Developments in Remote Collaboration and Distributed Computing

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The National Fusion Collaboratory Project is creating and deploying collaborative software tools to unite fusion research in the U.S. In particular, the NFC is developing and deploying a national FES "Grid" (FusionGrid) that is a system for secure sharing of computation, visualization, and data resources over the Internet. The goal of FusionGrid is to allow scientists at remote sites to participate as fully in experiments, machine design, and computational activities as if they were working onsite thereby creating a unified virtual organization of the geographically dispersed US fusion community. To ameliorate the problem of divergent security systems, a unified secure remote computing middleware package, the Globus Toolkit, is used for secure communication, authentication, and remote resource usage.

The open-source Access Grid (AG) software is used by FusionGrid to create a service that enables secure group-to-group interaction and collaboration that improves the user experience beyond teleconferencing. It also allows for application sharing, so researchers at remote locations can simultaneously see the same graphical visualization. The AG system is being used for seminars, working meetings, and experimental operations. Most recently the AG service was used by a San Diego-based scientist to lead an experiment on JET.

In addition to remote collaboration, FusionGrid provides fusion researchers with computational services. The first computational service on FusionGrid is the TRANSP transport analysis code. Instead of using locally-installed software, researchers dispatch the TRANSP code for execution on FusionGrid. The security features of Globus make it possible for computing resources to be shared without fear of unauthorized use. A secure version of the MDSplus data storage system was developed to enable data sharing in a standardized format.

The SCIRun visualization software is used to visualize in 3D large datasets stored in MDSplus and HDF5. SCIRun provides a visual programming interface, which allows for rapid prototyping of new data models.

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