Controls

Archiver Appliance Report
Spring 2012

SLAC NATIONAL ACCELERATOR LABORATORY

Murali Shankar
Luofeng Li

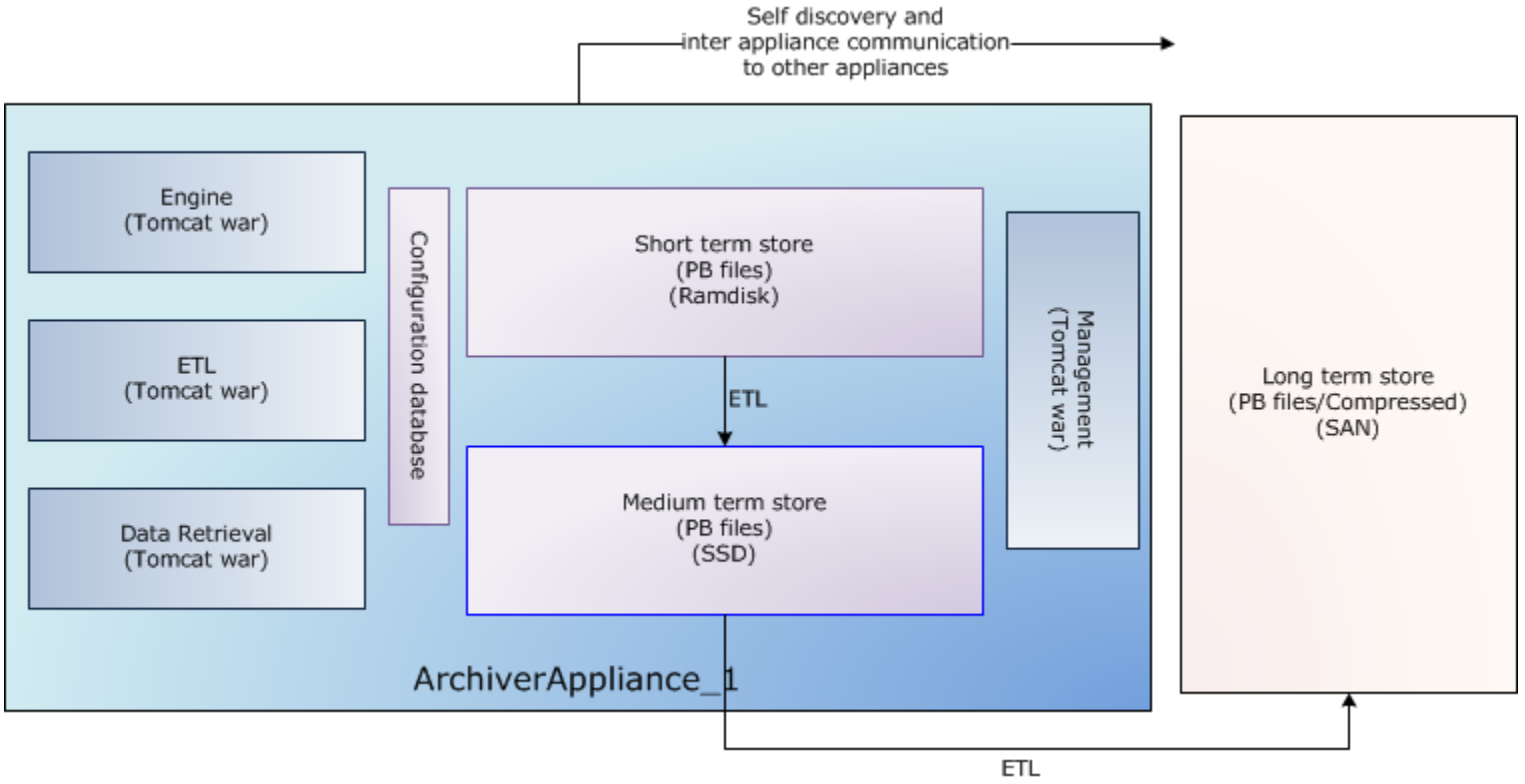
Our top 5 Objectives

Controls

- Scale to 1-2 millions PV's
- Fast data retrieval
- Users add PV's to archiver
- Zero oversight
- Flexible configurations on a per PV basis

Modules

Controls



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Retrieval

Controls

- Clients
  - ArchiveViewer
  - CSS DataBrowser
- Multiple MIME formats
  - RAW (PB over HTTP)
    - Efficient but requires client code
  - JSON
  - SVG
  - Others can be easily added (HDF5?)

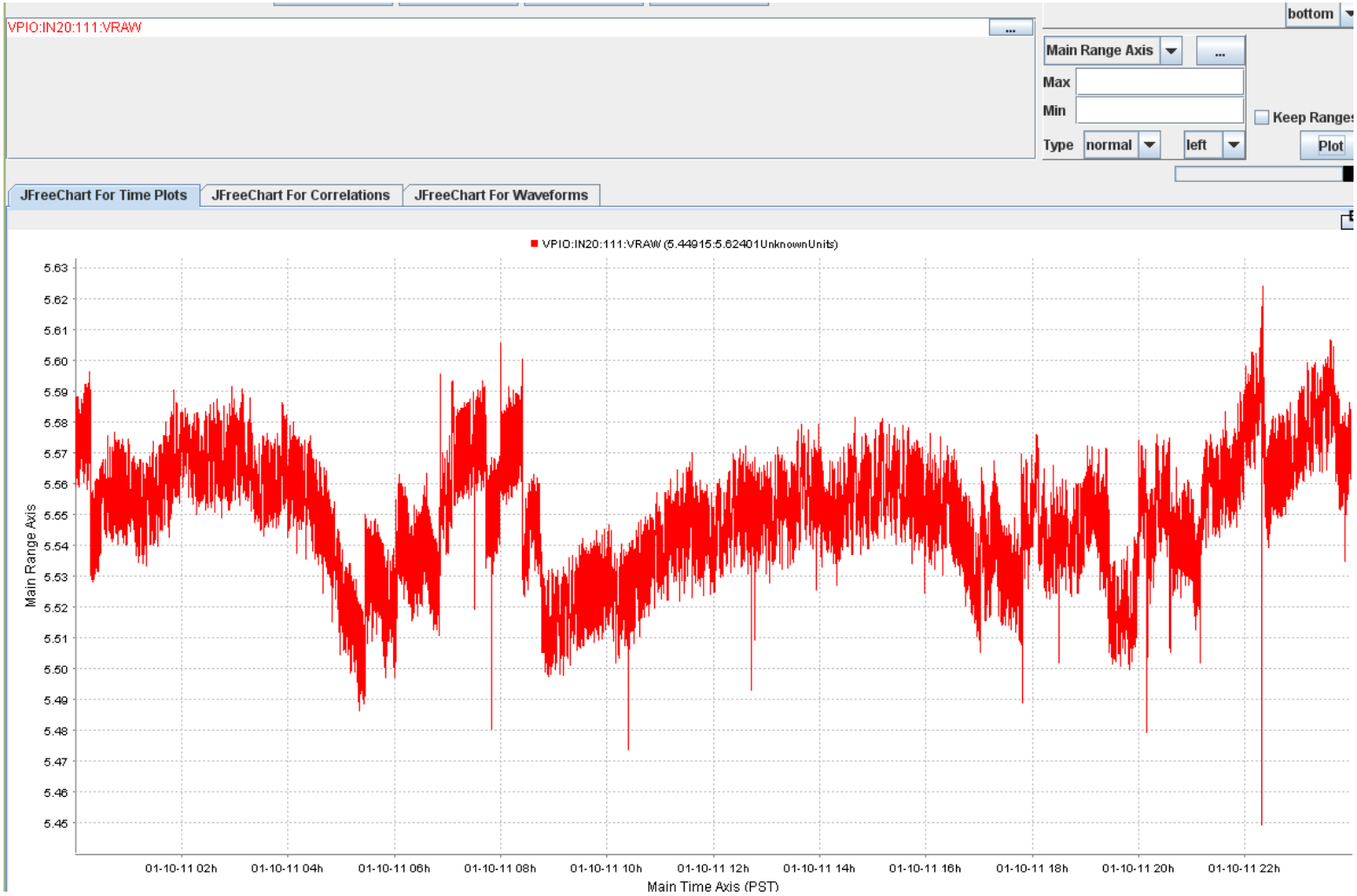
Retrieval benchmark (MTS, caches cleared)

Controls

- 1Hz DBR_DOUBLE raw data from MTS with caches cleared
  - ~ 1 days worth in 63ms returning 86395 samples
  - ~ 7 days worth in 115ms returning 604769 samples
- Goal
  - 1 days worth or raw data in 500ms or less
  - 1 years worth of sparsified data in 500ms or less.

ArchiveViewer

Controls



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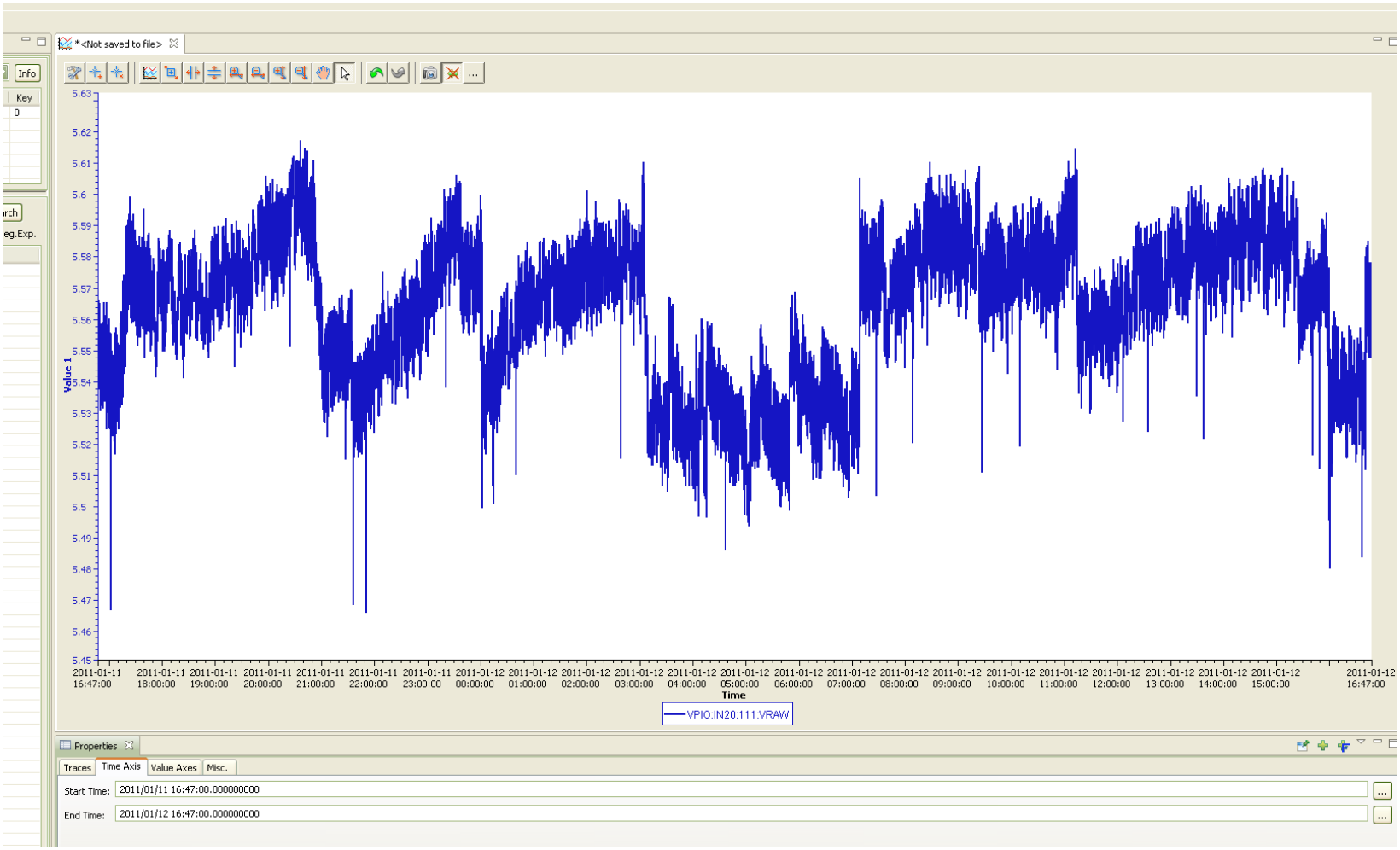
CSS DataBrowser

Controls



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Engine

Controls

- Reuse CSS engine
  - Some changes to cater to our interfaces
  - Support for Archive PV workflow
  - Support for metrics
    - Event rate for PV
    - Storage rate for PV
    - Others…
  - Support for archiving EPICS v4 datatypes

EPICS v4

Controls

- One of our milestones from last meeting.
- Proof of concept
  - Start up a V4 SIOC
  - SIOC has a PV with complex types
  - Store into PB as byte array (improve later as needed)
  - Retrieve and plot using gnuplot.

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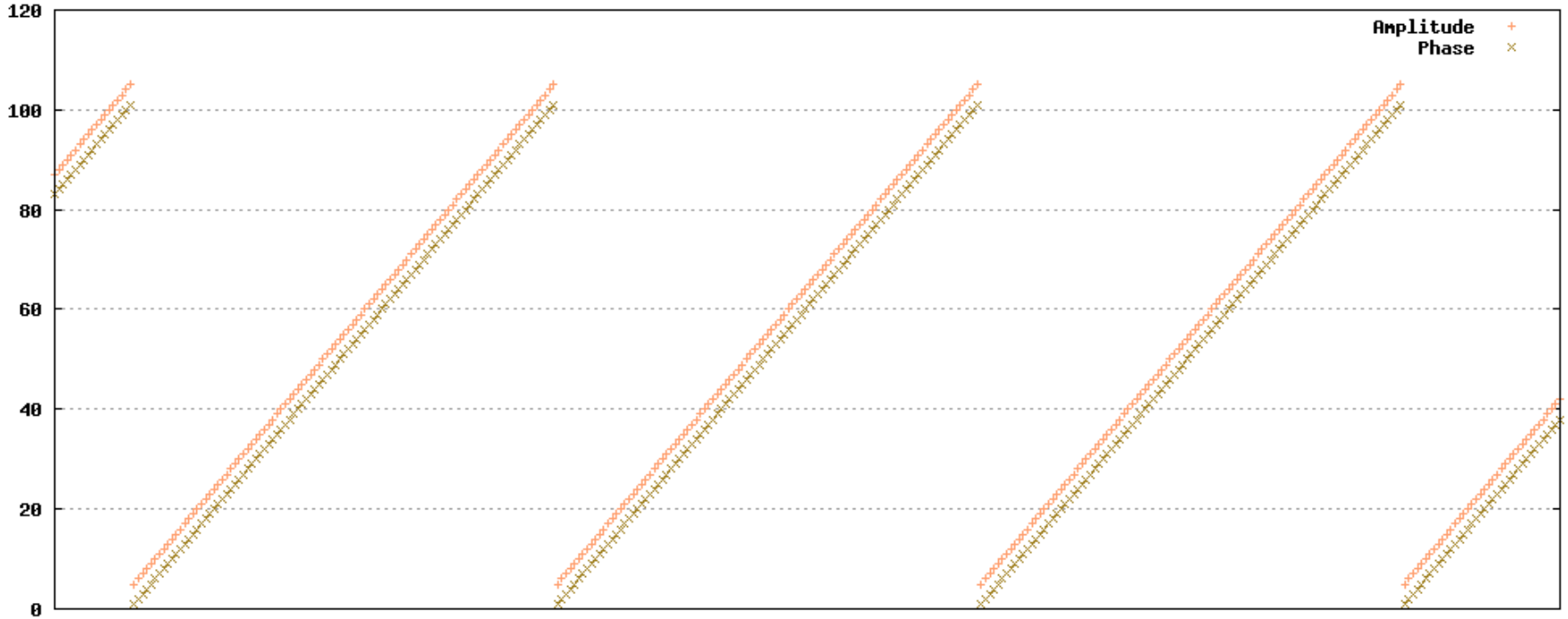
EPICS v4 data

Controls



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Clustering

- Scale by adding appliances to the cluster
  - Inter appliance communication is JSON/HTTP
  - Environment variables for appliance identity and members in cluster
    - export *ARCHAPPL_MYIDENTITY="cdlx27"*
    - export *ARCHAPPL_APPLIANCES="/nfs/appliances.xml"*
  - appliances.xml has list of appliances with
    - Identity
    - URL's for each of the modules

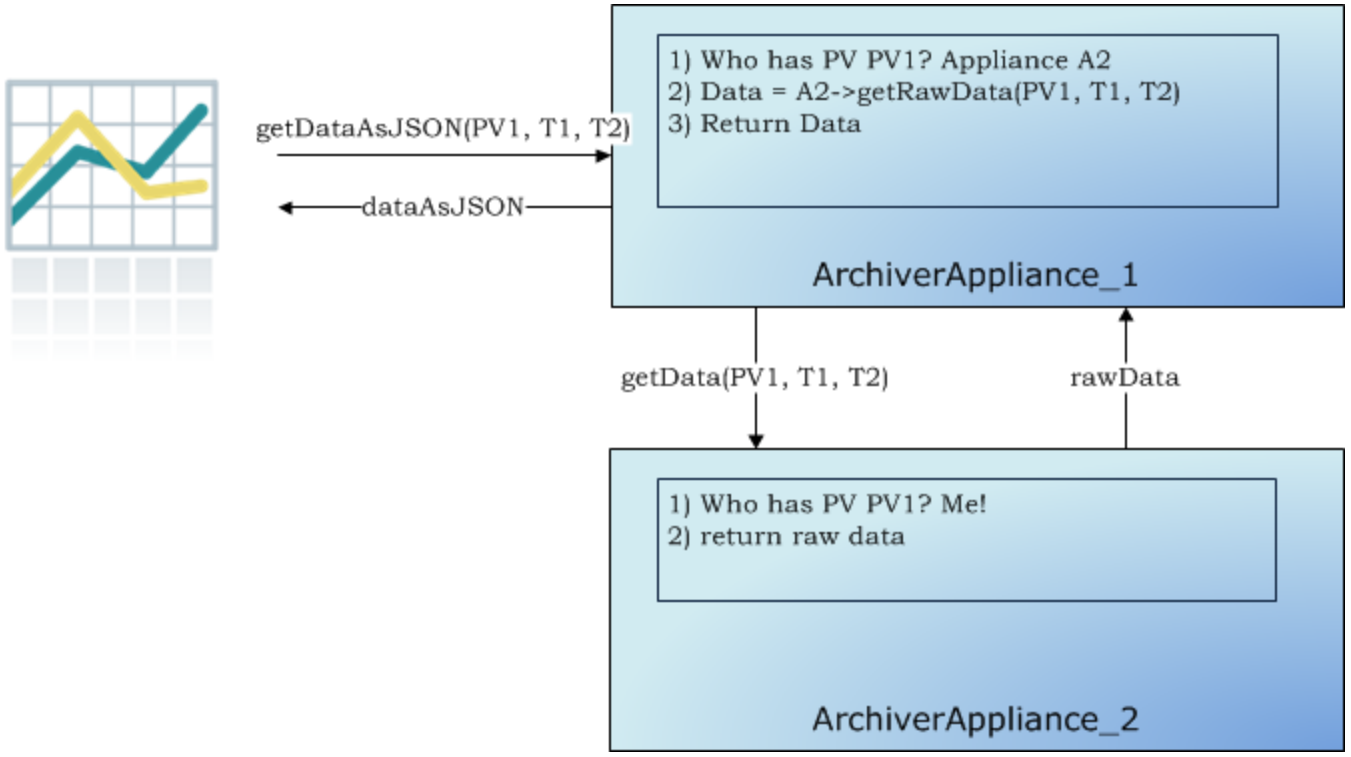
Capacity planning

Controls

- When you have a cluster of appliances, which appliance should you use to archive a PV?
  - PV is “assigned” to an appliance by capacity planning using minimax on various metrics.
  - In the “assigned” appliance
    - Engine gathers data from CA and so on
    - ETL moves it from STS → MTS → LTS and so on
- Retrieval from any appliance
  - Appliance being asked for data acts as proxy for “assigned” appliance.

Retrieval in a cluster

Controls



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Configuration

Controls

- ConfigService interface for configuration.
  - Default implementation is provided.
- ConfigService interface
  - Appliances in cluster (and “this” appliance)
  - PV Archival parameters
    - PV → “Assigned Appliance” mapping
  - PVs pending archival workflow completion
  - Channel archiver data servers
  - Policies
  - Runtime state for all modules.
  - Startup and shutdown of appliance

Scriptable interface

Controls

- All configuration can be manipulated using JSON/HTTP calls

```
#!/usr/bin/env python

import httplib
import json

httpclient = httplib.HTTPConnection('cdlx27.slac.stanford.edu:17665')
req = httpclient.request('GET', '/mgmt/bpl/getAllPVs')
resp = httpclient.getresponse()
resptext = resp.read()
allPVs = json.loads(resptext)
for pv in allPVs:
    print pv
```

Sample python script

Mgmt UI

Controls

- Web interface to system
- Uses same JSON/HTTP available to scripting.

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Home page

Controls

LCLS Archiver Appliance

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Home Reports Metrics Storage Policies Appliances Integration

This is the archiver appliance management console for the LCLS archiver. Please contact Jingchen Zhou for any questions regarding these archiver appliances. For support, please contact Murali Shankar at 650 xxx xxxx or Bob Hall at 650 xxx xxxx.

To check the status of or to archive some PV's, please type in some PV names here.

```
mshankar:arch:sine
mshankar:arch:sine1
mshankar:arch:sine2
mshankar:arch:sine3
```

Check Status | Archive | Archive (specify sampling period)

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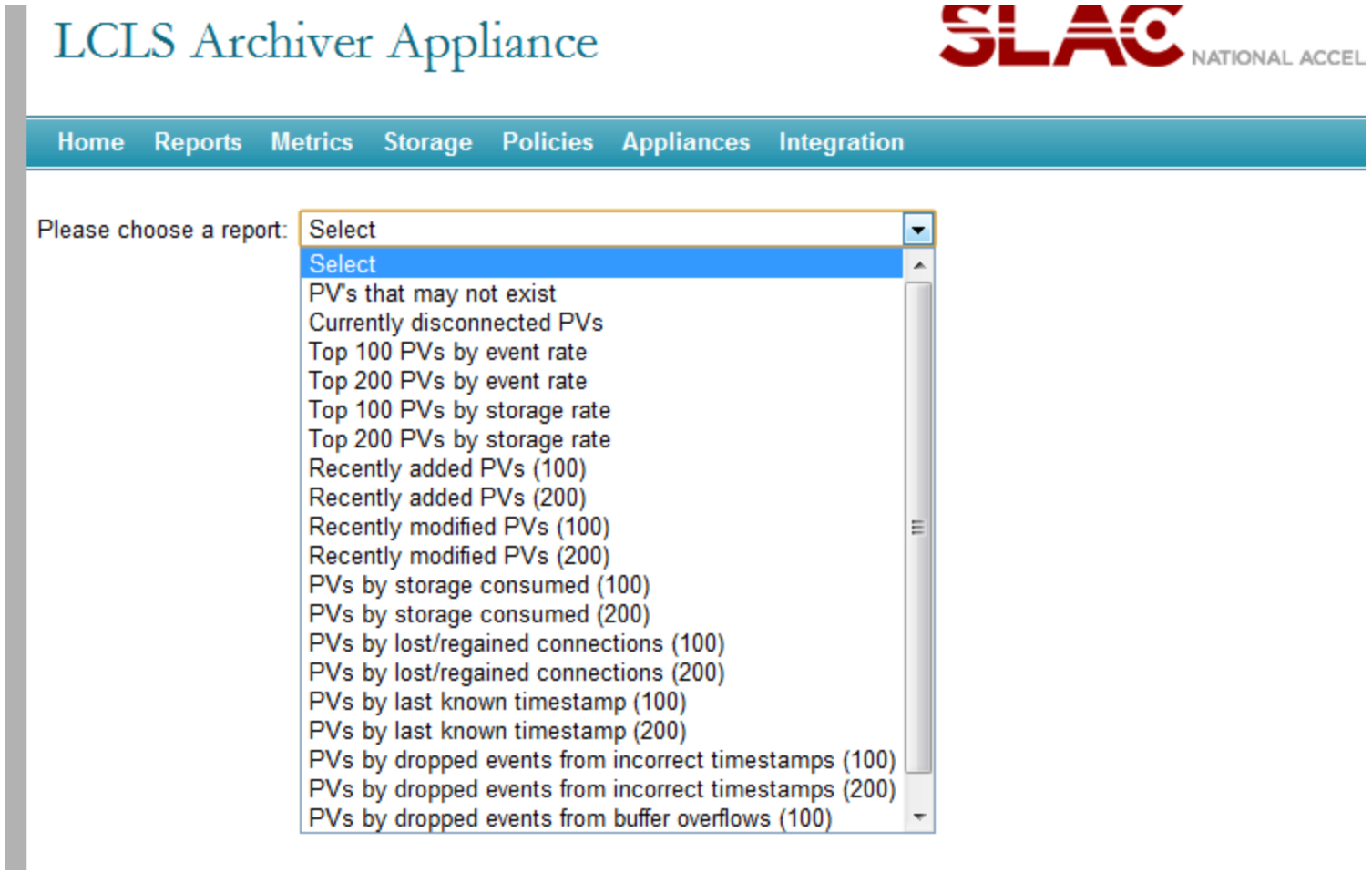
PV Name	Status	Appliance	Connected?	Monitored?	Sampling period	Last event	Details	Quick chart
mshankar:arch:sine	being archived	appliance0	true	true	1.0	Apr/19/2012 15:37:54 PDT		
mshankar:arch:sine1	being archived	appliance0	true	true	1.0	Apr/19/2012 15:37:54 PDT		
mshankar:arch:sine2	being archived	appliance0	true	true	1.0	Apr/19/2012 15:37:53 PDT		
mshankar:arch:sine3	being archived	appliance0	true	true	1.0	Apr/19/2012 15:37:53 PDT		

Reports

Controls



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Sample report

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Home | Reports | Metrics | Storage | Policies | Appliances | Integration

Please choose a report: Top 200 PVs by storage rate

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PV Name	Storage Rate (KB/hour)	Storage Rate (MB/day)	Storage Rate (GB/year)	Details	Quick chart
TORO:DMP1:685:CMFTWF	10366.98707014192	242.97625945645126	86.60774873203584		
TORO:DMP1:399:CMFTWF	10361.237718340612	242.84150902360807	86.55971757189155		
UBLF:UND1:500:BLF1D_S_R_WF	5191.145546530837	121.6674737468165	43.36780070076955		
UBLF:UND1:500:BLF1A_S_R_WF	3758.629026707048	88.09286781344645	31.40028979678511		
UBLF:UND1:500:BLF1C_S_R_WF	3626.645959526432	84.99951467640075	30.297678571178		
UBLF:UND1:500:BLF1B_S_R_WF	3624.245422632158	84.94325209294121	30.27762403703471		
TORO:DMP1:399:TRPWF	450.9211244541484	10.568463854394103	3.7670794012244606		
TORO:DMP1:685:TRPWF	450.9211244541484	10.568463854394103	3.7670794012244606		
LASR:IN20:475:PWR	84.45999313186813	1.9795310890281592	0.7055945776321075		

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Metrics

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Instance Name	Status	PV Count	Event Rate	Data Rate (GB/year)
cdlx27	Working	8986	697.65	581.23
test-arch	Working	5170	225.19	269.34

Here are the some detailed metrics of the appliance **test-arch**

Attribute	Detail
Appliance Identity	test-arch
Total PV count	5170
Disconnected PV count	0
Connected PV count	5170
Event Rate (in events/sec)	225.09
Data Rate (in bytes/sec)	9,151.44
Data Rate in (GB/Year)	268.78
Time consumed by Writting sampleBuffer to PB (in seconds)	0.04
Total number of ETL runs so far	4
Time spent in ETL (s)	0
Percentage of time spent in ETL	0.13
PVs in archive workflow	0
Engine Write Thread usage	2.5

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Archive PV workflow

- State machine
  - Ask engine to gather information
    - Event rate/storage rate etc (MetaInfo)
  - Use information gathered to determine policy
  - Policy has information on how we archive.
  - Use capacity planning to “assign” appliance
  - Ask engine on appliance to start archiving.
  - Make sure we are archiving data
  - Done

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Policies

- Policies are expressed in python.
  - Principal consumers for policies are IT folks.
  - Ability to release policy changes without releasing new code.
  - Ability to test policies outside the appliance context.
  - Python facilitates many integrations.
    - ChannelFinder/IRMIS

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Default policy

Controls

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```
#!/usr/bin/python

# policies.py
#
# Author:  M. Shankar, Jan 31, 2012
# Modification History
#        Jan 31, 2012, Shankar: Initial version of policies.py with comments.
#
# This is the policies.py used to enforce policies for archiving PVs
# At a very high level, when users request PVs to be archived, the mgmt web app samples the PV t
# In addition, various fields of the PV like .NAME, .ADEL, .MDEL etc are also obtained
# These are passed to this python script as a dictionary called 'pvInfo'.
# The script is expected to use this information to make decisions on various archiving paramete
# This is communicated back to the mgmt webapp as another dictionary called 'pvPolicy'.
# In addition, this script must communicate the list of available policies to the JVM as another

import sys
import os

# We use the environment variables ARCHAPPL_SHORT_TERM_FOLDER and ARCHAPPL_MEDIUM_TERM_FOLDER to
shorttermstore_plugin_url = 'pb://localhost?name=STS&rootFolder=${ARCHAPPL_SHORT_TERM_FOLDER}&pa
mediumtermstore_plugin_url = 'pb://localhost?name=MTS&rootFolder=${ARCHAPPL_MEDIUM_TERM_FOLDER}&
longtermstore_plugin_url = 'blackhole://localhost'

pvPolicy = {}

if pvInfo['eventRate'] > 2.0:
    pvPolicy['samplingPeriod'] = 1.0
    pvPolicy['samplingMethod'] = 'MONITOR'
    pvPolicy['dataStores'] = [
        shorttermstore_plugin_url,
        mediumtermstore_plugin_url,
        longtermstore_plugin_url
        ]
```

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Upload Channel Archiver config files

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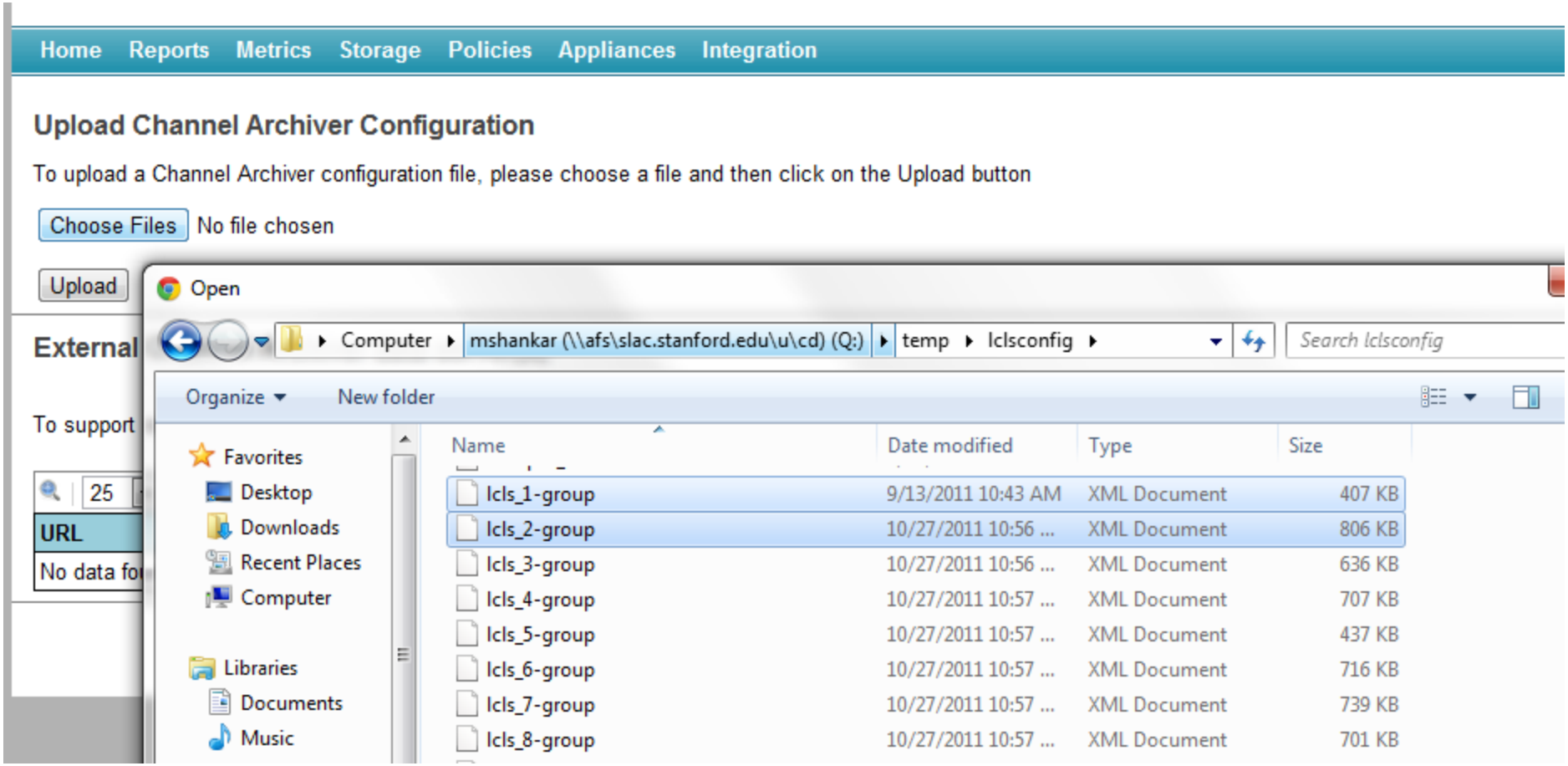

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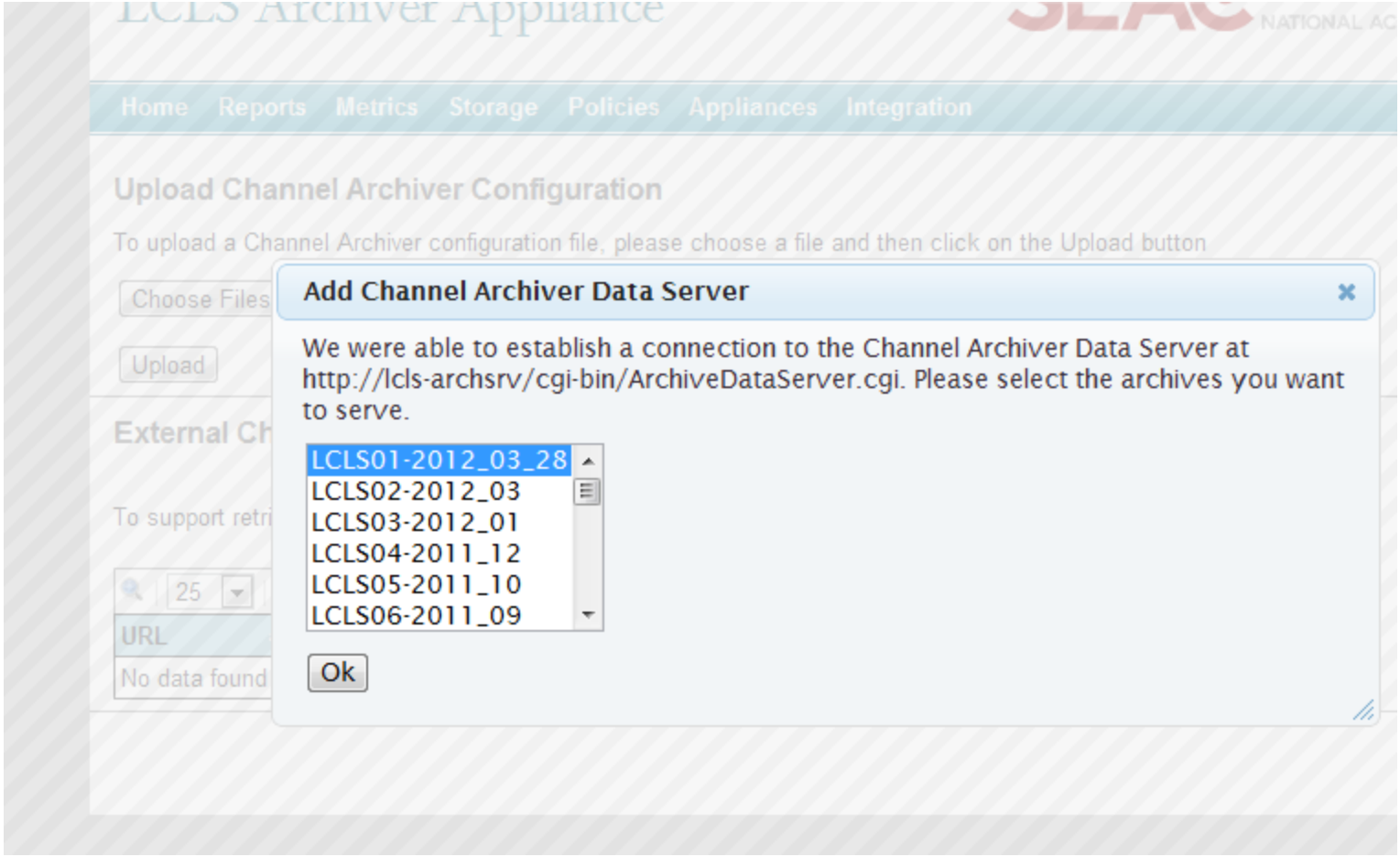
Proxy Channel Archiver data server

Controls



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Site specific builds

Controls

These are site specific

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Next steps

Controls

- Recent features
  - Support for compression
  - Conditional archiving
- Upcoming features
  - Additional post processing operators (RMS, RMS/mean etc.)
  - Sparsification
- Production deployment this fall

Questions

Controls

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