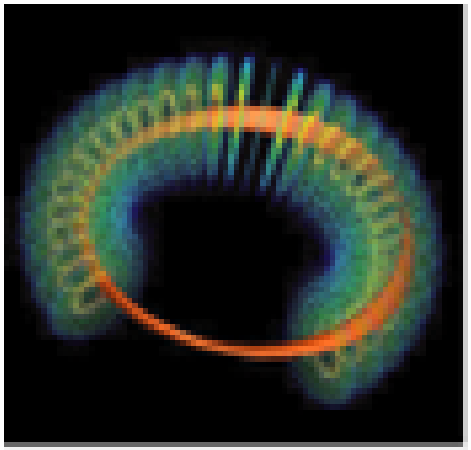
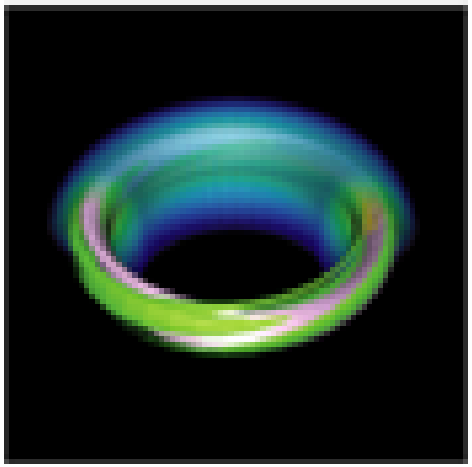




THE NATIONAL FUSION COLLABORATORY

Presented by

Martin Greenwald

ESSC – March 19, 2003

http://www.fusiongrid.org

MDSplus Enhancements for Collaboratory

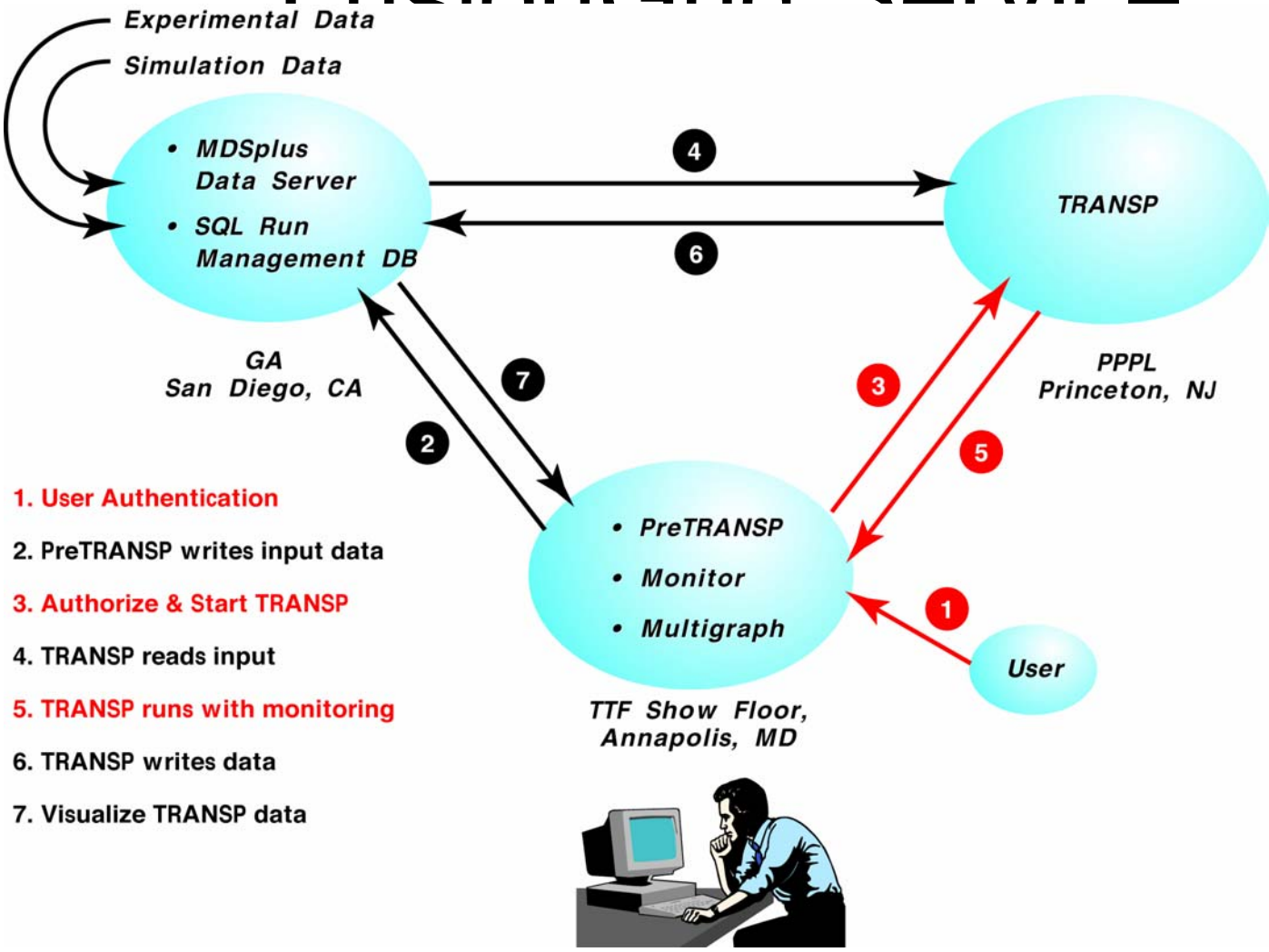
- MDSplus data system secured with Globus GSI
  - Underlying technologies are X.509 certificates/SSL
- Will use MDSplus layer to secure PC based relational database (SQL Server)
- Parallel MDSplus I/O - gridpst (grid parallel socket tunnel) $\Rightarrow$ **cross country data transfer at wire speeds**

Important shared fusion codes modified to

TRANSP – A Set of Tools for Time Dependent Analysis and Simulation of Tokamak Plasmas

- Over 20 years of development by PPPL (+ others)
  - >1,000,000 lines of Fortran, C, C++
  - >3,000 program modules
  - 10,000s lines of supporting script code: perl, python, shell-script
  - Used internationally for most tokamak experiments
  - Local maintenance has been **very**

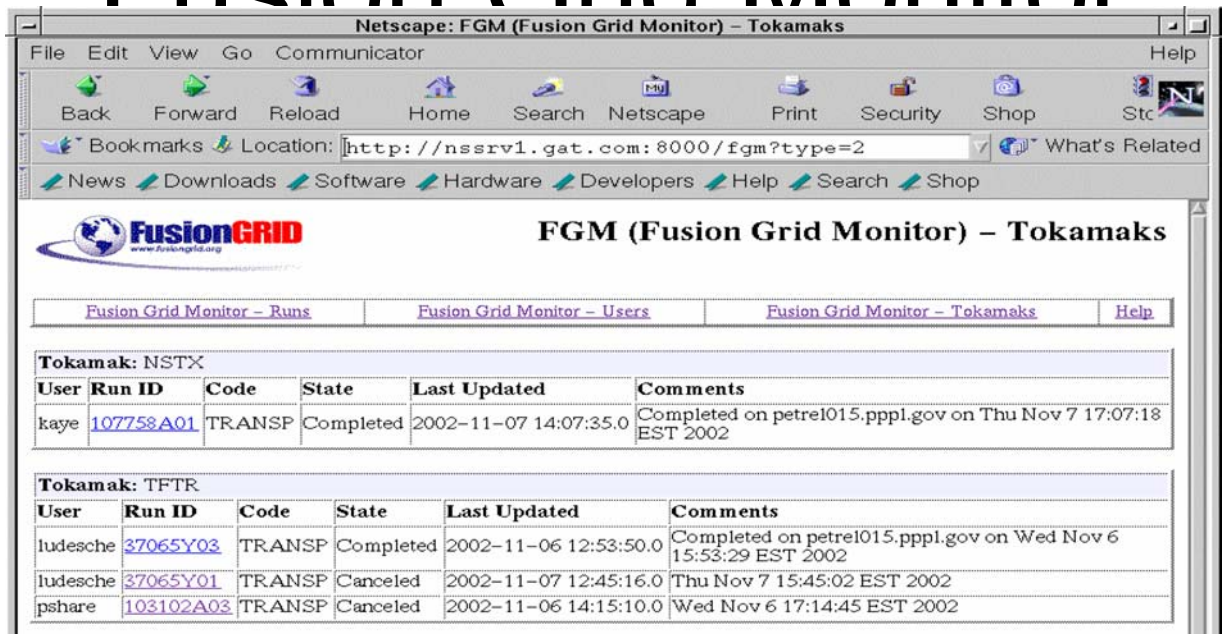
TRANSP Implemented as FusionGrid Service



TRANSP Service

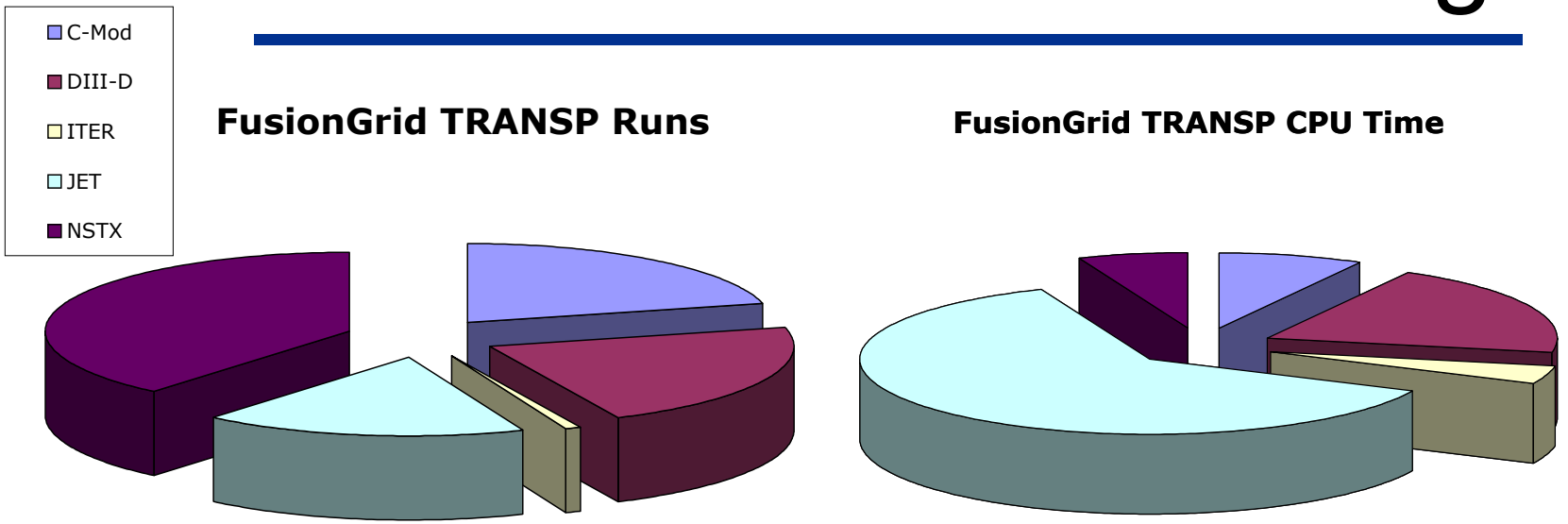
- Advantages of grid implementation
  - Remote sites avoid costly installation and code maintenance
  - PPPL maintains and supports a **single** production version of code on well characterized platform
- Production system
  - 16 processor linux cluster
  - Dedicated PBS queue

TRANSP Jobs Tracked by Fusion Grid Monitor



- Java Servlet derived from GA Data Analysis Monitor
- User presented with dynamical web display
- Sits on top of relational database – can feed

TRANSP Code - Accounting

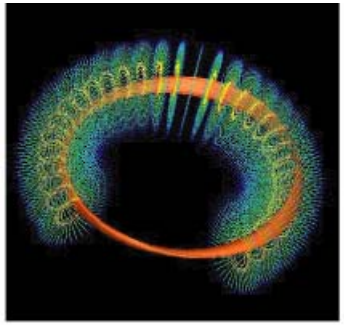


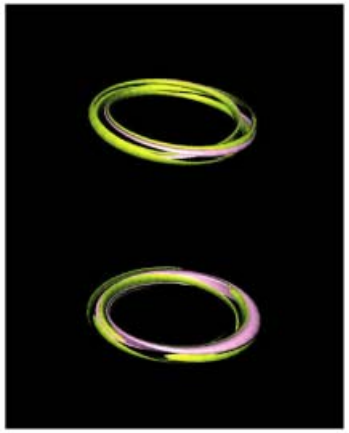
- Statistics for October, the first full month of operation
- Note US scientists supporting JET (UK based) and ITER
- Raises interesting authorization policy

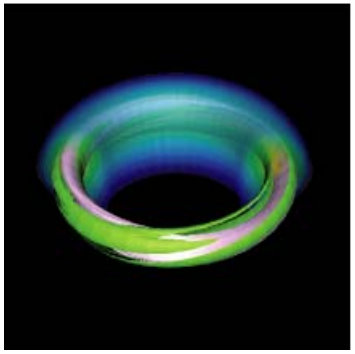
Advanced Visualization in Collaborative Environment

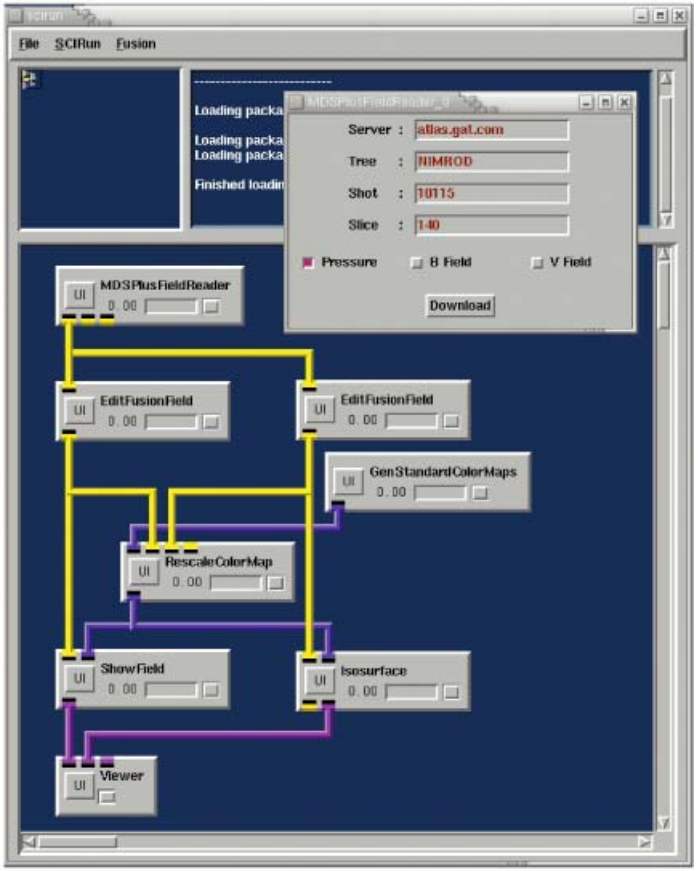
- Strive to dramatically reduce the hurdles that presently exist for collaborative scientific visualization
- Leverage existing technology where possible
  - SCIRun for advanced scientific visualization
  - Integrate AG collaborative tools with tiled display walls
- Collaborative Control Room

Visualization Using SCIRun



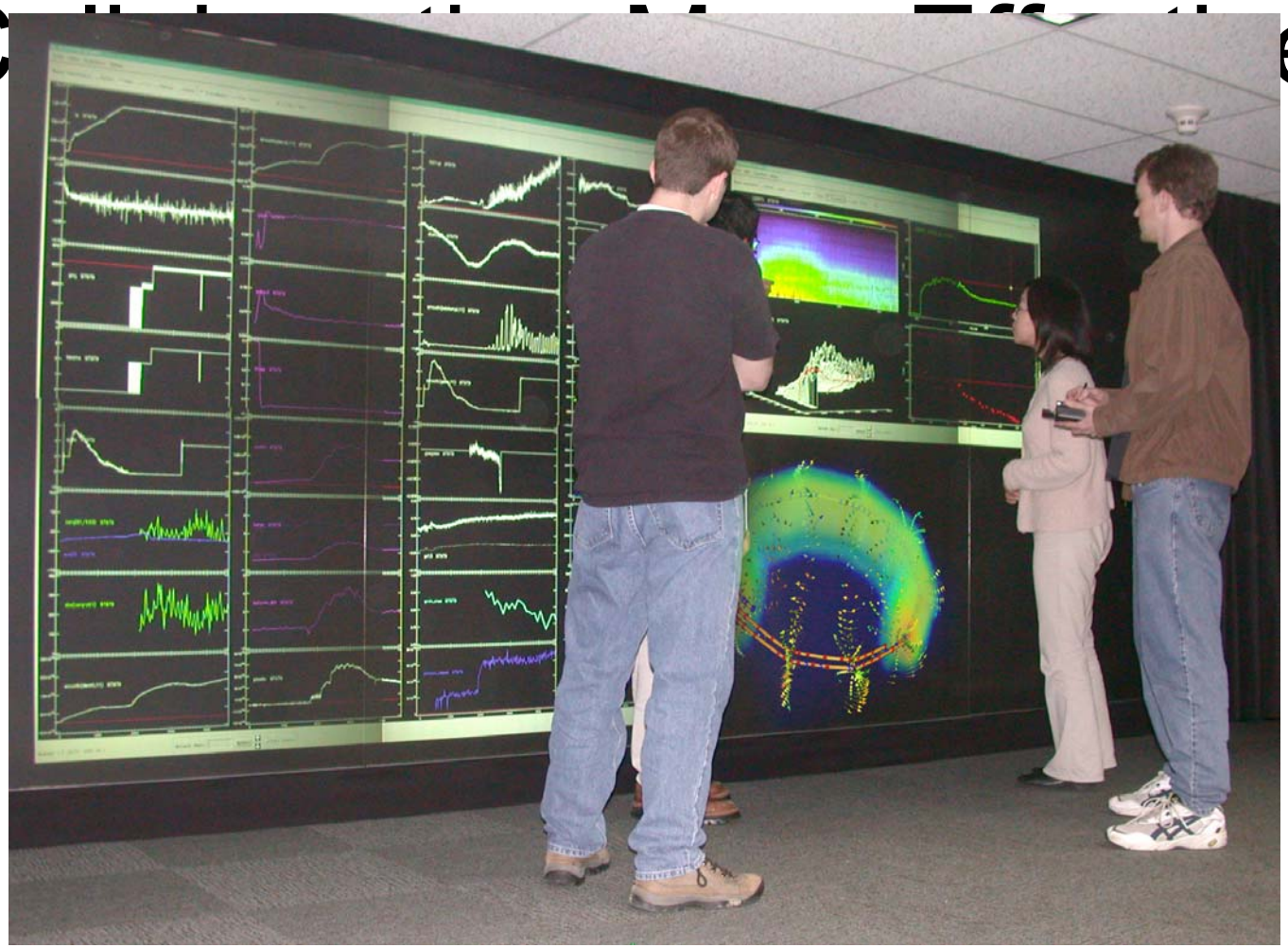






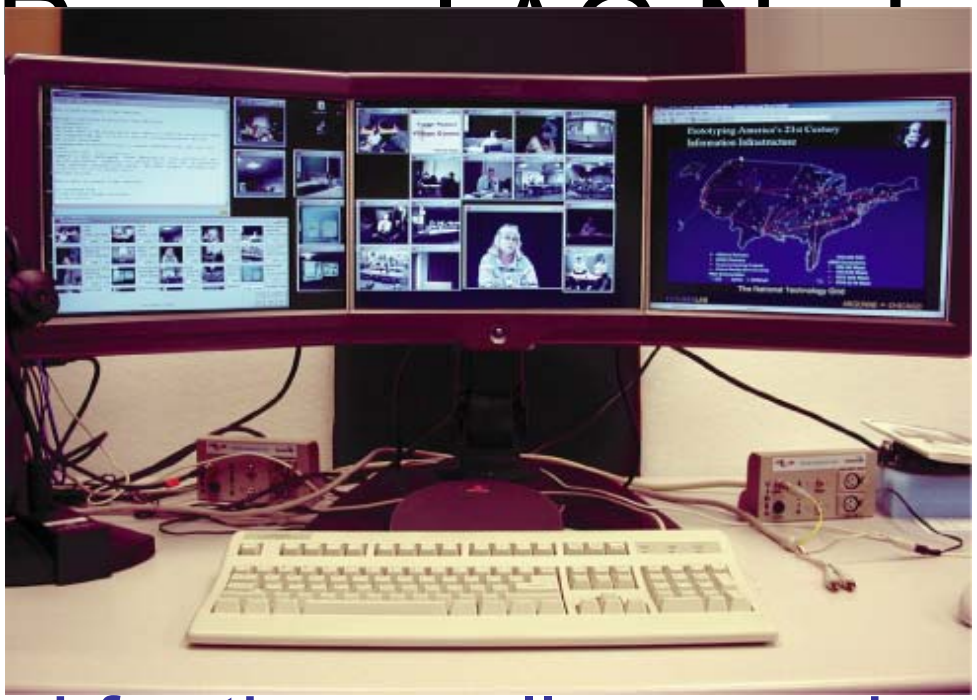
- SCIRun adapted for Fusion Simulations
  - From UII
  - Open source
  - Runs on low-cost platforms
- NIMROD

Tiled Walls Allow a Large Group to Explore Information in C[illegible]ely



General Atomics Advanced Imagery Laboratory

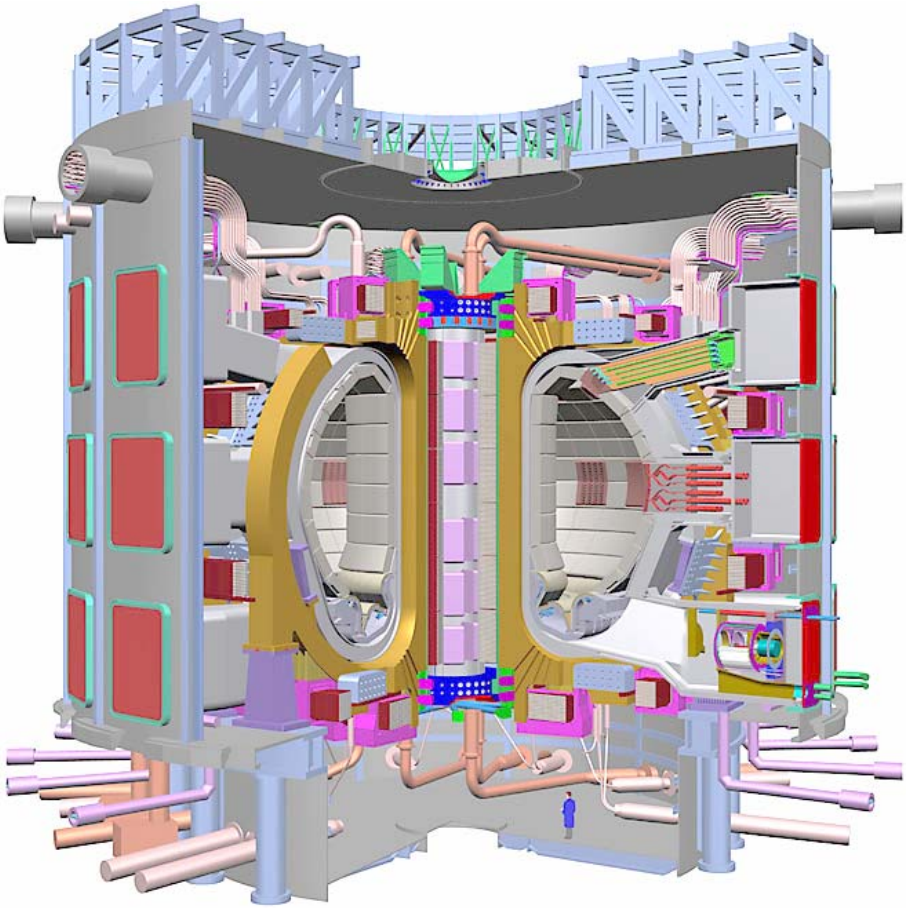
Remote Communication with



- Targeted for the small research center
  - For one to one and one to many interactions
- Usage example: communication to a tokamak control room

ITER – It's Back and It's Baad

- US rejoining negotiations
- $5B class experiment, over 20 countries, thousands of scientists
- Planning for data systems just beginning



Relation to Other SciDAC Projects

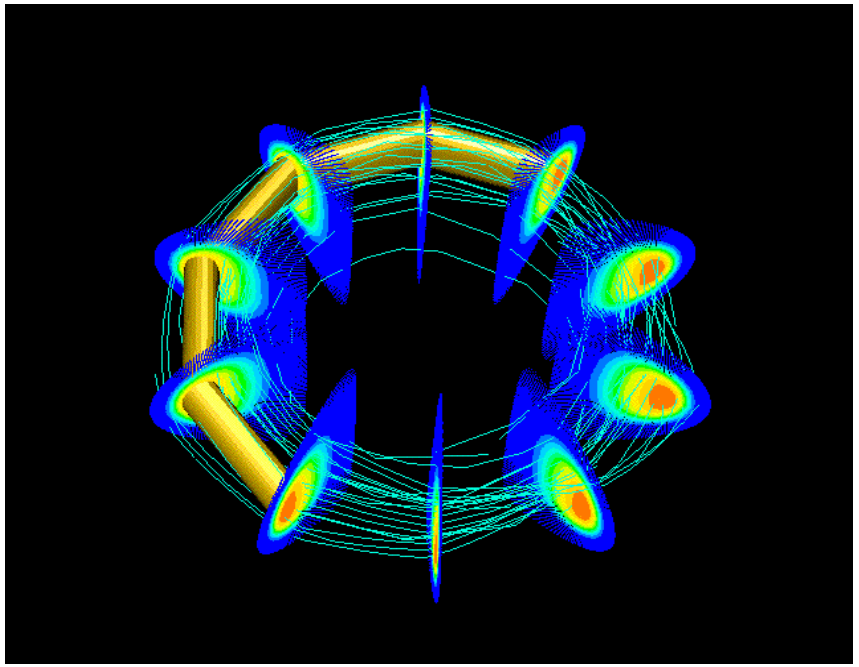
- SciDAC Center for Extended Magnetohydrodynamic Modeling
  - NIMROD data in MDSplus visualized by SCIRun presented at APS/DPP
- SciDAC Plasma Microturbulence Project
  - GS2 code being tested on FusionGrid for broader & easier usage
- Data Grid Toolkit; Security & Policy for Group Collaboration: Distributed Security Architecture
  - Secure access, authentication, authorization, Globus GSI/Akenti

First Year Accomplishments (1)

- FusionGrid created: MDSplus data access secured with GSI
- First service in production mode: TRANSP code, authorization via GRAM
- Demonstrations to user community at large science meetings
- Prototyped: between pulse pre-emptive scheduling, parallel MDSplus I/O

First Year Accomplishments (2)

- SCIRun visualization of NIMROD fusion data via MDSplus
  - New capability for 3D visualization & animation
  - Used for real research
- Access grid functional on tiled



Issues for Future Work

- Ease-of-use and Ease-of-installation still need a lot of work
  - Especially on security/certificate side
- Still have conflict on site security vs application security paradigm (firewalls, NAT, SecureID…)
- Globus undergoing major transformation
- Can “lighter weight”, small footprint

Concluding Comments

- The National Fusion Collaboratory Project is implementing and testing new collaborative technologies for fusion research
  - Grid computing
  - Shared visualization and communication
- Collaborative technology critical to the success of FE program