ADVANCED PHOTON SOURCE

Beamline Control & Data Acquisition

Beamline-control software at the Advanced Photon Source

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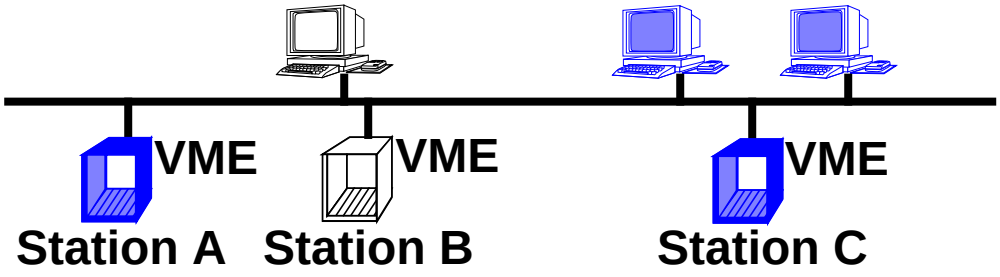
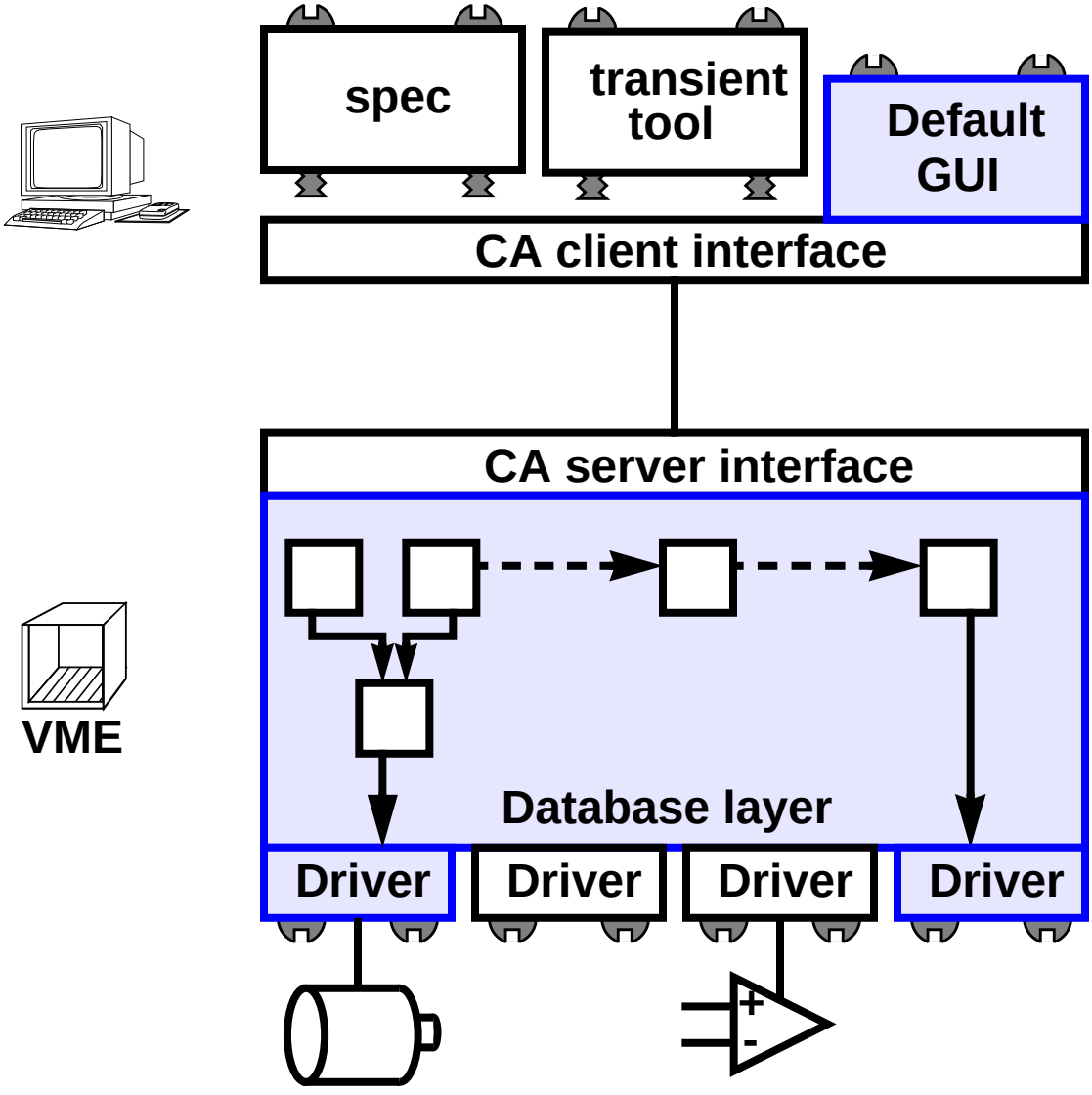
Typical beamline





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Roll call

Table 1:

sector	#stations	CAT	SOFTWARE	custom-client languages
1 BM,ID	******	SRI	EPICS, spec	IDL
2 BM,ID	*******	SRI	EPICS	IDL, tcl/tk
3 ID	****	SRI	EPICS	IDL
4 ID	***	SRI	EPICS	?
5 BM,ID	********	DND	SCIPE, spec	tcl/tk
6 ID	****	MU	EPICS, spec	?
7 BM,ID	******	MHATT	EPICS, spec	?
8 BM,ID	*****	IMM	spec	yorick
9 BM,ID	******	CMC	EPICS, spec	?
10 BM,ID	***	MR	EPICS, spec	c
11 ID	****	BESSRC	EPICS, spec	Delphi, tcl/tk,
12 BM,ID	******	BESSRC	EPICS, spec	...c++, Igor
13 BM,ID	********	GEOCARS	EPICS, spec	
14 BM,ID	**	BIOCARS	EPICS, spec	IDL, c
15 ID	****	CHEMCARS	?	?
17 BM,ID	****	IMCA	EPICS, MX	c
18 ID	***	BIO	EPICS, MX, *	tcl/tk, c, Fortran
19 BM,ID	******	SBC	EPICS, *	c
20 BM,ID	*****	PNC	EPICS, *	LabVIEW
32 ID	**	COM	spec	?
33 BM,ID	*******	UNI	EPICS, spec, *	tcl/tk
34		UNI	EPICS, spec, *	tcl/tk
35 BM,ID	****	ASD	EPICS, *	IDL

GREEN: planned, or not yet operational

BM: bending -magnet; ID: insertion device

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General remarks, issues

- **Average of one developer per sector. This developer handles sysadmin, netadmin, builds, custom software, and implementation. In many cases, the developer is also a user.**

- **EPICS-based beamline software requires facility support**

- **Three levels of EPICS application at APS beamlines**
  1. drivers + middleware (e.g., databases, SNL) + CA clients
  2. drivers + CA clients
  3. CA client only (for communication with accelerator)

- **Impromptu hardware & techniques**

- **Software is a hot-button issue. Beamlines are time shared by many users.**

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Recent developments

- **Scan-control software**
  - new completion detector--requires *no* user attention
  - unaffected by normal network latency
  - required extensive record and database modifications
  - nearly an order of magnitude faster (~250 Hz max.)

- **Data-storage software**
  - VME software writes directly to NSF-mounted disk
  - translate to NeXus (extend neXus? run as daemon?)
  - data viewer

- **String-expression software**
  - run-time integration of serial/GPIB devices
  - new EPICS record type
  - implementation of type-sensitive EPICS links

- **Remote beamline operation**
  - implemented frame-grabber, video-server software
  - developed Java software for remote-control camera
  - demonstrated the operation of an experiment station from a conference room at U. Florida

- **Motors**
  - support servo motors
  - address many requests from CAT developers and EPICS collaboration (e.g., "seek encoder index", backlash takeout for on-the-fly scans)
  - pave the way for new motor controllers and for "soft" motor support

Plans for the future

- **Improve multichannel-analyzer support**
  - Involve MCA/MCS in hardware assisted scans
  - Acquire spectra at ~100 Hz (for x-ray microscope)
  - Acquire scaler data at ~100 kHz (for x-ray tomography)
  - Goal: flexible event-analysis data acquisition
- **Data handling, visualization/analysis tools**
  - Cross-platform support for NeXus file format, and any customization of NeXus our data require
  - Run-time conversion of data files to NeXus
  - Archive experiment data, beamline parameters to DVD
- **Support automated alignment**
  - Develop a record for minimizing an arbitrary function of N variables. The record would behave much like the scan record.
- **Improve optical-table support**
  - Support new geometries using exact coordinate transforms. (Currently, transforms are correct to 1st order.)