

# Visualization with WSRF A Concrete Example

The Usable Grid Workshop

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# Outline

- Project Overview
- Current Status
- WSRF Application
- Benchmarking
- Conclusion
- Demo

# Project Overview

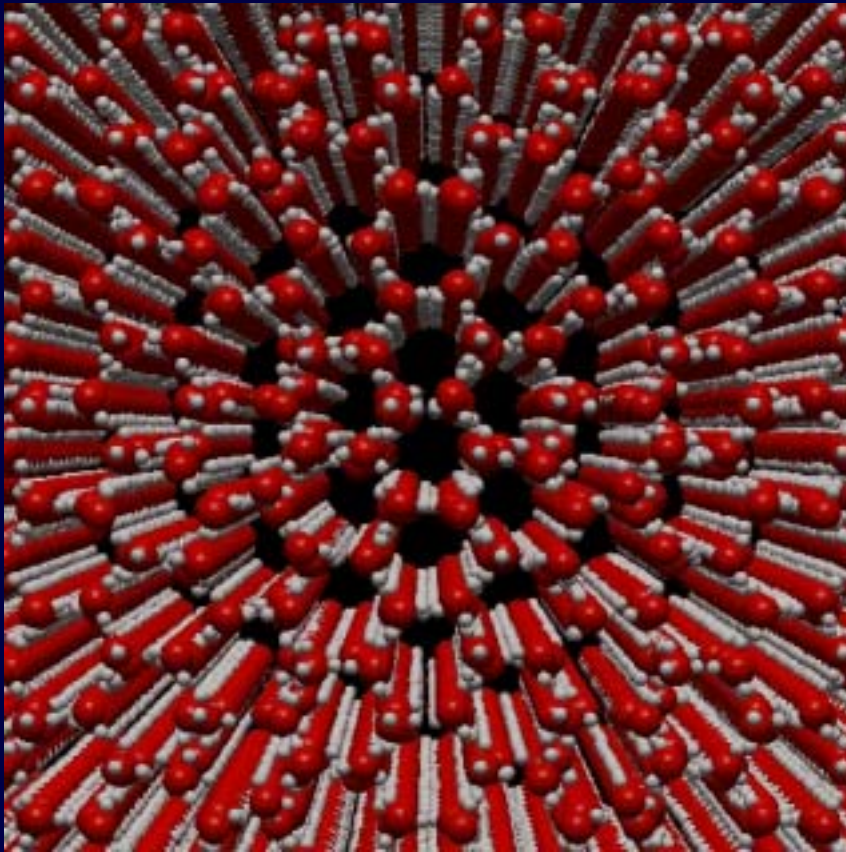
- **Background**
  - Essential tool for scientific simulations
  - Critical demand for coping with data on the Grid
- **Objectives**
  - Visualization large-scale distributed data
  - Generalized Grid visualization services
- **Mission**
  - Contribution to the improvement of usability and practicability of the Grid

# Current Status

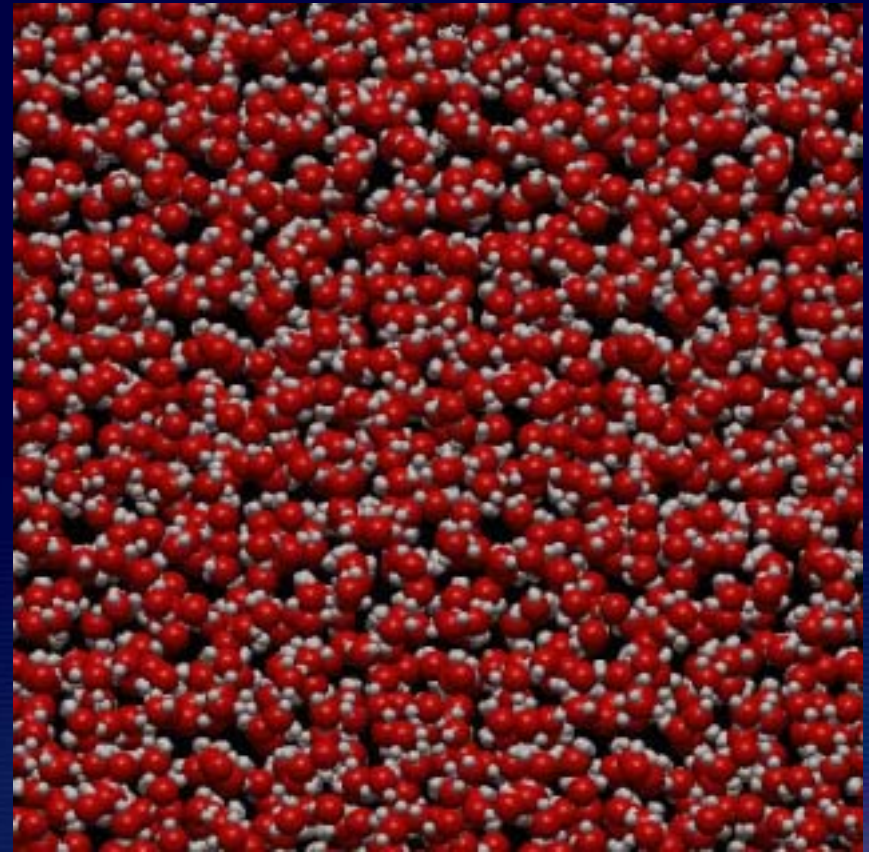
- Visualization Functionalities for Massive Data
  - **Extension**: molecular structures, iso-surfaces, etc.
  - **Application**: high-speed visualization of huge MD simulation results (3 million atoms)
- Visualization Grid Service Prototyping
  - WSRF-based interactive visualization system
  - Integrated parallel visualization module and 3rd party software (PyMOL) into a partial visualization service.

# Example of Massive Data Visualization

- Motion of 1 million molecules (3 million atoms)



Ice

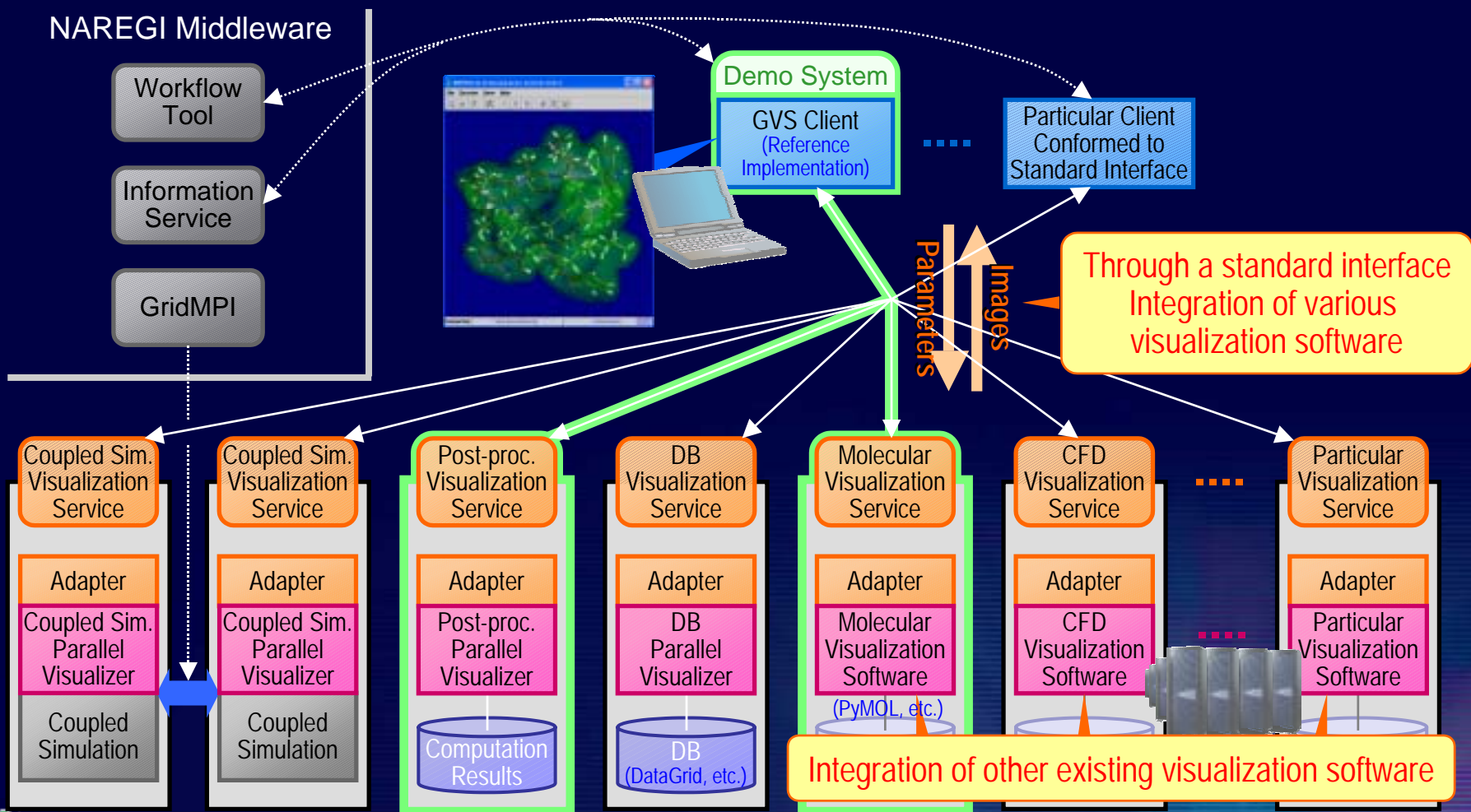


Water

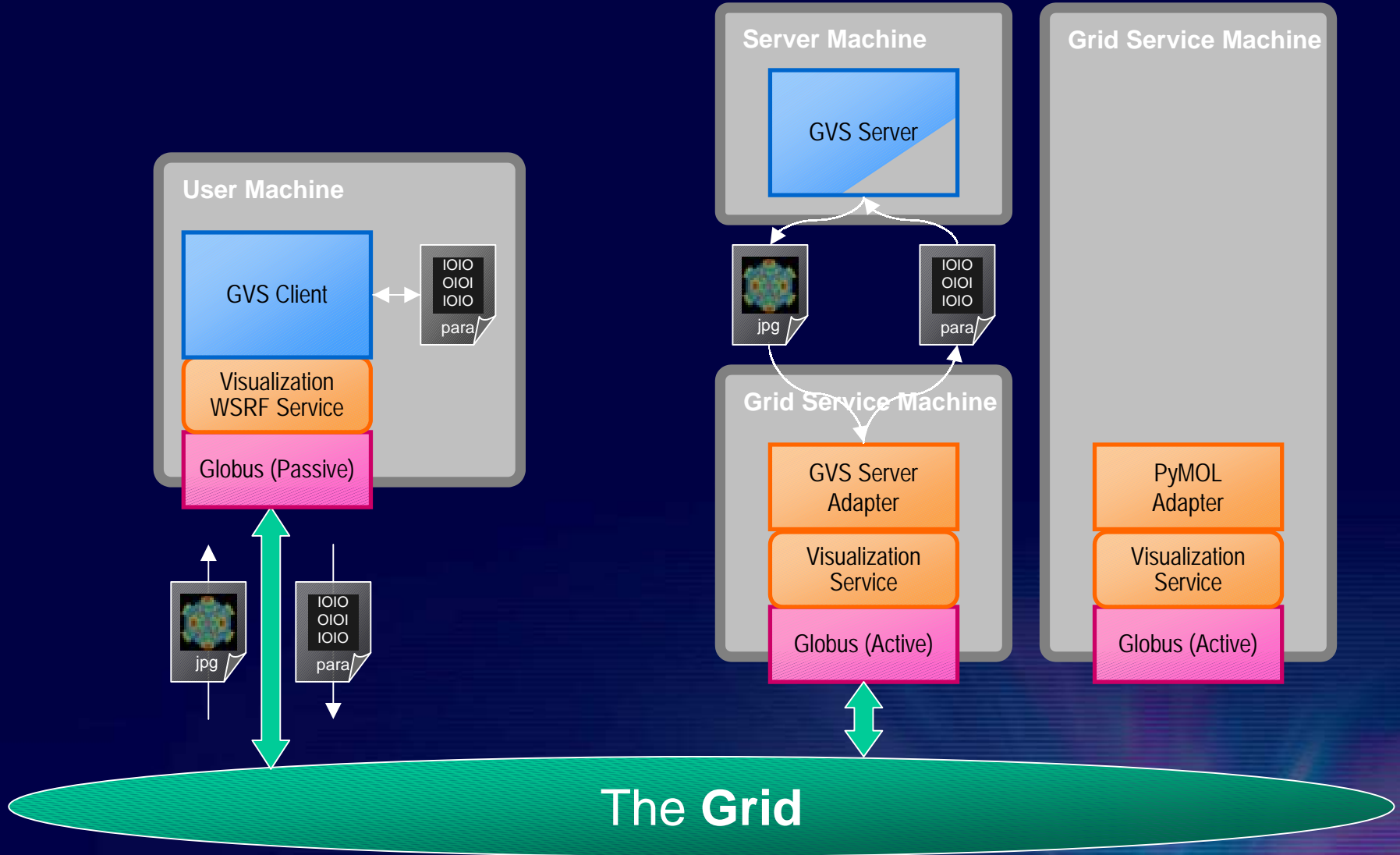
Data courtesy: Institute for Molecular Science

# Grid Visualization Service Framework

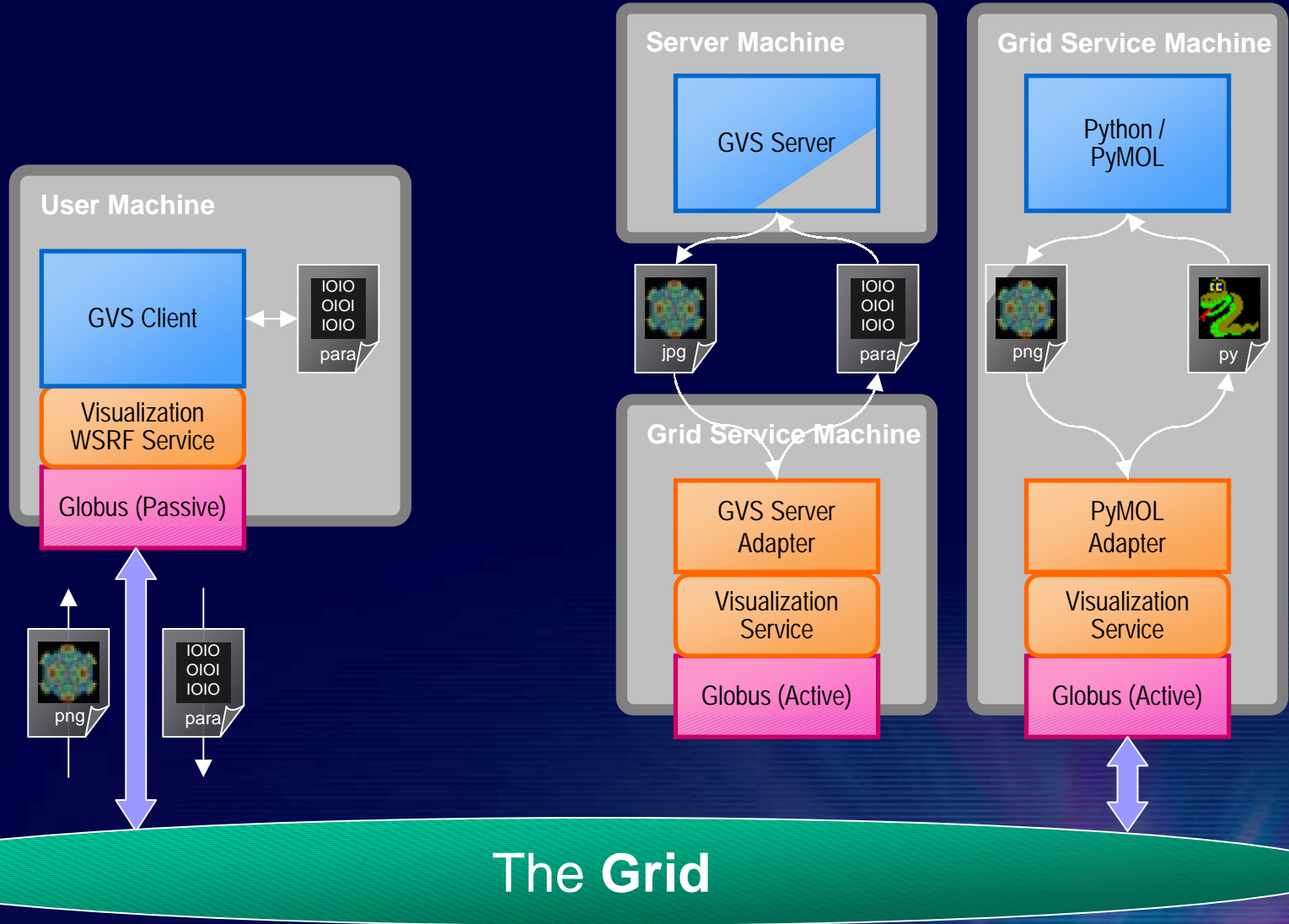
Integrated WSRF-based remote visualization environment



# WSRF Application



# WSRF Application



# Benchmarking

- **Objectives**

- Evaluate the impact of the Grid Layer on P2P applications.
- Analyze the feasibility of real-time applications over the grid.
- What is the performance state of the Grid Services compared to Web Services.

→ We only intend to benchmark the **middleware**

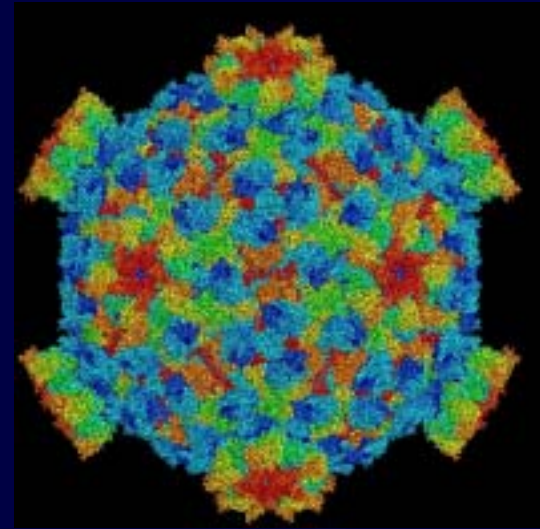
# Benchmarking (2)

- **Setup**
  - 2 Values tested
    - Initialization Time
    - Image Sending Time
  - 3 Configurations
    - Local
    - LAN
    - Internet
  - 2 Models
    - Globus (WSRF Grid Service)
    - Tomcat (Web Service, HTTP Streaming)

# Benchmarking (3)

- **Data Set**

- Type: Reovirus Core
- PDB: 1EJ6 (Bio. Unit)
- Size: +2 millions Atoms
- Coloring: Residue Seq.
- Radius: ~315 Å
- Image: 512x512 pixels, ~200 KB JPEG



- **Configuration**

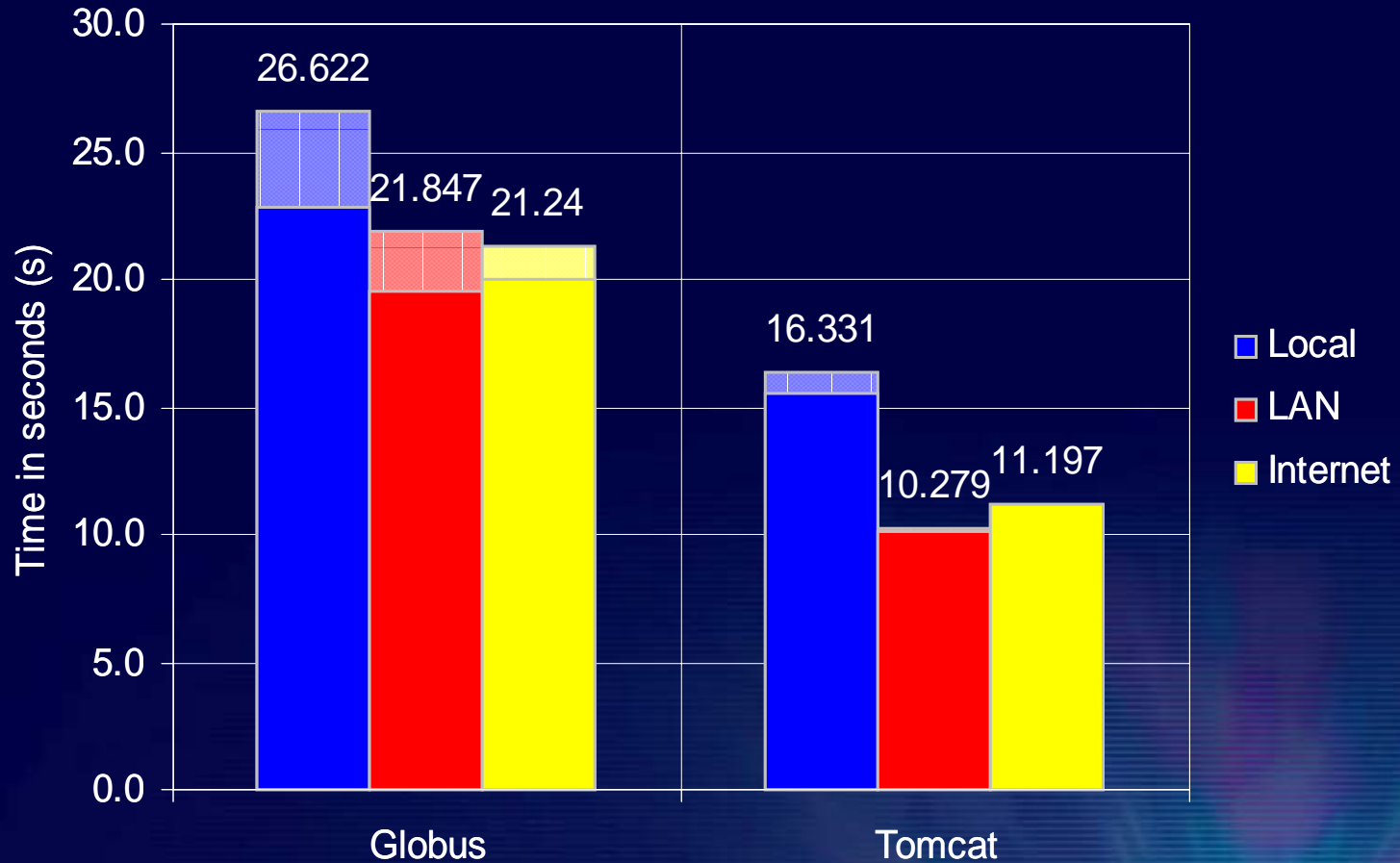
- GVS Client + GVS Server

# Benchmarking (4)

Target:	User	Service	Server
Local:			
CPU	2x P3 933 MHz	2x P3 933 MHz	8x Xeon 2.4 GHz
RAM	1.8GB / 2 CPU	1.8GB / 2 CPU	2.3 GB / 2 CPU
LAN:			
CPU	PM 1.3 GHz	2x Xeon 3.06 GHz	16x Xeon 2.8 GHz
RAM	512 MB	688 Mb / 2 CPU	1.0 GB / 2 CPU
Internet:			
CPU	PM 1.3 GHz	2x Xeon 3.06 GHz	16x Xeon 2.8 GHz
RAM	512 MB	688 Mb / 2 CPU	1.0 GB / 2 CPU

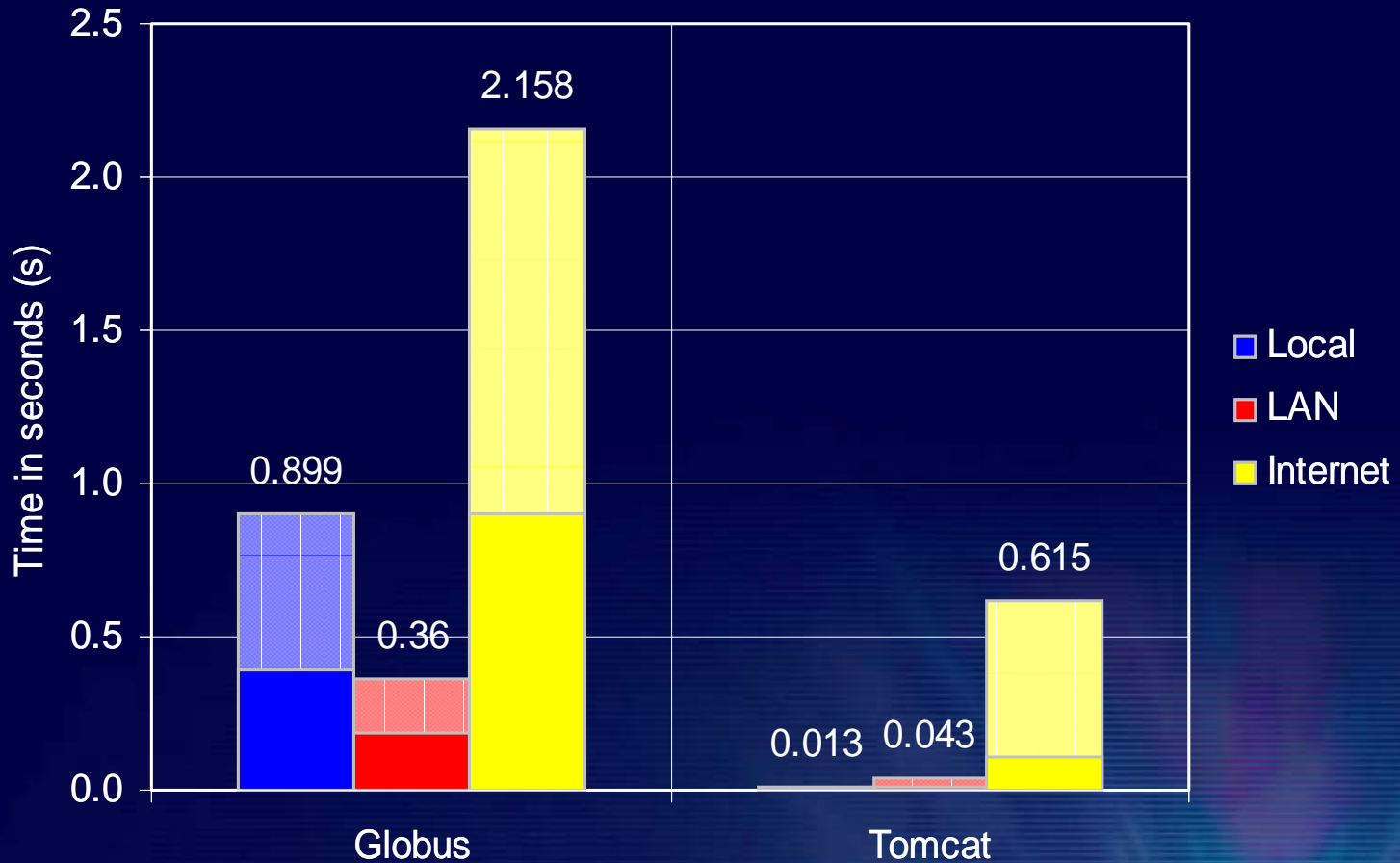
# Benchmarking (5)

- **Results: *Initialization***



# Benchmarking (6)

- Results: *Images*



# Conclusions

- WSRF Cons
  - Slow,
  - Unsuitable for large-scale Data,
  - Needs Polling.
- Needs
  - Streaming (not GridFTP or GridMPI),
  - Binary Transport,
  - Lower Latency.

# Conclusions (2)

- Real-time over Grid?
  - Yes, but it's still immature.
- Cost of porting/wrapping to the Grid?
  - Could seriously be improved
  - Isn't too difficult once the initial phase is assimilated.