

Plans of Data Analysis Applications Group's Support for DIII-D

Qian Peng
January 6, 2003



Mission of Data Analysis Applications Group for DIII-D

- First 5 years (September 1997 - 2002)
 - Increased data analysis throughput
 - Increased data retrieval rate
- Starting 2003
 - New ways of data analyses
 - Advanced scientific visualization

Overview of Plans

- Ready for operation
- Software development including the new signal analysis code
- Infrastructure enhancement including a more powerful MDSplus server and LSF Linux support
- Enhance communication
 - Prioritize and work on all CTAS requests
 - Keep users closely informed of the status of analysis tasks (newsgroups, science meeting, coordination meeting, etc.)
- Application support
 - Short and long term plans for GAPfiles
 - Improve support of ReviewPlus
- Longer term plans

Ready for FY03 DIII-D Tokamak Operation

- Pre-Physics Operation checkout
 - MDSplus
 - Between-shot analyses
 - Data Analysis Monitoring
- Presentation to Session Leaders before experimental campaign starts
 - Remind and educate scientists about software specific to tokamak operation
- DAAG members will keep a physical presence in the DIII-D control room in the beginning of the operation
 - Help resolve problems when they first appear
 - Observe the experiment and learn the need
 - Recent hire Gheni will learn the environment
- Provide physicists with contact information and a main point of contact of the group during operation



New and Continued Software Developments

- **Signal analysis and visualization code**
 - Combines and extends the functions of Newspec, HPA, Mode1, Svdtool
 - 2-D and true 3-D visualization capabilities
 - Streamlined graphical users interface

- **OpenGL visualization library**
 - First used by the signal code to provide 3-D capabilities
 - Callable from high-level languages (IDL, Fortran, C/C++...)
 - Open Source
 - Pave a way for the rewrite of GAPfiles

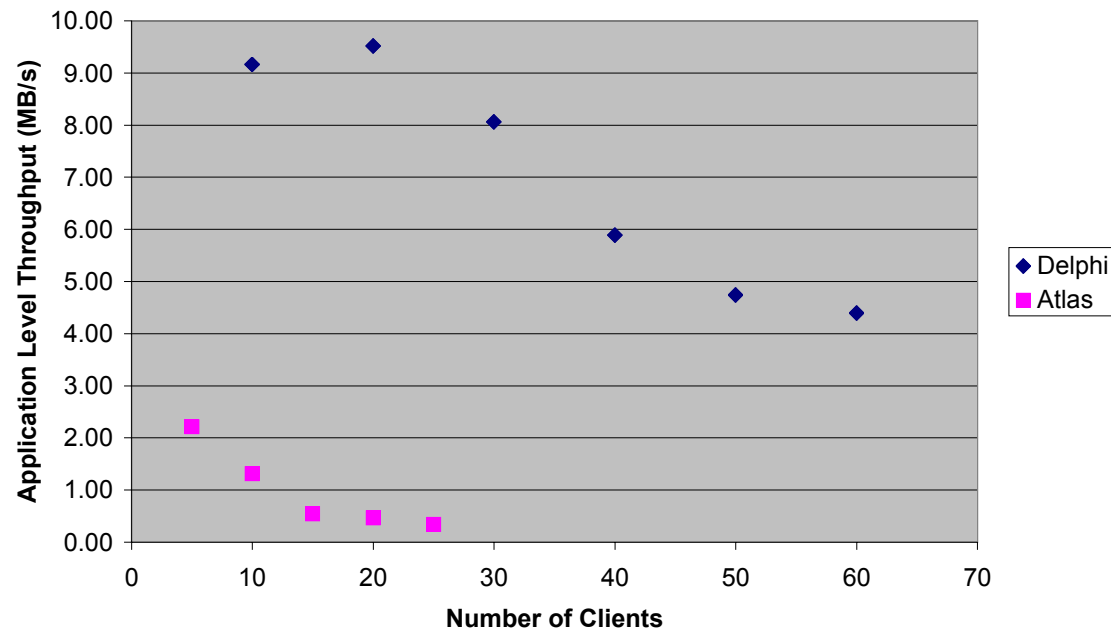
New and Continued Software Developments

- **New GADAT for IDL**
 - Retrieves PTDATA through MDSplus
 - Will not depend on client-side shared library as the existing one does
 - Increase portability and reliability
 - Pave the way for broader Linux usage
 - Replace pseudo pointnames with MDSplus TDI functions as needed
- **Make function Map_to_rho available to users**
 - Accessible through MDSplus data retrieval
 - Accessible from ReviewPlus
 - Complete necessary modifications to MDSplus trees
- **Complete profile-viewing tool ProfileViewer**
 - Prototype was created with GaPlotObj and has received valuable feedback
 - Specialized viewing tool similar to EFITViewer

New MDSplus Server to Replace ATLAS

- Multi-processor Linux server will dramatically increase server capacity and reduce data retrieval time
 - Atlas is heavily loaded and slows down considerably during operation
 - Tests show that a dual-processor Linux out-performs Atlas by 10 times
 - \$5K-8K for 2.8 GHz Xeon dual processor, 4GB RAM, 36-300 GB SCSI
 - Will try to bring the new server on-line during an operation break

Delphi Outperforms Atlas as an MDSplus Server
using C clients, 10 MB data retrieval size, December 2002



Other Infrastructure Enhancement

- Linux ready for general usage in LSF
 - Unified user login environment
 - Analyses tools will be available on Linux
- IDL 5.6 upgrade completes before operation starts
 - New and enhanced features from IDL5.6
 - Draw widget event will replace the kludge in GaPlotObj
 - Enhanced table widget, may revisit ReviewPlus signal table
 - Enable us to start supporting MacOS X
- Explore NERSC remote license serving
 - Pilot project at NERSC to serve software licenses for Fusion community
 - IDL - will explore Linux and MacOS
 - AVS (3-D visualization software) currently used at PPPL and our AIL

Communication Enhancement

- Track and respond to CTAS requests more rapidly
 - CTAS news group created for better and more detailed communication
 - Keep users closely informed of the progress of the requested tasks
- Bugzilla for bug reports and tracking
 - Open source defect tracking system used by many professional software development teams
 - Reliable relational database management system back-ends
 - Advanced reporting capabilities with well-thought-out natural bug resolution protocol
- Use newsgroup in general to encourage discussion and enhance communication
 - Update DAAG news through the newsgroup and the website
- Continue DAAG presence at Friday Science Meeting for group updates
 - Monthly detailed updates
- Resume DIII-D coordination meetings



Support of Existing Applications

- **GAPfiles**
 - Short-term supported by Ted Terpstra from PPPL at the old level as part of the software sharing
 - Long-term plan is to rewrite the code. Design starts in a half year.
 - The new GAPfiles will provide time and spatial fitting simultaneously.
 - Will provide core and edge fitting simultaneously
 - 3-D visualization with OpenGL (synergy with the Signal code)
- **ReviewPlus**
 - Consultant agreement with Jeff Schachter
 - Justin Burruss will support and improve the code locally
- **Review**
 - Supported by Joe Freeman and Kathy Greene

Long-Term Plan

- Linux desktop visualization workstation environment
 - Work with McHarg's group to replace the existing X-terminal environment
 - Provide advanced graphics capabilities needed by the new codes (Signal code and new GAPfiles)
 - Capable of 100-baseT or Gigabit Ethernet, 24 bit color and fast CPU for computation
 - Estimated cost ~\$1500
- Add a cluster of Linux to LSF
 - Will greatly increase computational power at low cost
 - Scalable solution
- Development of the new GAPfiles will lead to a new way to do analysis
 - Rapid simultaneous 2-D fitting instead of fitting one dimension at a time
 - Coupled with interactive 3-D graphics

Bring Results of National Fusion Collaboratory Back to DIII-D

- Help scientists to take advantage of the FusionGrid
 - Secured remote TRANSP analysis is in production mode
 - GS2 and other codes in the future
- Explore between-shot power balance analysis
 - Automatic TRANSP analysis for each shot
 - Will use FusionGrid and its resource management schema for deployment
- DIII-D control room will benefit from capabilities developed by NFC
 - Enhance control room and pre-ops meeting broadcast capability
 - Large display for collaborative and shared visualization
 - Incorporate some version of access grid to enhance communication