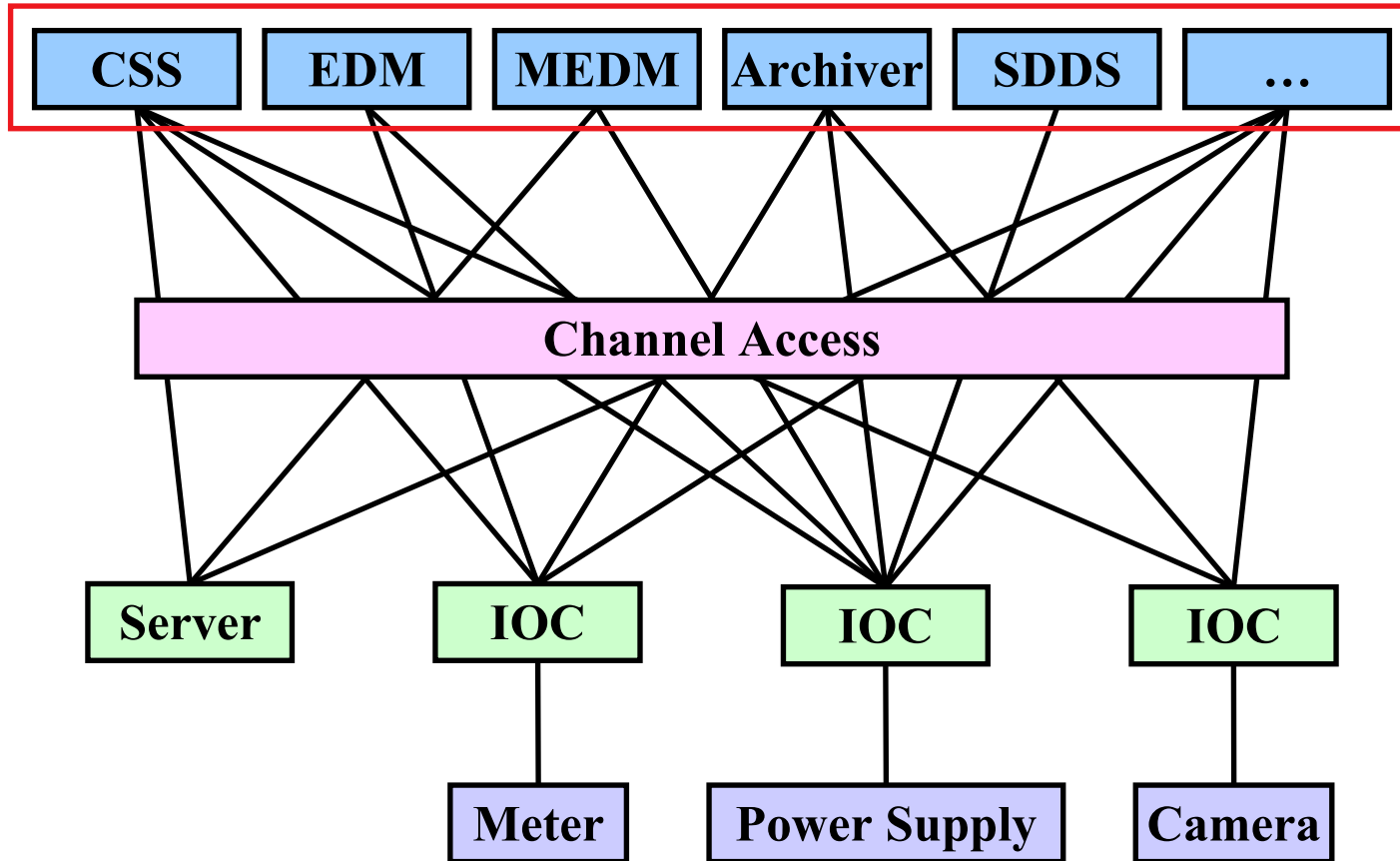


Channel Access and Client Tools

Author: Kenneth Evans, Jr. August 2004
Modified: Kay Kasemir October 2006
Andrew Johnson 2007 – 2014

EPICS Overview

Client Tools



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

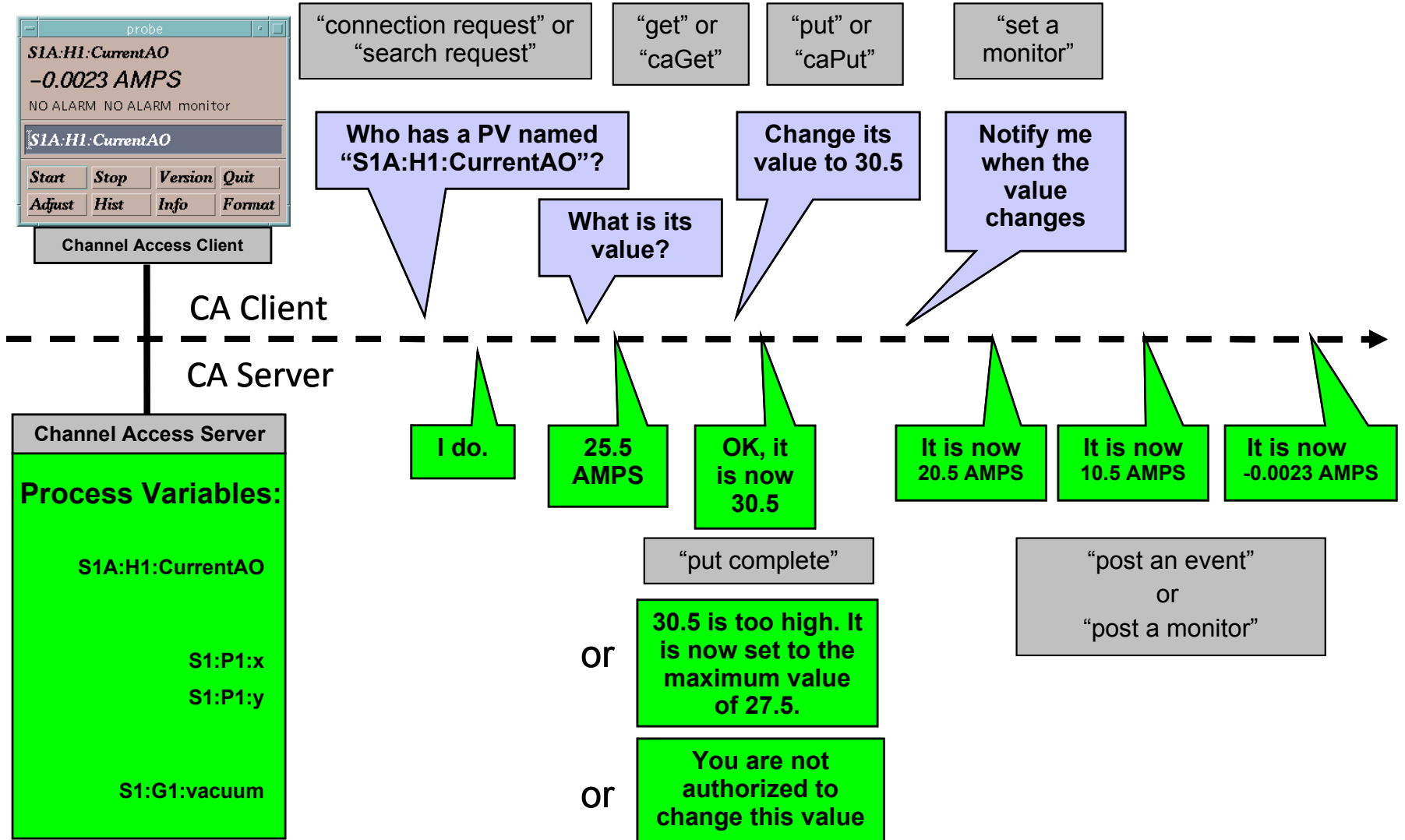


What is a Process Variable (PV)

- “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



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
```

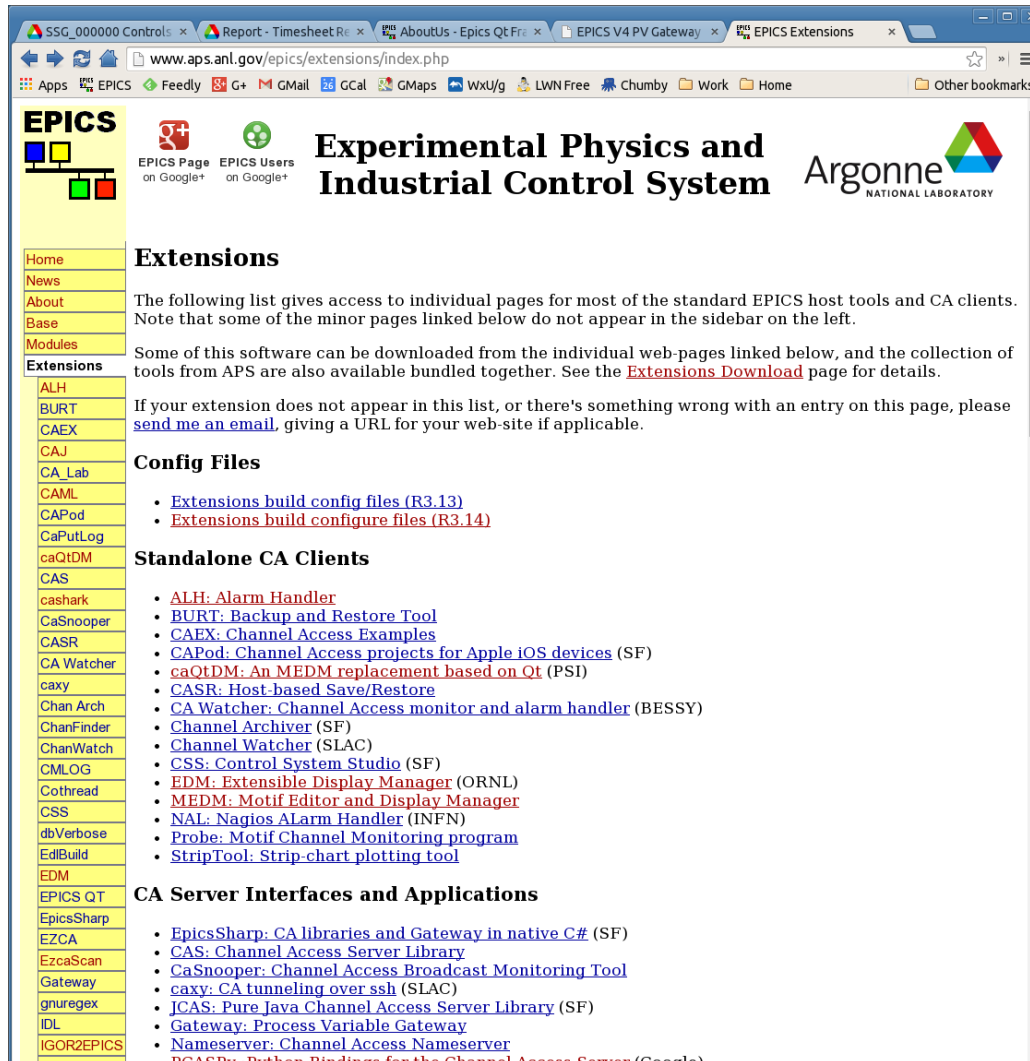
```
Data type: DBR_DOUBLE (native: DBF_DOUBLE)
```

```
Element count: 1
```

- Some additional information can be found using Probe



EPICS Extensions Web Page



The screenshot shows a web browser window displaying the EPICS Extensions page. The browser's address bar shows the URL www.aps.anl.gov/epics/extensions/index.php. The page header includes the EPICS logo, the text "Experimental Physics and Industrial Control System", and the Argonne National Laboratory logo. A sidebar on the left contains a navigation menu with items like Home, News, About, Base, Modules, and a list of extensions including ALH, BURT, CAEX, CAJ, CA_Lab, CAML, CAPod, CaPutLog, caQtDM, CAS, cashark, CaSnooper, CASR, CA Watcher, caxy, Chan Arch, ChanFinder, ChanWatch, CMLoG, Cothread, CSS, dbVerbose, EdtBuild, EDM, EPICS QT, EpicsSharp, EZCA, EzcaScan, Gateway, gnuregex, IDL, and IGOR2EPICS. The main content area is titled "Extensions" and contains several sections: a general introduction, a "Config Files" section with links to build files, a "Standalone CA Clients" section with a list of tools and their descriptions, and a "CA Server Interfaces and Applications" section with a list of server-related tools.

EPICS

Experimental Physics and Industrial Control System

Argonne NATIONAL LABORATORY

Extensions

The following list gives access to individual pages for most of the standard EPICS host tools and CA clients. Note that some of the minor pages linked below do not appear in the sidebar on the left.

Some of this software can be downloaded from the individual web-pages linked below, and the collection of tools from APS are also available bundled together. See the [Extensions Download](#) page for details.

If your extension does not appear in this list, or there's something wrong with an entry on this page, please [send me an email](#), giving a URL for your web-site if applicable.

Config Files

- [Extensions build config files \(R3.13\)](#)
- [Extensions build configure files \(R3.14\)](#)

Standalone CA Clients

- [ALH: Alarm Handler](#)
- [BURT: Backup and Restore Tool](#)
- [CAEX: Channel Access Examples](#)
- [CAPod: Channel Access projects for Apple iOS devices](#) (SF)
- [caQtDM: An MEDM replacement based on Qt](#) (PSI)
- [CASR: Host-based Save/Restore](#)
- [CA Watcher: Channel Access monitor and alarm handler](#) (BESSY)
- [Channel Archiver](#) (SF)
- [Channel Watcher](#) (SLAC)
- [CSS: Control System Studio](#) (SF)
- [EDM: Extensible Display Manager](#) (ORNL)
- [MEDM: Motif Editor and Display Manager](#)
- [NAL: Nagios Alarm Handler](#) (INFN)
- [Probe: Motif Channel Monitoring program](#)
- [StripTool: Strip-chart plotting tool](#)

CA Server Interfaces and Applications

- [EpicsSharp: CA libraries and Gateway in native C#](#) (SF)
- [CAS: Channel Access Server Library](#)
- [CaSnooper: Channel Access Broadcast Monitoring Tool](#)
- [caxy: CA tunneling over ssh](#) (SLAC)
- [JCAS: Pure Java Channel Access Server Library](#) (SF)
- [Gateway: Process Variable Gateway](#)
- [Nameserver: Channel Access Nameserver](#)
- [PCASD: Python Bindings for the Channel Access Server](#) (Google)

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

The image displays a collection of MEDM (Machine Element Display Manager) control screens for a particle accelerator system. The screens are arranged in a collage, showing various operational parameters and control interfaces.

- Beam Current Monitor:** Shows "Beam Current: 102.1 mA" and "Lifetime: 0.0 Hours". It includes a "Beam Current History" graph and a "Storage Ring" schematic diagram.
- WAVEGUIDE SWITCH MONITOR:** Displays a schematic of waveguide switches (S36, S37, S38, S40) and their status. It includes a "Relay Switching Status" table and a "Mode" selector.
- Booster RF Ramp Controls:** Shows "RF Ramp Signal", "Klystron Amp Output Signal", and "Cavity Gun Signal" plots. It includes an "Arbitrary Function Generator" and "Sun DAC" controls.
- MPS Overview:** A large table showing "SECTOR", "VALVES", "FLAGS", "ABSORBERS", and "UNUSED CONTROLLERS" with their respective status indicators.
- LEUTL Beamline:** Displays "LEUTL PAR Tools", "Diagnostics", and "RF" controls. It includes a "LEUTL Beamline" schematic and various control parameters like "LEUTL Tuning" and "LEUTL Power".
- Booster Extraction Timing:** Shows "PreTrigger" and "PostTrigger" control elements.
- Storage Ring BPMs:** Displays "Storage Ring BPMs" and "BPM Timing" controls, including "Global NewScan Controls" and "BPM Data Pool".

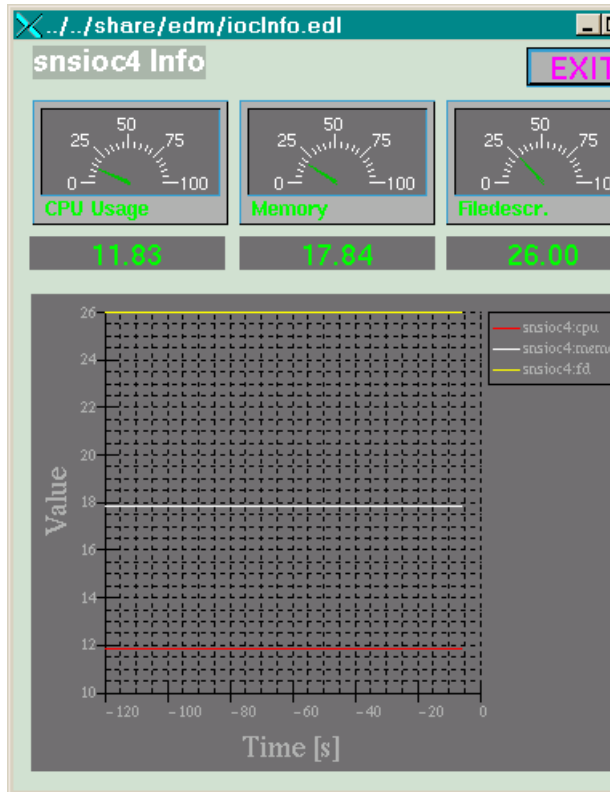
- And thousands of others

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)

/export/home/epics/tmp/steiner/edm/CouplingLine.edl

Barney running...

Coupling Line Beamline Controls

Beam: 40 Ar^{7+}

New BRho: 2.5368 Tm

New vs. Now: 0.0 %

Energy: 9.4600 MeV/nuc

Rigidity: 2.5368 Tm

Magnetic Rigidity: 3.3000 Tm

Optics: K5t1.data

Store Rcl: 2.5622, 2.5368

Recall Line: Last 2.5368

Set: [Red Box]

Apply BRho:

MagDetails | Detectors | Attenuators

Do Stuff

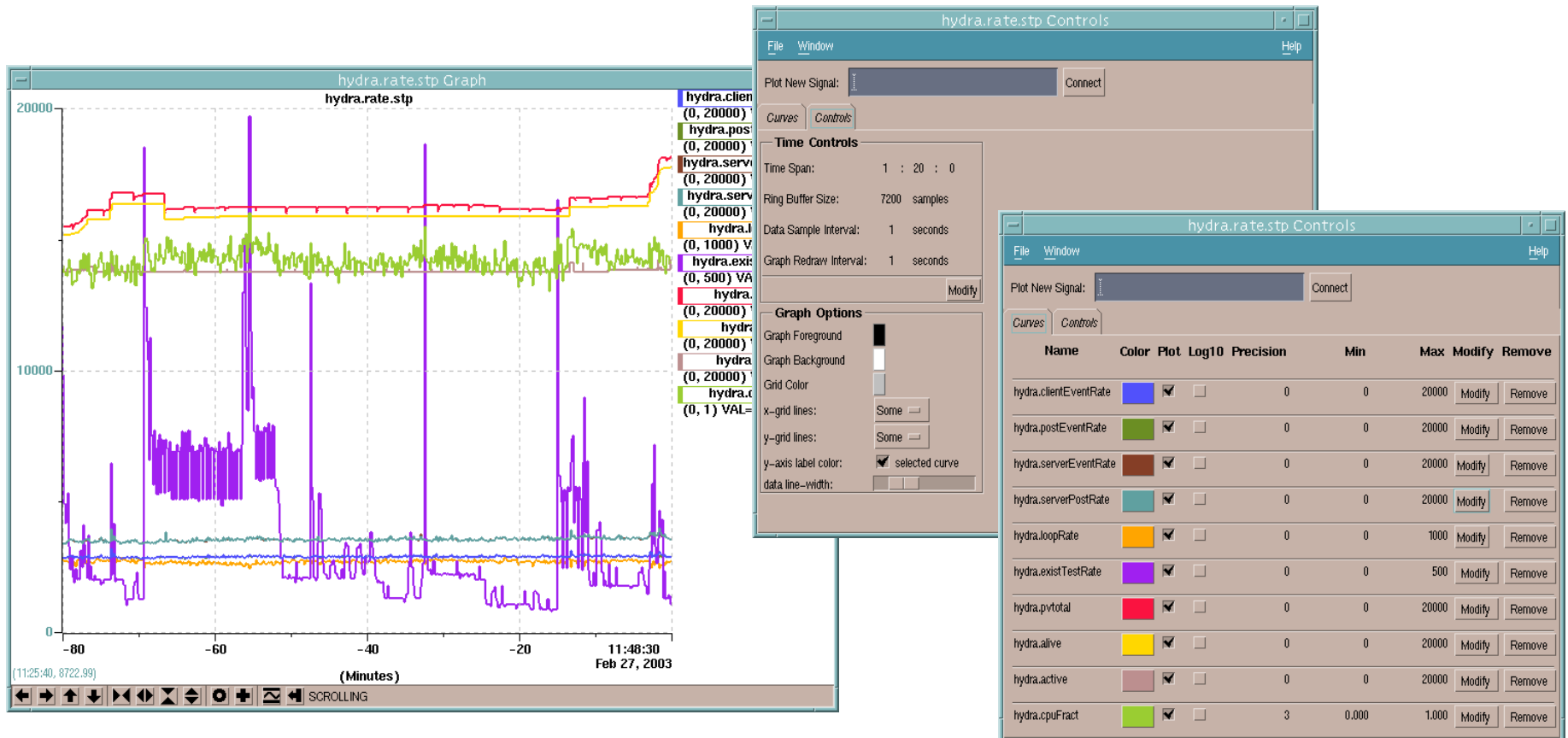
Monitor Choice: 1, 2, 3, 4, 5, 6, Camera 15

RFC2 | SFC2

(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

