RENCI@SC09

Renaissance Computing Institute Booth Presentation Schedule
Booth #1835

Monday, November 16

7 p.m.
Powering Cloud Computing for Education and Research Using the Virtual Computing Laboratory
Presenters: Patrick Dreher, RENCI and NC State University; Eric Sills, NC State University
Abstract: This demonstration will summarize the technology of the Virtual Computing Laboratory (VCL) that was initially developed at NC State University and is now an incubator project of the Apache Software Foundation. The demonstration also will illustrate how cloud computing technology is being applied today to education and research projects at both NC State and the Renaissance Computing Institute.

8 p.m.
RENCI Distributed Visualization Infrastructure
Presenter: Ongoing information presented on the plasma display, compiled by Ray Idaszak, RENCI
Abstract: RENCI's statewide visualization infrastructure is the largest coordinated distributed visualization effort in the U.S., linking sites across North Carolina as one seamlessly operating visualization and collaboration environment. Visualization facilities include a 13-foot x 5-foot multi-touch display wall at Duke University driven by 6 HD projectors; a 24-foot x 24-foot Social Computing Room at UNC Chapel Hill driven by 12 projectors that illuminate all four walls; and a 21-foot x 6-foot rear-projected stereoscopic display at East Carolina University. All the RENCI facilities are part of the RENCI Data Grid, managed by iRODS (the integrated Rule-Oriented Data System), which allows sharing of data collections and applications across all the sites. Visualization staff work with partners to visualize research data to gain insight and also to encourage collaboration with colleagues at other sites. In total, 11 facilities operate at the RENCI centers at UNC Asheville, Duke University, East Carolina University, NC State University, UNC Chapel Hill, UNC Charlotte, and RENCI's home office in Chapel Hill.

Tuesday, November 17

10:30 a.m.
iRODS: Policy-based Data Management
Presenter: Reagan Moore, RENCI and UNC Chapel Hill
Abstract: The integrated Rule-Oriented Data System (iRODS) organizes distributed data into shared collections, expresses management policies as computer actionable rules, and applies management procedures as remotely executed micro-services. The iRODS system is generic infrastructure on which a wide variety of data management applications have been ported. This presentation will demonstrate use of the technology to implement institutional repositories, shared collections, preservation environments, and data processing pipelines. The goal is to automate administrative functions for massive collections that scale to hundreds of millions of files and a hundred petabytes of data.

11:30 a.m.
Interactive Crowd Simulation and Evacuation Planning (REMOTE)
Presenters: Sean Curtis, Stephen Guy, Sachin Patil, Ming C. Lin and Dinesh Manocha, UNC Chapel Hill, will present live to the SC09 show floor from Chapel Hill, NC.
Abstract: The research group will demonstrate new technologies for simulation of a large number of autonomous human-like agents and crowds in complex environments. The researchers' formulation exploits the parallel capabilities of current multi-core and many-processor systems and can handle tens of thousands of agents at interactive rates. The group will demonstrate their application and its ability to generate emerging behaviors and evacuation plans in large, densely populated buildings.

12:30 p.m.
RENCI Distributed Visualization Infrastructure
Presenter: Ongoing information presented on the plasma display. RENCI Visualization Director Ray Idaszak will be available live from Chapel Hill to the SC show floor to answer questions.

1:30 p.m.
VGrADS: Enabling e-Science Workflows on Grids and Clouds with Fault Tolerance
Presenter: Ongoing information presented on the plasma display of research done by Anirban Mandel, RENCI, and the VGrADS team.
Note: A paper on this research will be presented Thursday, Nov. 19, in Room E145 – 146.
Abstract: Today's scientific workflows use distributed heterogeneous resources through diverse grid and cloud interfaces that are often hard to program. In addition, especially for time-sensitive critical applications, predictable quality of service is necessary across these distributed resources. VGrADS' virtual grid execution system (vgES) provides an uniform qualitative resource abstraction over grid and cloud systems. The researchers apply vgES for scheduling a set of deadline sensitive weather forecasting workflows. Specifically, they report on experiences with (1) virtualized reservations for batch-queue systems; (2) coordinated usage of TeraGrid (batch queue), Amazon EC2 (cloud), their own clusters (batch queue) and Eucalyptus (cloud) resources; and (3) fault tolerance through automated task replication. The combined effect of these techniques was to enable a new workflow planning method to balance performance, reliability and cost considerations. The results point toward improved resource selection and execution management support for a variety of e-Science applications over grids and cloud systems.

2:30 p.m.
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3:30 p.m.
Coastal Modeling Using ADCIRC on Windows HPC Server 2008
Presenter: Ongoing information from RENCI Research Scientist Brian Blanton presented on the plasma display.
Abstract: RENCI has verified that the ADCIRC coastal circulation and storm surge model runs fast and accurately on Windows HPC Server 2008 compute clusters. RENCI staff are developing productivity tools for the ADCIRC model using the Trident Workbench and Microsoft platform technologies. Running ADCIRC on Windows HPC Server 2008 opens up a new world of productivity tooling opportunities for scientists interested in finding solutions to their problems in the shortest time possible and in integrating many common applications.

4:30 p.m.
The RENCI Science Portal: High Throughput Computing Across TeraGrid, the Open Science Grid, and Beyond
Presenter: Ongoing information presented on the plasma display on RENCI's role in the Open Science Grid and TeraGrid.
Abstract: The RENCI Science Portal provides a highly scalable platform to rapidly assemble high throughput solutions for researchers using resources from the TeraGrid, Open Science Grid, RENCI, and a National Institutes of Health resource at UNC Chapel Hill. Scientists simply need an account on the Science Portal to be able to launch tens to hundreds of thousands of jobs that are then spread across the U.S. cyberinfrastructure to ensure the fastest possible turnaround time. The Science Portal bridges many different software stacks, policy frameworks, authentication and allocations requirements, shields

scientists from the gory details of global-scale distributed computing, and automatically seeks out the best possible place to run jobs at the time they are submitted.

Wednesday, November 18

10:30 a.m.
Production Computing on RENCI's "Blue Ridge" Cluster
Presenters: Rob Fowler, RENCI, (live), Brad Viviano, Brian Blanton and Brian Etherton, RENCI (live remote to the SC show floor from Chapel Hill, NC)
Abstract: RENCI researchers are able to create more detailed weather and storm surge models quicker than ever using RENCI's new Dell Intel/I-7 cluster (named Blue Ridge). These models will be given to the National Weather Service for use in creating production forecasts. They give North Carolina unprecedented detailed information about developing atmospheric and oceanic conditions, which could prove vital in the case of a hurricane, nor'easter or other severe weather. RENCI HPC specialist Rob Fowler will talk live about the Blue Ridge cluster and its capabilities and Brian Blanton, an oceanographer and member of RENCI's disaster research team, will address how he has used RENCI's IBM Blue Gene and now the Blue Ridge cluster to produce storm surge models of unprecedented resolution. In addition, Atmospheric Scientist Brian Etherton will talk about using the machines to create high-resolution Weather Research Forecast using the Weather Research and Forecasting (WRF) model. Blanton and Etherton will participate live from RENCI headquarters in Chapel Hill, NC.

11:30 a.m.
Collaborative Visualization Tools in the Social Computing Room
Presenter: RENCI Senior Visualization Researcher David Borland presents live to the SC09 show floor from Chapel Hill, NC.
Abstract: This presentation will introduce RENCI's Social Computing Room and suites of software under development that support general visualization activities, including adaptations of the InfoMesa technology demonstrator, developed by Microsoft Life Sciences and adapted to the Social Computing Room environment by RENCI. A custom-built, multi-touch visualization table also will be featured.

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1:30 p.m.
Multi-core Adaptive Execution System and Threaded Runtime Organization (MAESTRO)
Presenter: Allan Porterfield, RENCI
Abstract: As thread counts in x86 clusters and other systems increase at an exponential rate, each thread gets a smaller share of the available total memory bandwidth. A challenge the HPC community must face is how to maximize the usefulness of highly multi-threaded clusters given a reduced bandwidth per core. MAESTRO is a research prototype self-aware and self-introspective runtime developed at RENCI. MAESTRO takes advantage of the fact that many applications are memory bound and unable to use all available cores by using those 'excess' cores to dynamically monitor applications to improve computation. The process involves detecting bottlenecks throughout the system and informing the application scheduler about the current situation. Acquired information can be saved by post-execution tools and used to better understand interactions between parallel threads. Information can be used dynamically to obtain better load balancing, better use of heterogeneous computational elements, or to reduce power use. To give the application scheduler the needed flexibility, MAESTRO supports an interface to the compiler with very light threads and multiple synchronization methods. MAESTRO is currently in the early stages of development.

2:30 p.m.
PERI: Scalable Performance Tools
Presenters: Rob Fowler, RENCI; Todd Gamblin, Lawrence Livermore National Laboratory
Abstract: For applications to scale so that they run well on very large systems, they must continue to run efficiently on individual compute nodes and they must be extremely well balanced for the duration of a production run. The researchers will present recent advances made at RENCI and Lawrence Livermore National Laboratory to measure and analyze scalability and load balance. Successful measurement of scalability and load balance requires that the tools used scale well. At the scale of tens of thousands or hundreds of thousands of nodes, the user cannot allow tools to communicate and store extensive amounts of trace data. The researchers will describe how their tool set uses aggressive wavelet-based compression to reduce the data volume dramatically while preserving crucial information.

3:30 p.m.
RENCI's Breakable Experimental Network
Presenter: Ongoing information presented on the plasma display of research done by Ilia Baldine, RENCI; and Jeff Chase, Duke University
Abstract: ORCA-BEN has been a joint project between RENCI's Network and Research Infrastructure group and Duke's New Internet Computing Lab (NICL). Its goal is to adapt Duke's Open Resource Control Architecture (ORCA) to the needs of the NSF Global Environments for Network Innovation (GENI) program by applying it to the Breakable Experimental Network (BEN). In the first year the team has successfully proved the viability of the approach and demonstrated the ability of ORCA to create complex 'slices' of the substrate, which included virtual machines, static backbone links over National Lambda Rail and multi-layered connections across BEN. The team has expanded ORCA by adding a flexible ontological resource representation to allow almost infinite expandability to cover new substrate types like clouds, software, content, new types of wireless and sensor networks and storage devices. In the next year the team will develop ORCA into a production system capable of hosting cross-layer research activities on BEN and connecting BEN to other GENI 'islands'.

4:30 p.m.
Broad-Illumination Rendering of Molecules
Presenter: Ongoing information presented on the plasma display of research done by Russ Taylor and Edward Dale, UNC Chapel Hill; and David Banks, University of Tennessee and Oak Ridge National Laboratory.
Note: A poster will also be on display in the RENCI booth.
Abstract: The comprehension of unstructured, complex structures such as molecules benefits from a variety of rendering techniques. For cases such as the accessibility of docking sites to ligands, the understanding of pocket depths and their relationship to external structures is enhanced by the use of broad light sources, such as the sky on a cloudy day. The research group uses the UNC BASS supercomputer to produce interactive 3D Quicktime VR and Flash views of the structures in the Protein Data Bank (PDB) to provide a new and useful view on these molecules and to accelerate the rendering of such views in the Univeristy of Illinois' molecular visualization program VMD. With this online tool, researchers can download already-rendered 3D interactive models and request higher-quality renderings of molecules of particular interest, which will be immediately scheduled to run on the BASS. They can then follow the progress of the rendering online or provide an email address to be notified when the rendering is complete.

Thursday, November 19

10:30 a.m.
The Urbanization Explorer TouchTable
Presenters: Jeff Michael and Bill Ribarsky, UNC Charlotte, will present live to the SC09 show floor from Charlotte, NC.

Abstract: Using high-performance computing, the Charlotte Visualization Center, a participant in RENCI's UNC Charlotte engagement center, transforms data into technology-based visualization tools. These tools not only help users gain a visual perspective on data, they also provide an interactive portrayal of the potential impacts of growth and the public policy decisions that follow. One such tool is the Urbanization Explorer TouchTable, which brings an intuitive approach to interacting with maps. The TouchTable allows multiple users to zoom, pan, and navigate the colorful, large-format maps using only their fingertips and on-screen digital tools. Visualization tools are grouped together in one location on the UNC Charlotte campus and form a visualization "situation room" that allows for coordinated application development. Along with the TouchTable the Charlotte Visualization Center offers a multi-tile, high resolution display system and an immersive 3D environment. This demonstration will show data on the Charlotte region's growth and development since 1976. Experts will describe the visualization tools and how they help planners, researchers and policy makers understand Charlotte's growth.

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