

## Second Quarter FY 2006 Report – National Fusion Collaboratory

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### Highlights

- *Proxy renewal service put into production.* To support long-running tasks without compromising security, an automated proxy renewal service was added to FusionGrid.
- *AutoTRANSP released.* TRANSP input processing was automated for DIII-D users through the new AutoTRANSP client code; this greatly simplifies the TRANSP workflow, and makes possible between-shot TRANSP at DIII-D.
- *Access Grid 3.0 ported to Mac OS X.* Improvements in this new version include enhanced security, support for Jabber, and an integrated meeting scheduler.
- *Support for federated portals.* Infrastructure to support single sign-on across distributed web portals was developed. This will allow for the development of federated web portals, and is a critical step in the development of the authentication and delegation server (ADS).
- *VoIP deployed at Alcator C-Mod.* VoIP phones were deployed to the Alcator C-Mod control room for testing SIP-based collaboration tools.
- *SharedAppVNC and Muticursor window manager deployed at DIII-D.* To facilitate data sharing and interaction with the control room display wall during experiments, SharedAppVNC and Multicursor window manager were deployed at DIII-D and demonstrated to physics staff.

### General

So that fusion scientists can quickly search documentation, and so that developers can more easily document their systems, a wiki was created for DIII-D. The new [D3dWiki](#) was implemented using MediaWiki and deployed for evaluation. D3dWiki supports text, images, media files and even physics formulae. This system empowers users to create, edit, and crosslink content without the need to write HTML.

The paper “ROAM: An Authorization System for Grids” was accepted for publication in the Journal of Grid Computing.

### Secure Distributed Computing

To support long-running tasks without compromising security, a [proxy renewal service](#) was deployed to FusionGrid. The service allows for the automation of proxy renewal and will be used for long running jobs. In this way, codes can start execution with shorter-duration (and hence more secure) proxies, but renew as needed and without user intervention. FusionGrid jobs have run for as many as 700 CPU hours, so it is critical that FusionGrid support long running tasks.

So that scientists can seamlessly navigate and make use of federated web portals, an [infrastructure for supporting single sign-on across federated web portals](#) was developed. This system integrates the PubCookie single sign-on for web servers with the MyProxy server. The portal server enables a member of FusionGrid to use their existing Grid username and password to authenticate to any co-operating web server. An existing FusionGrid web server can now use the PubCookie mechanism to authenticate FusionGrid users, to use ROAM to authorize access to their web functions, and to get proxy credentials for an authenticated user to use for access to grid services.

The TRANSP FusionGrid service greatly simplifies the process of running TRANSP, leaving the scientist free to focus on preparation of inputs and analysis out outputs. Input preparation is, however, a time-consuming task with a steep learning curve which discourages new users. A new application was deployed to automate TRANSP input preparation tasks for FusionGrid TRANSP runs for the DIII-D tokamak. The new application—named AutoTRANSP—allows scientists to prepare their TRANSP runs for execution on FusionGrid without the need to manually gather and process inputs. It is expected that the input automation features of AutoTRANSP will make it easier for new users to run TRANSP, and speed up the process for more experienced users. Furthermore, automation of input preparation makes possible a between-shot TRANSP system, which in turns offers a way forward for between-shot kinetic EFIT.

PreTRANSP was updated with a new input processing capability; this was needed for MIT users of PreTRANSP. This functionality will allow MIT staff to retire aging VMS machines, which were being kept around only to run the original pre-grid PreTRANSP. The C-Mod workstations were reconfigured to utilize the FusionGrid software for grid logins in preparation for moving the TRANSP job-preparation and submission from VMS to Linux.

PPPL and MIT have started the next stage in remote coupling of parallel TORIC with TRANSP through a client/server architecture. Tests with a serial version of TORIC on the same machine coupled with TRANSP have been completed successfully. Parallelism offers a way forward to produce faster, more scalable services.

### **Remote Participation and Visualization**

The beta release of [Access Grid 3.0](#) was ported to OS X. This is important as Mac OS X is a popular platform for fusion scientists. Improvements in this new version include enhanced security, support for Jabber, and an integrated meeting scheduler.

[SharedAppVNC](#) and [Multicursor window manager](#) were deployed to the DIII-D control room and will be evaluated during the upcoming run campaign. A tutorial was given to DIII-D scientists; the technology was well received, and it is hoped that the simplified application sharing and interaction with control room display wall will enhance both local and remote participation in DIII-D experiments.

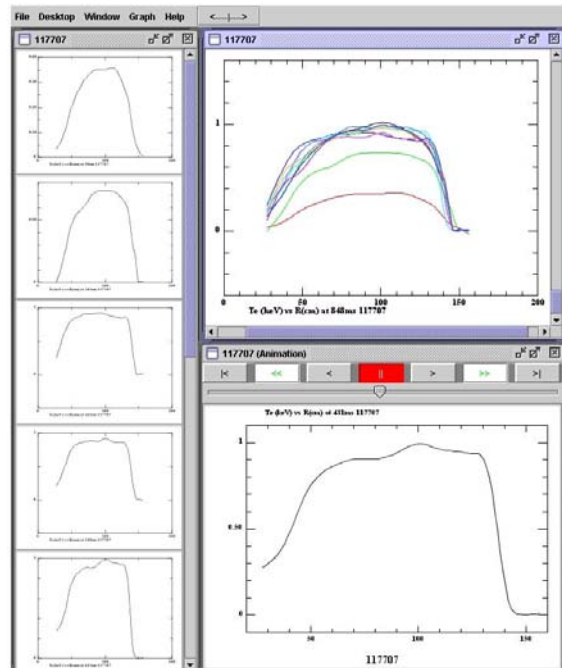
To simplify the process of installing FusionGrid software, packaging was improved for Access Grid, SharedAppVNC, and Multicursor window manager. All three of these

already work on Mac and Linux; work has already started on a Windows port of SharedAppVNC, at which time we will have all three working on Windows as well. Because fusion scientists make use of all three platforms, it is necessary that we develop easy-to-install software for each system.

VoIP phones were deployed to the Alcator C-Mod control room for testing SIP-based collaboration tools. Engineering and physics operators will evaluate the new technology during Alcator C-Mod operations. A web-based map for locating and dialing the VoIP phones was developed; the map displays control room phones, which when clicked will cause the client phone to call the control room phone.

The Java-based ELVis plotting tool was improved to enable sharing of displays through web browsers and to allow for the visualization of multiple  $f(x)$  ELVis graphs into a single indexed display (**Fig. 1**). The display sharing feature is useful for collaboration, and the overlaid plots feature helps to enhance data visualization and facilitate data comparison.

The FusionSlicer SCIRun Power App was improved in FY06 Q2. Efforts have concentrated on infrastructure improvements for the GUI and the ability to separate it from the C Code. This separation will make creating and maintaining the power apps easier as well allow for greater stability with new releases of SCIRun. New SCIRun modules have been created that allow for easier arbitrary slicing and displaying of data. The ease creation of these new modules is attributed to the infrastructure changes.



**Fig. 1:** ELVis can now display overlaid  $f(x)$  plots.

## Appendix A: Non-edited Reports from Individual Institutions

### **A1. M. Papka for the ANL Futures Lab**

Time was split between continued support of Access Grid 2 on OS X and development of Access Grid 3 for OS X. Significant effort was spent on debugging issues with the use of myProxy and communicating the findings with ESnet on issues with their CA certificate.

- Support Deployment of myProxy-enabled Access Grid for the FusionGrid community
- Debugging use of FusionGrid myProxy server to understand why retrieved proxy certificates were unusable, discovered error in the ESnet CA signing policy that didn't include reference to FusionGrid CA.
- Worked with FusionGrid and ESnet to correct the issues with ESnet signing policy to correct the problem.
- Continued Development and Support of OS X port of Access Grid
- Improved media tool support for both Access Grid 2 and 3
- Completed port of Access Grid 3.0 to OS X (currently released in Beta)
- Full support of FTP/SSL file transfer
- Modifications/fixes for OS X user interface
- Development and integration of ANL multicast beacon client
- Development/Release of Python Bonjour interfaces
- Updated OS X packaging

### **A2. K. Keahey for ANL MCS Distributed Systems Laboratory**

No report.

### **A3. J. R. Burruss for General Atomics**

PreTRANSP was updated with a new input processing capability; this was needed for MIT users of PreTRANSP. This functionality will allow MIT staff to retire aging VMS machines, which were being kept around only to run the original pre-grid PreTRANSP.

The AutoTRANSP client application was deployed at General Atomics. This graphical client code automates input processing for DIII-D TRANSP users; this is beneficial because input automation greatly simplifies the process of running TRANSP. Furthermore, input automation when combined with the proof-of-concept between-shot TRANSP system demonstrated last year makes possible a production between-shot TRANSP system.

The paper “ROAM: An Authorization System for Grids” was accepted for publication in the Journal of Grid Computing.

### **A4. M. Thompson for Lawrence Berkeley National Laboratory**

This quarter we completed and deployed the proxy renewal service, completed the code for the federated portals and designed and started the implementation of additional user management functions through the ROAM web interface.

#### **FusionGrid Credential Manager**

We completed the deployment of the proxy renewal service and its mirror.

This server can be used to store 4-week proxies that can be used by specified services to renew the short (24-hr) proxies that are issued to users. This eliminates the need to issue 2-week long proxies directly to users and increases the security of proxies. We are currently working on deploying new user interfaces and PPPL is adding the code to the TRANSP monitor to periodically renew the credentials. Documentation on the certificate renewal interface can be found at <http://cert.fusiongrid.org/docs>.

#### **Federated Portals**

We have completed the code and a draft version of the documentation for the federated portal. This system integrates the PubCookie single signon for web servers with the MyProxy server. The portal server enables a member of the FusionGrid to use their existing Grid username and password to authenticate to any co-operating Web server. An existing FusionGrid web server can now use the PubCookie mechanism to authenticate FusionGrid users, to use ROAM to authorize access to their web functions, and to get proxy credentials for an authenticated user to use for access to grid services. Documentation on how to federate an existing web server can be found at <http://cert.fusiongrid.org/docs>.

## **A5. M. Greenwald for the MIT Plasma Fusion Science Center**

The C-Mod workstations were reconfigured to utilize the FusionGrid software for grid logins in preparation for moving the TRANSP job-preparation and submission from VMS to Linux. (Words from Justin on PreTRANSP work?)

PPPL and MIT are initiating the next stage in remote coupling of parallel TORIC with TRANSP through a client/server architecture. Tests by Doug McCune with a serial version of TORIC on the same machine coupled with TRANSP have been completed successfully. Lew Randerson is now working with Josh Stillerman and Tom Fredian to setup a Globus server at MIT which will relay requests from the TRANSP client at PPPL to the TORIC server running on the parallel cluster, Marshall, at MIT. Minor modifications to the TORIC code at MIT have been made by John Wright and Doug McCune to accommodate the server requirements.

We configured and deployed VOIP phones for engineering and physics operators. These will be used for early tests of SIP based collaboration tools. Implemented web/room-map based prototype dialing scheme.

## **A6. D. McCune for Princeton Plasma Physics Laboratory**

### **Collaborative Computational Services**

Users from UCLA and Lehigh University and from within PPPL were added to the access list for PPPL Fusion Grid services-- TRANSP tokamak plasma simulation, and the FWR reflectometry diagnostic simulation tool. The FWR front end was upgraded to run in web browsers as a Java applet, providing for convenience, portability, and automatic software update.

Fusion Grid proxies were upgraded to support a declaration of renewability. This enables proxies to be kept active for the duration of a service job, without requiring the user to know what this duration will be in advance.

Prototype work has commenced for support of remotely accessible proxy authenticated MPI-parallel Fusion Grid services. TRANSP is now able to run intensive calculations as detached subprocesses which could be implemented as services. For testing purposes, server clusters are being prepared at PPPL, MIT, and Indiana University.

### **Interactive Collaboration Software**

A new version of the Princeton University Computer Science department's multi-mouse display wall sharing software was installed and tested on PPPL display walls. The software was used for a training and software demonstration in connection with a separate collaboration between PPPL and Lehigh University.

The ability to run EIVis scientific graphics displays as Java applets has been improved--this enables sharing of displays through web browsers. A feature has been implemented to enable combination of multiple  $f(x)$  EIVis graphs into a single indexed display.

## **A7. G. Wallace for Princeton U. Computer Science Department**

Princeton's focus for this quarter was on packaging and deploying software as well as adding some requested features.

### **Packaging Software**

Two projects were packaged and released via SourceForge.net. SharedAppVnc, which allows application sharing, was released in source code and binary form for Linux and Mac OS X platforms. Also, the Multi-cursor window manager was released in source and binary form for Linux, with client applications for Linux, Windows and Mac. Both projects were documented with user help, installation and configuration information. Web pages were set up at the following links:

SharedAppVnc: <http://shared-app-vnc.sourceforge.net/>

Multicursor-wm: <http://multicursor-wm.sourceforge.net/>

### **Deploying Software**

The applications, SharedAppVnc and Multi-cursor window manager, were installed in the GA and PPPL control rooms. The installation gives all the Mac computers access to share applications and control the display wall. The Windows and X-terminals in those control rooms have access to control the display wall with a multi-cursor. We held demo and tutorial sessions to train users. Feedback was very positive and enthusiastic. PPPL started using the tools that day for their 5 O'clock meeting, and GA is reorganizing the Mac workstations to allow for easier viewing of the display wall. We also did installations in GA and PPPL display wall meeting rooms. PPPL used the tools to do a TRANSP tutorial where each user in the tutorial had their own multi-cursor and set of windows on the display wall.

### **Added Features**

Several features were added based on user requests:

- We bundled the SharedAppVnc viewer with the server in the Mac OS X version. This allows users to start everything from one application and then share content back and forth with other users.
- We added support for easy creation and management of SSH Tunnels in the Mac OS X version of SharedAppVnc. This allows collaborators to establish connections across firewalls.
- Online help was added to the Mac OS X version of SharedAppVnc.

- We modified the Multi-cursor manager so that the cursors would auto-hide after several minutes without use. This helps reduce clutter on the screen.
- Fixed several bugs having to do with SharedAppVnc fullscreen sharing, muticursor hotspots, and multicursor client under Windows.

#### **A8. A. Sanderson for U. of Utah Center for Scientific Computing and Imaging**

During this quarter work has continued on the FusionSlicer SCIRun Power App. Efforts have concentrated on infrastructure improvements for the GUI and the ability to separate it from the C Code. This separation will make creating and maintaining the power apps easier as well allow for greater stability with new releases of SCIRun. New SCIRun modules have been created that allow for easier arbitrary slicing and displaying of data. The ease creation of these new modules is attributed to the infrastructure changes. Other activities have included support for selected third party mesh generation tools.

It should also be noted that two derivative papers from our previous research work on new vector visualization techniques (funded by SciDAC during the first round) have been the accepted and submitted for publication. One of the papers which examines accelerated computation on a Graphics Processing Unit (GPU), has gained interest from researchers outside of DOE who have a need to do computation on problems that do not have large scale resource needs but solving them on traditional CPUs is becoming prohibited.