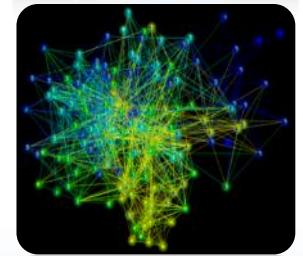
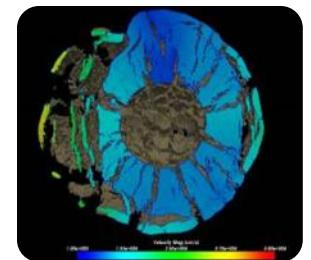




Processing and Visualization of Scientific Datasets

Julien Jomier

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Open Source Myths

1. Open Source software **are not reliable**
2. Open Source software **are not well supported**
3. Large **corporations do not use** open source software
4. Open Source is **important only for programmers**
5. Open Source development **is not viable** because it can stops anytime



Open Source and the Industry



Open Source is everywhere



Plan

- Three main open-source toolkits:
 - **Insight Toolkit** (Image Processing)
 - **Visualization Toolkit** (Visualization)
 - **ParaView** (Parallel Visualization)
- Visualization and Processing (some) hot topics

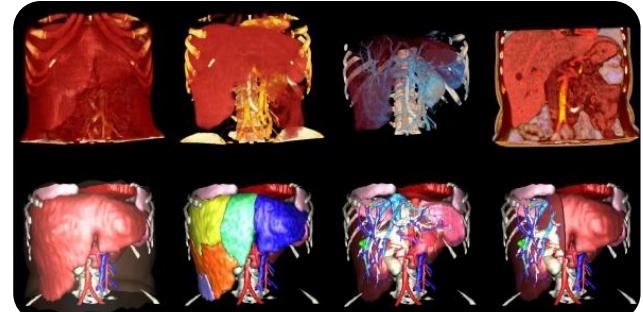


THE INSIGHT TOOLKIT (ITK)



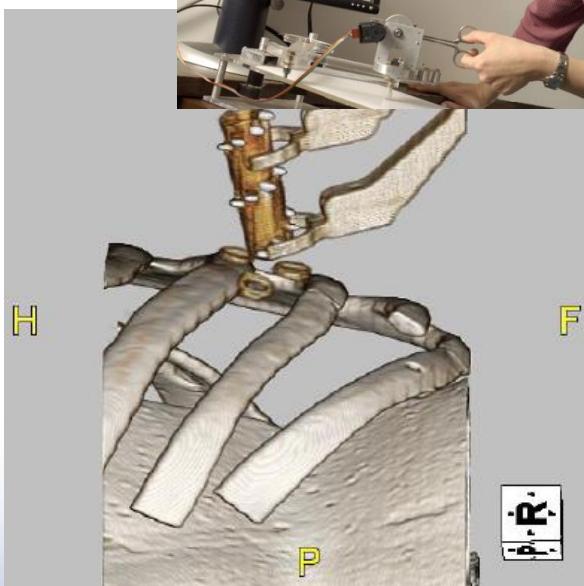
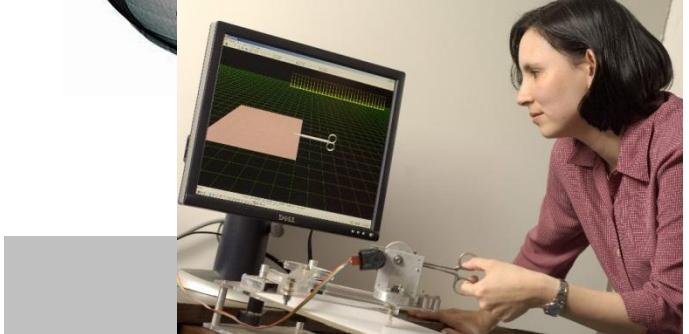
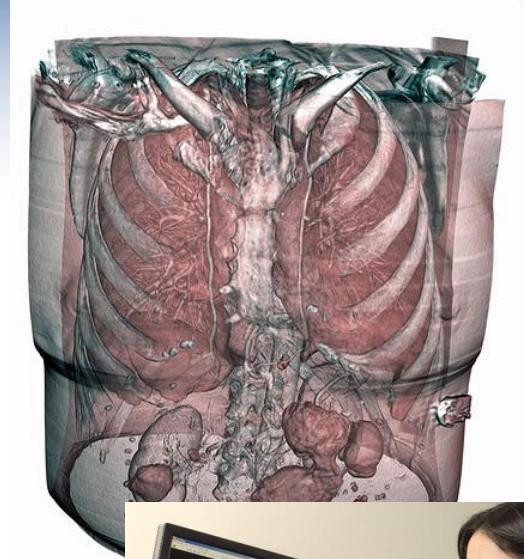
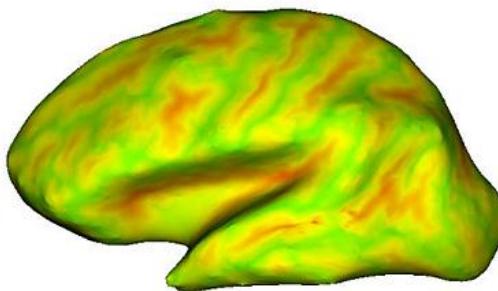
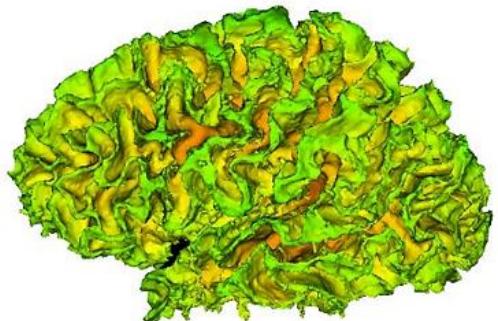
Insight Toolkit

- www.itk.org
- Started in 2000 from the NIH
- Low-level image processing library
 - Segmentation
 - Registration
- C++ Library (2+ million LOC)
- BSD License
- Automatic wrapping in Java, Python, TCL
 - Portable by design: Linux, Windows, Mac OSX, ...
- Active Community: 3000+ users

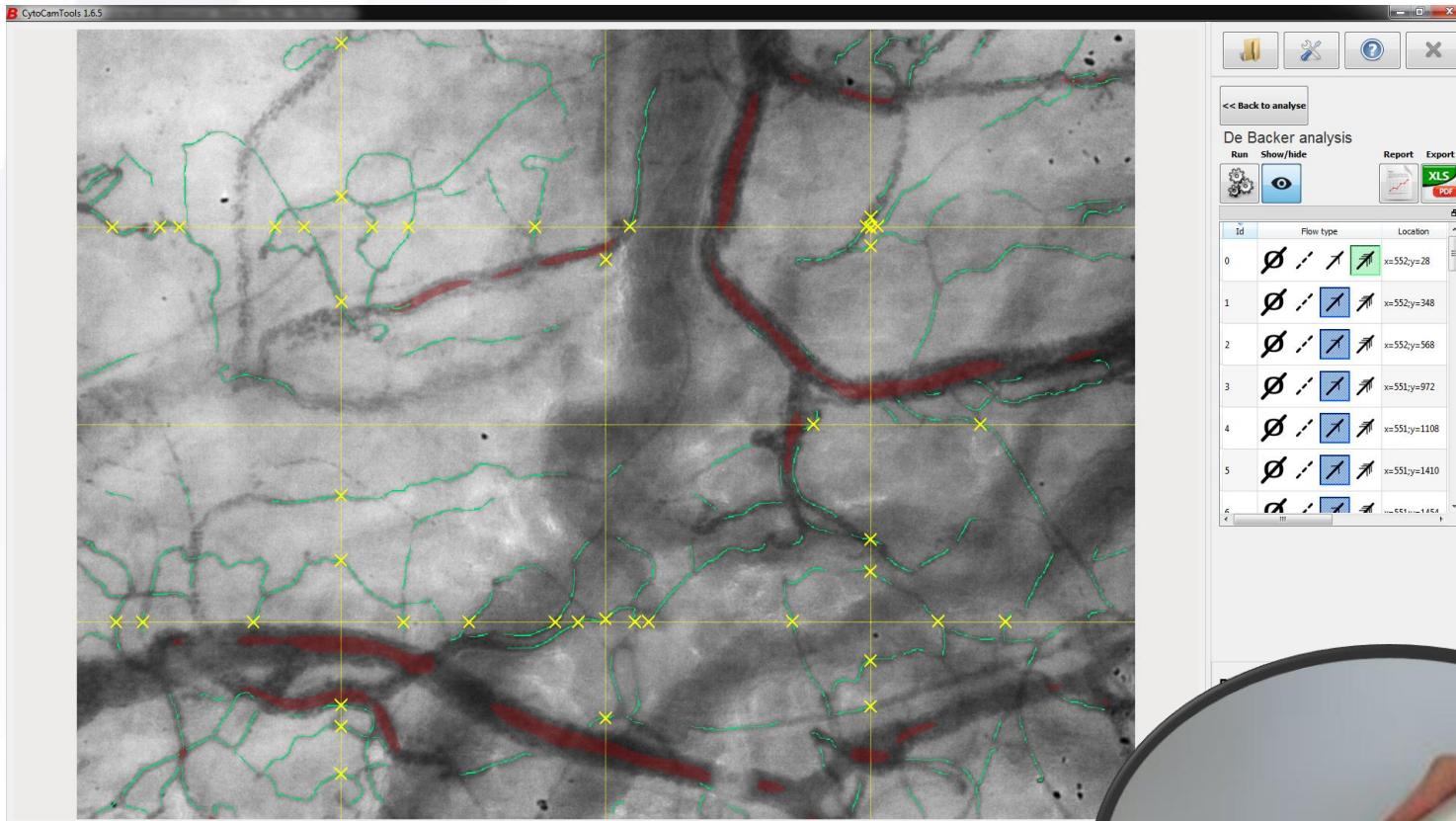


ITK in use

- Image-Guided Surgery
- Simulation
- Industrial/clinical applications
 - Medical applications
 - Industrial inspection
 - Satellite imaging
- Bridge between R&D



ITK in use - Braedius



Braedius

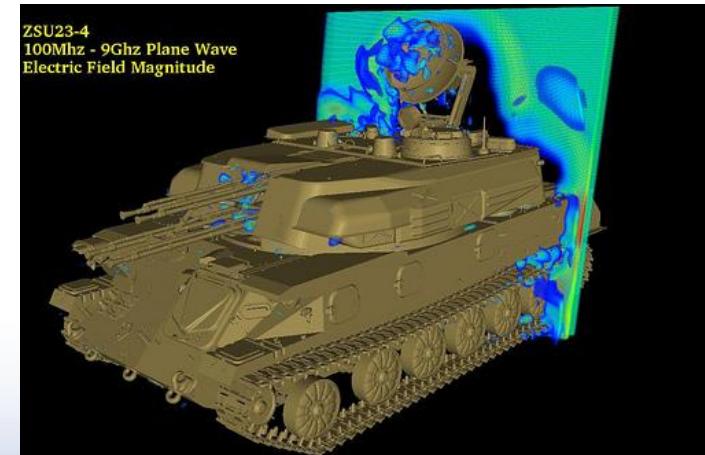
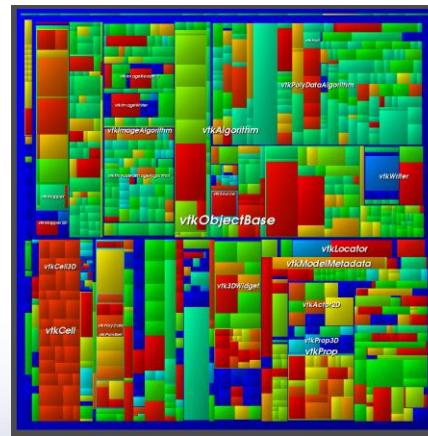
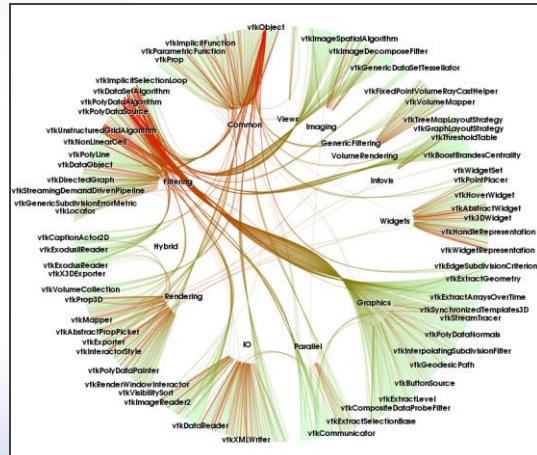


THE VISUALIZATION TOOLKIT (VTK)



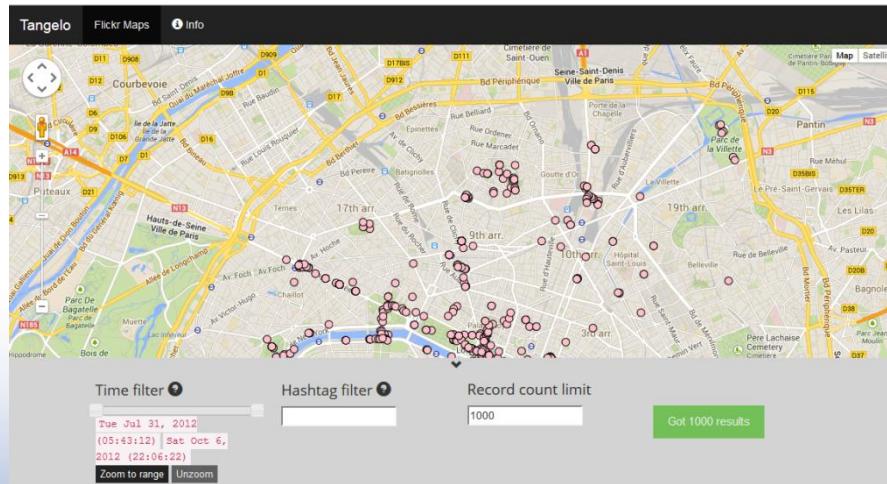
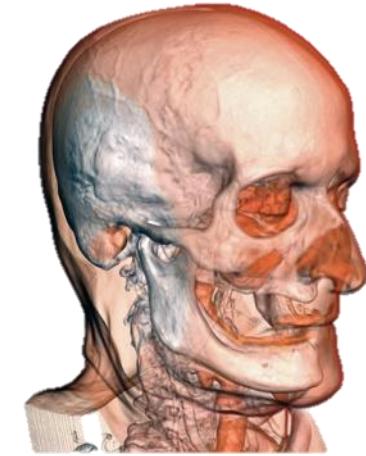
The Visualization Toolkit (VTK)

- www.vtk.org
 - Started in 1993 at GE
 - Visualization Library
 - Written in C++ (+5.5 million LOC) – BSD License
 - Automatic binding for Java, TCL, Python
 - Portable by design: Linux, Windows, Mac OSX, Solaris...
 - Very active community: 4000+ users on the mailing list



The Visualization Toolkit (VTK)

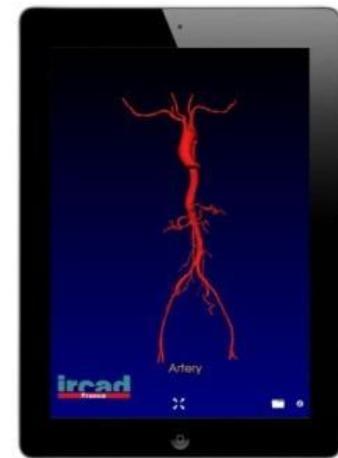
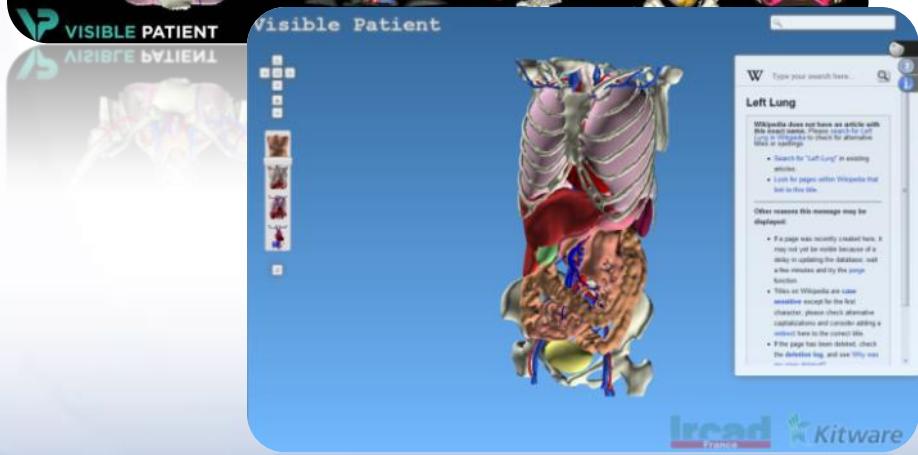
- **Web Visualization**
 - VTKWeb
 - Tangelo (tangelo.kitware.com)
- **Mobile Visualization**
 - VES/KiwiViewer
- **Information Visualization**



VTK in use: Visible Patient



Visible Patient extracts the 3D models of patient



Kitware **ircad**
France

KIMMIG
IRCAD

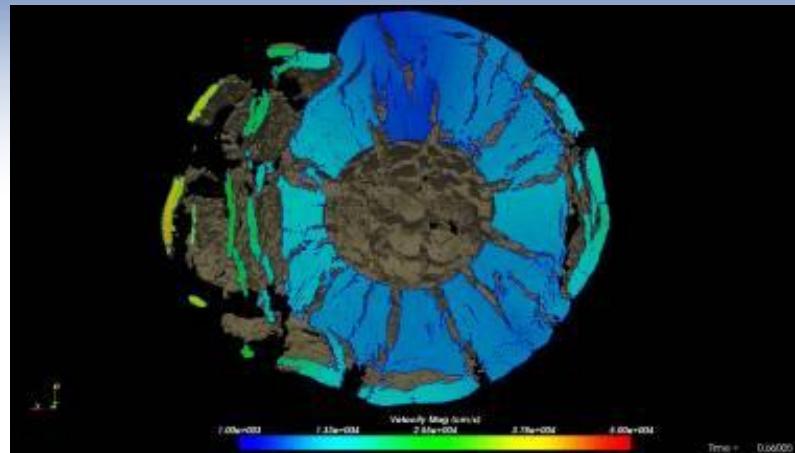


PARAVIEW

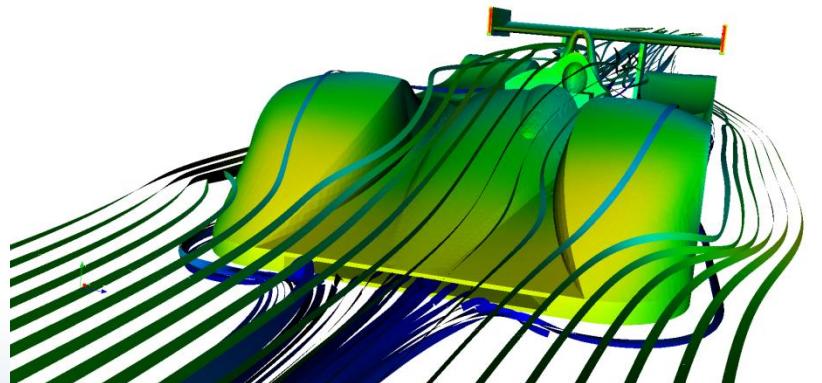


ParaView

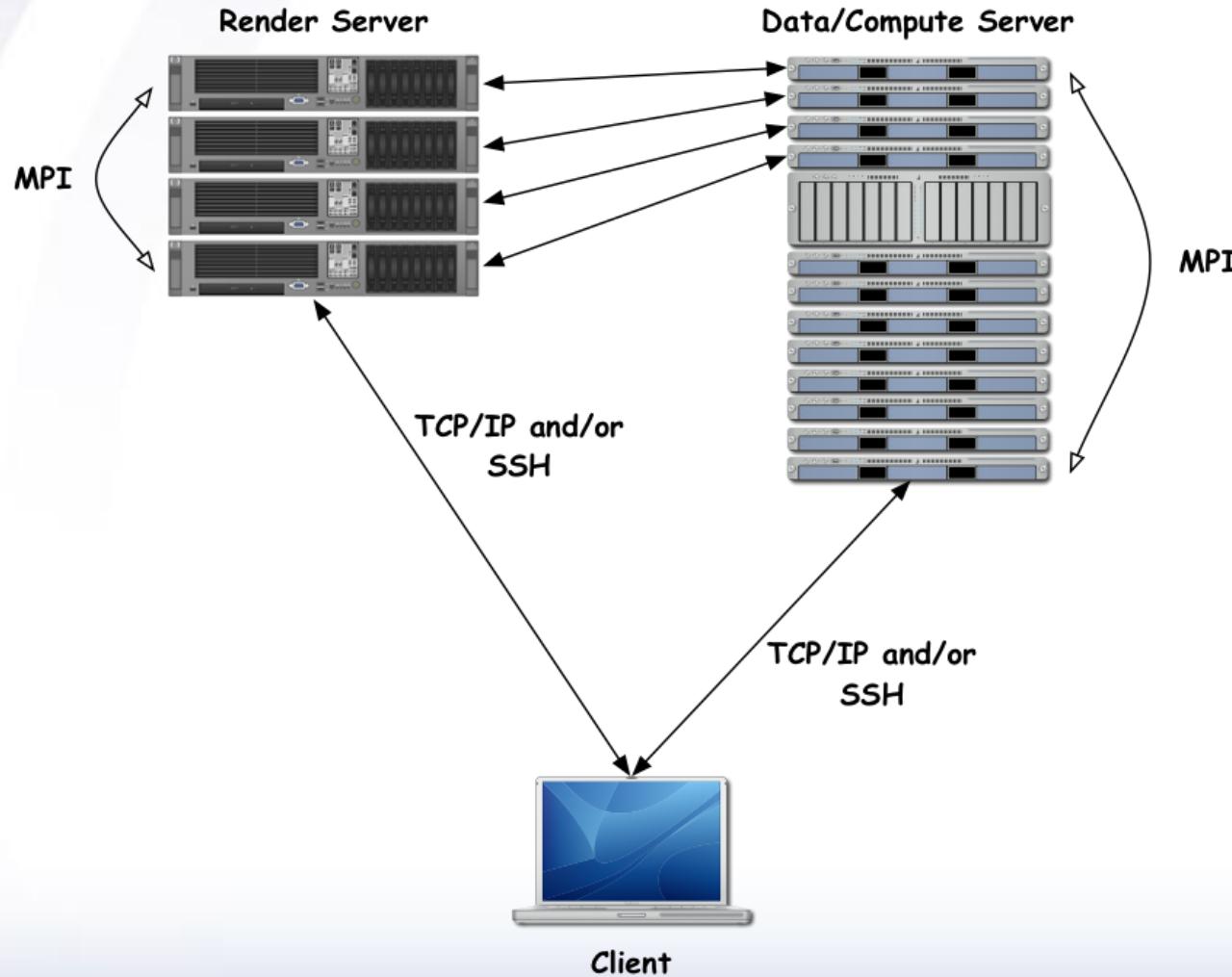
- www.paraview.org
- OpenSource (BSD)
- Based on VTK
- C++/Qt
- Python support
- Very active community (HPC wire award)
- Multi-core support (MPI)
- Co-Processing (in-situ)
- More than 50 data readers



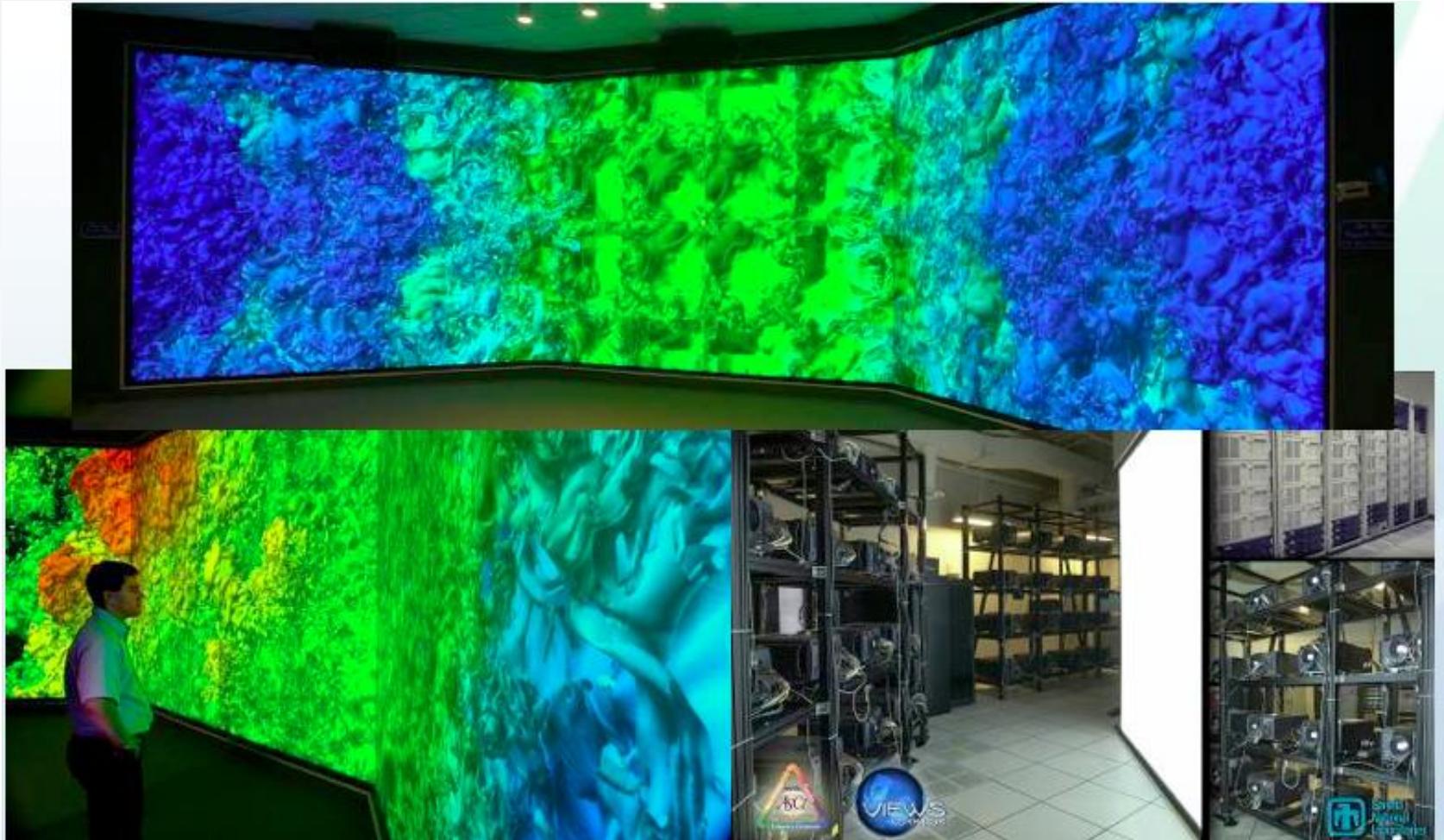
1 billion cell asteroid
detonation simulation



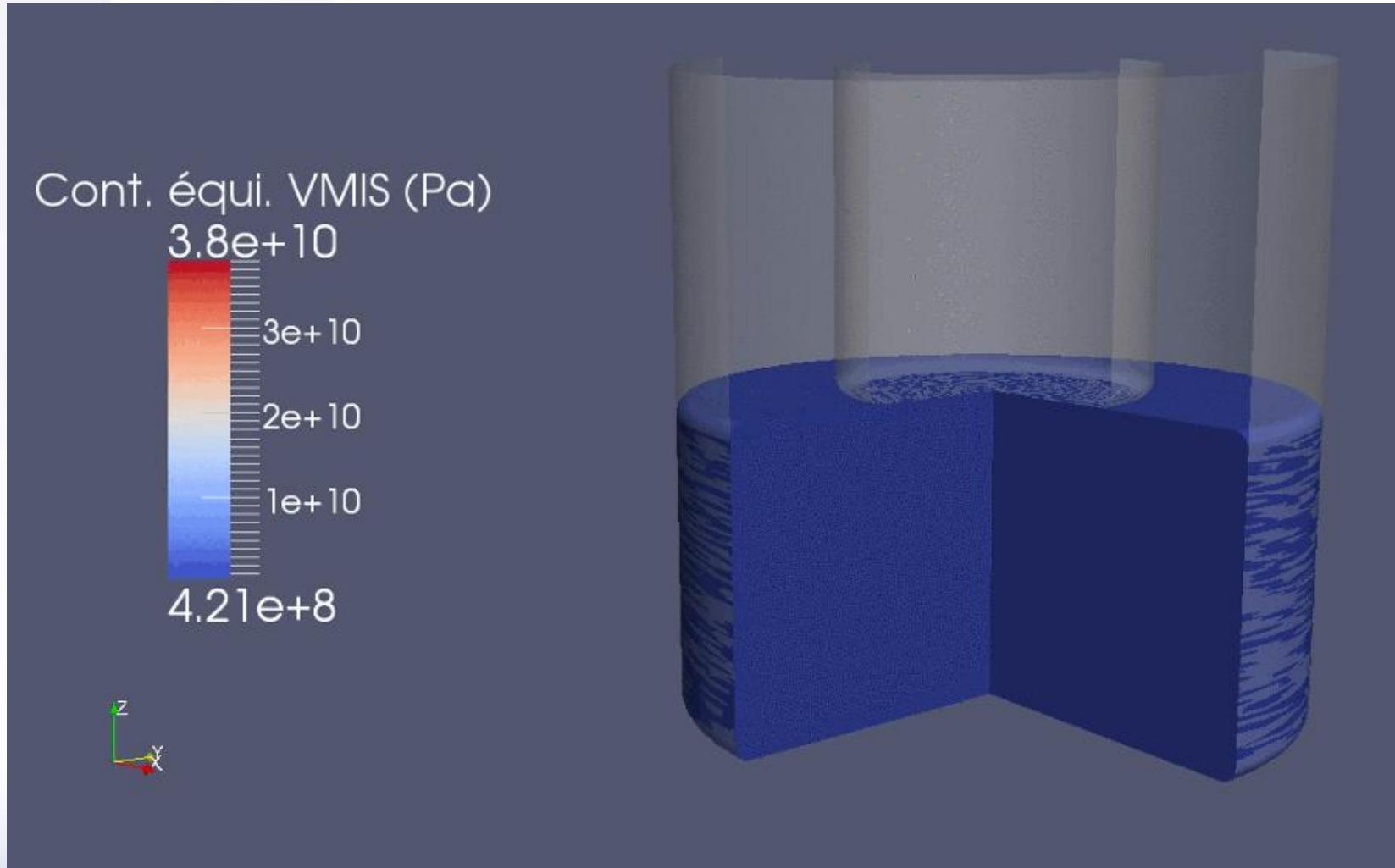
ParaView Architecture



ParaView in Use – Immersive Visualization



ParaView in Use – EDF/Code Aster

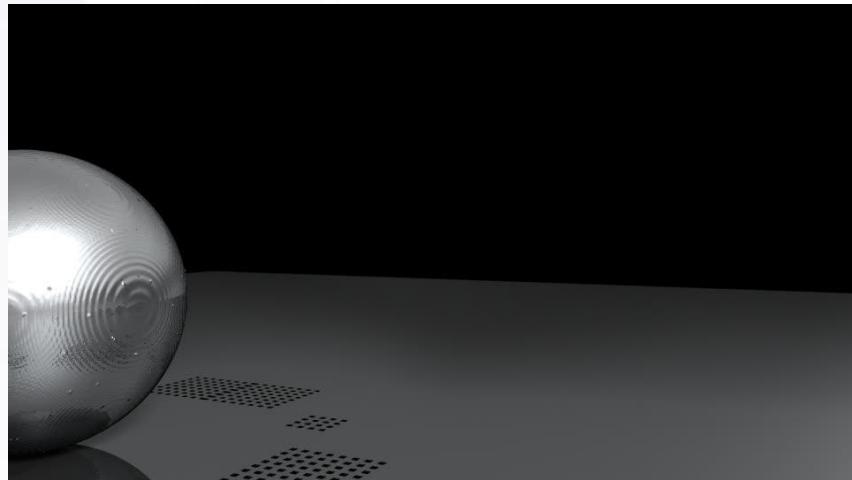


(SOME) HOT TOPICS

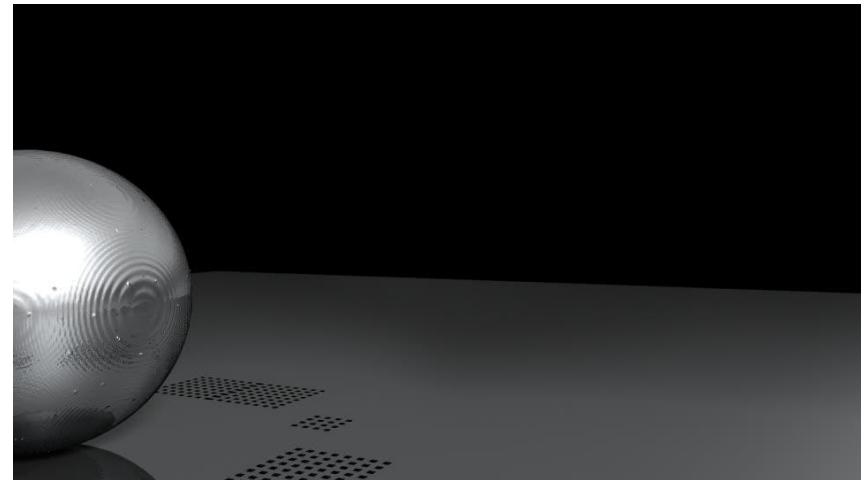


In-Situ : Access to More/Richer Data

*Post-Processing
(every 100 time steps)*



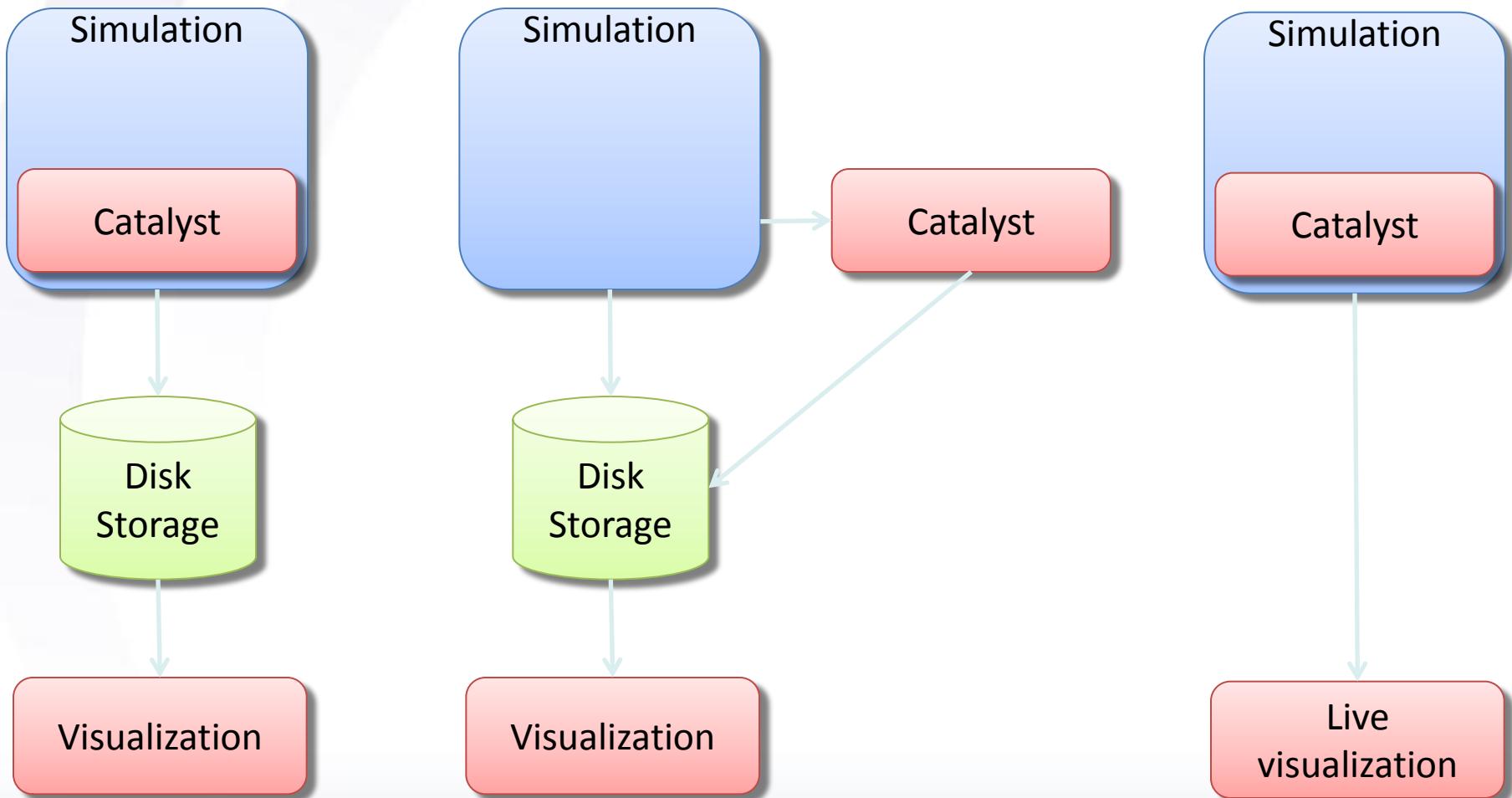
*In-situ
(every time step)*



Note: Reflections and shadows added in post-processing



In situ Analysis & Visualization



WebViz - Online Visualization

- No plugin
- Works on all devices and browsers
- Instant Visualization (fast loading)
- Fully interactive visualization

<http://www.webviz.org>

This screenshot shows a typical scientific article page from a journal like *JNeurosci*. The main content is an article titled "Comparison of Human Ventral Frontal Cortex Areas for Cognitive Control and Language with Areas in Monkey Frontal Cortex". The page includes a navigation bar, a sidebar with article sections like "Article outline", and a central area with the full text and figures. A 3D brain model is visible on the left, and a reference section on the right.

This image displays three separate windows of the WebViz interface, each showing a 3D model for visualization. The first window shows two 3D skull models with a grid overlay. The second window shows a 3D brain model with a color-coded heatmap overlay, labeled with coordinates (X=113 Y=52 Z=110) and planes (Coronal, Axial, Sagittal). The third window shows a 3D model of a classical statue group.

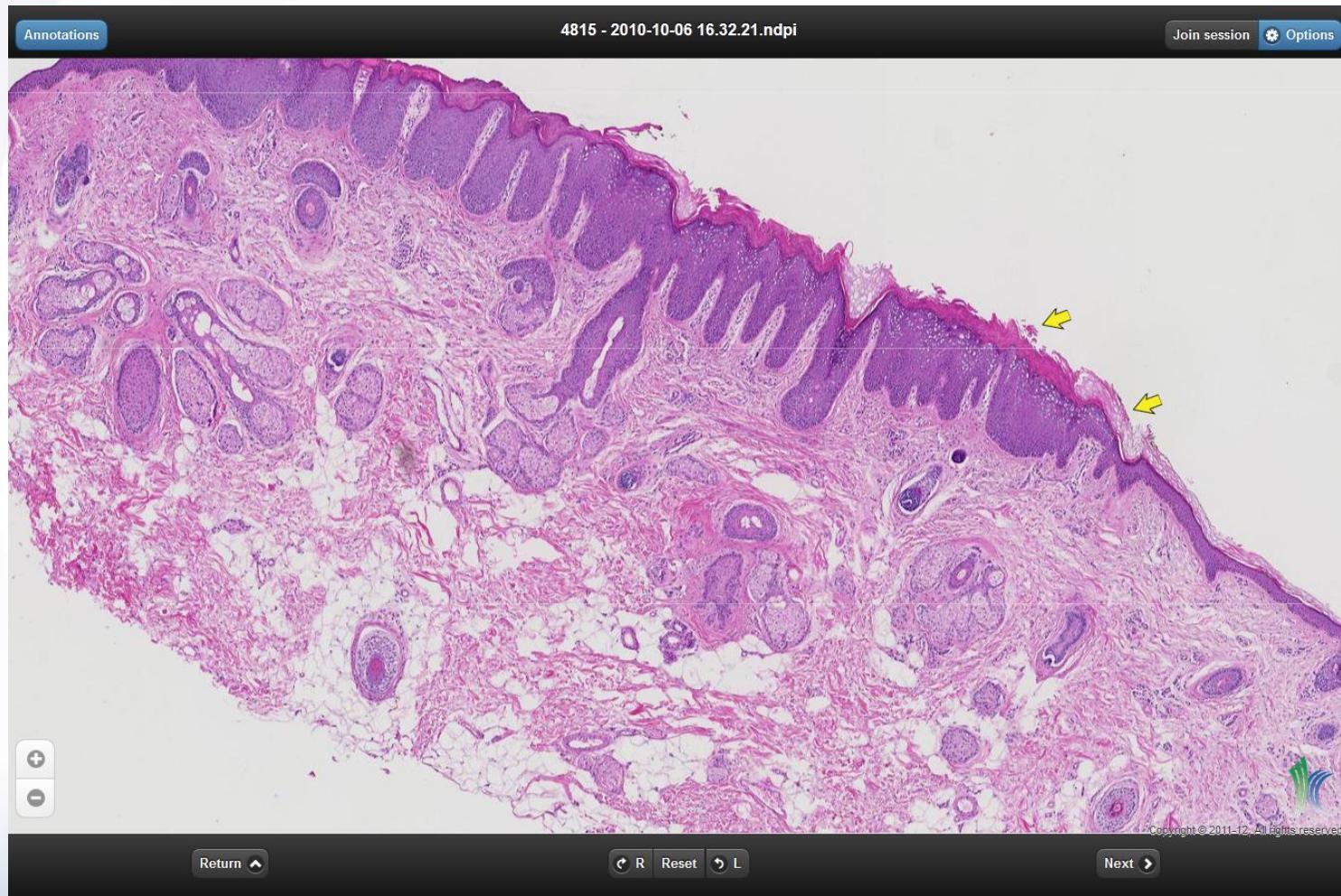


Powered by WebViz



Digital Pathology

- <https://slide-atlas.org/>



Conclusion





Thank you.

Julien Jomier

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