Argonne NATIONAL LABORATORY

Channel Access and Client Tools

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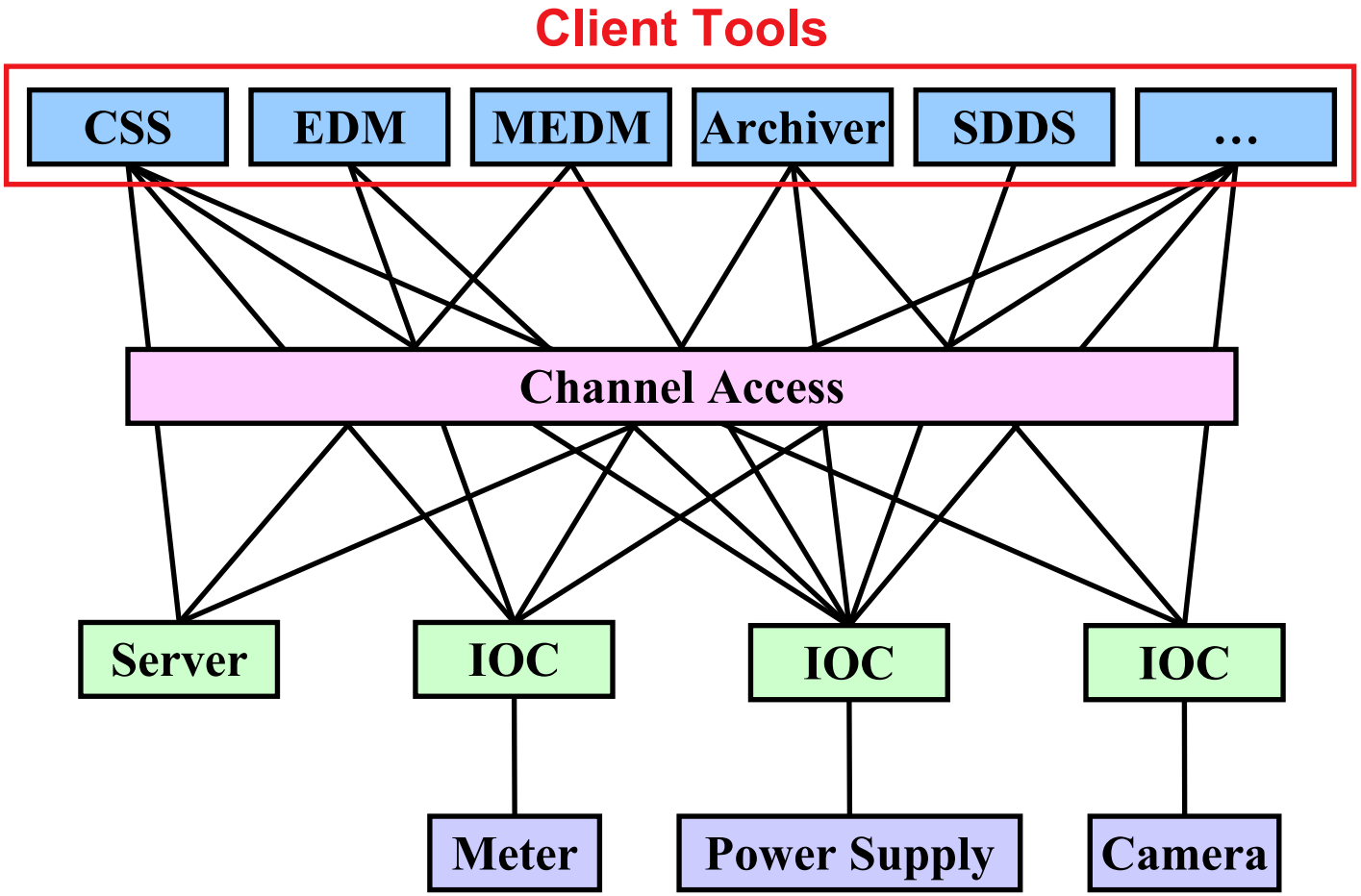
U.S. DEPARTMENT OF ENERGY

EPICS Overview



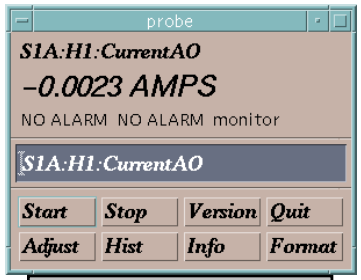
Channel Access

- The EPICS “software bus”
- Used to read and write values to/from Process Variables
- To many people, Channel Access *is* EPICS
  - Especially those that have no IOC experience
  - “Integrate X into EPICS” often means “Be able to control X via CA”
- CA is not defined by a protocol specification
  - EPICS Core Developers maintain CA client and server libraries in EPICS Base
    - Any client version can connect to and communicate with any server version
  - Other client and server implementations exist
    - These may not interoperate as well with other versions

What is a Process Variable (PV)

- "A named item of data, with associated optional attributes"
  - Data is an Integer, Floating point number, enumeration value or string, or an array of any of those types
  - Possible attributes include timestamp, alarm status/severity, precision, engineering units string, list of enumeration strings, operator/control/ alarm limits
  - The specific attributes you can fetch along with the data are restricted to some predefined subsets of those available

Channel Access in One Slide



Channel Access Client

"connection request" or "search request"

"get" or "caGet"

"put" or "caPut"

"set a monitor"

Who has a PV named "S1A:H1:CurrentAO"?

What is its value?

Change its value to 30.5

Notify me when the value changes

CA Client

CA Server

Channel Access Server

Process Variables:

S1A:H1:CurrentAO

S1:P1:x

S1:P1:y

S1:G1:vacuum

I do.

25.5 AMPS

OK, it is now 30.5

It is now 20.5 AMPS

It is now 10.5 AMPS

It is now -0.0023 AMPS

"put complete"

or

30.5 is too high. It is now set to the maximum value of 27.5.

or

You are not authorized to change this value

"post an event" or "post a monitor"

Tools Described in This Presentation

- Command-line tools provided with EPICS Base
  - caget
  - caput
  - camonitor
  - cainfo
- Various clients provided as EPICS Extensions
  - MEDM
  - EDM
  - StripTool
  - ALH

More Information & Tools

- The EPICS website provides a wealth of information

  http://www.aps.anl.gov/epics/
- All EPICS Extensions programs here have a link or a page there
- There are many other tools described/linked there too

- Base command line tools are usually found at
  - …epics/base-<*version*>/bin/<*platform*>/<*executable*>
    - /opt/epics/base-3.14.12.4/bin/linux-x86_64/…
- Extensions programs are usually installed in
  - …epics/extensions/bin/<*platform*>/<*executable*>
    - /opt/epics/extensions/bin/linux-x86_64/…
  - Platforms are linux-x86_64, darwin-x86, win32-x86, etc.

Command-Line Tools

- There used to be several versions of these tools
- We will discuss the ones that come with EPICS Base
- The tools we will cover are:
  - caget
    - *Gets the value of one or more process variables*
  - caput
    - *Sets the value of one process variable*
  - camonitor
    - *Monitors value changes of one or more process variables*
  - cainfo
    - *Gets information about one or more process variables*
- All accept –h to display usage and options

- NOTE: Some sites may have much older versions of these programs in their default Unix search path.

Caget Example

- Get the values of two process variables

```
caget S35DCCT:currentCC S:SRlifeTimeHrsCC
```

- Returns

```
S35DCCT:currentCC     102.037
S:SRlifeTimeHrsCC     7.46514
```

Caput Example

- Set the value of a process variable

```
caput Xorbit:S1A:H1:CurrentAO 1.2
```

- Returns

```
Old : Xorbit:S1A:H1:CurrentAO    0
New : Xorbit:S1A:H1:CurrentAO    1.2
```

Camonitor Example

- Monitor two process variables

```
camonitor evans:calc evans:bo01
```

- Returns

```
evans:calc     2004-08-05 17:23:04.623245 1
evans:bo01     2004-08-05 17:23:04.623245 On
evans:calc     2004-08-05 17:23:05.123245 2
evans:bo01     2004-08-05 17:23:05.123245 Off
evans:calc     2004-08-05 17:23:05.623245 3
evans:calc     2004-08-05 17:23:06.123245 4
evans:calc     2004-08-05 17:23:06.623233 5
evans:calc     2004-08-05 17:23:07.123183 6
```

- Use Ctrl-C to stop monitoring

Cainfo Example

- Get information about a process variable

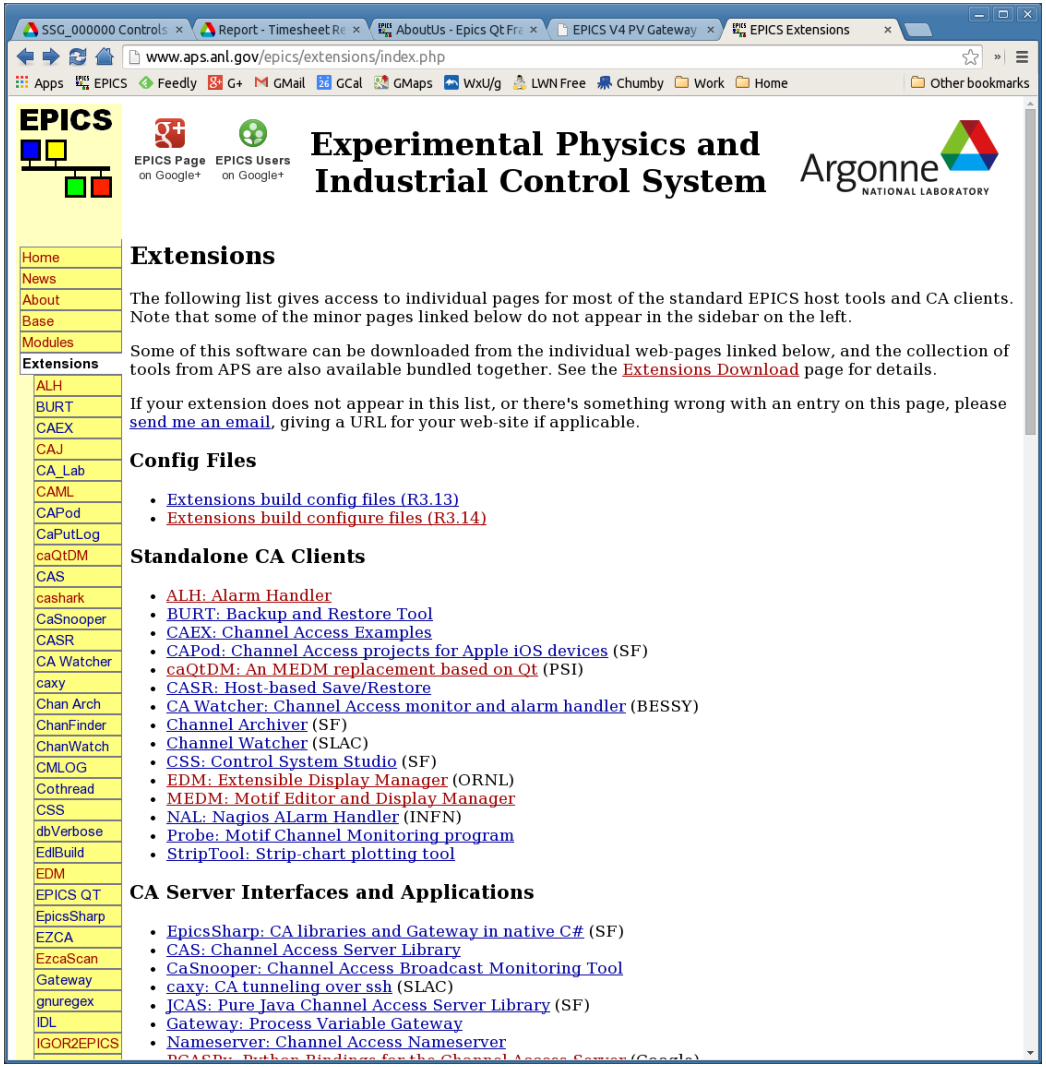
```
cainfo S35DCCT:currentCC
```

- Returns

```
State:      connected
Host:       ctlapps41188:5064
Access:     read, no write
Data type: DBR_DOUBLE (native: DBF_DOUBLE)
Element count: 1
```

- Some additional information can be found using Probe

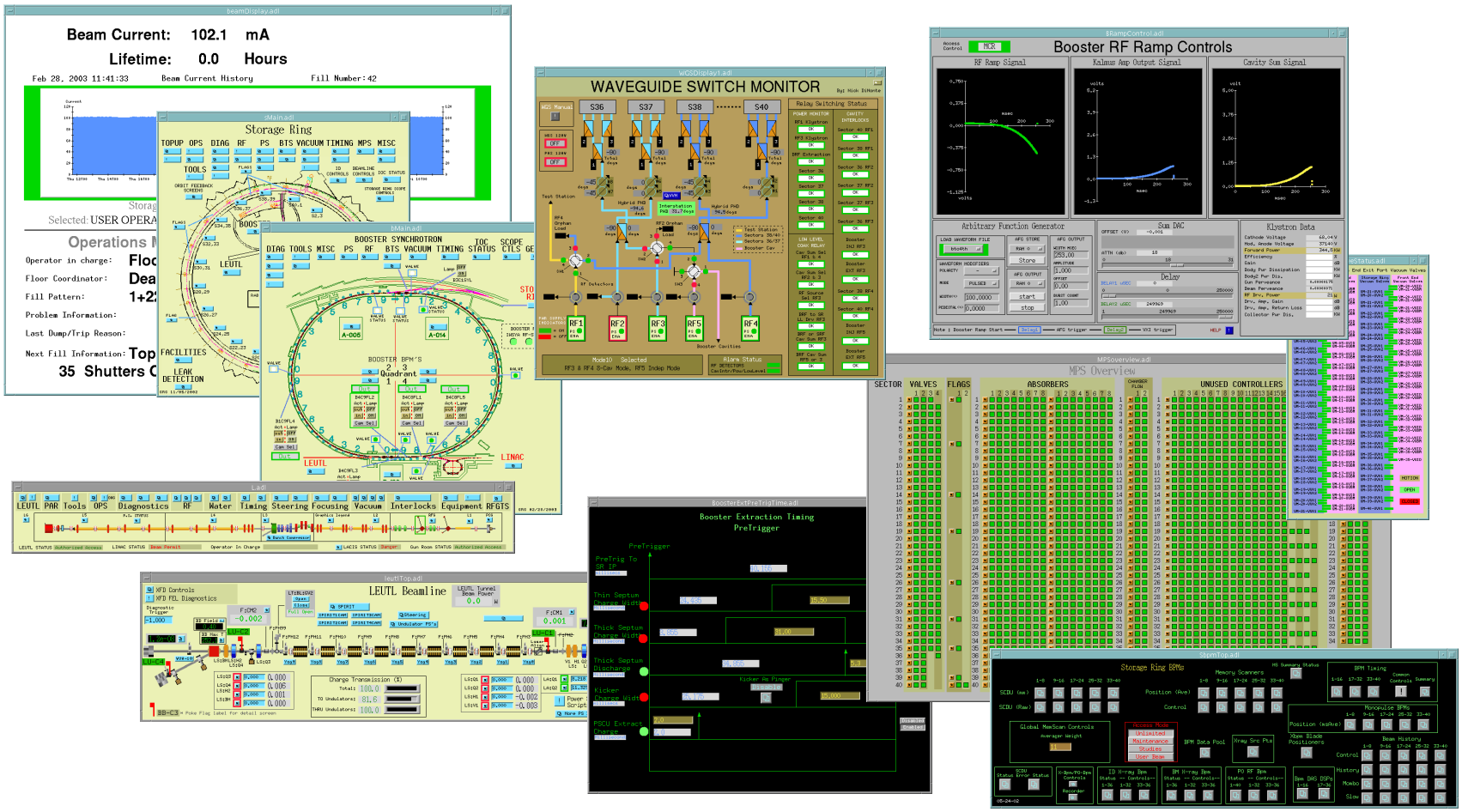
EPICS Extensions Web Page



MEDM

- Stands for Motif Editor and Display Manager
- Created in 1990, still used at many facilities worldwide
- Written in C, very hard to extend and modify
- The principal human interface to the APS control system

MEDM Screens

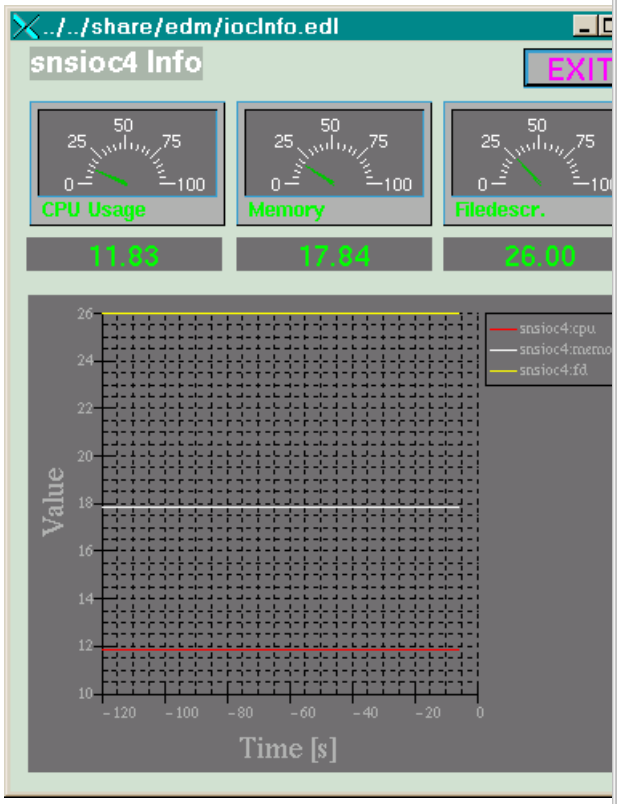


- And thousands of others

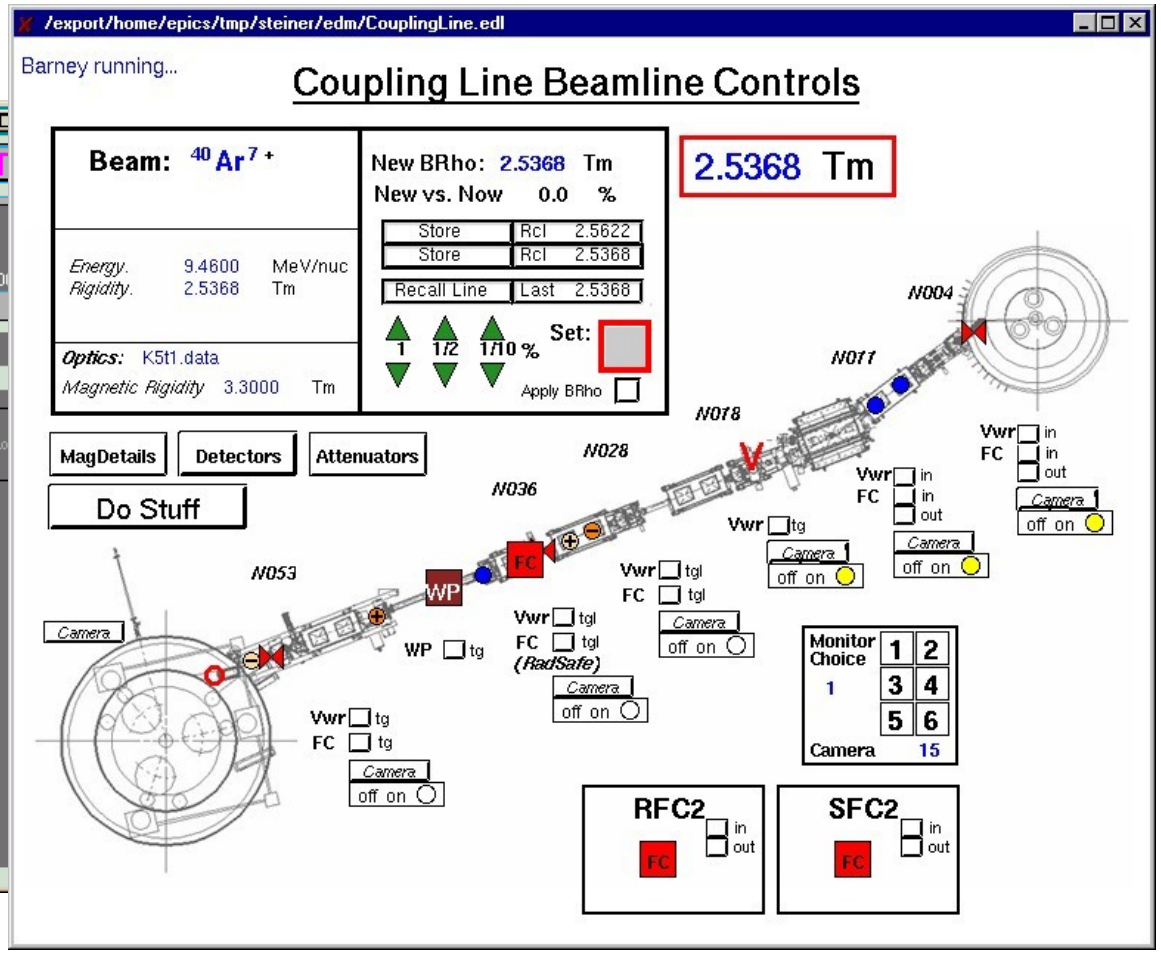
EDM

- Extensible Display Manager (C++, still based on Motif)
- Created at SNS (Oak Ridge) in 2001, used at many EPICS sites
- All widgets are loaded from shared libraries and versioned
- Administrator can make additional widgets available without rebuilding EDM

EDM Screens



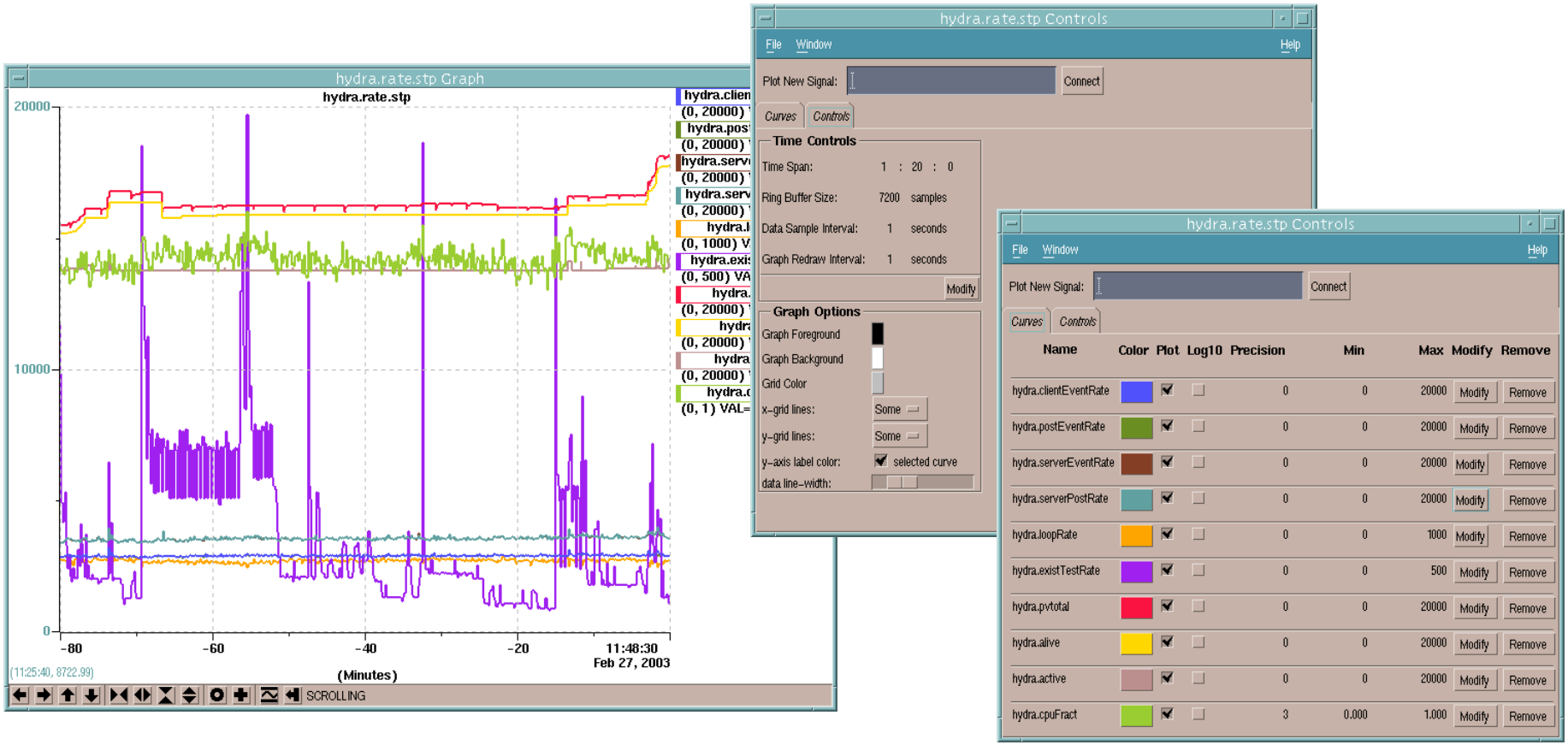
(SNS Linac test)



(Matthias Steiner, Nat'l Superconducting Cyclotron Lab., Michigan State University)

StripTool

- Plots process variables in real time on a strip chart
- Heavily used at APS and older sites



ALH (Alarm Handler)

- Monitors the operation of the machine
- Notifies control-room operators when abnormal conditions arise
- Provides guidance, logs operator acknowledgements and other actions