Plotting 3D and Time Dependent Data with ParaView

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Questions? #RC_Meetups

Link to survey on this topic: http://goo.gl/forms/8VidcwOhRT

Slides: https://github.com/ResearchComputing/Final_Tutorials

Outline

- What is ParaView
- ParaView GUI
- Common ParaView Filters
- Test dataset

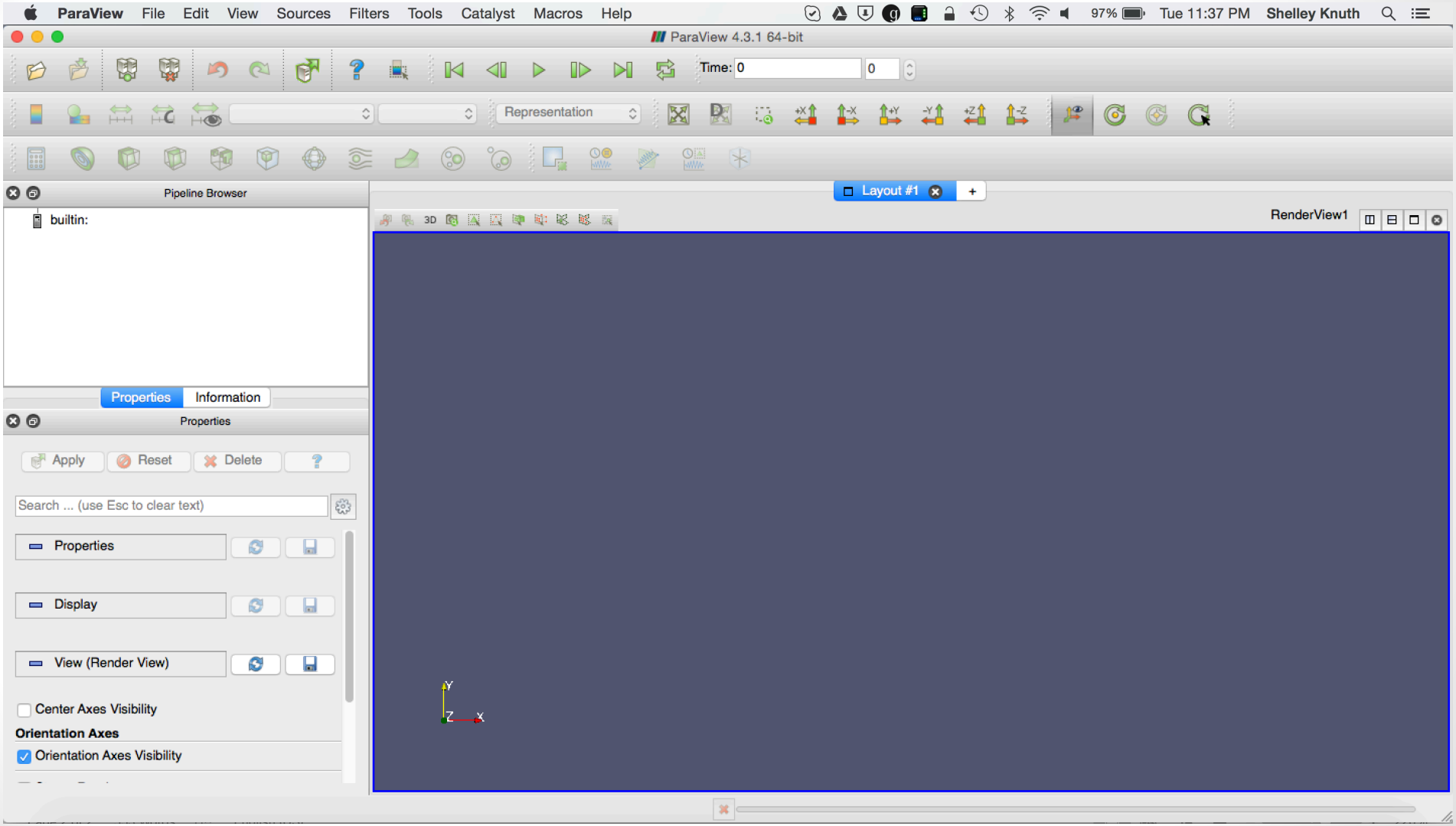
What Is ParaView?

- It's an application for scientific visualization
- Intended for analyzing large-scale datasets
  - Utilizes shared or distributed memory clusters
- Can also run on your laptop
- Will run on a single processor machine
- Runs on multiple platforms
- Interactive or programmatically
- Open source
- Good user interface

ParaView Data Types

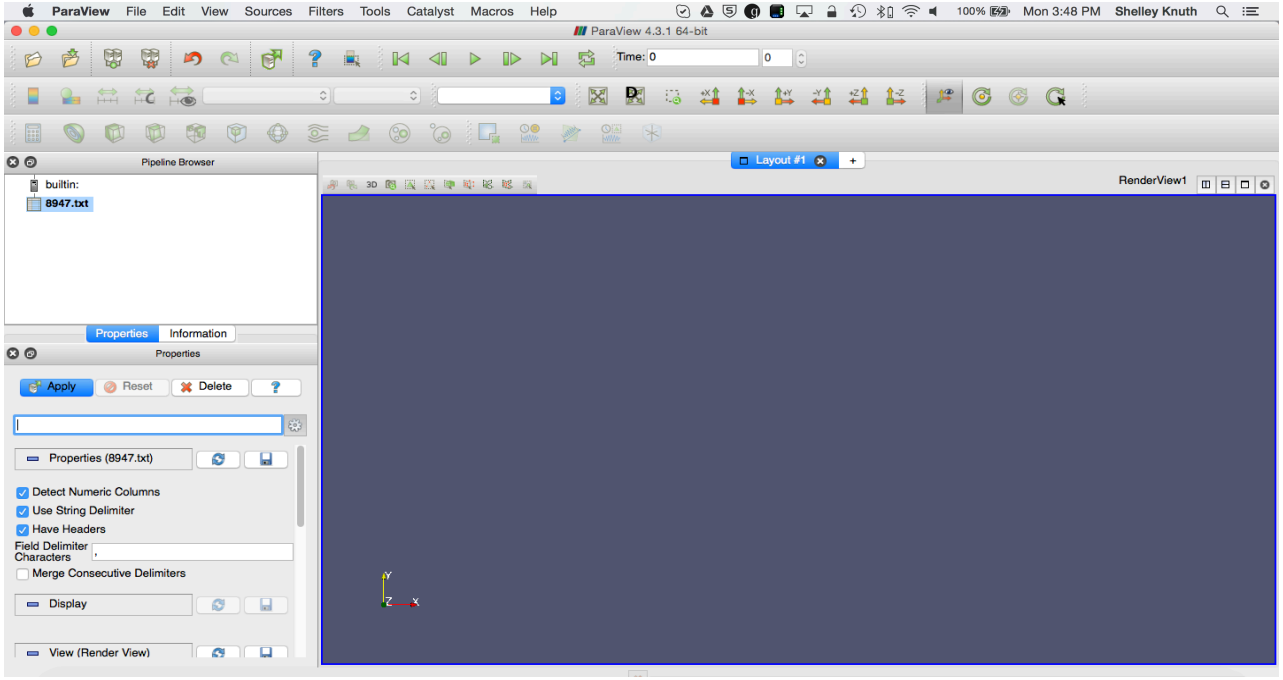
- Many data types supported by ParaView
  - Images
  - Structured grids
  - Unstructured grids
  - Polygonal data
- Supports/understands many data formats including:
  - VTK
  - CSV
  - Text

The ParaView GUI



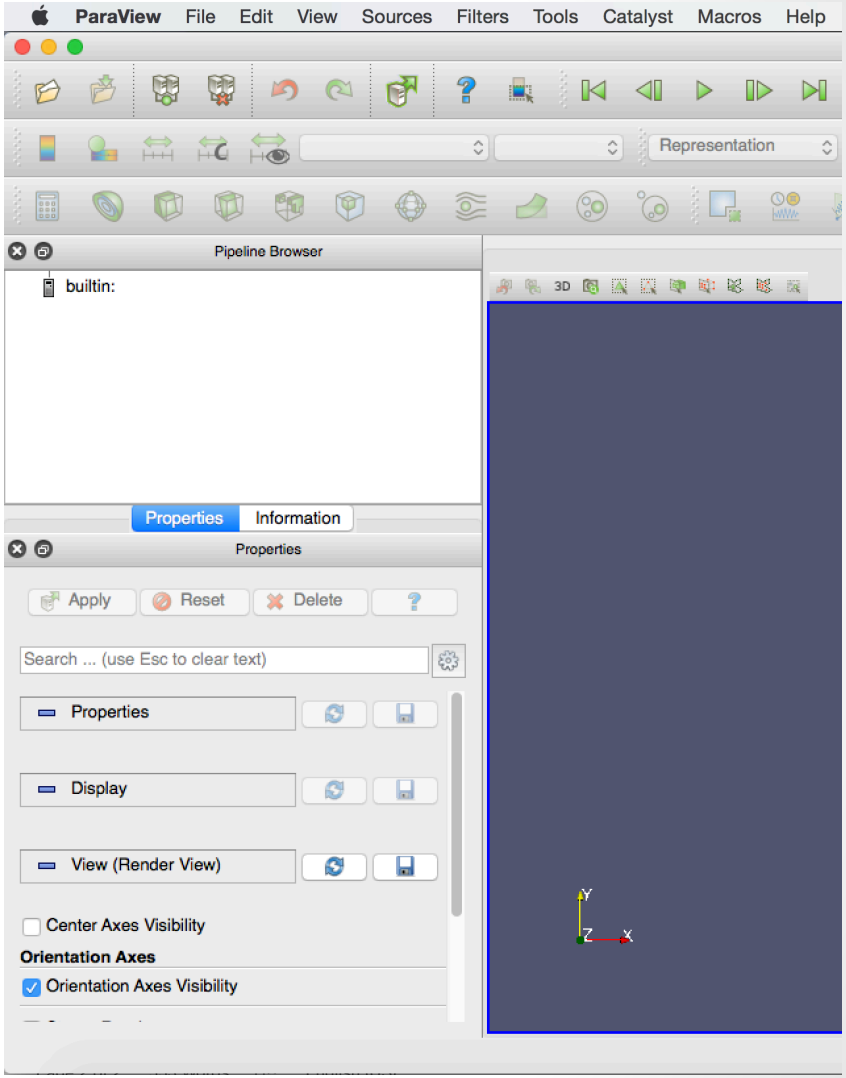
Reading in Data

- Launch ParaView
- File -> Open -> Choose file
- File now appears in the “Pipeline Browser”



ParaView Workflow

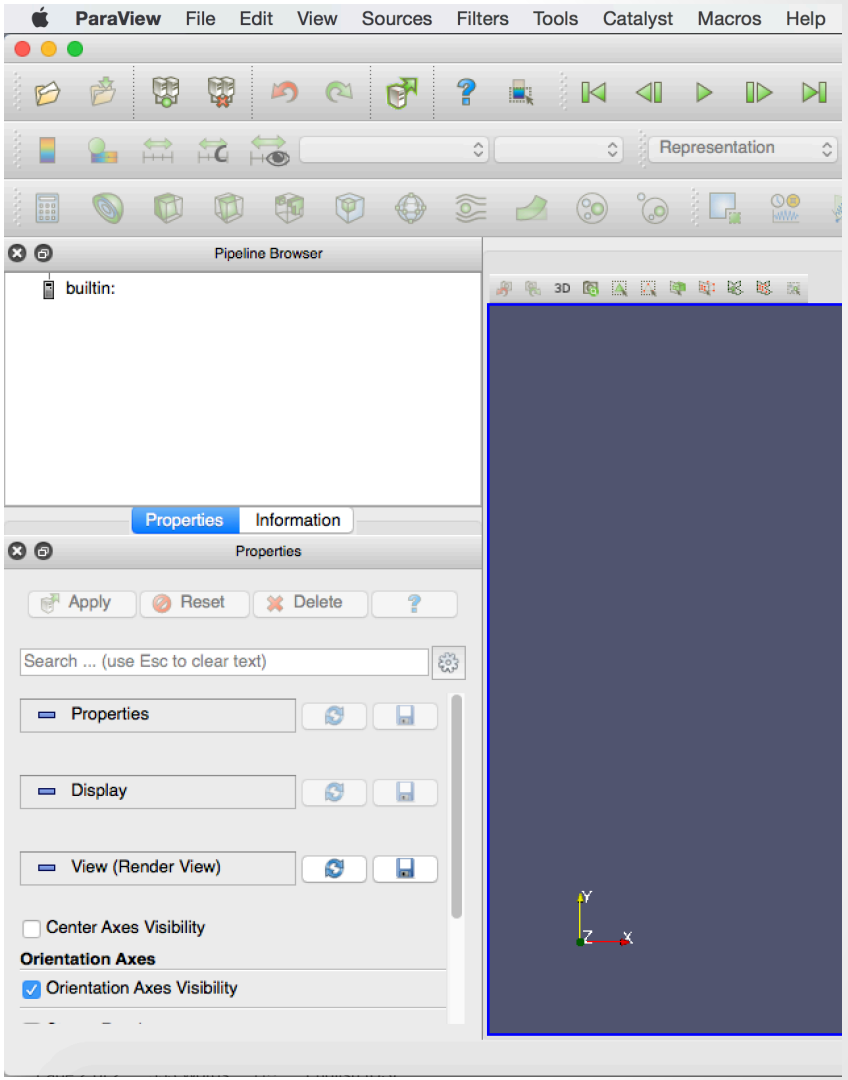
- Open dataset
- Select source
- Apply filter
- Updates Properties, Information, and Display
  - Properties: Modify parameters of the filter
  - Information: meta-information about the data
  - Display: control over visual characteristics of data produced by filter



http://www.rasmsys.com/resources/Documents/ParaView-Documentation/ModifyingData.pdf

Properties Tab

- **Apply** takes values changed in properties tab and processes them on the source data
  - Doesn't occur automatically unless you specify
- **Reset** returns GUI to last committed state
- **Delete** removes filter from pipeline
- Help (**?**) opens documentation on filter



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Data for Scientific Visualization

- Want to discover some information about the dataset
- Display data in a certain way for publication
- Need to process the raw data
  - Slice the data to look at its interior
  - Calculate statistical measurements
  - Extracting regions with particular qualities
- Take an original value and compute derived value

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Data for Scientific Visualization

- Filters are the tools that allow this
  - Operate by ingesting data, processing it, and producing other data
  - Set of filters you create become your pipeline
- Filters don't modify data
  - Copy it and change the data
  - This means you can apply several filters at once
  - All filters get displayed in the Pipeline Browser along with source data

http://www.rasmsys.com/resources/Documents/ParaView-Documentation/ModifyingData.pdf

Common ParaView Filters

- Contour
  - Generates an isosurface for a given scalar value
- Warp
  - Displaces each point in a mesh by a given vector field
- Glyph
  - Generates an arrow, cone, line, sphere at each point in the mesh from the dataset

http://daac.hpc.mil/software/ParaView/

Common ParaView Filters

- Calculator
  - Can create new data arrays by performing operations on current data arrays
- Slice
  - Intersects the geometry with a plane. All that remains is the geometry where the plane is located
- Volume rendering
  - Visualize a volume between two specified values
    - Want to see areas of high pressure?

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Other Important Things to Note

- Edit -> Reset Session
  - When things get rough, this is your friend
- Save state
  - Save a session recording of what has been done to create the visualization
  - Can load it up later

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ParaView

- Let's manipulate some data!

https://github.com/ResearchComputing/Final_Tutorials/tree/master/3D_ParaView

WRF_paraview_instructions.docx

- Provides instructions on what we will do

wrf_small-59.zip

- Unzip these files to use the data

Questions?

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- Twitter: @CUBoulderRC

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