Collaviz®

Large Scale Computing with VTK and ParaView

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Kitware, Inc.

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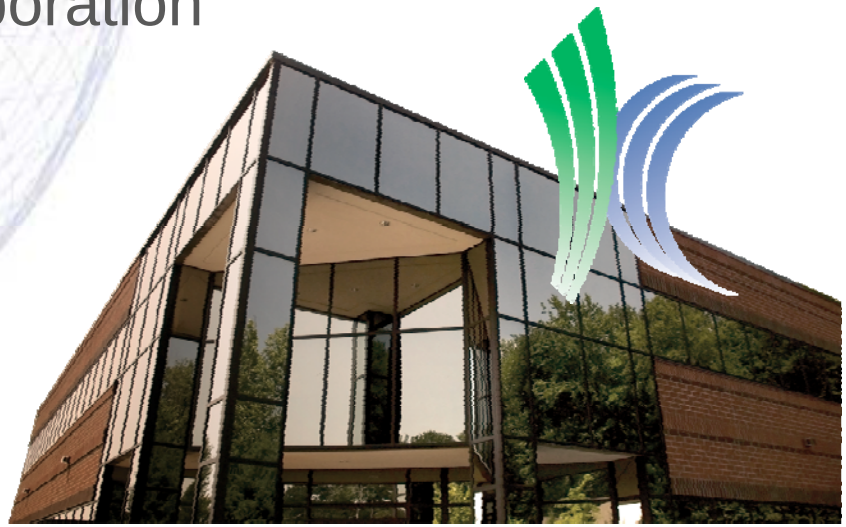
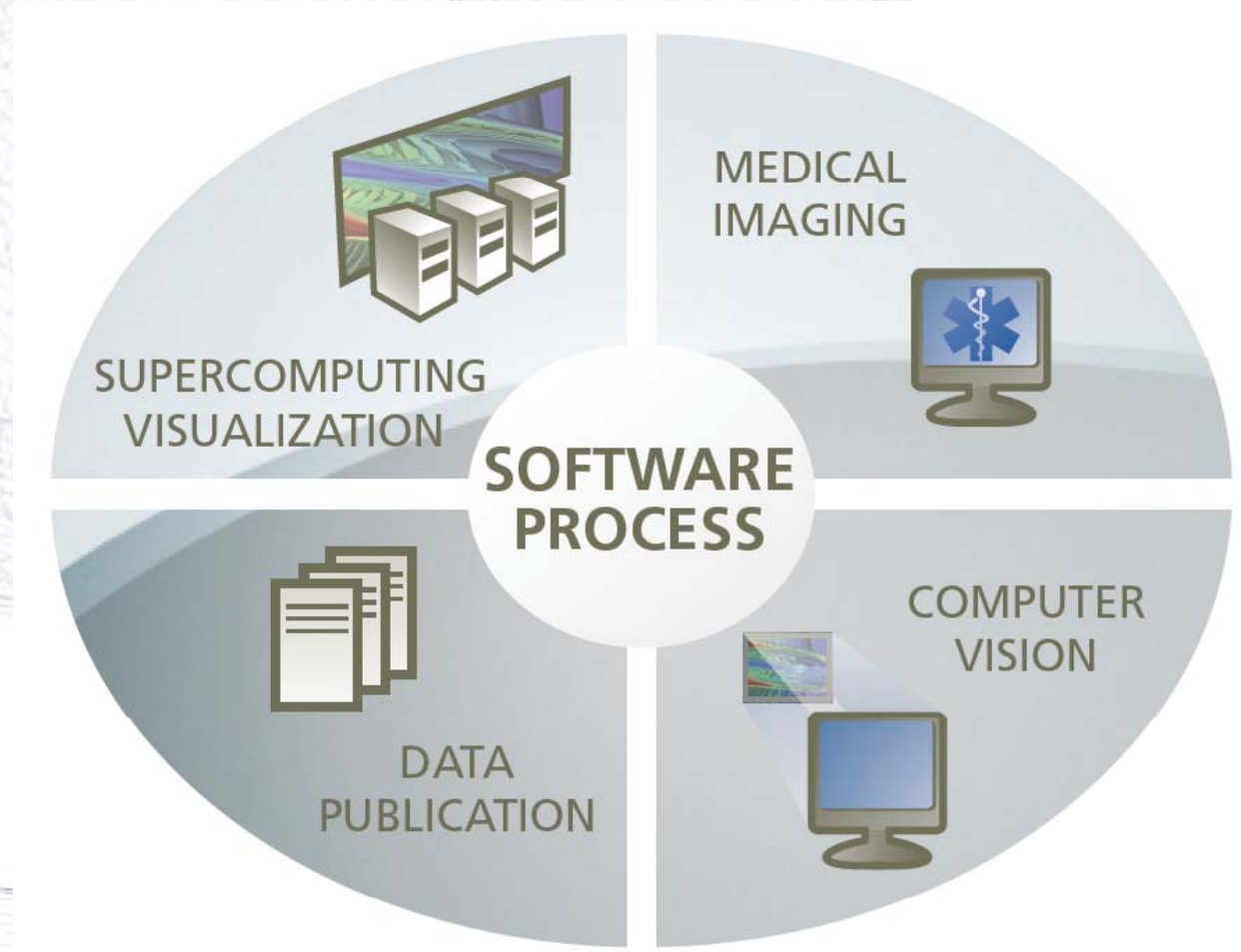
Introduction: Kitware

- A software company
- creating open-source collaboration platforms
- which are used globally for
  - research
  - teaching
  - commercial application.

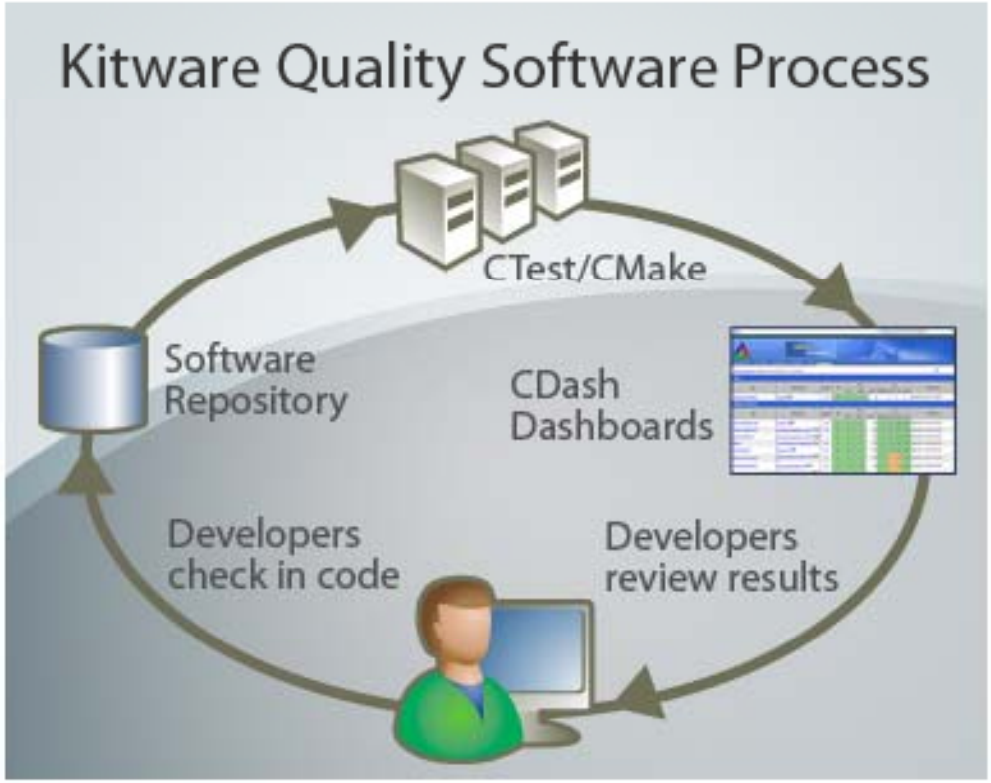


- This software is created by
  - internationally recognized experts
  - in extended communities
  - using a rigorous, quality-inducing software development process.

Technical Portfolio



Heart and Soul: Software Quality Process



VTK Development Team

- From Ohloh: **Very large, active development team:** Over the past twelve months, **66 developers** contributed new code to VTK. This is one of the largest open-source teams in the world, and is in the **top 2%** of all project teams on Ohloh.
- C++ Toolkit
  - 1.5 mloc, 1200+ classes
  - Python, Java, Tcl wrapping

PITTSBURGH SUPERCOMPUTING CENTER
EDF
CSCS
Swiss National Supercomputing Centre
Los Alamos NATIONAL LABORATORY
CD-adapco
ARL
U.S. Army Research Laboratory
Kitware
THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL
Sandia National Laboratories
TU Delft
Delft University of Technology
SCI
www.sci.utah.edu
INDIANA UNIVERSITY
GEORGETOWN UNIVERSITY
cea
JOHNS HOPKINS UNIVERSITY
Massachusetts Institute of Technology
Rensselaer

and many others...

VTK Development Team

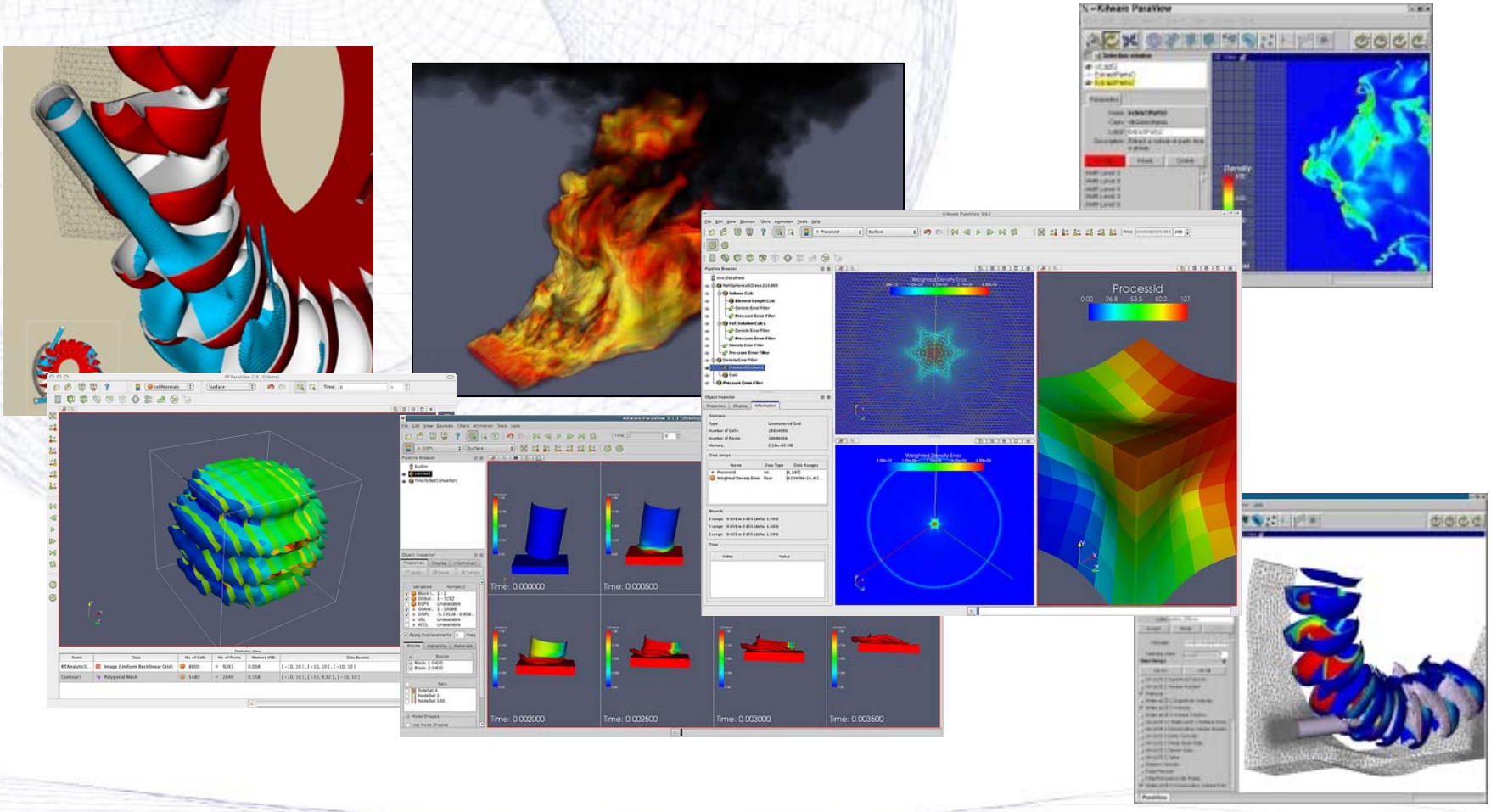
VTK and ParaView Funding

Army Aeroflightdnymics Directorate

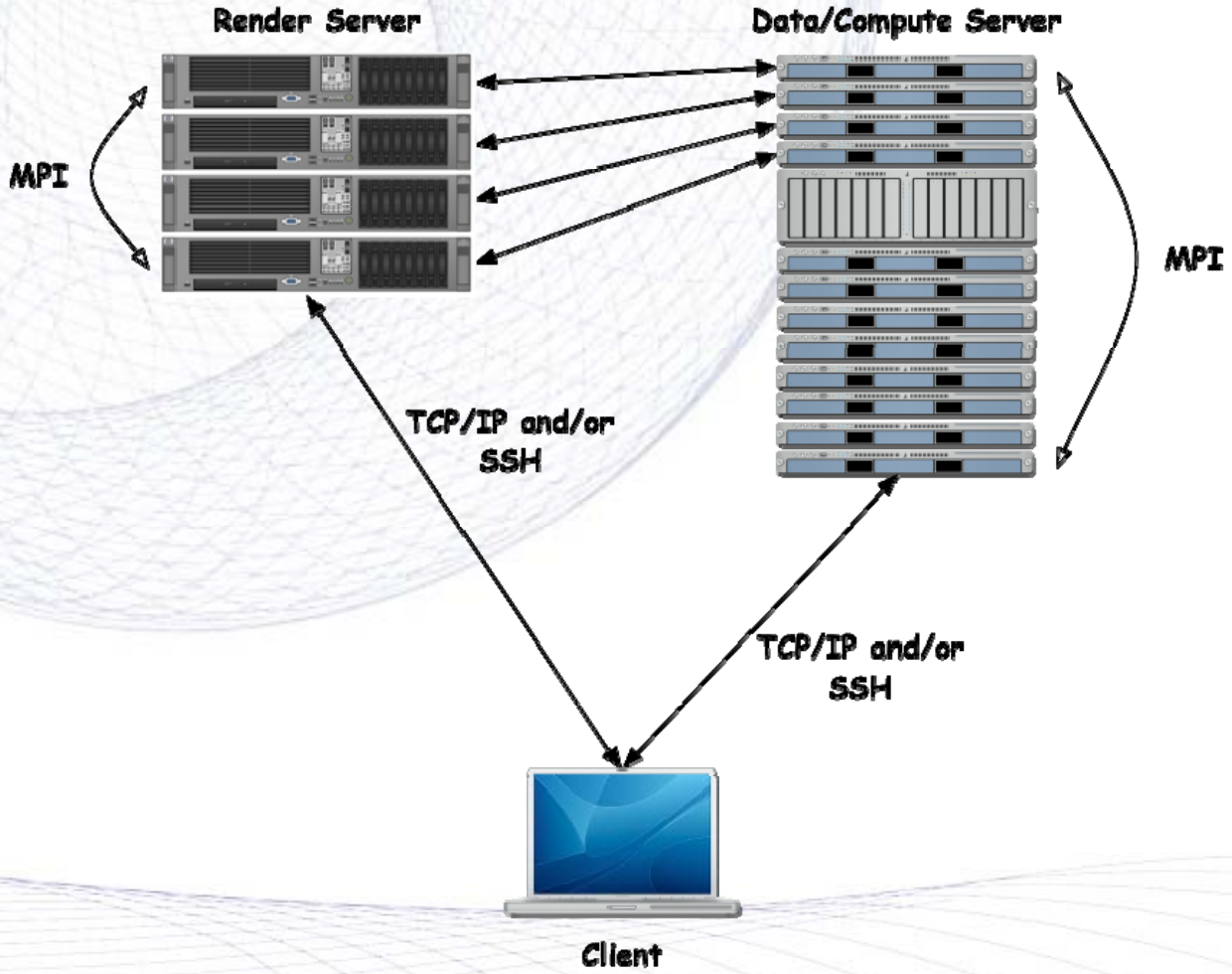
National Alliance for
Medical Computing

and many others...

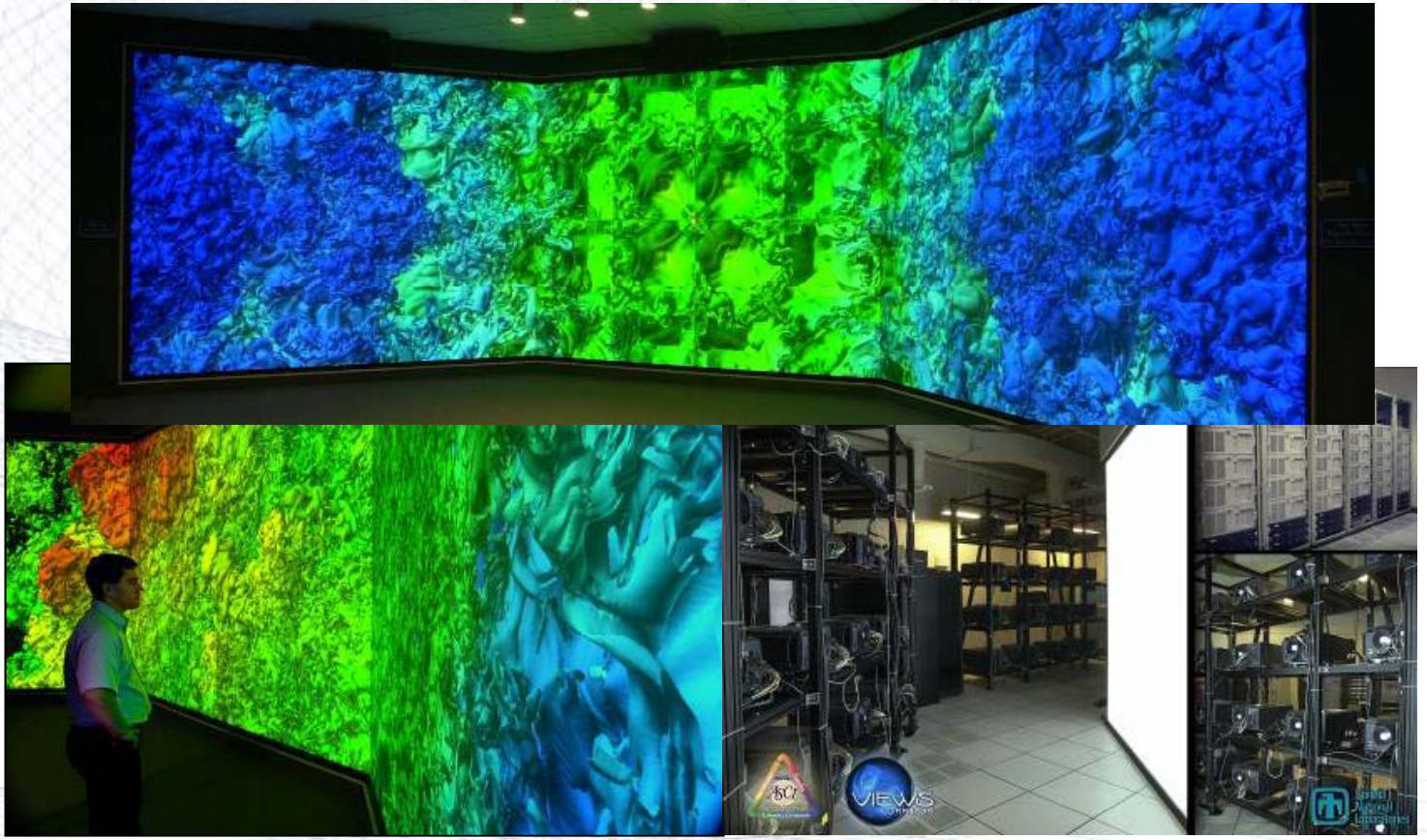
Then Came ParaView



ParaView Architecture



Support for Large Displays



ParaView is VTK

- ParaView is developed by the VTK team
- The ParaView team develops in the VTK repository : *all development benefits the whole community*
- ParaView leverages *all* features of VTK

ParaView is a Framework

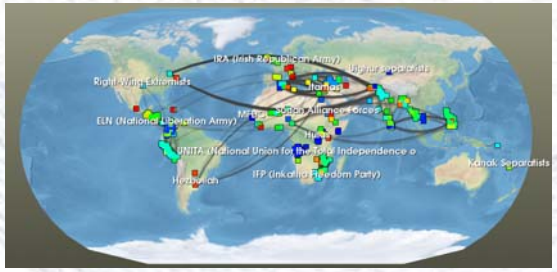
- ParaView extends VTK to provide:
  - Client-server computing
  - State management
  - Python modules
  - Application/GUI framework
- ParaView framework can be used to develop other applications
- ParaView can be embedded in other application and frameworks

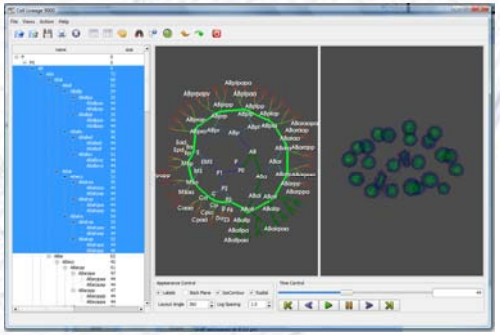
Key Development Initiatives

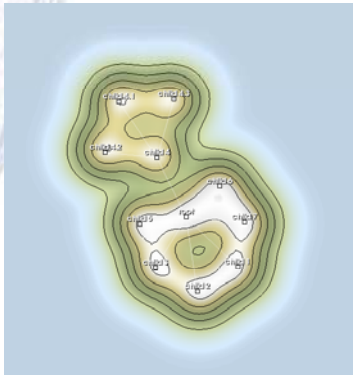
- Informatics
- Co-Processing
- Streaming
- Web Visualization
- Collaboration
- Data-Centric Computing

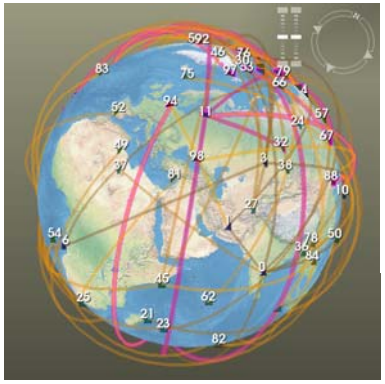
Informatics

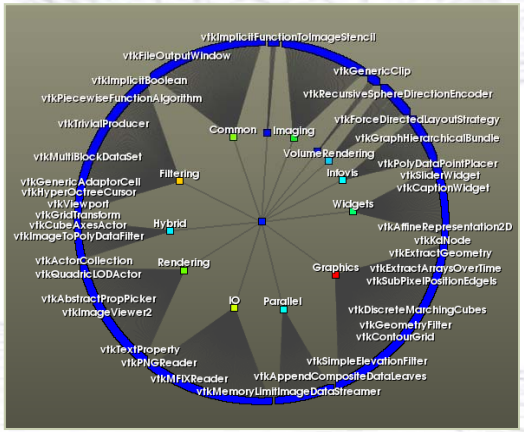
- Titan Toolkit – VTK informatics subsystem
  - Sandia & Kitware

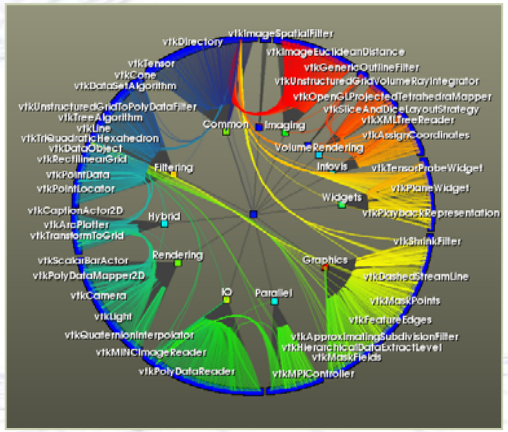


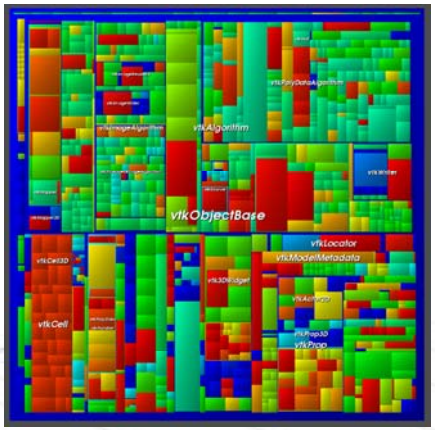




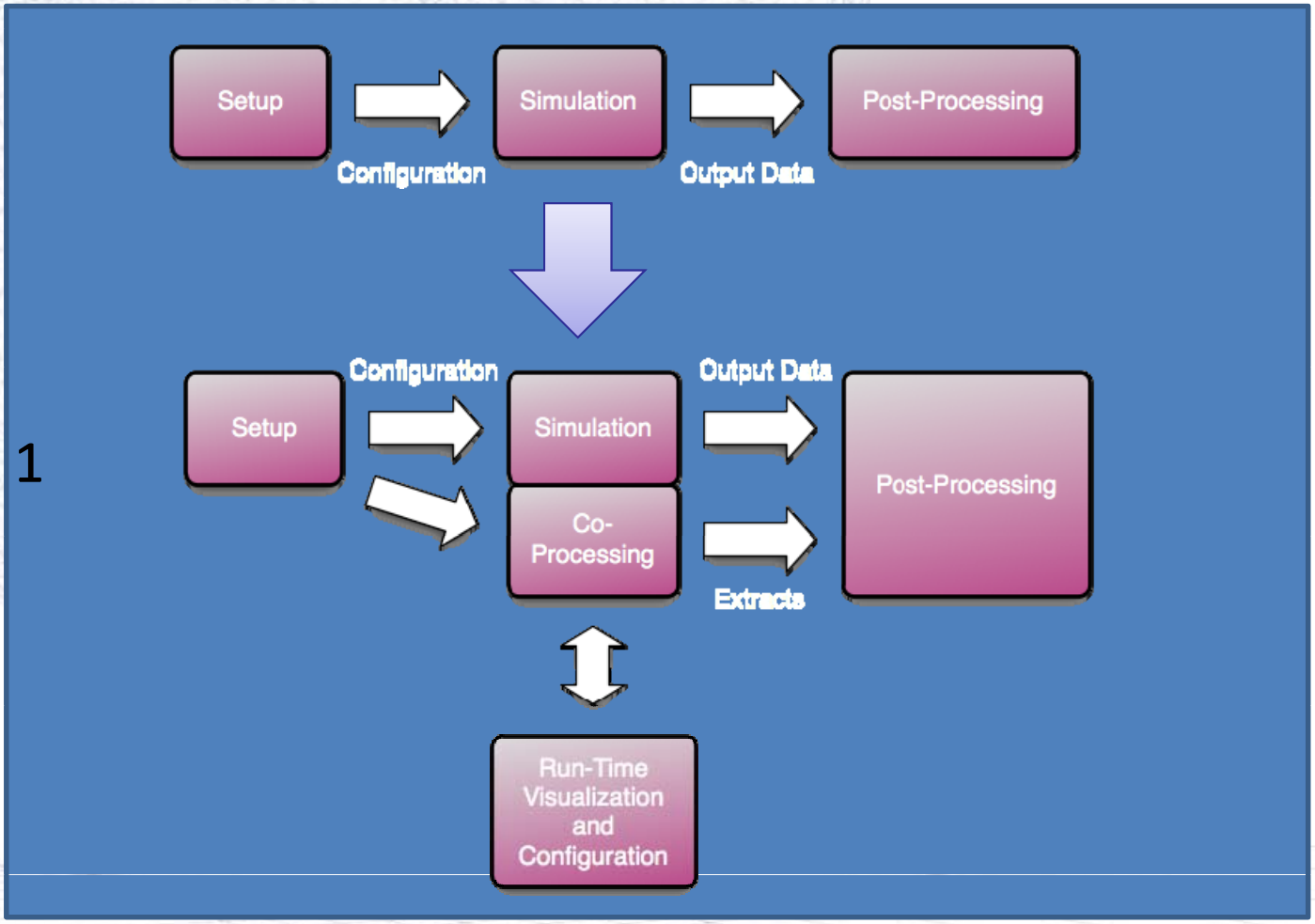








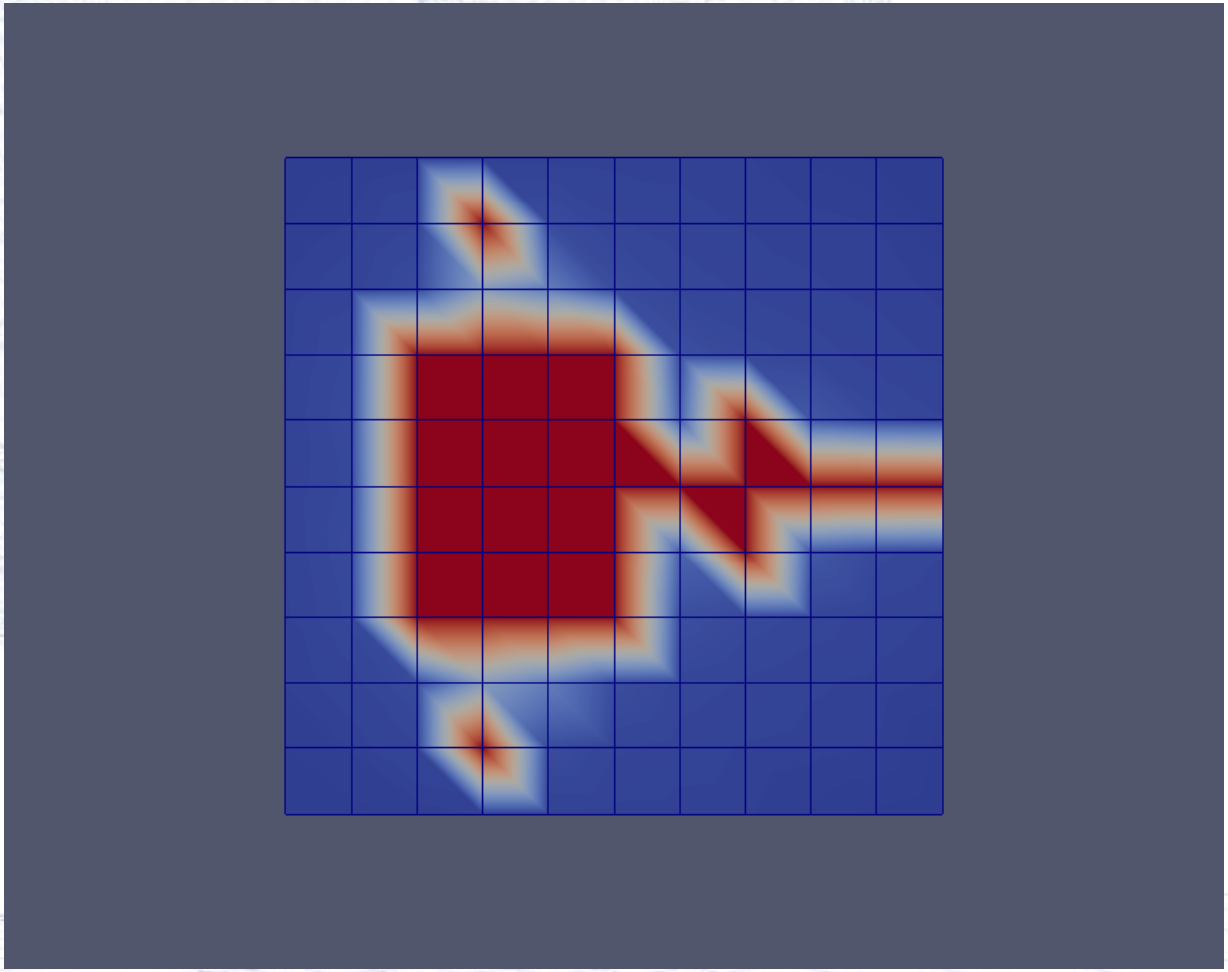
Co-Processing



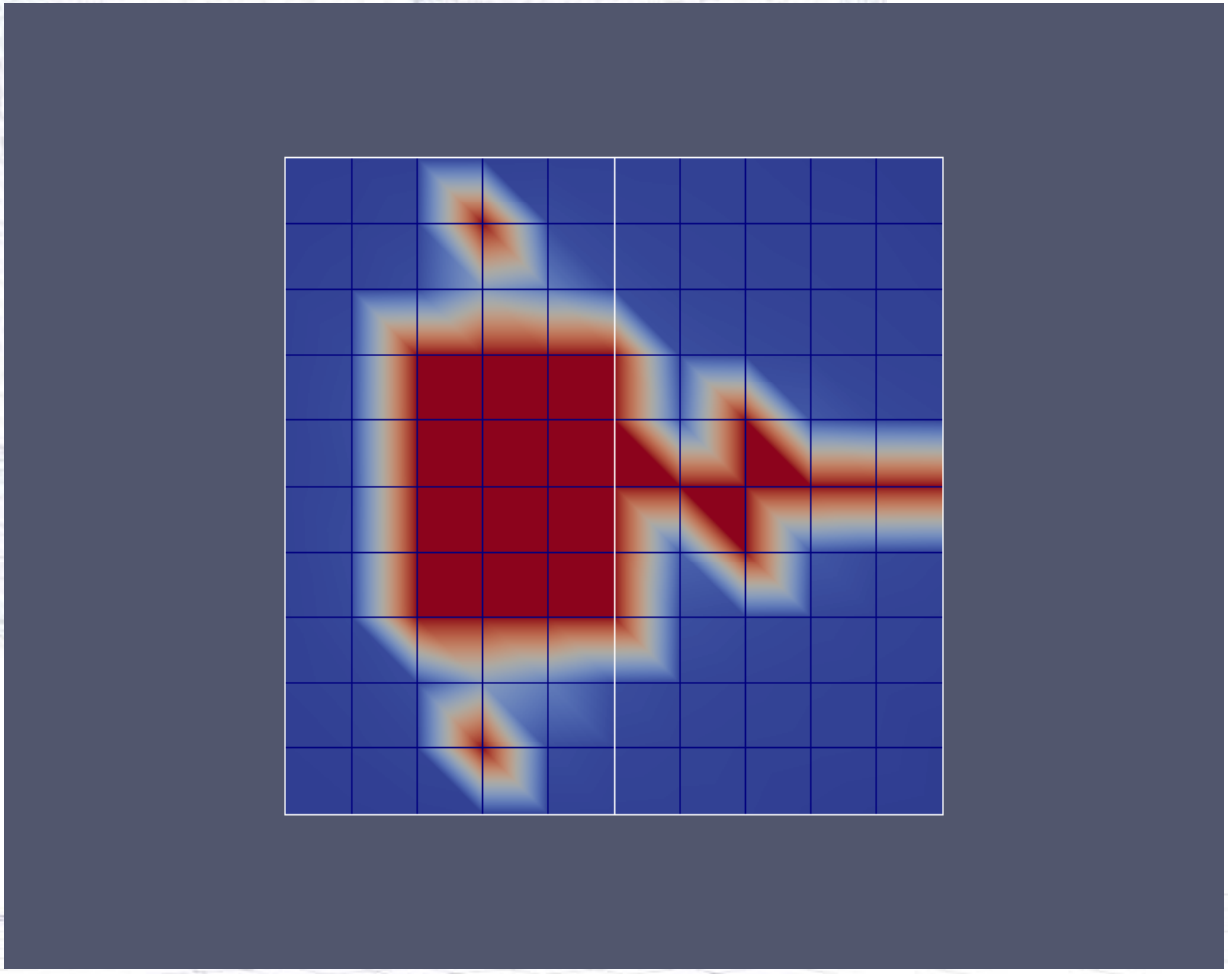
Streaming

- Adaptively process and display data

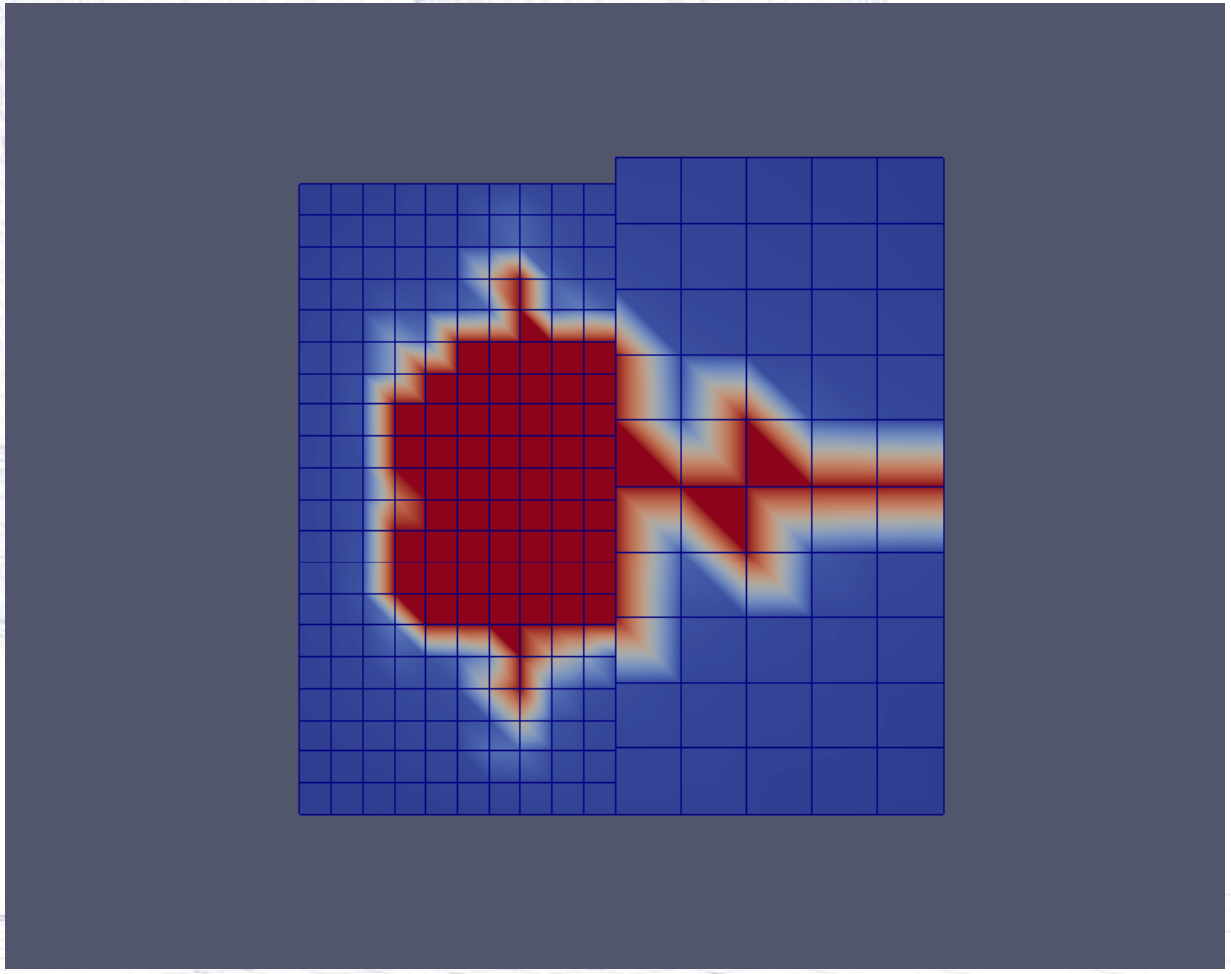
Streaming



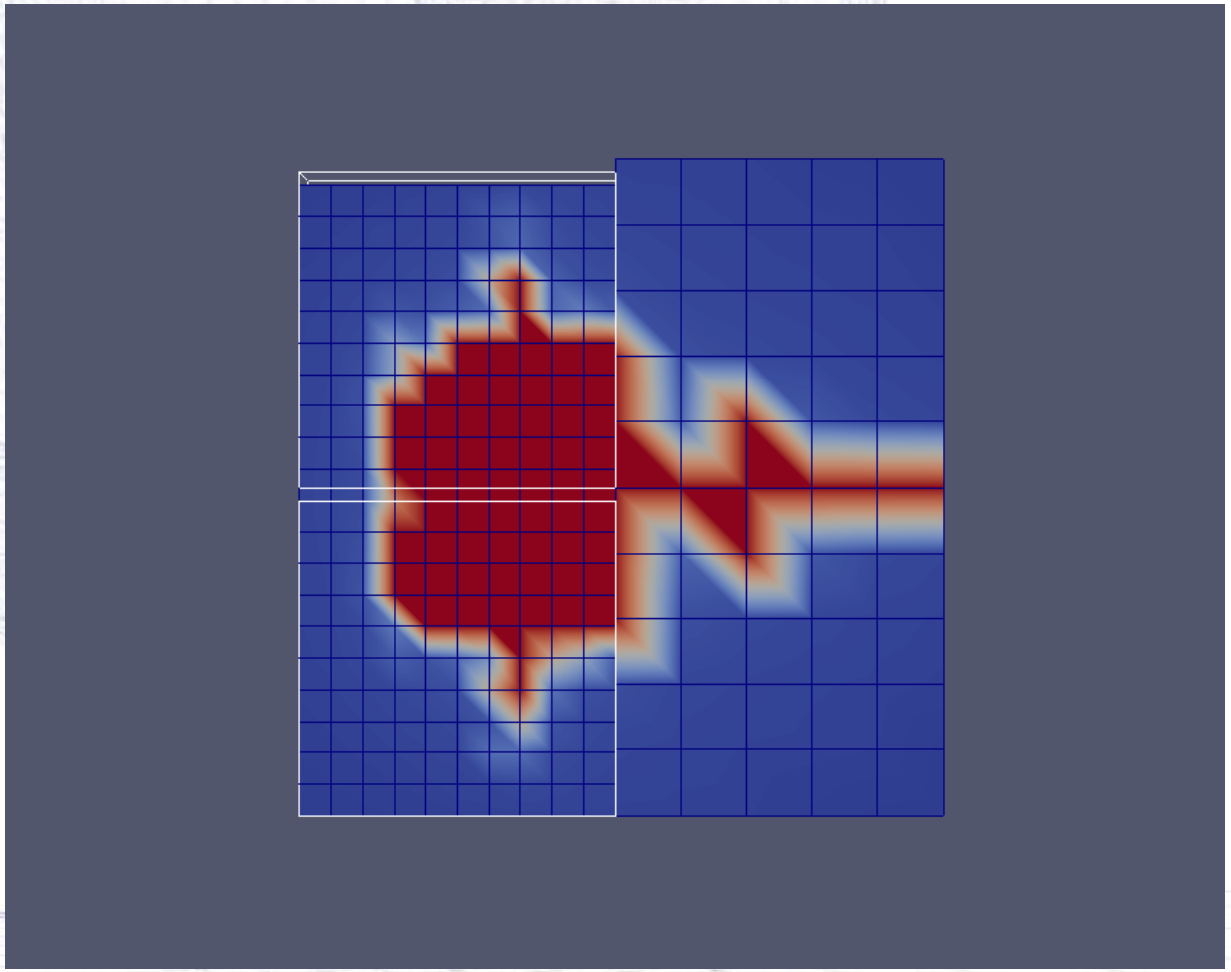
Streaming



Streaming



Streaming



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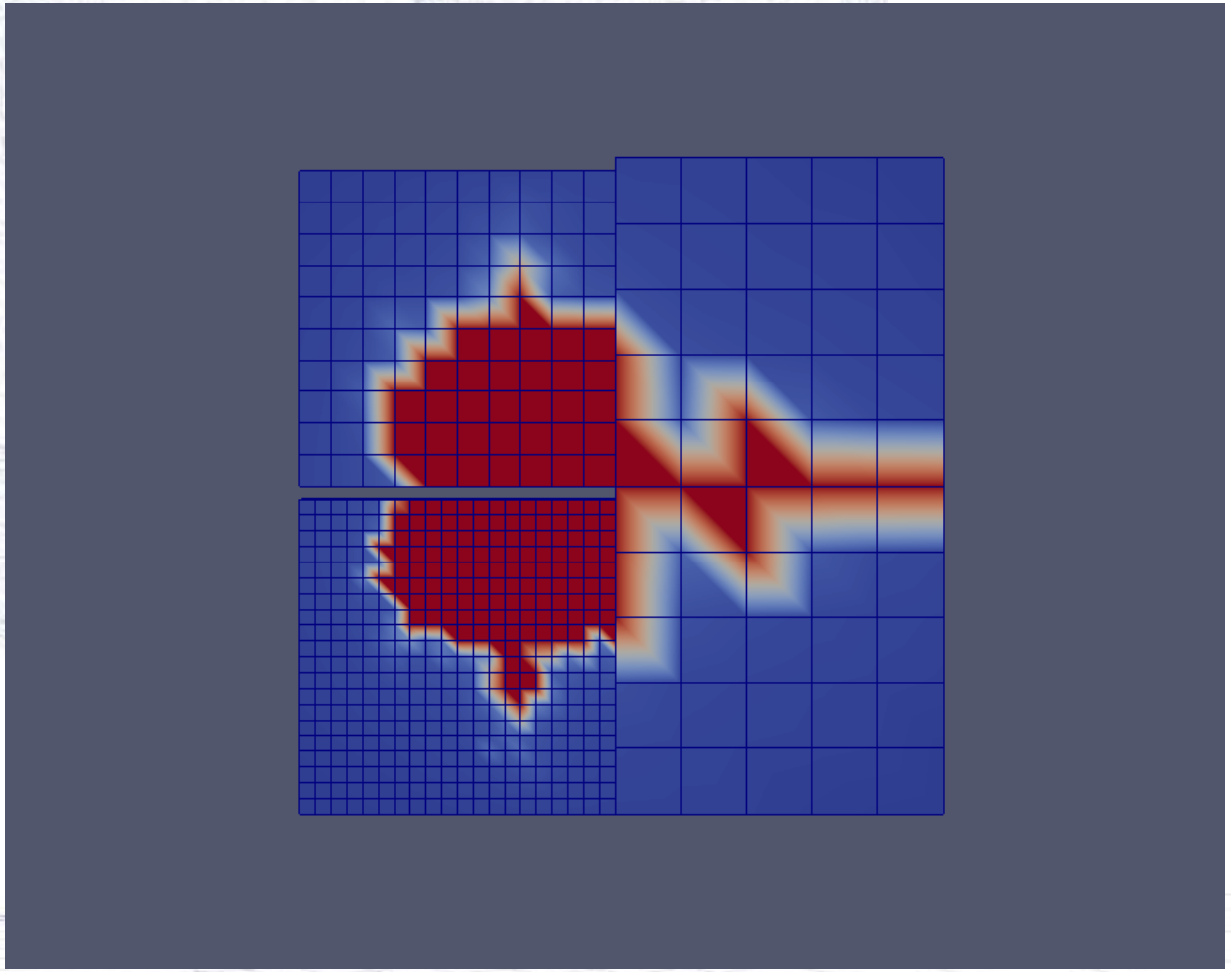
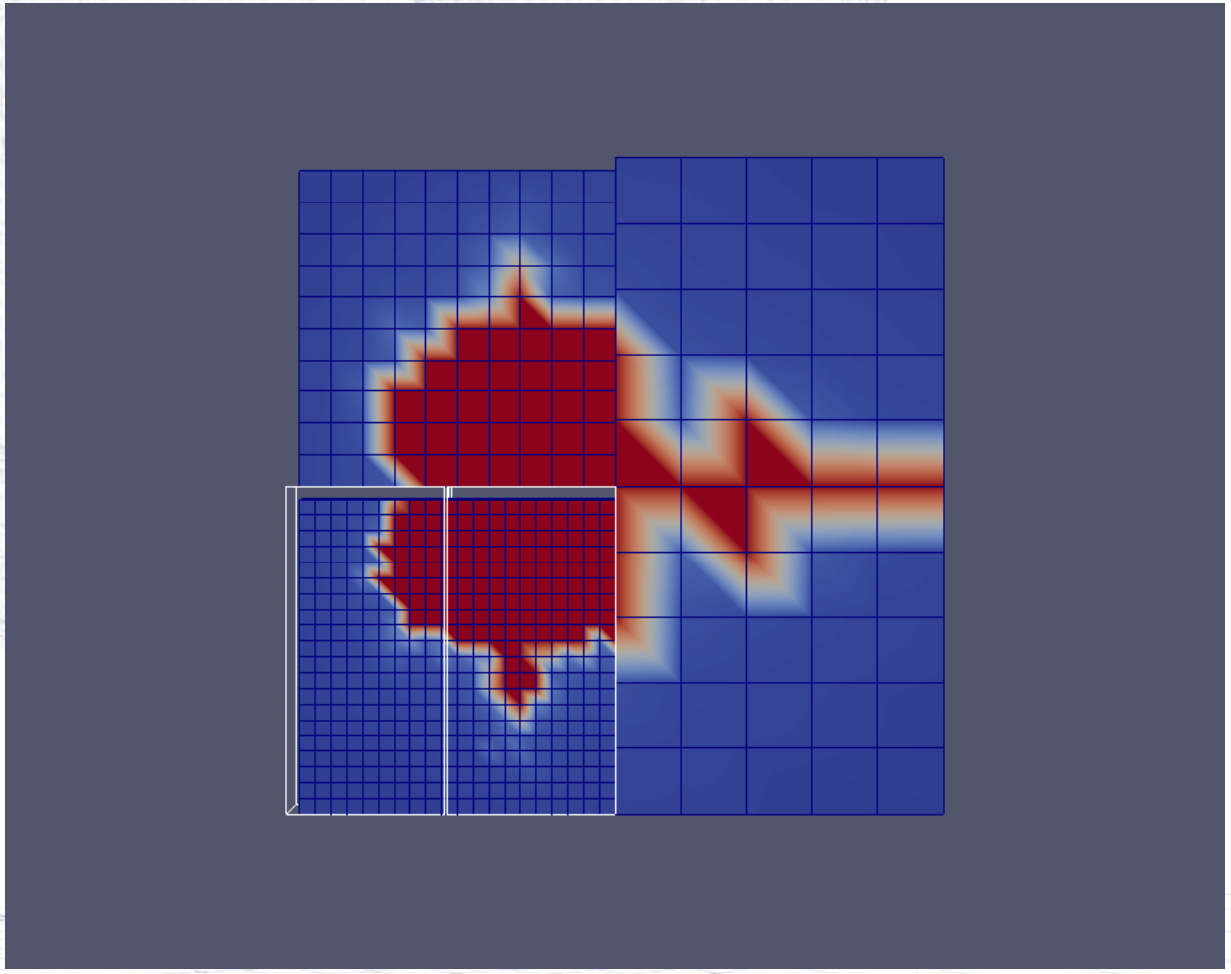
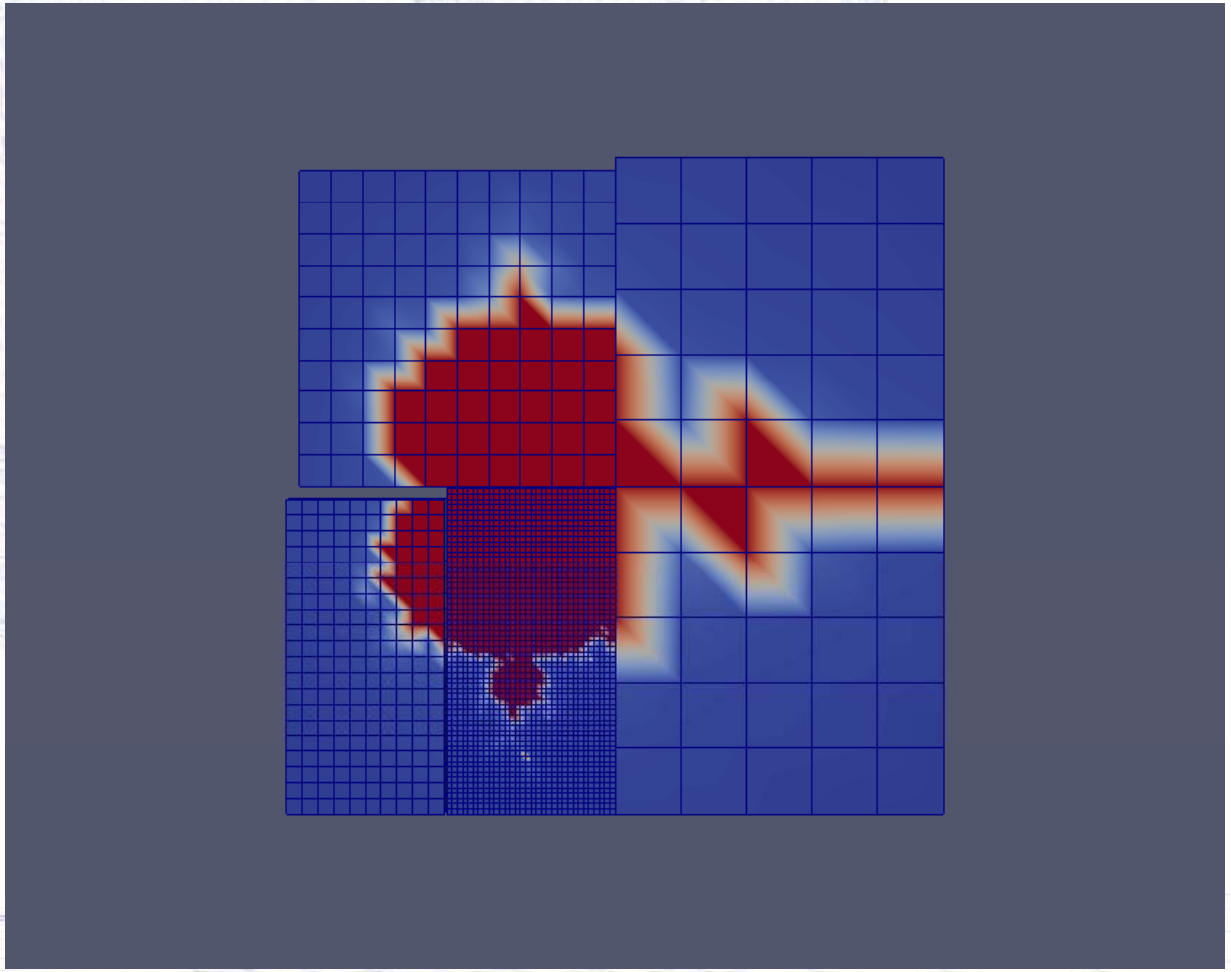


Streaming



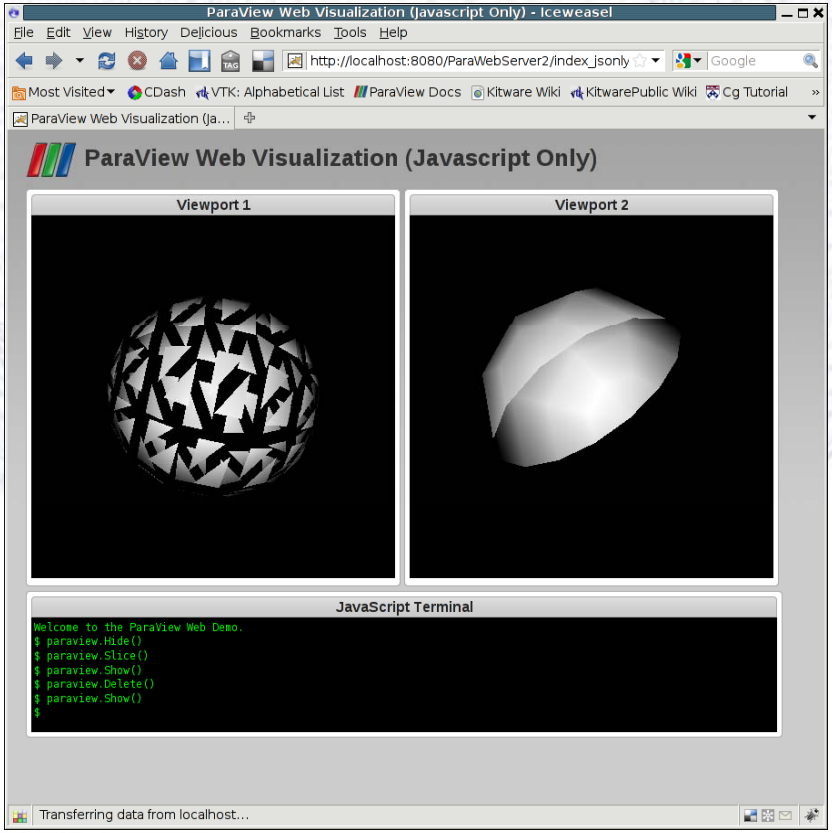
Streaming

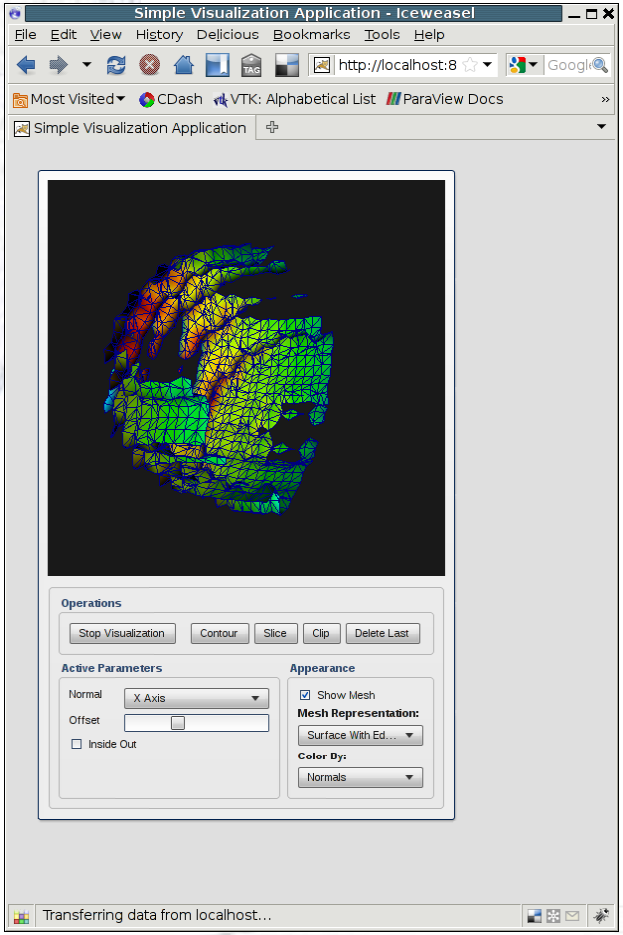


Web Visualization

- Client-Server
- Deployed in web browser
- Various rendering techniques
  - Java
  - Javascript
  - Flash
  - http://paraviewweb.kitware.com/PW/

Web Visualization

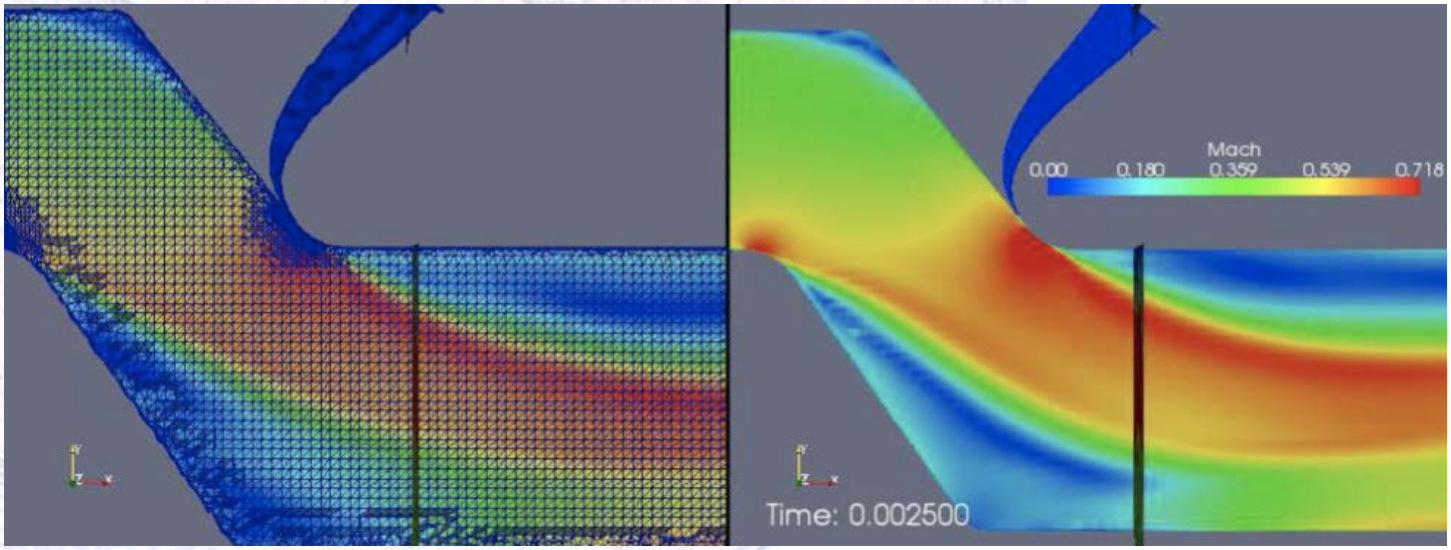




Data-Centric Computing

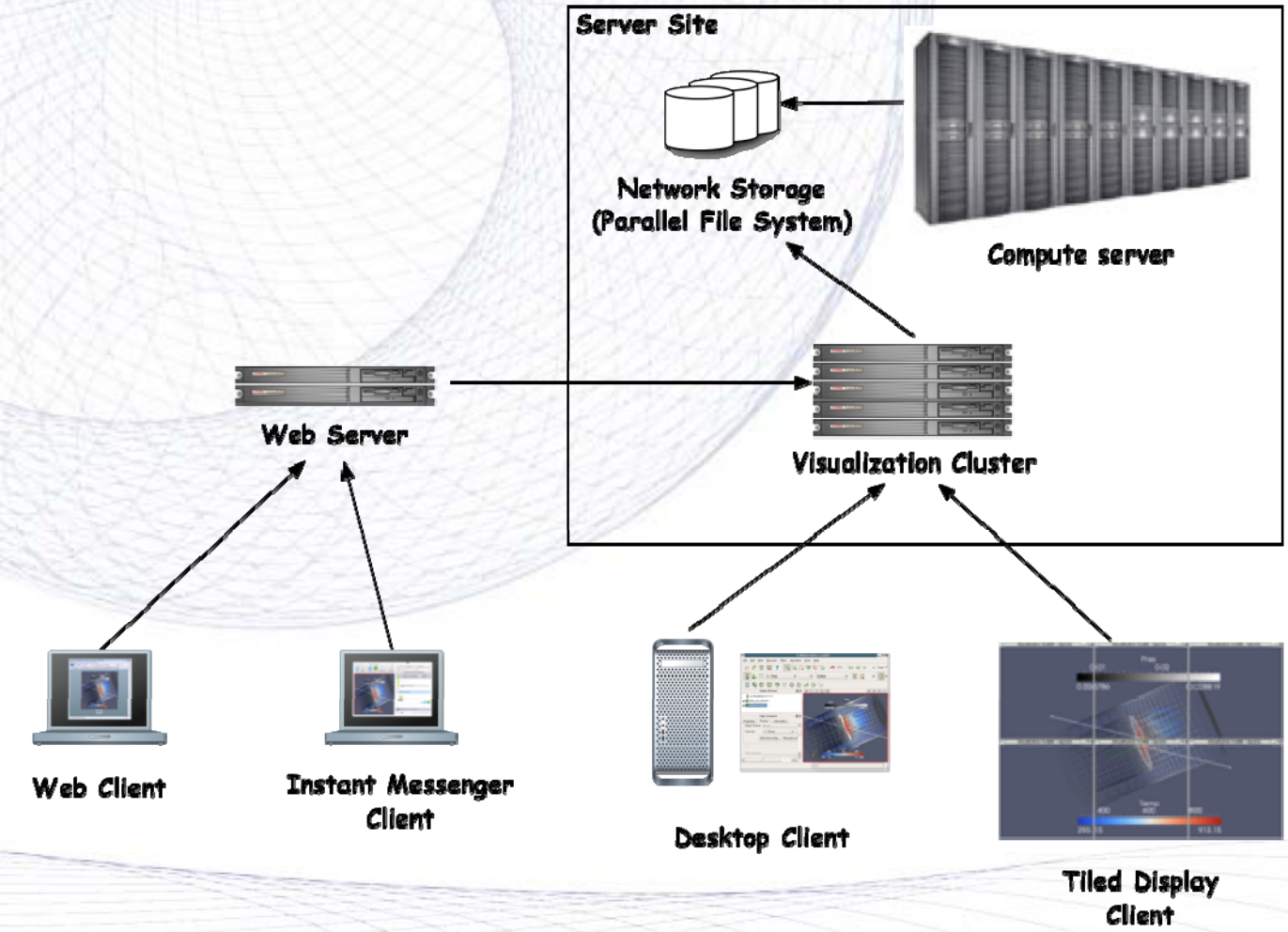
- The Role of Data Ensembles
  - Large collections of data
  - Includes meta-data
  - Must incorporate informatics
- MIDAS
  - Web-based Multimedia Digital Archiving System
  - Store, search and manage digital media
  - Open Source (BSD)

Data-Centric Computing



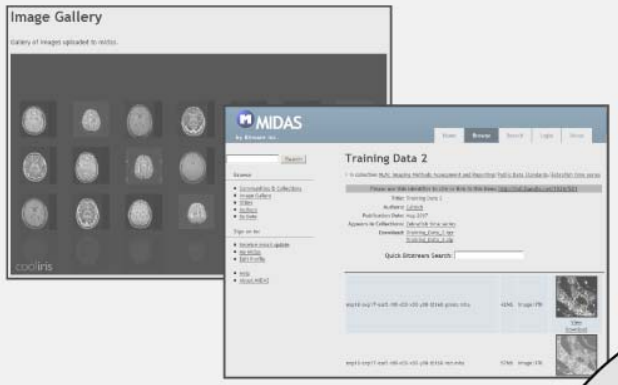
- Engine inlet with aggressive bend
- Active control
- Parameters: duct geometry, location of jet, gap width, jet waveform, jet frequency, ...

Collaboration

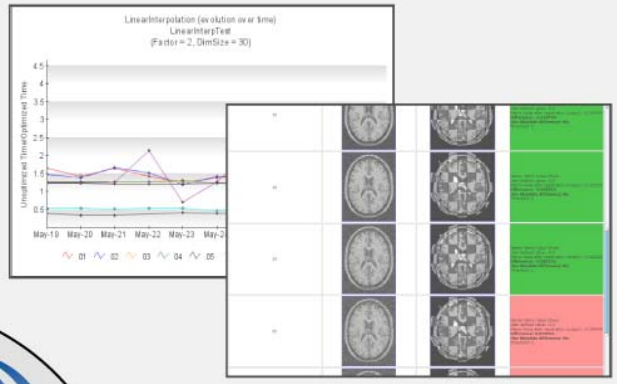


Supplemental Materials

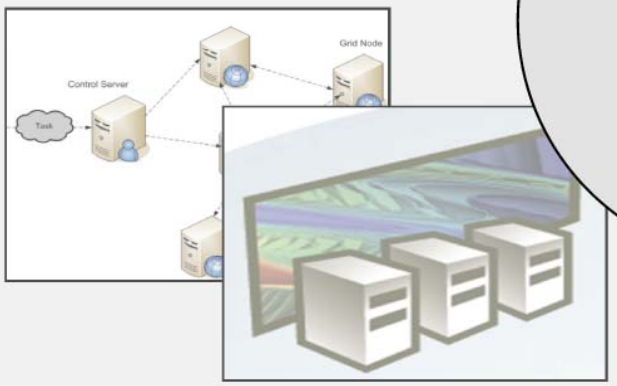
MIDAS



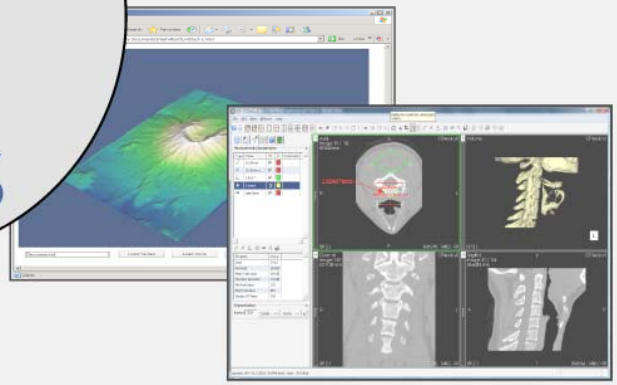
Digital Storage



Online Reporting



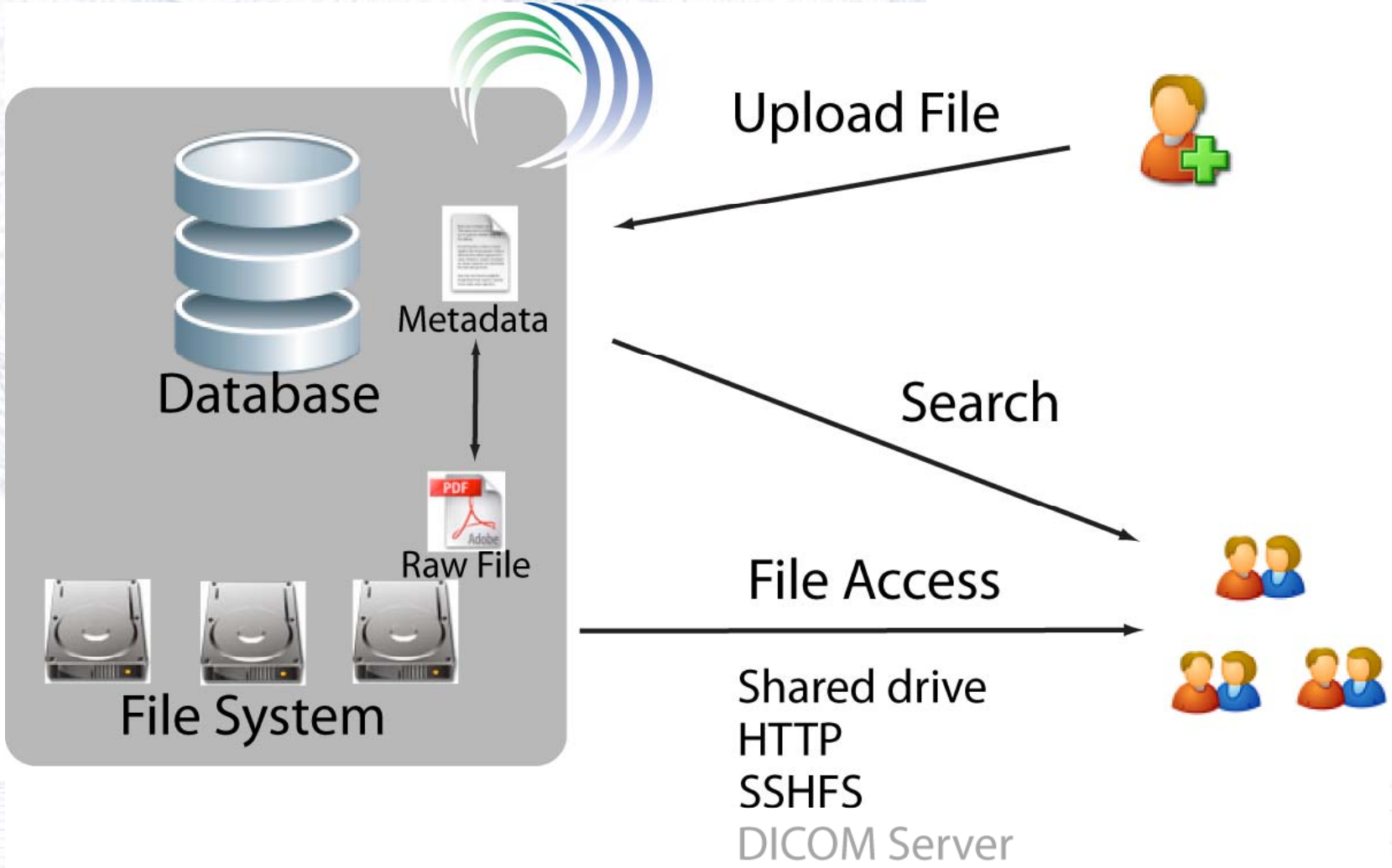
Server-Side Processing



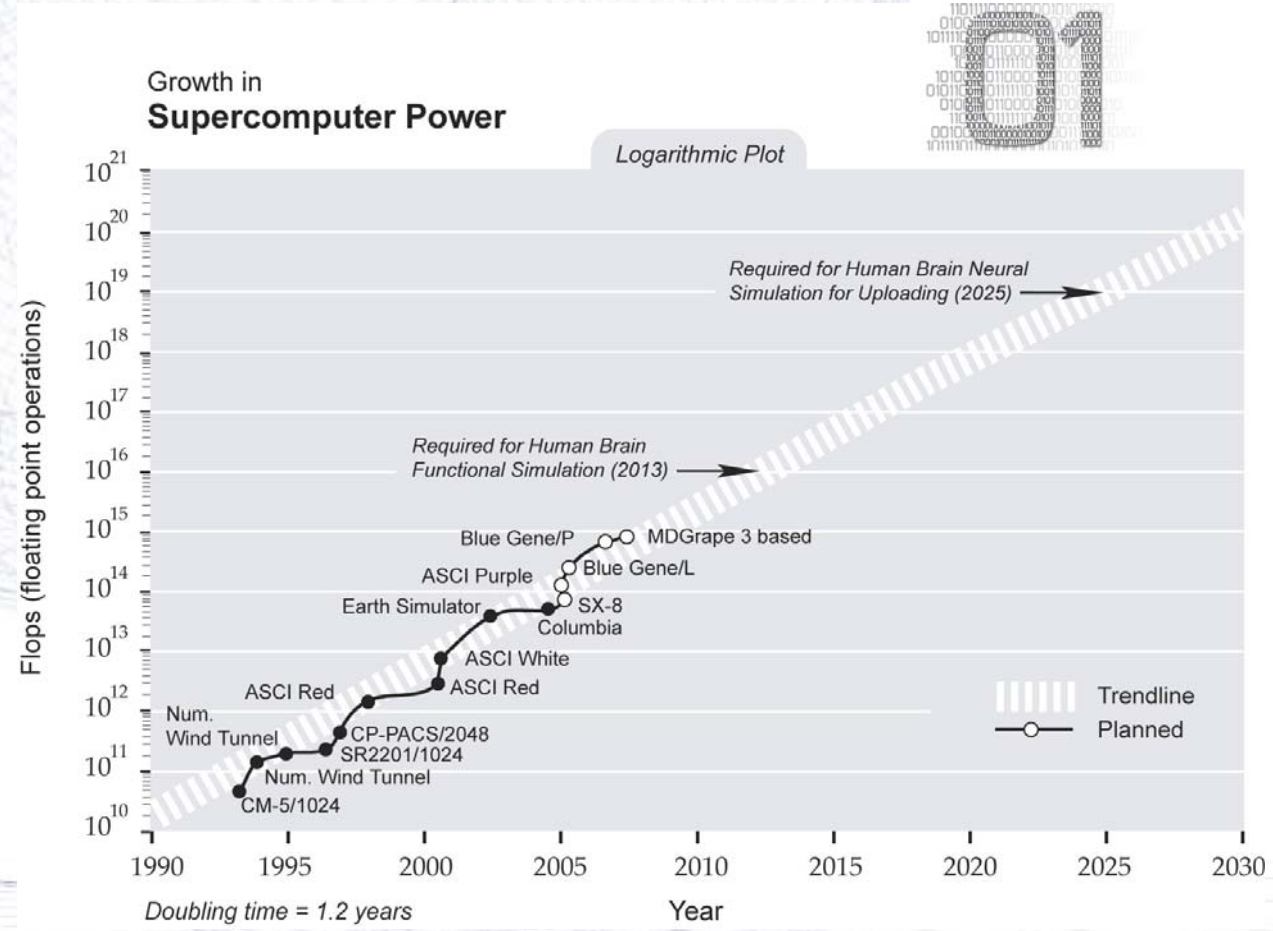
Interactive Visualization

MIDAS

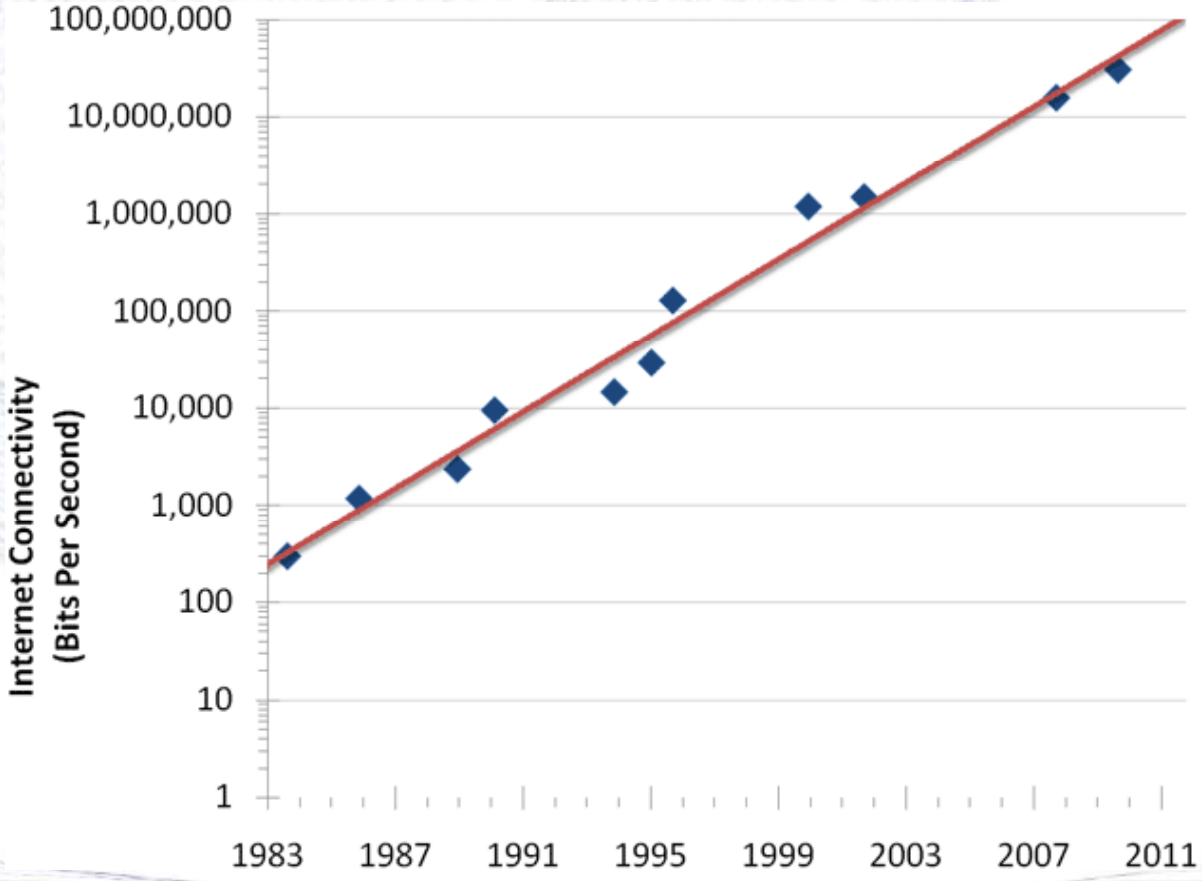
MIDAS



Ability to Compute



Ability to Communicate



The Bad

Ability to Compute >> Ability to Transfer >> Ability to Store/Read