of red and blue. The lines are contained within a white, curved, tube-like structure that appears to be part of a larger, more complex shape.

EnVision: Web-Based Remote Scientific Visualization

EnVision Team: Greg P. Johnson, Stephen Mock, Greg S.
Johnson

Motivation for EnVision

- Most visualization software takes significant time and effort to learn effectively
- EnVision was created with these audiences in mind:
 1. Computational scientists with little to no visualization experience
 2. Users who want to quickly import and visualize their data from anywhere

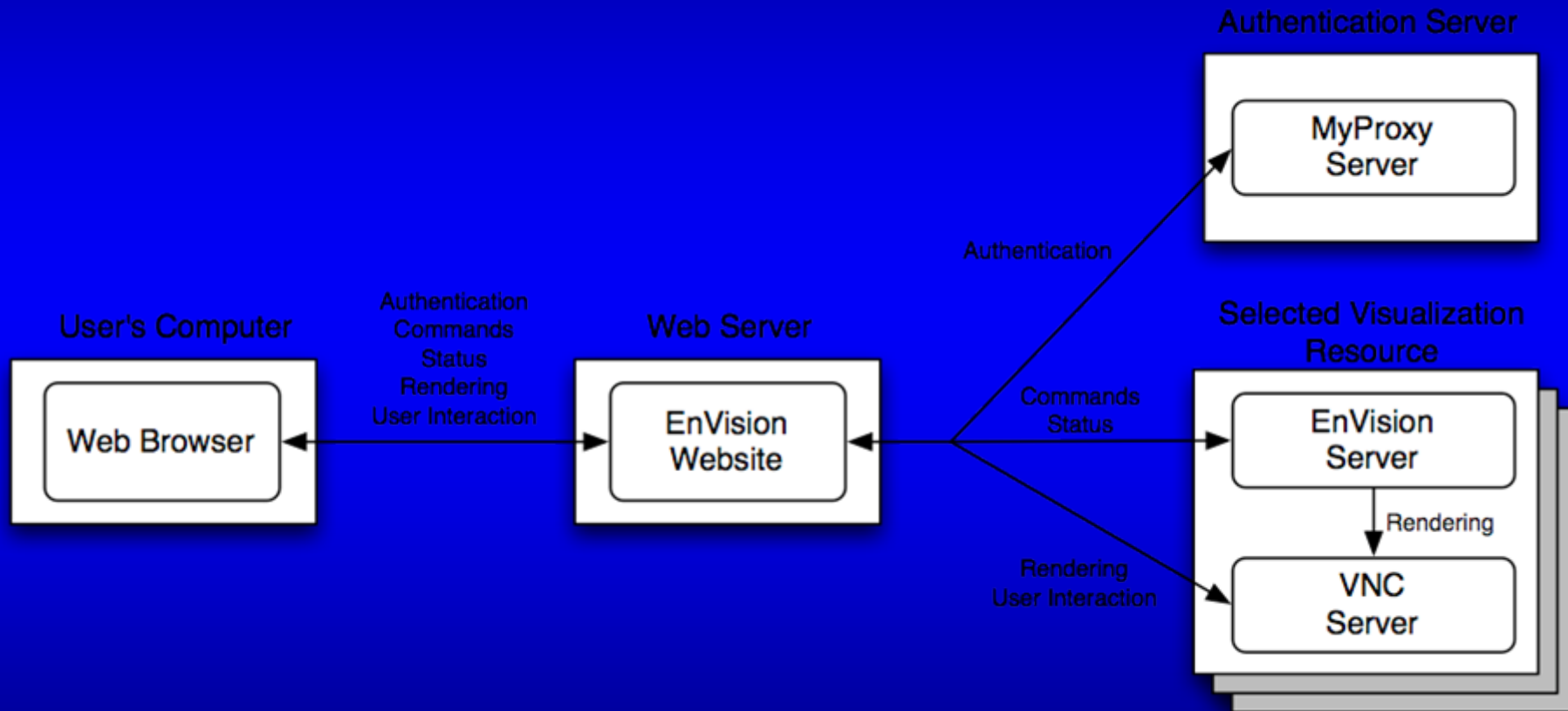
EnVision Goals: Simple, Intuitive, Immediate

- Web-based visualization application with a wizard-style interface
- Does not aim to supersede or replace current visualization applications
- Focus is on simplicity and ease-of-use
- Semi-automates the data importation process
- Presents visualization methods, with examples, that are applicable to their data set

EnVision Guides the User Through the Process

1. Authenticates user, shows visualization resources, and automatically starts a remote visualization job on selected resource
2. Imports data in nearly any format based on a series of intuitive questions
3. Presents user with examples of visualization methods to add
4. Builds the visualization using reasonable defaults for color mapping, etc.
5. Renders the visualization and allows user to interact with it and save snapshots

EnVision General Architecture



Current State and Future Plans

- Version 2.0b1 released June 9, 2008
- Current capabilities:
 - TACC Maverick visualization resource
 - supports any VTK formatted data set
 - structured and point arbitrarily formatted data importation through interview
 - basic visualization methods
- Future capabilities include:
 - additional visualization resources
 - additional visualization methods (e.g. volume rendering)
 - collaborative visualization sessions
 - unstructured arbitrarily formatted data importation through interview
 - automated data staging

EnVision Demo

<https://envision2.tacc.utexas.edu>

EnVision Demo

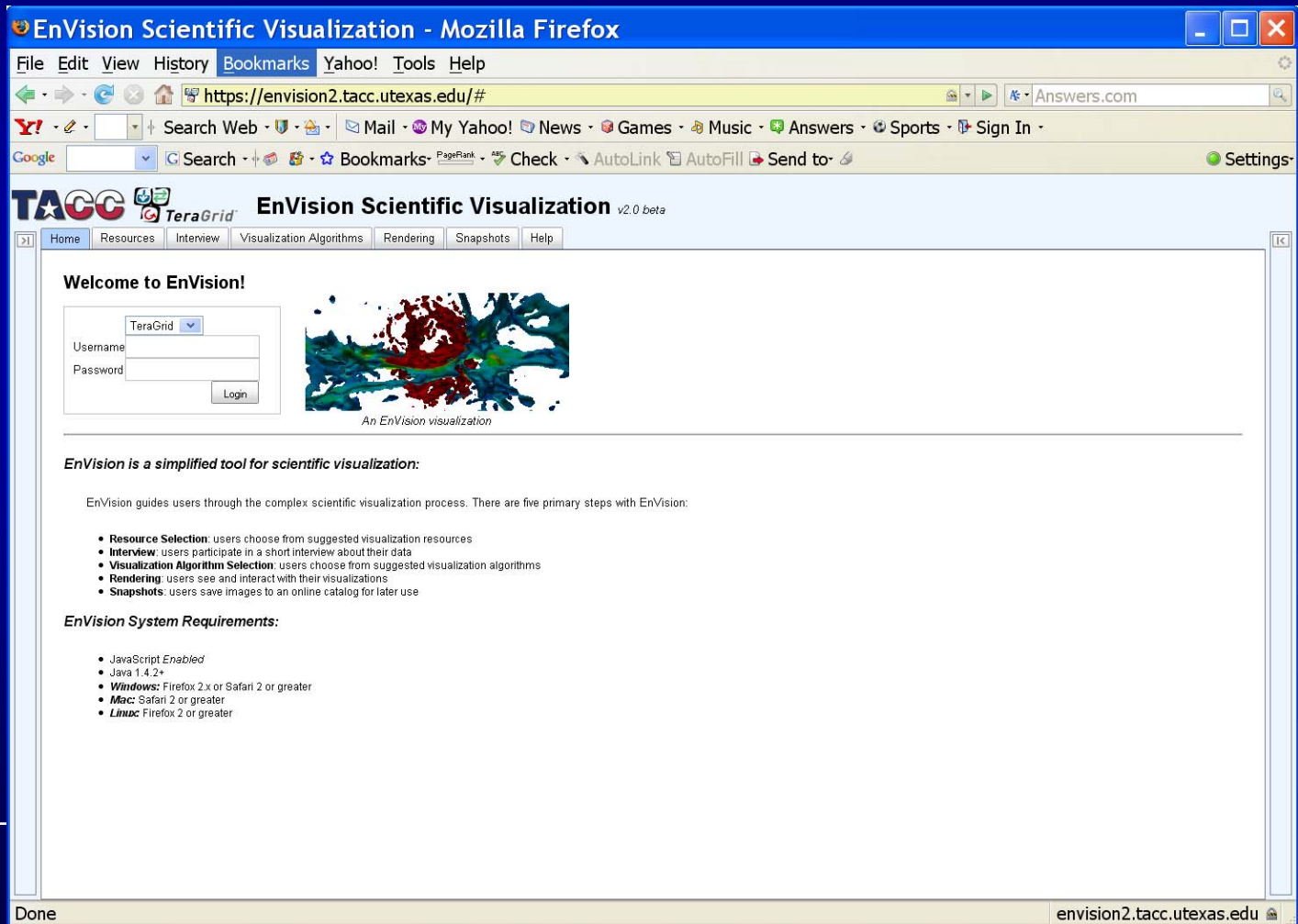
Step 1: Login in to your maverick account and type the following command:

```
cp -R ~train00/envision_demo ./
```

Then log out of maverick

EnVision Demo

Step 2: Login and authenticate: goto
<http://envision2.tacc.utexas.edu>



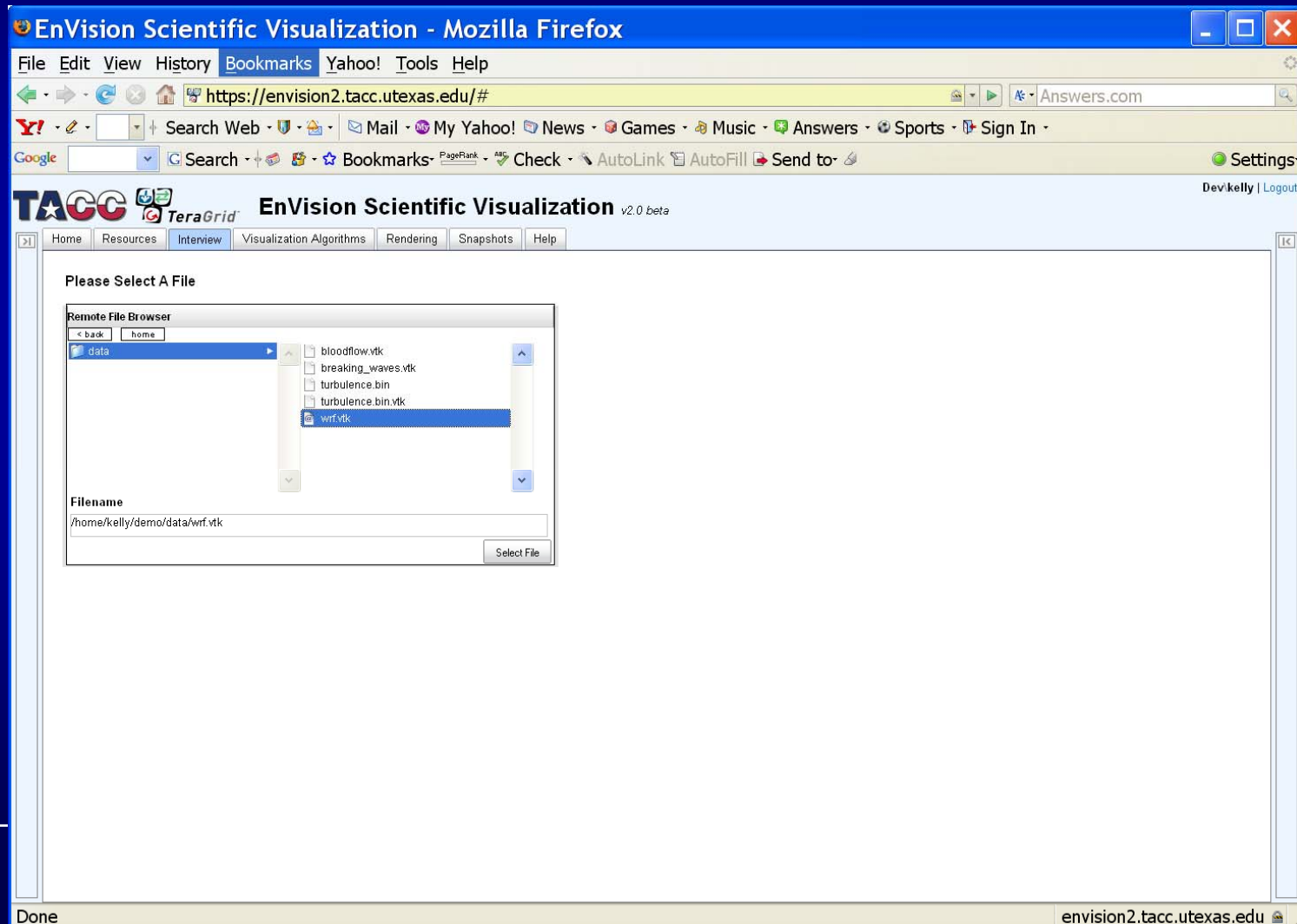
EnVision Demo

Step 3: Select the resource. (Maverick)

The screenshot shows a Mozilla Firefox browser window displaying the EnVision Scientific Visualization web application. The browser's address bar shows the URL `https://envision2.tacc.utexas.edu/#`. The application's header includes the TACC and TeraGrid logos, the title "EnVision Scientific Visualization v2.0 beta", and a user login "Dev:kelly | Logout". A navigation menu contains links for Home, Resources, Interview, Visualization Algorithms, Rendering, Snapshots, and Help. The main content area is titled "Select a Resource" and features a dropdown menu with "Dev" selected and a "Select" button. Below this, the "Available Resources:" section lists "Maverick" with a detailed description: "The Maverick terascale visualization system is a Sun E25K server with 64 dual-core 1.05 GHz UltraSPARC IV processors and 512 gigabytes of shared memory. Maverick provides users with access to 16 high-end graphics devices, and is available to TACC and TeraGrid users. For more detailed information on Maverick, please see the [Maverick User Guide](#)." The status bar at the bottom of the browser shows "Done" and the URL `envision2.tacc.utexas.edu`. The TACC logo is also visible in the bottom left corner of the slide.

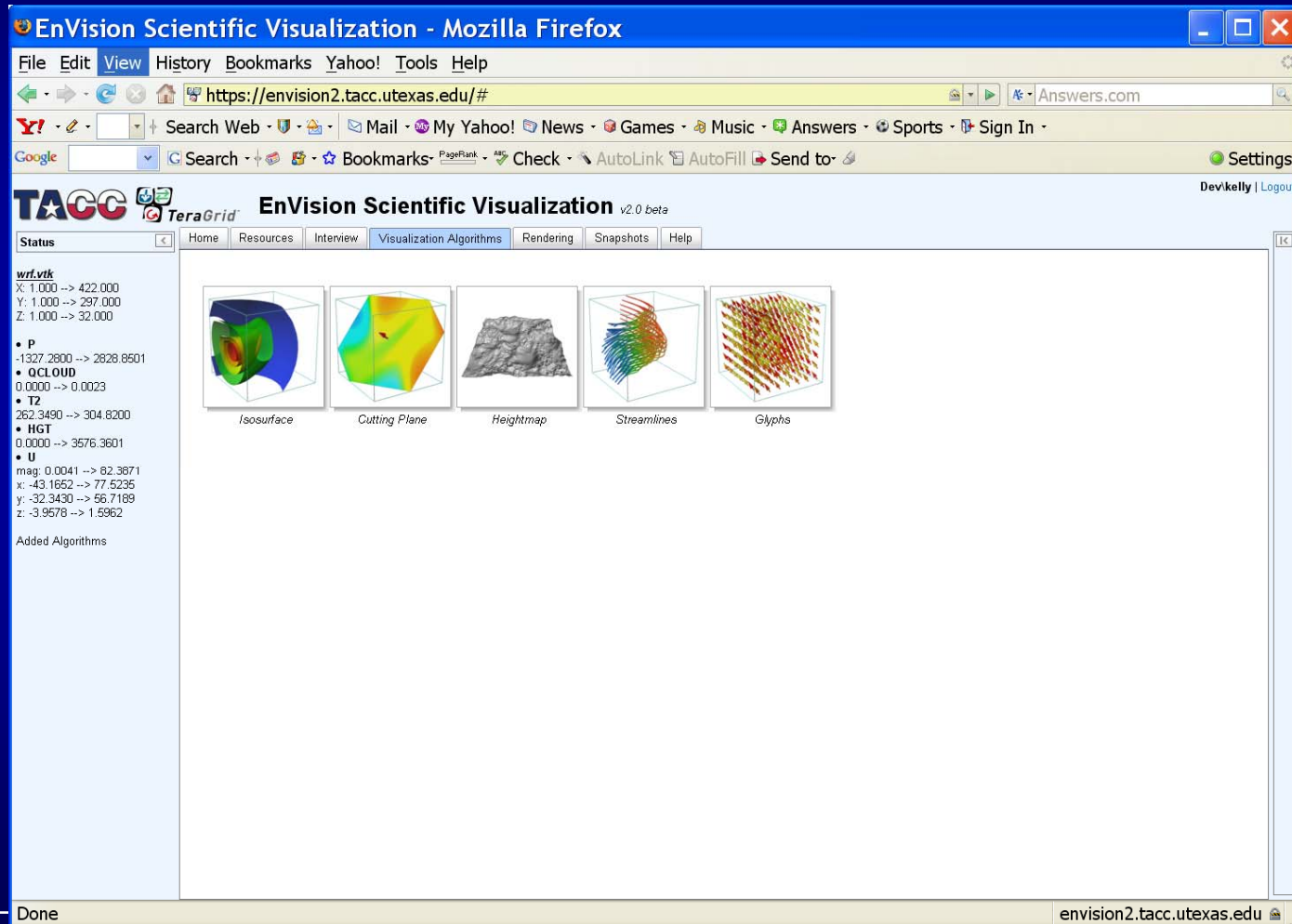
EnVision Demo

Step 4: Load the data.



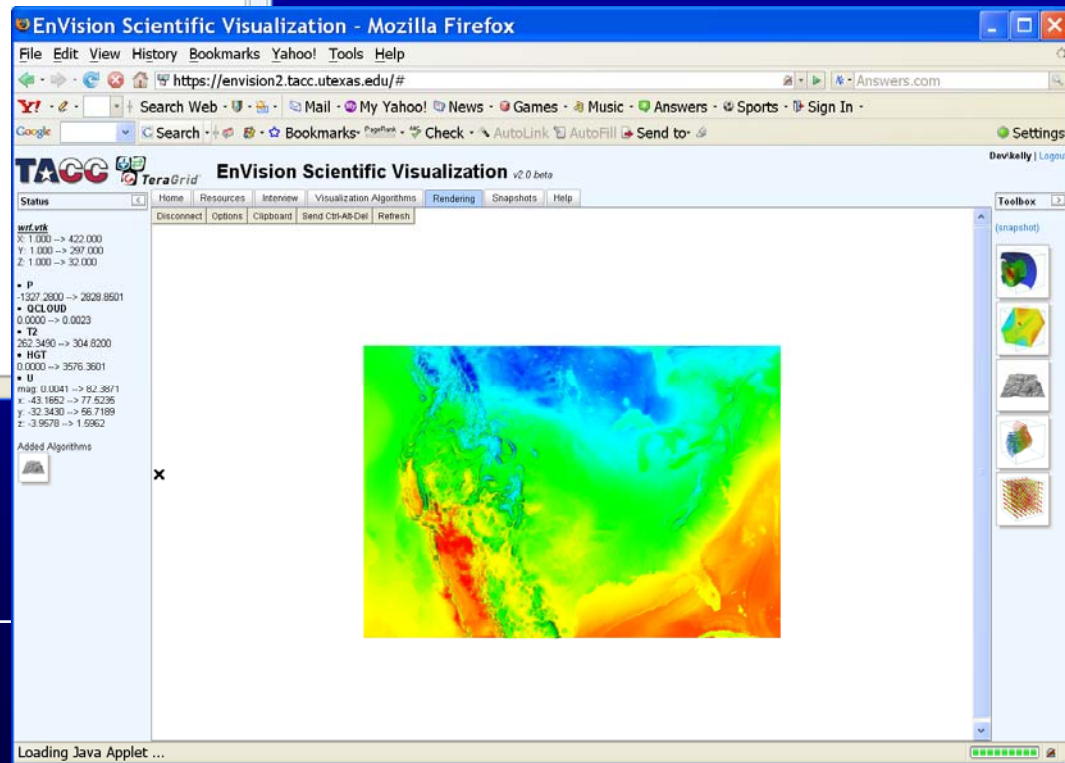
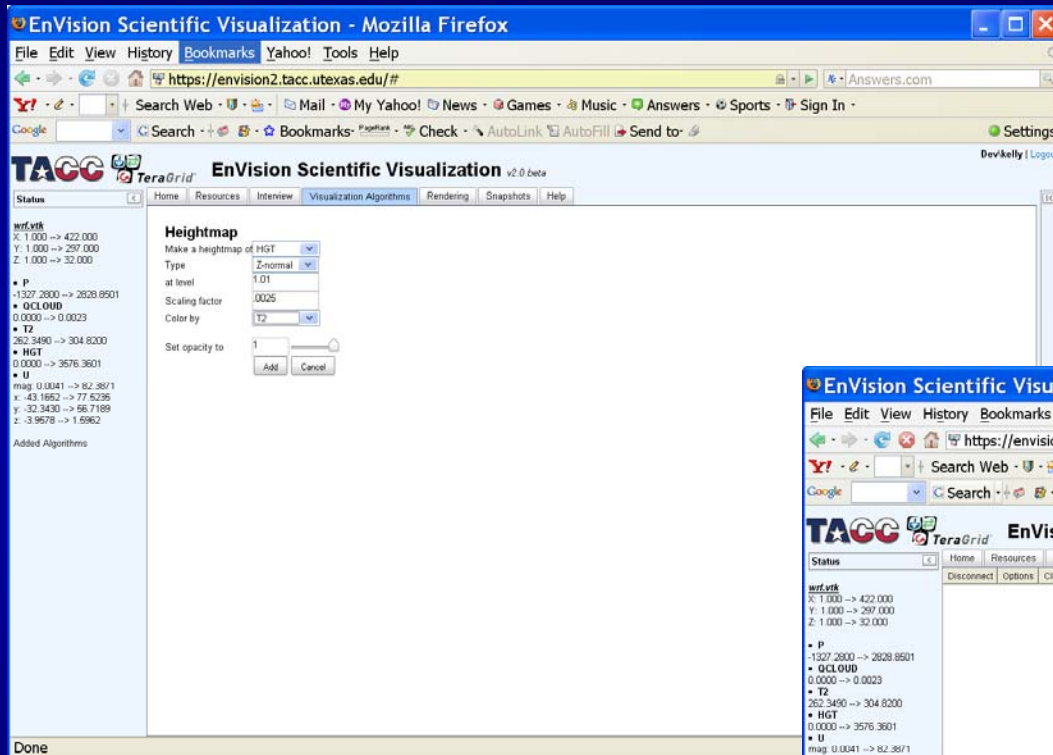
EnVision Demo

Step 5: Select the type of visualization you want to see.



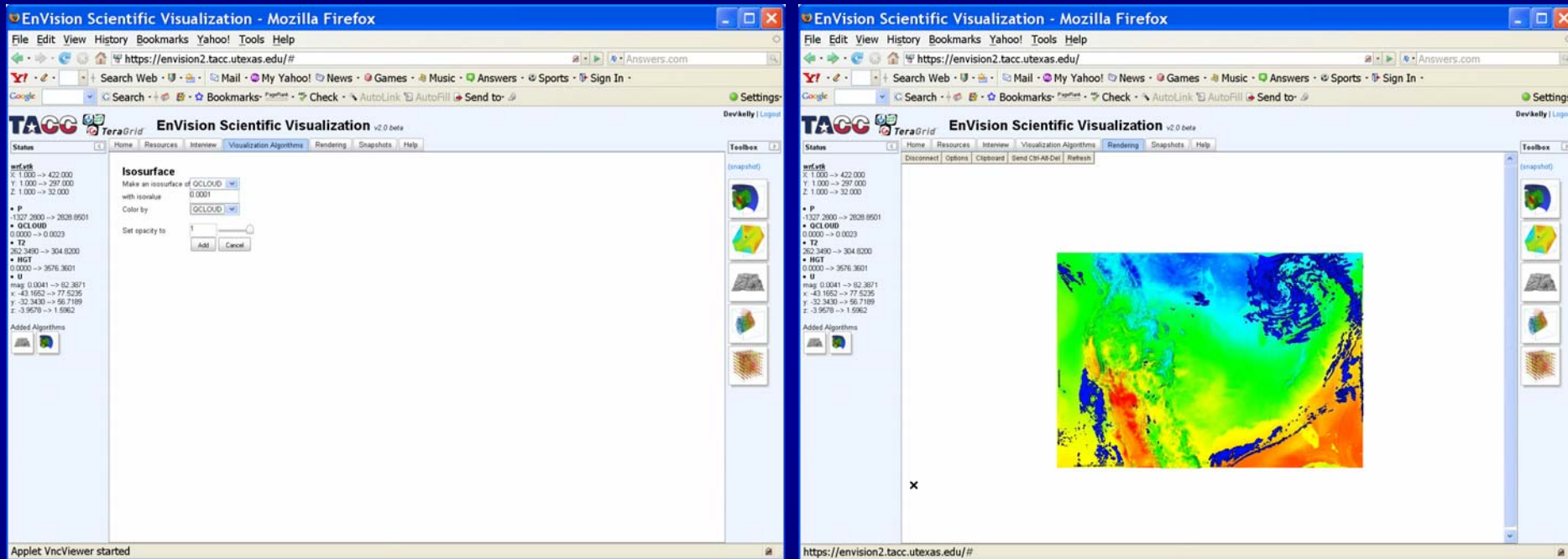
EnVision Demo

Step 6: Create a heightmap.



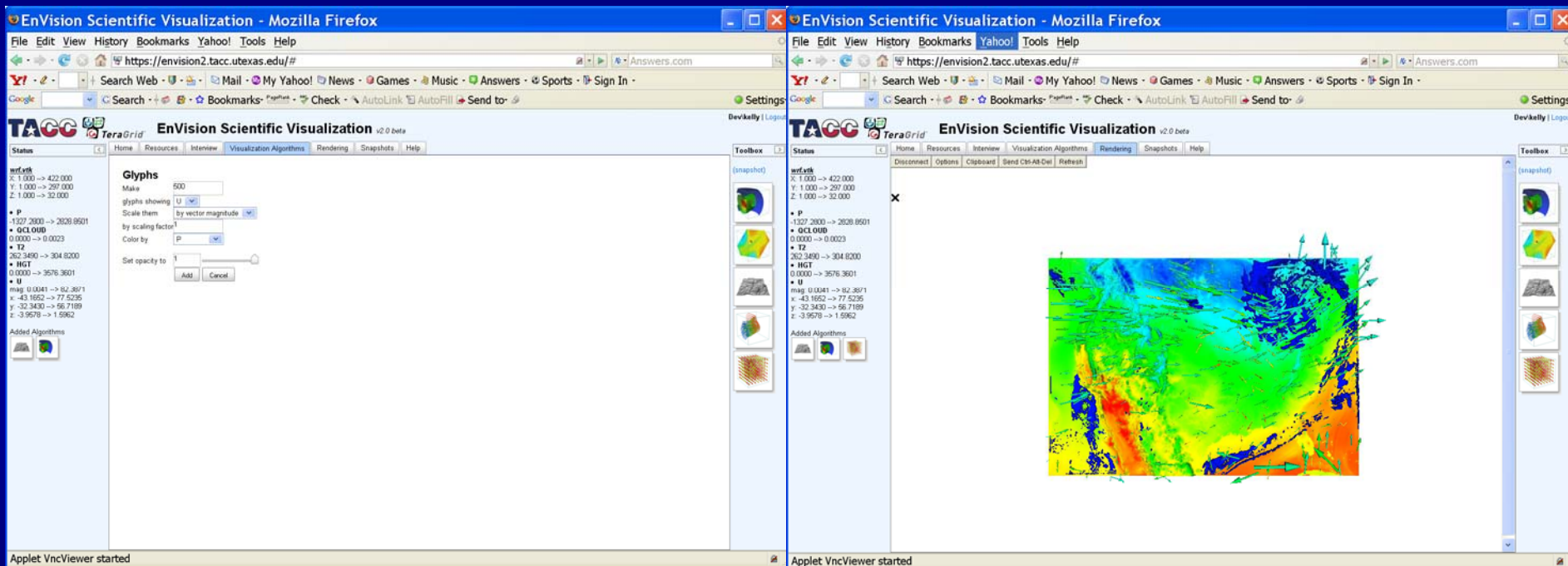
EnVision Demo

Step 7: Create an isosurface.



EnVision Demo

Step 8: Create glyphs.



Topics Covered

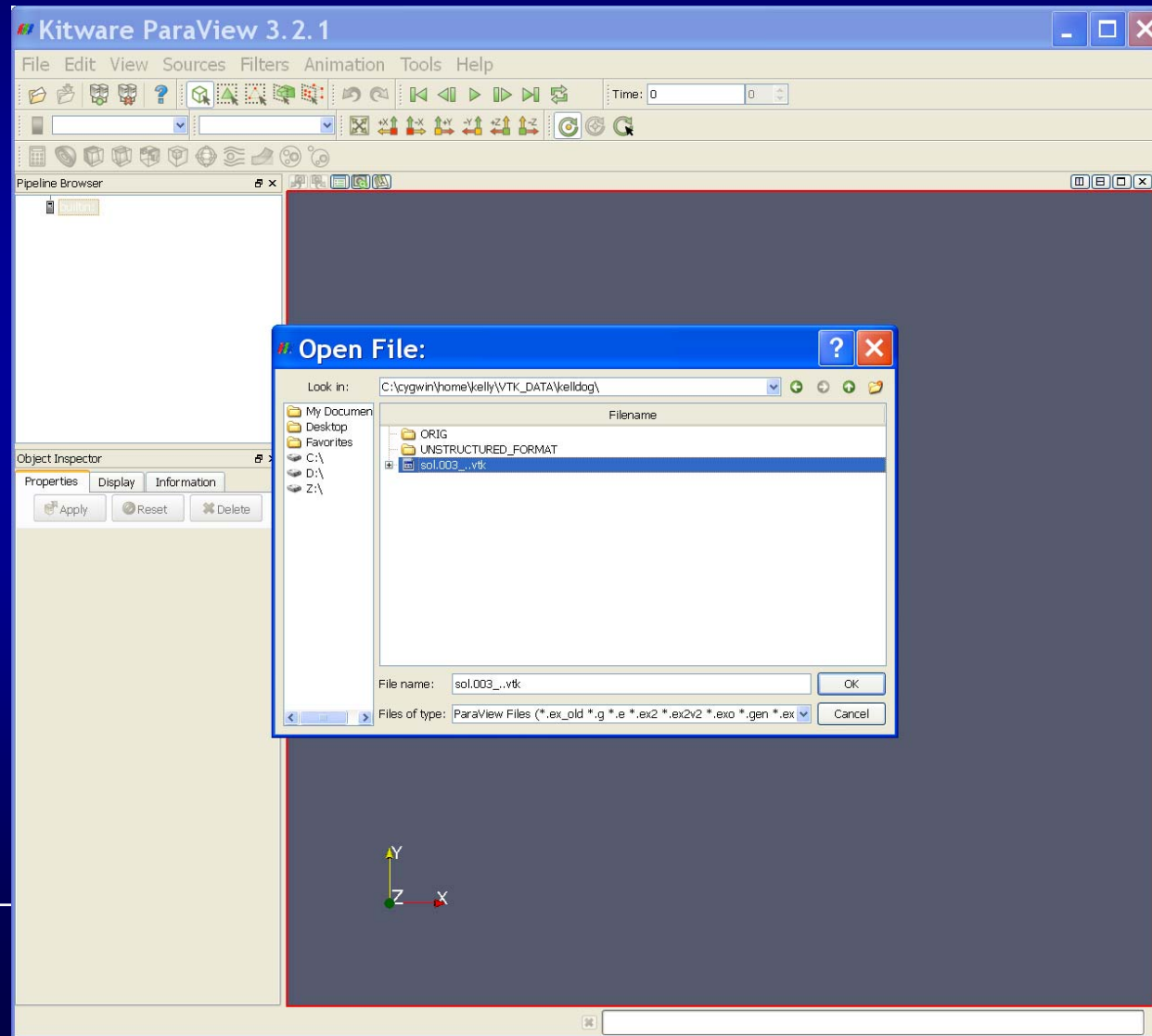
- Remote and Collaborative Visualization
- EnVision – simplified Interface for Visualization
- Visualizing and Animating a Time Series in Paraview
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Visualizing and Animating a Time Varying Dataset

- Download the data from your maverick account at `/work/utexas/staff/kelly/PORTUGAL/`
- The data is called `sol_data.tar.gz`
- gunzip the file: `gunzip sol_data.tar.gz`
- Untar the file: `tar -xvf sol_data.tar`
- This will produce a series of time steps

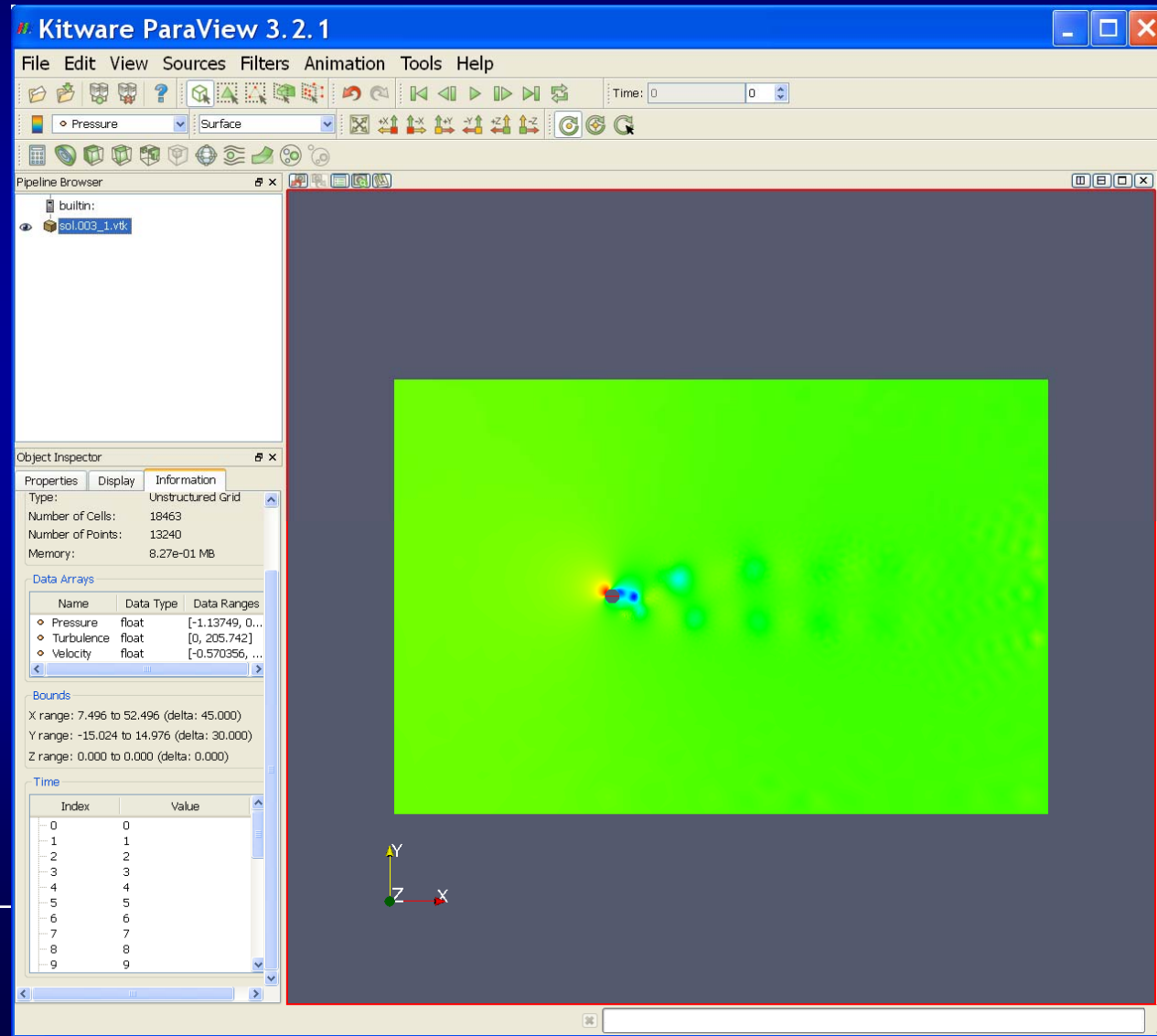
Visualizing and Animating a Time Varying Dataset

- Step 1: In paraview, locate the time series data, select it and load the data.



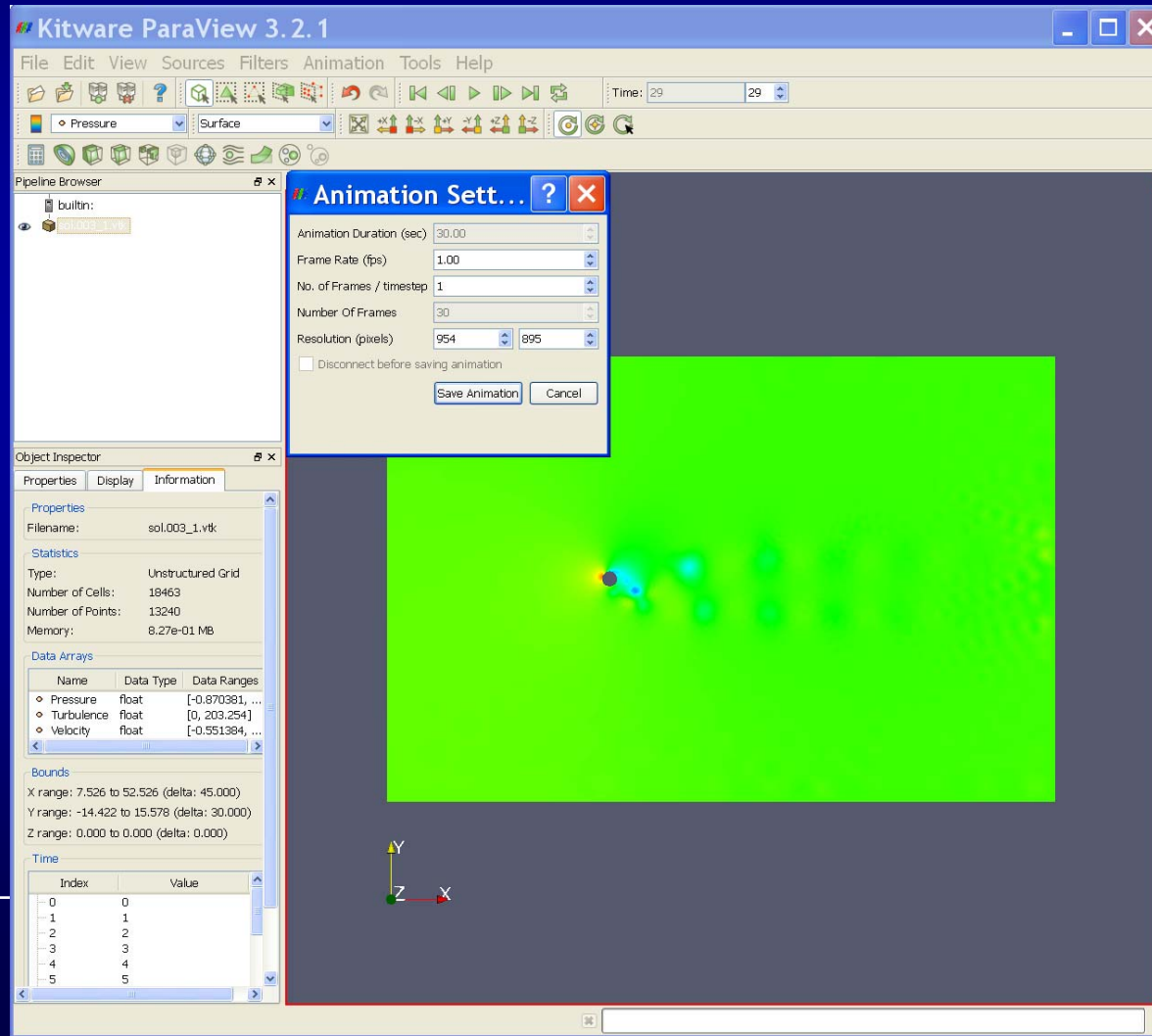
Visualizing and Animating a Time Varying Dataset

- Step2: Find the data's information and verify that all time steps were loaded.



Visualizing and Animating a Time Varying Dataset

- Step 3: In the File menu, select “Save Animation”. This will animate the time series.

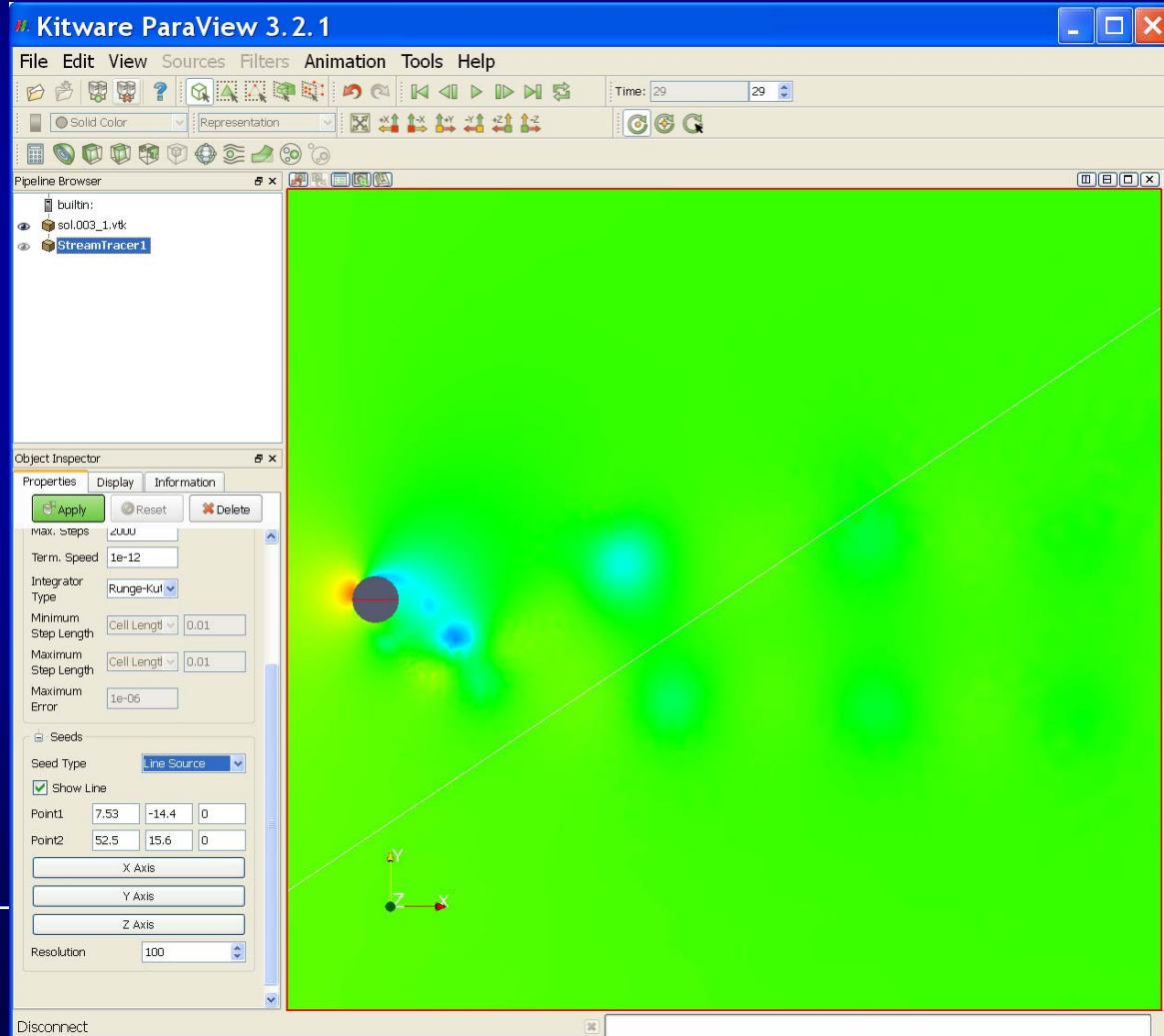


Visualizing and Animating a Time Varying Dataset

- The movie should look like:

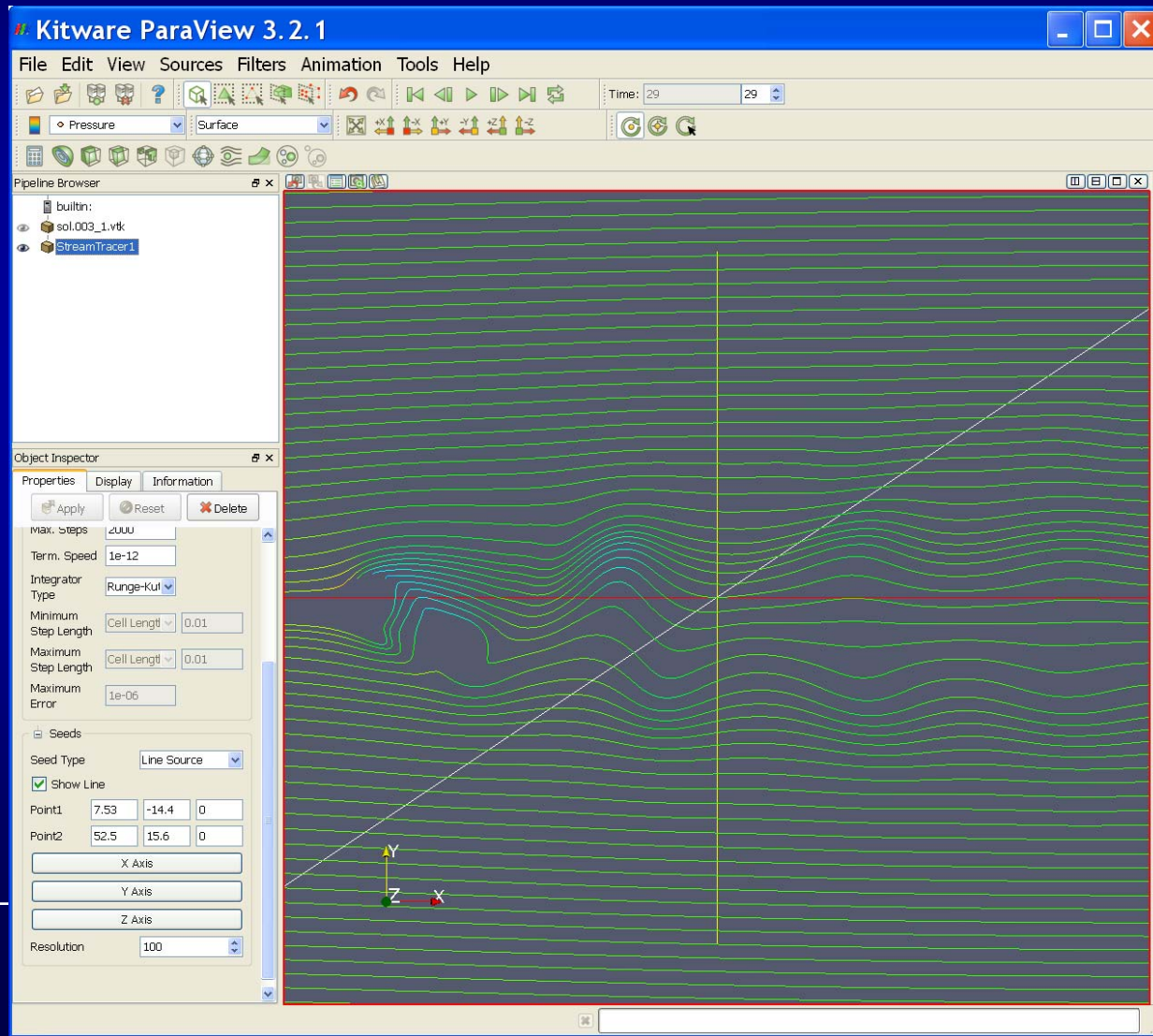
Visualizing and Animating a Time Varying Dataset

- Step 4: Add particle traces using a line to seed the points. Change the color to black and line width to 1.



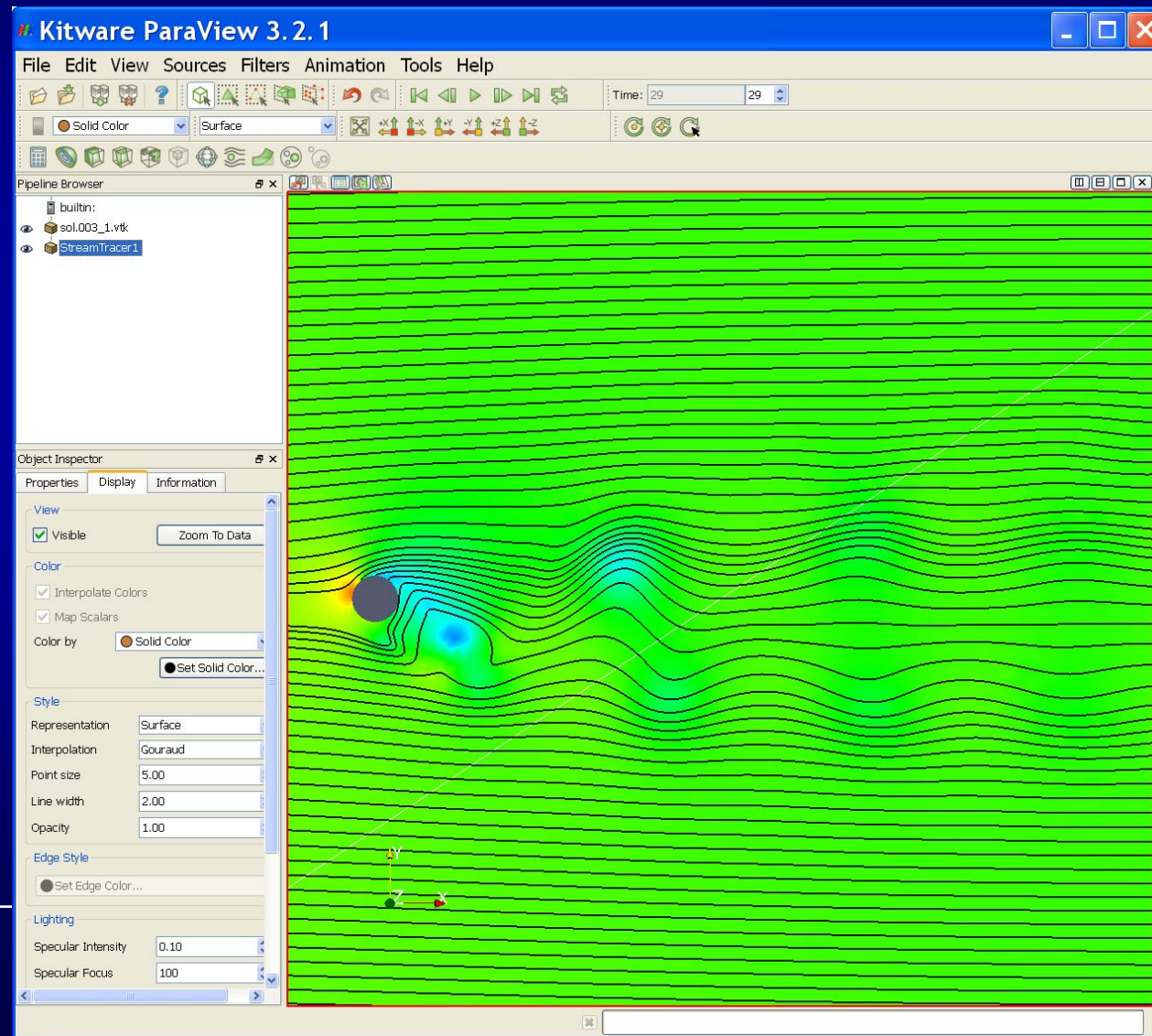
Visualizing and Animating a Time Varying Dataset

- Step 5: Go back to the contour and turn it back on.



Visualizing and Animating a Time Varying Dataset

- Step 6: Save an animation of this view.



Visualizing and Animating a Time Varying Dataset

- The movie should look like:

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- Remote and Collaborative Visualization
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- **VisIt**
- Parallel Visualization

VisIt

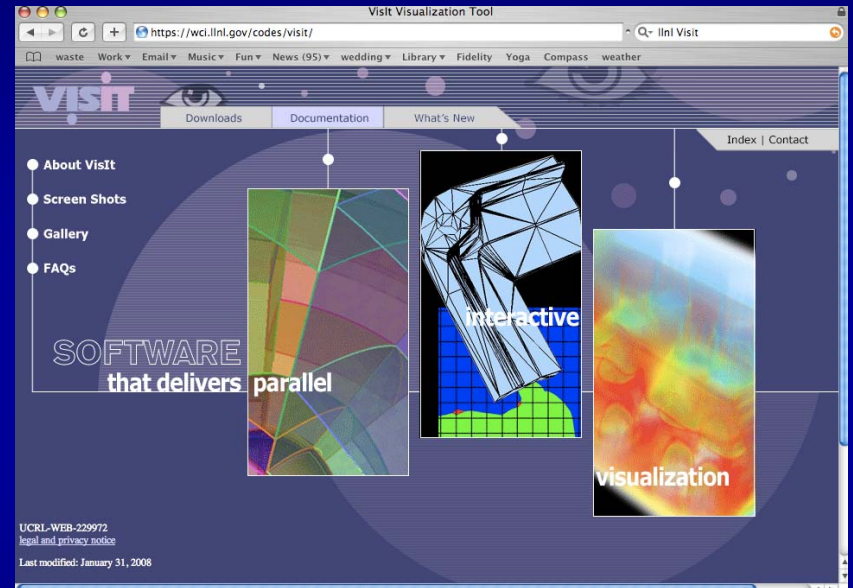
- Open source parallel visualization tool out of LLNL
- Key features:
 - Scalar, vector, and tensor field visualization
 - Structured and unstructured mesh types
 - Support for structured AMR meshes and CSG meshes\
 - Quantitative analysis (expressions, queries, picking, lineout)
 - GIS support
 - Image export (*BMP, JPEG, PNG, PPM, Raster Postscript, RGB, TIFF, stereo images*)
 - Annotation support for publication and presentation graphics
 - Built on VTK (open source graphics library)

Visit Supported File Formats

ANALYZE	FVCOM	PLOT3D
ANSYS	GGCM	Protein Databank
BOV (brick of values)	H5Nimrod	SAMRAI
Boxlib	H5Part	Silo
CGNS	Image	Spheral
Chombo	ITAPS	STL
CTRL	MFIX	TecPlot
Curve2D	MM5	VASP
Enight Gold	NASTRAN	Vis5D
Enzo	Nek3D	VTK
Exodus	NetCDF	Wavefront OBJ
FITS	OpenFOAM	Xmdv
FLASH	PATRAN	ZeusMP (HDF4)
FLUENT		
GIS (DEM, ArcGrid, ESRI Shapefile, vector file formats...)		

Running VisIt

- Download from web and install on local computer



VisIt Application

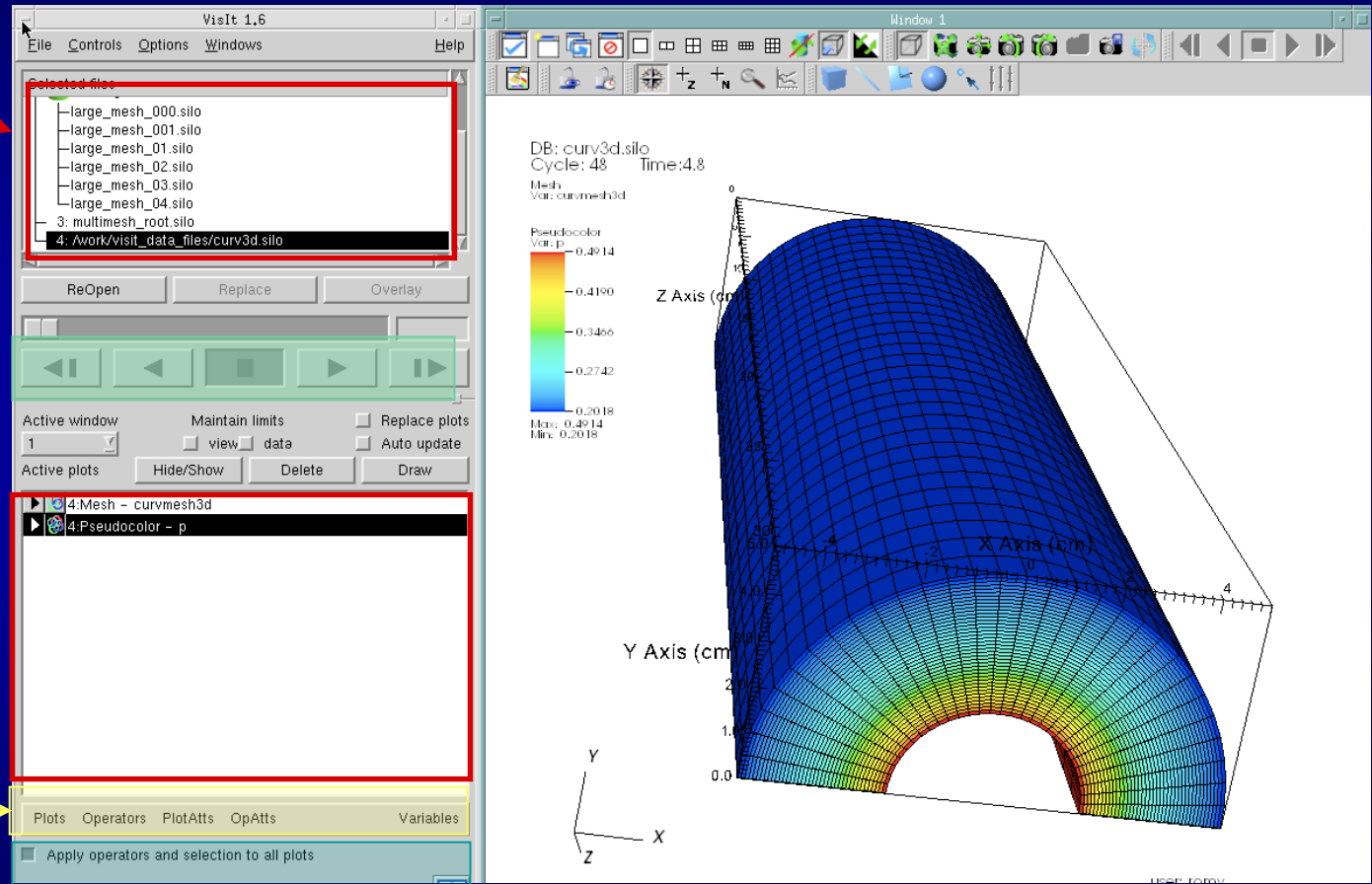
Database Viewer
(File List)

Animation
Controls

Plot List

Plot and Operator
Menus

Status Bar



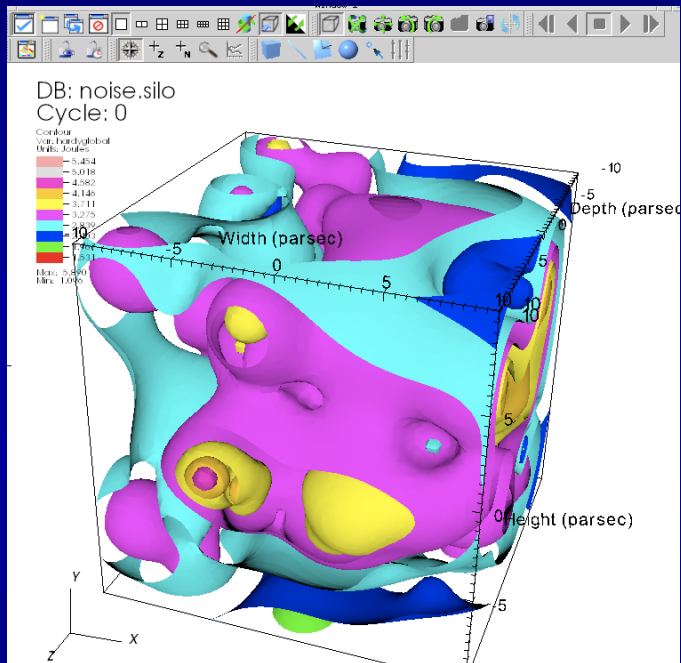
Viewer (Output Window)

Visit Terminology

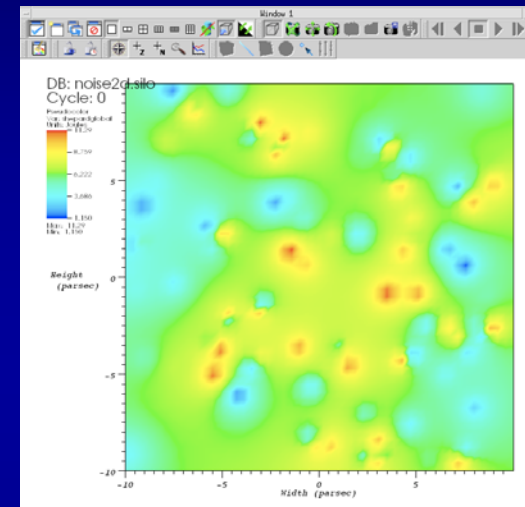
- Plot = Mapping Algorithm
 - Pseudocolor plot (scalar color map)
 - Surface plot (of 3D isosurface or 2D data)
 - Volume plot (3D volume rendered image)
- Operator = Data Manipulation Algorithm
 - Slice (extract data)
 - Resample (change data resolution)
 - Transform (move data in space or time)
- Database = file or set of files

Common Plots

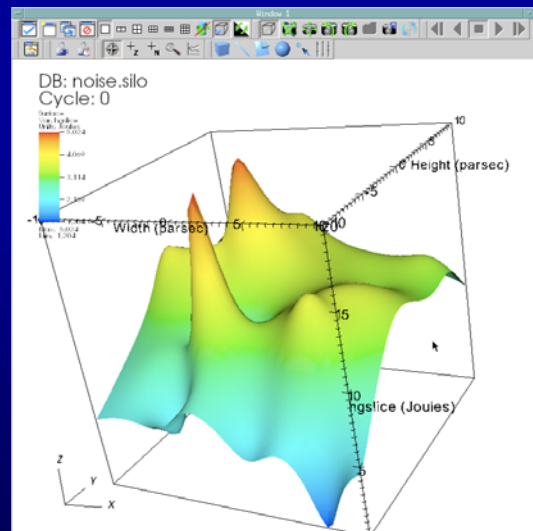
Contour



Pseudocolor

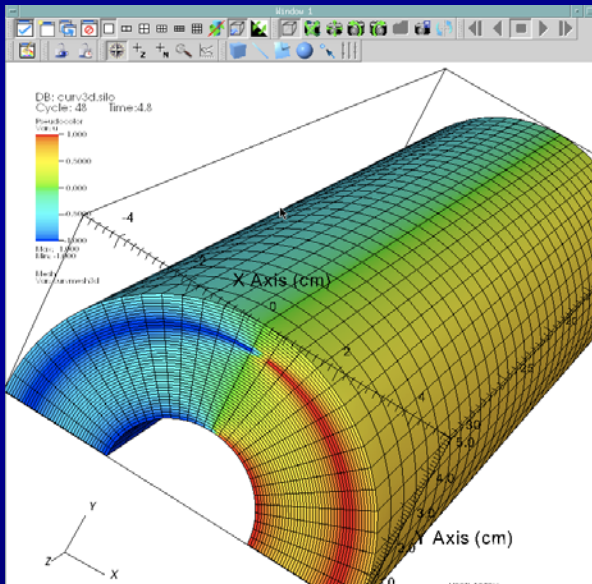


Surface

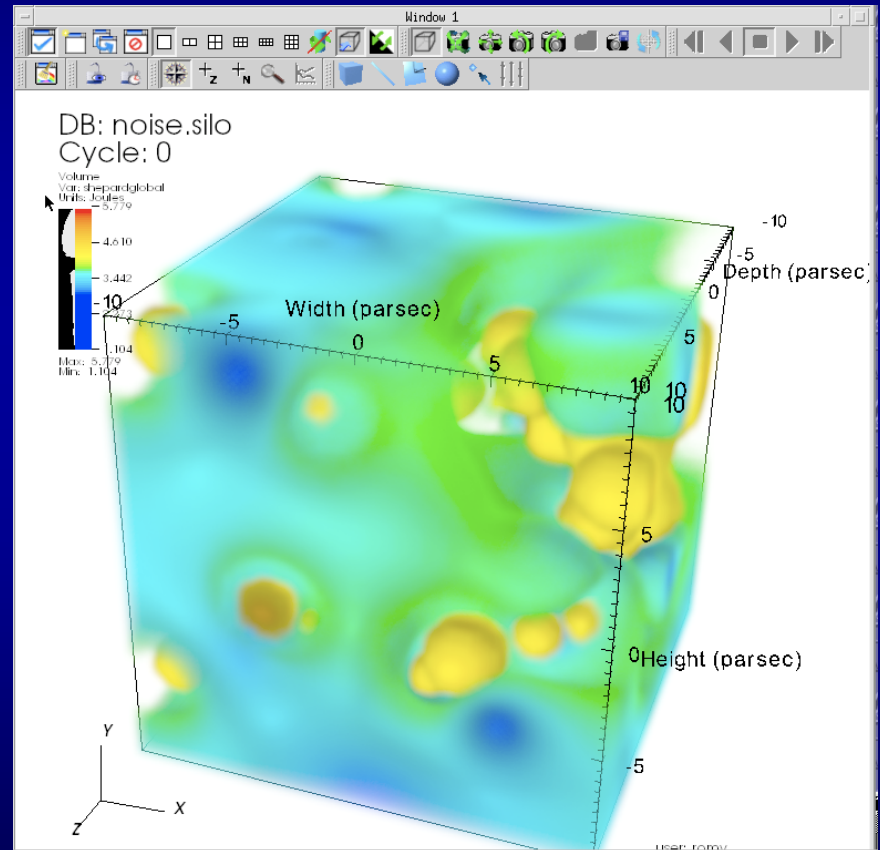


Common Plots

Mesh + Pseudocolor



Volume



VisIt Advanced Features

- Various lighting, rendering, and view (camera) options
- Geometry export (*Curve, Alias WaveFront Obj, STL, ULTRA, and VTK*)
- Animation and movie generation
- Scripting interface with Python
- API interface with C++ and Java
- Dynamically extensible through plugins
- Parallel and distributed architecture for visualizing very large data sets
- Database export (BOV, SILO, Tecplot, SimV1Writer, VTK, columnar ascii file (xmdf))
- Multiple database correlation / visualization

Download VisIt and Go Through Example

- **Step 1: Download VisIt from**
 - <https://wci.llnl.gov/codes/visit/executables.html>

VisIt Executables - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

<https://wci.llnl.gov/codes/visit/executables.html> Answers.com

Search Web Mail My Yahoo! News Games Music

Google VisIt Search Bookmarks PageRank Check AutoLink AutoFill Settings

- [VisIt md5 checksums](#)
- [VisIt sha1 checksums](#)
- [VisIt file sizes](#)

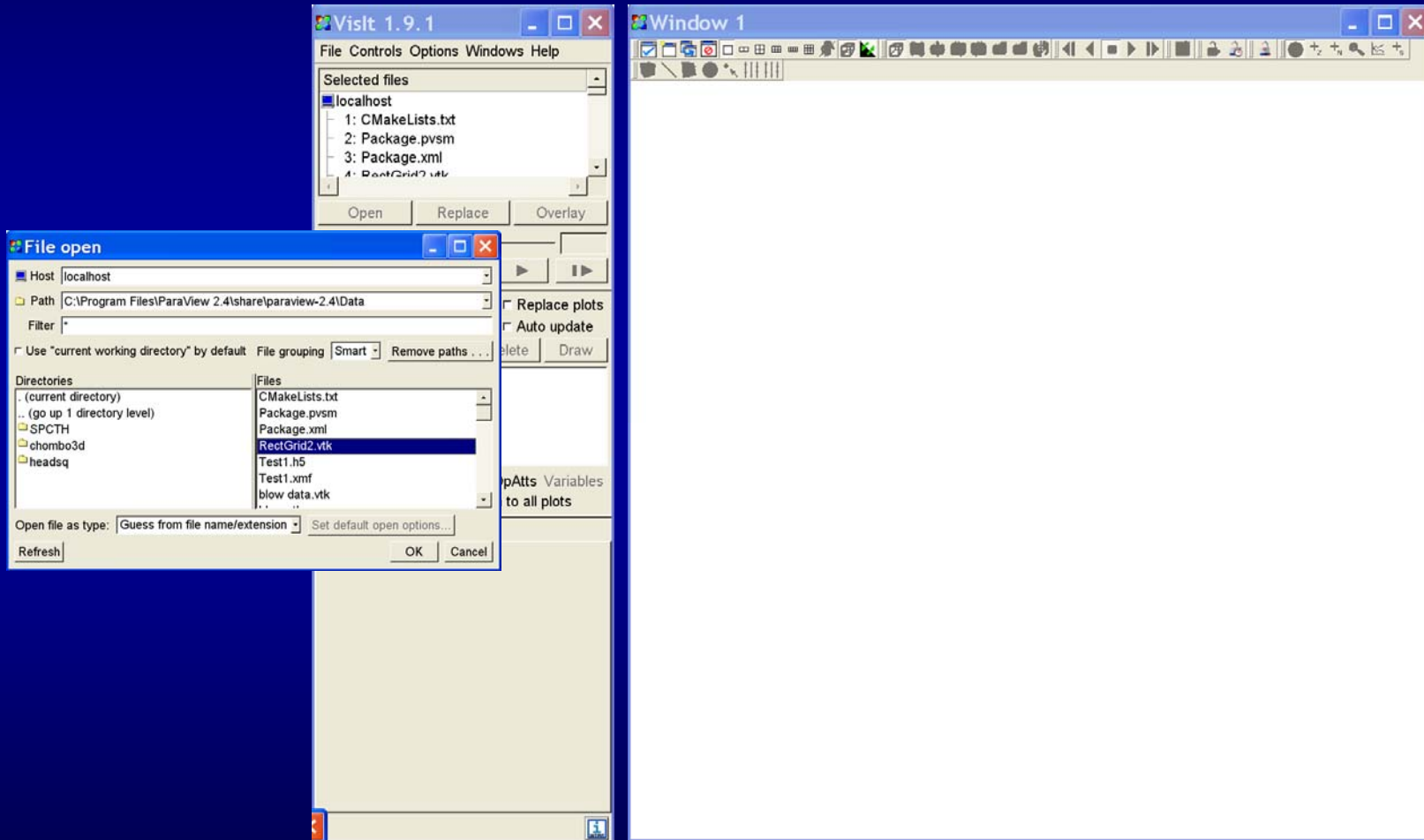
platform	executable
Linux - x86 32 bit Redhat Enterprise Linux 3, hoth.llnl.gov 2.4.21-27.0.2.c.ELsmp, gcc 3.2.3	download
Linux - x86 32 bit Redhat Enterprise Linux 4, ellipse.uchicago.edu 2.6.9-42.0.10.ELsmp, gcc 3.4.6	download
Linux - Opteron 64 bit Redhat Enterprise Linux 4, vertex.llnl.gov 2.6.9-70chaos, gcc 3.4.4	download
Linux - Opteron 64 bit Fedora Core 4, xchem.llnl.gov 2.6.17-1.2142_FC4smp, gcc 4.0.2	download
Linux - Itanium 64 bit Redhat Enterprise Linux 4, thunder.llnl.gov 2.6.9-70chaos, gcc 3.2.3	download
Linux - Altix 64 bit SUSE Linux Enterprise Server 9, davinci.nersc.gov 2.6.5-7.283-sn2, gcc 3.3.3	download
Windows SE/ME/2000/Xp MSVC7, Visual Studio 2003	download
Mac OS X - Intel Darwin 10.4.11, Darwin Kernel Version 8.11.1, gcc 4.0.1	download
Mac OS X - PowerPC Darwin 10.4, Darwin Kernel Version 8.10.0, gcc 4.0.1	download
Solaris SunOS 5.7, sunspot.llnl.gov Generic_106541-23, gcc 3.2	download
AIX - 32 bit AIX 5.3, up.llnl.gov 00C5D6DD4C00, xlc	download
AIX - 64 bit AIX 5.3, up.llnl.gov 00C5D6DD4C00, xlc	download
Irix IRIX 64 6.5, quad.llnl.gov 07010238, MIPSpro 7.41	download
Java client library (jar file, compiled classes, source code, examples)	download

VisIt 1.9.0

Done wci.llnl.gov

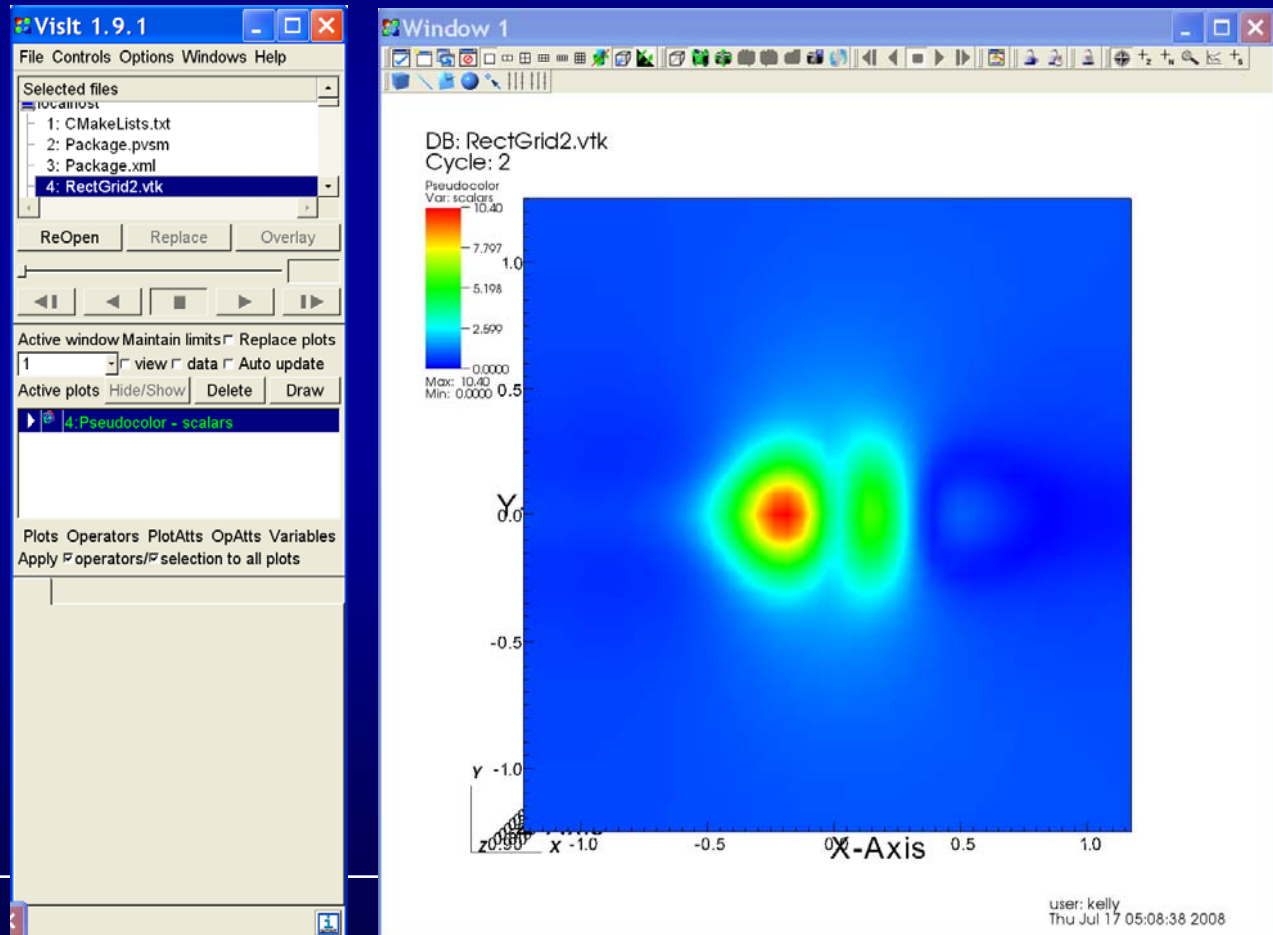
Download VisIt and Go Through Example

- Step 2: Bring up VisIt and Load the RectGrid2.vtk dataset



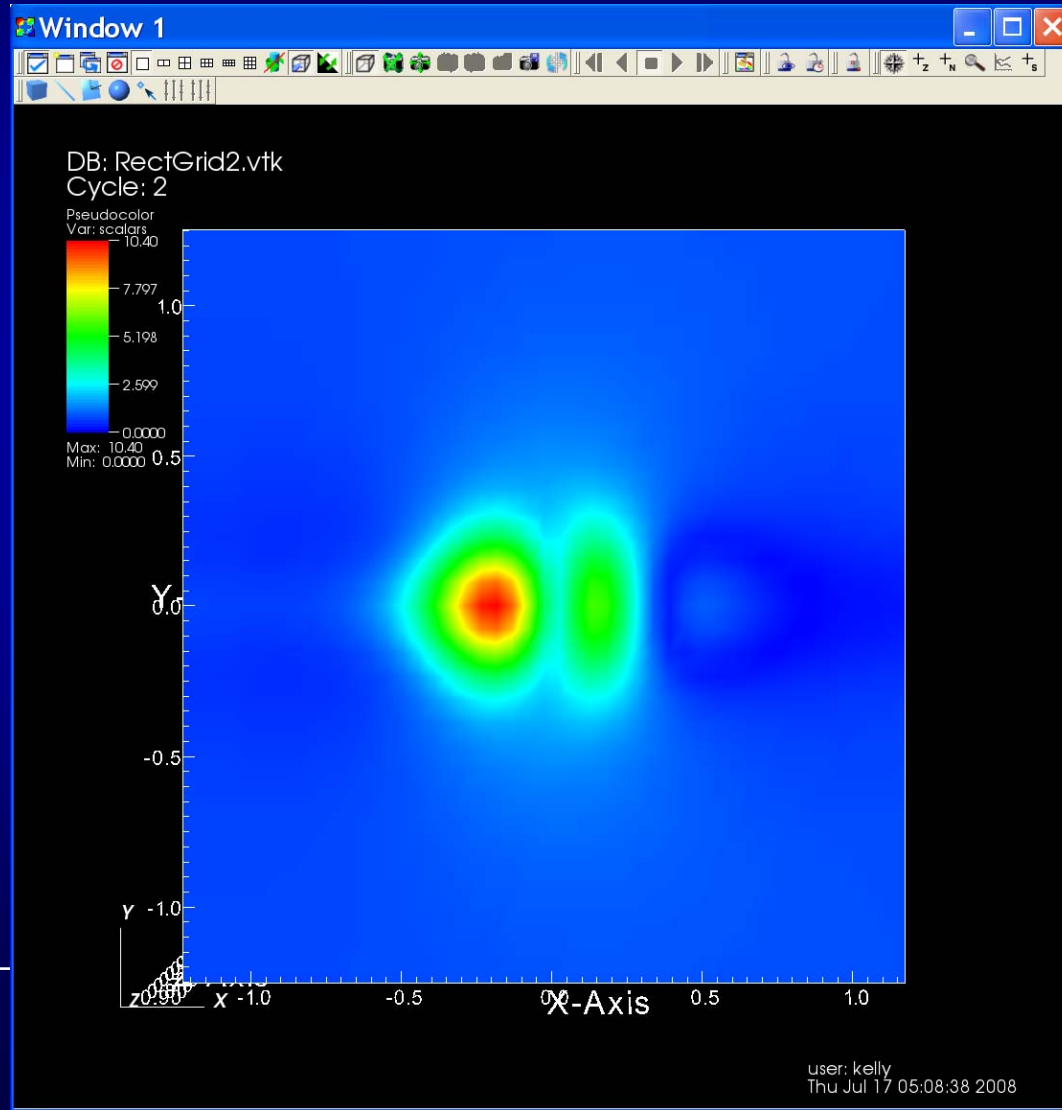
Download VisIt and Go Through Example

- Step 3: Create a surface plot (pseudocolor) of the volume boundary by clicking on plots and selecting pseudocolor.



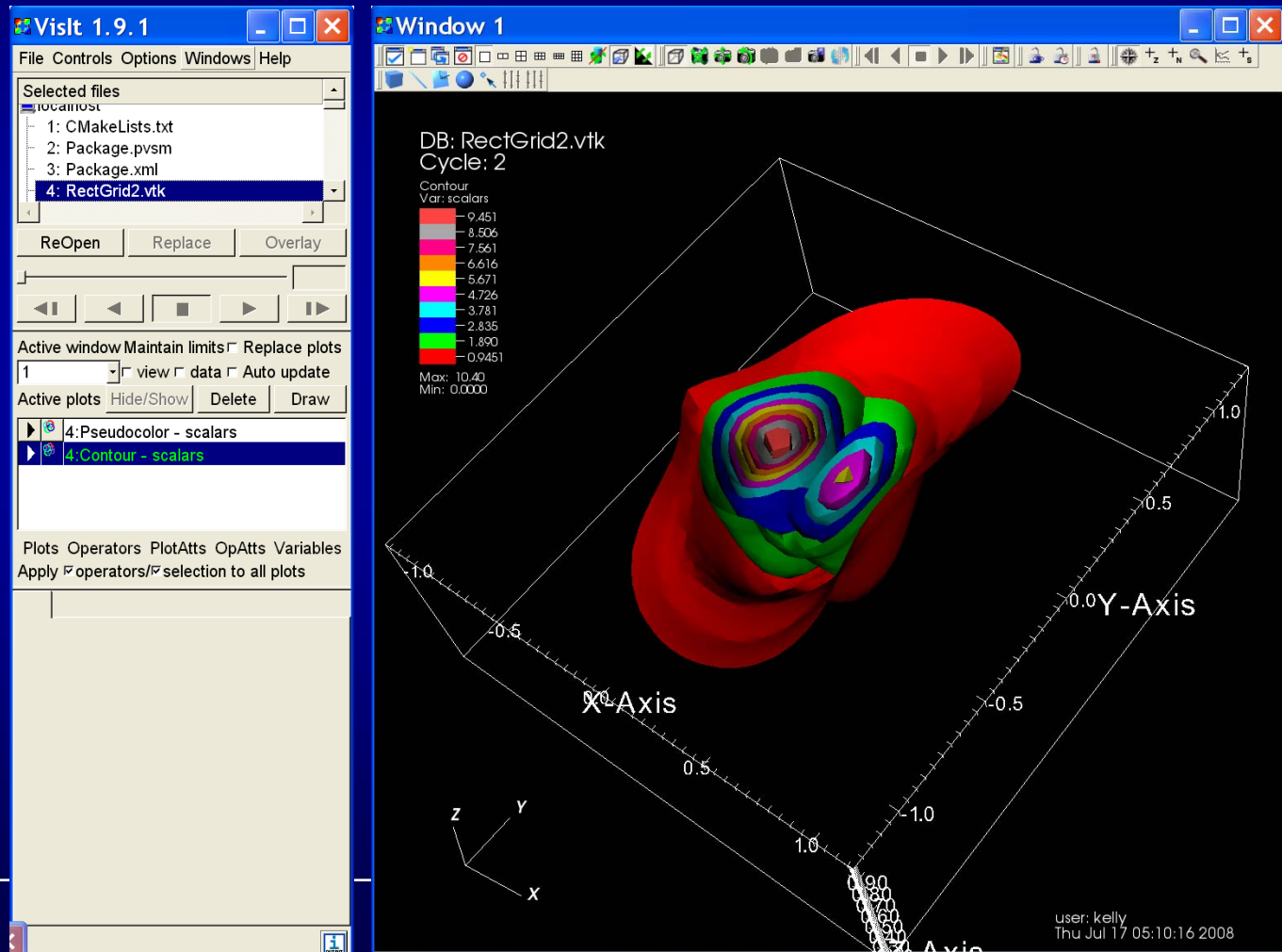
Download VisIt and Go Through Example

- Step 4: Swap the background color and foreground color



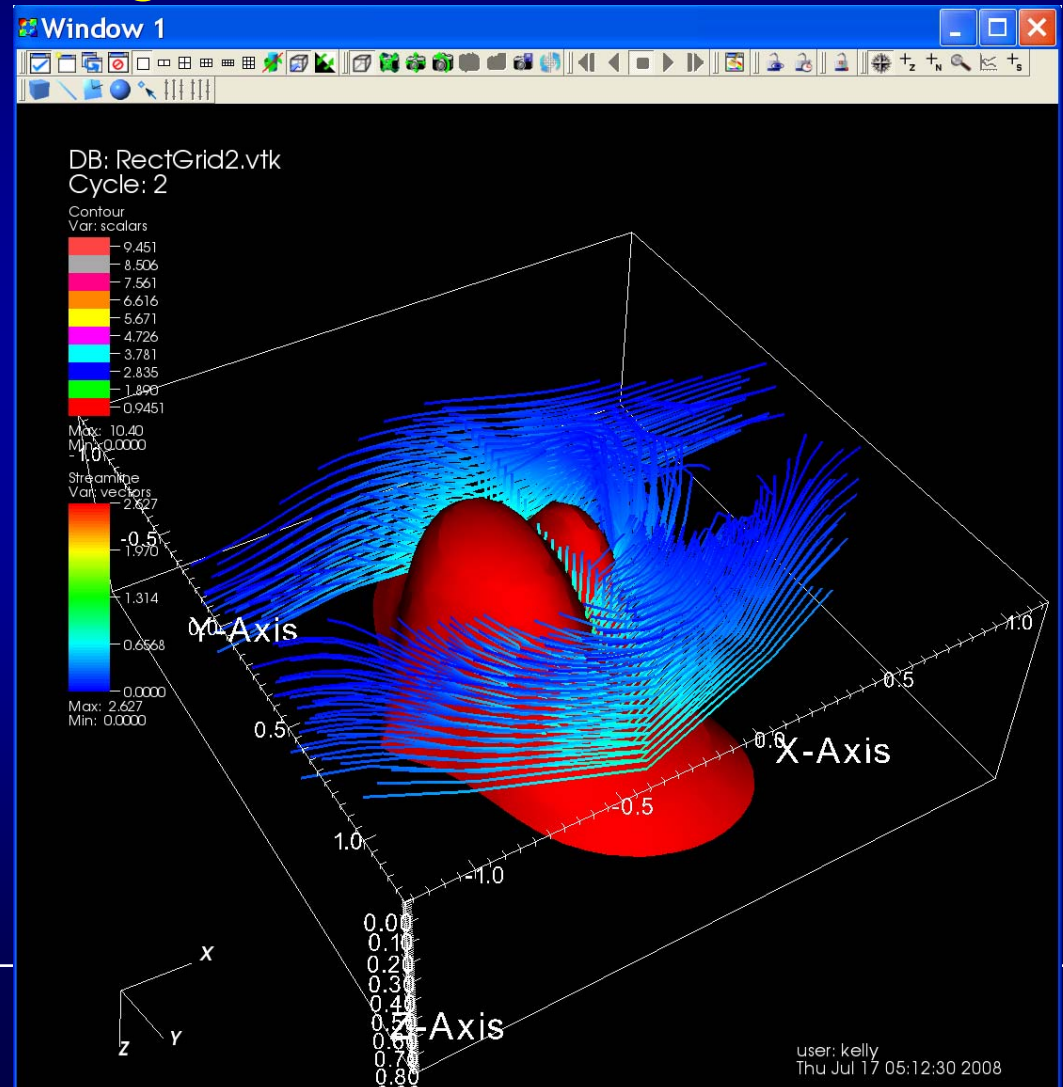
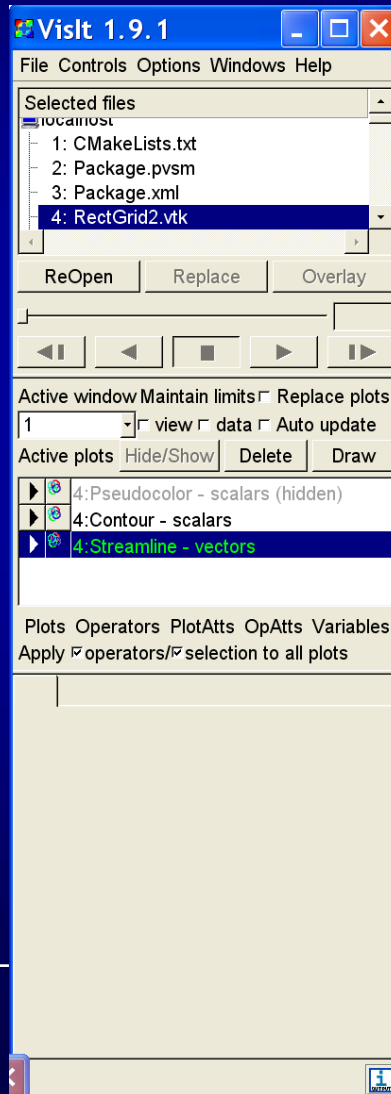
Download VisIt and Go Through Example

- Step 5: Create a set of isosurfaces by clicking on plots and selecting contours.



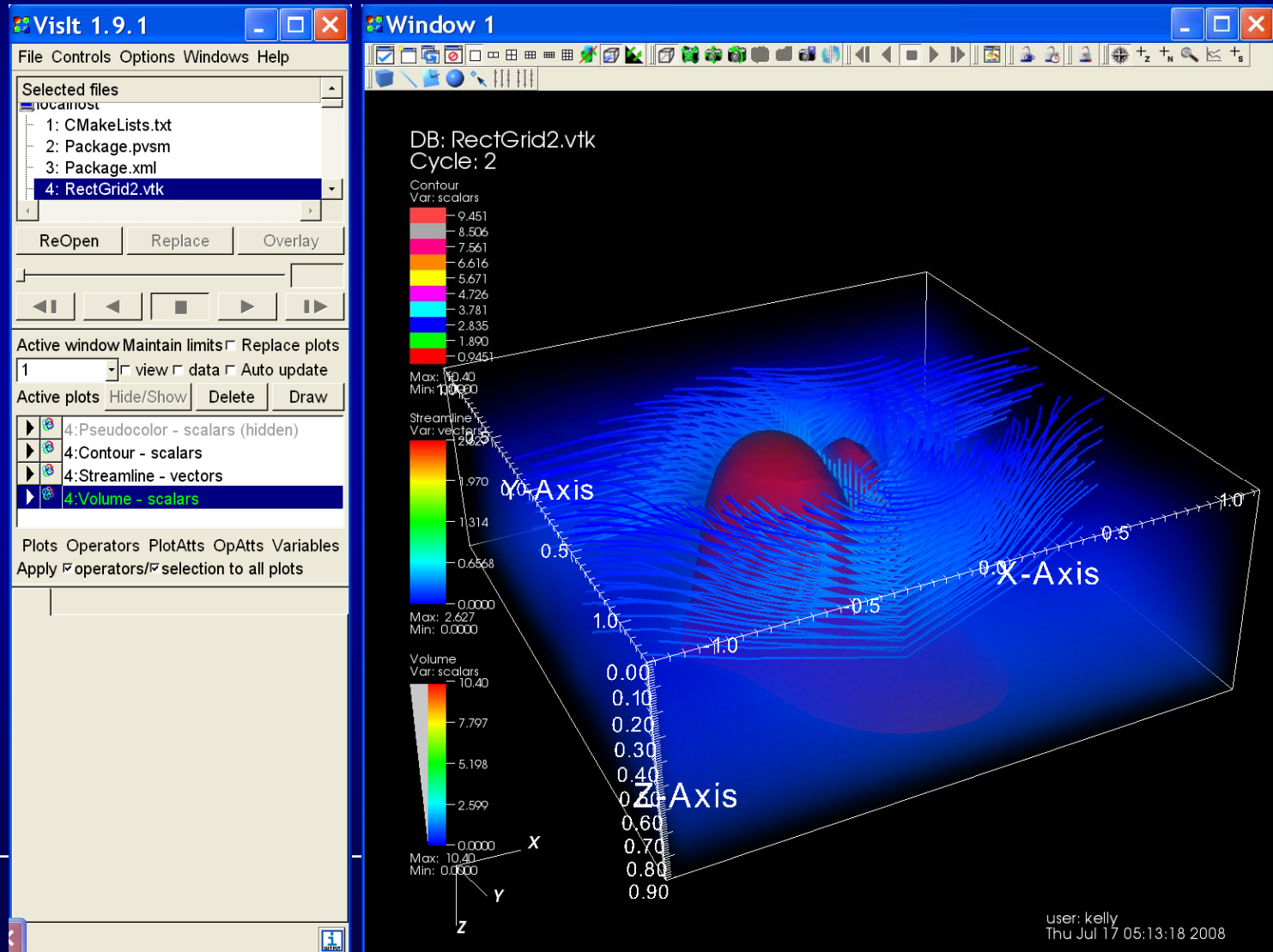
Download VisIt and Go Through Example

- Step 6: Create a set of streamlines by clicking on plots and selecting streamline



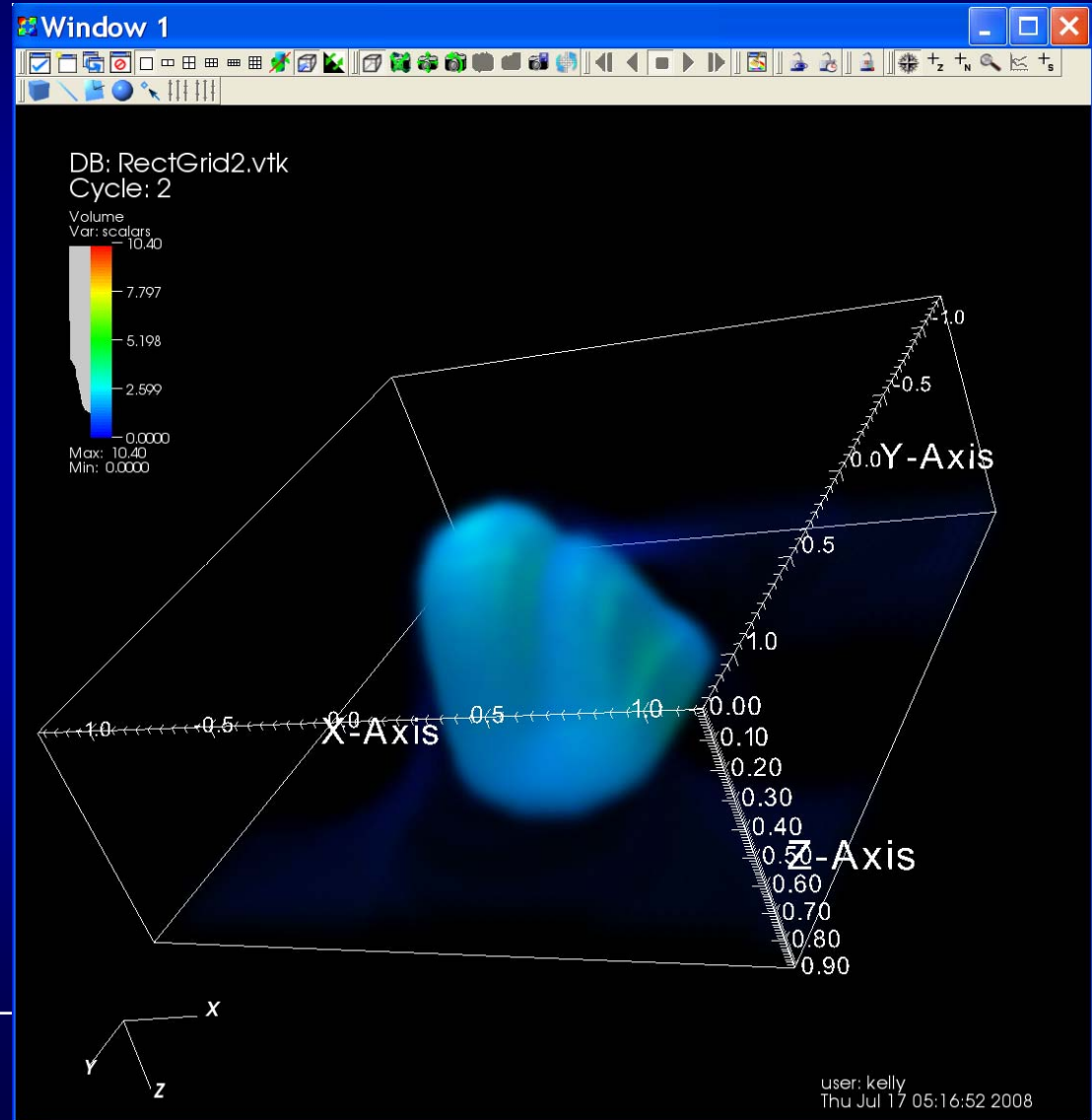
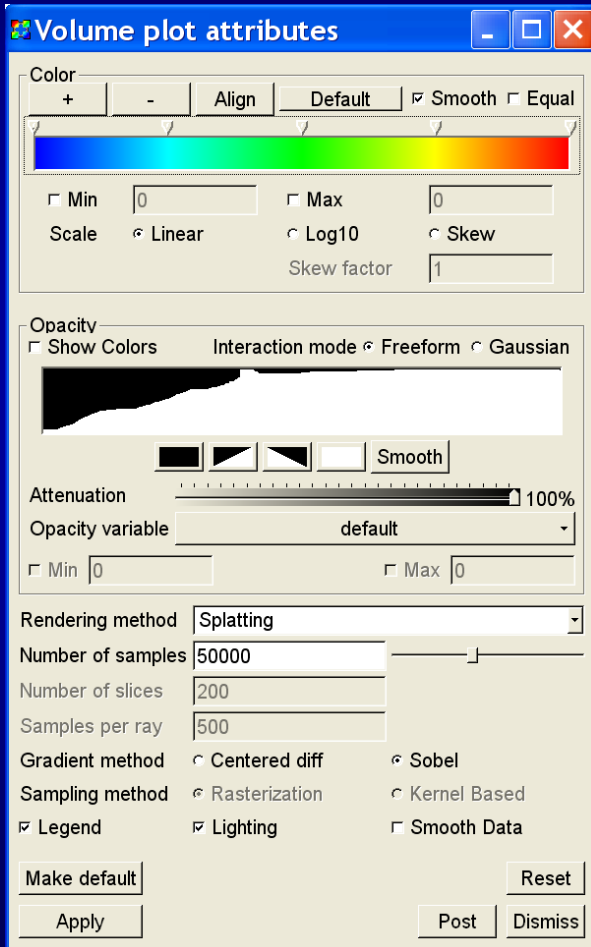
Download VisIt and Go Through Example

- Step 7: Create volume by selecting volume in plots



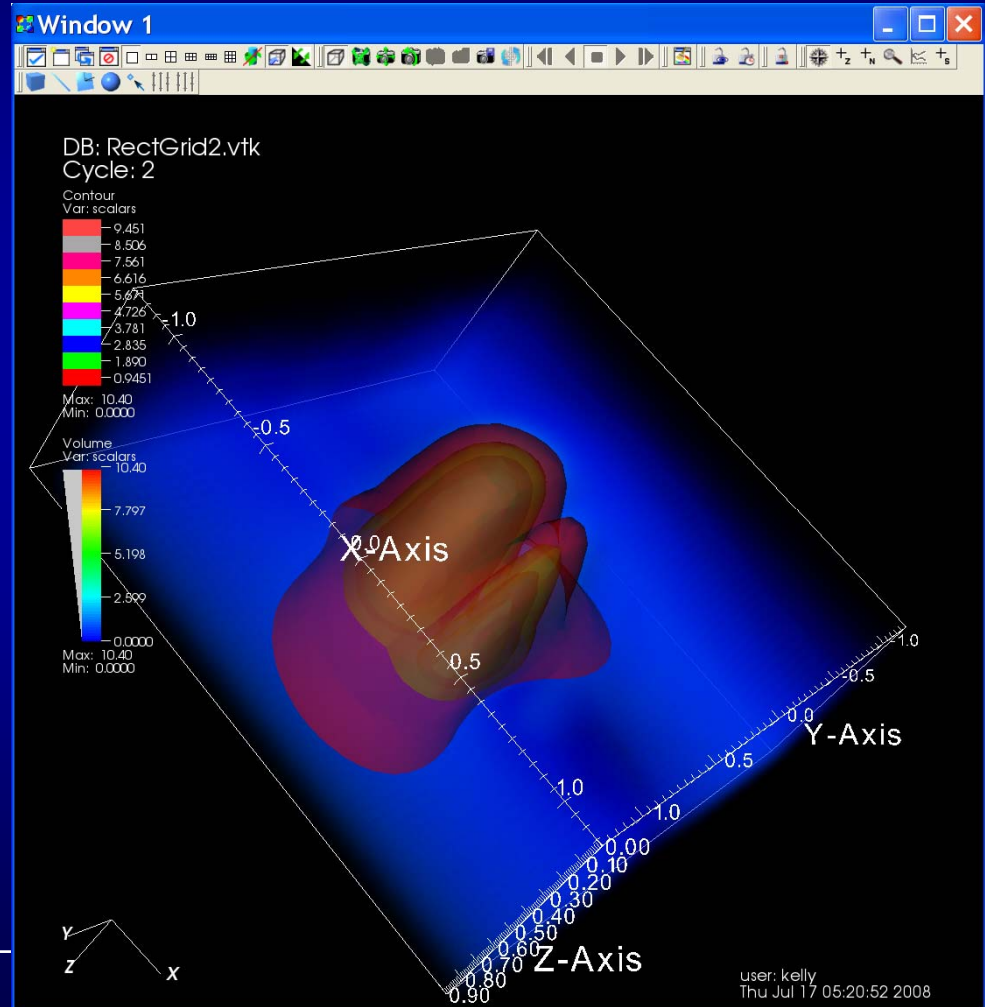
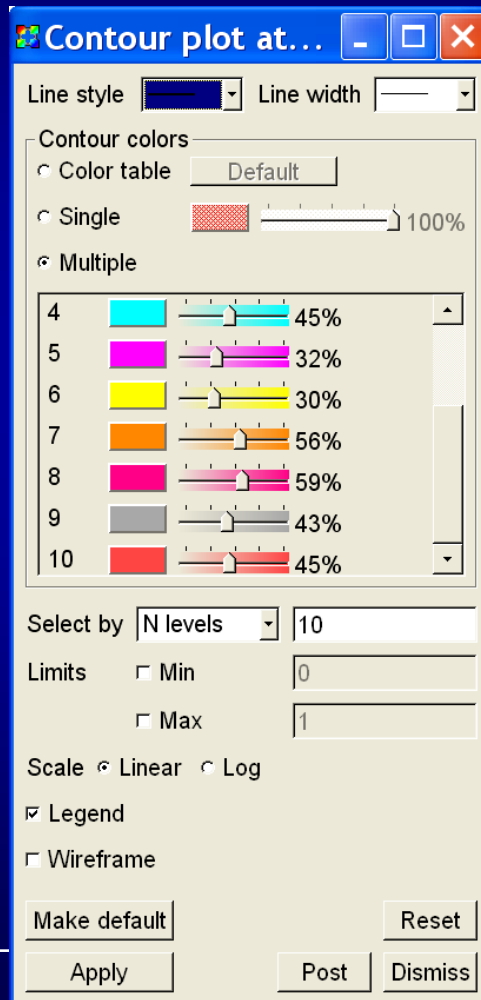
Download VisIt and Go Through Example

- Step 8: Adjust the volume rendering color profile



Download VisIt and Go Through Example

- Step 9: Adjust the transparency and color of isosurfaces



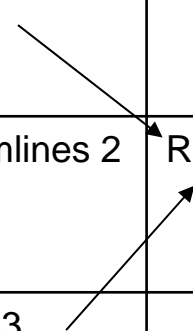
Topics Covered

- Remote and Collaborative Visualization
- EnVision – simplified Interface for Visualization
- Visualizing and Animating a Time Series in Paraview
- VisIt
- **Parallel Visualization**

Parallel Visualization

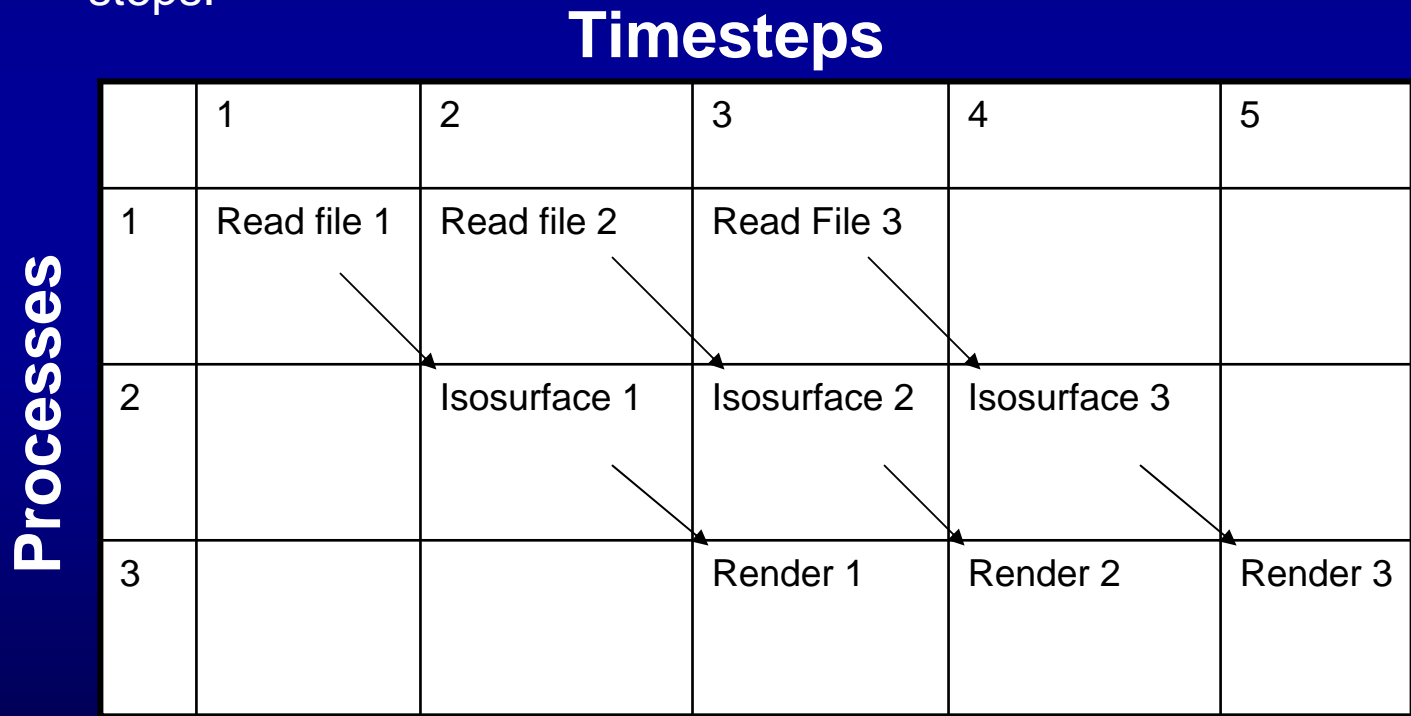
- Three types of parallelism to think about:
 - Task parallelism – passing results to 1 process for rendering

		Timesteps				
Processes		1	2	3	4	5
	1		Read file 1	Isosurface 1	Cut Plane 1	
	2			Read file 2	Streamlines 2	Render
	3	Read file 3	Triangulate 3	Decimate 3	Glyph 3	



Parallel Visualization

- Three types of parallelism to think about:
 - Pipeline parallelism – useful when processes have access to separate resources or when an operation requires many steps.



Parallel Visualization

- Three types of parallelism to think about:
 - Data parallelism – data set is partitioned between the processes and all processes execute same operations on the data. Scales well as long as the data and operations can be decomposed.

		Timesteps		
Processes		1	2	3
	1	Read partition 1	Isosurface partition 1	Render partition 1
	2	Read partition 2	Isosurface partition 2	Render partition 2
	3	Read partition 3	Isosurface partition 2	Render partition 3

Questions?

Parallel Paraview

- Paraview has three main logical components:
 - Client server responsible for user interface of the application
 - Data server reads and processes data sets to create final geometric models. Each process is told which partition of the data it should load
 - Render Server is responsible for rendering the final geometry. The render server can run in parallel if it is configured to do so.
- It is possible to run the render server with less processes than the data server, but never more.

Parallel Paraview

- Paraview can be run in a variety of configurations
 - Client, Data Server and Render Server all running on the same process (the way we have been running this week)
 - Client as a single process program, Data Server and Render Server as MPI multi-process programs.
 - MPI is used to send messages between processes
 - Sockets are used to send messages and data between servers

Running Parallel Paraview through VNC Session on Ranger

- Login to `login3.ranger.tacc.utexas.edu`
- Set your vnc password by typing 'vncpasswd'
- Start a vnc server: `vncserver`
- Pay attention to the display number on ranger as this is the one you are going to connect to
- Point vnc client to that adisplay:
 - E.g., 'Login3.ranger.tacc.utexas.edu, using display 3'
- This will bring up a vnc window

Running Parallel Paraview through VNC Session on Ranger

- Look for the file 'job' in your home directory. This is your job script
- Type 'module delete mvapich2'
- Type 'module swap pgi intel'
- Type 'module load mvapich'
- Type 'module load vis'
- Type 'module load mesa'
- Type 'module load qt'
- Type 'module load paraview'

Running Parallel Paraview through VNC Session on Ranger

- Type 'qsub job'
- Type 'showq -u' to see when your job starts to run
- When the job starts to run, do a 'qstat' to find your job. Look for the compute node you are running on
 - Example: If the compute node is: i115-406.ranger.tacc.utexas.edu, your compute node is i115-406
- Run paraview by typing 'paraview'
- Open the server dialog with: File -> Connect
- Click "Add Server"
- Enter a name, for example: i115-406 (look at qstat and look for compute node assigned to you)
- For "Server Type" select "Client / Server"

Running Parallel Paraview through VNC Session on Ranger

- For host, enter the compute node address, e.g.: i115-406.ranger.tacc.utexas.edu
- Click the “Configure” button
- For “Startup Type:” select “Manual”
- Click “Save”
- Under “Choose a server:” select the name you just entered, e.g. i115-406
- Click “Connect”

Running Parallel Paraview through VNC Session on Ranger

- NOTE: you will get a message that says rendering disabled on server. This is okay.
- NOTE: you will need to configure a new server each time the compute node changes, which will likely be each time you run ParaView.

Running Parallel VisIt through VNC Session on Ranger

- Login to `login3.ranger.tacc.utexas.edu`
- Start a vnc server: `vncserver` (if not already running)
- Pay attention to the display number on ranger as this is the one you are going to connect to
- Point vnc client to that display:
 - E.g., ‘`Login3.ranger.tacc.utexas.edu`, using display 3’
- This will bring up a vnc window

Running Parallel VisIt through VNC Session on Ranger

- Type 'module delete mvapich2'
- Type 'module swap pgi intel'
- Type 'module load mvapich'
- Type 'module load vis'
- Type 'module load mesa'
- Type 'module load qt'
- Type 'module load visit'

Running Parallel VisIt through VNC Session on Ranger

- Launch VisIt by typing 'visit'
- Configure a parallel run engine:
 - Open the host profile: <Ctrl+H> or **Options -> Host Profiles**
 - Click the button "New Profile"
 - Under the "Selected profile" tab:
 - Name the profile, e.g. "ranger-login3"
 - Remote host name will be the current login node, e.g. login3.ranger.tacc.utexas.edu
 - Check the "Parallel computation engine" box (this activates the "Parallel options" tab)

Running Parallel VisIt through VNC Session on Ranger

- Under the “Parallel options” tab:
 - Check the “Parallel launch method” box, and select “qsub/srun”
 - Check the “Launcher arguments” box, and enter arguments that you would put at the top of a job script, except for the queue (-q) and the account information (-A). For example:
 - V -cwd -N visit_engine -j y
 - o \$JOB_NAME.o\$JOB_ID -pe 16way 16
 - l h_rt=00:30:00
 - Check the “Partition / Pool” box, and enter the queue name. This will usually be “normal” or “development”
 - Set the “Default number of processors” field to a value greater than one. The exact value is ignored, but it must be 2 or more to avoid automatic launch of the serial engine. The number of processors requested is controlled by the “-pe” argument in the “Launcher arguments” field above.
 - Check the “Default Bank” box, and enter the account to charge against: A-tr3

Running Parallel VisIt through VNC Session on Ranger

- Under the “Advanced options” tab:
 - Check the box “Use VisIt script to set up parallel environment”
 - Check the box “Tunnel data connections through SSH”
- Click the button “Apply”
- Click the button “Dismiss”
- Save your configuration! Select Options -> Save Settings
- When you load a data file, a dialog will open where you can select the host configuration. Here you can change the account you would like to use, if needed.

Questions?