PROFILE DATABASE OVERVIEW

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Possible Demo in Working Session: *for anyone who wants to **use** the profile database*

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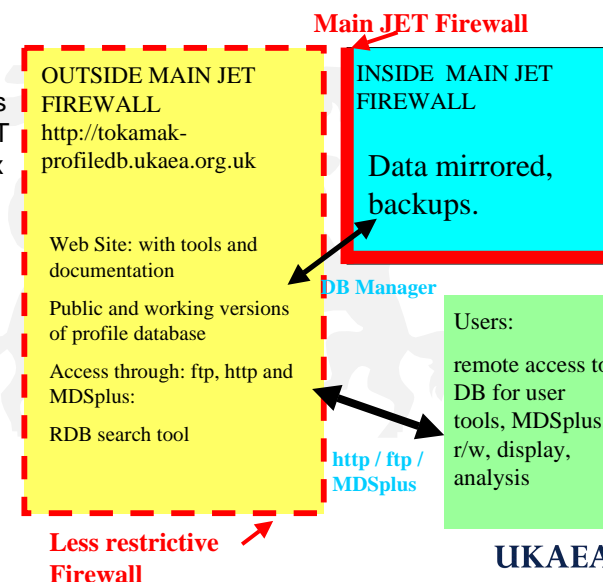IDL Read Access,

GS2 Input file generator

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Profile Database Hardware Infrastructure

Main JET Firewall

Profile Database sits OUTSIDE MAIN JET FIREWALL on Linux PC, and is backed-up inside firewall

http://tokamak-profiledb.ukaea.org.uk

OUTSIDE MAIN JET FIREWALL
http://tokamak-profiledb.ukaea.org.uk

Web Site: with tools and documentation

Public and working versions of profile database

Access through: ftp, http and MDSplus:

RDB search tool

INSIDE MAIN JET FIREWALL

Data mirrored, backups.

DB Manager

http / ftp / MDSplus

Users:
remote access to DB for user tools, MDSplus, r/w, display, analysis

Less restrictive Firewall

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DATA IN THE PROFILE DATABASE FRAMEWORK

Number of discharges provided by each tokamak in Public Release 1998 (PR98), Working Database (WDB), and ITB Profile Database (September 2003)

Tokamak	# PR98 discharges	# WDB discharges	# ITB discharges
AUG	2	8	
CMOD	5	5	
D3D	27	33	10
FTU	1	3	
JET	20	57	
JT60U	9	9	
MAST	0	5	
RTP	2	2	6
T10	20	23	
TFTR	107	107	6
TS	7	34	
TXTR	1	3	
Total	202	289	22

NB ~10 ITB discharges with profile data remain to be added, and JET ITB discharges are still erroneously in WDB

WDB discharges of many confinement modes and heating schemes:

– Ohmic, L and H-mode (with different ELM types) supershots, ITBs, RI modes, hot ion and hot electron modes, range of isotopes (including DT), transients (eg impurity injection, cold pulses)

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Data Stored for each Discharge:

- **'Comments'**: useful text characterizing the discharge's principle features, eg form of heating and confinement mode.

- **'0-D'**: a set of global variables (such as toroidal field, plasma composition, neutral beam energy) at one (or a few) fixed time points;

- **'1-D'**: time traces of global variables (such as plasma current, line averaged density, heating power) at a larger number of time points

- **'2-D'**: radial profiles of local plasma quantities at a range of specified times: eg densities and temperatures, the safety factor and heat and particle deposition

All variables are documented at:

http ://tokamak-profiledb.ukaea.org.uk/DOCS/pdbvardoc.htm

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Data Formats:

Two formats co-exist:
- **(i) ASCII files (maybe living on borrowed time!)**
- **(ii) MDSplus trees**

So far all discharges were submitted as ASCII files, but equivalent MDSplus trees have been generated using a converter.

(i) ASCII Files
- 4 files per discharge, formats based on the traditional UFILE format
- Filenames of form: 'tok_#####_com.dat', 'tok_#####_0d.dat', 'tok_#####_1d.dat' and 'tok_#####_2d.dat'
    (where tok='d3d','jt60u','aug' etc, and ##### is the shot number)
- File formats are documented in detail in:
http://tokamak-profiledb.ukaea.org.uk/DOCS/PDBMAN/pdbman.html
- Contributed software to read/write these files are available at:
http://tokamak-profiledb.ukaea.org.uk/DOCS/PDBMAN/tools.htm

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Data Formats (ctd):

(ii) MDSplus trees
Four MDSplus nodes hang off \top of tree structure (1 per ASCII file):
- ⇒ COMMENTS   ONED   TWOD   ZEROD
- ⇒ Full tree structure defined more rigorously in
http://tokamak-profiledb.ukaea.org.uk/DOCS/PDBMAN/mdstree.html

MDSplus has some advantages
- Trees are easily extended (no file format issues).
  Can readily add
    - ⇒ extra variables
    - ⇒ or even extra nodes off \top, eg in future we may choose to add EQUIL node to include RZ equilibria
- Access to MDSplus display tools which are widely used in fusion laboratories

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Data Submission:

The full procedure is defined at
http://tokamak-profiledb.ukaea.org.uk/DOCS/PDBMAN/pdbman.html#Contribute

Data acceptable either as:
- 4 ASCII files per discharge: comments, 0D, 1D, 2D ufiles
- MDSplus trees with correct tree structure are acceptable

Data provider is in control, and **little** administration effort required by the host site.
- Data-providers have write access to the DB machine via:
    - **ftp**: one guest account for each tokamak with write access to an incoming directory to be used to upload both Ufiles and MDSplus trees
    - **MDSplus**: one (nologin) user for each tokamak will be allocated MDSplus write access to an incoming tree area.

- Incoming areas are NOT the database itself
- Data Provider will drive **checking** and **uploading** of the data

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Outline of Submission Procedure *

4 stage process, **driven by data provider**

Data provider
- adds data to a private transit area via FTP/MDSplus
- visits checking webpage
    - ⇒ run crude checking procedure on selected discharges (looking for gross data errors and for data inconsistencies)
    - ⇒ views check reports
- flags data for upload to the database, on satisfactory check reports

Batch job
- generates corresponding ufiles/trees, records changes on the website and RDB

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Data Access

Profile Database is accessible read only via:

- ASCII file formats via:
  - http follow links from home page
    http://tokamak-profiledb.ukaea.org.uk
  - ftp ftp.tokamak-profiledb.ukaea.org.uk
- MDSplus trees available through MDSplus server
  tokamak-profiledb.ukaea.org.uk
  - Accessing the profile database via MDSplus is described in:
    http://tokamak-profiledb.ukaea.org.uk/DOCS/PDBMAN/mdsplus.htm
  - MDSplus is interfaced to fortran, C, IDL, MATLAB

Access Control for Restricted Datasets:

- guest accounts used for http and ftp access
- username+IP registration required for MDSplus access
- see http://tokamak-profiledb.ukaea.org.uk/DOCS/PDBMAN/access.htm

Write access available to Data Providers in the Transit Areas

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TOOLS

Range of Tools have been interfaced to the Profile Database:

(some will be shown in the DEMO session)

Search Tool:

- **IPRED**

  Provides a powerful way to find discharges of interest, exploiting a relational database containing 0D, comments, and meta-data.
  - **web interface** at: http://tokamak-profiledb.ukaea.org.uk/IPRED.html

Data Display

- **NTCC Data Server**

  Plot profile database data at JAVA enabled web browser (J Carlsson, J Cary and A Kritz).
  - see http://tokamak-profiledb.ukaea.org.uk/~ntcc/pub.html
- **JETDSP**

  JET display program (IDL) can display the profile database, see JETDSP links off
  http://tokamak-profiledb.ukaea.org.uk/DOCS/PDBMAN/tools.htm
- **MDSplus Display Tools**

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TOOLS (ctd)

Microstability Codes

- **GS2** generate input files for GS2 using the gs2get tool (IDL) …
  see http://tokamak-profiledb.ukaea.org.uk/MDS_EXAMPLES/GS2GET/
- **KINEZERO** Clarisse Bourdelle's microstability code
  see http://tokamak-profiledb.ukaea.org.uk/KZERO/KINEZERO.htm

Transport Codes

- **JETTO, CRONOS, ASTRA**   work with profile database data
- **OTHERS?** can we make these available?

Interfaces to various Packages/Languages from MDSplus

- **C, Fortran, IDL, MATLAB**

  Examples available at http://tokamak-profiledb.ukaea.org.uk/DOCS/PDBMAN/mdsplus.htm

  Exploit these to interface **your own code** to the Profile Database!

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Broadening the Scope of the Profile Database *

Maximise the usefulness of a valuable resource with minimal multiplication of effort.

- Merging existing profile databases will make physics effort more efficient.
- New profile databases, built to be compatible with existing databases, will benefit from existing technology/tools.

Issues to be addressed if this is to succeed:

- Compatibility, eg making variable names, definitions, and types more uniform across our various databases
- Documentation
- Controlled Access to restricted databases
- Extendable database technology so that it can incorporate new needs

Goal:

A uniform way to access experimental profile information for a wide range of machines and scenarios, with sound documentation.

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Topical Groups and Access Control *

At present the Profile Database incorporates
- Public release PR98 of original profile database
- Profile data from 2 Topical Groups: WDB, ITB

Access Control for the Topical Groups

System administration on host machine sets up:
- – independent user-groups for each Topical Group
- – guest accounts for members of topical groups to access their own areas of the ftp, http, MDSplus servers
- – Topical Project Managers and data providers are responsible for their own data.

ITB Profile Data presently coexists with WDB and PR98 data using this framework in a useful test-bed of the approach.

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Extending the Profile Database *

To extend the Profile Database to be useful for new or more sophisticated types of physics analysis we will need to add:
- extra variables
  - – presently working with ITB group to decide which extra variables are required to accommodate their profile data
- new types of data, eg
  - – profiles measured in real space, not mapped onto rho (Pedestal group?)
  - – R,Z equilibria

These extensions will require additional
- ASCII files

and/or
- structures within the MDSplus tree

Extensions need to be proposed, agreed, and documented.

THESE THINGS CAN BE DONE!

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Demo

*Maybe possible at CDBM Working Session for anyone who wants to **use** the profile database.*

l Brief tour of the Profile Database Website

l Find your Perfect Discharge using the Search Tool

l IDL Read Access

l GS2 Input file generator

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Conclusions

- PDB is increasingly powerful resource
  - contains interesting data
  - interfaces to powerful physics tools

- More tools are/can be contributed by users

- PDB is being extended to incorporate ITB profile data, and equilibria

- It could be extended further to cover different types of physics analysis

We could like to encourage more users to exploit and contribute to this community resource!

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