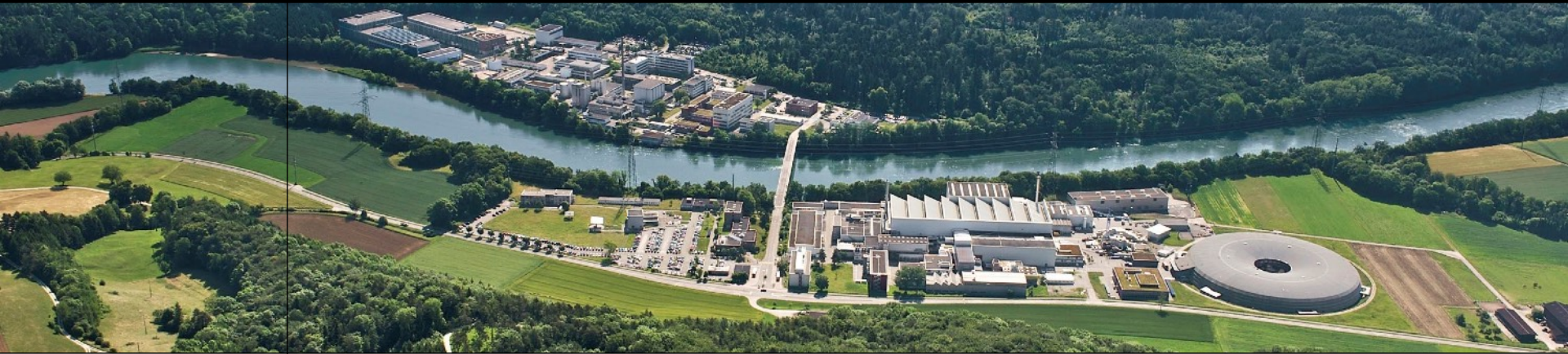




Wir schaffen Wissen – heute für morgen

Paul Scherrer Institut

Alexandre Gobbo

PShell, a Swiss Army knife for experiment automation

Automation in Beamline Control and Data Acquisition - 2019 - HZB

- 1. Overview**
- 2. Motivation**
- 3. PShell @ PSI**
- 4. Features**
- 5. Questions**

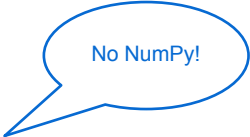
Design platform for experiment scripting, data acquisition and instrumentation control.

- ▶ PSI in-house development since 10.2014.
- ▶ In use at SLS, SwissFEL and Proscan.

- Paper: <http://icalepcs2017.vrws.de/papers/tush102.pdf>
- Source code: <https://github.com/paulscherrerinstitute/pshell>
- Download: <https://github.com/paulscherrerinstitute/pshell/releases>
- Posters: http://icalepcs.synchrotron.org.au/posters/mopgf061_poster.pdf
http://icalepcs2017.vrws.de/posters/tush102_poster.pdf

- Scripted logic
- Reliability & maintainability
- Drop-in deployment, no initial configuration
- Fast learning curve and low support cost
- Architectural freedom & flexible user interface
- Extensible with easy creation of custom GUI
- Automated version management
- Modern protocols

Python



No NumPy!

Java

Single jar

Intuitive API & Tutorials

CLI, GUI, Web, Mobile

Plugins

GIT

REST, ZMQ

In Production for DAQ

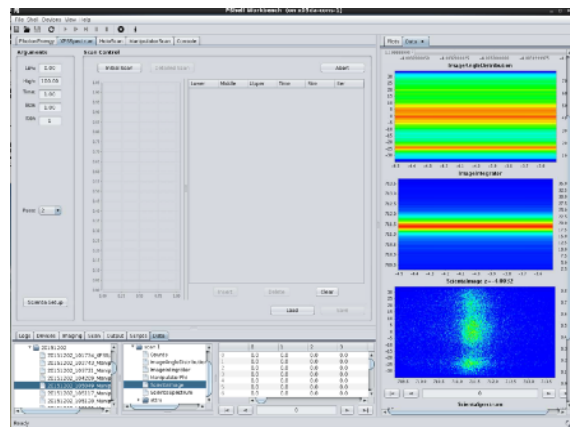
- X03DA (Pearl)
- X07MA (X-Treme)
- X11 (SIM)
- X04SA-ES2 (MS PD)

In Commissioning

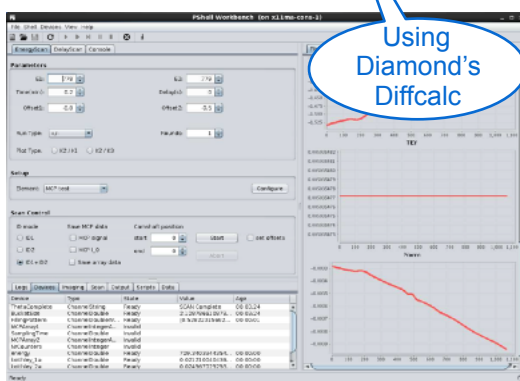
- X07MB (Phoenix)
- X10DA (SuperXAS)
- X05LA (MicroXAS)
 - Replacing FDA
- X04SA-ES3 (MS SD)
 - Replacing SPEC

Beamline Setup / Device Testing

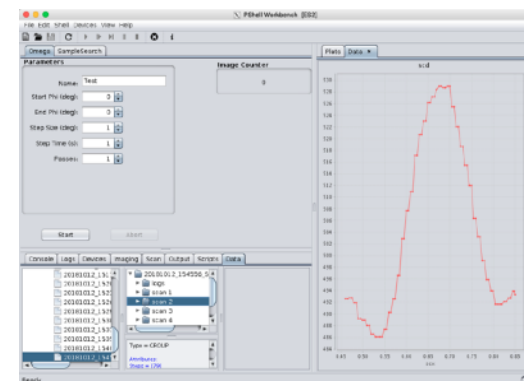
- X06SA (PXI)
- X10SA (PXII)
- X06DA (PXIII)
 - Replacing IDL
- X12SA (CSAXS)
- X01DC (IR)



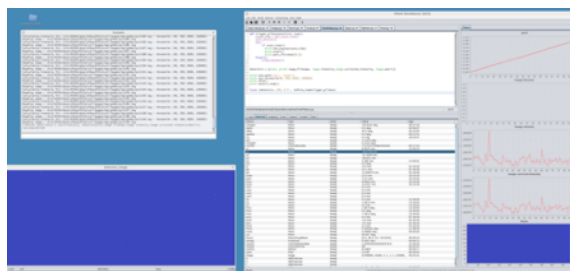
X03DA



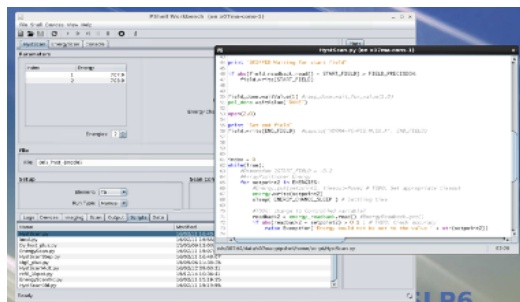
X11MA



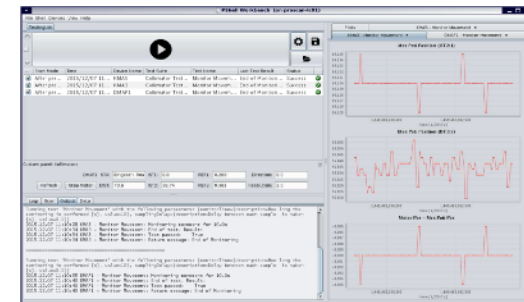
X07MA



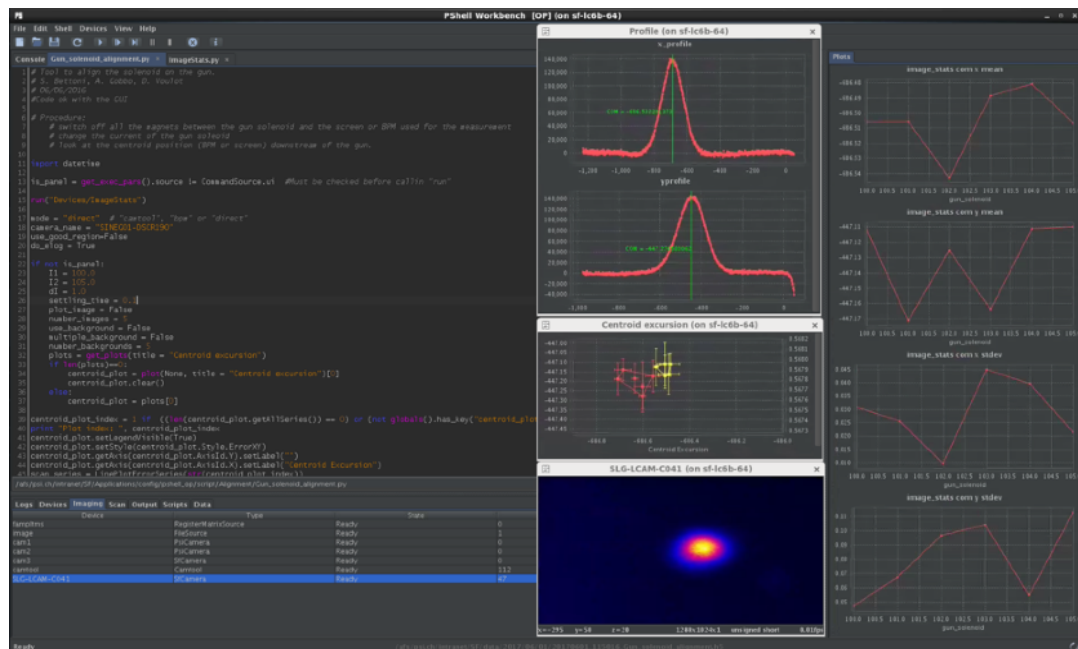
X04SA-ES3



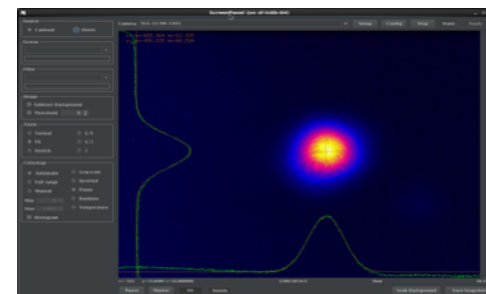
X04SA-ES2



Proscan Test Sequencer



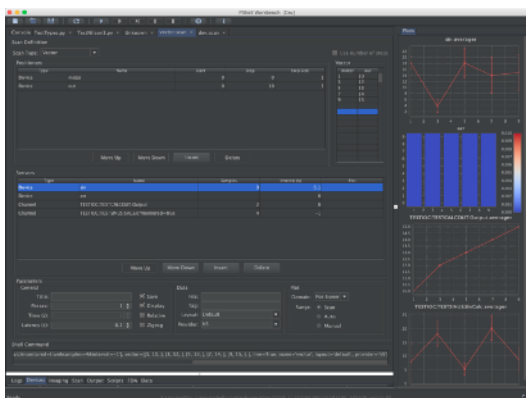
A DAQ script in development in the Control Room.



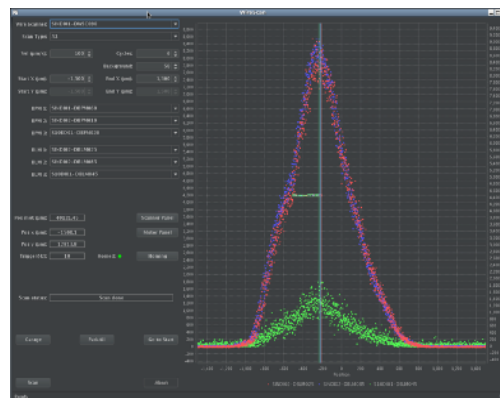
Panel plugin: CamServer visualization



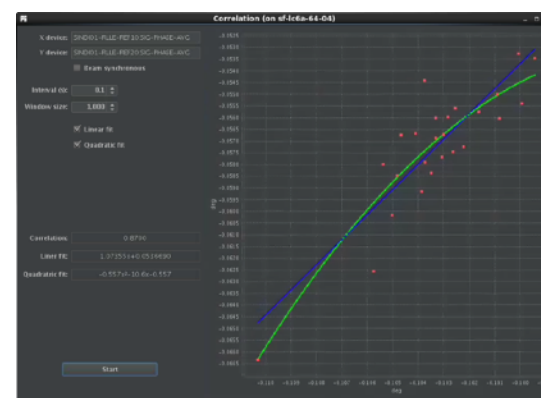
Time plot utility ("StripChart")



Simple scan using Scan Editor



Panel plugin: BLM DAQ



Panel plugin: correlation utility

Delivered

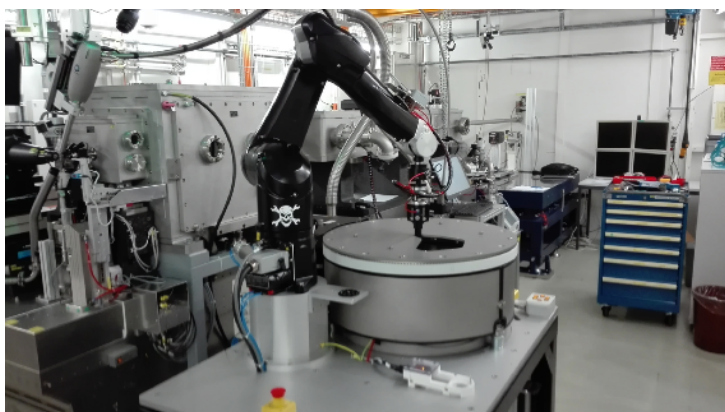
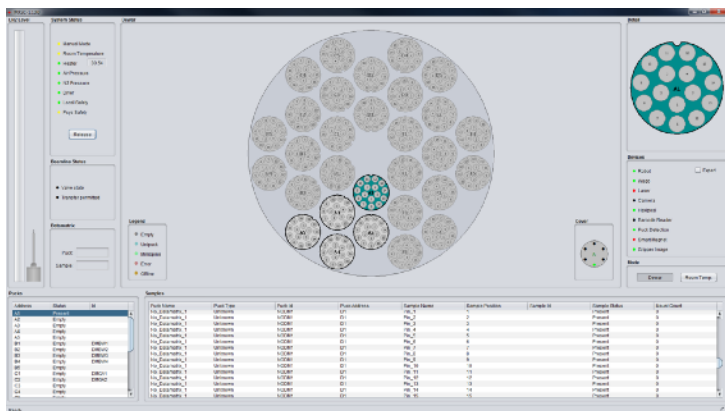
- SwissFEL MX Experiment at Bernina beamline

In Commissioning

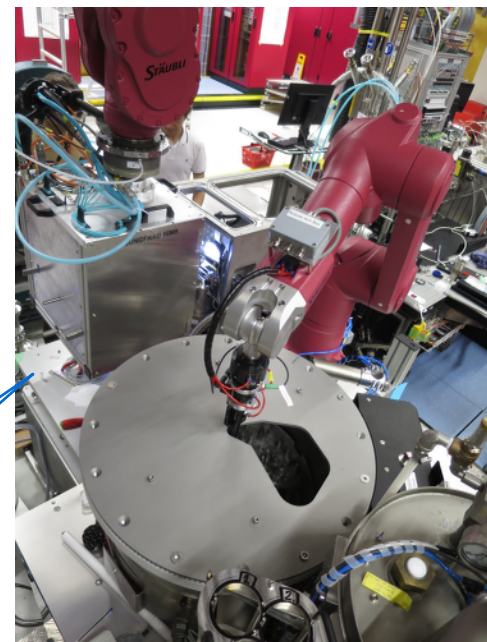
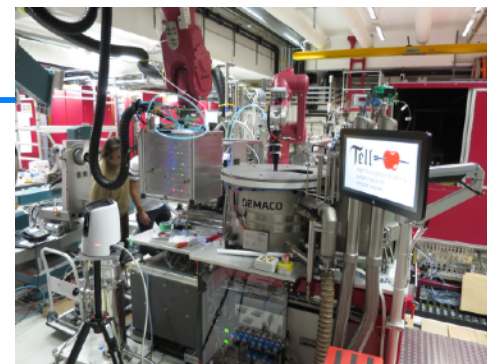
- SLS X06SA

Following

- SLS X06DA
- SLS X10SA



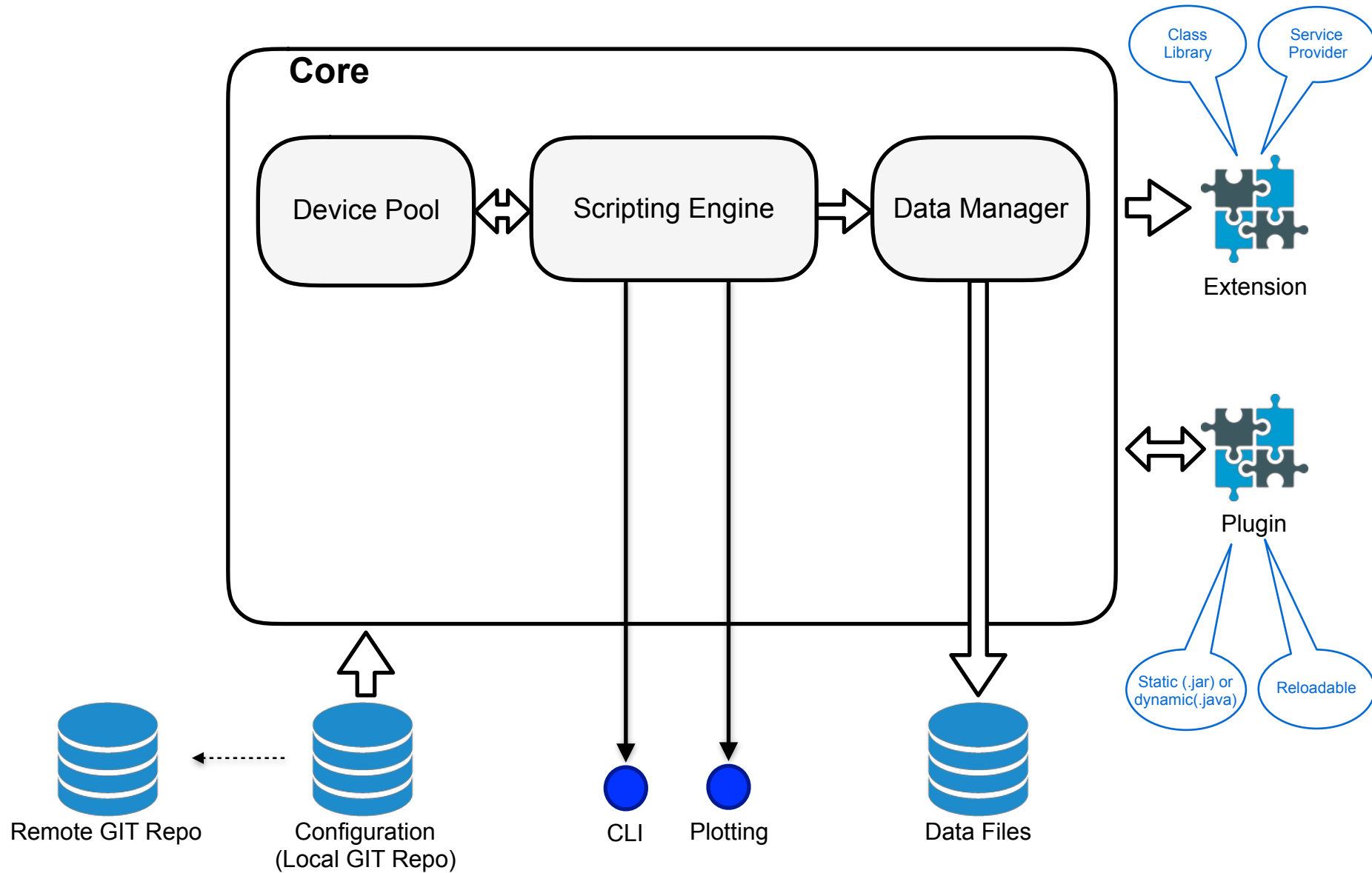
SLS X06SA - PXI

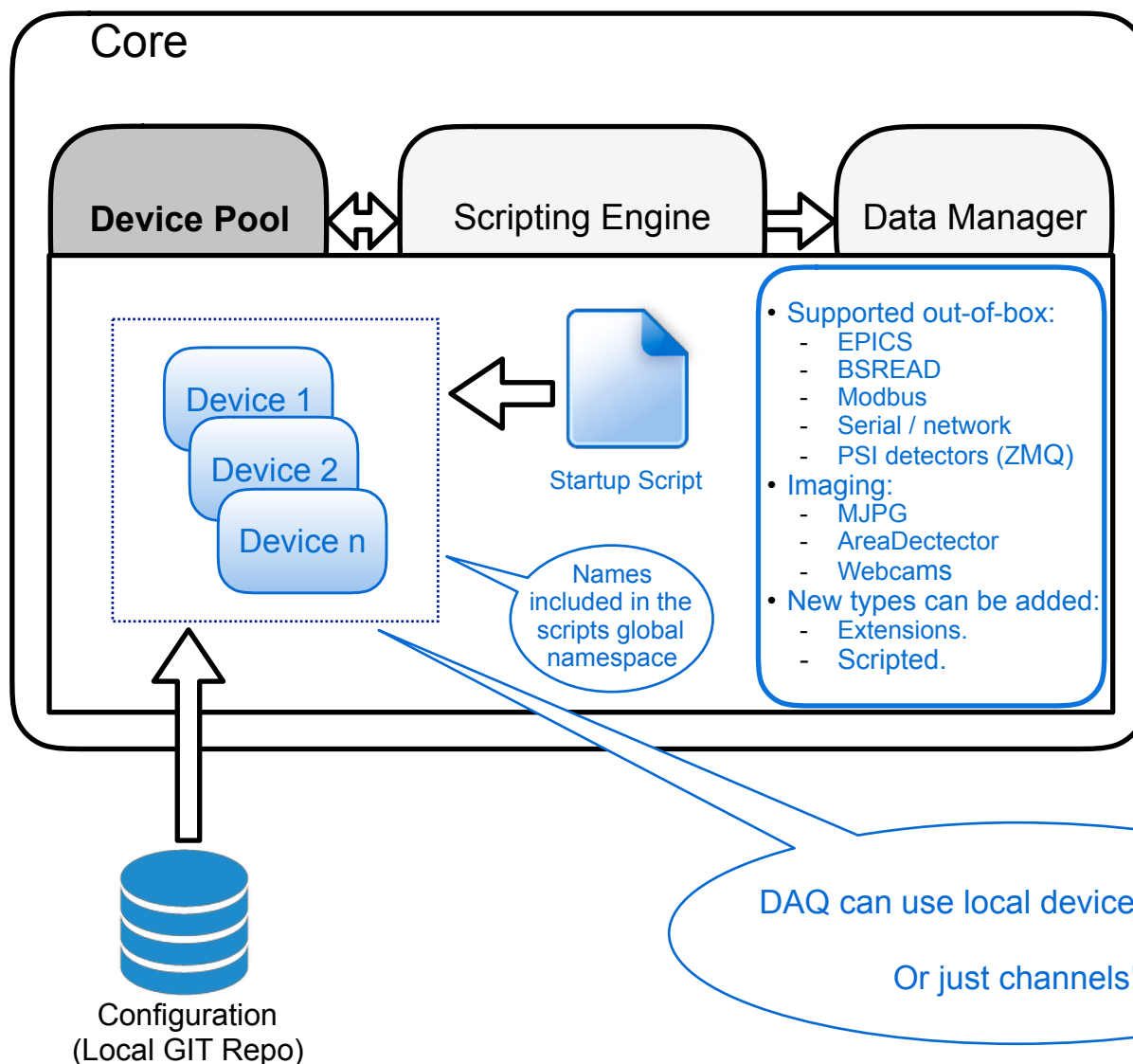


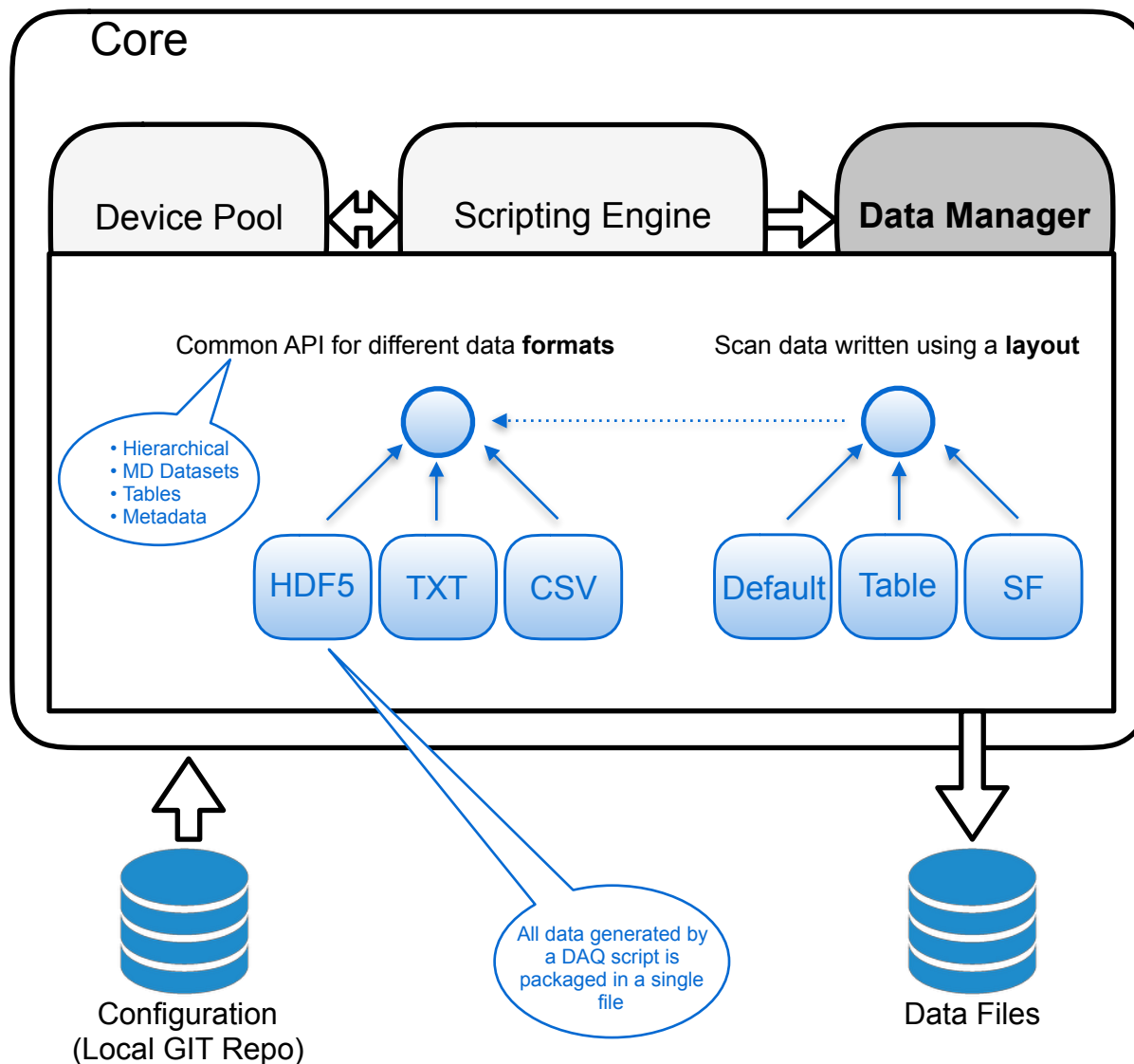
PShell is also suited for developing and packaging instrumentation software: smooth transition from prototyping to final software and easy integration.

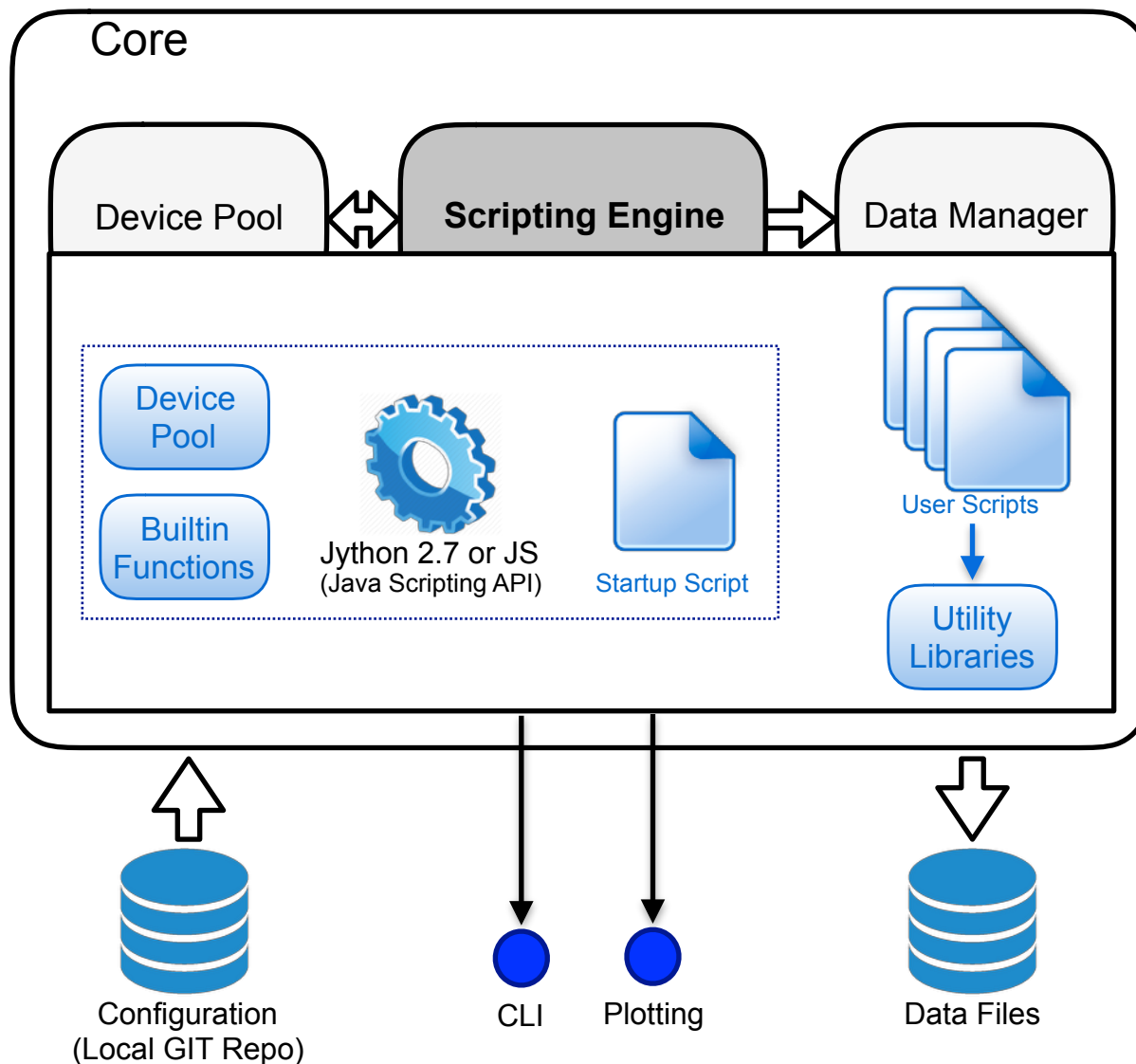


SwissFEL ESB

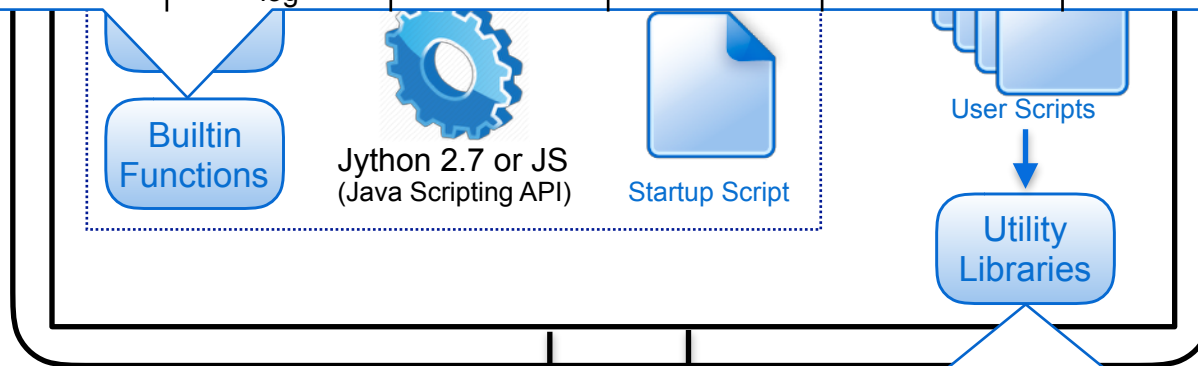






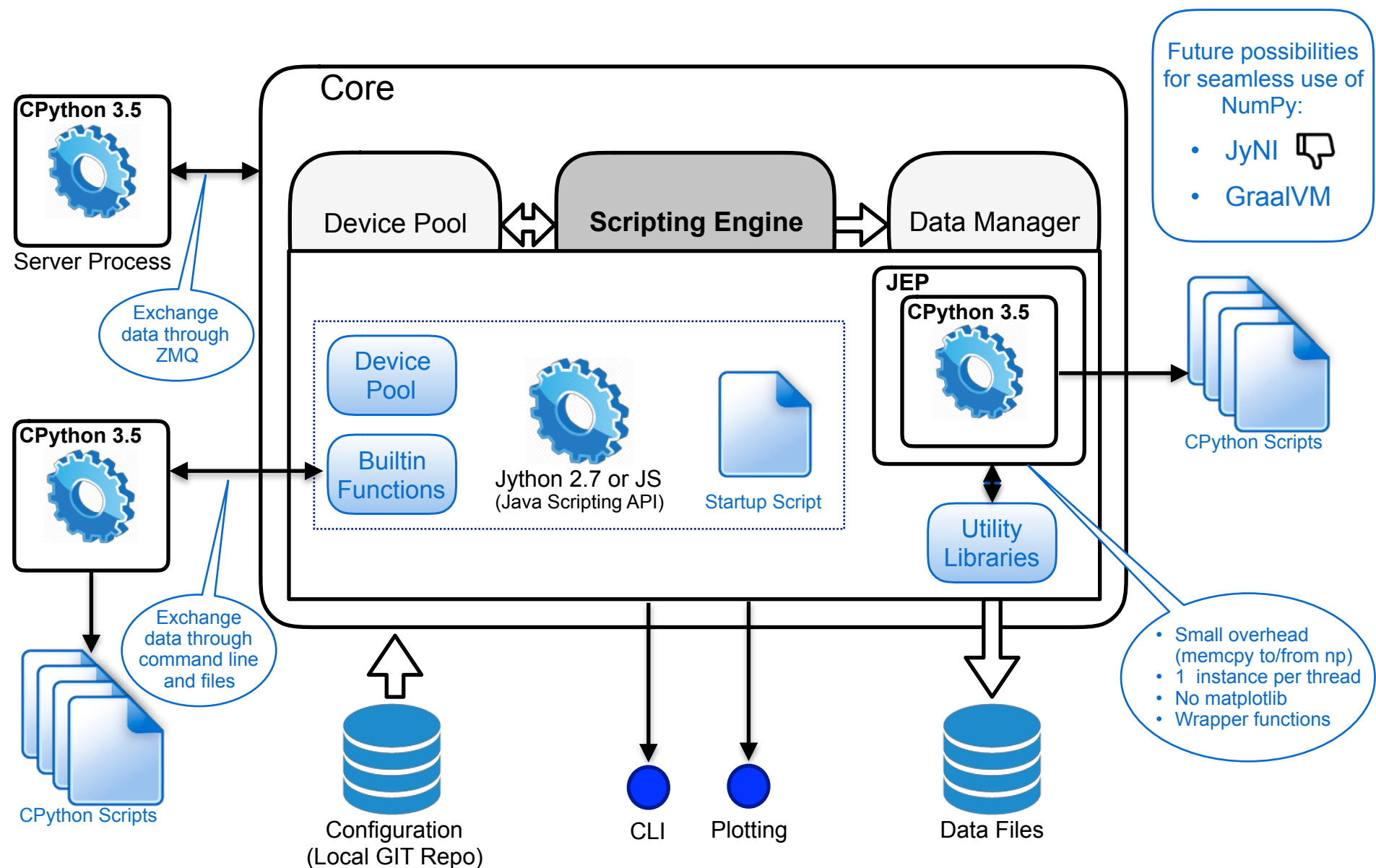


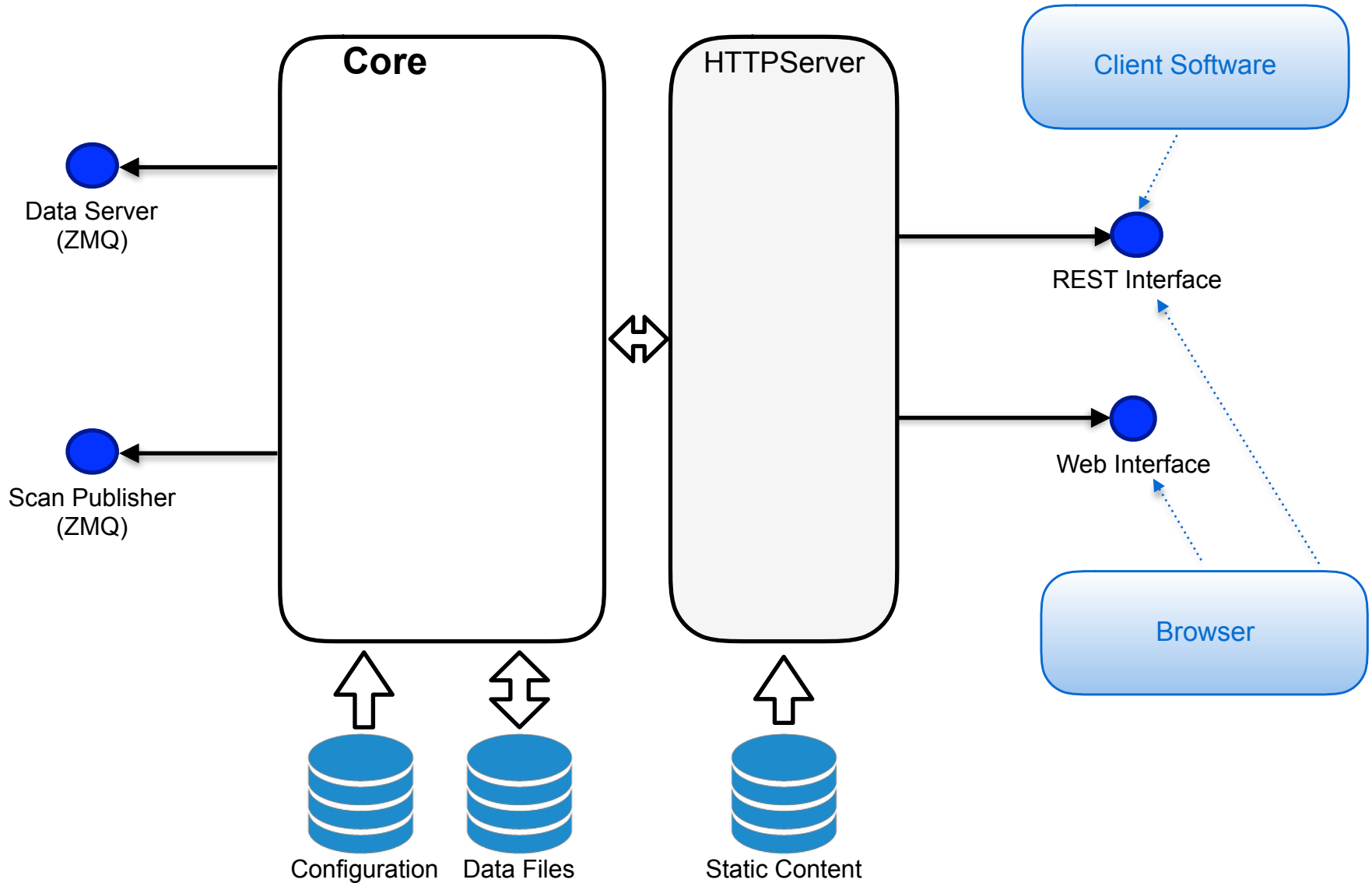
Scan	Plot	Data	EPICS	Execution	Devices	Math	Utilities
lscan vscan ascan rscan cscan hscan bscan tscan mscan escan bsearch hsearch	plot get_plots	load_data get_attributes save_dataset create_group create_dataset create_table append_dataset append_table flush_data set_attribute set_exec_pars get_exec_pars log	caget cawait camon caput caputq	fork join parallelize run abort start_task stop_task set_return exec_cmd exec_cpython	add_device remove_device get_device set_device_alias stop update reinit create_device create_averager	armul, arradd, arrdiv, arrsub, arrabs, arroff mean variance stdev center_of_mass poly histogram convex_hull	get_setting set_setting bsget frange flatten to_array to_list inject notify help



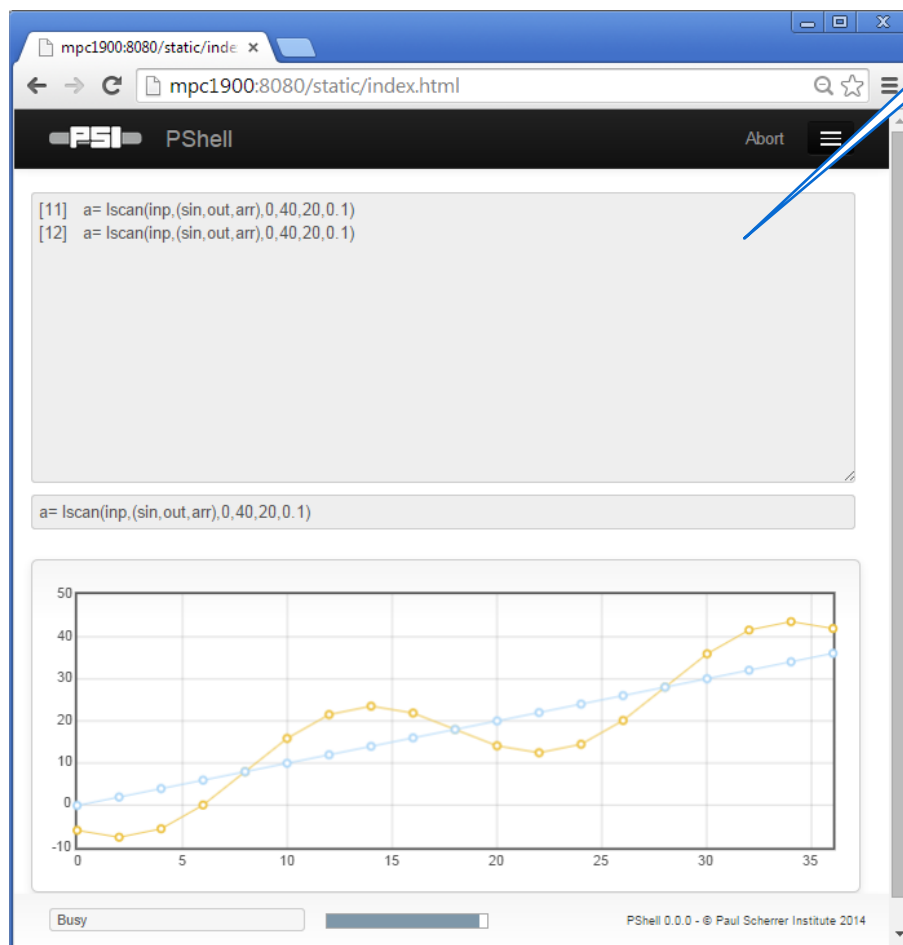
mathutils	ijutils	plotutils	jeputils	diffutils
Facade to Apache Commons Math: - Derivative - Interpolation - Least square - Fitting - Peak search - FFT	Facade to ImageJ: - Image manipulation & conversion - Convolution - Threshold - Binary Functions - Particle Analysis - Image Operators, Rank, EDM, FFT	Simplify plotting of CommonMath functions and simple shapes.	Facade do JEP: - Run / Call / Eval Support: - NumPy - SciPy - Pandas	Interface to Diamond's Diffcalc, mapping HKL to PShell positioners.

Replacement of NumPy for common tasks as sample alignment and beamline setup





- Complete for managing server installation.
- Unfinished for end-user front end.

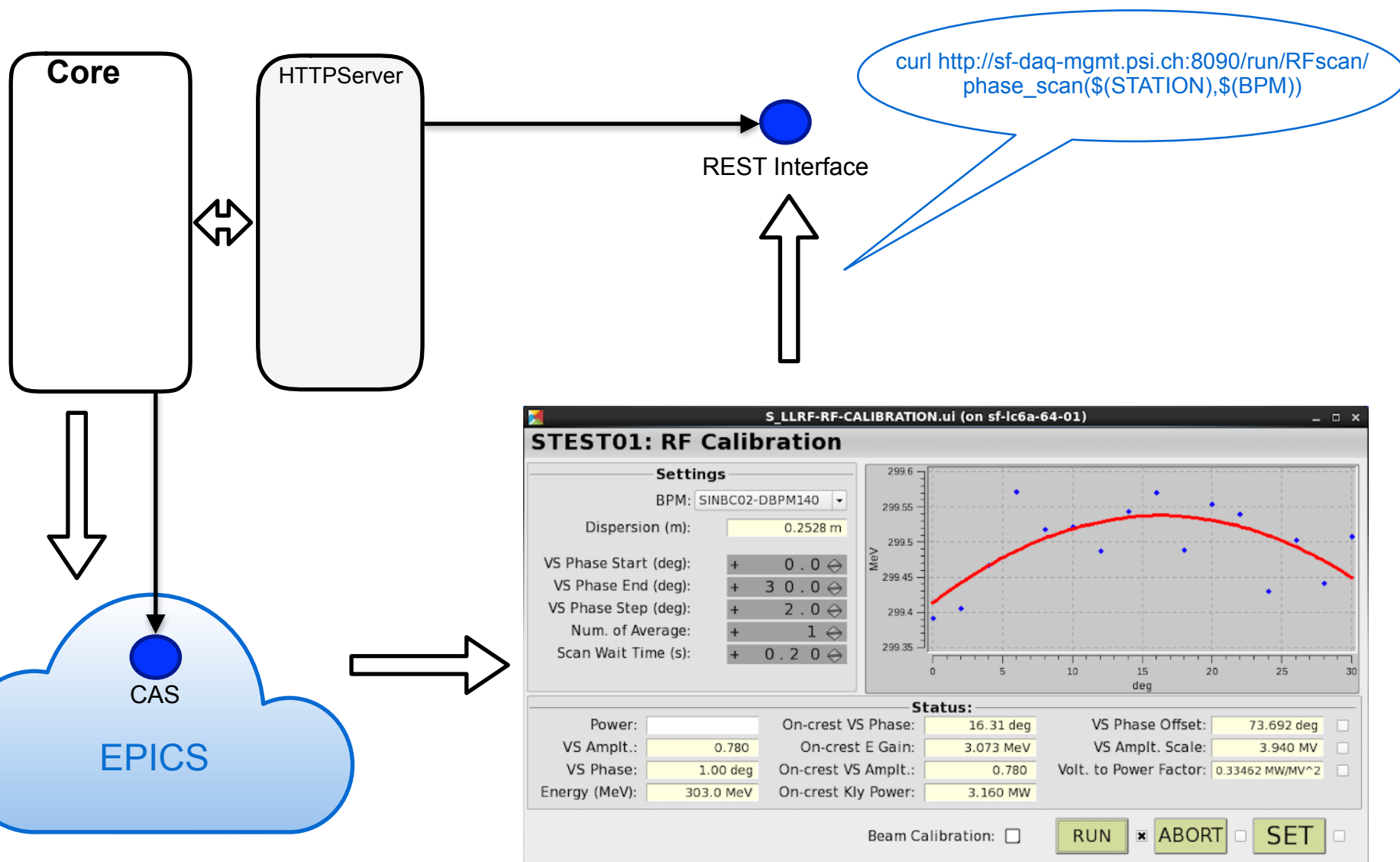


The screenshot shows the PSI PShell web client interface displaying a table of device status. The browser address bar displays `mpc1900:8080/static/devices.html`. The interface includes a "Devices" section and a "Logs" section. The table below lists the status of various devices:

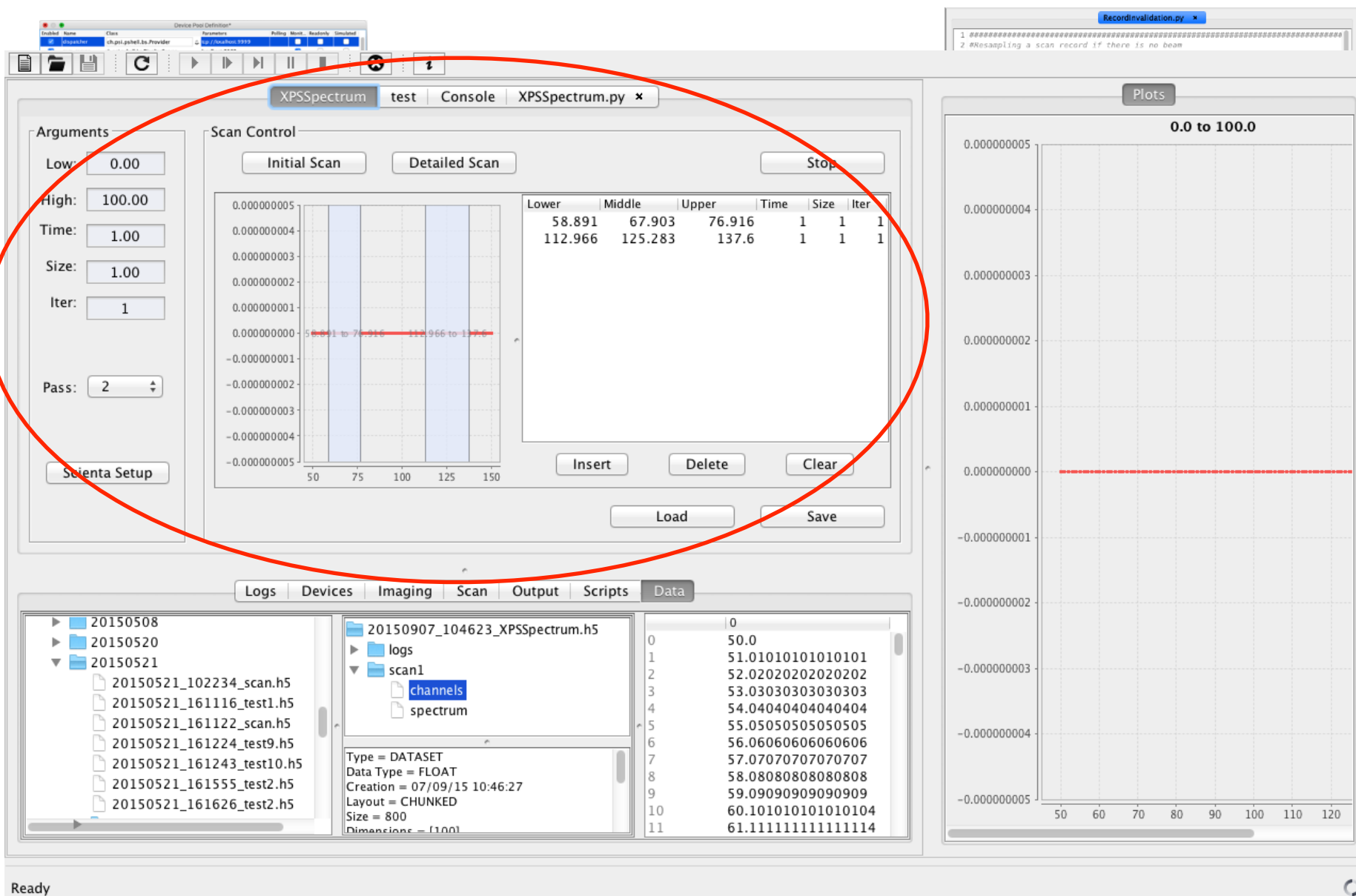
Device	Type	State	Value	Age
arr	ChannelDoubleArray	Ready	[40.0, 0.0, 0.0, 0.0, 0.0...]	00:00:33
dev	DummyRegister	Ready		
dev2	MyDevice	Ready		
inp	ChannelDouble	Ready	40.0	00:00:33
inpc	ChannelDouble	Ready		
motor	EpicsMotor	Ready	0.0	00:00:33
out	ChannelDouble	Ready		
outc	ChannelDouble	Ready		
pv	EpicsProcessVariable	Ready		
sin	ChannelDouble	Ready	49.510565	00:00:00
vhq	ChannelDouble	Invalid		

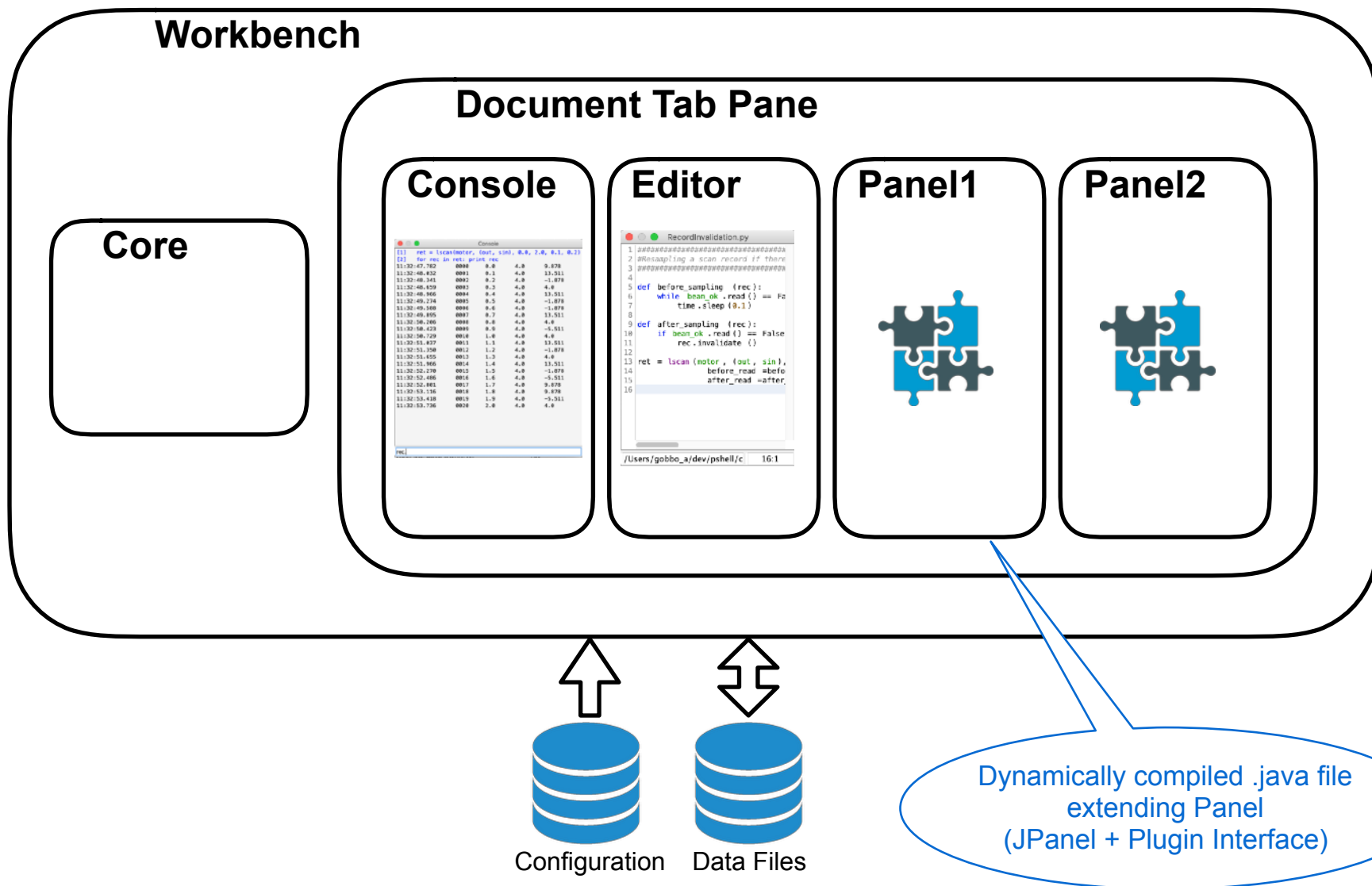
At the bottom of the interface, there is a "Ready" status indicator.

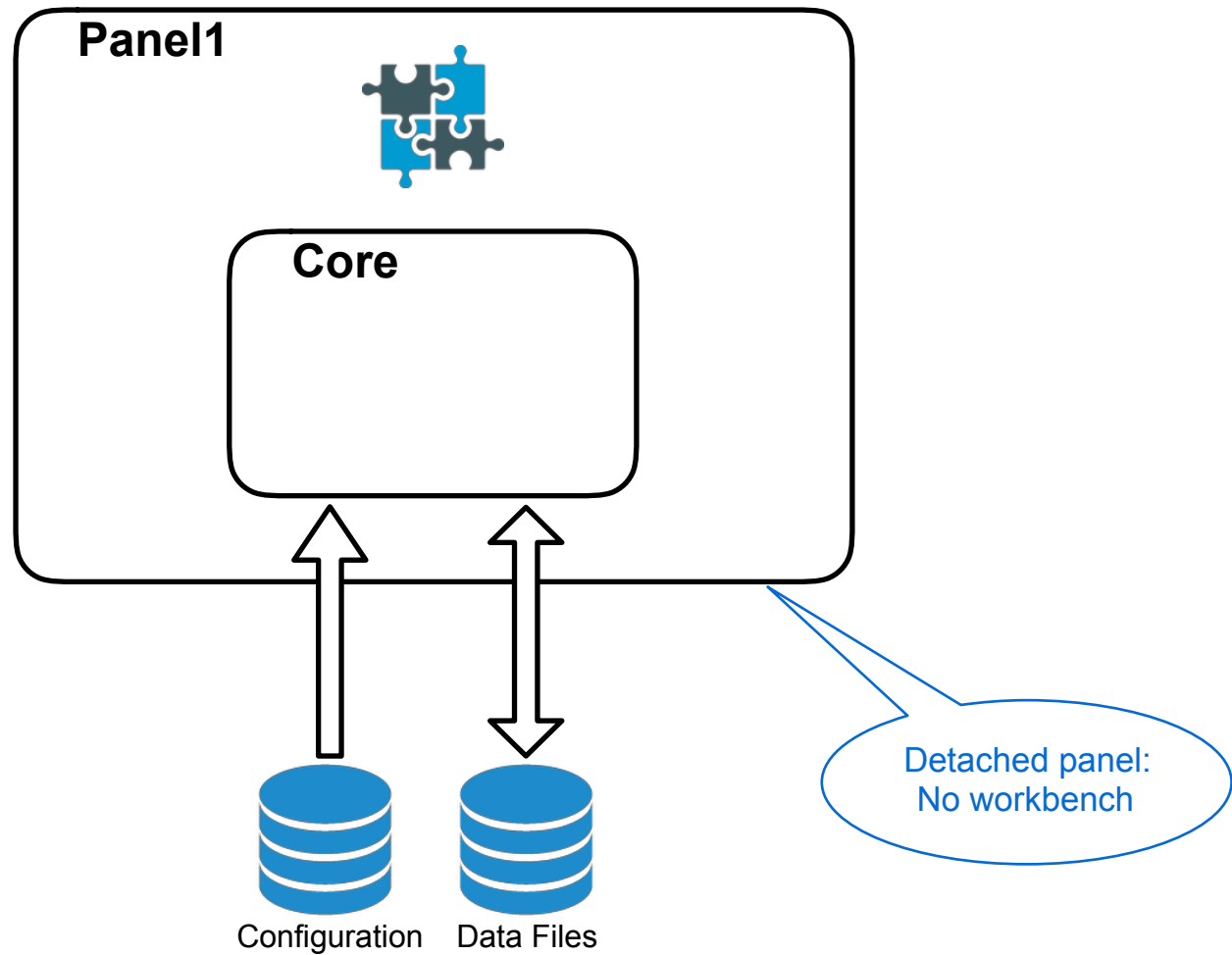
The standard web client.

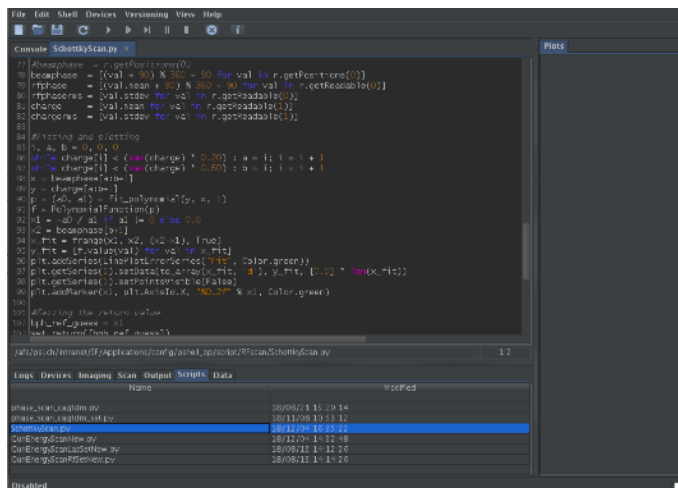




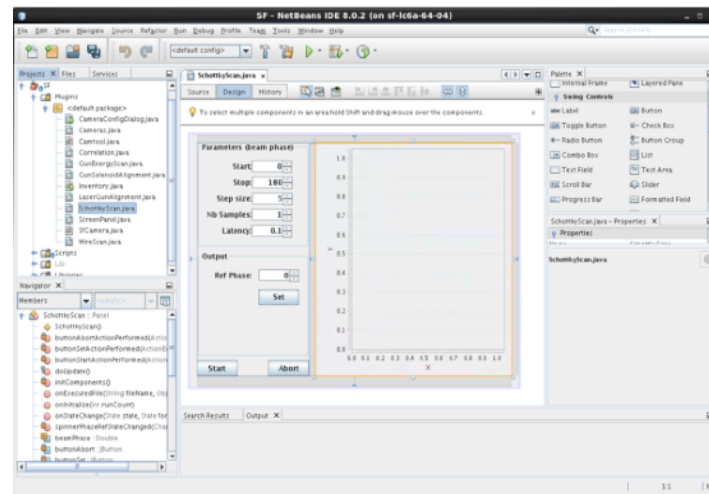




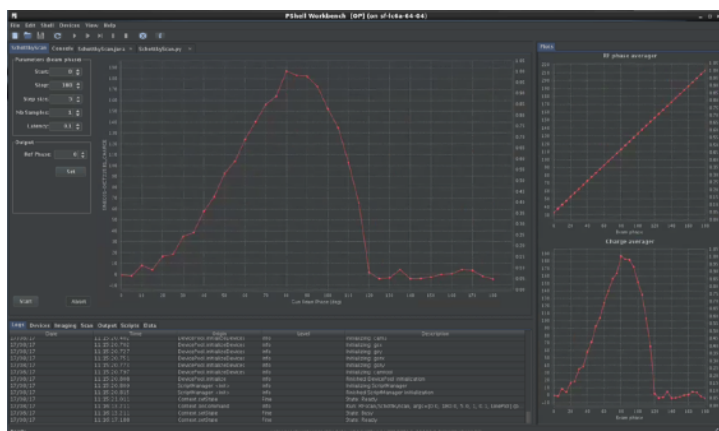




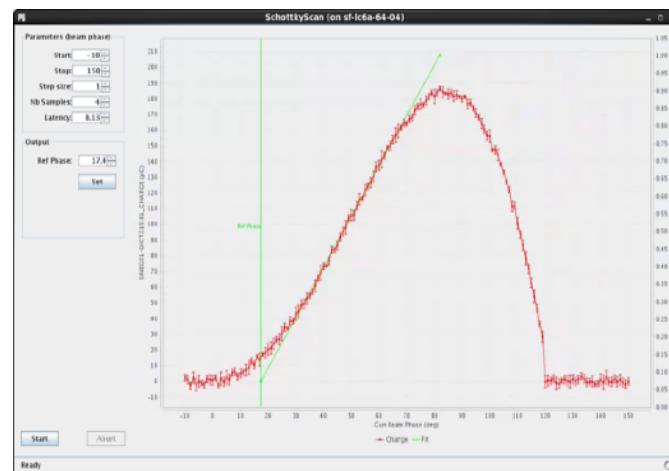
Script edition and debugging in Workbench



Panel plugin edition with Netbeans



Panel plugin loaded in the workbench



Panel plugin detached

Projects in pshell_config group:

Project Name	Stars	Last Update
nca	1	3 years ago
st-cr	0	2 years ago
x07da	0	2 years ago
x03da	1	11 months ago
x06da	0	a year ago
x07na	0	a year ago
x10na	0	2 years ago
x11na	0	11 months ago
x17na	0	a year ago
dev	0	11 months ago
st-ep	1	11 months ago
st-rt	1	11 months ago
maxc	0	11 months ago
x10da	0	11 months ago
st-ph	0	11 months ago
x04da-es2	0	10 months ago
x08da-es3	0	10 months ago
x01dc	0	7 months ago

Repository details for x03da:

Files (1.1 MB) Commits (1,516) Branch (1) Tags (0)

Configuration change: Context gac-x03da authored 8 months ago

Name	Last commit	Last update
config	Configuration change: Context	8 months ago
devices	Configuration change: MjpegSource cam1	11 months ago
plugins	Closedown	11 months ago
script	Startup	8 months ago
.gitignore	Startup	3 years ago

Exciting and challenging system targeting multiple

- Facilities (SwissFEL, SLS).
- Domains (machine, beamline, instrument control).
- User profiles (programmers and not).
- Platforms (Windows, Linux, Mac).
- Architectures (user front-end, batch, server).
- Data formats (hdf5, txt).

