WebScan
(or Goodbye scanSee!)
Visualising sscan data in a web browser

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Outline

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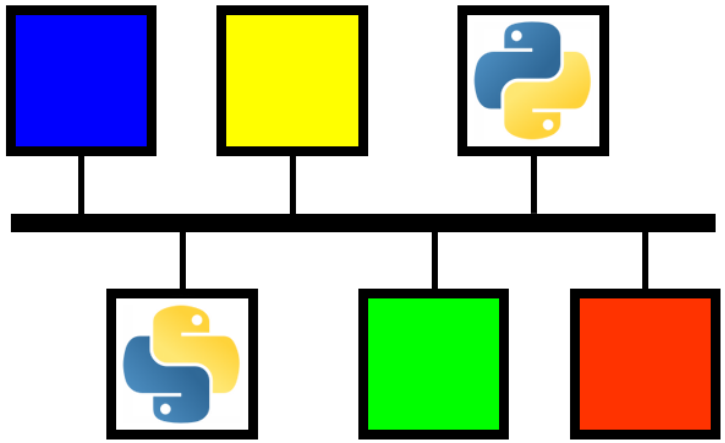
Why put scans on the web?

- Cross platform (Mac, *nix, Windoze, SunOS)
- Location independent - beamline, guesthouse, home (via VPN)
- Single instance to maintain
- Searchable archive of scan data (currently 7 days stored)

What is it?

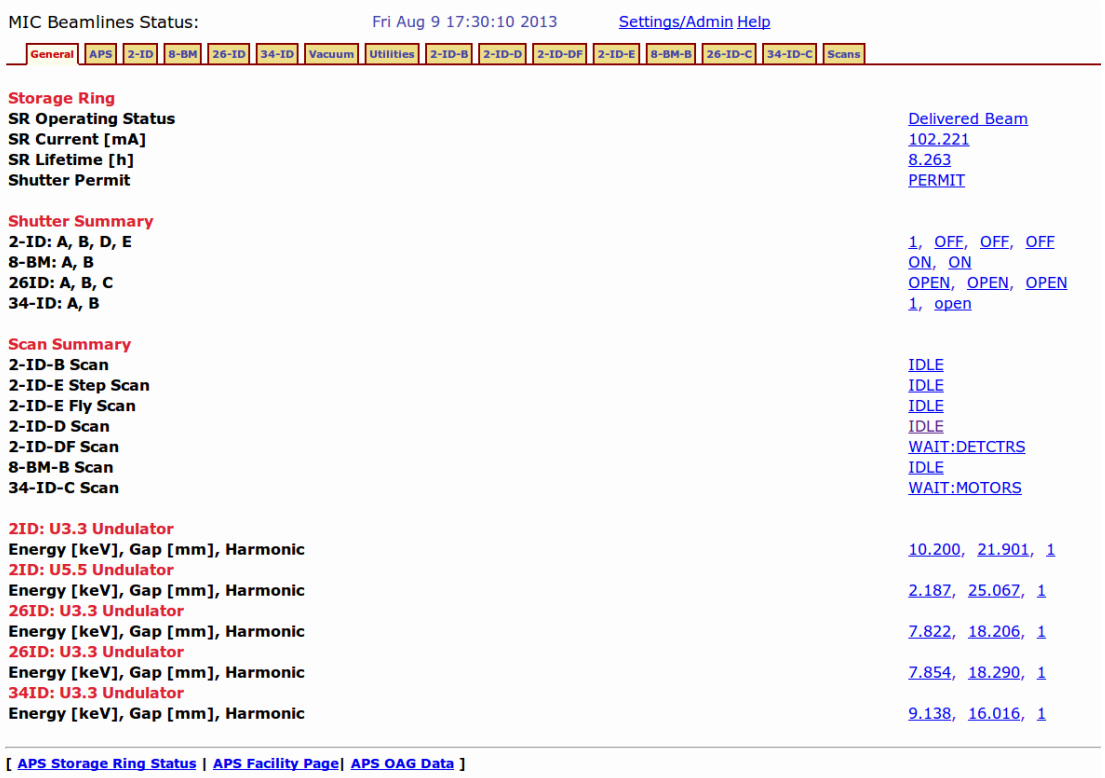
- Matt Newville's EPICS PV Archiver
  - Python + PyEpics
  - LAMP server
- WebScan
  - Javascript + Google Chart Tools + ASP



Outline

The PV Archiver

`s2pva.xray.aps.anl.gov/cgi-bin/pvarch/show.py`



MIC Beamlines Status: Fri Aug 9 17:30:10 2013 Settings/Admin Help

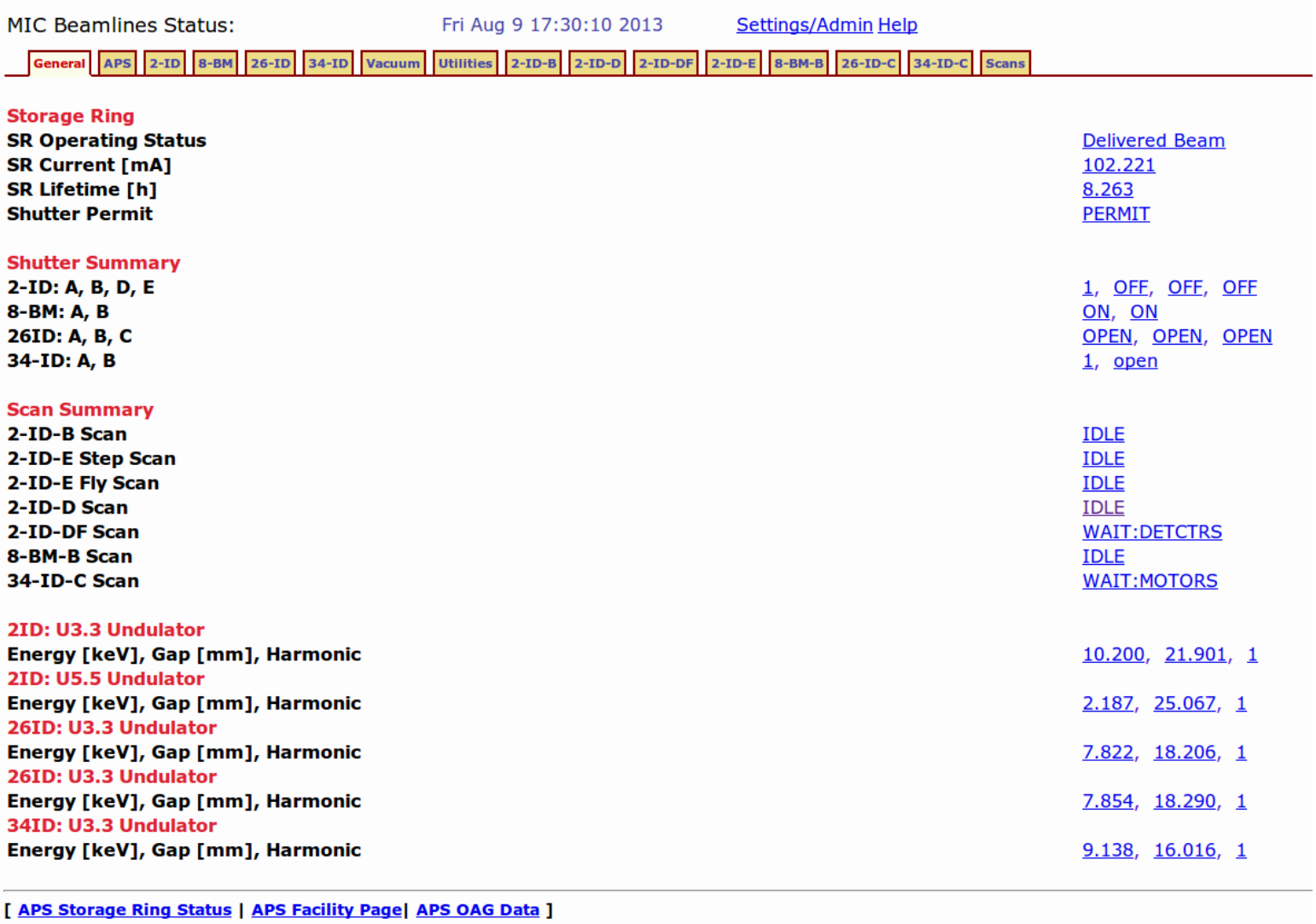
General | APS | 2-ID | 8-BM | 26-ID | 34-ID | Vacuum | Utilities | 2-ID-B | 2-ID-D | 2-ID-DF | 2-ID-E | 8-BM-B | 26-ID-C | 34-ID-C | Scans

Storage Ring	
SR Operating Status	Delivered Beam
SR Current [mA]	102.221
SR Lifetime [h]	8.263
Shutter Permit	PERMIT
Shutter Summary	
2-ID: A, B, D, E	1, OFF, OFF, OFF
8-BM: A, B	ON, ON
26ID: A, B, C	OPEN, OPEN, OPEN
34-ID: A, B	1, open
Scan Summary	
2-ID-B Scan	IDLE
2-ID-E Step Scan	IDLE
2-ID-E Fly Scan	IDLE
2-ID-D Scan	IDLE
2-ID-DF Scan	WAIT:DETCTRS
8-BM-B Scan	IDLE
34-ID-C Scan	WAIT:MOTORS
2ID: U3.3 Undulator	
Energy [keV], Gap [mm], Harmonic	10.200, 21.901, 1
2ID: U5.5 Undulator	
Energy [keV], Gap [mm], Harmonic	2.187, 25.067, 1
26ID: U3.3 Undulator	
Energy [keV], Gap [mm], Harmonic	7.822, 18.206, 1
26ID: U3.3 Undulator	
Energy [keV], Gap [mm], Harmonic	7.854, 18.290, 1
34ID: U3.3 Undulator	
Energy [keV], Gap [mm], Harmonic	9.138, 16.016, 1

[APS Storage Ring Status | APS Facility Page | APS OAG Data]

- The EPICS PV Archiver
  `cars9.uchicago.edu/~newville/Epics/PVArchiver/`

The PV Archiver



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[APS Storage Ring Status | APS Facility Page | APS OAG Data]

- Monitoring ≈ 2500 PVs, 7 beamlines, 4 sectors

Outline

System Model - PV Archiver

PV PV PV

Channel Access

Cacher

Archiver

MYSQL Queries

MYSQL DB

cgi-bin python scripts to generate webpages

Mod Python

Apache Server

Browser

Browser

Browser

Outline

Design philosophy

- Different paradigm to Archiver
  - not a replacement for mda files
- Store scan data in MYSQL DB
  - delete entries > 7 days old
- DB atomicity - scan rows
- Cache values to local variable
- Serialize and write arrays to DB
- Using callbacks:
  - no need for handshaking (AAWAIT, AWAIT)
  - sscan performance is not slowed
- Assumes that slow axis$\rightarrow$ fast axis goes Scan2$\rightarrow$Scan1$\rightarrow$ScanH

Features

Current:

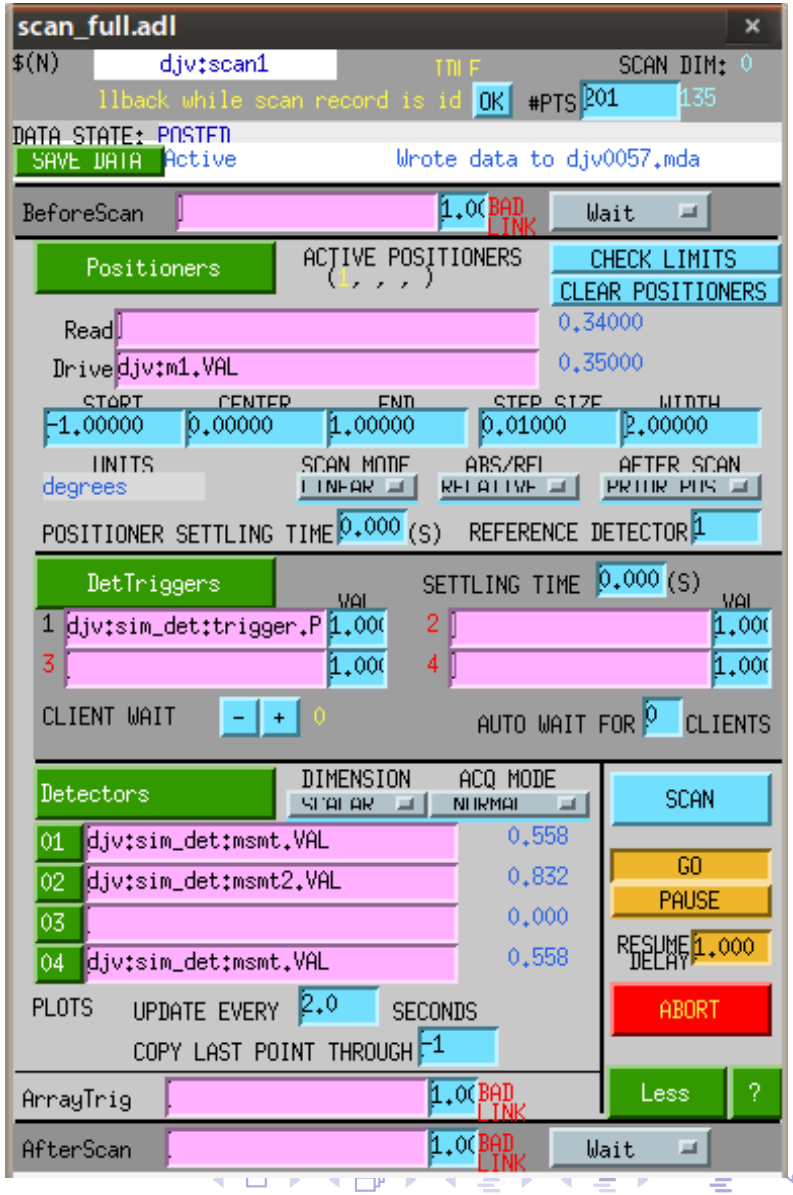
- Realtime line-by-line scan updates
- Realtime images
- Select & deselect detectors at any time during scan
- Oblivious to IOC reboot & scan progress
- Monitor scans in multiple IOCs simultaneously

Planned:

- Click through scan history
- Interactive web pages

Collecting SScan Data

- **Scalar**
  - *ioc:scan1.DnnCV*
  - Less network overhead
- **Array**
  - *ioc:scan1.DnnCA*
  - Independent of IOC reboot
  - Ensures all data collected



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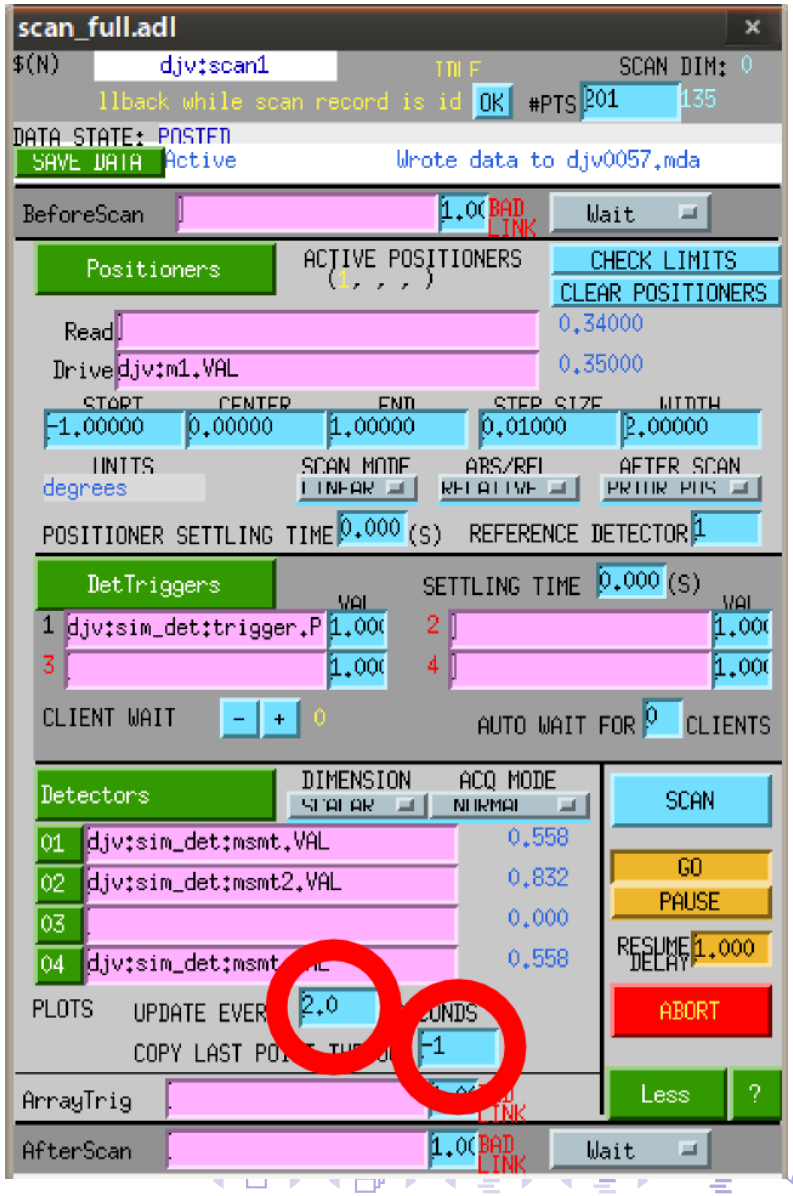

How does it work

Scan Record

DnnCA

PV

PV

PV

Channel Access

Scan

Cacher

Archiver

MYSQL DB

MYSQL Queries

Apache Server

Browser

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Browser

Mod Python

cgi-bin python scripts to generate webpages

Scan Process - Pseudocode

main loop

```
Connect to database

Connect to PVs & add callback

while True:
        Process queue

        Update scan database
```

on callback

```
Cache new value
Append pv to queue
```

Process queue

```
while not queue == empty:
    pvname, value = queue.pop()
    If pvname ends with "2.EXSC":
        if value == 1: # 2D Scan Begins
            ...
    else if pvname ends with "CA":
        ...
add pvname to scan DB queue
```

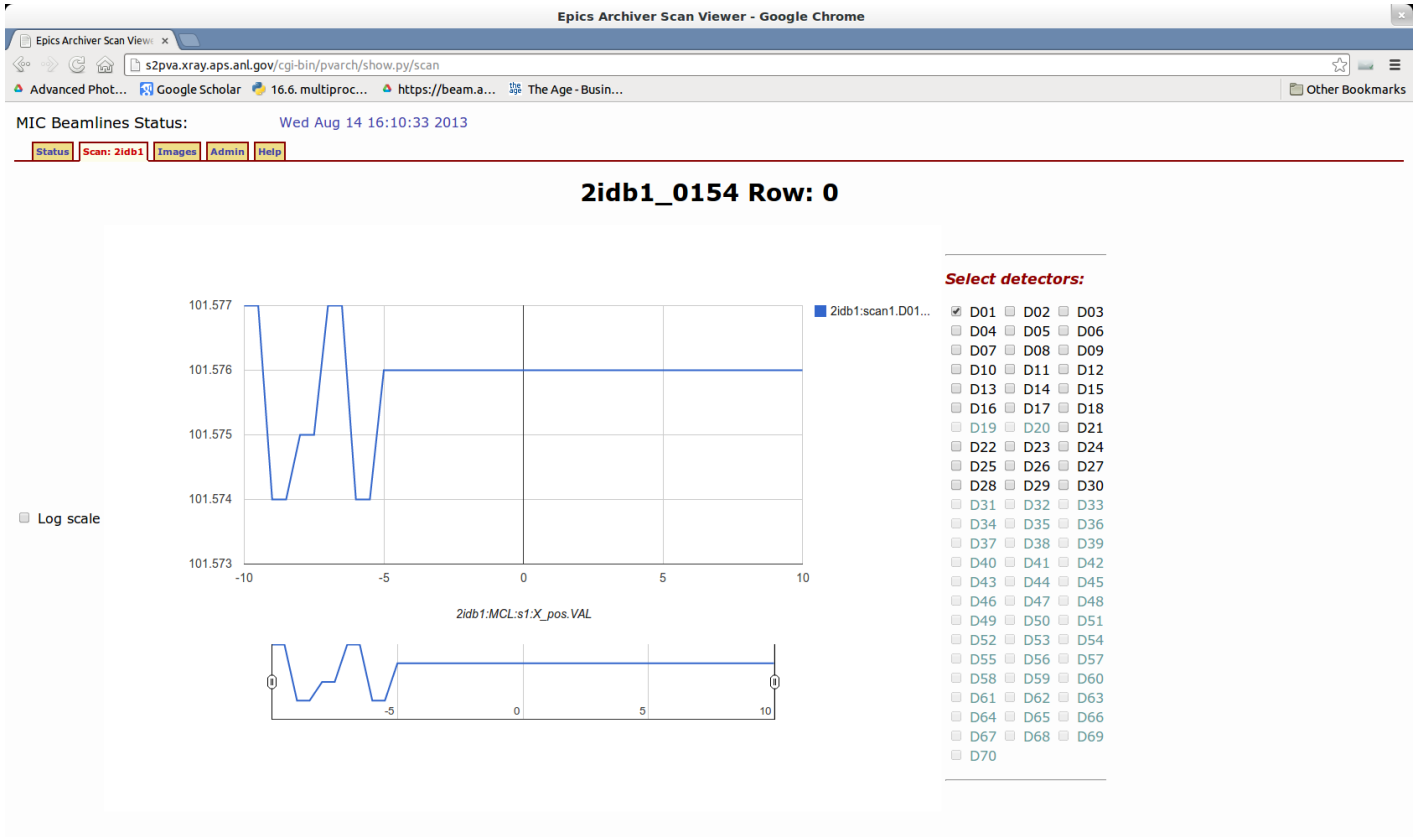
Scan Database

id	pvname	value	row	scan_id	ts
90439	djv:ScanDim.VAL	F2\n.	0	/home/david/data/mda/djv_0091	1376323793.51
82864	djv:scan1.EXSC	I0\n.	0	/home/david/data/mda/djv_0057	1376323952.784

Query for single row

MYSQL: select value from scan where pvname="djv:scan1.D01CA" and row=0 and scan_id="xxx";
Python: self.scan.select('value', 'pvname="djv:scan.D01CA" and row=0 and scan_id="xxx"'

Browser Side Interaction



- Continuous updating with ASP and Google Chart Tools
- Chart tools requires connection to internet to Google JavaScript API (data NOT sent to Google)
- Page uses ≈100% of 1 processor

Future

- Add some more advanced features of scan see - derivative, FWHM
- More interactive pages with ASP
- Migrate to Django