



FRITZ-HABER-INSTITUT
MAX-PLANCK-GESELLSCHAFT

IT at the FHI “Enabling Science”



FRITZ-HABER-INSTITUT
MAX-PLANCK-GESELLSCHAFT

IT at the FHI “Enabling Science”



FRITZ-HABER-INSTITUT
MAX-PLANCK-GESELLSCHAFT

- Providing standard IT services to support science
(not the administration)



FRITZ-HABER-INSTITUT MAX-PLANCK-GESELLSCHAFT

- ✦ Storage
- ✦ Mail / Web
- ✦ Databases
- ✦ Compute-Cluster
- ✦ Telecom system



All with the background that this must be available for
>25 years. -> <http://w3.rz-berlin.mpg.de/hjf/>



FRITZ-HABER-INSTITUT

MAX-PLANCK-GESELLSCHAFT

We also provide services that comply with privacy policies and save money (selfhosted services, federation, no or limited license fees)

- Powerfolder (encoded!, as a substitute for dropbox &Co.)
- OnlyOffice (as a substitute for Office(365), google Hangout, ...)
- RocketChat (as a substitute for whatsApps, ...)
- mySQL, Postgres, Mongo, Elasticsearch (as a substitute for Oracle, Microsoft-SQL, ...)
- Sandstorm Apps (EtherCalc, EtherPad, EtherDraw, ...)
(<https://sandstorm.io/apps/index>)
- Mailman (as a substitute for local mail-lists)



FRITZ-HABER-INSTITUT
MAX-PLANCK-GESELLSCHAFT

- Indico Conferencesystem
-> <https://indico.fhi-berlin.mpg.de> (hosted by FHI)



Data Acquisition in Science. A General Approach

Heinz Junkes

Based on this infrastructure we had setup a complete framework for data acquisition using the epics framework

Always follow the SCADA approach

Do not ignore machine protection and safety

Never run control on single user desktop systems

Supervisory control and data acquisition (SCADA)
 Uses computers, networked data communications and GUIs for process supervisory management.

Peripheral devices such as fast controllers (VMEbus, RTEMS), PLCs, and FPGA based controllers are used to interface to the experiment, process plant or machinery.

The operator interfaces which enable monitoring and the issuing of process commands, such as controller set point changes, are handled through the SCADA supervisory system which can also be distributed.

All the real-time control logic or controller calculations are performed by the networked controllers which connect to the field sensors and actuators.

Machine Protection and Safety
 Fault condition sensors check everything from water, temperature and vacuum to e.g. beam missteering.

Different implementation levels from software to hardware.

Implements fail save operation.

Use Interlocks: Permit certain operations only if all underlying conditions are met.
 (RF_Permit = Vac_OK && Cooling_OK && ...)

For safety (personal protection) use self controlled-devices only.

Process control requires:
 A system with a minimal attack surface, so that biweekly or monthly patches are not required.

A consistent programming interface that will not change every four to five years, requiring a complete rewrite of their software.

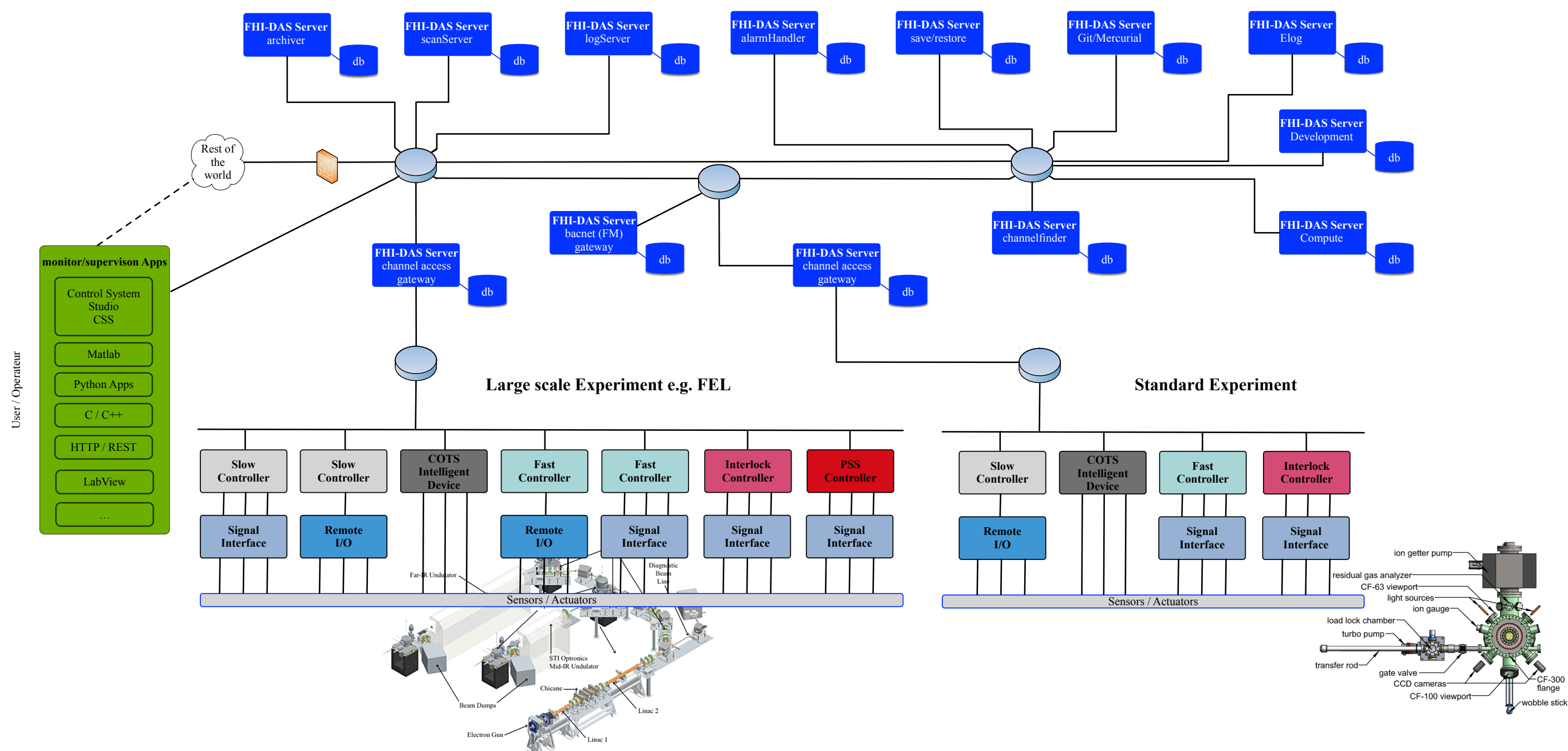
An environment that can be quickly and safely "locked down" to reduce the risk from hacking.

A system with limited network access, only through specific ports to reduce the risk of network based attacks

Support for priority-based multi-tasking, preferably a real-time operating system (RTOS) that supports hard real-time requirements.

A robust ecosystem of utilities and tools to make development, installation, debugging, and maintenance as easy as it is on consumer systems.

FHI-DAS (Fritz-Haber-Institut Data Acquisition System) components / services





FRITZ-HABER-INSTITUT
MAX-PLANCK-GESELLSCHAFT

- EPICS -> <https://epics-controls.org> (hosted by FHI)



- actual state (19109 PVs for the FEL,
about 2000 PVs for the other experiments)

[http://fel02.rz-berlin.mpg.de/channelfinder/
channelfinder.php](http://fel02.rz-berlin.mpg.de/channelfinder/channelfinder.php)

Heinzies Channelfinder

fel02.rz-berlin.mpg.de/channelfinder/channelfinder.php?ioc=iocIOCPYRO

Welcome to the FHI FEL channelfinder (Date: Tue Apr 17 19:38:54 CEST 2018).

Search PV : submit

List Disabled records : [list](#)

IOC	name	
iocu1	resume	PVs
iocrf	resume	PVs
iocdias	fel03	PVs
iocIOCPYRO	agrajag	PVs
iocIOCBERTHOLD	bacnet-gw	PVs
iocIOCBACNET	bacnet-gw	PVs
iocIMSO	fel04	PVs
iocDIAS	fel04	PVs

PVs on iocIOCPYRO :

Name	Description	Value	HW-Host:Port	Disabled	Time taken
AGRAJAG:pyroArray		7.62939453125E-5	agrajag:5064	0	2018-01-19 13:45:28
AGRAJAG:shotNr		23	agrajag:5064	0	2018-01-19 13:45:28



FRITZ-HABER-INSTITUT
MAX-PLANCK-GESELLSCHAFT

EPICS record reference

<https://wiki-ext.aps.anl.gov/epics>

```
epics@felgate:~$ cainfo AGRAJAG:pyroArray
AGRAJAG:pyroArray
```

```
State:      connected
Host:      agrajag:5064
Access:    read, write
Native data type: DBF_DOUBLE
Request type:  DBR_DOUBLE
Element count:  130
```

```
epics@felgate:~$ caget -a AGRAJAG:pyroArray
```

```
AGRAJAG:pyroArray 2018-04-17 16:16:55.073681 130 0.0162506 0.0115204 0.0107574 ...
```

```
0.0157928 0.0163269 0.0113678 0.016861 0.0156403 0.0161743 0.0211334 0.0147247 0.012207 0 681
```

```
epics> dbpr AGRAJAG:pyroArray,4
```

```
ACKS: NO_ALARM   ACKT: YES       APST: Always    ASG:
ASP: (nil)       BKPT: 00       BPTR: 0x805a8c8  BUSY: 0
DESC:           DISA: 0        DISP: 0        DISS: NO_ALARM
DISV: 42        DPVT: 0x805ace0  DSET: 0x80502b8  DTYP: diasPyro
EGU: V         EVNT: 0       FLNK:DB_LINK AGRAJAG:shotNr
FTVL: DOUBLE   HASH: 0       HOPR: 2.5      INP:CONSTANT 20000
LCNT: 0       LOPR: 0       LSET: 0x805af90
MLIS: 88 9b 0d 08 b0 9b 0d 08 0a 00 00 00      MLOK: b0 a8 05 08
MPST: Always   NAME: AGRAJAG:pyroArray      NELM: 130
NORD: 130     NSEV: NO_ALARM   NSTA: NO_ALARM  PACT: 0
PHAS: 0      PINI: NO        PPN: (nil)     PPNR: (nil)
PREC: 4      PRIO: LOW       PROC: 0        PUTF: 0
RARM: 0     RDES: 0x809d868  RPRO: 0       RSET: 0xb7f7db60
SCAN: I/O Intr  SDIS:CONSTANT   SEVR: NO_ALARM  SIML:CONSTANT
SIMM: NO     SIMS: NO_ALARM  SIOL:CONSTANT  SPVT: 0x805b7b8
STAT: NO_ALARM  TIME: 2018-04-17 16:22:11.476845000  TPRO: 0
TSE: -2     TSEL:CONSTANT 42  UDF: 0        VAL: (nil)
```



- Other services
save/restore
scan server (<http://fel01.rz-berlin.mpg.de:4810/scans.html>)

...

ID	Name	Created	State	Percentage	Runtime	Finish	Command	Error
411 (cmds)(data)	shutdown	2018-09-24 16:48:59	Finished <input type="button" value="Delete"/>	100.0%	330.4 seconds	2018-09-24 16:54:30	- end -	
410 (cmds)(data)	shutdown	2018-09-22 07:44:41	Finished <input type="button" value="Delete"/>	100.0%	321.6 seconds	2018-09-22 07:50:03	- end -	
409 (cmds)(data)	shutdown	2018-09-20 23:02:14	Finished <input type="button" value="Delete"/>	100.0%	322.1 seconds	2018-09-20 23:07:36	- end -	
408 (cmds)(data)	shutdown	2018-09-19 23:28:47	Finished <input type="button" value="Delete"/>	100.0%	322.4 seconds	2018-09-19 23:34:09	- end -	
407 (cmds)(data)	shutdown	2018-09-18 22:34:02	Finished <input type="button" value="Delete"/>	100.0%	323.4 seconds	2018-09-18 22:39:25	- end -	
406 (cmds)(data)	shutdown	2018-09-15 05:11:58	Finished <input type="button" value="Delete"/>	100.0%	322.6 seconds	2018-09-15 05:17:21	- end -	
405 (cmds)(data)	shutdown	2018-09-13 14:22:35	Finished <input type="button" value="Delete"/>	100.0%	322.1 seconds	2018-09-13 14:27:57	- end -	
404 (cmds)(data)	shutdown	2018-09-12 14:29:38	Finished <input type="button" value="Delete"/>	100.0%	321.4 seconds	2018-09-12 14:34:59	- end -	
403 (cmds)(data)	shutdown	2018-09-11 23:18:37	Finished <input type="button" value="Delete"/>	100.0%	320.9 seconds	2018-09-11 23:23:58	- end -	
402 (cmds)(data)	shutdown	2018-09-10 16:46:39	Finished <input type="button" value="Delete"/>	100.0%	321.7 seconds	2018-09-10 16:52:01	- end -	
401 (cmds)(data)	shutdown	2018-09-07 14:31:27	Finished <input type="button" value="Delete"/>	100.0%	322.4 seconds	2018-09-07 14:36:50	- end -	
400 (cmds)(data)	shutdown	2018-09-06 14:25:13	Finished <input type="button" value="Delete"/>	100.0%	322.4 seconds	2018-09-06 14:30:35	- end -	
399 (cmds)(data)	shutdown	2018-09-05 16:31:53	Finished <input type="button" value="Delete"/>	100.0%	321.8 seconds	2018-09-05 16:37:15	- end -	
398 (cmds)(data)	shutdown	2018-09-04 20:24:53	Finished <input type="button" value="Delete"/>	100.0%	323.3 seconds	2018-09-04 20:30:17	- end -	
397 (cmds)(data)	shutdown	2018-08-31 14:38:49	Finished <input type="button" value="Delete"/>	100.0%	322.1 seconds	2018-08-31 14:44:11	- end -	
396 (cmds)(data)	shutdown	2018-08-30 22:16:09	Finished <input type="button" value="Delete"/>	100.0%	322.5 seconds	2018-08-30 22:21:31	- end -	



- Ignored by the FEL operators
log server : <http://fel02.rz-berlin.mpg.de:3000/#/>

alarm-handler?

syslogng-web 0.0.6 View on GitHub Report an issue

localhost logs

Realtime search...

Date	Host	Process	Priority	Log message
Sep 26 20:40:33	ioc168	IOCINFRA	notice	20:40:33.002 drvModbusAsyn::doModbusIO port C1rdb error calling writeRead, error=10.0.0.200 temporarily unavailable, nwrite=6/6, nread=0
Sep 26 20:40:32	ioc165	IOCFRANKENSTEIN2	notice	20:40:32.024677 SPELLM02 FHIFEL:GUN:HV_2:M_PSFault: pasynCommon->connect() failed: C 10.0.0.109:50000: No route to host
Sep 26 20:40:32	ioc165	IOCFRANKENSTEIN2	notice	20:40:32.025207 SPELLM02 FHIFEL:GUN:HV_2:M_PSFault: Protocol aborted
Sep 26 20:40:32	ioc167	IOCUSR	notice	20:40:32.920 Can't connect to 10.0.0.97:2500: No route to host BONNAMP -1 autoConnect coul
Sep 26	ioc163	IOGACUS8	notice	20:40:31.021610 MOXA2_P3 FHIFEL:ACUC8:NumberOfSteps: No reply from device within 2500



❖ archiverAppliance

<http://aa0.fhi-berlin.mpg.de:17665/mgmt/ui/index.html>

FHI Archiver Appliance (aa1)

Home Reports Metrics Storage Appliances Integration

This is the EPICS archiver appliance management console for FHI including the FEL facility. Please contact Heinz Junkes at 4270 if you have any questions. To check the status of or to archive some PV's, please type in some PV names here.

Temp

Name	Status	Appliance	Archived	Auto	Value	Last Update
FHIFEL:BacNet:Mirror1:Temp1	Being archived	archappl1	true	true	10.0	Apr/17/2018 19:27:45 +02:00
FHIFEL:BacNet:Mirror1:Temp2	Being archived	archappl1	true	true	10.0	Apr/17/2018 19:42:17 +02:00
FHIFEL:BacNet:Mirror2:Temp1	Being archived	archappl1	true	true	10.0	Apr/17/2018 13:15:01 +02:00
FHIFEL:BacNet:Mirror2:Temp2	Being archived	archappl1	true	true	10.0	Apr/17/2018 01:59:50 +02:00
FHIFEL:BacNet:RLT:TempBunker_1	Being archived	archappl1	true	true	120.0	Apr/17/2018 18:35:48 +02:00
FHIFEL:BacNet:RLT:TempBunker_2	Being archived	archappl1	true	true	120.0	Apr/17/2018 19:29:48 +02:00
FHIFEL:BacNet:RLT:TempBunker_3	Being archived	archappl1	true	true	120.0	Apr/17/2018 19:29:48 +02:00
FHIFEL:BacNet:RLT:TempBunker_4	Being archived	archappl1	true	true	120.0	Apr/17/2018 19:41:48 +02:00
FHIFEL:TV301SF1:PumpTemperature	Being archived	archappl1	true	true	60.0	Apr/17/2018 19:42:31 +02:00
FHIFEL:TV301SF2:PumpTemperature	Being archived	archappl1	true	true	60.0	Apr/17/2018 19:35:41 +02:00
FHIFEL:TV301SF3:PumpTemperature	Being archived	archappl1	true	true	60.0	Apr/17/2018 19:37:21 +02:00

EPICS Archiver Appliance Version 0.0.1_SNAPSHOT_10-Jan

EPICS Archive Viewer: <save>

Mirror

Del	Plot	Name	DBRType	Units	Processing	Scale	Time (local)	Value	Notes
<input type="checkbox"/>	<input checked="" type="checkbox"/>	FHIFEL:BacNet:Mirror1:Temp1	DBR_SCALAR_DOUBLE	gradC		linear	2018-03-30 15:11:22	23.600000381469727	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	FHIFEL:BacNet:Mirror2:Temp2	DBR_SCALAR_DOUBLE	gradC		linear	2018-03-30 15:11:22	1638.3499755859375	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	FHIFEL:BacNet:Mirror1:Temp2	DBR_SCALAR_DOUBLE	gradC		linear	2018-03-30 15:11:22	25.399999618530273	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	FHIFEL:BacNet:Mirror2:Temp1	DBR_SCALAR_DOUBLE	gradC		linear	2018-03-30 15:11:22	23.899999618530273	

WINDOW SIZE: 1 year 1 month 2 w 1 w 2.5 d 1 d 18 h 12 h 8 h 4 h 2 h 1 h 30 m 10 m 5 m 1 m 30 s

END: 2018-04-17 19 :45 :23

Now < > AUTO

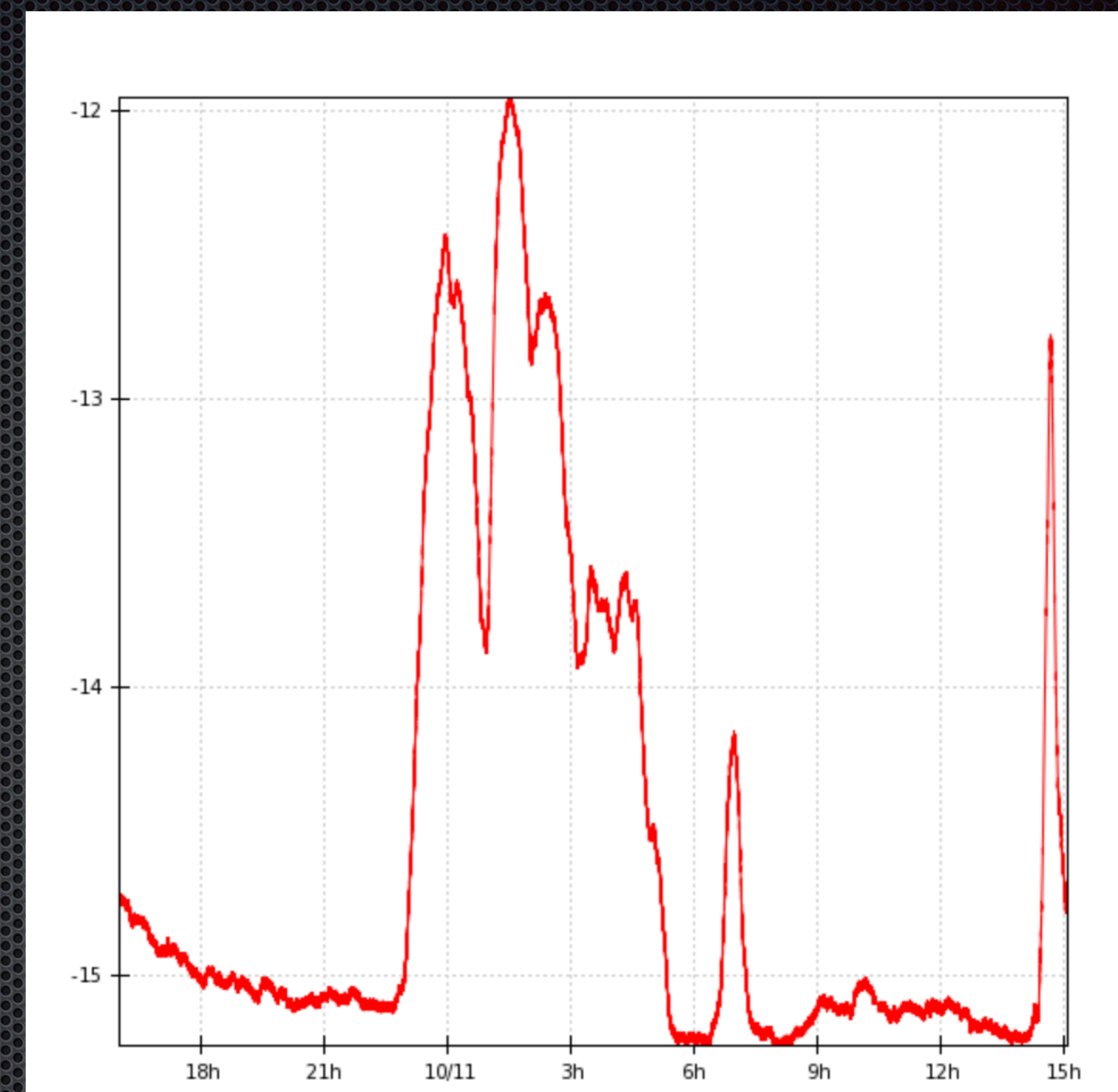
https://slacmshankar.github.io/epicsarchiver_docs/



```
import numpy as np
from chaco.shell import *
import urllib2
import json

req = urllib2.urlopen("http://archiver.slac.stanford.edu/retrieval/data/getData.json?pv=test%3Apv%3A123&donotchunk")
data = json.load(req)
secs = [x['secs'] for x in data[0]['data']]
vals = [x['val'] for x in data[0]['data']]
plot(secs, vals, "r-")
xscale('time')
show()
```

archiver retrieval



Retrieving data using other tools

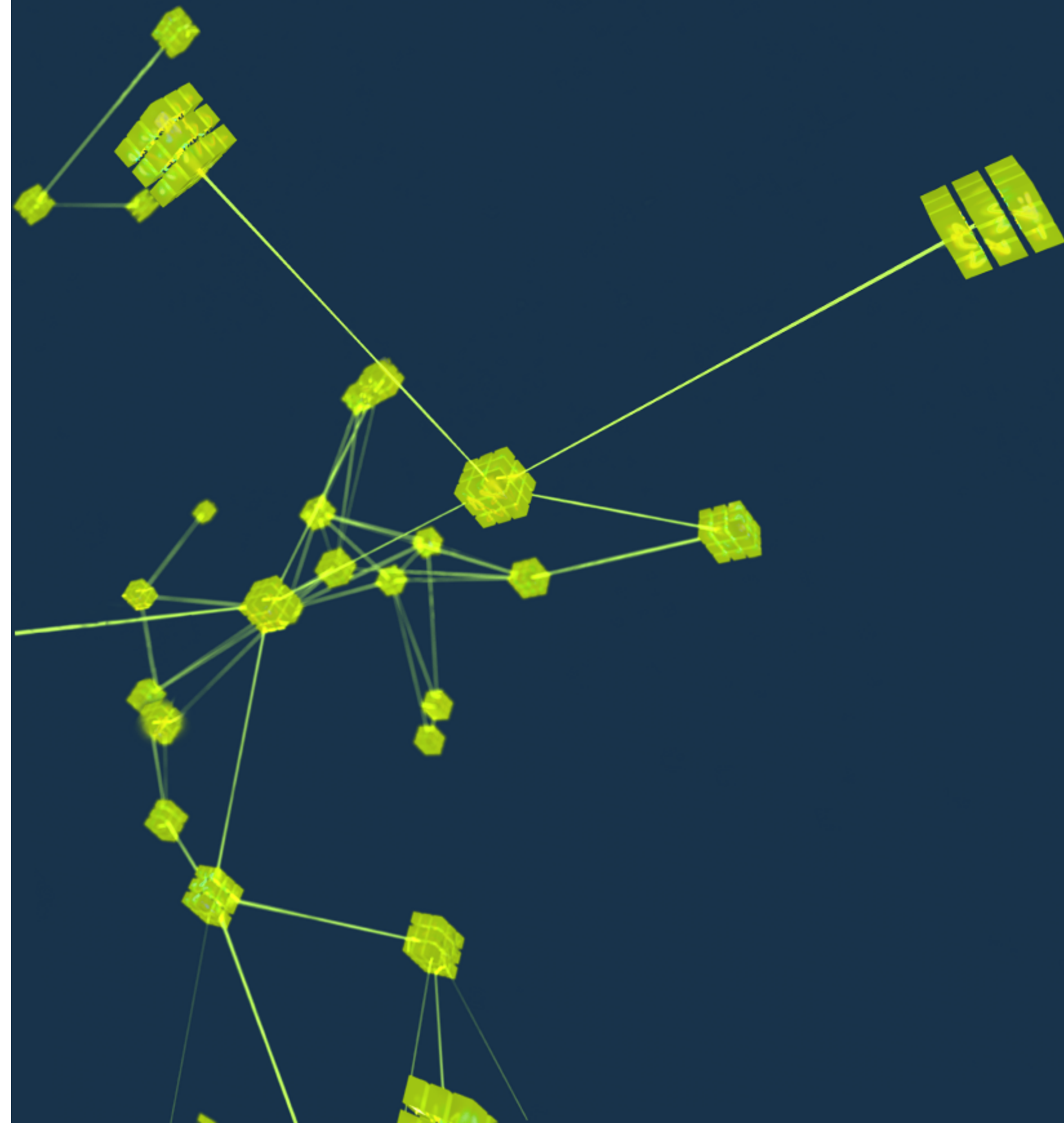
The EPICS Archiver Appliance supports data retrieval in multiple formats/MIME types. These are some of the few formats supported today; more can easily be added as needed.

1. [JSON](#) - A generic JSON format that can be easily loaded into most browsers using Javascript.
2. CSV - Can be used for importing into Excel and other spreadsheets.
3. MAT - This is the file format used for interoperating with Matlab.
4. RAW - This is a binary format used by the Archive Viewer and is based on the [PB/HTTP](#) protocol.
5. TXT - A simple text format that is often helpful for debugging.
6. [SVG](#) - A XML format that can also be used as a SVG element in tools that support this format.

In general, getting data into a tool necessitates construction of a data retrieval URL as the first step. A data retrieval URL looks something like so

EPICS

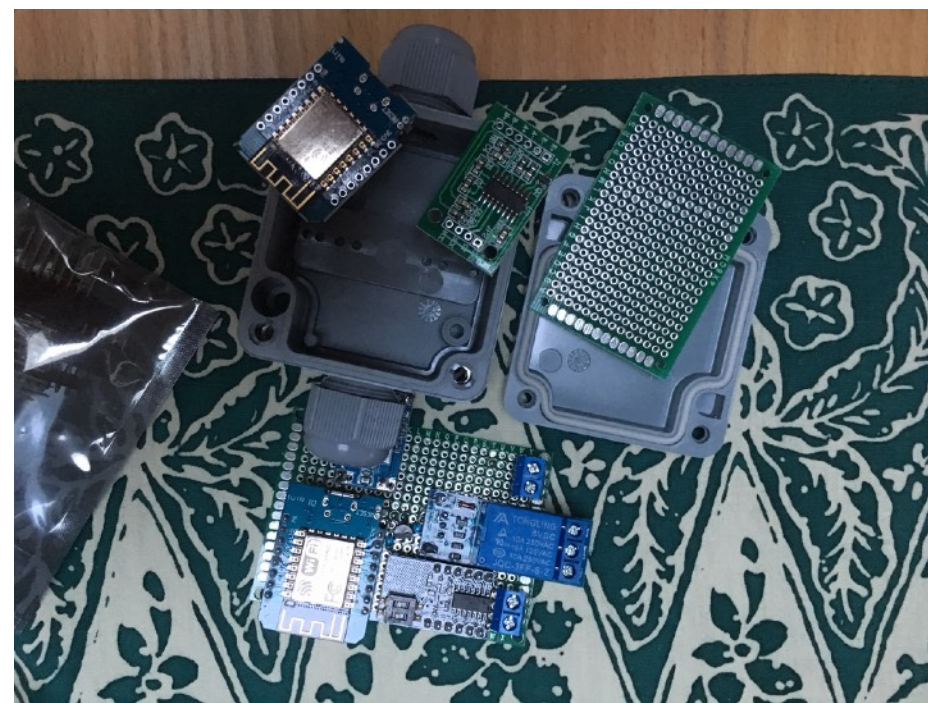
A electronic balance for beehives
(a more private project)



- A hive scale is an important tool which gives assessment if food consumption has been high and whether there is a need for feeding
- It is important to know how long the winter storage is, in addition it gives a very good indication of periods without any nectar flow



The central module is placed between two wooden plates under the hive and consists of an Arduino WeMos D1 (including WiFi), a temperature sensor, a single point load cell for weighting purposes (BOSCHE H30A), a load cell amplifier (HX711), and a pb accu (4V)



- With the deep sleep function of the Arduino platform one can maximize the battery life. In deep sleep it consumes just 40 μ A.
- WeMos D1 is a ESP8266 WiFi based board
- It's super easy to program



```
bbbGreenUdpSender | Arduino 1.8.5  
bbbGreenUdpSender §  
void loop() {  
  double Weight;  
  double Temp;  
  char buffer[64];  
  scale.power_up();  
  Weight = scale.get_units(20);  
  scale.power_down();  
  Weight -= bbbOffset;  
  Temp = readTemp(tAddr, ds);  
  /* Gruen (4711), gelb (4712), blau (4713), braun (4714) gelb, braun, */  
  sprintf(buffer, "%f,%f\n", Weight, Temp);  
  int res;  
  UDP.beginPacket(bienenwaagenIp, bienenwaagenPort);  
  UDP.write(buffer);  
  UDP.endPacket();  
  yield();  
  delay(1000);  
  ESP.deepSleep(sleepSeconds * 1000000, WAKE_RF_DEFAULT);  
}
```

125 WEMOS D1 & mini, 80 MHz, 115200, 4M (3M SPIFFS), Disabled, None on /dev/cu.wchusbserial1410

- Arduino sends UDP messages to an IOC running on a VServer
- IOC receives data and “put” them into PV’s

```

epics@bienenwaagen:~/bb/BBB/bbbApp/Db$ cat bbb.db
record(waveform,"$(P)") {
  field(DTYP,"UDP Intr")
  field(DESC,"$(D)")
  field(SCAN,"I/O Intr")
  field(INP,"$(PORT)")
  field(FTVL,"DOUBLE")
  field(NELM,"4")
}

record(subArray,"$(P)[0]") {
  field(INP,"$(P) CP")
  field(INDX,"0")
  field(MALM,"4")
  field(NELM,"1")
  field(FTVL,"DOUBLE")
  field(FLNK,"$(P):Weight")
}

record(ai,"$(P):Weight") {
  field(INP,"$(P)[0].VAL")
  field(EGU,"Kg")
}

record(subArray,"$(P)[1]") {
  field(INP,"$(P) CP")
  field(INDX,"1")
  field(MALM,"4")
  field(NELM,"1")
  field(FTVL,"DOUBLE")
  field(FLNK,"$(P):Temp")
}

record(ai,"$(P):Temp") {
  field(INP,"$(P)[1].VAL")
  field(EGU,"gradC")
}

```

```

epicsFloat64 *dbuf;

while(1) {

  if(!buf) {
    /* allocate and initialize a new buffer for later (local) use */
    buf = callocMustSucceed(1, nbytes, "buffer");
    dbuf = (epicsFloat64*)buf;
  }

  // try to receive some data, this is a blocking call
  if ((recv_len = recvfrom(s, receiveBuf, RECV_BUFLen, 0,
    (struct sockaddr *) &si_other, &slen)) == -1)
  {
    perror("recvfrom()");
    return;
  }
  receiveBuf[recv_len] = 0;
  /* print details of the client/peer and the data received */
  printf("Received packet from %s:%d\n", inet_ntoa(si_other.sin_addr),
    ntohs(si_other.sin_port));
  printf("received: %s\n", receiveBuf);
  if (nbytes >= 2 * sizeof(double)) {
    sscanf (receiveBuf, "%lf,%lf", &dbuf[0], &dbuf[1]);
    printf("scanf : %lf, %lf\n", dbuf[0], dbuf[1]);
  }

  epicsMutexMustLock(priv->lock);
  if(!priv->nextBuffer) {
    /* make the local buffer available to the read_wf function */
    priv->nextBuffer = buf;
    buf = NULL;
    priv->numBytes = priv->maxBytes;
  }
  epicsMutexUnlock(priv->lock);

  scanIoImmediate(priv->scan, priorityHigh);
}


```

```

epics@bienenwaagen:~/bb/BBB$ ps -ef | grep proc
bbb      1379      1  0 Jun05 ?        00:00:50 /usr/bin/procServ -q -c /epics/iocs/bbb
-i ^D^C^] -p /var/run/softioc-bbb.pid -n bbb --restrict --logfile=/var/log/softioc/bbb
/bbb.log --coresize= 4051 /epics/iocs/bbb/st.cmd

```

- To archive the incoming data archiver appliance is used

Bee-log (for Bettina)


BERLINER GARTEN
HONIG

Home Reports Metrics Storage Appliances Integration
Help

This is the EPICS archiver appliance management console for Bettinas beehive balances.
Please contact Heinz if you have any issues.

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

Check Status
Archive
Archive (specify sampling period)
Lookup
Pause
Resume

25
Page 1 of 1

PV Name	Status	Appliance	Connected?	Monitored?	Sampling period	Last event	Details	Quick chart
BBB:Blau:Temp	Being archived	appliance0	true	true	1.0	Jun/11/2018 15:27:41 +02:00		
BBB:Blau:Weight	Being archived	appliance0	true	true	1.0	Jun/11/2018 15:27:41 +02:00		
BBB:Gelb:Temp	Being archived	appliance0	true	true	1.0	Jun/05/2018 21:54:42 +02:00		
BBB:Gelb:Weight	Being archived	appliance0	true	true	1.0	Jun/11/2018 15:25:25 +02:00		
BBB:Gruen:Temp	Being archived	appliance0	true	true	1.0	Jun/11/2018 15:23:51 +02:00		
BBB:Gruen:Weight	Being archived	appliance0	true	true	1.0	Jun/11/2018 15:28:43 +02:00		
BBB:NN:Temp	Being archived	appliance0	false	true	1.0	Never		
BBB:NN:Weight	Being archived	appliance0	false	true	1.0	Never		
BBB:Rot:Temp	Being archived	appliance0	true	true	1.0	Jun/11/2018 15:19:07 +02:00		
BBB:Rot:Weight	Being archived	appliance0	true	true	1.0	Jun/11/2018 15:28:51 +02:00		

- To visualize data on iPhone/iPad Daviz is used



App Store Preview

This app is only available on the App Store for iOS devices.

Screenshots iPhone iPad

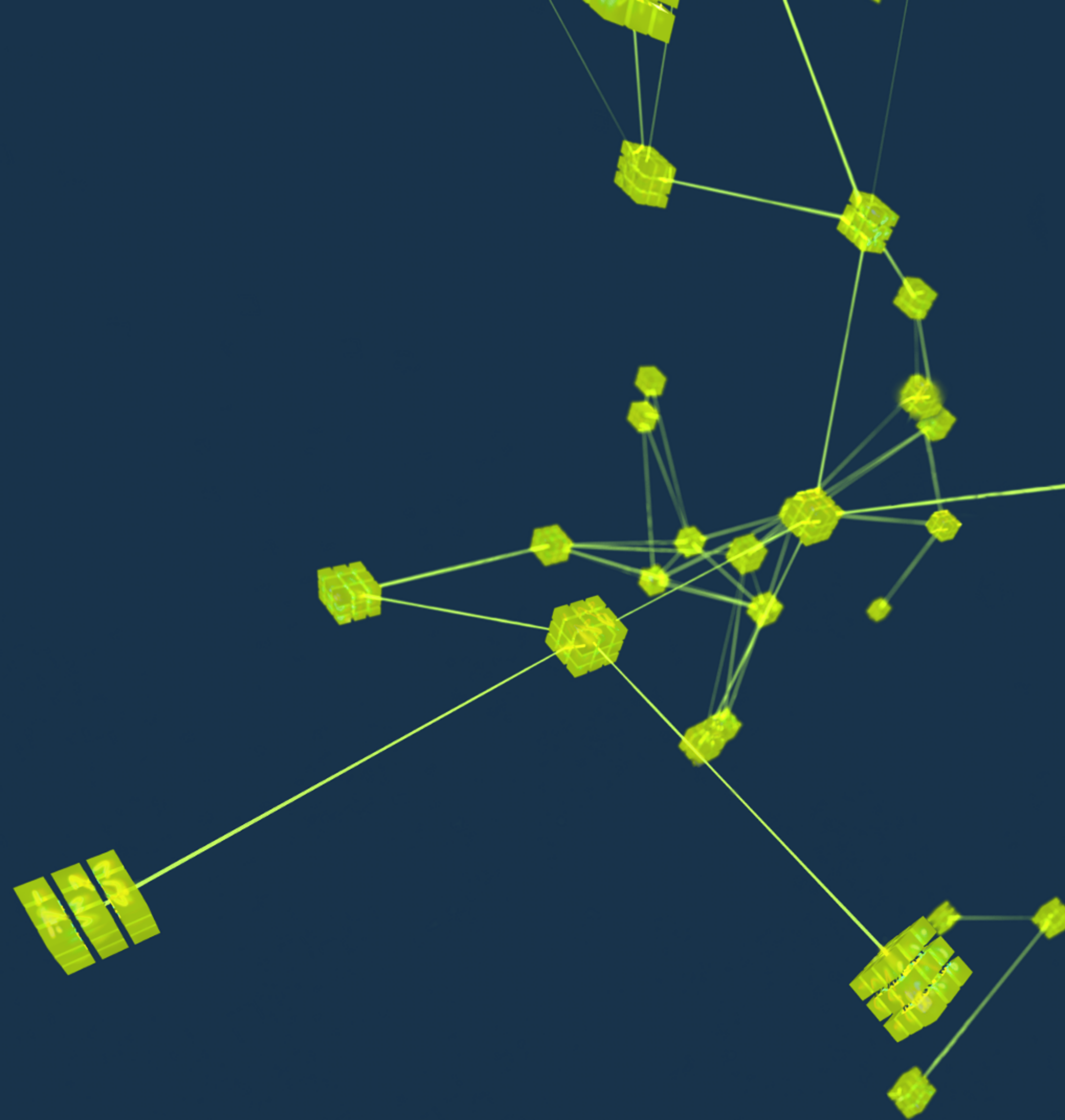
Description

Daviz is a data visualisation tool for iOS. The App works both on iPhone and iPad. The macro language which is used by Daviz is very similar to the one you can find in Plot2

In the App you have to enter a data source which is just an URL. In the simplest case this can be a text file which provides data and formatting information (See documentation at <https://davizdoc.micw.org>).... [more](#)

- data read from the archive on demand by JSON like
 $\$url = "http://185.228.137.144:17668/retrieval/data/getData.json?pv=median_1800(BBB\%3AGelb\%3ATemp)\&from=\$old\&to=\$now";$
 $\$json = file_get_contents(\$url);$

EPICS 7



Matej Sekoranyja, Marty Kraimer, Michael Davidsaver, Ralph Lange, Andrew Johnson, Timo Korhonen, Heinz Junkes, Patrik Marschalik, Murali Shankar, Bruno Martins, Kunal Shroff, Arman Arkilic, Michael Dalesio, Anton Metzger, Greg White, David Hikins, Guobao Shen, Sinesa Veseli, Bob Dalesio, Steve Hartman

EPICS 7 Outline

- What is it?
- Status
- Services Support Application Development
- Community Use
- Conclusions

What Is EPICS 7 (not)

- V4 is not a replacement for V3
- V4 does not introduce a new IOC database
- V4 does not require you to rewrite all your drivers
- V4 does not break existing systems

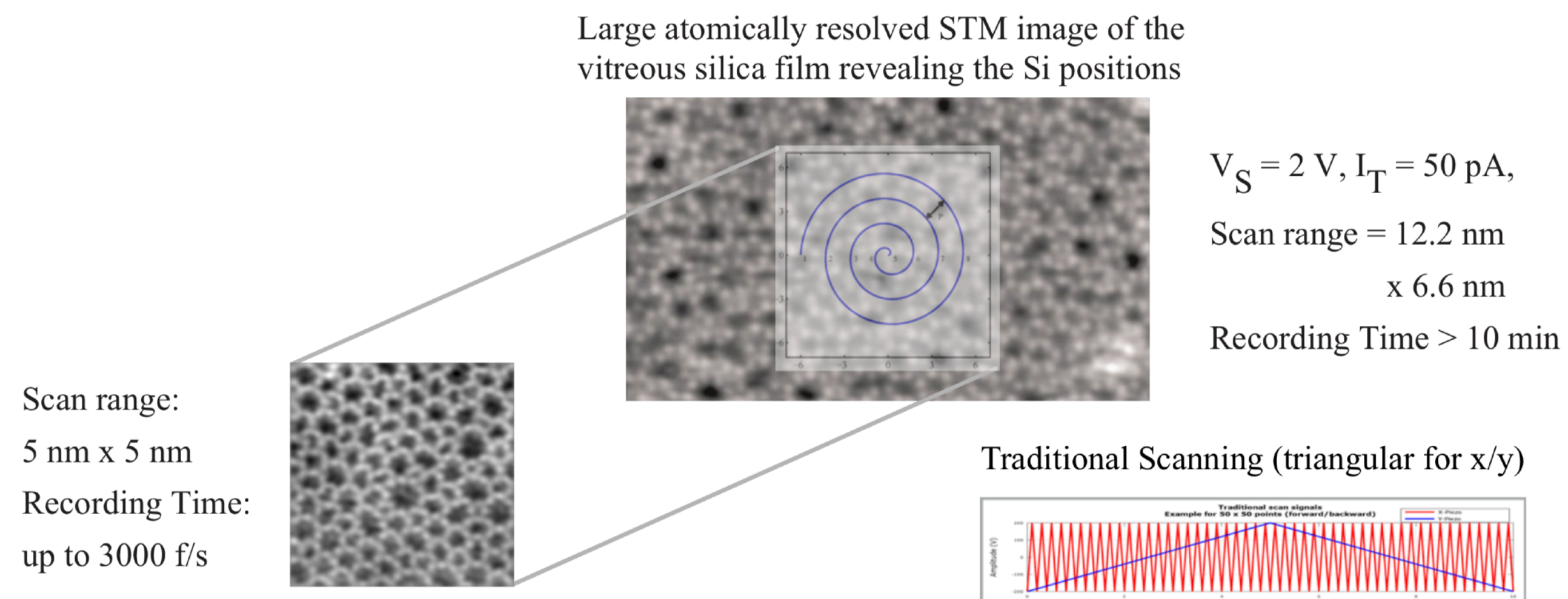
What is EPICS 7

EPICS 3 is a set of tools, libraries and applications to create a distributed control system

EPICS 7 extends V3, and does not require upgrading any of your applications.

EPICS 7 adds structured data to EPICS V3

- RTEMS 5 support included into EPICS 7 (merge request)
- Uses Posix Api
- Most of the existing libcom (posix) is used for RTEMS 5 with only some minor changes, does not interfere with existing RTEMS 4.x
- EPICS 7 on IOC's with QSrv is in production on VMEbus with mvme6100 with multiple ethernet interfaces
- Heavily use of NTNDArray data type




Collaboration



National Science Foundation
WHERE DISCOVERIES BEGIN

[HOME](#) [RESEARCH AREAS](#) [FUNDING](#) [AWARDS](#) [DOCUMENT LIBRARY](#) [NEWS](#) [ABOUT NSF](#)

Awards



- [Search Awards](#)
- [Recent Awards](#)
- [Presidential and Honorary Awards](#)
- [About Awards](#)

How to Manage Your Award

- [Grant Policy Manual](#)
- [Grant General Conditions](#)
- [Cooperative Agreement Conditions](#)
- [Special Conditions](#)
- [Federal Demonstration Partnership](#)
- [Policy Office Website](#)



Award Abstract #1839321

CICI: SSC: Real-Time Operating System and Network Security for Scientific Middleware

NSF Org:	OAC Office of Advanced Cyberinfrastructure (OAC)
Initial Amendment Date:	August 17, 2018
Latest Amendment Date:	August 17, 2018
Award Number:	1839321
Award Instrument:	Standard Grant
Program Manager:	Kevin L. Thompson OAC Office of Advanced Cyberinfrastructure (OAC) CSE Direct For Computer & Info Scie & Enginr
Start Date:	October 1, 2018
End Date:	September 30, 2021 (Estimated)
Awarded Amount to Date:	\$999,915.00
Investigator(s):	Gedare Bloom gedare.bloom@howard.edu (Principal Investigator)
Sponsor:	Howard University 2400 Sixth Street N W Washington, DC 20059-9000 (202)806-4759





➤ API for scripting environment

- ❖ 7 APIs in Python

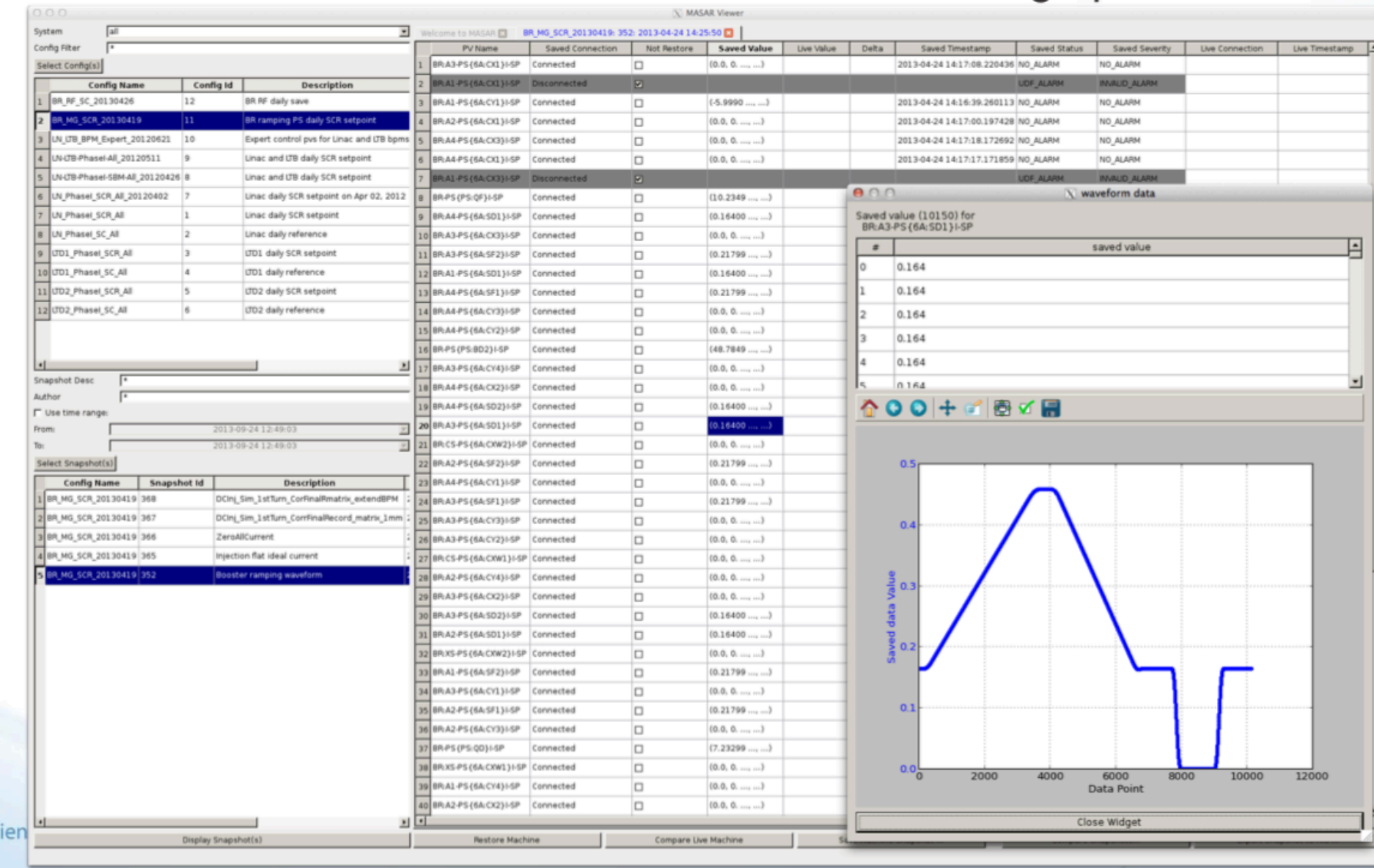
➤ PyQt UI

- ❖ Based on above APIs
- ❖ Browse config
- ❖ Browse event
- ❖ Take snapshot
- ❖ Retrieve data
- ❖ Compare data
- ❖ Restore machine
- ❖ Export data

PV Name	Saved Connection	Not Restore	Saved Value	Live Value	Delta	Saved Timestamp	Saved Status
LN-RF (Mtr.1) Pos-Set	Connected	<input type="checkbox"/>	140.0			2012-06-14 14:59:31.419293	NO_ALARM NC
UTB-MG (Quad.5) RampEnd1-SP	Connected	<input type="checkbox"/>	0.0			2012-06-14 14:59:31.420127	NO_ALARM NC
UTB-MG (Quad.1) RampEnd1-SP	Connected	<input type="checkbox"/>	16.0			2012-06-14 16:10:51.761703	NO_ALARM NC
UTB-BI (BPM.2) Trig.AdcDelay-SP	Connected	<input type="checkbox"/>	0			2012-06-14 14:59:31.479697	NO_ALARM NC
UTB-BI (VF:1BD2) Go-Set	Connected	<input type="checkbox"/>	no filter			2012-06-14 14:59:31.436407	NO_ALARM NC
UTB-MG (Quad.2) RampEnd1-SP	Connected	<input type="checkbox"/>	0.0			2012-06-14 15:54:41.958684	NO_ALARM NC
UTB-MG (Quad.1BD1) RampEnd1-SP	Connected	<input type="checkbox"/>	0.0			2012-06-14 14:59:31.420110	NO_ALARM NC
LN-BI (BPM.5) Beam-Gain-SP	Connected	<input type="checkbox"/>	100.0			2012-06-14 14:59:31.418982	NO_ALARM NC
UTB-BI (DIG.BCM) NbrSamples-SP	Connected	<input type="checkbox"/>	8000			2012-06-14 14:59:31.422096	NO_ALARM NC
UTB-MG (Con.4) RampEnd1-SP	Connected	<input type="checkbox"/>	0.0			2012-06-14 14:59:31.418985	NO_ALARM NC
UTB-MG (Con.3) RampEnd2-SP	Connected	<input type="checkbox"/>	0.0			2012-06-14 14:59:31.418982	NO_ALARM NC
UTB-BI (FC.2) Bandwidth-Set	Connected	<input type="checkbox"/>	No_Limit			2012-06-14 14:59:31.428113	NO_ALARM NC
UTB-BI (BPM.2) Pos.UsrOffset-SP	Connected	<input type="checkbox"/>	0.0			2012-06-14 14:59:31.423870	NO_ALARM NC
UTB-MG (Con.1BD1) RampEnd1-SP	Connected	<input type="checkbox"/>	0.0			2012-06-14 14:59:31.418950	NO_ALARM NC
UTB-MG (Con.1BD1) RampEnd2-SP	Connected	<input type="checkbox"/>	0.0			2012-06-14 14:59:31.418954	NO_ALARM NC
UTB-MG (Con.2BD1) RampEnd1-SP	Connected	<input type="checkbox"/>	0.0			2012-06-14 14:59:31.418958	NO_ALARM NC
UTB-MG (Con.1) RampEnd2-SP	Connected	<input type="checkbox"/>	-0.5			2012-06-14 14:59:31.418921	NO_ALARM NC
UTB-MG (Con.2) RampEnd1-SP	Connected	<input type="checkbox"/>	-2.5			2012-06-14 15:42:16.843832	NO_ALARM NC
UTB-MG (Con.2) RampEnd2-SP	Connected	<input type="checkbox"/>	0.5			2012-06-14 14:59:31.418930	NO_ALARM NC
LN-RF (Amp.1) On-Set	Connected	<input type="checkbox"/>	On			2012-06-14 14:59:31.419388	NO_ALARM NC
UTB-MG (Con.1) RampEnd1-SP	Connected	<input type="checkbox"/>	-0.5			2012-06-14 15:43:20.219197	NO_ALARM NC
LN-MG (50L) PS-11-SP	Connected	<input type="checkbox"/>	10.0			2012-06-14 14:59:31.323848	HIGH_ALARM MI
UTB-BI (ICT.1) CalQ-Set	Connected	<input type="checkbox"/>	100pC			2012-06-14 14:59:31.419371	NO_ALARM NC
UTB-BI (VF:1BD2) cam1:imageMode	Connected	<input type="checkbox"/>	Continuous			2012-06-14 14:59:31.425706	NO_ALARM NC
UTB-BI (VF:2BD1) Go-Set	Connected	<input type="checkbox"/>	lightest			2012-06-14 14:59:31.436417	NO_ALARM NC
UTB-BI (VF:1BD2) cam1:TriggerMode	Connected	<input type="checkbox"/>	On			2012-06-14 11:12:37.678587	NO_ALARM NC
UTB-BI (ES) cam1:AcquireTime	Connected	<input type="checkbox"/>	0.08			2012-06-14 16:13:20.815001	NO_ALARM NC
UTB-BI (ES) Go-Set	Disconnected	<input checked="" type="checkbox"/>					UDF_ALARM BN
UTB-BI (VF:3BD1) cam1:imageMode	Connected	<input type="checkbox"/>	Continuous			2012-06-14 14:59:31.420069	NO_ALARM NC
UTB-BI (VF:1BD1) Go-Set	Connected	<input type="checkbox"/>	no filter			2012-06-14 14:59:31.436829	NO_ALARM NC
UTB-BI (VF:2BD1) cam1:TriggerMode	Connected	<input type="checkbox"/>	On			2012-06-14 14:59:31.424564	NO_ALARM NC

➤ Data plot for waveform PV

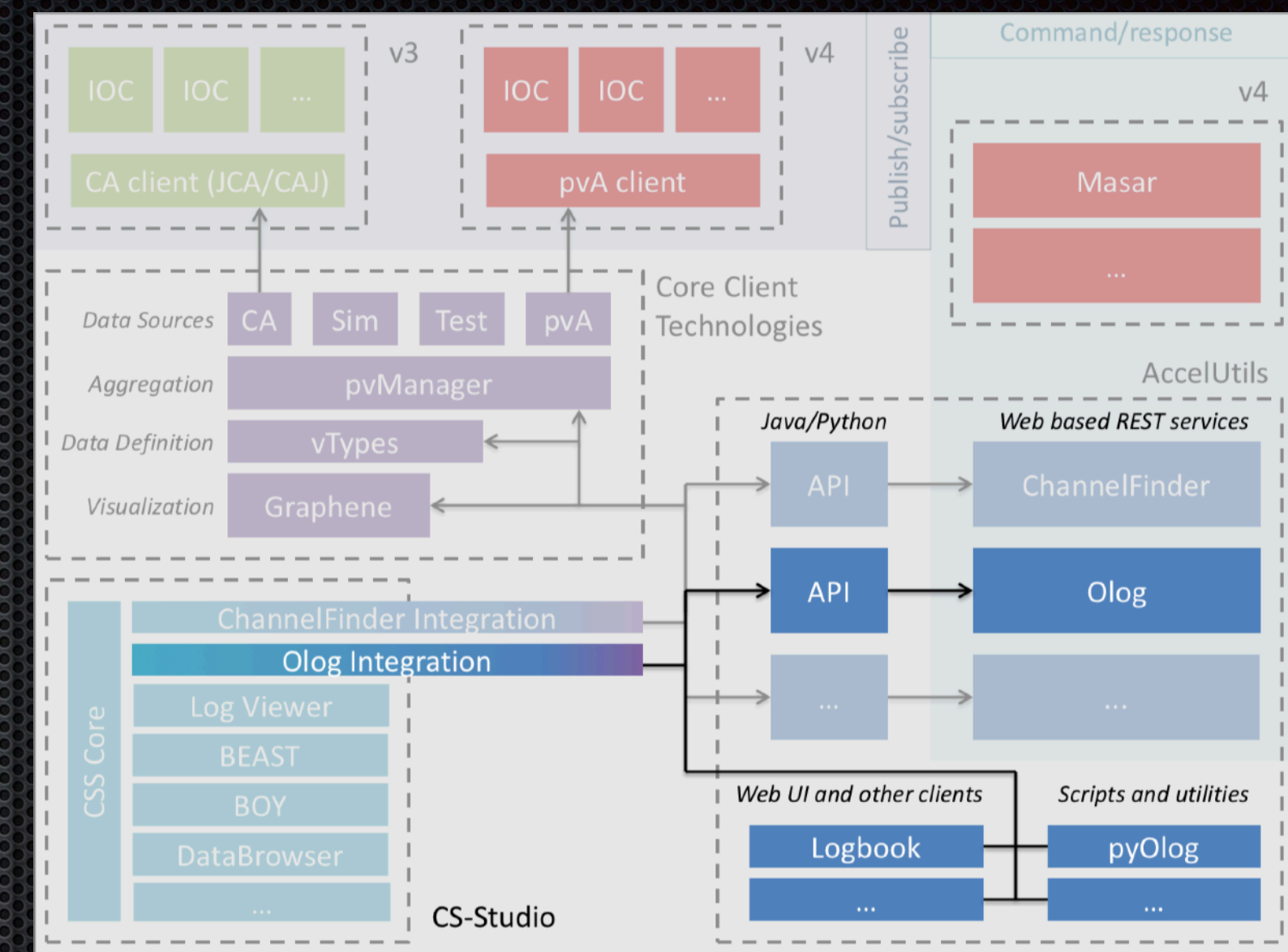
- ❖ Saved data and live data of one waveform PV in one graph





FRITZ-HABER-INSTITUT MAX-PLANCK-GESELLSCHAFT

The screenshot shows the Olog web interface. On the left, there are filters for logbooks (Controls Commissioning, Electronics Maintenance, LOTO, Mechanical Technicians, Operations) and tags (Bumps, Inverpower Power Supplies, Kicker, Large Power Supplies, RF Area, Septums, Timing Systems). The main content area displays a log entry from 'mdavidsaver' dated April 10th 2012 at 7:16 pm. The entry text describes a mod 1 shutdown and includes a plot of pressure over time. The plot shows a sharp spike in pressure around 18:00:00. Below the plot, there are attachments for text files and other plots.



Olog Clients – CS-Studio

- Log Entries initialized with application specific information
- Alarm server
 - PV name
 - Alarm status
 - Alarm time

The screenshot shows the 'Create Log Entry' form. It includes fields for User Name, Password, Date (Sep 26, 2013), and Level. Below these fields, there is a section for 'Current Alarms' with details like Alarm Time, Alarm Severity/Message, and Alarm Value. There are also dropdown menus for Logbooks (Operations) and Tags. At the bottom, there are buttons for 'Add Image', 'Screenshot', 'CSS Window', 'Cancel', and 'Submit'.

Olog: <https://github.com/Olog>



FRITZ-HABER-INSTITUT MAX-PLANCK-GESELLSCHAFT

Version control (incl. configuration and algorithms)

hg.rz-berlin.mpg.de

Mercurial

Name	Description	Contact	Last modified	zip	gz
4kSTM	control stuff (CSS and EPICS) for the 4kSTM in the CP departement, Markus Heyde	Heinz Junkes	Sat, 13 Jun 2015 15:12:33 +0200	zip	gz
4kSTM/CSS	control stuff (CSS) for the 4kSTM in the CP departement, Markus Heyde	Heinz Junkes	Tue, 16 Jun 2015 16:38:56 +0200	zip	gz
4kSTM/EPICS	control stuff (EPICS) for the 4kSTM in the CP departement, Markus Heyde	Heinz Junkes	Mon, 27 Jun 2016 18:08:15 +0200	zip	gz
APARTVW	Apartment Verwaltung	Carla Tschentscher	Wed, 10 Feb 2016 17:36:14 +0200	zip	gz
BACnet_Plugfest	BACnet - EPICS - gateway	Heinz Junkes	Tue, 21 May 2013 20:04:30 +0200	zip	gz
BOB_CSS	New CSS bob-files (for DisplayBuilder) for FHI FEL	Heinz Junkes	Fri, 13 Apr 2018 12:31:01 +0200	zip	gz
EPICS_BACnet_Server	EPICS - BACnet - Server	Heinz Junkes	Mon, 27 May 2013 11:15:29 +0200	zip	gz
EPICS_SUPPORT/DEBPKG_MODULES/epicsBase	from debian package epics base (3.14.12)	Heinz Junkes	Mon, 09 Dec 2013 11:58:40 +0200	zip	gz
EPICS_SUPPORT/DEBPKG_MODULES/synApps	from debian packages synapps&more	Heinz Junkes	Mon, 09 Dec 2013 11:58:48 +0200	zip	gz
EPICS_SUPPORT/IMPORT_MODULES/FINS	imported Moodule FINS (for OMRON SPS)	Heinz Junkes	Tue, 10 Dec 2013 18:15:14 +0200	zip	gz
EPICS_SUPPORT/IMPORT_MODULES/GTR	imported Module Transienten Recorder (Struck SIS3301)	Heinz Junkes	Tue, 10 Dec 2013 18:16:27 +0200	zip	gz
EPICS_SUPPORT/IMPORT_MODULES/StreamDevice	imported Moodule StreamDevice (serial devices)	Heinz Junkes	Mon, 09 Dec 2013 11:48:19 +0200	zip	gz
EPICS_SUPPORT/IMPORT_MODULES/areaDetector	imported Module for camera control	Heinz Junkes	Mon, 09 Dec 2013 11:48:24 +0200	zip	gz
EPICS_SUPPORT/IMPORT_MODULES/delaygen	imported Module delay generator (SR DG645)	Heinz Junkes	Mon, 09 Dec 2013 11:48:41 +0200	zip	gz
EPICS_SUPPORT/IMPORT_MODULES/seq	imported Moodule sequencer	Heinz Junkes	Mon, 09 Dec 2013 11:48:54 +0200	zip	gz
EPICS_SUPPORT/LOCAL_MODULES/datahandling	und noch eins fuer ralph Save/Restore, Tools und Konfiguration	Heinz Junkes	Tue, 10 Dec 2013 18:11:48 +0200	zip	gz
EPICS_SUPPORT/LOCAL_MODULES/generic	local generated module for db-patterns (e.g. Store/Recall)	Heinz Junkes	Tue, 10 Dec 2013 18:15:55 +0200	zip	gz
EPICS_SUPPORT/LOCAL_MODULES/instruments	stream device protocols for different devices	Heinz Junkes	Tue, 10 Dec 2013 18:17:28 +0200	zip	gz
FHIFEL_CSS	CSS control-files for FHI FEL	Heinz Junkes	Mon, 11 Dec 2017 20:00:43 +0200	zip	gz
FHIFEL_IOCs	IOC programs and settings	Heinz Junkes	Tue, 18 Mar 2014 17:06:50 +0200	zip	gz
FHIFEL_IOCs/AgrajagIOC	IOC on Agrajag (PC104) controls Pyro-Array	Heinz Junkes	Thu, 29 Jan 2015 10:26:00 +0200	zip	gz
FHIFEL_IOCs/IOCBACNET-GW	IOCBACNET-GW (runs on IPC/Schaltsschrank) programs and settings	Heinz Junkes	Thu, 26 Mar 2015 10:54:50 +0200	zip	gz
FHIFEL_IOCs/IOCDOSE	IOCDOSE (softIOC, controls dose meters,...) programs and settings	Heinz Junkes	Tue, 28 Oct 2014 05:27:15 +0200	zip	gz
FHIFEL_IOCs/IOCFRANKENSTEIN2	IOCFRANKENSTEIN2 (softIOC, controls Frankenstein 2) programs and settings	Heinz Junkes	Thu, 08 Oct 2015 10:25:41 +0200	zip	gz
FHIFEL_IOCs/IOCHELPH	IOCHELPH (softIOC, provisorium gun relay etc.) programs and settings	Heinz Junkes	Wed, 25 Sep 2013 13:20:57 +0200	zip	gz
FHIFEL_IOCs/IOCINFRA	IOCHELPH (softIOC, provisorium gun relay etc.) programs and settings	Heinz Junkes	Wed, 17 Aug 2016 10:06:15 +0200	zip	gz
FHIFEL_IOCs/IOCLeCroy	IOCLeCroy (softIOC, runs on fel03, controls LeCroy scope) programs and records	Heinz Junkes	Thu, 13 Aug 2015 14:24:47 +0200	zip	gz
FHIFEL_IOCs/IOCMPROT	IOCMPROT (softIOC, VM, 166, machine protection) programs and settings	Heinz Junkes	Wed, 23 Sep 2015 13:47:20 +0200	zip	gz
FHIFEL_IOCs/IOCPG9520	IOCPG9520 (softIOC, controls quantum composer clock) programs and settings	Heinz Junkes	Thu, 10 Dec 2015 13:45:31 +0200	zip	gz
FHIFEL_IOCs/IOCRIO	IOCRIO (softIOC, runs RIOs in Mezz and Diag) programs and settings	Heinz Junkes	Thu, 07 Aug 2014 13:31:18 +0200	zip	gz

GitHub, Inc. github.com/epics-base/epics-base

15,128 commits 7 branches 109 releases 22 contributors

Branch: core/master New pull request Find file Clone or download

Switch branches/tags

Filter branches/tags

Branches	Tags
3.14	Latest commit f712f85 26 days ago
3.15	to core/master and related master branches 2 months ago
3.16	submodules 26 days ago
ca/master	to core/master 26 days ago
core/master	version and add 3.15 edits 2 years ago
database/master	and @TOP@ and @ARCH@ in .plt files 7 months ago
libcom/master	remove depth limit on submodules a month ago
.gitattributes	forgot to update .gitattributes 2 months ago
.gitignore	Fixes for sharing a build tree between Windows + Unix 4 months ago
.gitmodules	Removed modules/example from .gitmodules for now 6 months ago
.travis.yml	modules: add pva2pva, example 7 months ago
LICENSE	Update copyright names and dates in LICENSE file. 7 years ago
Makefile	Add submodule context 7 months ago
README	Merge 3.16 into core/master and related master branches 2 months ago

README

git (<https://github.com>)

And within the MPG:
<https://github.molgen.mpg.de>

mercurial (<https://www.mercurial-scm.org>)



pcaspy

latest

Search docs

Installation
Tutorial
Other Tips
Reference
Development
Release Notes

Starting a new project? Deploy to DigitalOcean for free with a 60 day trial.
Sponsored · Ads served ethically

Read the Docs v: latest

Docs » PCASpy Documentation [Edit on GitHub](#)

PCASpy Documentation

Overview

PCASpy provides not only the low level python binding to EPICS Portable Channel Access Server but also the necessary high level abstraction to ease the server tool programming.

To get PCASpy for your system, checkout the [Installation](#) guide. Then to get started with, check out a series of [Tutorial](#). It walks through the principles of a PCASpy application. After that you should feel confident to start your adventure. If necessary consult the [Reference](#) about the API.

After you have created an application, be it generic or site specific, share your experience at [success stories](#) and let others be inspired.

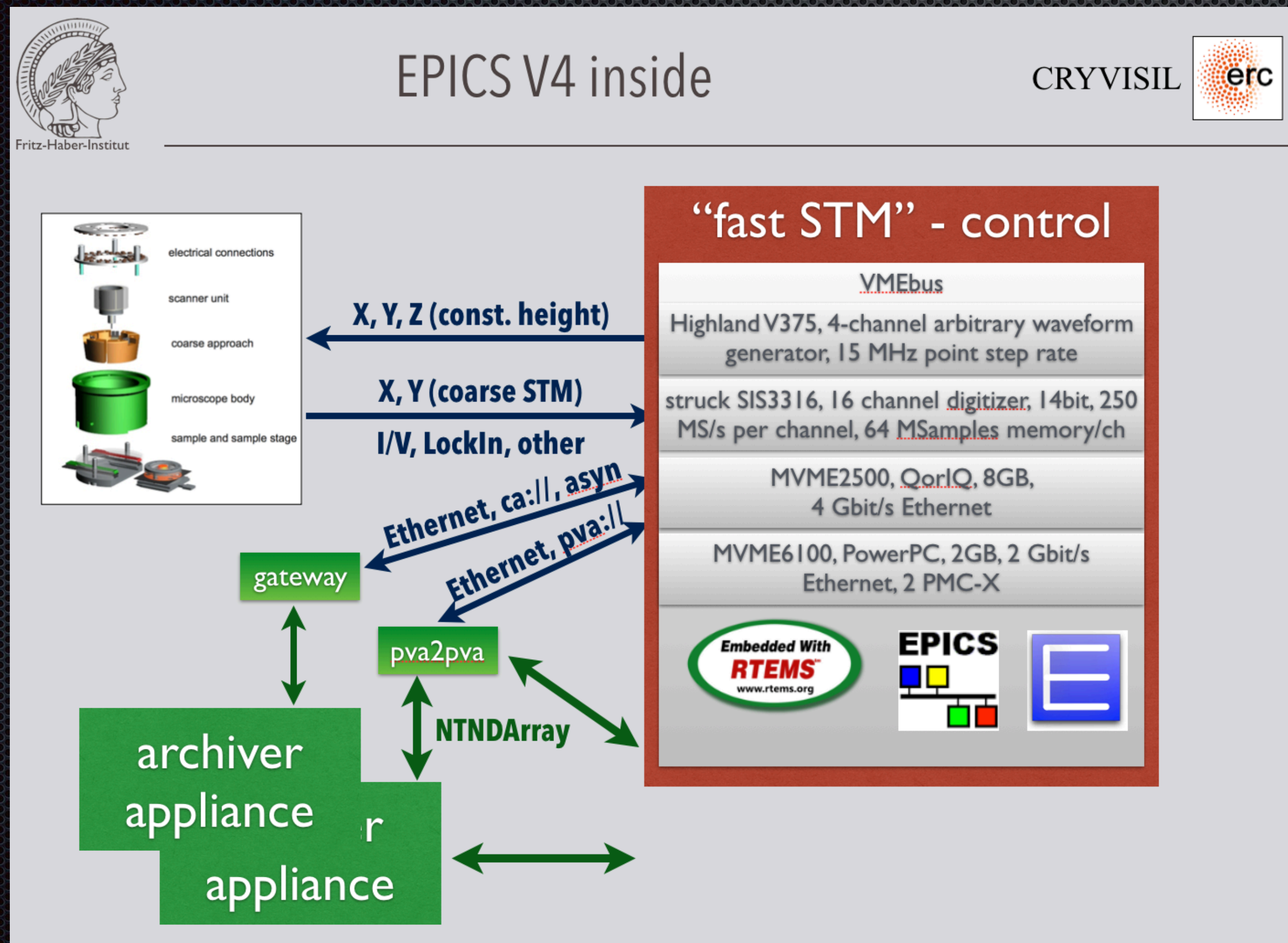
Contents

- [Installation](#)
 - [Binary Installers](#)
 - [Source](#)
 - [Package](#)
- [Tutorial](#)
 - [Example 1: Expose some random number\(s\)](#)
 - [Example 2: Interface to any shell command](#)
 - [Example 3: A Simulated Oscilloscope](#)

Read the docs (<https://readthedocs.org>)
on own server at FHI

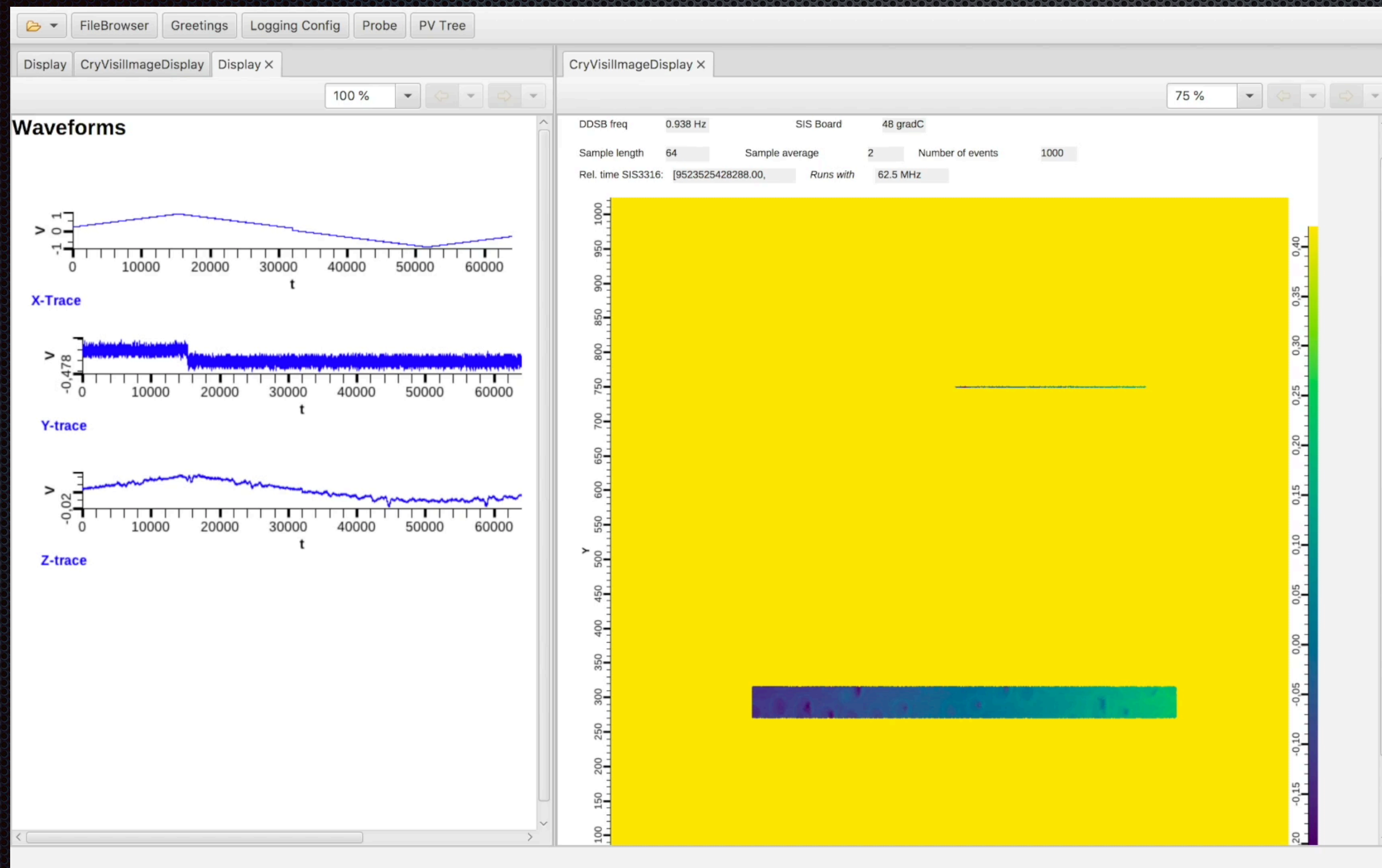


EPICS for CryVisil





Standard STM mode





❖ Spiral scan mode

The screenshot displays a computer desktop environment. On the left, a terminal window shows the following log output:

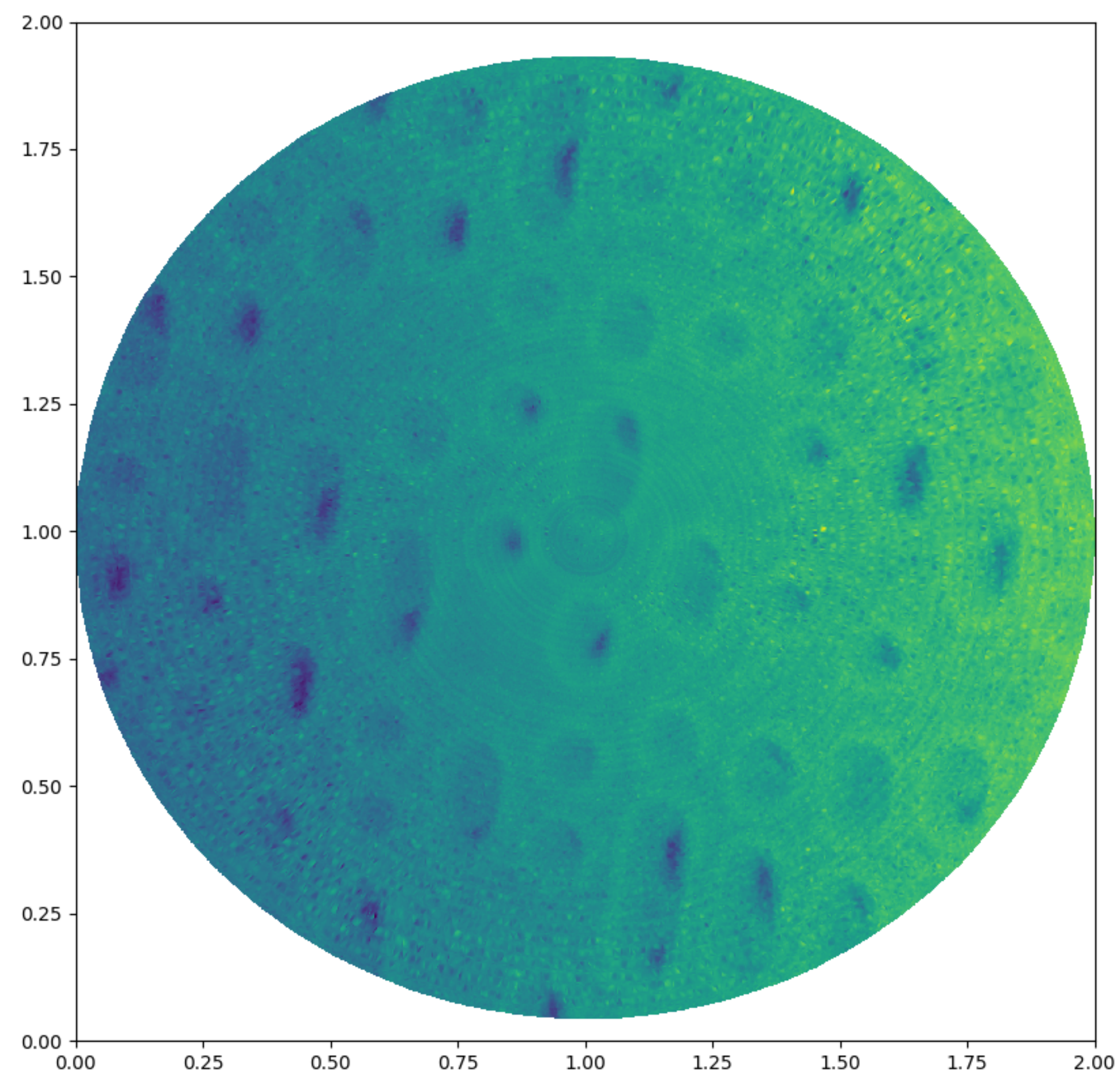
```
...app.DisplayRuntimeInstance.lambda$re...  
...ThreadPoolExecutor.runWorker(ThreadPoolExe...  
...ThreadPoolExecutor$Worker.run(ThreadPoolEx...  
...d.java:844)  
  
sh  
10:41:31 INFO [org.phoebus.product.L...  
...ation.PhoebusApplication] Client conn...  
...ation.PhoebusApplication] Sending par...  
...ation.PhoebusApplication] Client sent
```

The desktop background is a landscape with yellow flowers and a lake. Several files are visible on the desktop, including 'PATCH', 'aaiRecordPostNor...d.patch', 'EPICSHoWto_For_Gabriele.pdf', 'MD', 'Sophos.md', 'dreck.jpeg', 'Scan.jpeg', 'otherPitch.jpeg', and 'Reference.jpeg'. On the right, a software window titled 'CryVisImageDisplay X' is open, showing 'Waveforms' and a 'CryVisImageDisplay X' panel. The waveforms section contains three plots: 'V' (Voltage) vs 't' (Time), 'X-Trace', and 'Y-trace'. The 'V' plot shows a smooth curve peaking around 20,000. The 'X-Trace' and 'Y-trace' plots show similar curves. The 'Z-trace' plot shows a noisy signal. The 'CryVisImageDisplay X' panel shows a yellow rectangular area on a coordinate system with axes labeled 'Y' and 't'.



FRITZ-HABER-INSTITUT
MAX-PLANCK-GESELLSCHAFT

✦ Math helps





Genehmigungsnotiz:

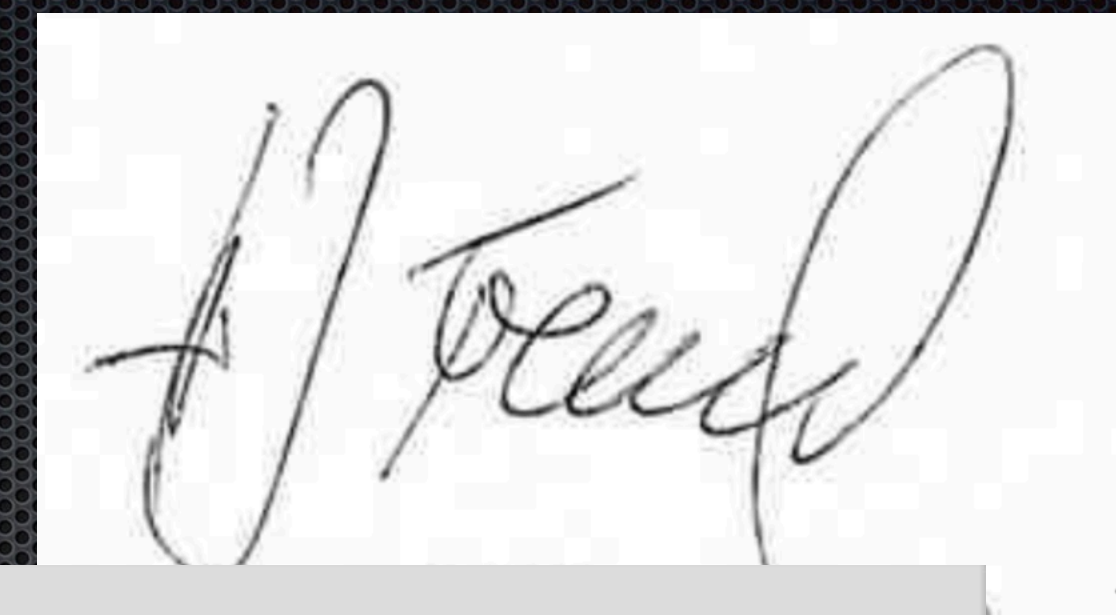
Terminalserver kompatibel zu bestehenden Installationen, Software
Ansteuerung vorhanden, gute Erfahrungen. Ein Gerat wird Nachwuchsgruppe
Ernstorfer in Rechnung gestellt. Eines bleibt bei PP&B zum
Softwareentwickeln. Wir spaeter auch in Rechnung gestellt.
(Heinz Junkes 18.07.2018 13:47:14 CET)

Funktion	Name	Unterschrift
Anforderer	Heinz Junkes	
Einkauf		

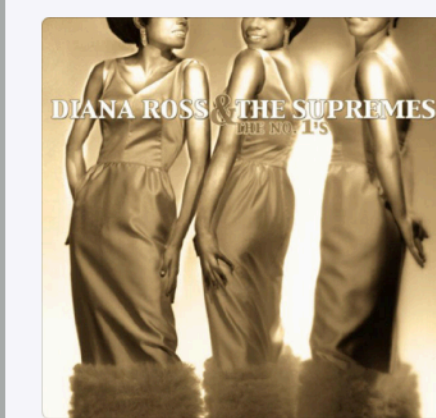
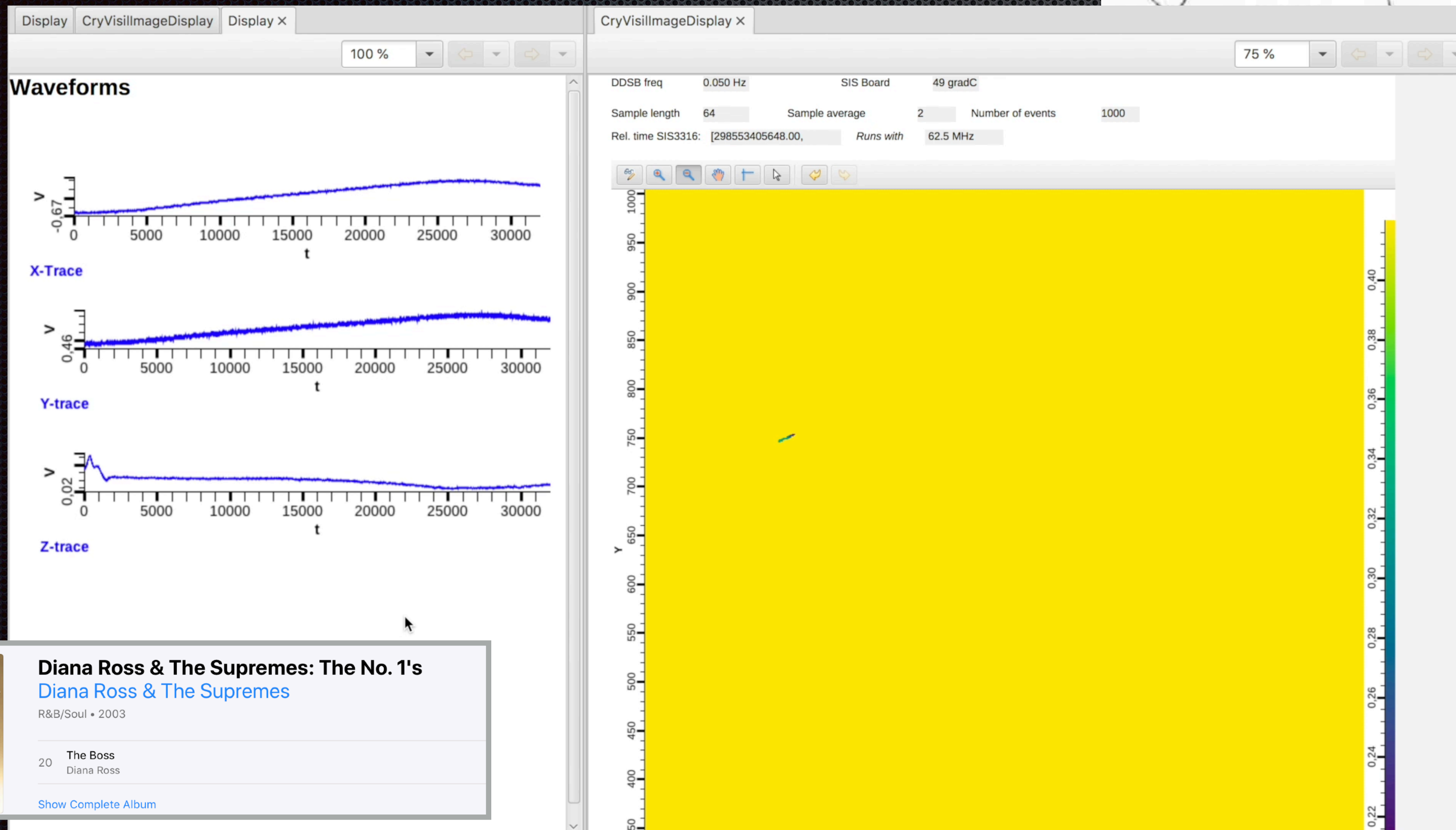
Dr. Freund,
mit der Bitte um
Genehmigung
TdB
T. DeGroot

5000 350534

433 3265



Freund scan mode



Diana Ross & The Supremes: The No. 1's Diana Ross & The Supremes

R&B/Soul • 2003

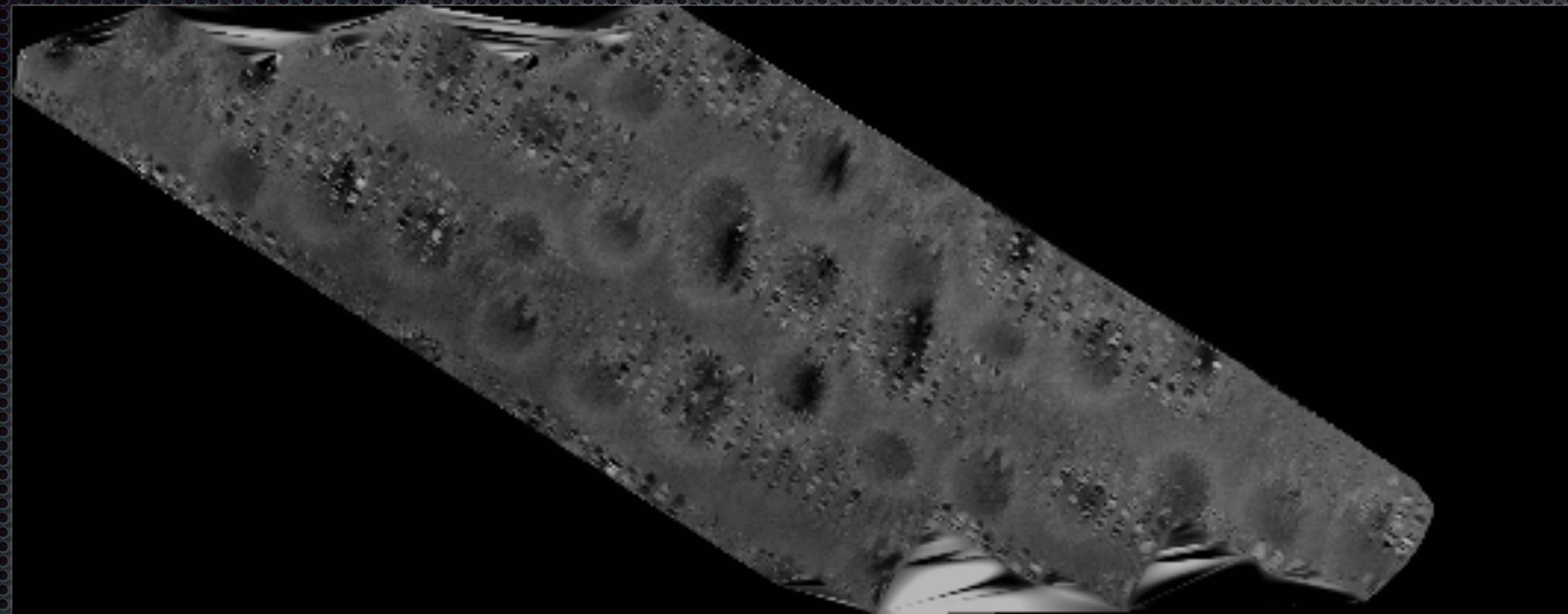
20 The Boss
Diana Ross

[Show Complete Album](#)



FRITZ-HABER-INSTITUT
MAX-PLANCK-GESELLSCHAFT

• Math helps





FRITZ-HABER-INSTITUT
MAX-PLANCK-GESELLSCHAFT

Thanks to

- ✦ The PP&B group
- ✦ The GNZ at the Fritz-Haber-Institut
- ✦ The electronic lab at the Fritz-Haber-Institut
- ✦ Markus Heyde, Patrik Marschalik, Leonard Gura (CryVisil)
- ✦ Prof. Freund for the support over the last 2 decades