



Paraview

- Excellent for computational fluid dynamics
- Straightforward to use
- Runs in parallel several ways
- Download at <http://www.paraview.org/New/download.html>



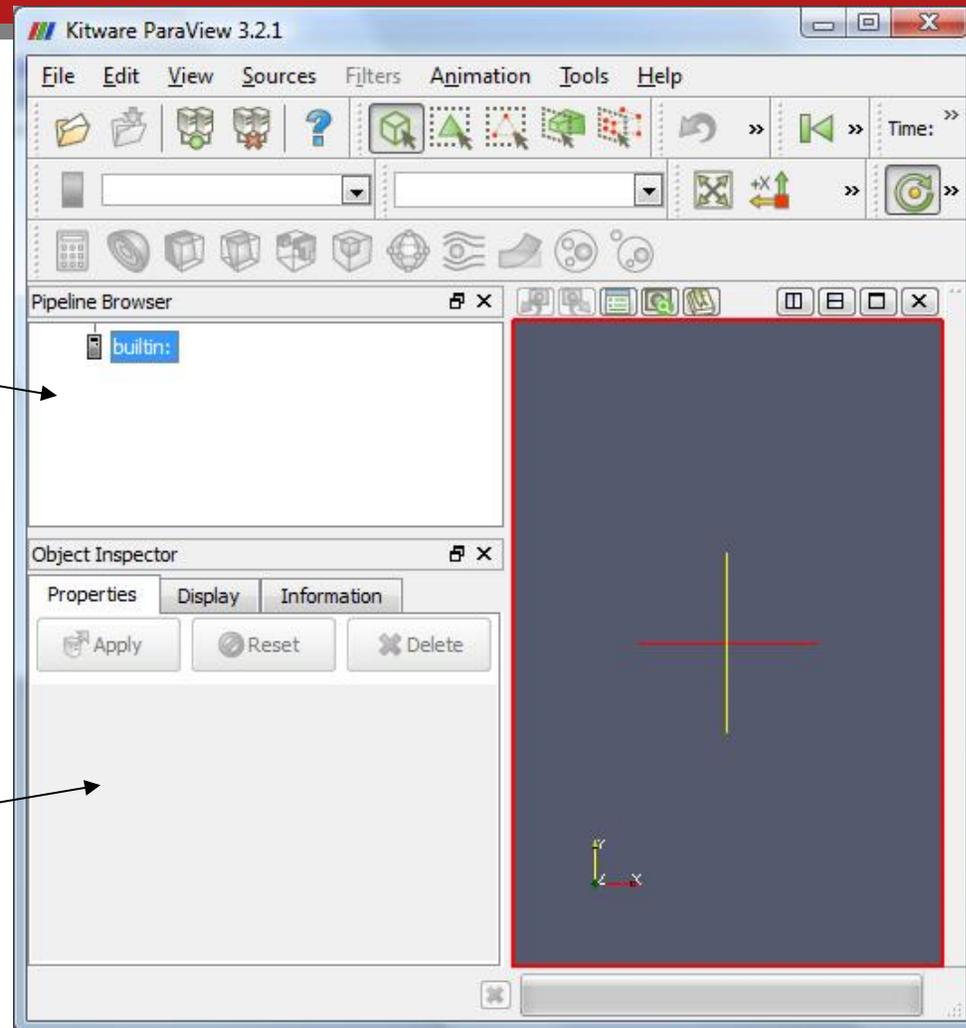
Paraview Lab

- Goal is to see basic functions – contour, streamline, volume rendering – on a local machine before we go to Spur.
- Copy RectGrid2.vtk to your machine.
- Start Paraview from the Windows menu.



Pipeline browser

Object inspector

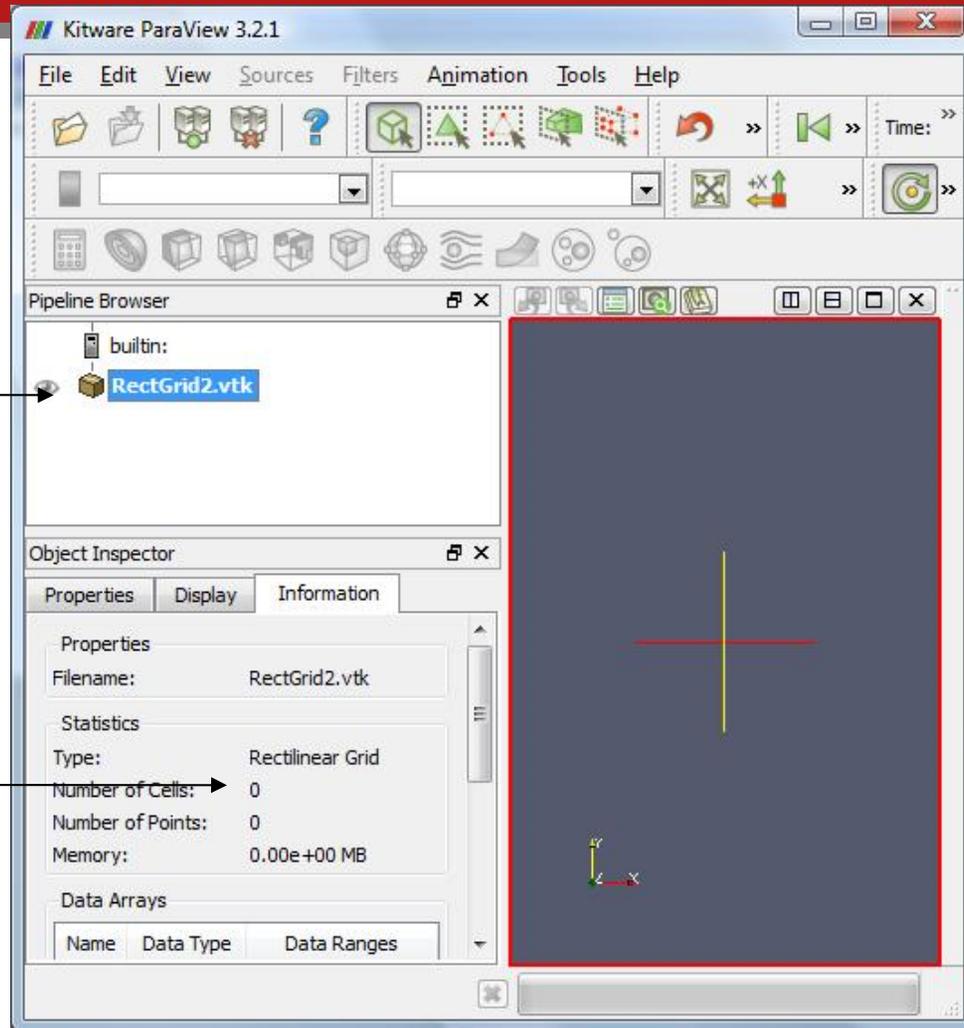




Load RectGrid2.vtk
using File->open.

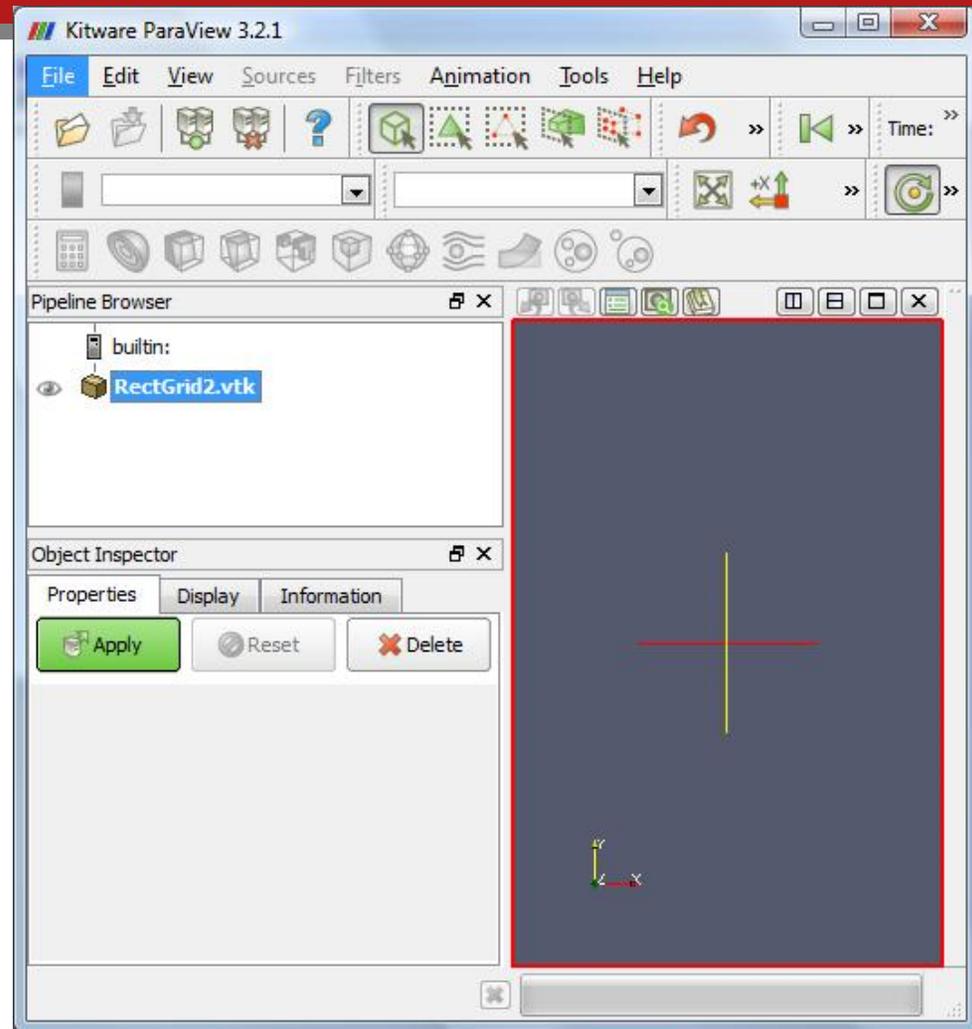
Your file at the top
of the pipeline.

It thinks there are no
cells or points in the file.



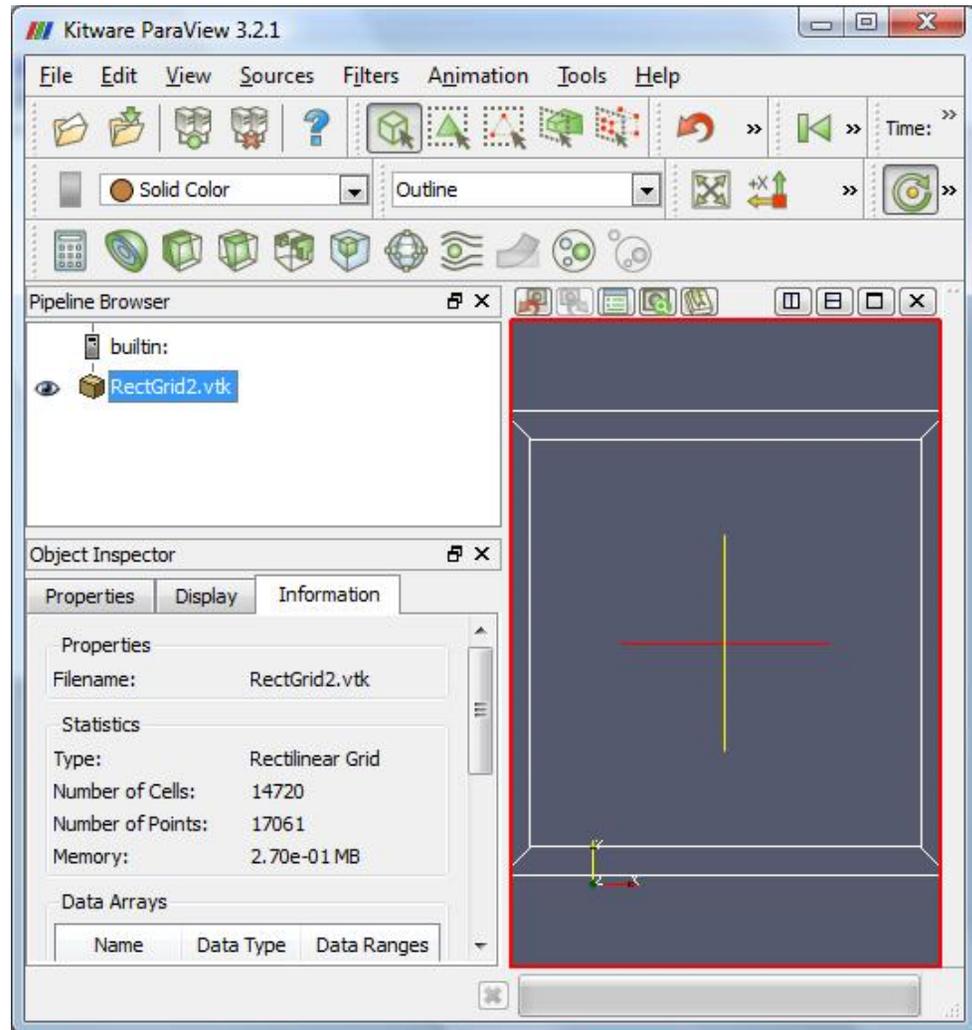


Hit "Apply" to load the file.



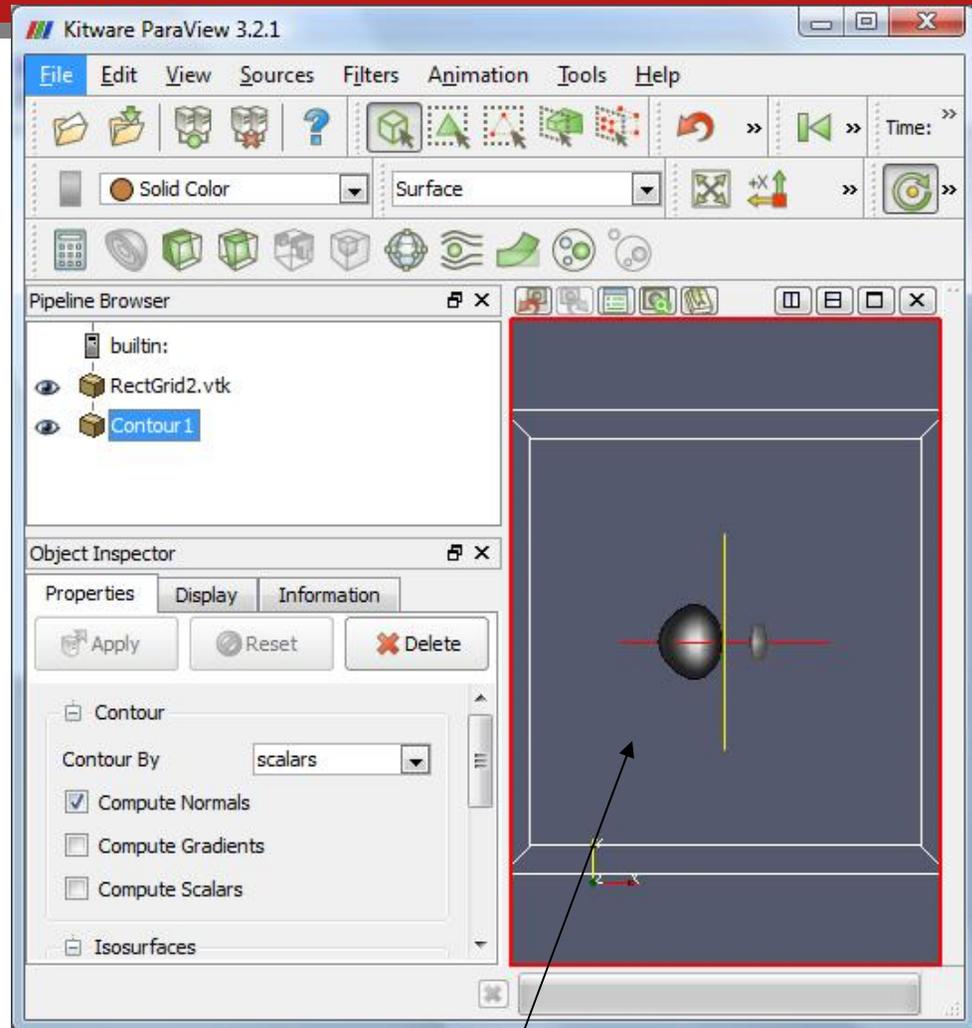


Cells!
Points!





1. Select dataset
2. Find Contour filter in the Filters menu.
3. Hit Apply, as usual.



Click and drag. Try ctrl, shift, middle-click, right-click.

03/11/09

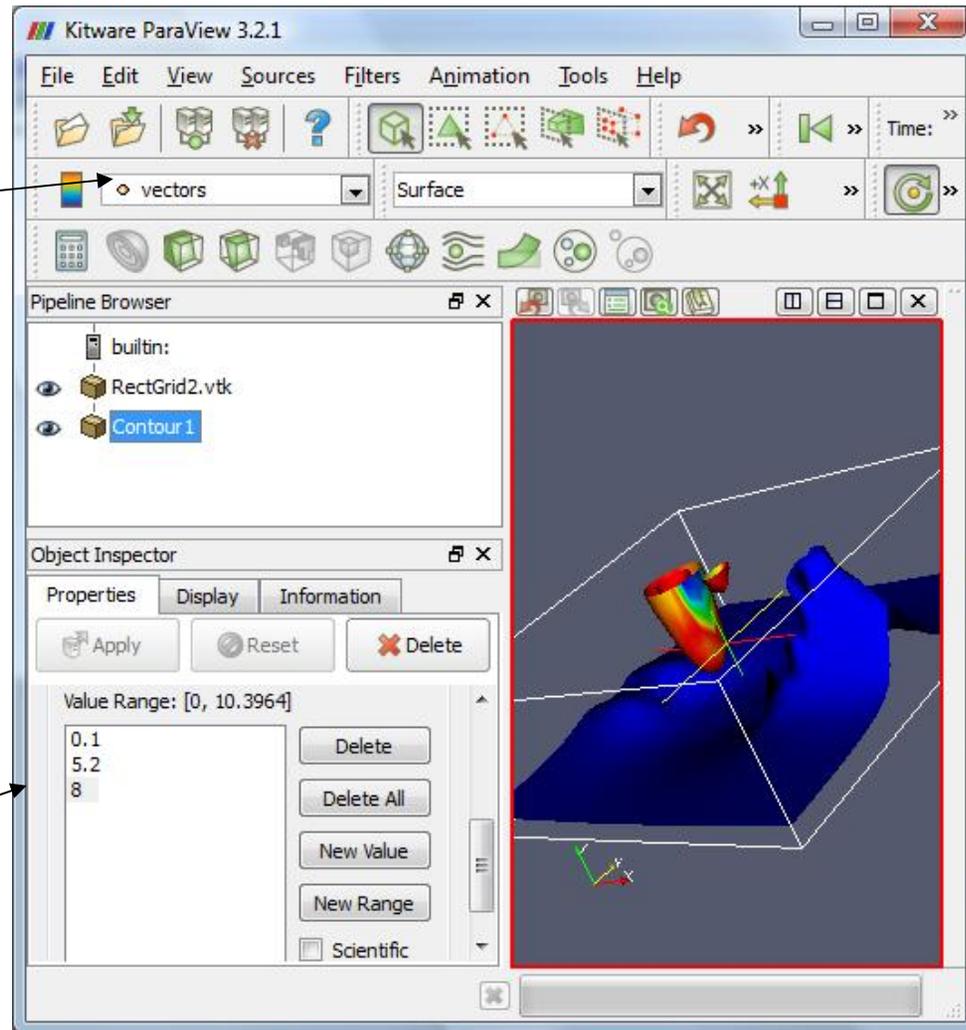
www.cac.cornell.edu

(Change navigation in Edit menu->Settings->Render View->Camera.)



Add colors with the drop-down list box. The choices come from fields of the dataset.

Change contours



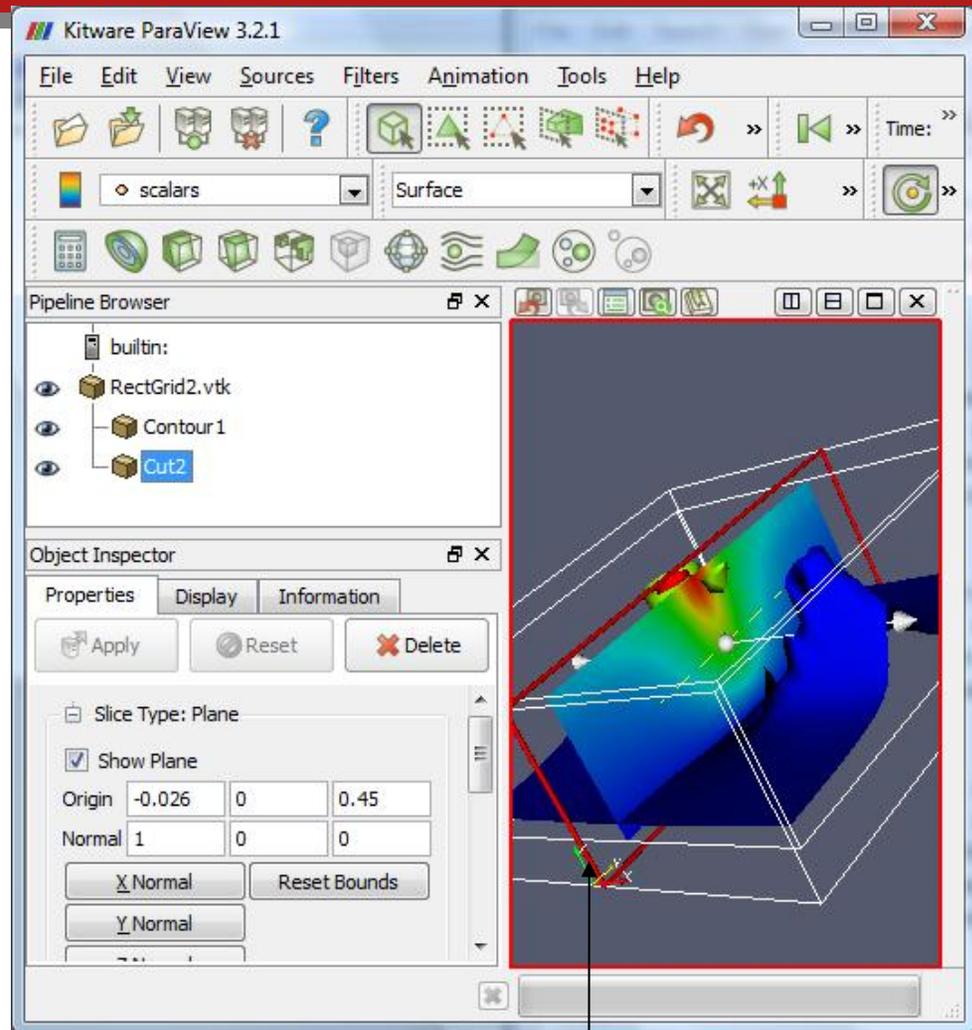


1. Select RectGrid2.vtk
2. Add Slice filter.
3. Hit apply, again.

or...

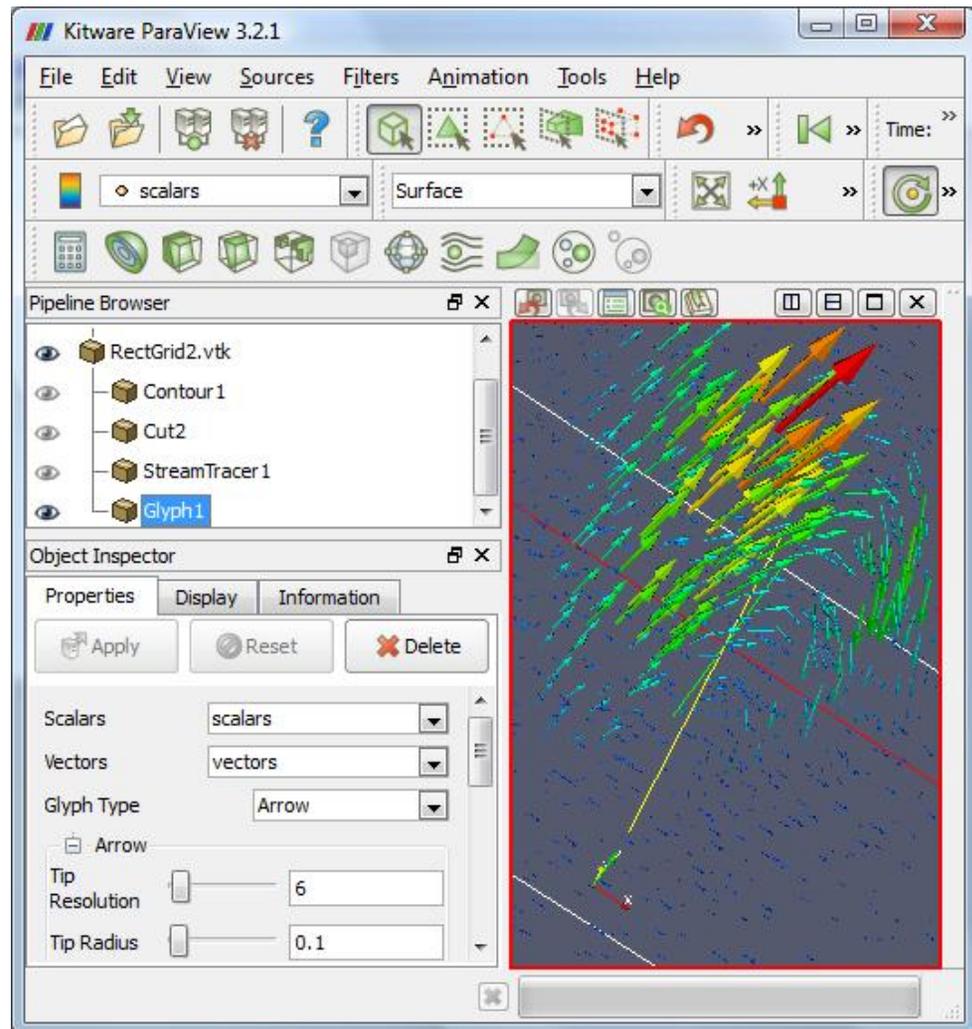
1. Select Contour1
2. Add Slice filter.
3. Apply, apply.

What is the difference?



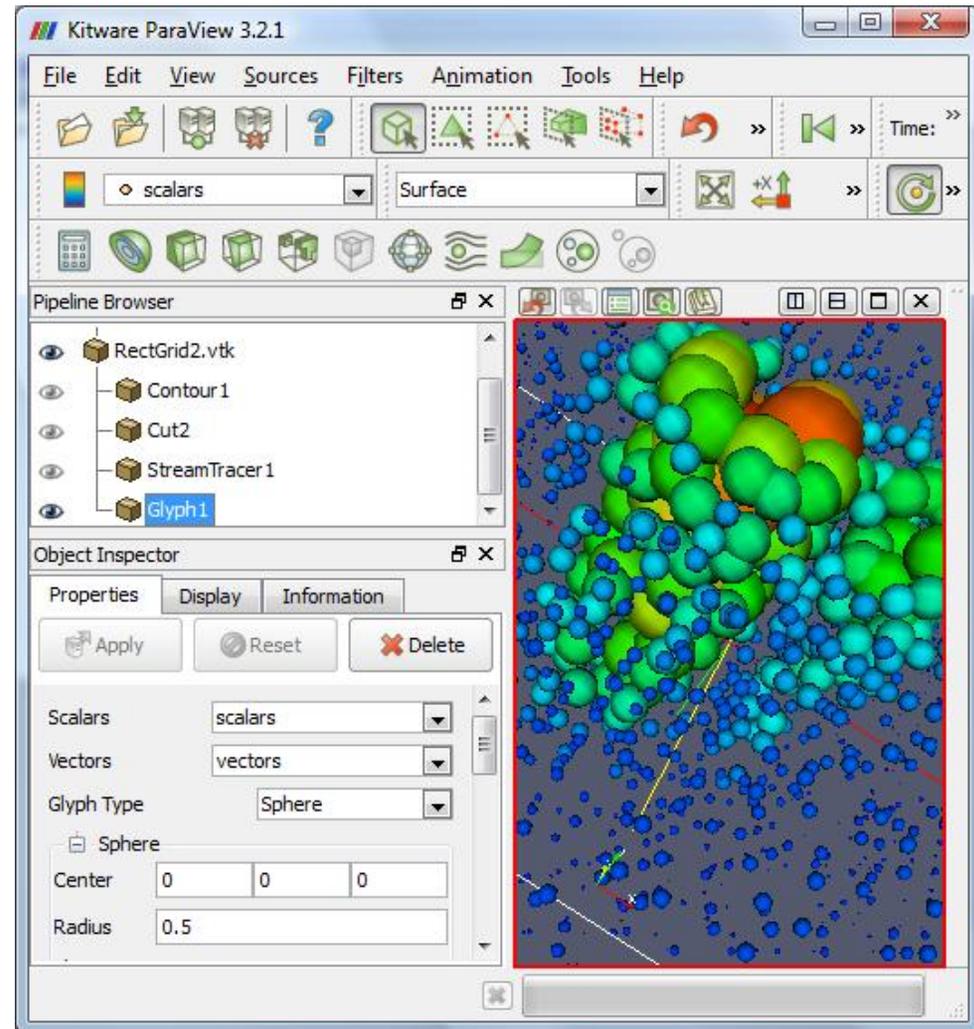


Glyph filter.
Play with the glyph type options.



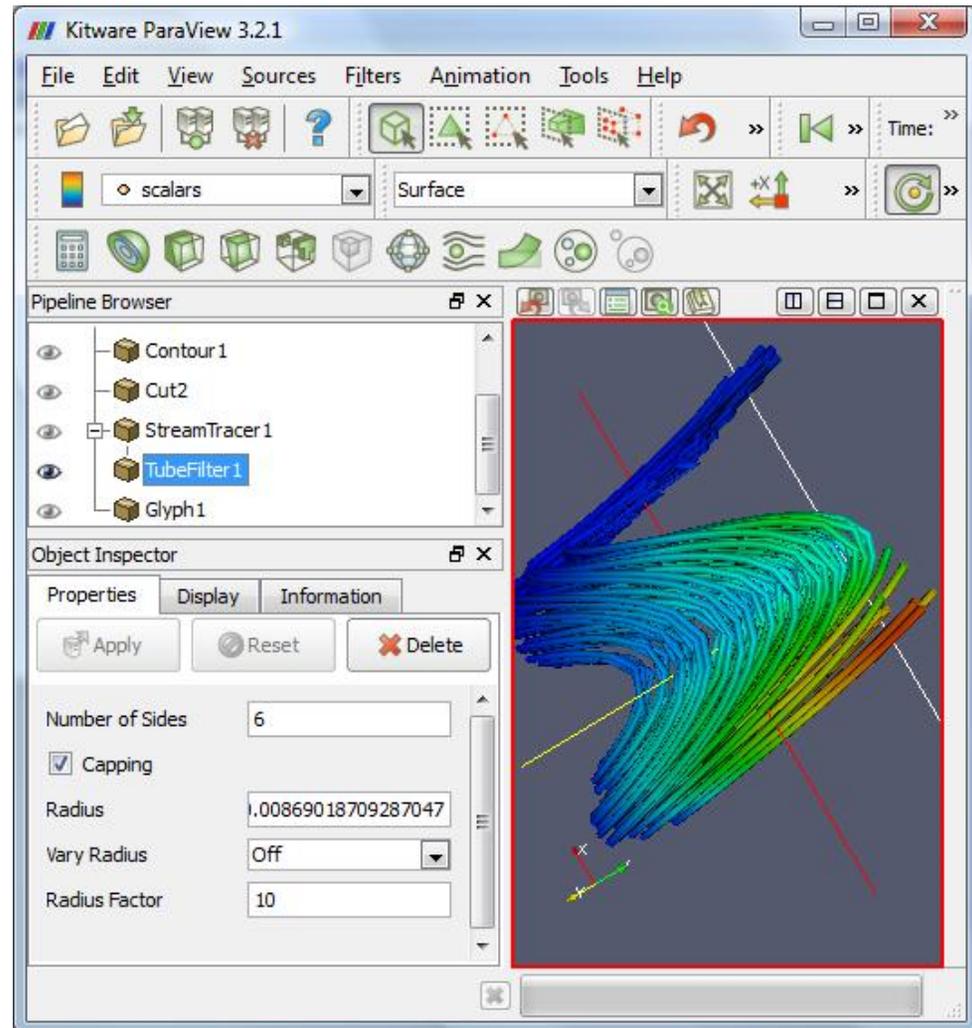


The human visual system does not know whether to compare sphere size by diameter or volume. There is no good sense of “twice as much.”





This time, add the tube filter to the StreamTracer, not to RectGrid2.

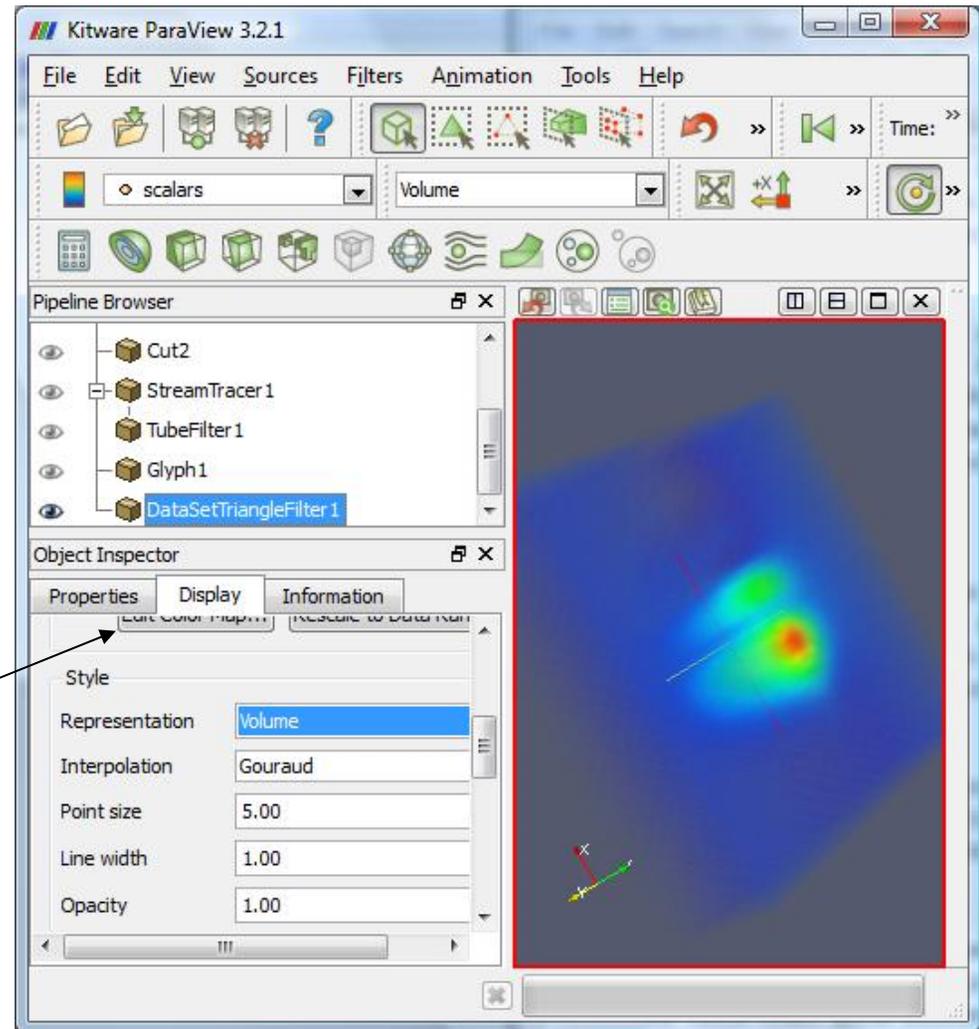




Volume Rendering

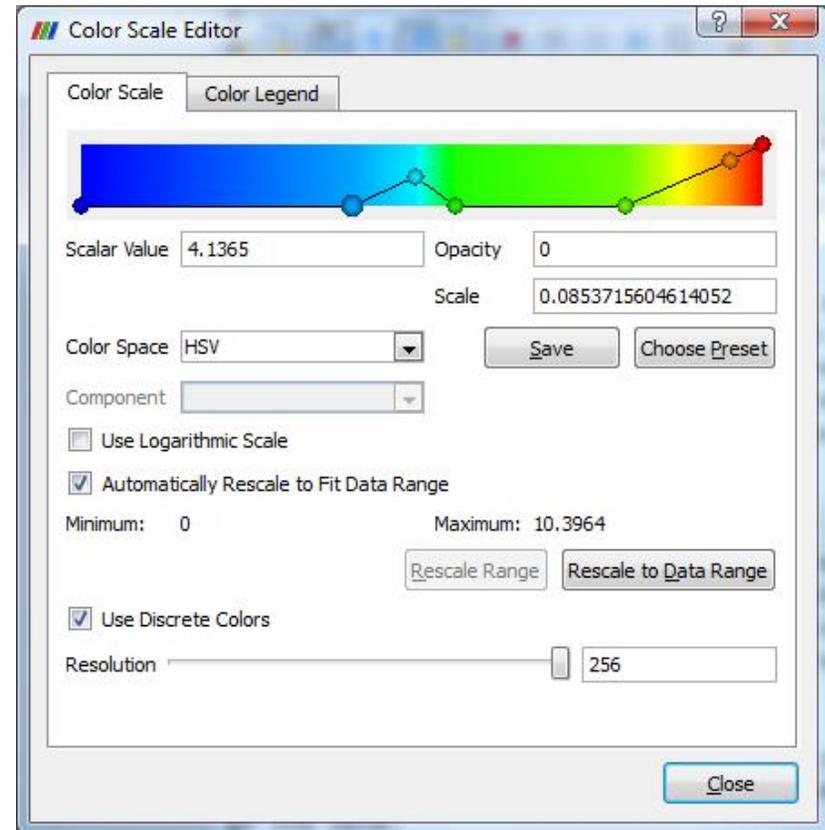
First, add “tetrahedralize” filter.
Select Display tab.
Find the Style section.
Change representation.

The colormap is just above
the Style section if you scroll up.





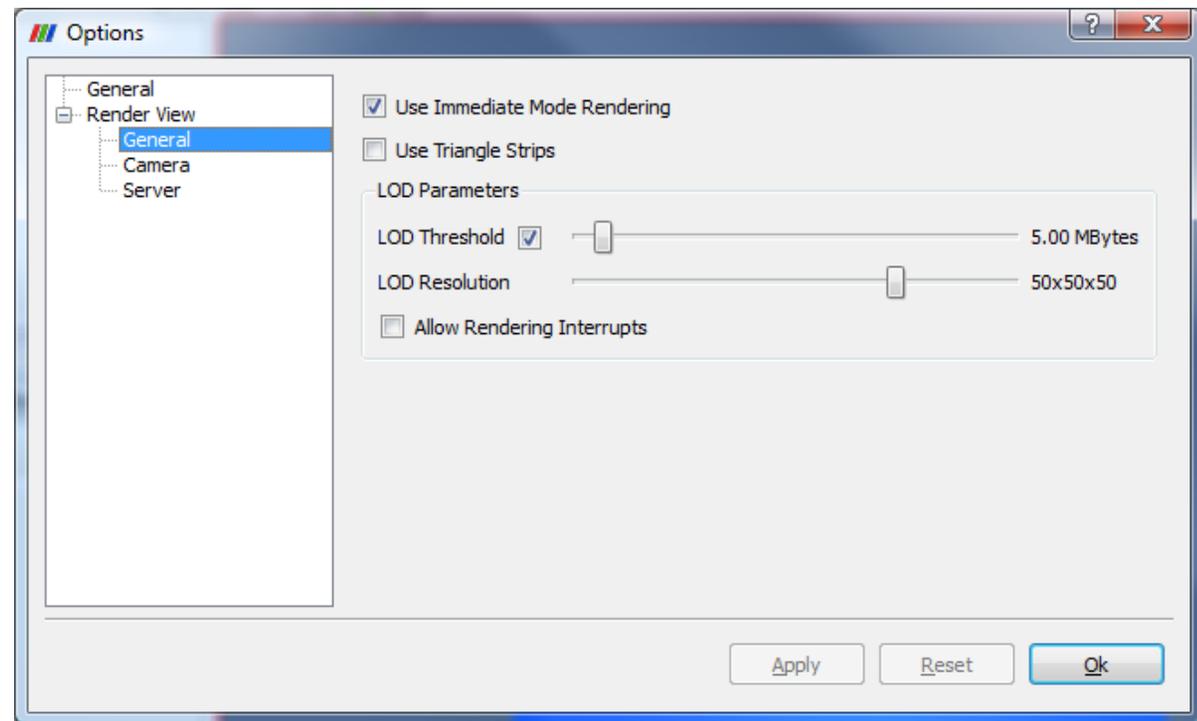
For volume rendering, the y axis
of the line determines opacity.





Level of Detail for Interaction

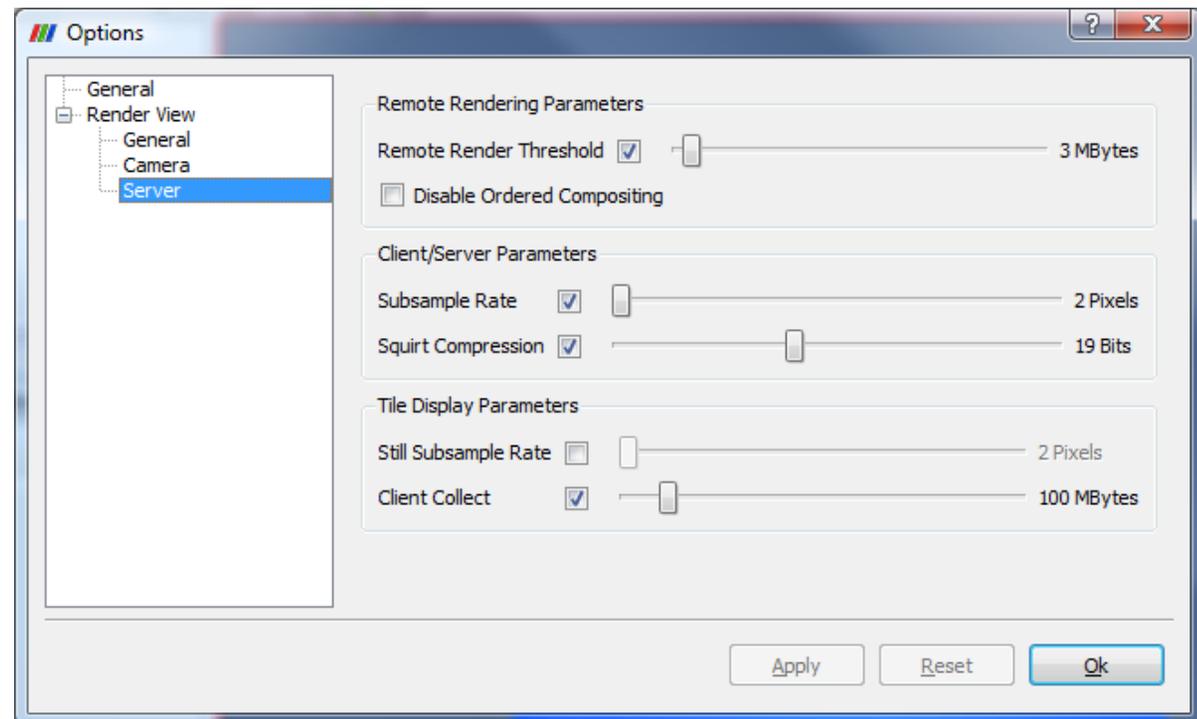
- So spinning the model is faster.





Remote Render Threshold

- Have the server send raw polygon data if there isn't much of it.
- Good if you only have an outline up for a bit.





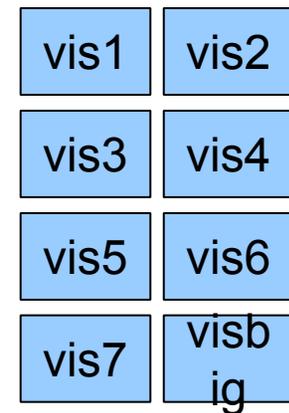
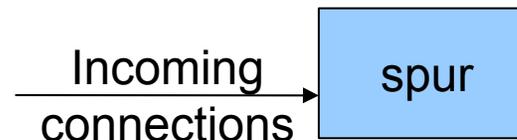
Paraview Remote Lab

- Goal: Experience joys and pains of remote visualization.
- Compare remote with local.
- Account is train1xx. It will work for a week.



Overview of Remote Paraview Lab

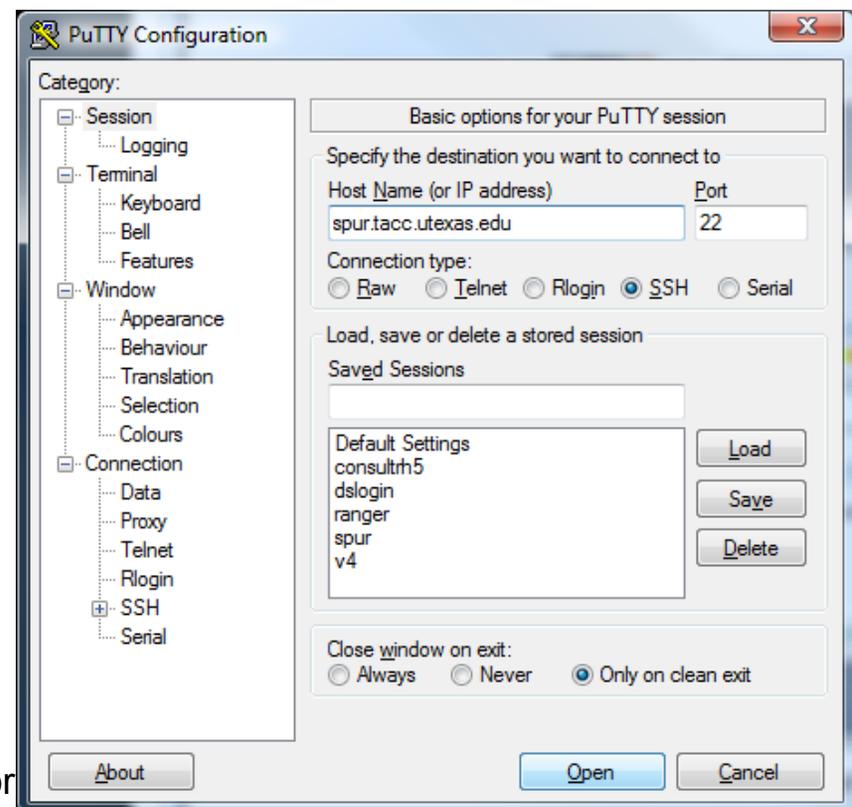
- SSH to Spur.
- Submit a job to SGE (the scheduler) to start VNC.
- Open a tunnel for VNC.
- Let your friends join.
- Start Paraview.





First SSH

- On Linux, don't ssh -X. Just ssh train1xx@spur.tacc.utexas.edu.
- On Windows, fill in the host name and click Open.





On Login, Get Account Name

```
----- Project balances for user train150 -----
| Name                Avail SUs      Expires |
| 20090312HPC         500                |
-----
----- Disk quotas for user train150 -----
| Disk                Usage (GB)   Limit    %Used   File Usage   Limit    %Used
| /share              0.0         6        0.02   68          100000   0.07
-----

spur% vncpasswd
Password: <type "casper">
Verify:   <type "casper">
```

- Account is 20090312HPC
- Make your (vncpasswd = casper) so we don't have to ask later.



Special for Tutorial: Share VNC

- Four people share one 128MB 16-way server.
- One person submits the job script, gets a node.
- Same person connects with VNC, starts 3 more VNC servers.
- Other 3 connect to those VNC servers, using the account of the first person.



Edit the Job Script

- Copy it. Then add `-A 20090312HPC` and `-pe 4way`. And change runtime to go the whole day.

```
spur% cp /share/sgc/default/pe_scripts/job.vnc job.vnc
spur% vi job.vnc
```

```
## -V                # Inherit the submission environment
## -A 20090312HPC
## -cwd              # Start job in submission dir
## -N vncserver      # Job name
## -j y              # Combine stderr and stdout into stdout
## -o $HOME/$JOB_NAME.out # Name of the output file
## -pe 4way 16        # Request 1 Vis node
## -q vis             # Queue name
## -l h_rt=6:00:00   # runtime (hh:mm:ss) - 4 hours
```

In vi, type “i” to edit. Then hit the escape key to return to *command mode*.

Save the file with “:w<return>” and quit with “:q<return>”. Quit without saving with “:q!”.



Submit the Job

```
spur% qsub job.vnc -geometry 1440x900
```

```
-----  
Welcome to TACC's Spur Visualization System, an NSF TeraGrid Resource  
-----
```

```
--> Submitting 16 tasks...  
--> Submitting 4 tasks/host...  
--> Submitting exclusive job to 1 hosts...  
--> Verifying HOME file-system availability...  
--> Verifying WORK file-system availability...  
--> Verifying SCRATCH file-system availability...  
--> Ensuring absence of dubious h_vmem,h_data,s_vmem,s_data limits...  
--> Requesting valid memory configuration (mt=31.3G)...  
--> Checking ssh keys...  
--> Checking file existence and permissions for passwordless ssh...  
--> Verifying accounting...  
--> Validating against Spur allocations  
--> Using queue vis ...  
--> Using parallel environment 16way ...  
--> Using project TG-MyAcct ...
```

```
Your job 581332 ("vncserver") has been submitted  
03/11/09 www.cac.cornell.edu
```



Find Which Node and VNC Server

- “showq -u” tells you whether your job is running.
- Use “ls” to find vncserver.out after the job is running.
- “tail vncserver.out” to see information at end.
- “-f” helpful if file already exists.

```
spur% showq -u
spur% ls
spur% tail vncserver.out
job execution at: Sat Mar 7 15:03:17 CST 2009
got VNC display vis3.ranger.tacc.utexas.edu:1
VNC display number is 1
local (compute node) VNC port is 5901
got spur vnc port 5931
Your VNC server is now running!
To connect via VNC client:  SSH tunnel port 5931 to
spur.tacc.utexas.edu:5931
                                Then connect to localhost:5931
```



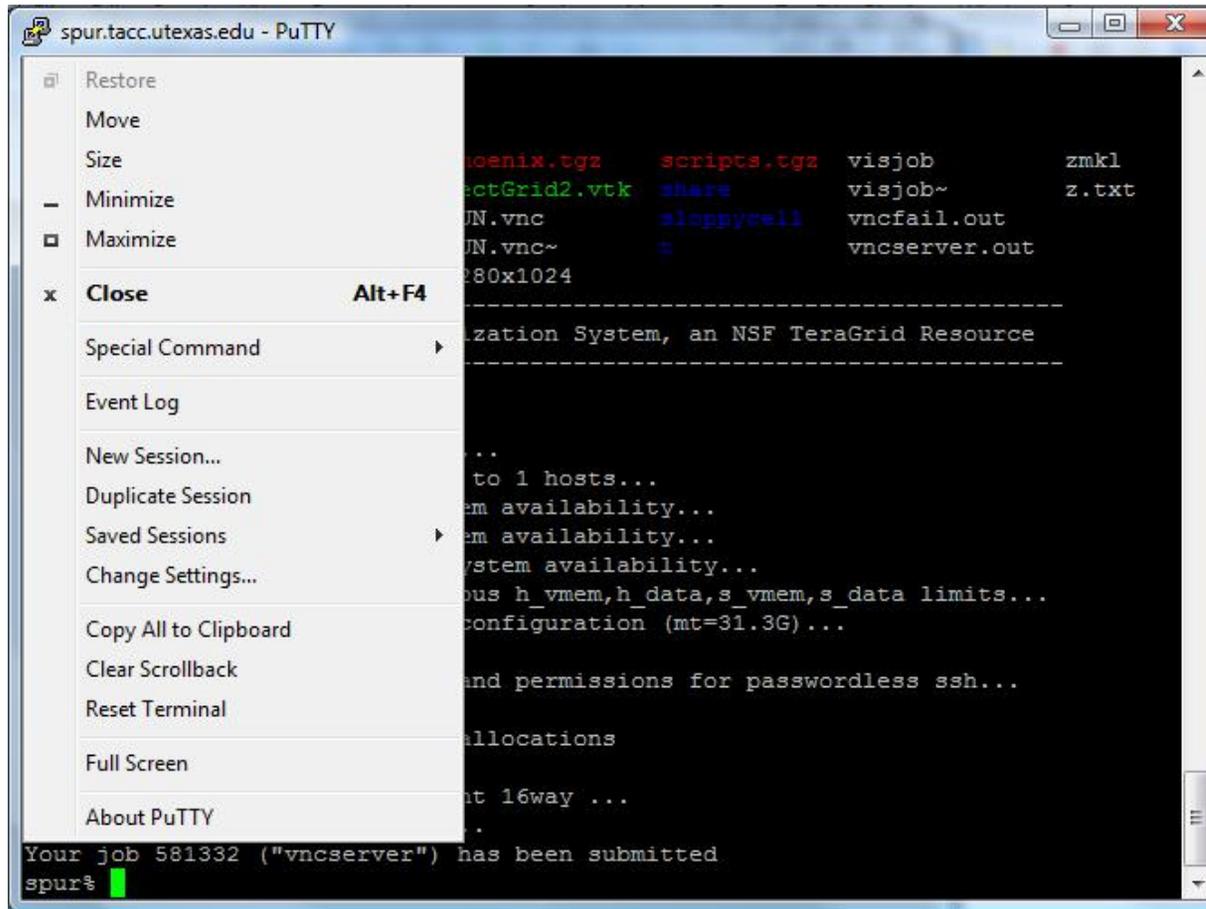
Why Does Job Have Two Ports?

- Vncserver starts on vis5 at port 5901 as display :1.
- Spur port-forwards from spur:5951 to vis5.
- You set up a tunnel from localhost:5951 to spur:5951.
- VNC connects to 5900+display number, so specify address as localhost:51.

Vis Node	Spur	Your Machine
Vis1:5901	Spur:5911	Localhost:5911 or localhost:11
Vis1:5902	Spur:5912	Localhost:5912 or localhost:12
Vis2:5901	Spur:5921	Localhost:5921 or localhost:21
Vis3:5903	Spur:5931	Localhost:5931 or localhost:31



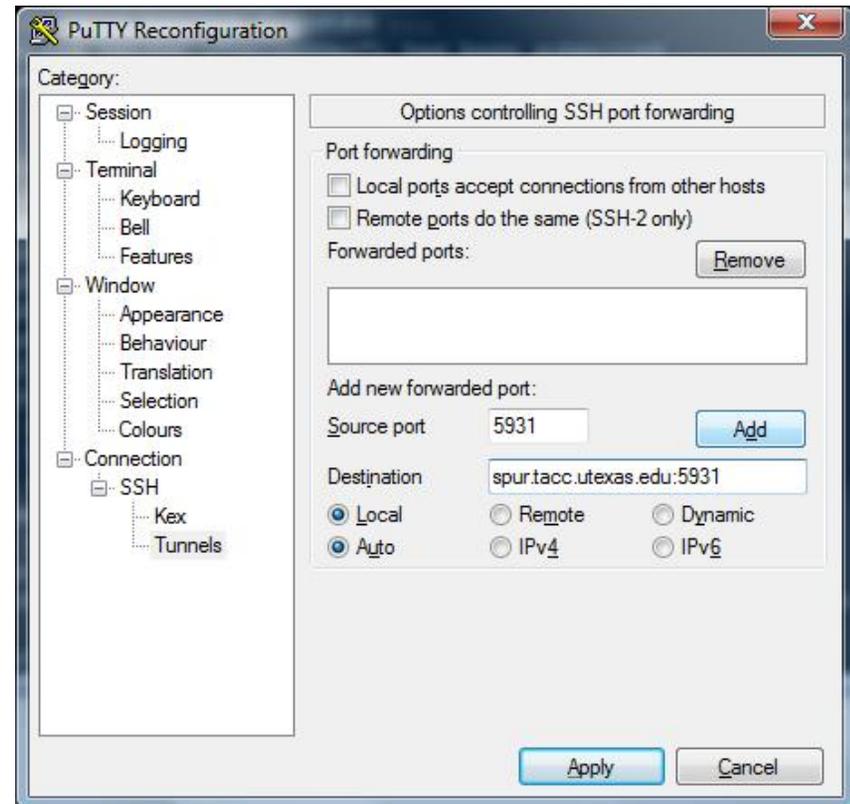
Add a Tunnel to Your Putty Session: Open Change Settings...





Specify Local and Remote Ports

- Don't forget to CLICK ADD. Then Apply.





Linux SSH Tunnel

- From the command line to start ssh with tunnel
`ssh -L5941:spur.tacc.utexas.edu:5941 train1xx@spur.tacc.utexas.edu`
- Within SSH, when coming from a Linux host, use the escape sequence `<ret><ret>~C` to open a prompt.
`-L5941:spur.tacc.utexas.edu:5941`



Open VNC and Connect

- Open RealVNC (TightVNC would be faster, especially with high compression. Vinagre on Ubuntu).
- Connect to localhost:xx (where xx are the last digits of 59xx for the port).
- Type in the password, which is “casper”.



After you connect VNC

The image shows two VNC terminal windows. The top window has a white background and the title bar 'vis7.ranger.tacc.utexas.edu:1 (train400) Desktop'. The bottom window has a black background and the title bar '*** Exit this window to kill your VNC server ***'. Both windows display the same text: 'Module pgi already loaded', project balances for user train400, and disk quotas for user train400.

```
Module pgi already loaded

----- Project balances for user train400 -----
| Name      Avail SUs  Expires |
| 20081023DATA  5000  2008-10-31 |
-----

----- Disk quotas for user train400 -----
| Disk      Usage (GB)  Limit  %Used  File Usage  Limit  %Used |
| /share    0.0        6      0.02   72          100000  0.07 |
-----

[train400@vis7 ~]$
```

```
Module pgi already loaded

----- Project balances for user train400 -----
| Name      Avail SUs  Expires |
| 20081023DATA  5000  2008-10-31 |
-----

----- Disk quotas for user train400 -----
| Disk      Usage (GB)  Limit  %Used  File Usage  Limit  %Used |
| /share    0.0        6      0.02   72          100000  0.07 |
-----

[train400@vis7 ~]$
```



Did the Tunnel Not Work?

- You didn't type the address correctly.
- You used the wrong port.
- Check Putty's Event Log (where Change Settings was).
- Check that Spur is listening.
spur% telnet spur 5941 < /dev/null
Should see "RFB..." as the reply.
- Check that your job ran: showq -u.



Invite Friends

- If you submitted the job for this group of four
 - start three vncservers. They will start on 5902, 5903, 5904.
 - Type “vncserver” three times.
 - If you exit the black window, everybody quits. Start a new xterm with “xterm&”. Then click to tell it where to place the xterm. Work there.
- If you are one of the three
 - set up a tunnel to the right port: vis4:5903 becomes spur:5943. Use your friend's password: casper.
 - You will be in under their account.



Once VNC Starts Load Modules

- Module command changes environment vars.
module load
module del
- Your goal is:
module load vis
module load paraview
- “vglrun” is used for all OpenGL programs on VNC. It makes GLX work.
- spur% vglrun paraview



Load Paraview Engines

- Start paraview.
- IBRun starts MPI tasks with the server (data+render)

```
[username@vis5 ~]$ module delete mvapich mvapich2
[username@vis5 ~]$ module load openmpi/1.3
[username@vis5 ~]$ module load vis
[username@vis5 ~]$ module load paraview
[username@vis5 ~]$ vglrun paraview&
[username@vis5 ~]$ ibrun vglrun pvserver
TACC: Setting up parallel environment for OpenMPI mpirun.
TACC: Setup complete. Running job script.
TACC: starting parallel tasks...
Listen on port: 11111
Waiting for client...
```



Tell Paraview to Use the Engines

- Click the "Connect" button, or select File -> Connect
- Click "Add Server"
- Enter a "Name", e.g. "manual launch"
- Click "Configure"
- For "Startup Type", select "Manual"
- Click "Save"
- Select the name of your server configuration, and click "Connect"
- In the xterm where you launched ParaView server, you should see "Client connected."



Is It Running?

- Try running “top” in an xterm in the VNC desktop.
- Compare behavior with the desktop version you ran.