

The Henry Moseley X-Ray Imaging Facility Massive Remote Batch Visualization Projects

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Remote Visualization to be useful requires an efficient parallel distribution of the data coupled with a parallel image compositing system, all preferably running at interactive rates. Since 1999 Research Computing Services has developed various parallel GPU and CPU solutions.

MRBV on HECToR

Massive Remote Batch Visualizer (MRBV) is a project to develop a batch rendering system on the UK's national supercomputer service (HECToR) running on a Cray XT4.

This will integrate the parallel data distribution, compute and rendering pipelines so that visualization takes place on HECToR. Current dataset sizes (~50Gb) exceed the capabilities of desktop systems. We aim to visualize these and larger datasets in under 30 minutes to allow much quicker visual inspection of meshes prior to simulation jobs being started.

Users of the I12 JEEP beamline at the Diamond Light Source facility will acquire X-ray tomographic volume datasets of material samples. Currently no method of visualizing the dataset is available without down-sampling the dataset. Down-sampling should be avoided, particularly when examining materials for faults (cracking being one example).

Remote Viewing and Streaming

Working with industrial partners, we have developed versions of AVS/Express for multi CPU and GPU systems. Part of this work was with HP on the development of their Parallel Compositing Library specification and implementation, which is now being used in the high-end versions of AVS/Express Parallel Edition. Recent work has been to add full parallel volume rendering support.

VizNET Support

VizNET is a national network to promote visualization across the UK. Research Computing Services at the University of Manchester is one of the five regional centres.

Their main site is at <http://www.viznet.ac.uk/>

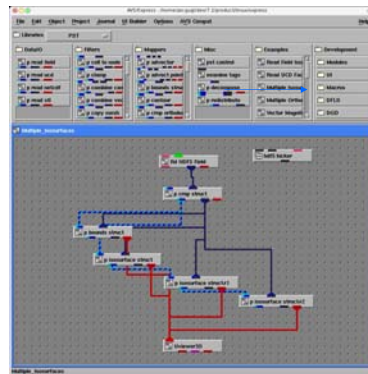


Figure 1a AVS/Express Distributed Data Renderer Edition being tested on a visualization workstation. File reading, volume cropping and isosurface modules form a visualization network. Remote MPI processes execute the network in parallel.

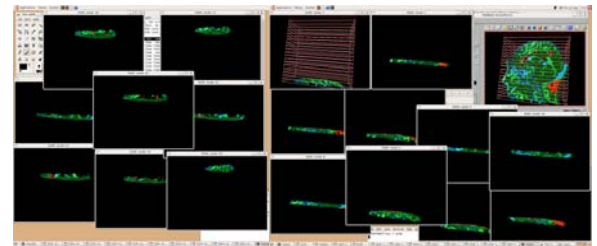


Figure 1b 20 DDR MPI processes render the distributed data (usually off screen). The final composited image is visible at the top right.

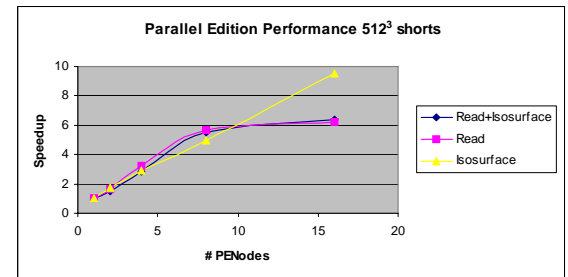


Figure 1c Small scalability test results for the file reader module on a shared-memory SMP system.

Currently the visualization system is used as a local service for the University of Manchester on an HP Scalable Visualization Array composed of x86_64 Xeon processors (currently 10 cores). This will render at interactive rates datasets up to 8Gb

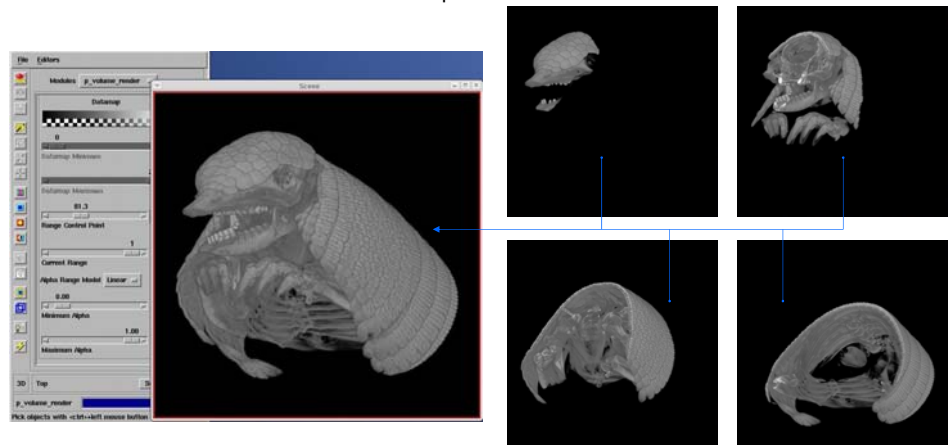


Figure 2 End-user volume viewer application (left) displays a composited image from raycasting volume rendering processes running in parallel on cluster nodes (right).

The Ultimate Goals:

- 1: Demonstrate remote visualization techniques by practice to enlighten and educate a wider audience.
- 2: Employ supercomputing resources to batch visualize objects that have never before been visualised.

Thanks to the members of the Visualization Team within Research Computing Services and those who collected the data. The two visualization examples shown used the AVS/Express product range. <http://www.rcs.manchester.ac.uk/>