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PSI

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Testing NICOS on AMOR

7th ECP Workshop I 04th September 2018

Agenda

Nicos on AMOR

AMOR instrument

EPICS Integration

Kafka Integration

Histogram Streaming

Setup & Installation

Installation

Configuration

Feedback

General Feedback

GUI Feedback

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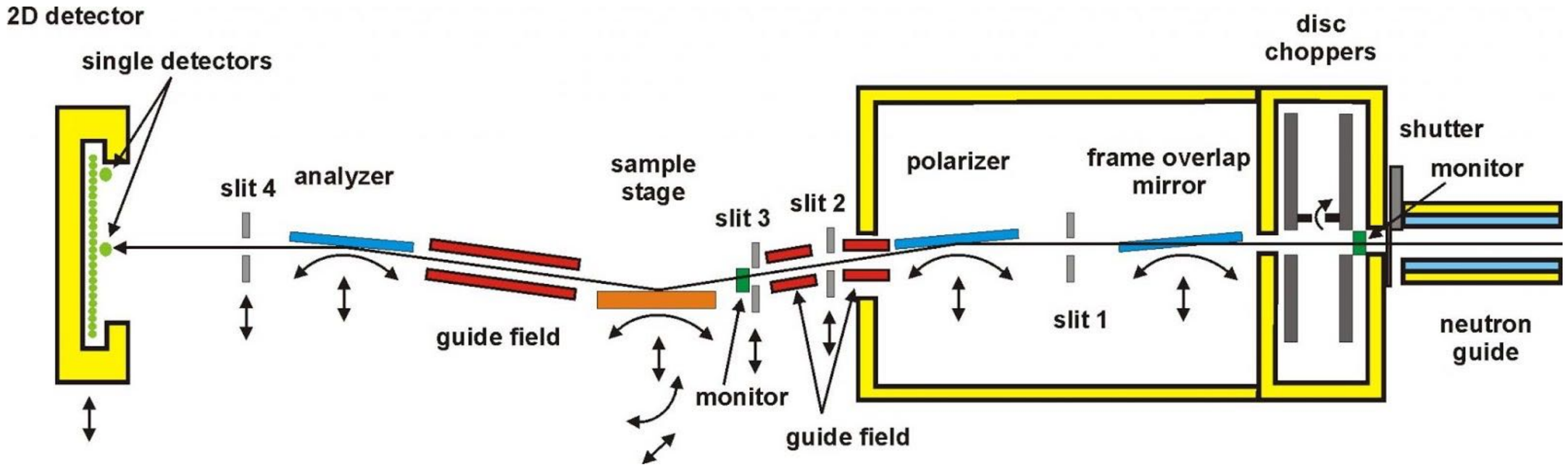
NICOS on AMOR

AMOR Reflectometer at SINQ PSI

Motors | Magnets | Counter channels | Multi-disc choppers | Shutter …



Configurations

Default	Optional
Chopper	Analyser
Detector	Polariser
Counter	Selene
Frame-Overlap	Slit 2/3/4/5
Sample	
Slit 1	

Components controlled by EPICS

Chopper	ch1, ch2	*EpicsAstriumChopper*
Detector	**Presets:** Monitor/Time	*EpicsActiveChannel/EpicsPassiveChannel*
	Monitors: Current Monitor, Proton Current	*EpicsDetector/EpicsScalerRecord*
Motors	**Analyser:** aom, aoz, atz **Counter:** com, coz, c3z, cox **Frame Overlap Filter:** fom, ftz **Polariser:** mom, moz, mtz, mty **Sample:** som, soz, stz, sch **Selene:** eoz, eom **Slits:** d1l, d1r, dXb, dXt, d5h, d5v; X: 1-4 **Laser:** xlz	*EpicsMotor*
SPS	**Spin Flipper, Shutter, Laser Switch**	*EpicsSpsSwitch*
Others	**Dimetix Laser measurement**	*EpicsReadable*
	Sample magnet	*EpicsMagnet*

Other Components

Distances

Analyser, detector, chopper, counter, frame overlap, polariser, sample, selene, slit 1/2/3/4/5

1

Each component has a mirror attached on different heights

2

A vertical motor can move the laser to these heights

3

The laser measures the distance of each component

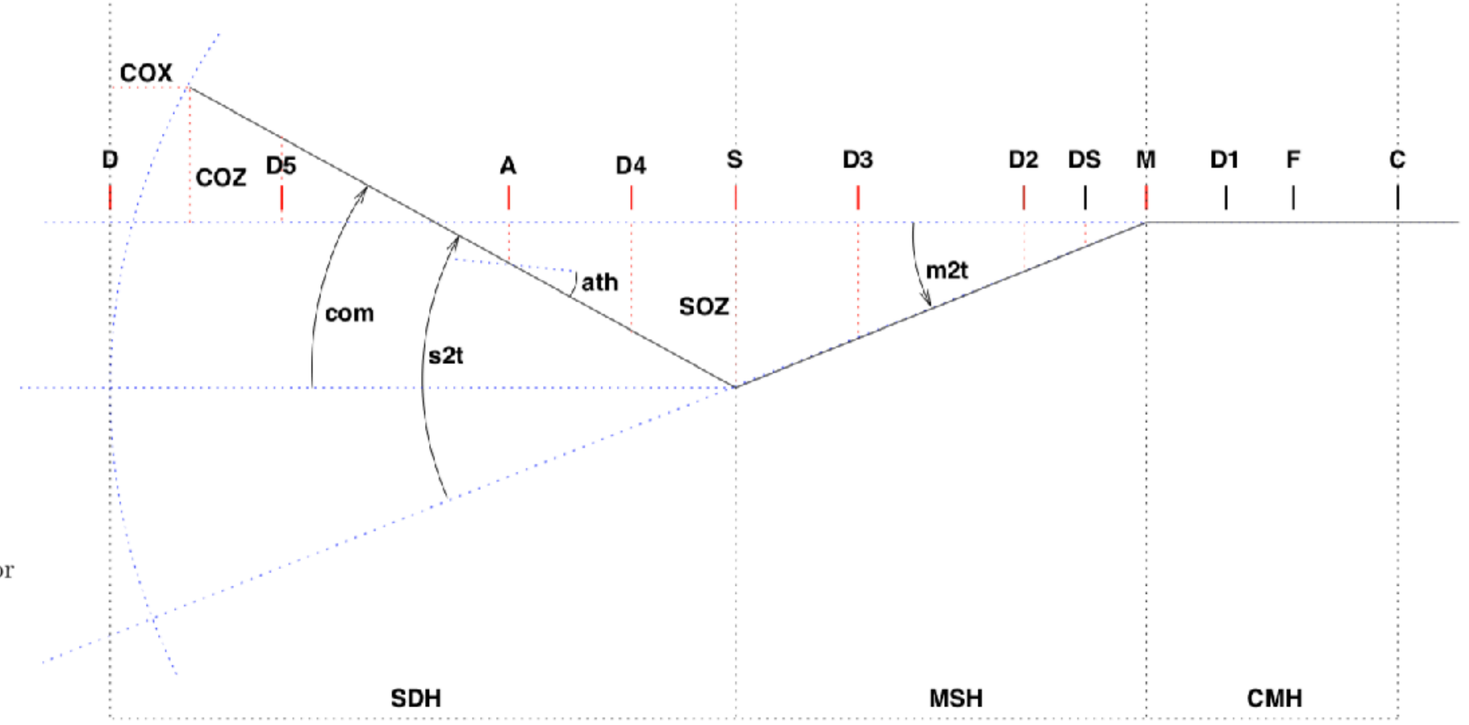
Other Components

Logical Motors

Analyser theta: ath

Monochromator two theta: m2t

Sample two theta: s2t



C chopper
F Filter
M Monochromator / Polarisator
S sample
A Analysator
D Detektor
D_x Blende x

$$\begin{aligned}
SOZ &= MSH\,\tan[-m2t] \\
com &= s2t - m2t \\
COX &= -SDH\,(\cos[com] - 1) \\
COZ &= SOZ + SDH\,\sin[com] \\
C3Z & \\
D_5B &= MB_S\,\tan[-m2t] - 10 \\
D_2B &= MD_2\,\tan[-m2t] - 0.5\,D_2T \\
D_3B &= MD_3\,\tan[-m2t] - 0.5\,D_3T \\
D_4B &= SOZ + SD_4\,\tan[com] - 0.5\,D_4T \\
D_5B &= SOZ + SD_5\,\tan[com] - 0.5\,D_5T \\
AOZ &= SOZ + SA\,\tan[com] \\
aom &= com + ath
\end{aligned}$$

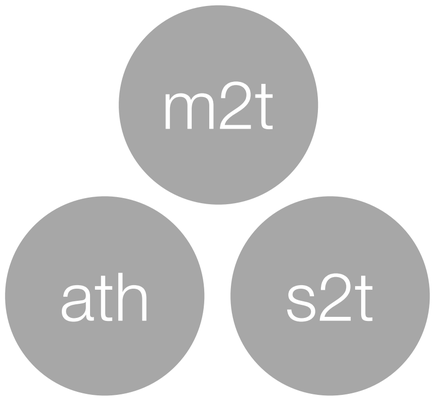
Other Components

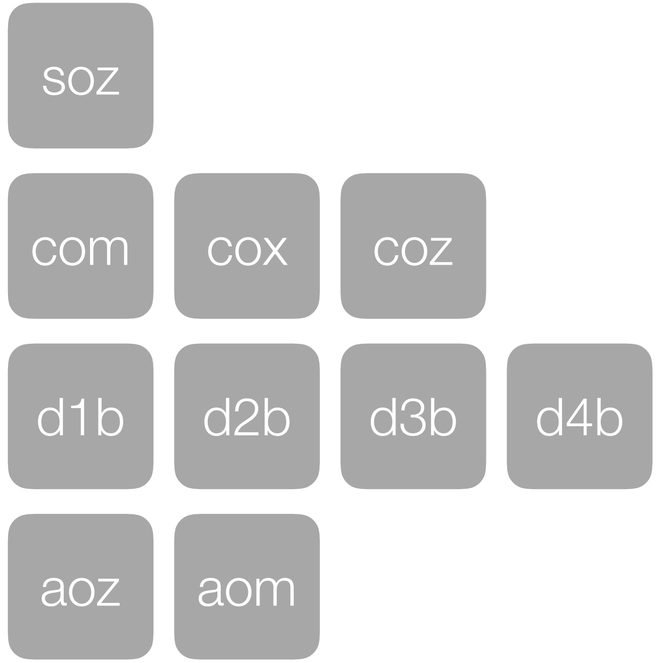
Logical Motors

Analyser theta: ath

Monochromator two theta: m2t

Sample two theta: s2t





Other Components

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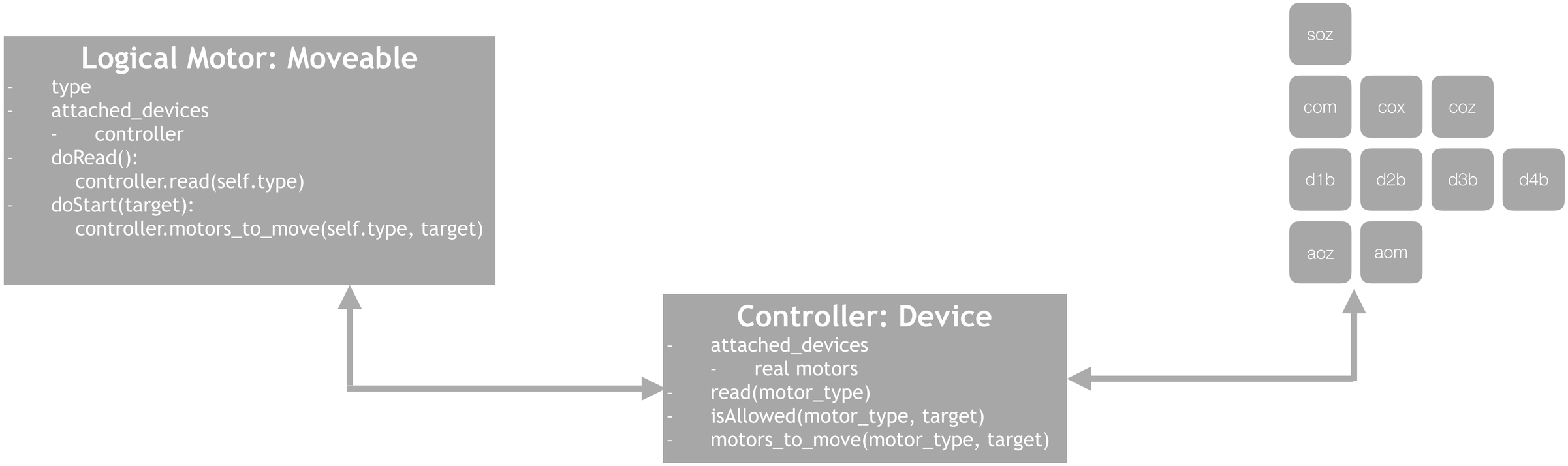


Kafka Integration

NICOS Cache

The NICOS Cache Daemon uses Kafka on the backend

All historic meta data for devices: e.g. motor positions, device status, experiment information now live in Kafka

EPICS Forwarder

NICOS can configure and issue commands to the Forwarder

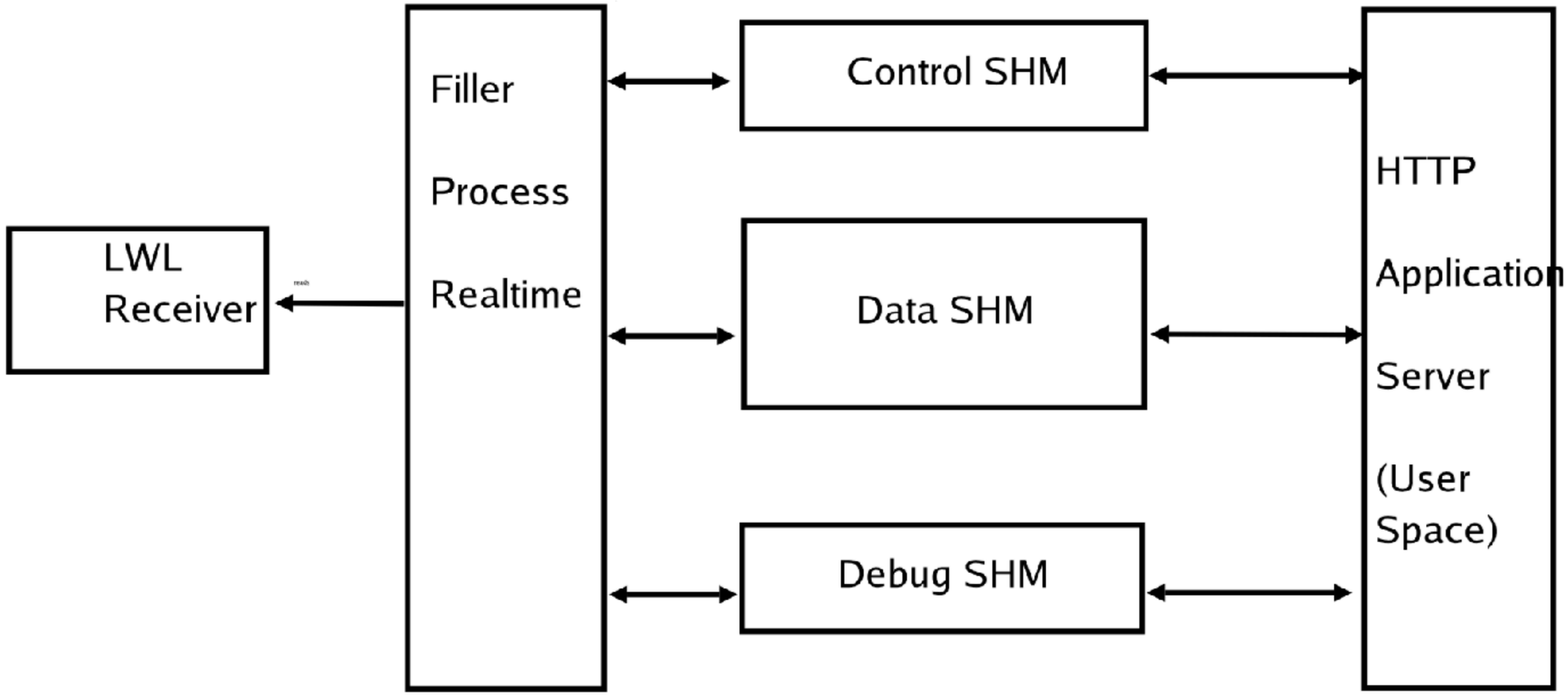
All PVs and their updates live in Kafka

NeXus File Writer

NICOS can configure and provide NeXus template to the file writer

Data is taken from Kafka and written to NeXus files

SINQ: Histogram Memory



SINQ: Histogram Memory

For staring and stopping data acquisition the following paths are to be used:

startdaq.egi initialises the histogram memory data and eventual counters to zero and starts data acquisition.

stopdaq.egi stops data acquisition.

pausedaq.egi pauses data acquisition. The data in the histogram memory is not modified.

continuedaq.egi continues a paused data acquisition.

SINQ: Histogram Memory

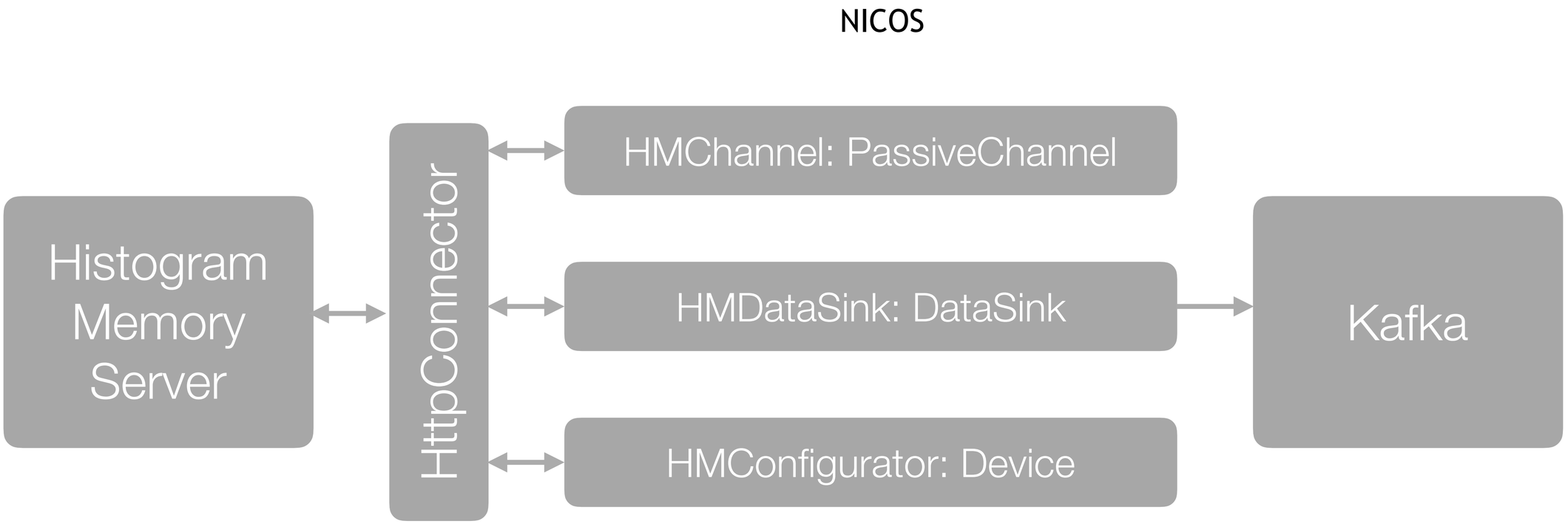
readhmdata.egi?bank=val&start=val&end=val

bank: The id of bank to retrieve data from. The SinqHM supports multiple banks.

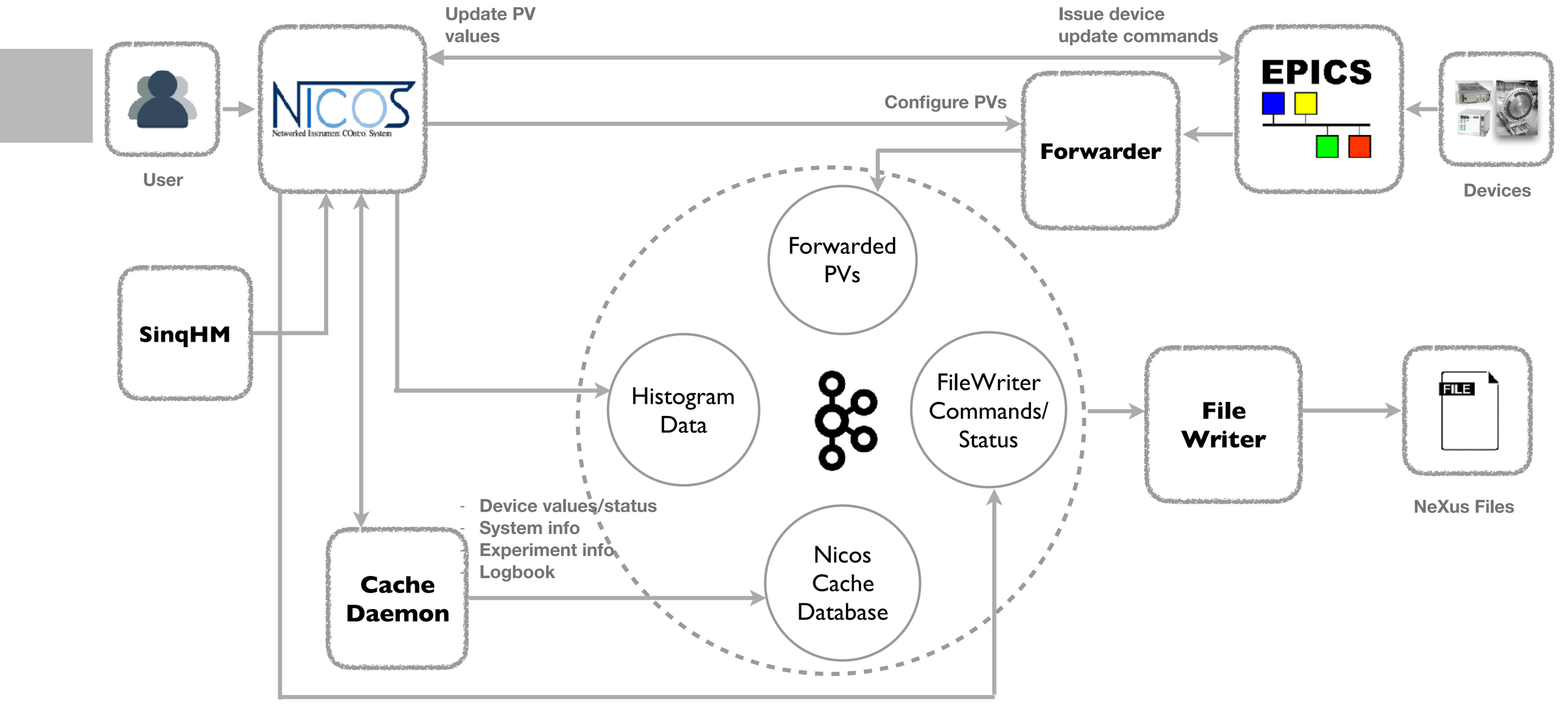
start: start downloading at the given index in the histogram memory data area.

end: download data only until the given index in the data area.

SINQ: Histogram Memory



EPICS - Kafka - SinqHM - NICOS



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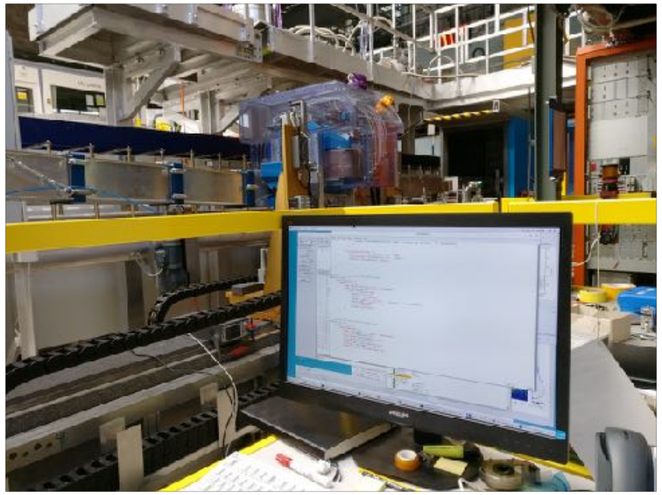
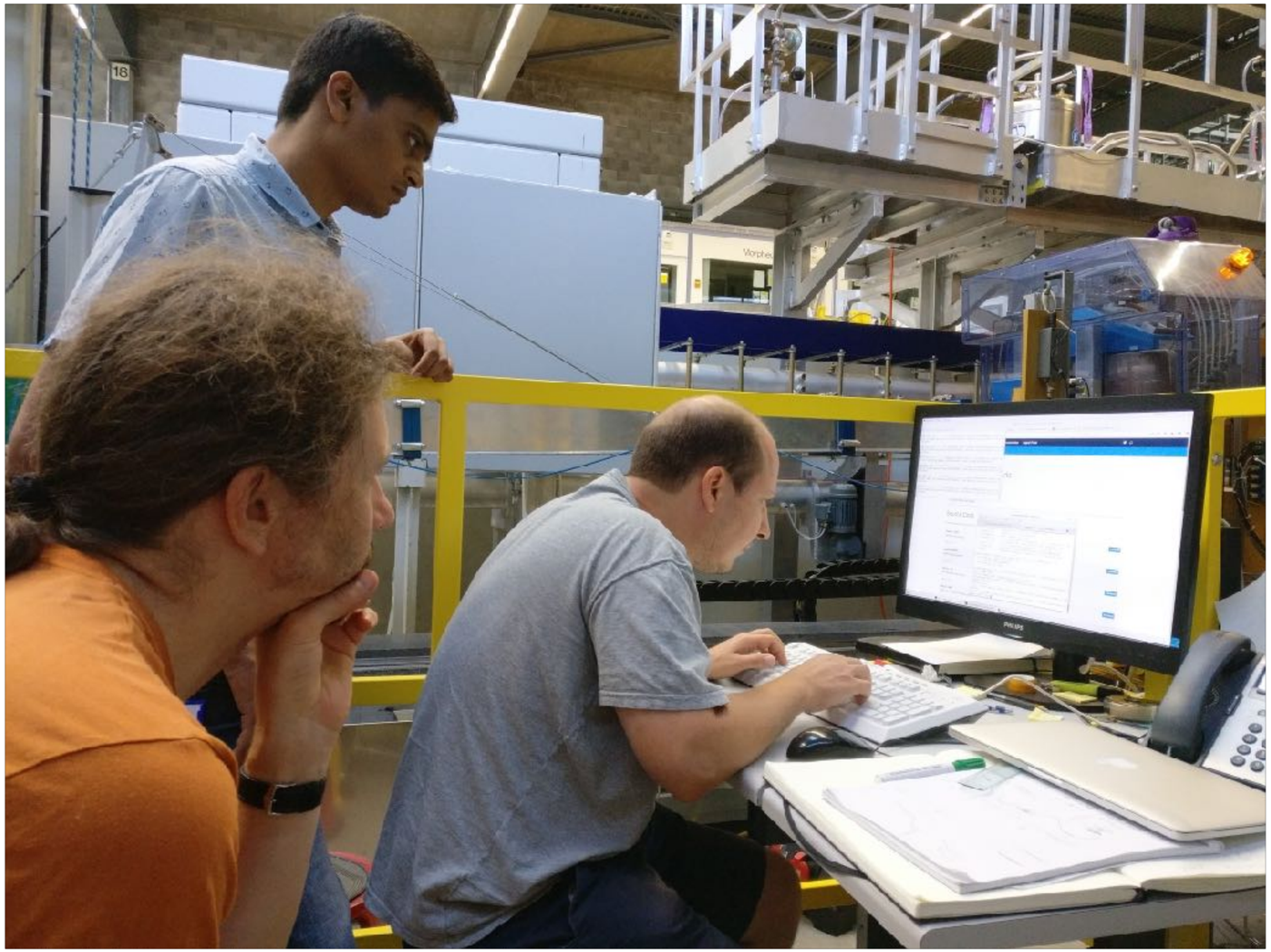
Setup & Installation





Pictures from Tobias

Installation

Packages

EPICS: Ansible

Kafka: Ansible

Forwarder: Conan

File Writer: Conan

NICOS: Ansible

Services

EPICS: amor_ioc/facade_chopper

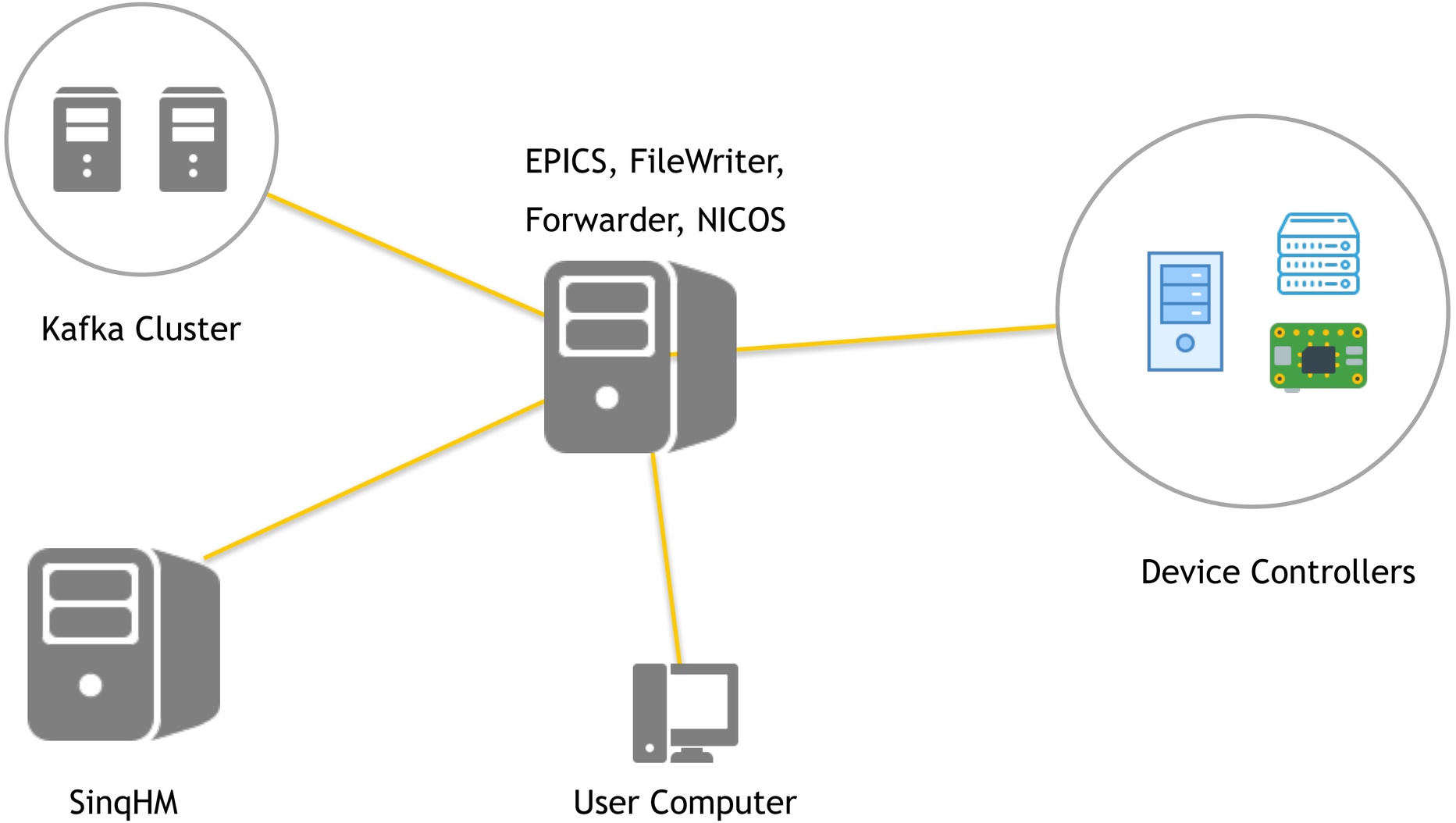
Kafka: kafka

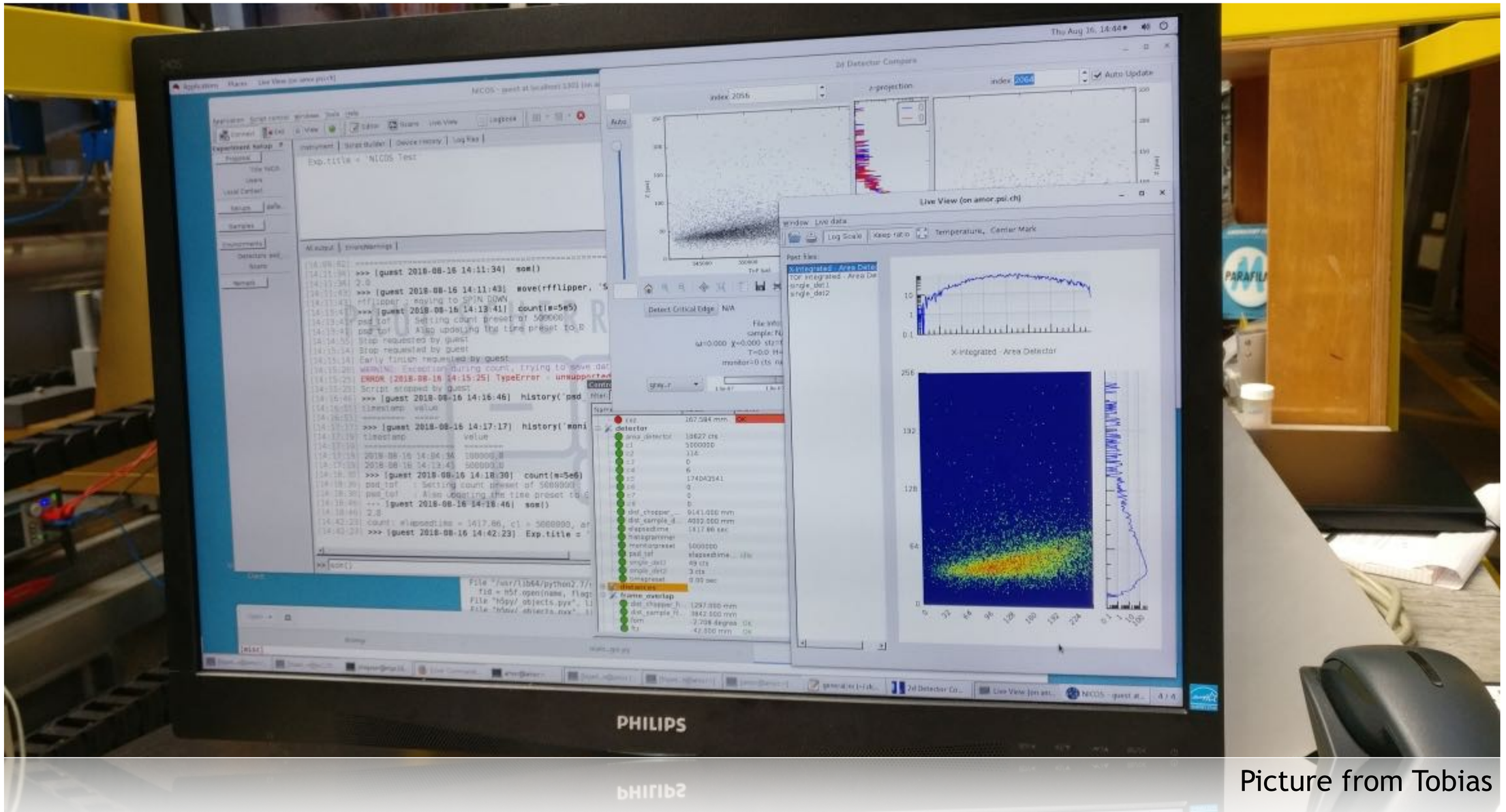
Forwarder: forward-epics-to-kafka

File Writer: kafka-to-nexus

NICOS: nicks-system

Configuration





Picture from Tobias

What was achieved?

Instrument Operation	Test most of the devices	Start and stop counting	Write NeXus Files
Visualisation	Live View from detectors		
Scans	Scan over motor		

Yet to be discovered..

NICOS	Sample environment	Plug n Play	Write Historic Data
Configuration	Multiple Kafka Brokers	Multiple Topic Partitions	Services on different machines
Hardware/Data	Events from detector	Timing System	Chopper/ TDCE

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Feedback

General

- Writing scripts in Python advantageous
- NICOS produces a lot of output which should be reduced to only limited lines in the log, rest can be pushed to debug
- There are a lot of generic methods such as reset which do not do anything but appear when one uses ListMethods(dev). These further confuses users and should be reduced as much as possible.
- EPICS related problems:
  - Motor different sign + Offset!
  - Autosave was not enabled
- FileWriter:
  - 1.10.x library in NeXus File Writer, our tools only read 1.8.x (disable SWMR support)
  - Writing only the final value from stream

GUI

- NICOS has more GUI components! List of devices is confusing and might sometimes expose incorrect values of devices such as logical (virtual) motors

- NICOS exposes a lot of parameters such as pollinterval, formatstr, pvnames which a user is not interested in! They should be restricted as much as possible, otherwise user tries to change them.

- Issue with low-level devices!
  - Cannot write values in files (no meta info!)
  - Cannot use them in GUI (only as strings to read, move)

- NICOS devices ought to get a visibility parameter. Then in the GUI you can modify that value and thus control the visibility of devices in the GUI

Improvements required from NICOS..

- Visibility control
- Write data of devices even though they are not visible (lowlevel in metainfo?)
- Attached devices optional dependent on configuration

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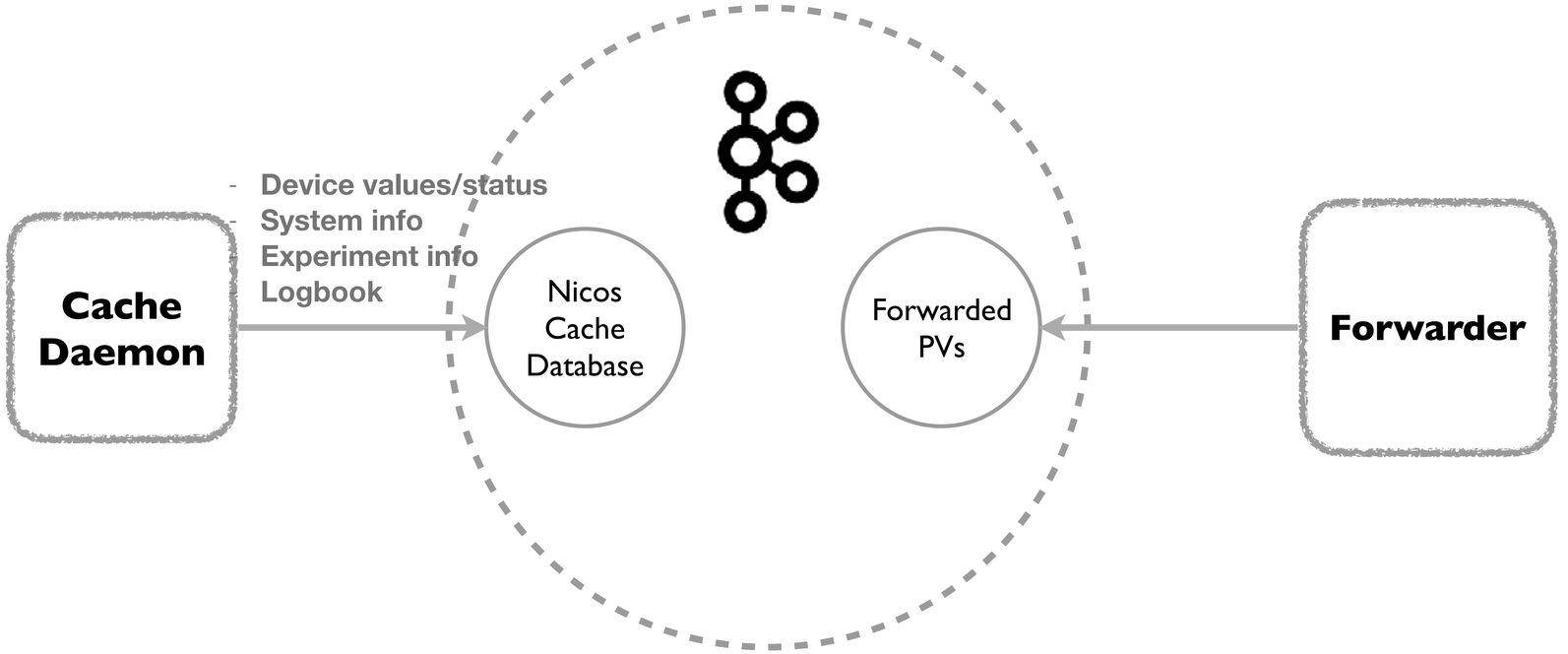
Discussions

NICOS Cache + Forwarder



Avoiding Data Duplication

Can we use f142 to write NICOS Cache?

Expired field?

Motion Control

- Hardware limits and software limits in NICOS
  - Directly from EPICS?
  - User changeable?

- MsgTxt Field?
  - Aim and Scope
  - Avoid duplication

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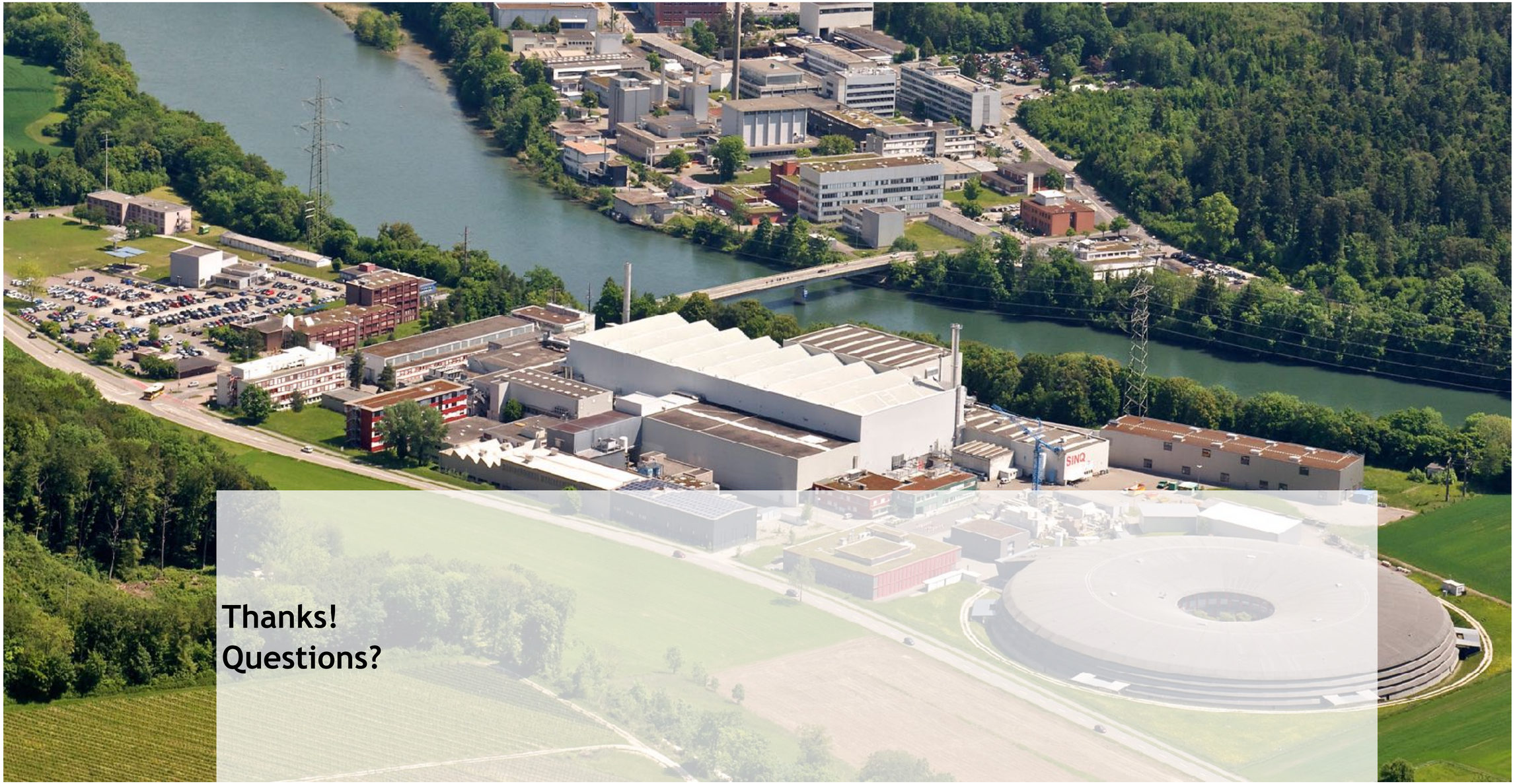

Thanks!
Questions?