Client-Server Job Launching

Army HPC User Group Review
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What is HPC Job Launching?

- **First and foremost it's a lot of wizardry, hidden tricks and hand-waving**
  - You must be 48" inches tall for this ride
  - Those with a weak constitution should avoid diving in to the details
  - Great for the end users – complete nightmare for the DAAC staff

- **Allows desktop software to launch and communicate with HPC-side server software (distributed computing)**
  - Data remains on the HPC system
  - I/O & calculations on HPC-side
  - Interactive graphics performance at the desktop

- **Supported by client-server applications**
  - EnSight
  - ParaView
  - VisIt

What is HPC Job Launching?

- **Client-side application**
  - Starts up the graphical user interface (GUI)
  - Connects to remote HPC system
  - Requests resource allocation
  - Processes all of the graphic-intensive operations
    - rotations, color, rendering, etc

- **Remote server-side application**
  - Establishes communication hub on login node
  - Submits PBS batch job
  - Initiates server-side processes across allocated resources
    - mpirun, aprun, mpiexec_mpt, openmpirun.pbs
  - Data I/O, manipulation, computational operations
  - Communicates results back to client-side application

What is HPC Job Launching?

- Prior to implementation of HPC job launching support, use of client-server applications was limited to power users due to the complexity of manually establishing communication paths and batch job submission
  - No Secure Remote Desktop (SRD) functionality
  - Data downloaded to workstation (too much data)
  - Remote X-display from HPC system back to desktop (slow graphics)
  - Visualization was just too hard without this capability!
  - Interactive data analysis should not require a computer science degree!
- Support for HPC job launching has evolved/matured over the past 10 years
  - DAAC staff actively involved in development/debugging of this functionality in ParaView, VisIt and EnSight

Overview

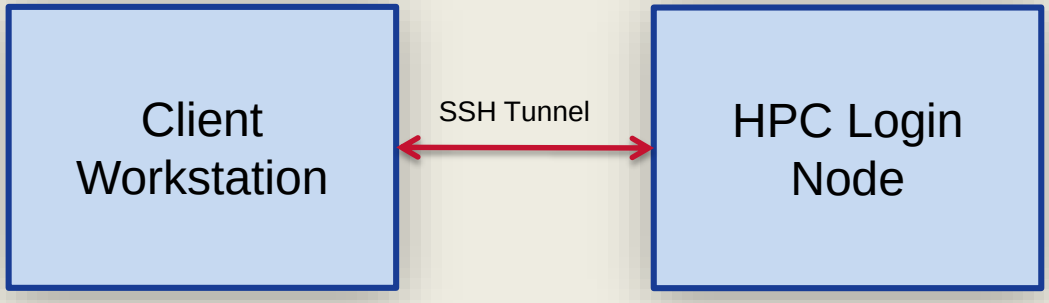
What happens when we launch ParaView/VisIt/EnSight in client-server mode?

Client Workstation

- Client-side GUI
- Graphics rendering
- Present HPC job launching options
  - HPC User Name
  - Project ID
  - # of nodes/processors

Overview

What happens when we launch ParaView/VisIt/EnSight in client-server mode?



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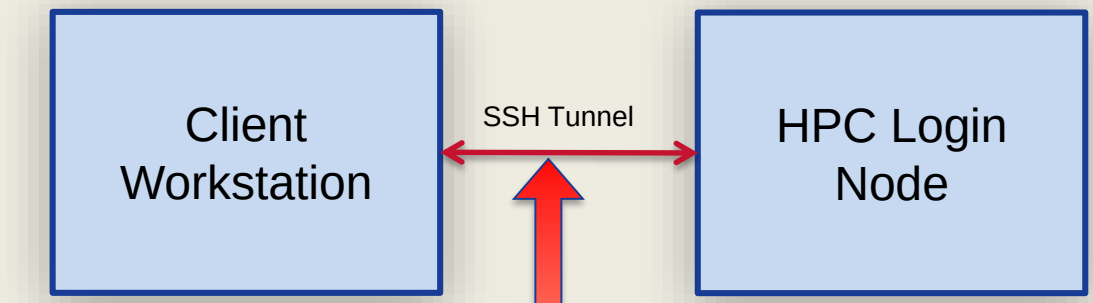

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The use of ssh tunnelling provides a secure data transport method and avoids inevitable port blocks and firewall issues

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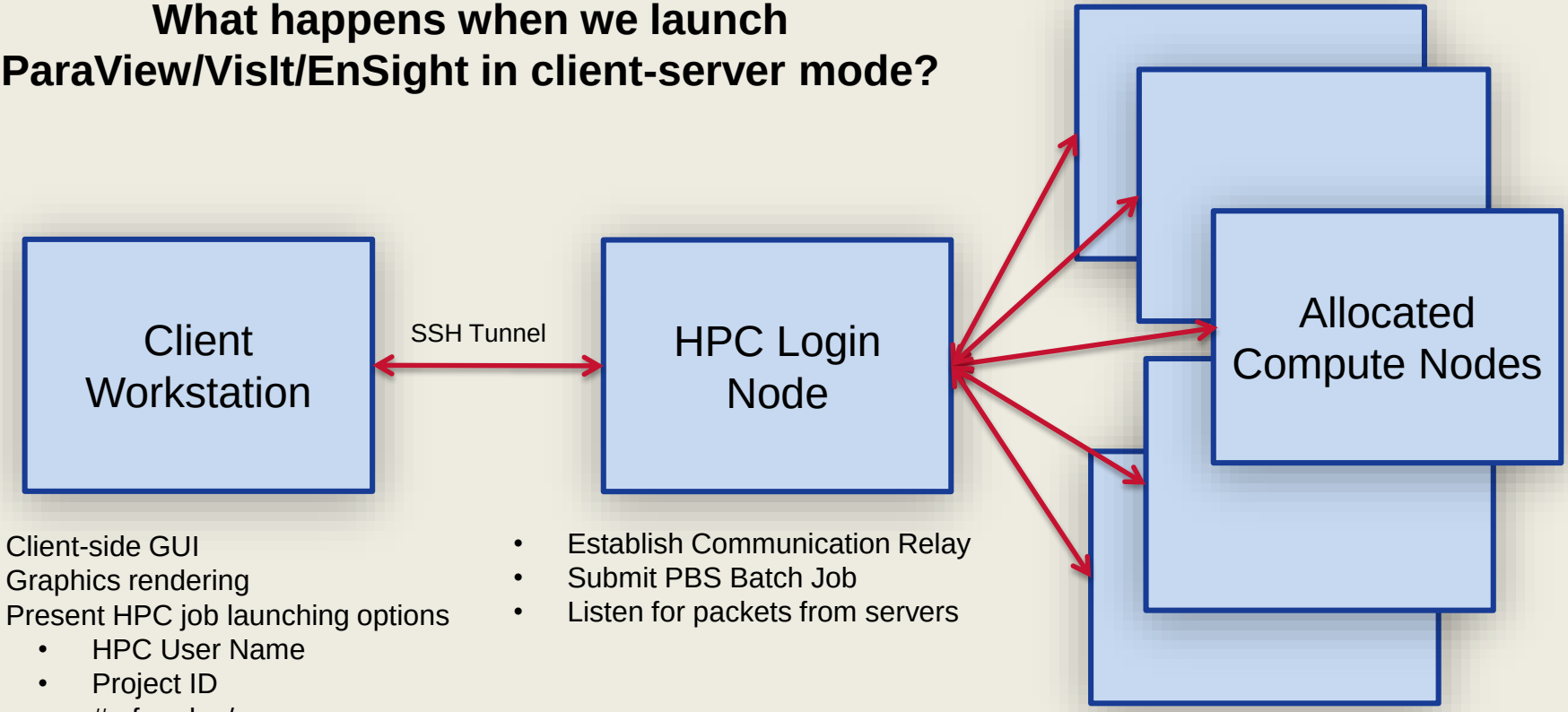

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- mpirun/aprun launches servers
- Data I/O, vis computations
- Results passed back thru login node

Client-side requirements

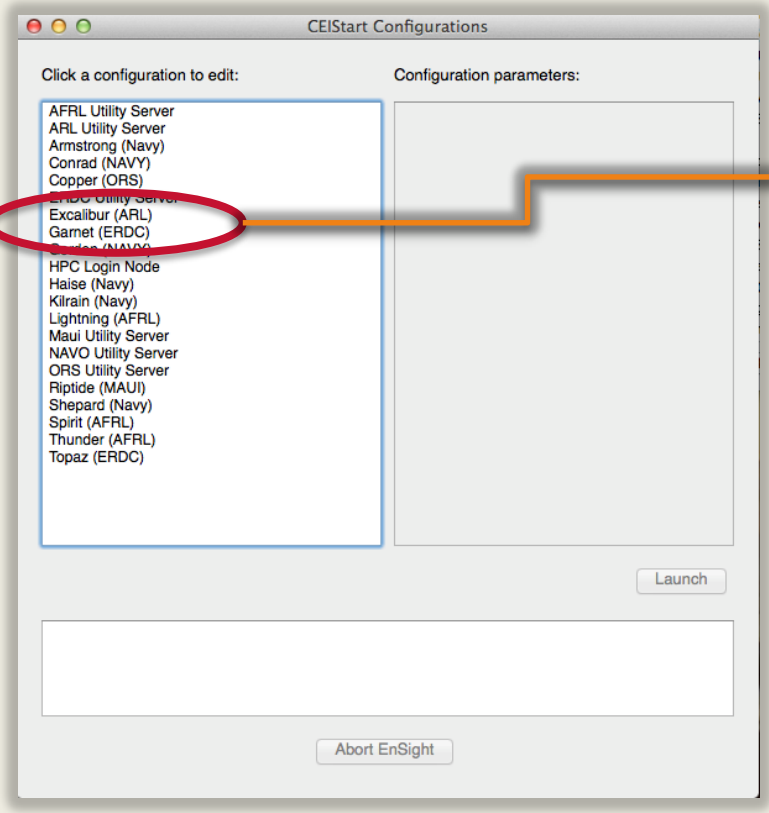
- **Remote host definition file**
  - Unique implementation for each package
  - Defines fields necessary to communicate to remote HPC system and job launching parameters
- **SSH-based communication script**
  - Gathers up server-side launching parameters
  - Passes values to HPC-side login node
- **Pre-Configured & available for download**
  - https://daac.hpc.mil/software/cssoftware.html

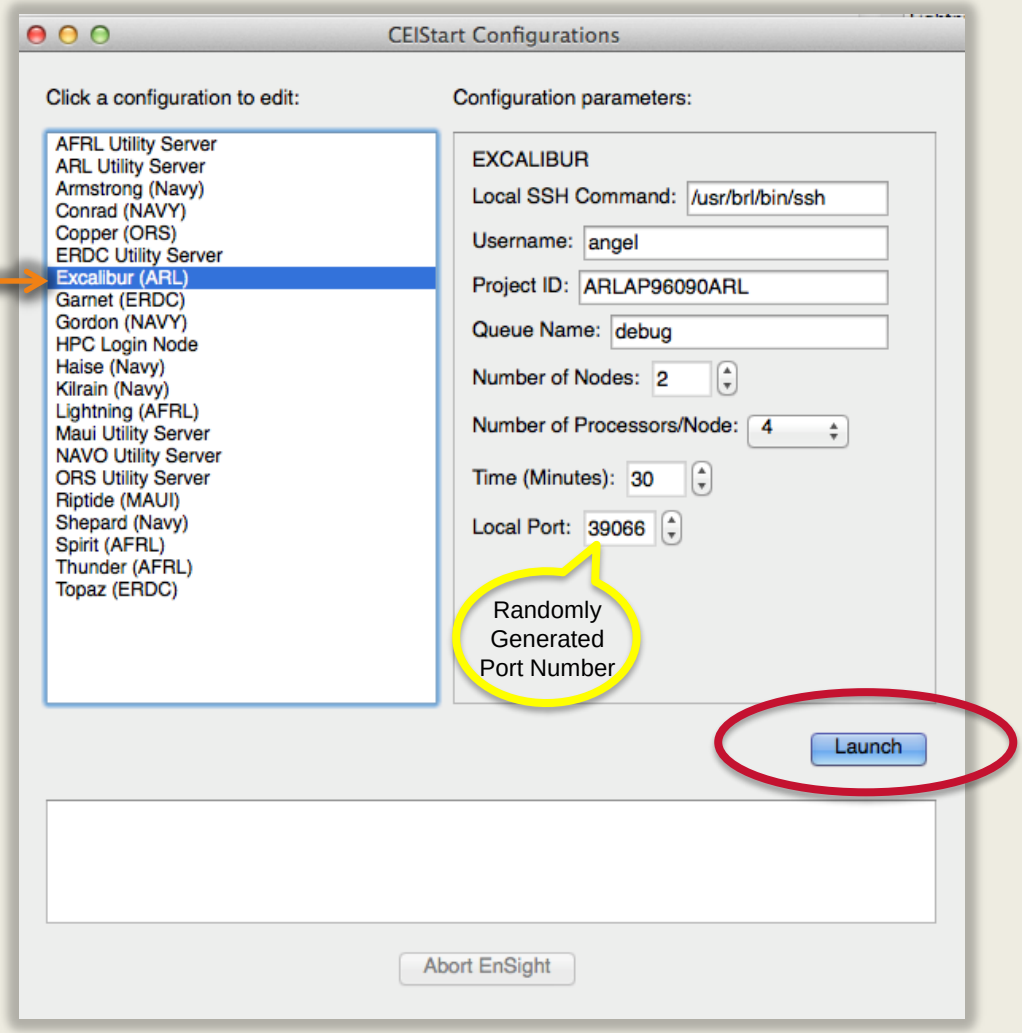
EnSight

On Client Workstation

$ module load ensight/10.1.6a

$ ceistart101





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ParaView

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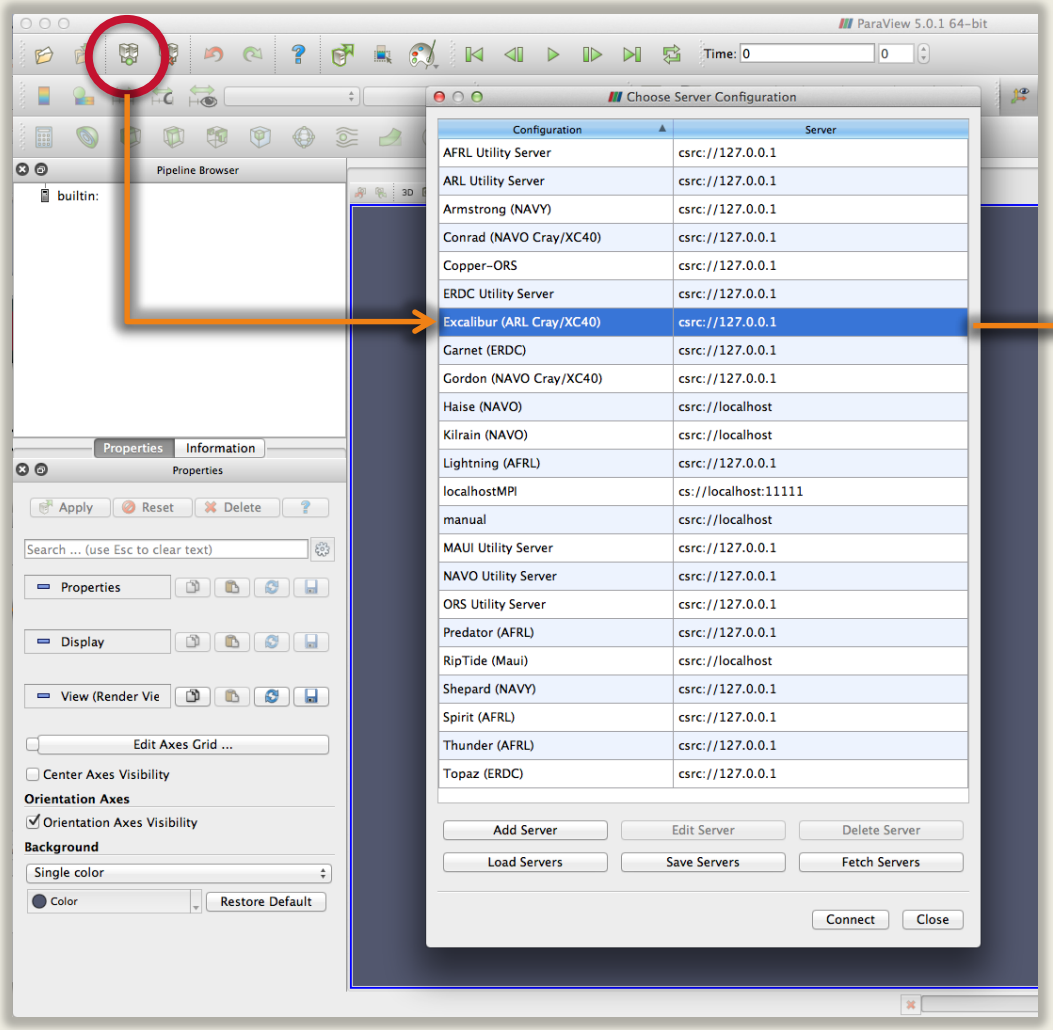
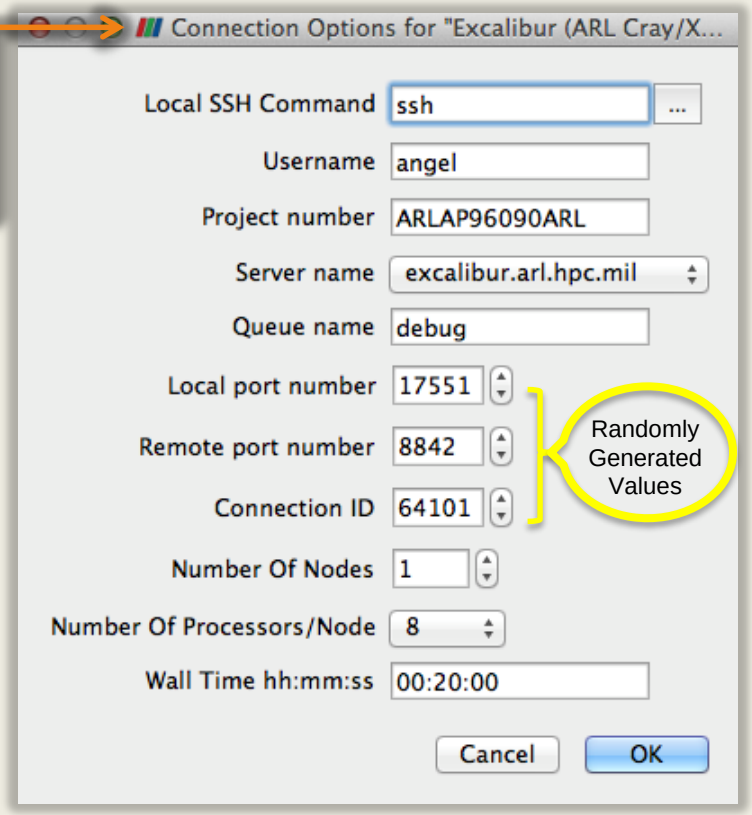
On Client Workstation

$ module load paraview/5.0.1
$ paraview





ParaView

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VisIt

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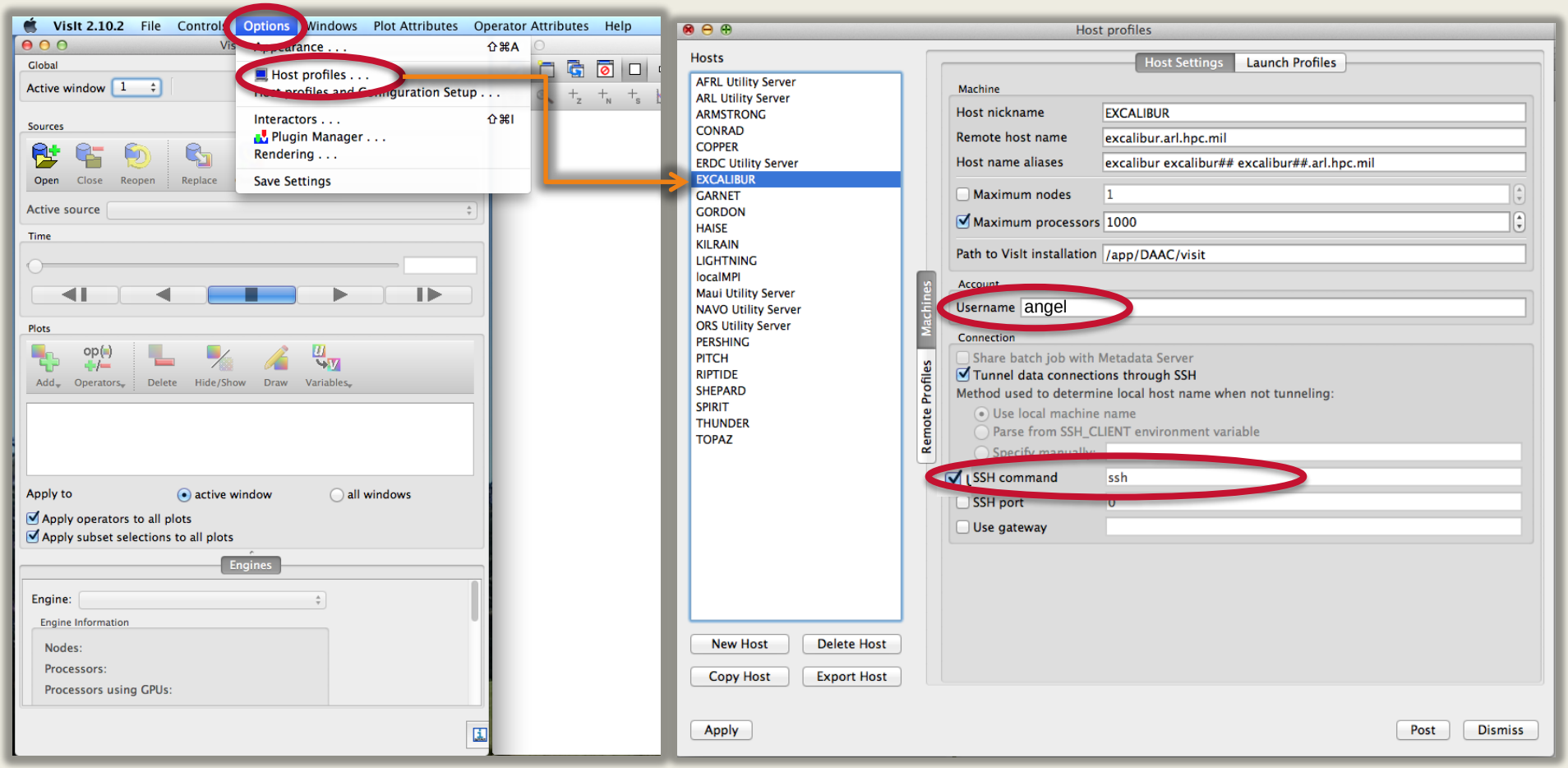
On Client Workstation

$ module load visit/2.10.2

$ visit



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VisIt

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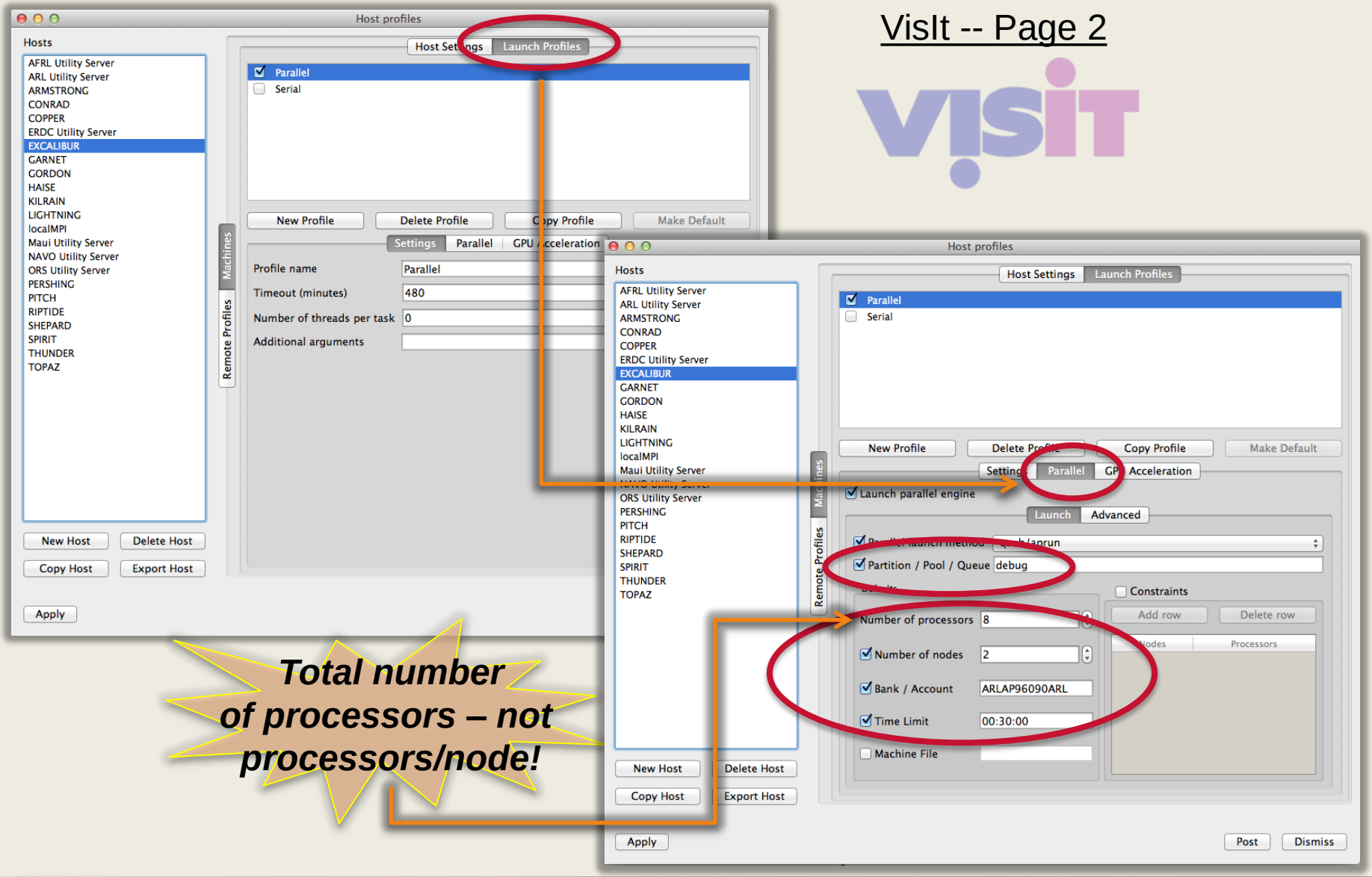
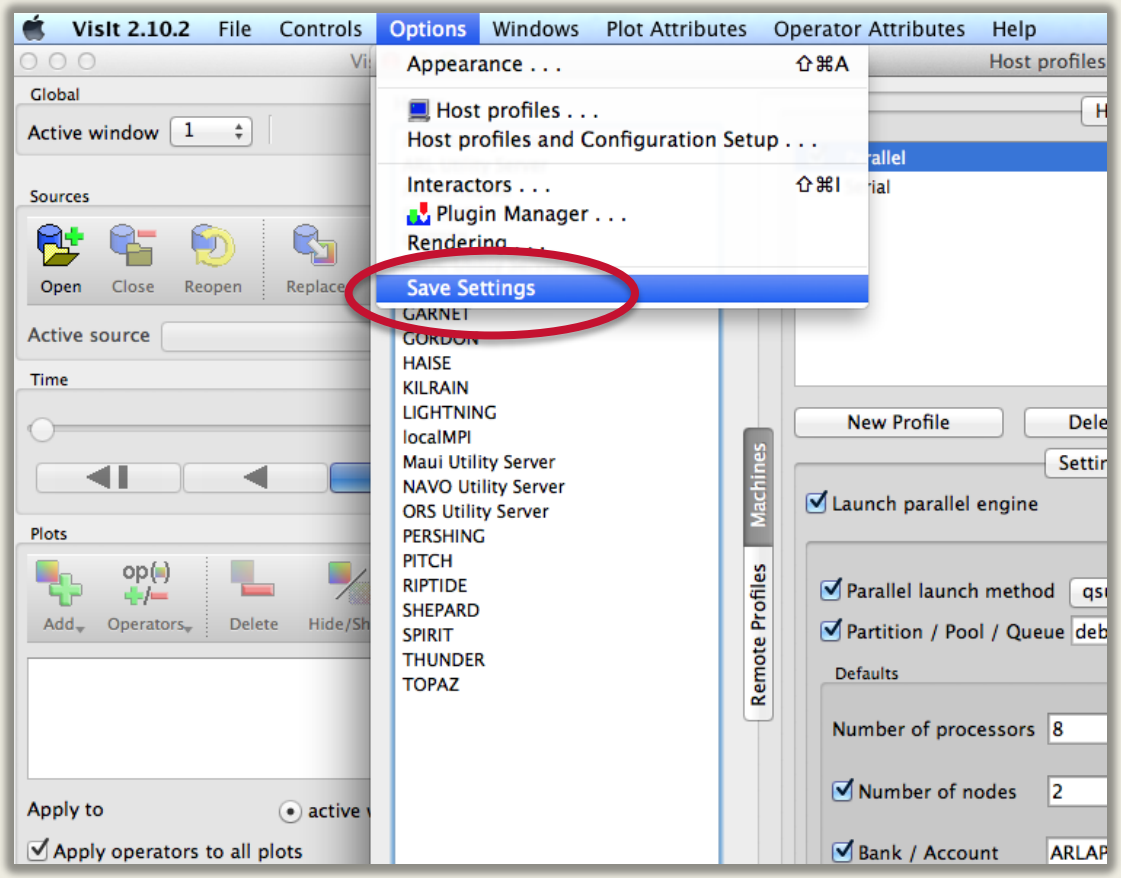
VisIt -- Page 2



Total number of processors – not processors/node!

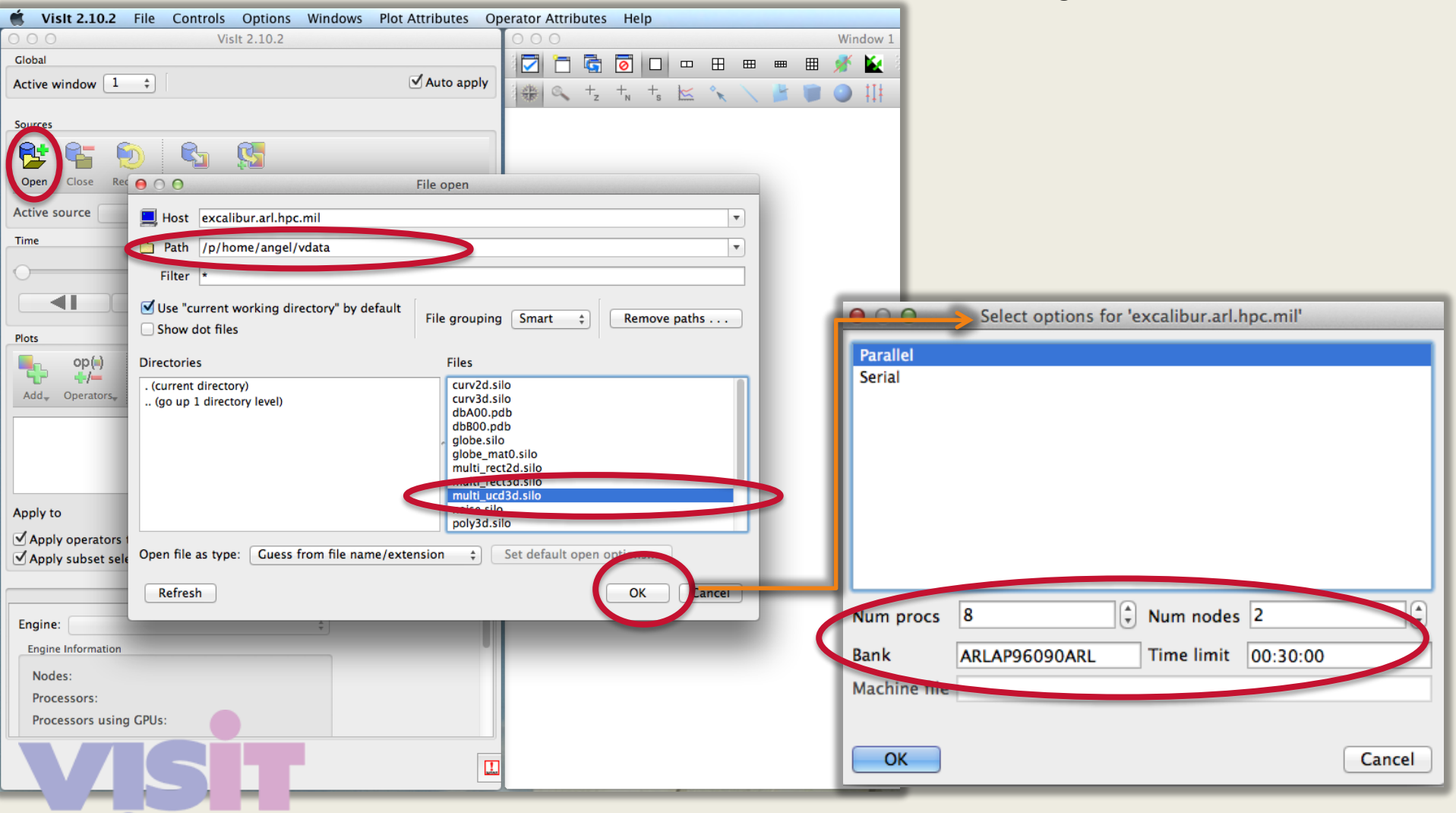
VisIt -- Page 3

MUST save your settings!



Need to go through this configuration process for each host!

VisIt -- Page 4

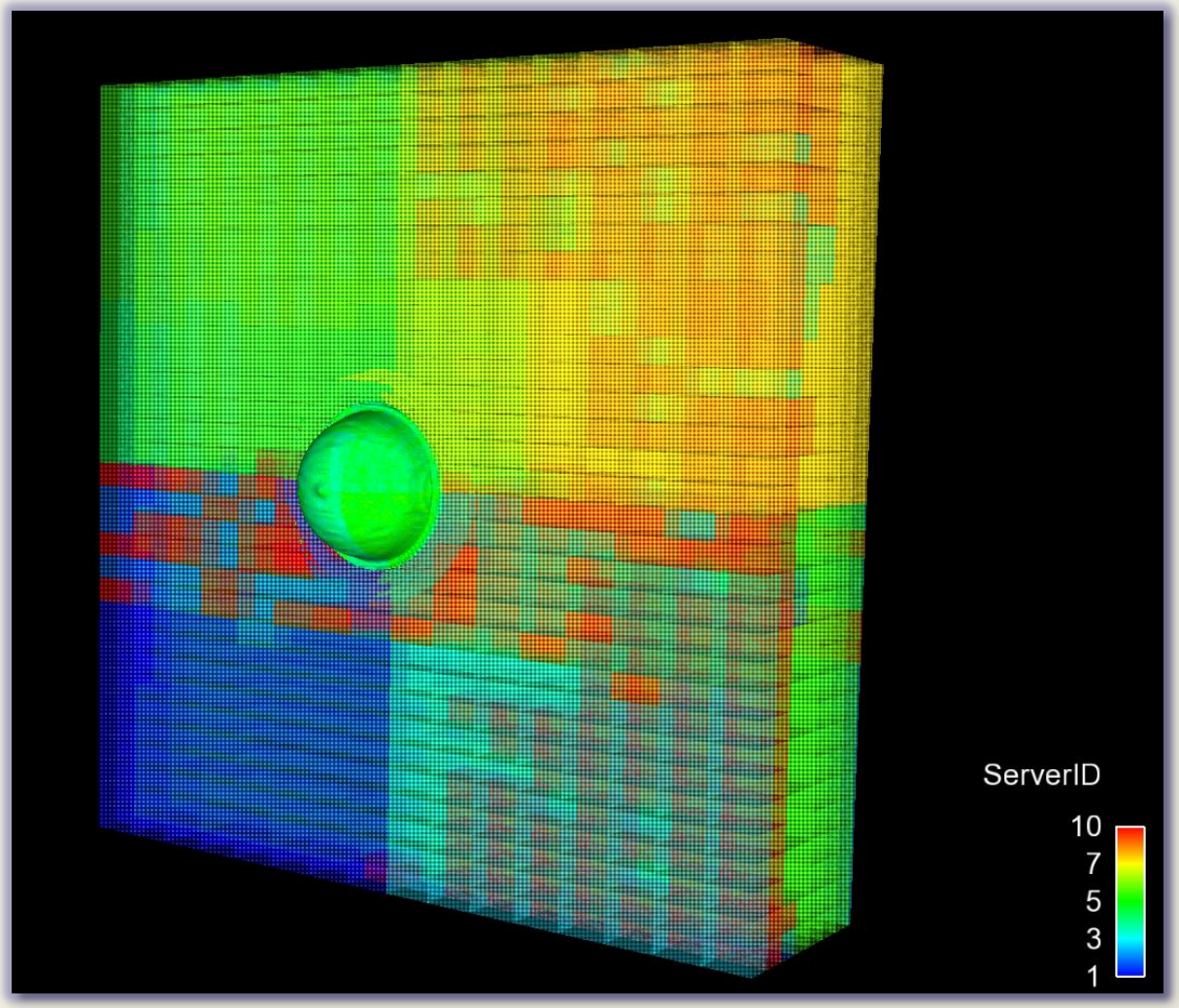

VisIt 2.10.2 File Controls Options Windows Plot Attributes Operator Attributes Help
VisIt 2.10.2
Window 1
Global
Active window 1
Auto apply
Sources
Open
Close
Active source
Time
Plots
Add
Operators
Apply to
Apply operators
Apply subset sel
Engine:
Engine Information
Nodes:
Processors:
Processors using GPUs:
File open
Host excalibur.arl.hpc.mil
Path /p/home/angel/vdata
Filter *
Use "current working directory" by default
Show dot files
File grouping Smart
Remove paths . . .
Directories
. (current directory)
.. (go up 1 directory level)
Files
curv2d.silo
curv3d.silo
dbA00.pdb
dbB00.pdb
globe.silo
globe_mat0.silo
multi_rect2d.silo
multi_ucd3d.silo
poly3d.silo
Open file as type: Guess from file name/extension
Refresh
OK
Cancel
Select options for 'excalibur.arl.hpc.mil'
Parallel
Serial
Num procs 8
Num nodes 2
Bank ARLAP96090ARL
Time limit 00:30:00
Machine file
OK
Cancel

Is the Job Running?

```
51 excalibur03 > qstat -u angel

excalibur-wlm1:
                                                                  Req'd  Req'd   Elap
Job ID          Username Queue    Jobname    SessID NDS TSK Memory Time  S Time
--------------- -------- -------- ---------- ------ --- --- ------ ----- - -----
1938618.excalib angel    vnc      gnome.sh    30546   1  32    --  08:00 R 07:06
1939317.excalib angel    debug    VisIt       65026   2  64    --  00:30 R 00:00
```

Is my session really running in parallel?



EnSight:

Use the calculator function to calculate "ServerID" variable

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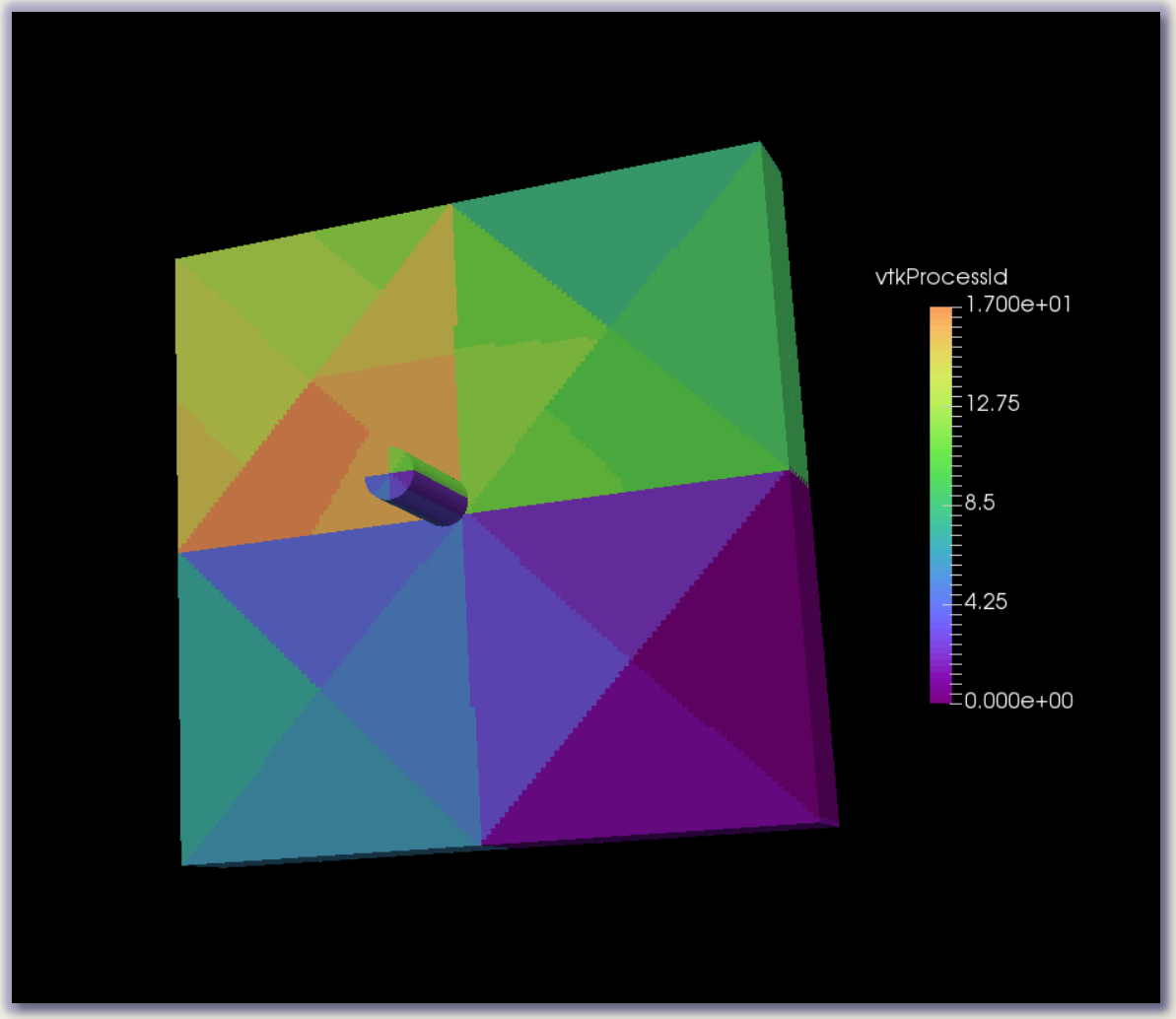
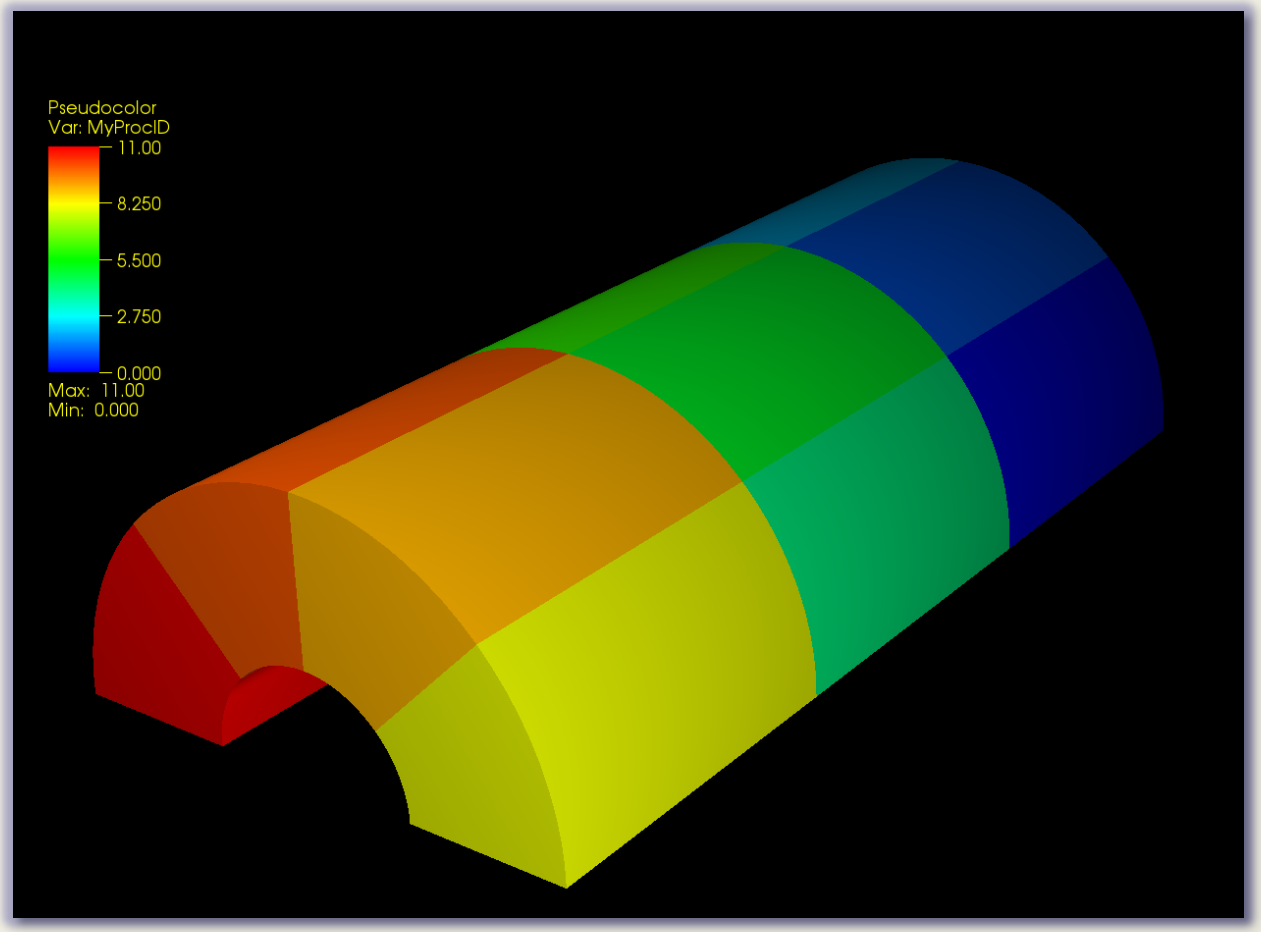


ParaView:

Use vtkProcessID from the properties menu or create a new variable using the ProcessID filter

Is my session really running in parallel?



VisIt:

Use the Expression editor to create a new variable via the “procid” function

Ex: procid(mesh1)

What is HPC Job Launching?

- Behind the scenes it is an extraordinarily complex set of moving parts
- For the user, it is an extraordinarily powerful addition to the interactive data analysis toolkit
- Documentation/Tutorials available at https://daac.hpc.mil