



MDSplus Access to ITPA Data

- Introduction to MDSplus
- How to get and install software
- How to access data
- Local vs. Remote access
- Miscellaneous MDSplus information
- Resources



MDSplus

- Initial implementation 1987-1991
- Hierarchical Data Storage
- Rich data types
 - <http://www.mdsplus.org/gettingstarted/datatypes.html>
- Powerful Expression Evaluator
- Widely used by Fusion Community



MDSplus Data Types

- Scalars and Arrays of most integer and floating point data types as well as text
- Advanced types
 - signals (value, optional raw data, dim0, dim1...)
 - with_units (value, units)
 - with_error (value, error)
 - range (start : end : increment)
 - expressions



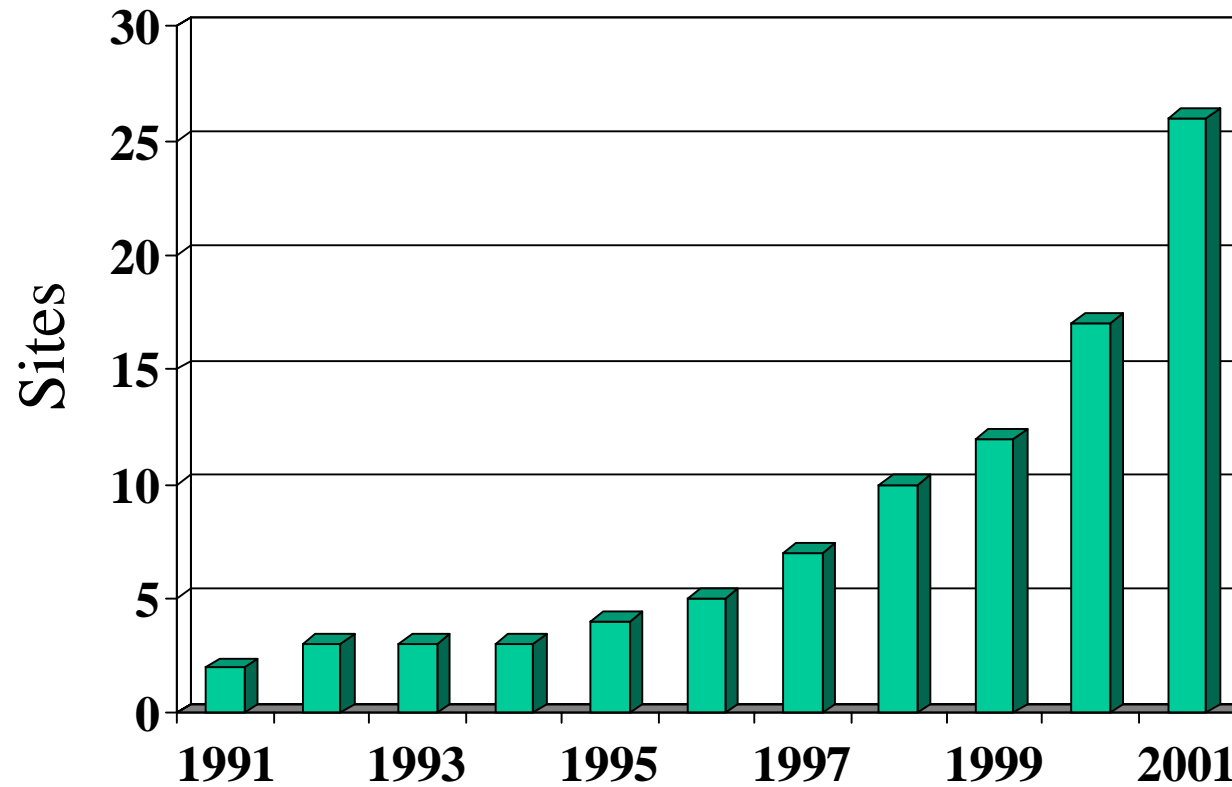
MDSplus Installations



	Location	Machine/ Code	First Used	Platforms
1	MIT, Cambridge, MA	C-Mod	1991	OVMS,W NT, Linux, Tru64, MacOS
2	CNR, Padova, Italy	RFX	1991	OVMS, Tru64, Solaris, Linux, W NT, vxW orks
3	EPFL, Lausanne, Switzerland	TCV	1992	OVMS, Linux
4	MIT, Cambridge, MA	PTF	1995	OVMS
5	Taejeon, South Korea	HANBIT	1996	OVMS, Solaris
6	General Atomics, San Diego, CA	DIII-D	1997	Tru64, HPUX, Linux, W NT, IRIX, OVMS, MacOS
7	PPPL, Princeton, NJ	NSTX	1997	OVMS, Solaris, Tru64, Linux, W NT
8	U of Washington, Seattle, W A	ZaP	1998	Linux, W NT, OVMS, Tru64
9	U of Washington, Seattle, W A	HIT	1998	"
10	U of Washington, Seattle, W A	TIP	1998	"
11	ANU, Canberra, Australia	H1	1999	OVMS, Tru64, Linux, W NT
12	Frascati, Italy	FTU	1999	Tru64
13	EFDA	JET	2000	Linux, Solaris
14	Tianjin University of China, PRC	HT-7U	2000	W NT
15	NIFS, Tajimi, Japan	CHS	2000	OVMS, Tru64, W NT
16	UCSD, San Diego, CA	PISCES	2000	W NT
17	SAIC, San Diego, CA	NIMROD	2000	Linux, SGI Irix, Cray Unicos
18	MIT, Cambridge, MA	LDX	2001	OVMS, MAC
19	Columbia U, NY, NY	HBT-EP	2001	OVMS, W NT
20	Columbia U, NY, NY	CTX	2001	"
21	Kurcatov Institute, Moscow, Russia	T-10	2001	Linux
22	LANL, Los Alamos, NM	MTF	2001	SunOS
23	LANL, Los Alamos, NM	FRX-L	2001	"
24	U of Washington, Redmond, W A	TCS	2001	W NT, MAC, OVMS
25	LBL, Oakland, CA	NIMROD	2001	Cray T3E
26	U of Wisconsin, Madison, W I	MST	2001	OVMS
27	LBL, Oakland, CA	Globus	2001	Linux, Solaris
28	ANL, Argonne, IL	Globus	2001	Linux, Solaris
29	Garching, Germany	ASDEX	2002	Solaris



MDSplus Usage Growth





Installing MDSplus

- Distributions at:
http://www.mdsplus.org/mdsplus/install_kits.html
- RPM's for several Unix platforms
- Install kit for Windows (95+)
- CVS repository
(:pserver:MDSguest@www.mdsplus.org:/mdsplus/repos
---- password: MDSguest)



Accessing Data

- 1) Connect to Data Server
- 2) Open MDSplus Data File (Tree)
- 3) Read Data
- 4) Read Associated Data
- 5) Close Tree
- 6) Disconnect from Server



1) Connect to Data Server

```
IDL> mdsconnect, 'tokamak-profiledb.ukaea.org.uk'
```

Program Test

Include 'mdslib.inc'

Integer status

```
status = MdsConnect('tokamak-profiledb.ukaea.org.uk'//char(0))
```

Null termination →



2) Open MDSplus Tree

```
IDL> mdsopen, 'pr98_tftr', 102257 [,status=status,/quiet]
```

```
status = MdsOpen('pr98_tftr'//char(0),102257)
```

Null termination

3) Read Data

```
IDL> zeff = mdsvalue(‘\top.oned:zeff’)
```

"expression"

Real*4 zeff(2000)

Integer*4 samples_returned

Integer*4 status

...

```
status = MdsValue2(‘\\top.oned:zeff’//char(0),
```

```
+ descr2(IDTYPE_FLOAT,2000,0),zeff,0,samples_returned)
```

Variable Descriptor

Data Type

Array Size 1

End of sizes



4) Read Associated Data

```
IDL> time = mdsvalue('dim_of(\top.oned:zeff)')
```

```
IDL> units = mdsvalue('units_of(\top.oned:zeff)')
```

Real*4 time(2000)

Integer*4 samples_returned

Integer*4 status

Character*12 units

...

```
status = MdsValue2('dim_of(\top.oned:zeff)//char(0),  
+ descr2(IDTYPE_FLOAT,2000,0),time,0,samples_returned)
```

```
status = MdsValue2('units_of(\top.oned:zeff)//char(0),  
+ descr2(IDTYPE_CSTRING,0,12),units,0,samples_returned)
```



5) Close Tree

```
IDL> MdsClose,'pr98_tftr', 102257
```

```
status = MdsClose('pr98_tftr'//char(0),102257)
```



6) Disconnect from Server

```
IDL> mdsdisconnect
```

```
status = MdsDisconnect()
```



Status checking

- Odd status value equals success
- Text of message obtained by expression:
'getmsg(status-value)'

```
IDL> msg=mdsvalue('getmsg(42)')
```



Writing Data

```
IDL> mdspout, '\top.oned:zeff', 'build_signal($,*,$)', zeff, time
```

```
Real*4 zeff(2000)
```

```
Real*4 time(2000)
```

```
Integer*4 status
```

```
Character*12 units
```

```
...
```

```
status = MdsPut2('\top.oned:zeff'//char(0),
```

```
+ build_signal($,*,$)//char(0)',
```

```
+ descr2(IDTYPE_FLOAT,2000,0),zeff,0),zeff,
```

```
+ descr2(IDTYPE_FLOAT,2000,0),time,0)
```



Writing Data (advanced)

```
IDL> mdspout, '\top.oned:zeff', $  
'build_signal(build_with_units($, "amperes"), $  
*, $  
build_with_units(.5 : 1.5 : .01, "seconds"))', zeff
```

*Ramp Definition
start : end : increment*



Compiling and Linking

```
# f77 -o myapp -I/usr/local/mdsplus/include myapp.f \  
-L/usr/local/mdsplus/lib -lMdsLib
```



Local versus Remote

- Trees can reside on remote system or on local file system
- Local tree location defined by environment variables or Windows registry entries
 - `mytree_path=/home/twf/mytreedir`
 - `HKEY_LOCAL_MACHINE\SOFTWARE\MIT\MDSplus\mytree_path=C:\mytree`



Tools for Accessing Data

- API for programming languages (C, Fortran)
- High level languages (IDL, MATLAB, Visual Basic, LABVIEW)
- General purpose visualization tools
 - Reviewplus
 - Dwscope and jScope
 - Traverser and jTraverser

Traverser

The screenshot shows the Traverser application window titled "TRAVERSER - Tree: CMOD Shot: 960301055". The interface includes a menu bar with "File", "Data", "Customize", and "Help". The main area displays a tree view of nodes, including "CRYO ...", "POWER_SYSTEM ...", "FIZZ_DETECT", "TEST", "BUS_DIAG ...", "CAMAC ...", "CLOSE_SHOT", "DIG_FREQ", "DIG_TIME", "J221_START", "MHZ_CLOCK", "TSTART", "ALTERNATOR ...", "BUSHV ...", "A12_1 ...", "A12_2 ...", "A12_3 ...", "DDECODER ...", "FAST_START", "L8212_1 ...", "BUSLV ...", "BUSOH ...", "EF3 ...", "EF4 ...", "ENG ...", and "OH1 ...". A right-click context menu is open over the "CLOSE_SHOT" node, listing options: "Display Data", "Display Nci", "Modify Data", "Set Default", "Setup Device", "Do Action", "Toggle On/Off", "Open", "Close", and "Quit". A command window at the bottom left shows "TCL>".

Icons for Node usage

Expandable Node

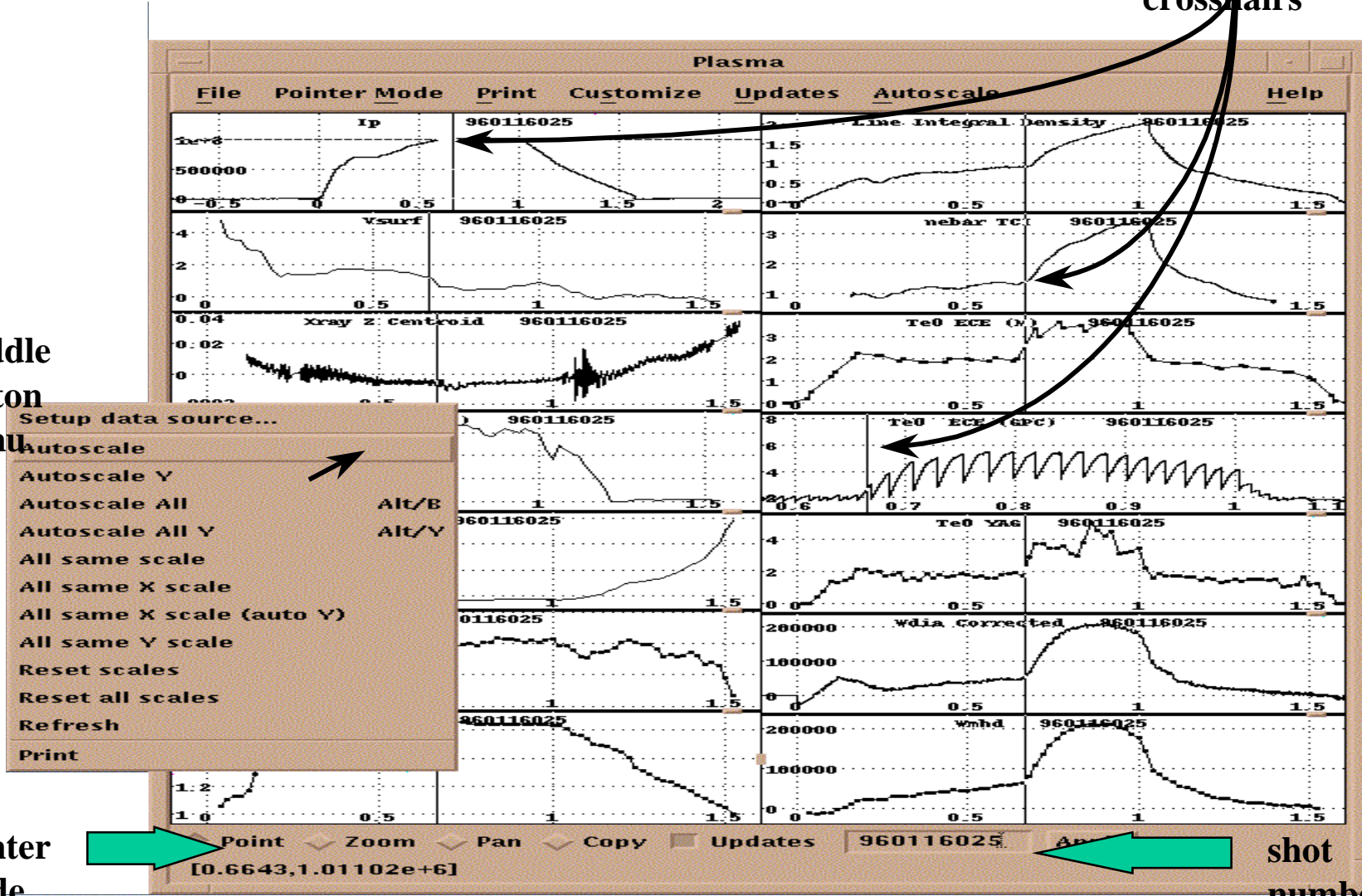
Right button popup menu

Command Window

Scope

Auto tracking
crosshairs

Middle
button
menu



Pointer
Mode

shot
number



Tree Creation

- Traverser and/or jTraverser
- mdstcl command language
- Model tree replication



Data Server Access Control

- Mapping file for mapping remote clients to local accounts
- Coming soon: Secure connections using X509 certificates with Globus/Akenti enhancements



Useful links

- Getting started

http://www.mdsplus.org/gettingstarted/table_of_contents.html

- Graphical Interfaces

<http://www.mdsplus.org/gettingstarted/graphicinterfaces.html>

- Fortran Interface

<http://www.mdsplus.org/mdslib/mdslib.html>

- MDSplus Speak

<http://www.mdsplus.org/glossary/glossary.pdf>



Resources

- Documentation/papers found at <http://www.mdsplus.org/>
- FusionGrid work <http://www.fusiongrid.org/>
- twf@psfc.mit.edu