
Assembling Visible Neurons for Simulation

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Mark H. Ellisman
University of California, San Diego

This project aims to enhance and accelerate the process of very large-field 3D laser-scanning light microscopy to increase the throughput of generating multi-resolution visible cells for computational neuroscience. The acceleration of the process has been accomplished via several parallel development efforts across all logical layers of the Telescience architecture that serves as a foundation of this project.

At the highest level, the Telescience Portal has been fully updated to a JSR168 compliant Portal. Specifically, the GridSphere framework has allowed workflow developers to simultaneously develop codes or portlets for an integrated release in the greater portal environment. To accelerate the workflow for ultra-wide field light microscopy, instrumentation enhancements been made to accelerate and automate data acquisition and data delivery from our high speed multi-photon light microscope to networked resources for computation, archival, and visualization. Through the subcontract with ISI/USC, the Chimera/Pegasus toolkit has been integrated as a generalized framework for planning and executing computationally intensive LM application codes via the Telescience cyberinfrastrucuture and for jumpstarting efforts to more effectively manage Grid resources. As a testbed for this effort, the GTOMO (simple back-projection) code has been successfully executed on resources at both ISI and NCMIR. Execution plans for GTOMO have been successfully stressed via the computation of 4k x 4k x 4k volumes. The TxBR (affine back-projection) code has also been prepared for the Pegasus/Chimera Toolkit. At the systems level, NCMIR computational resources are undergoing a transition to a Condor managed system. Condor pools composed of Unix workstations and multiple clusters have been deployed and integrated within the Telescience framework.

In addition to these efforts to increase the throughput of the overall process, several application and tools have been developed and integrated to increase the accuracy of the data products. Through the subcontract with SCI at the University of Utah, Simian (recently re-cast as SciRun) tools have been integrated into the Telescience Portal using Telescience-ATOMIC tools. Novel tools to merge images of multiple scales have also been developed and integrated with the Telescience Portal. A new workflow integrating Jibber and Jetsam applications can now warp brain images between disparate coordinate systems. Another Portal based segmentation tool, Jinx, has been developed to merge manual tracing tools with automated fuzzy segmentation routines.

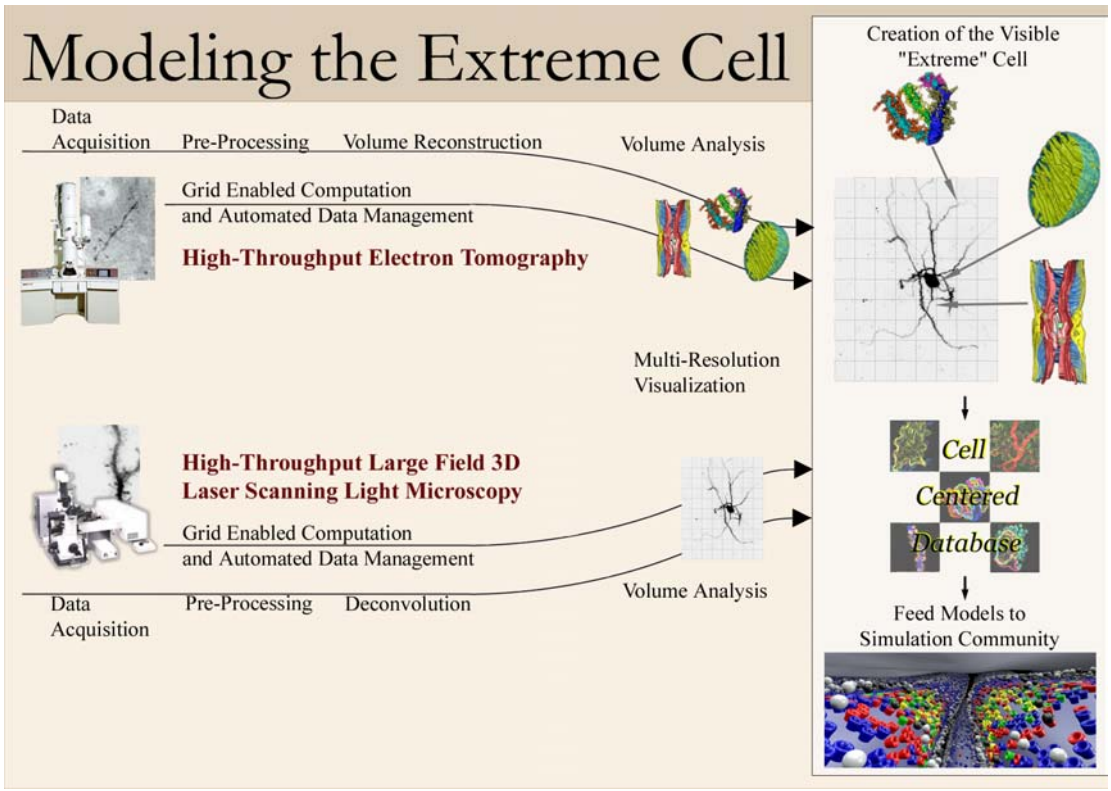

Figure 1: High throughput workflows for large field light and electron microscopy converge to create integrative models of visible "extreme" cells for systems biology simulations