

# Operational challenges during COVID19



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LEAPS-IT Workshop  
Lund (Zoom)  
18 June 2020



# Outline

- Facility status
- Remote data analysis
  - offline
  - online
- Remote control
- Citizen science project: Tracking COVID19 infections and deaths in your region (OSCOVIDA)
- Communication: instant messaging
- Disclaimer: views my own

## COVID-19 reduced operation

- European XFEL went into reduced operation with minimal staff on site by on 16 March
- Extended use of home office
  - Software work
  - Data analysis
  - Infrastructure development
  - Publications
- Restart with < 30% staff on site started 4 May
- No **regular** user operation this year



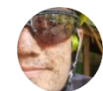
Hans Fangohr  
@ProfCompMod

#homeoffice - Data Analysis team at @EuropeanXFEL working from home to #flattenthecurve . A mixture of instant chat, email, video conferencing, GitHub and Gitlab issues help staying in touch. Seen one cat on screen during video meetings so far. @AcademicChatter #coronavirus



10:24 PM · Mar 17, 2020 · Tweetbot for Mac

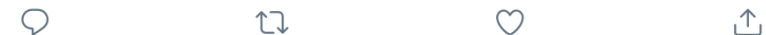
1 Retweet 15 Likes



Alun 🚧 🌱 📊 📧 📱 🇬🇧 @AlunAshton · Mar 18

Replying to @ProfCompMod @EuropeanXFEL and @AcademicChatter  
The science IT section @psich\_en are 'virtually' the same 🐱, but the cat invasion started Monday!

Should review the policy of pets in the workplace! (Said the cat 🐱)



## On site

- COVID-19 Safety Guidelines and training for work on site
  - Increased hygiene and distancing measures in place
  - Occupancy restrictions for all European XFEL rooms
    - ▶ Only 1 person per office
    - ▶ Maximum occupancy given at door
    - ▶ Includes experiment hutches
  
- Staff members only allowed on site with permission of Group Leader
  - Home office preferred if possible

XFEL.EU SR-2020-002-01.0

### SAFETY REGULATION

## Hygiene Guidelines for Safe Operation During the COVID-19 Epidemic



## Remote experiments

### Issues

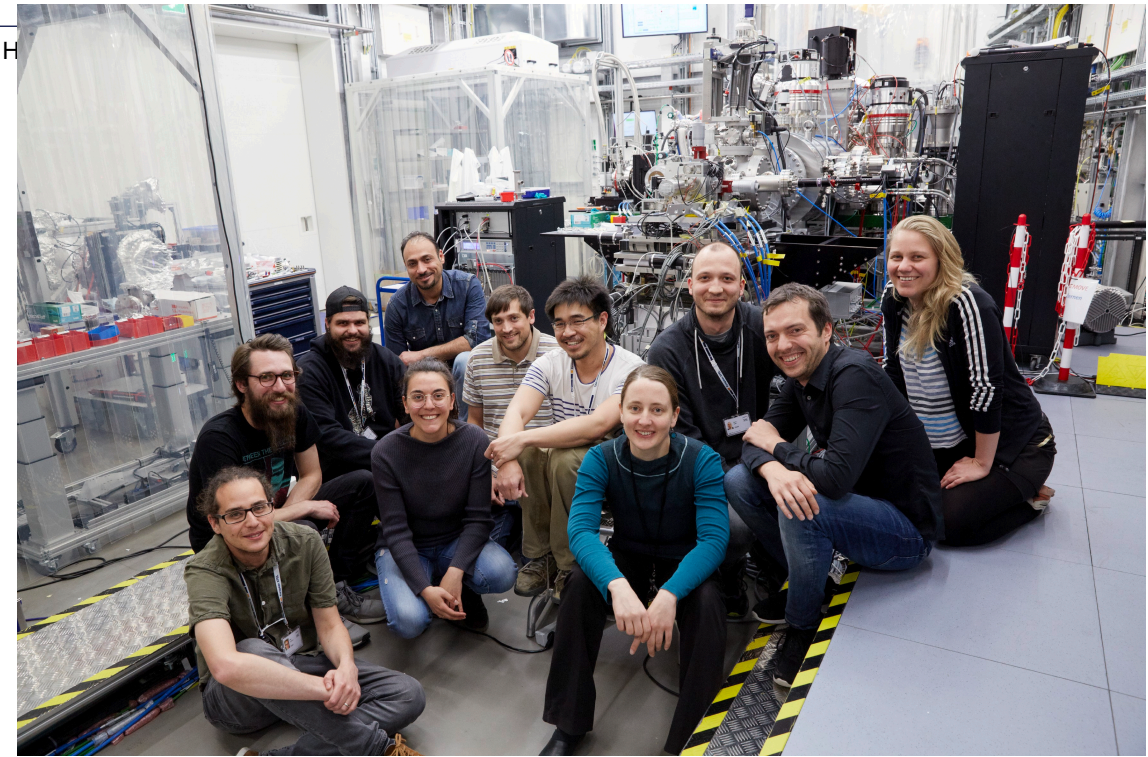
- Can users come to the facility?
- What about social distancing / PP during experiment?
  - ▶ COVID19 regulation: at most 2 people in hutch

### “Unattended operation of experiments”

- impossible
- people in hutch during experiment ~10

### Remote control of experiments

- facility staff acting on behalf of users
- user representatives may join them
- Other users *connected remotely*



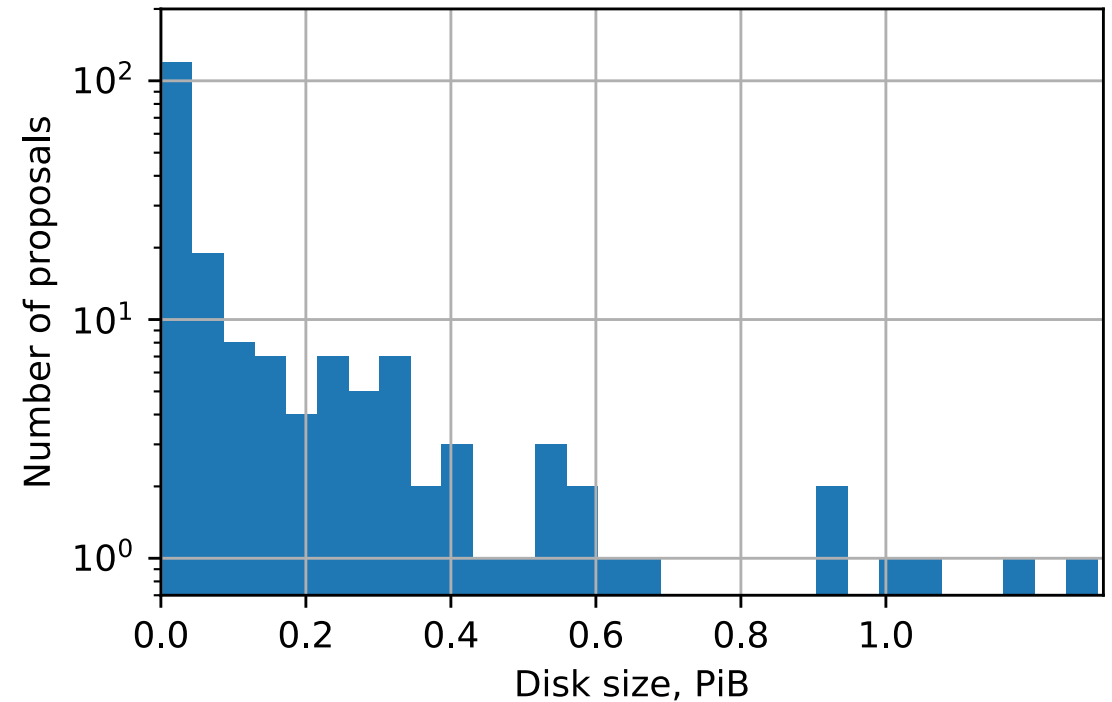
## Remote offline data analysis

### Data set size

- ~100 TB not unusual per experiment
- > 1 PB is possible
  - ▶ Most offline data analysis is remote already

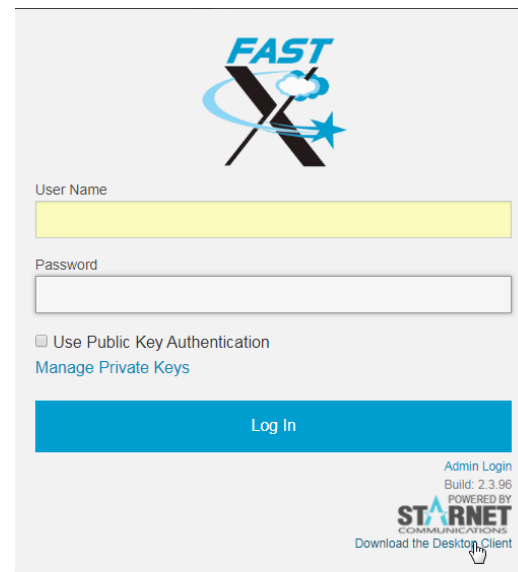
### Remote offline data analysis

- ssh -X
- FastX
- JupyterHub

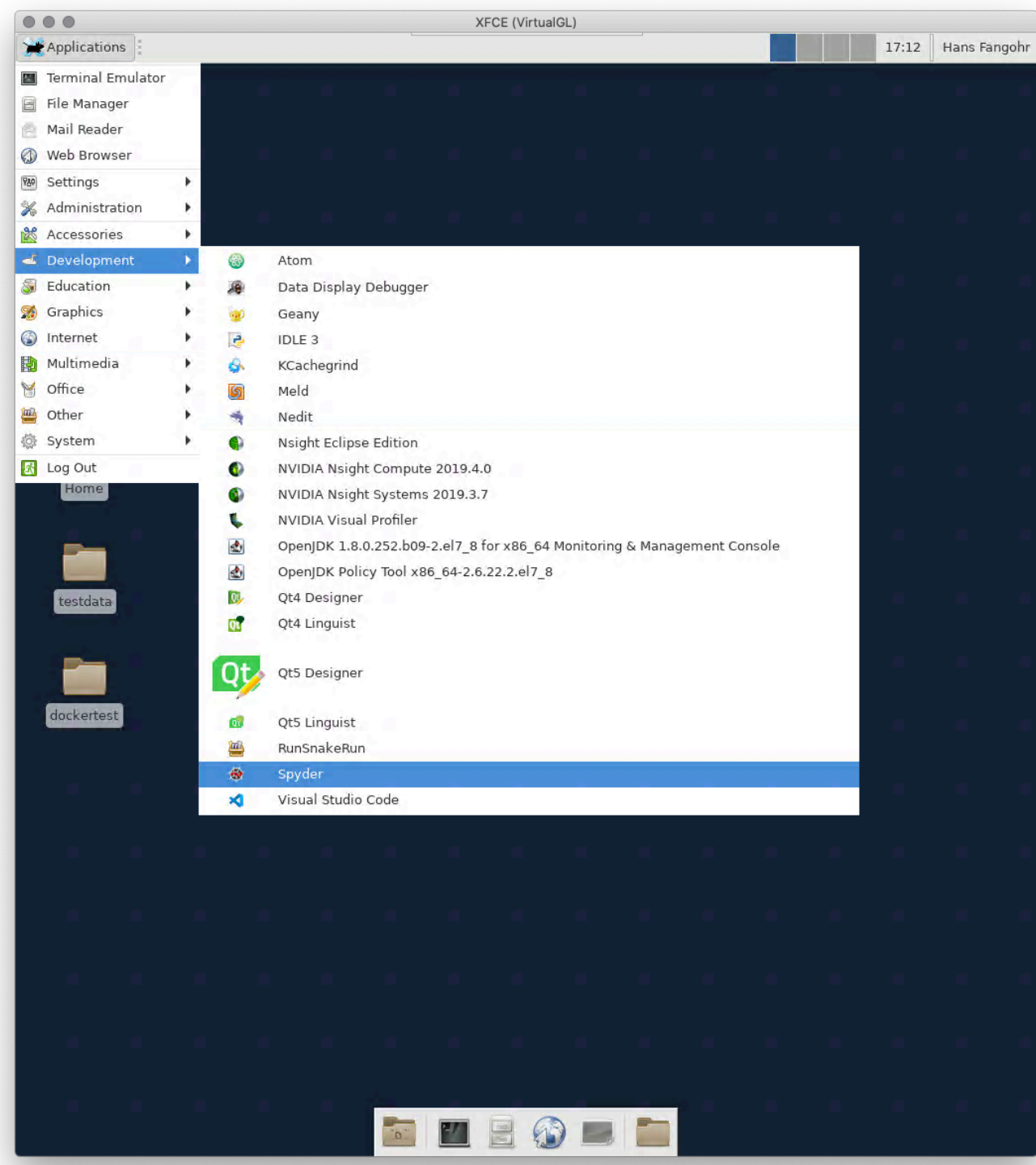


# FastX

- Remote Desktop (VNC, NoMachine, ...)
- Graphical user interface (including window manager) made available to user via dedicated app or web browser
- Better performance than X-forwarding



The image shows a login interface for FastX. At the top center is the FastX logo, which consists of the word "FAST" in blue above a stylized "X" with a blue arrow and a star. Below the logo are two input fields: "User Name" with a yellow background and "Password" with a white background. Underneath the password field is a checkbox labeled "Use Public Key Authentication" and a link "Manage Private Keys". A large blue "Log In" button is positioned below these elements. In the bottom right corner, there is small text: "Admin Login Build: 2.3.96 POWERED BY STARNET COMMUNICATIONS Download the Desktop Client".



# JupyterHub: use HPC resources through Jupyter Notebook from remote

## JupyterHub

- users connect through browser and `https`
- serve notebooks on facility hardware
- use existing authentication systems
- connect to users' file storage

## Popular with users:

- browser and OS of choice
- works locally and remotely the same

## Orthogonal aspects:

- Good for reproducibility
- Cannot provide for all use cases (GUIs, ...)

## Maxwell Jupyter Job Options

Maxwell partitions

Choice of GPU

Note: For partitions without GPUs (or choice of GPUs) the GPU selection will be set to 'none'

Constraints

Note: This will override GPU selections!

Number of Nodes

Note: Number of nodes will be set to 1 on shared jhub partition!

Job duration

Note: on the shared Jupyter partition (jhub) the time limit is always 7 days!

Launch modus

Remote Notebook

Node and GPU availability					
Partition	# nodes	# avail	# GPUs avail	# P100 avail	# V100 avail
jhub	3	3	0	0	0
maxwell	61	46	0	0	0
maxgpu	19	12	12	1	10
all	327	188	0	0	0
allgpu	88	67	67	48	10

Spawn



## Use case: notebooks as recipes

- Pre-populate notebook with cells to carry out a particular type of data analysis
  - provide a directory full of such recipes to users
  - users execute cells during beamtime and later
  
- Convenient compromise between
  - static recipe (=script)
  - interactive exploration

```
In [3]: import ToolBox as tb
```

### X-ray Absorption Spectroscopy

Step 1: Load data and align them by train id and pulse id

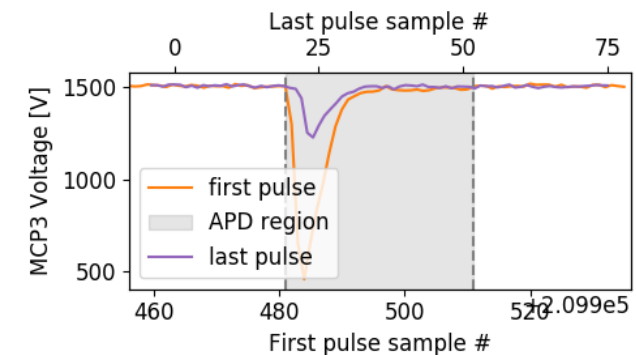
```
In [4]: proposalNB = 900074
semesterNB = 201930
runNB = 487
topic = 'SCS'
fields = ["SCS_photonFlux", "SCS_XGM", "MCP3apd", "nrj"]
run = tb.load(fields, runNB, proposalNB, semesterNB, topic,
             validate=True, display=False)
nrun = tb.matchXgmTimPulseId(run)
```

```
Checking run directory: /gpfs/exfel/exp/SCS/201930/p900074/raw/r0487/
No problems found
```

Step 2: check the pulse integration window

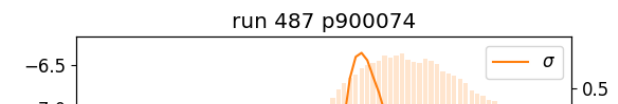
```
In [5]: tb.checkTimApdWindow(nrun, mcp=3)
```

```
no raw data for MCP3. Loading trace from MCP3
```



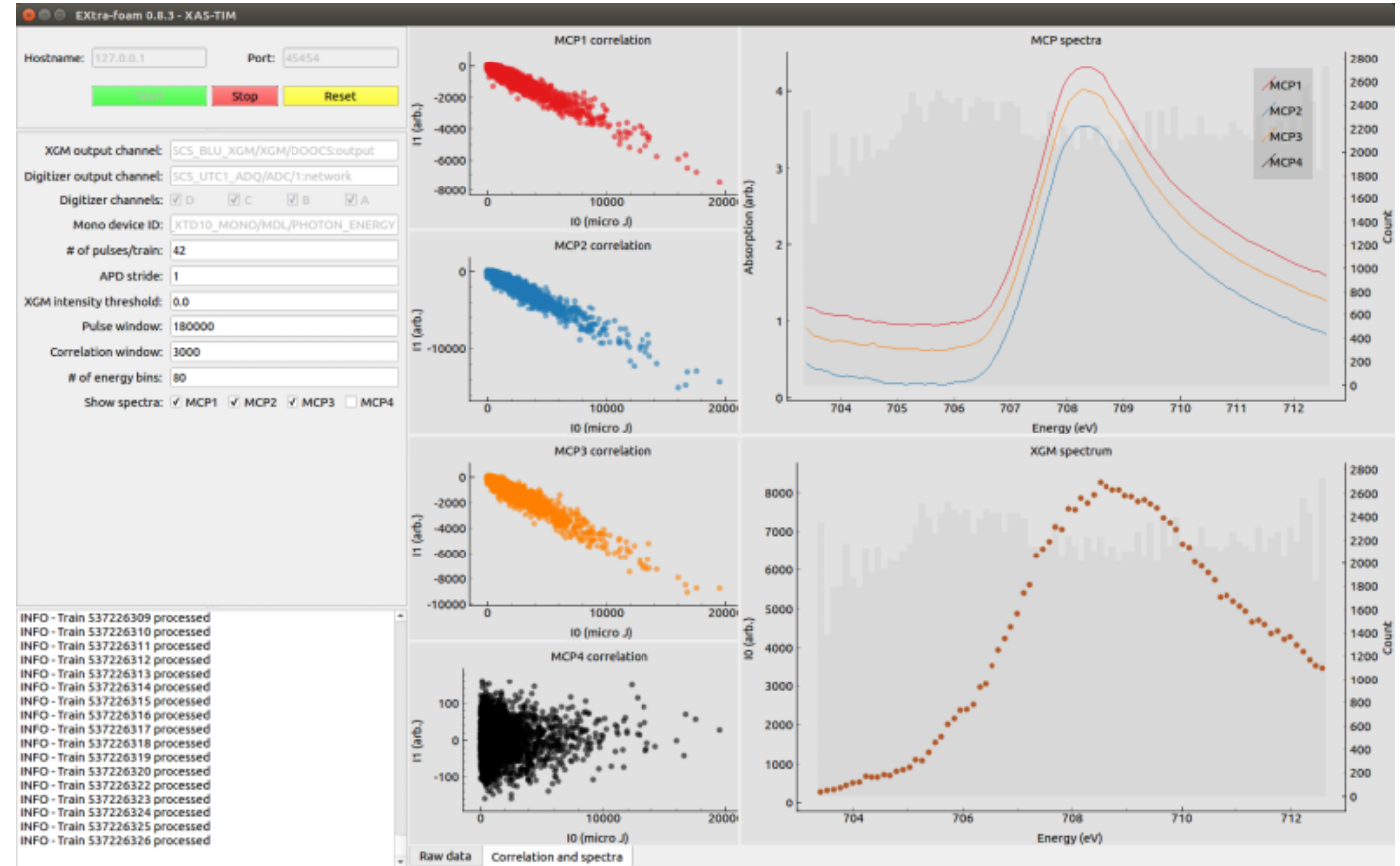
Step 3: bin the data and plot the XAS spectrum

```
In [6]: nrj = np.linspace(nrun.nrj.min(), nrun.nrj.max(), 80)
xas = tb.xas(nrun, nrj, plot=True)
```

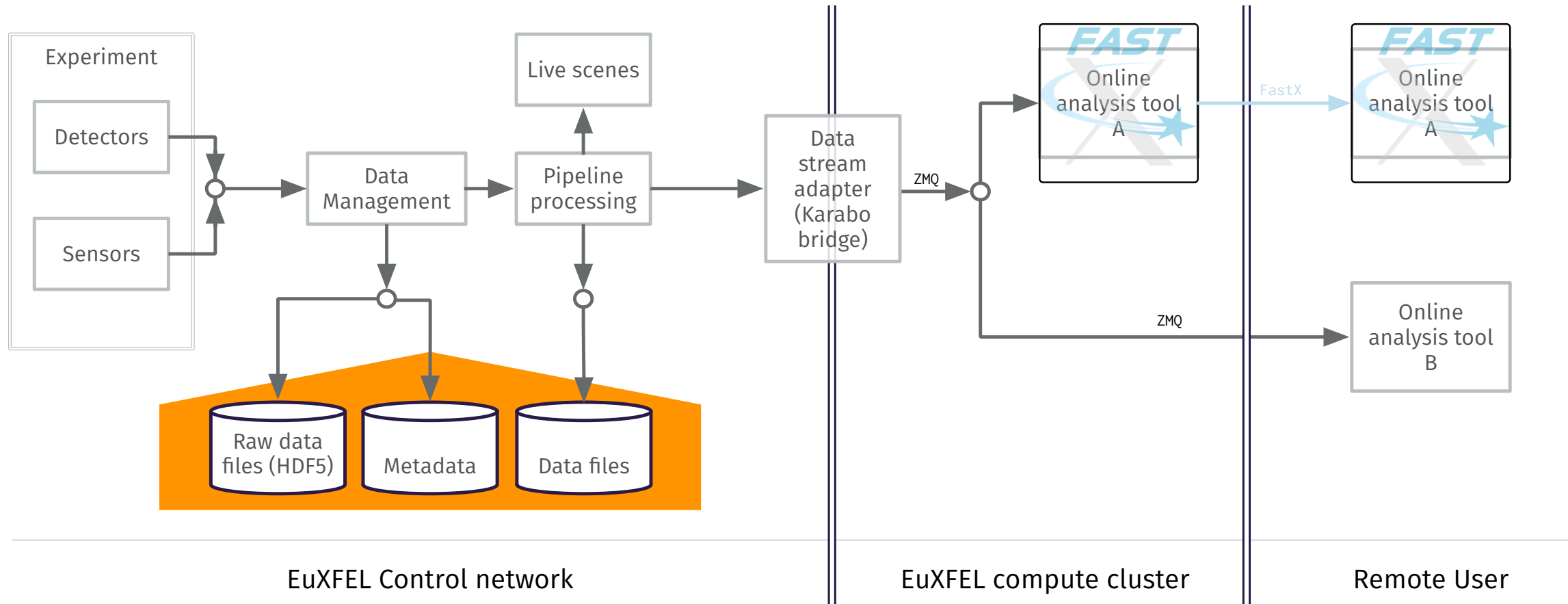


# Online data analysis

■ Fast feedback during experiment



## Remote Data Analysis options



# Remote control

- Can users control hardware from remote?
  - ▶ No, safety regulations.
- Users need to participate in experiment
  - ▶ Read-only view of control panels.

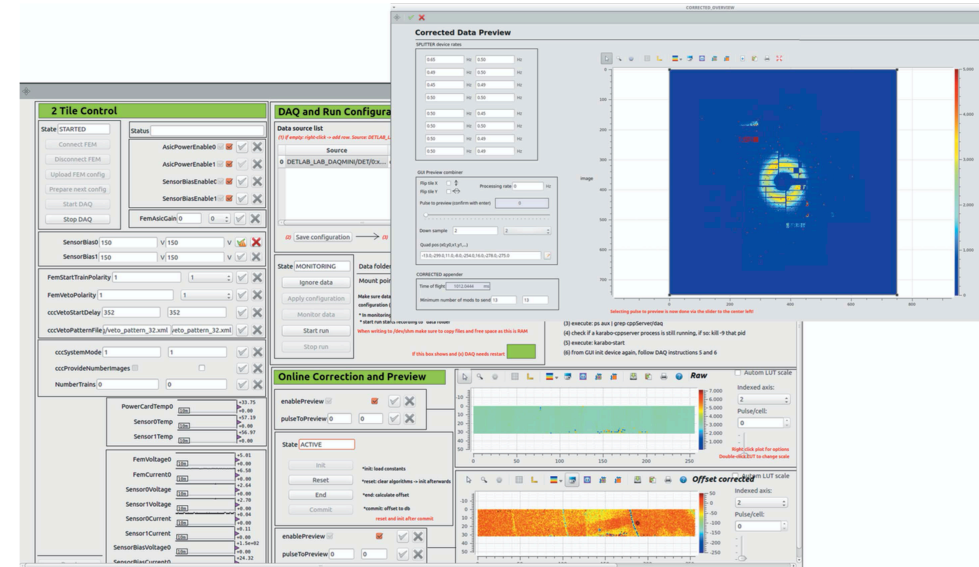
The screenshot displays a complex software interface for remote control and data analysis. It is divided into several main sections:

- 2 Tile Control:** Contains buttons for 'Connect FEM', 'Disconnect FEM', 'Upload FEM config', 'Prepare next config', 'Start DAQ', and 'Stop DAQ'. It also shows a 'Status' field set to 'STARTED' and several status indicators for 'AsicPowerEnable', 'SensorBiasEnable', and 'FemAsicGain'.
- DAQ and Run Configuration:** Features a 'Data source list' with a source 'DETLAB\_LAB\_DAQMINI/DET/0x...', a 'Save configuration' button, and a 'State' dropdown set to 'MONITORING'. It includes buttons for 'Ignore data', 'Apply configuration', 'Monitor data', 'Start run', and 'Stop run'.
- Online Correction and Preview:** Shows 'enablePreview' and 'pulseToPreview' settings. The 'State' is 'ACTIVE', and it includes buttons for 'Init', 'Reset', 'End', and 'Commit'. It also has 'enablePreview' and 'pulseToPreview' controls for a second instance.
- Corrected Data Preview:** Displays 'SPLITTER device rates' in a grid, a 'GUI Preview combiner' with 'Flip tile X' and 'Flip tile Y' options, and a 'CORRECTED appender' with 'Time of flight' and 'Minimum number of mods to send' fields. It includes a large heatmap visualization of the data.
- Raw Data:** Shows a 'Raw' data plot with a green shaded area and a 'Raw' label.
- Offset corrected:** Shows an 'Offset corrected' data plot with a color scale from -250 to 50 and an 'Offset corrected' label.

At the bottom right, there are instructions for execution:

- (3) execute: ps aux | grep cppServer/daq
- (4) check if a karabo-cppserver process is still running, if so: kill -9 that pid
- (5) execute: karabo-start
- (6) from GUI init device again, follow DAQ instructions 5 and 6

## Remote control



- Similar options as for remote data analysis
- Either have read-only control panels and forward display via FastX (or other remote desktop software)
- Or provide the software (here Karabo GUI client) to run on their remote hardware, and offer Karabo-specific data stream to connect to
  - ▶ Preferred, as data can be interrogated interactively (zoom, pan, etc)
- Must be *read-only*.

```
In [2]: overview("Italy");
```

Operational challenges for research facilities during COVID19

# Open Science COVID19 Analysis (OSCOVIDA) project

Photon and Neutron Open Science Cloud (PaNOSC) activity

Dashboard with time series analysis

infections and deaths

updated daily

Data sets for

All countries (Johns Hopkins)

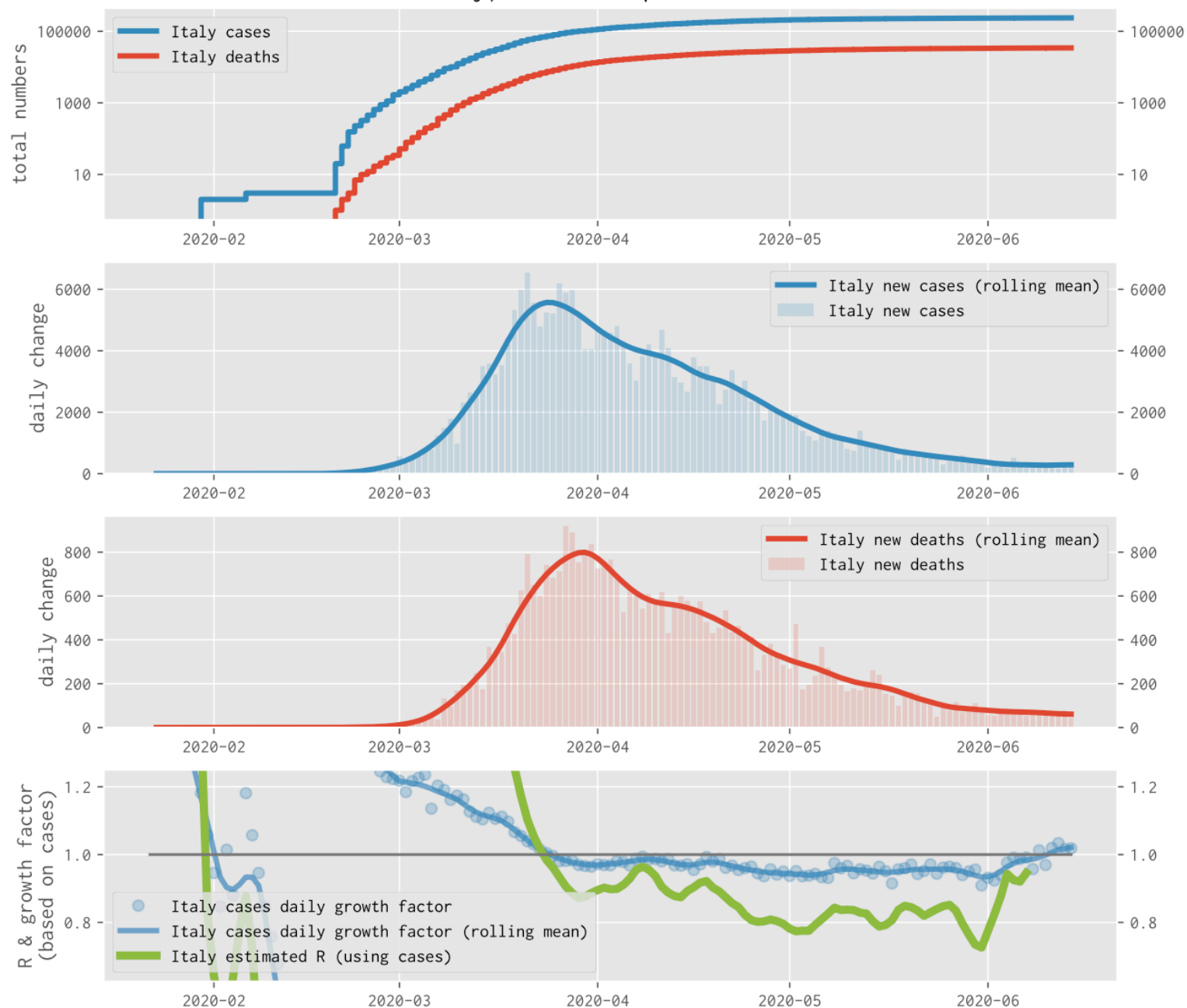
US states (Johns Hopkins)

412 districts in Germany (Robert Koch Institute)

<https://oscovida.github.io>

European XFEL

Overview Italy, last data point from 2020-06-14



# Open Science COVID19 Analysis (OSCOVIDA) project

## Motivation

- put media reports into context
- motivate social distancing
- track pandemic & new outbreaks

## Open Science & citizen science

- Data sources are public
- Processing code is public

## Re-producible and re-usable

- Plots created in Jupyter Notebooks
- Can re-execute each notebook in the cloud (Binder)
- Can re-use and extend analysis

## Contributions welcome

# OSCOVIDA: Open Science COVID Analysis

Home All regions Countries Germany US Articles Analysis About

## Tracking plots: Countries of the world

Show 25 entries

Search:

Location	Total cases	Total deaths	New cases last week
<a href="#">Brazil</a>	867,624	43,332	175,866
<a href="#">US</a>	2,094,058	115,732	149,749
<a href="#">India</a>	320,922	9,195	63,436
<a href="#">Russia</a>	528,267	6,938	61,194
<a href="#">Pakistan</a>	144,478	2,729	40,807
<a href="#">Chile</a>	174,293	3,323	40,143
<a href="#">Peru</a>	229,736	6,688	33,221
<a href="#">Mexico</a>	146,837	17,141	29,734
<a href="#">Saudi Arabia</a>	127,541	972	25,627
<a href="#">South Africa</a>	70,038	1,480	21,753
<a href="#">Bangladesh</a>	87,520	1,171	21,751
<a href="#">Iran</a>	187,427	8,837	15,638
<a href="#">Qatar</a>	79,602	73	10,812

# Communication – instant messaging / chat tools

Mixture between email and phone call

interactive

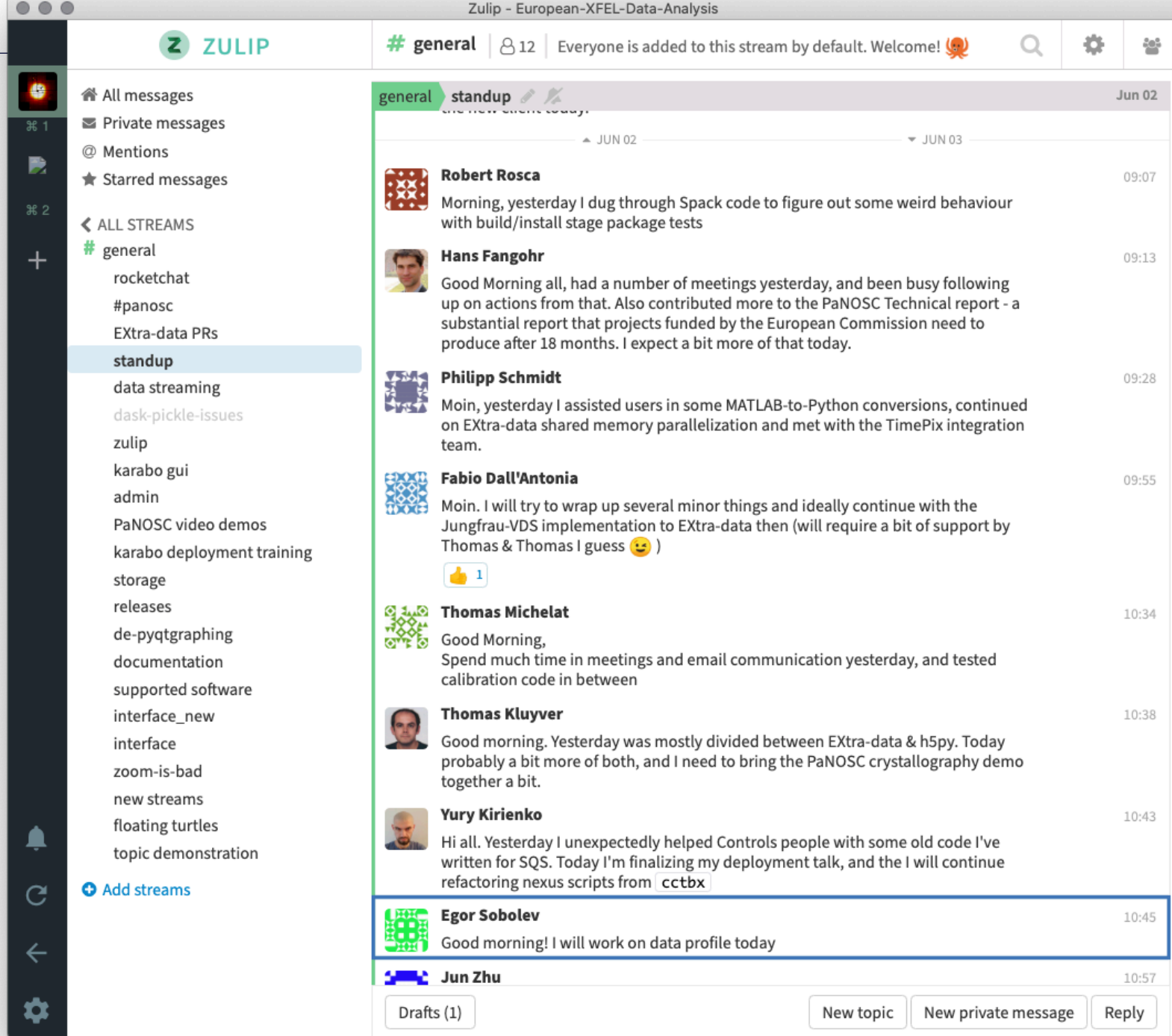
but asynchronous

Tools tried

Slack, RocketChat, Zulip, Mattermost, Zoom(chat), [IRC in the past]

Example:

Data Analysis group at EuXFEL





# Communication – instant messaging / chat tools

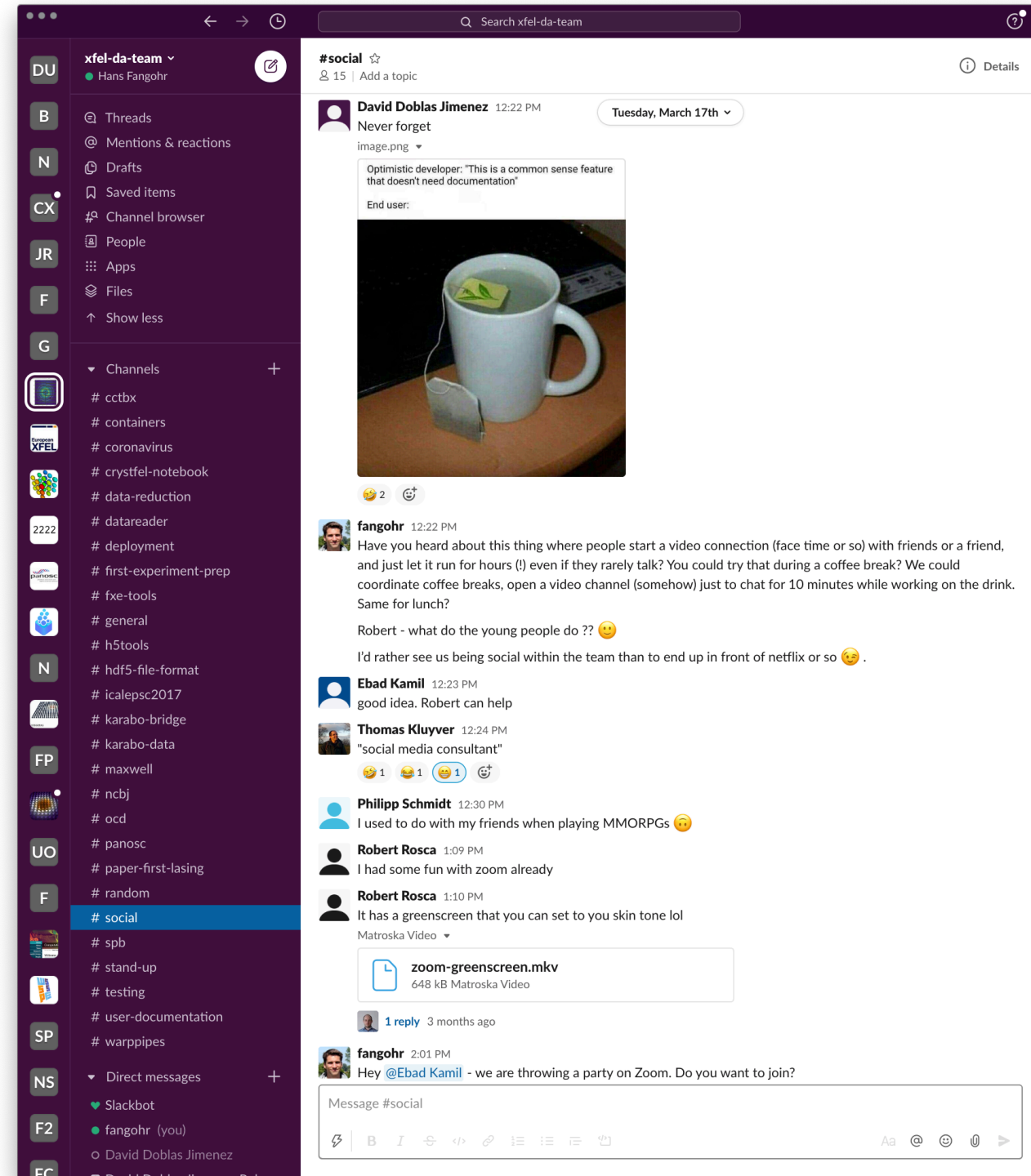
## High potential for communication improvements:

- Within-team
- Within-facility
- Remote-teams
  - Social glue

- For user groups
  - Meta data capture

## Recent insight:

- Zulip has interesting concept of “topics” within “channels/streams”.



# Thank you for your attention

