Burst Advocates training
Technical implementation details

Damien Turpin (CNES/CEA) & Henri Louvin (CEA)

with the collaboration of
Kamshat Tazhenova (CEA), Nicolas Dagoneau (CEA), Stéphane Schanne (CEA), Tatyana Sadibekova (CEA), Chrystel Moreau (LAM), Stéphane Basa (LAM), Arnaud Claret (CEA), Bertrand Cordier (CEA), Li-Ping Xin (NAOC), Mo Zhang (NAOC)

SVOM

cea

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

SVOM workshop @OHP
Nov, 8th 2021

Outlines

1. From the generation of an alert to the SVOM VOEvent : the different services @FSC
2. From the follow-up observations to the image analysis & results
3. A first try with the IRiS telescope @OHP

1.
The VHF services @ the SVOM / FSC

SVOM

cea

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

SVOM workshop @OHP
Nov, 8th 2021

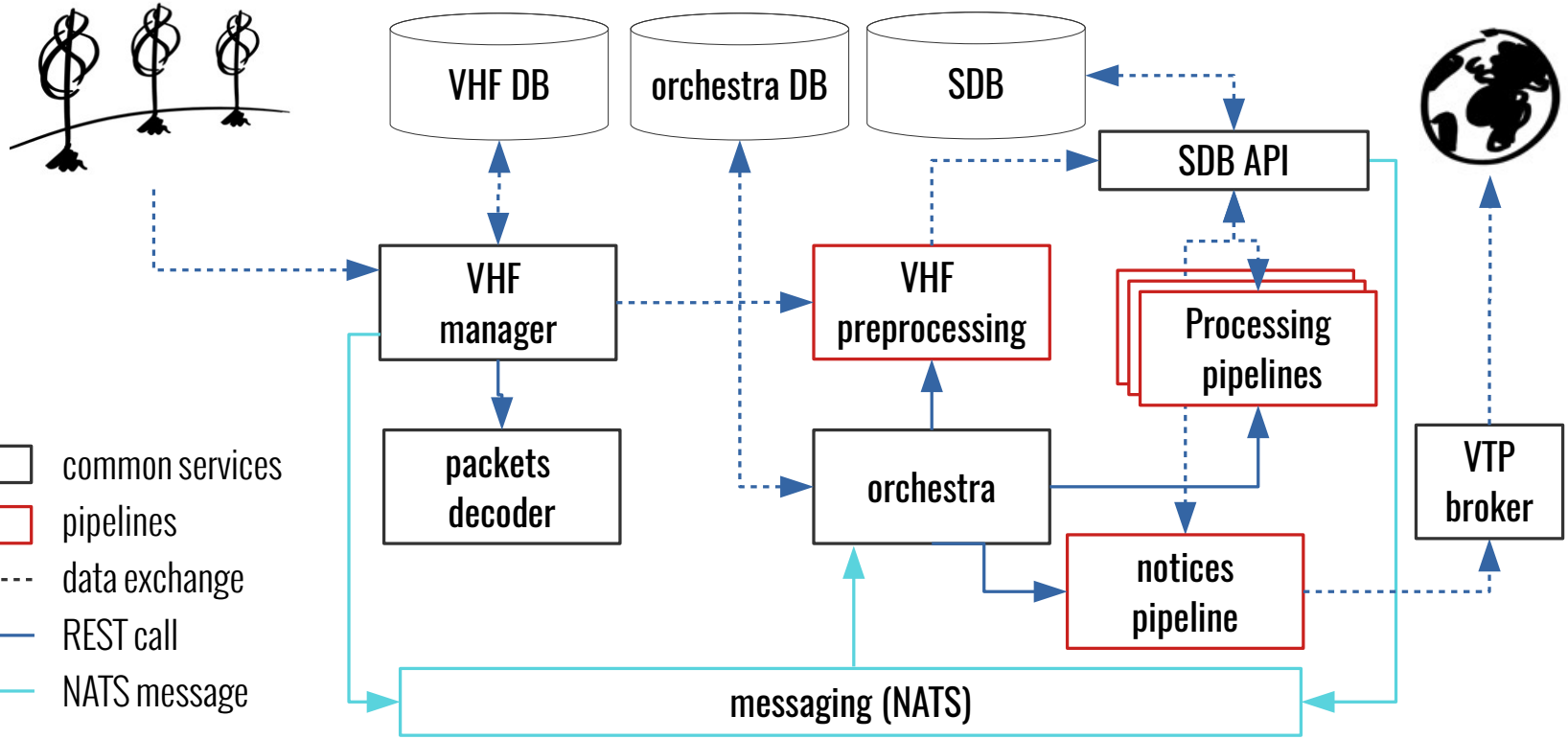
Objectives

Once the Svom-formatted VHF alert is simulated from Swift data (see D.Turpin talk),
it is sent to FSC and the FSC real-time alert processing starts :

- Reception of the encoded VHF alert packet by the **VHF manager service** as if it were sent by a real VHF antenna
- Decoding of the packet and data storage in the **VHF database**
- Automated triggering of the **VHF preprocessing pipeline** which produces the first scientific products and pushes them in **SDB**
- Automated triggering of the **notices pipeline** which produces and broadcasts notices in VOEvent format

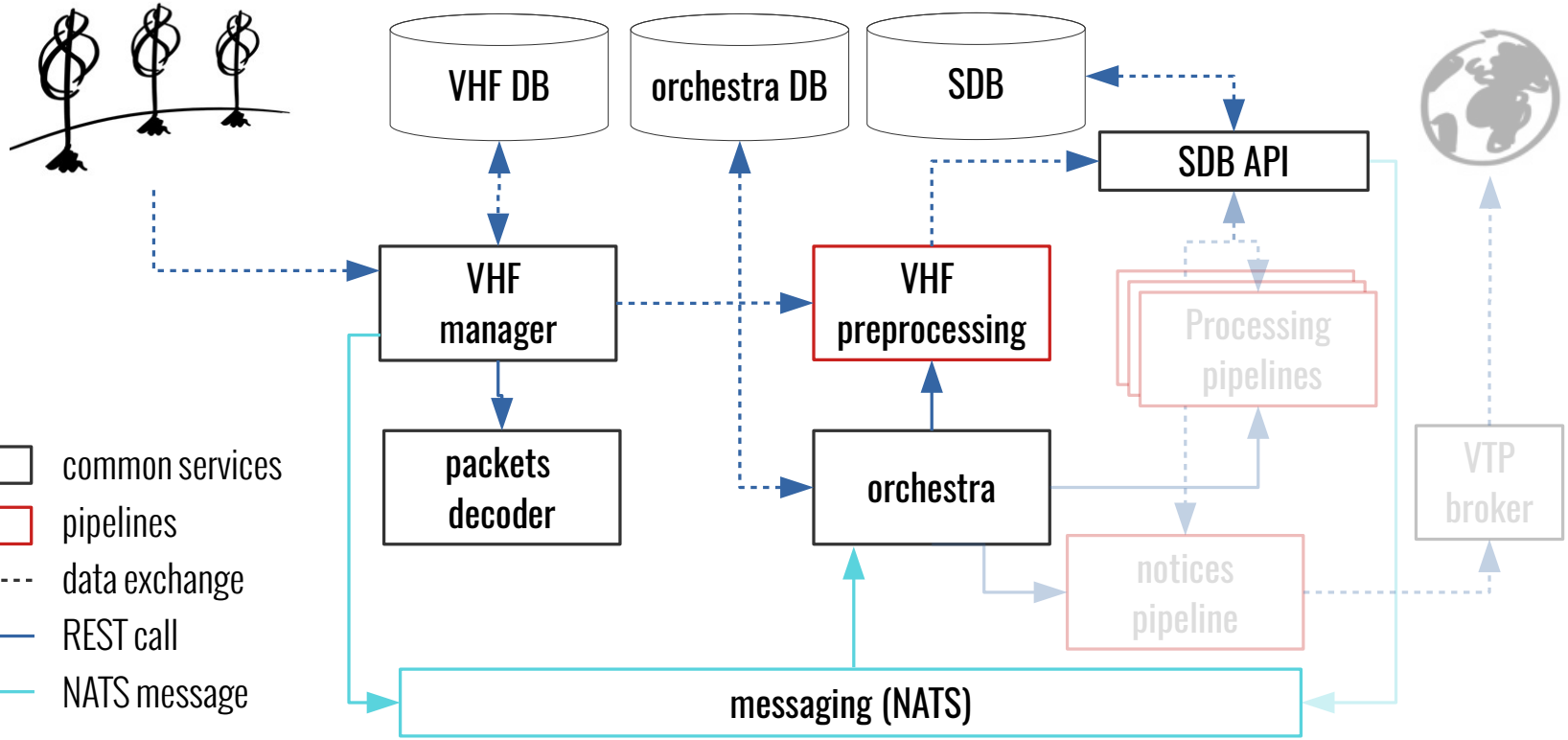
FSC real-time alert processing

Overview of the complete VHF data flow:



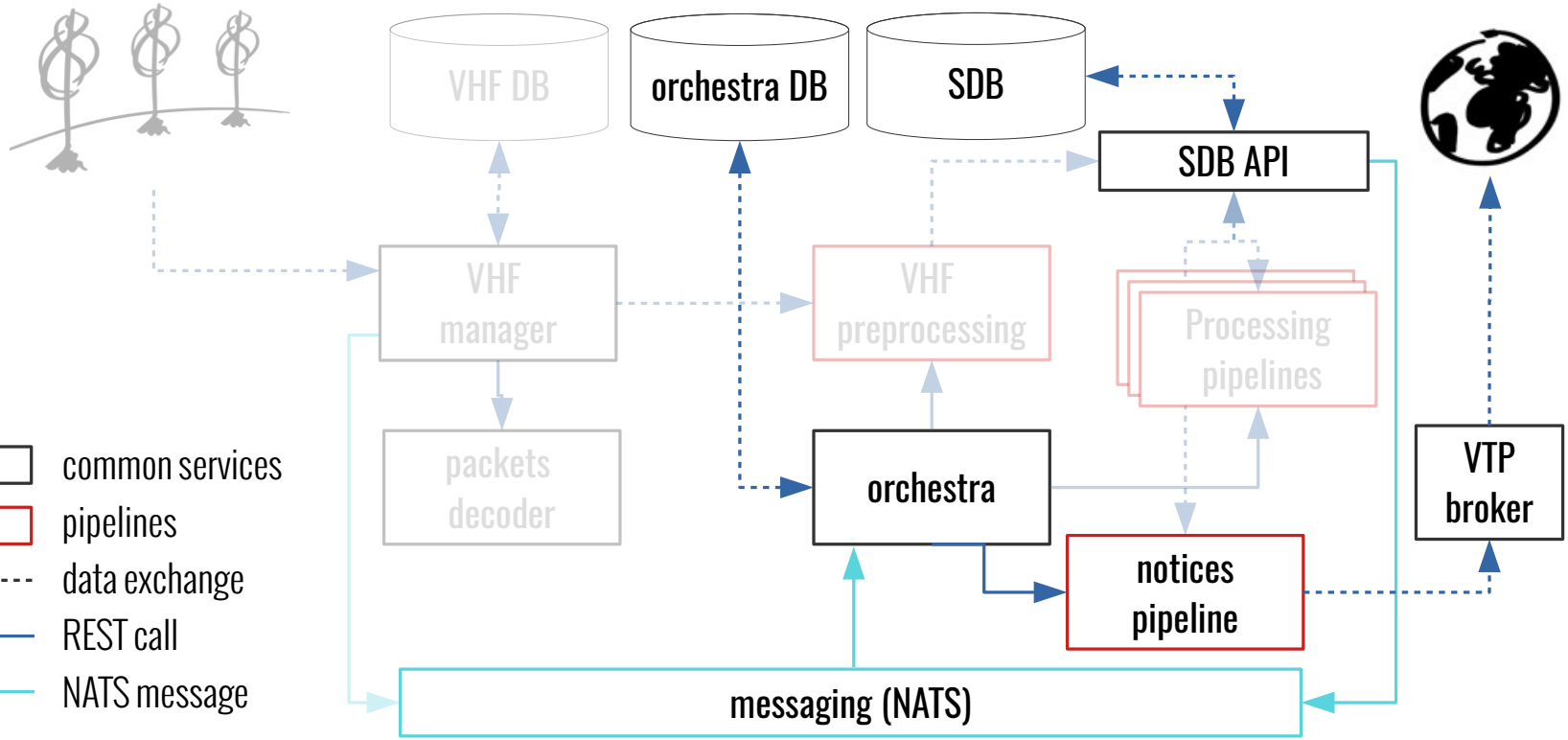
FSC real-time alert processing

Focus on the preprocessing step :



FSC real-time alert processing

Focus on the notices generation step :



FSC VHF Manager

The vhfmgr service at FSC is in charge of the reception of VHF packets and the storage of decoded packets in the VHF DB

- **Provides a REST API** on which the VHF antennas can post binary-encoded VHF packets in hexadecimal format
- Decodes the packets using the packets_decoder service REST API to get packet content in **JSON format**
- Removes duplicated and faulty packets
- Stores data in **VHF-DB**
- Broadcasts **NATS messages** notifying the availability of data (mostly for orchestrator use)
- Sends specific **NATS B.A. monitoring message** for ifsctools (see C. Moreau talk)

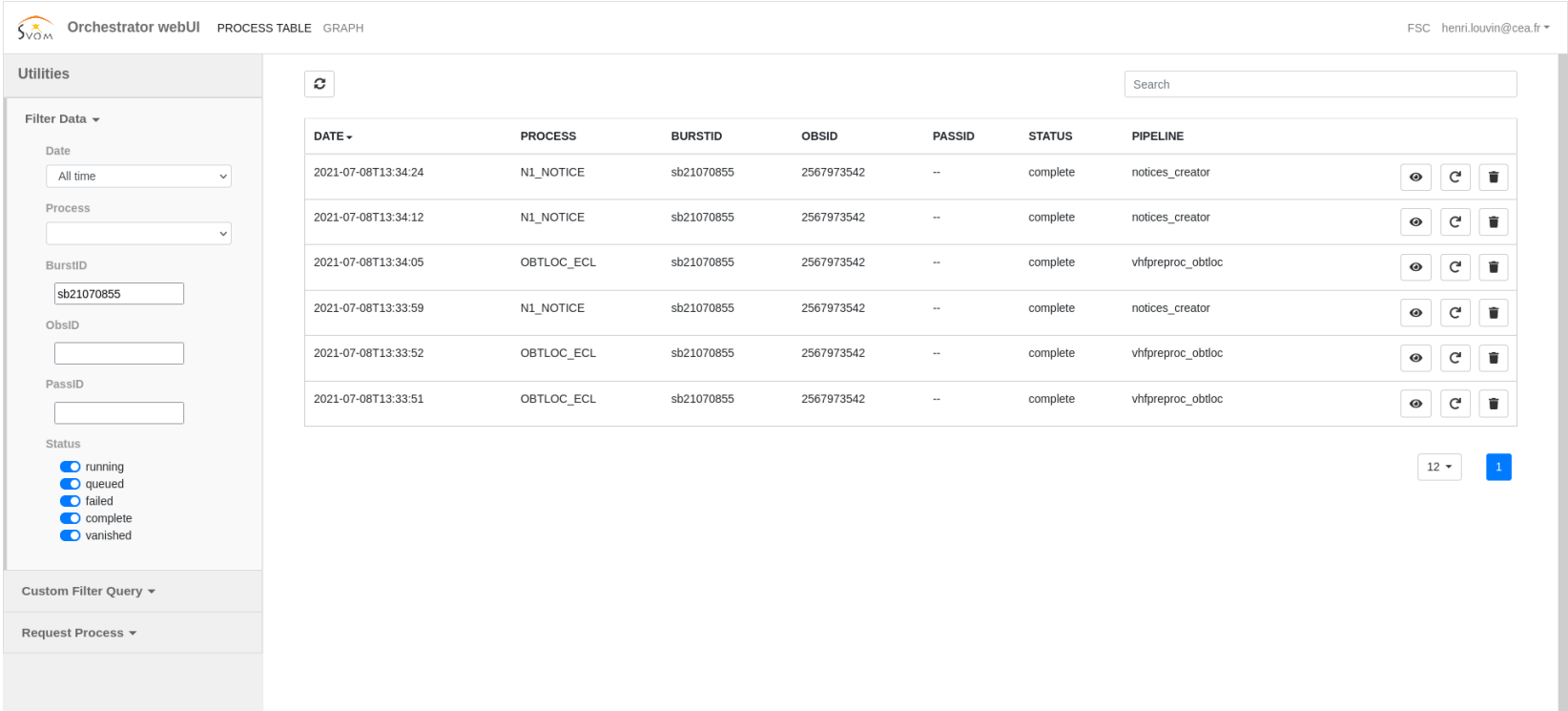
FSC orchestrator

The FSC orchestrator service is in charge of the pipelines orchestration.
It is essential to the real-time aspect of the alert processing

- **Gathers information** from the various DB upon reception of NATS messages notifying the availability of new data
- Uses the **BURST_ID** to identify all data concerning a given event
- **Triggers pipelines automatically** when all their input are available
- Gives all necessary informations to the pipelines through the REST processing requests, in order to allow pipeline to retrieve the proper input data
- **Monitors ongoing processings** and retries failed ones
- **Stores all processings**, their status and their logs in a dedicated database

FSC orchestrator

The orchestrator webUI provides real-time visualisation of the content of the orchestrator DB: https://fsc.svom.org/orchestra-web/ (with access-control and permission handling)



FSC preprocessing pipeline

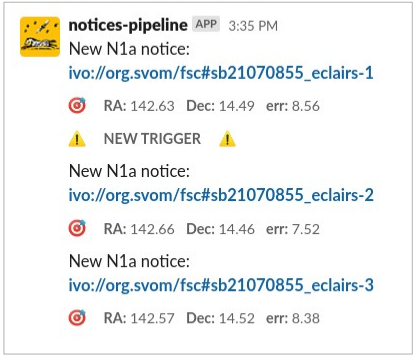
The preprocessing pipeline is responsible of producing the first FITS products (level Q1)

- Is triggered **by the orchestrator** when data is available in VHF-DB
- Uses the BURST_ID to **retrieve data from the VHF-DB** in decoded JSON format
- Retrieves the **latest data model from the SDB** for the products associated to the retrieved VHF data
- **Creates FITS products** using the latest data model. In the case of an ECLAIRs alert, produces: TT_ECL, QPO_ECL and QCL_ECL
- **Imports or updates** FITS products **in SDB**

FSC notice pipeline

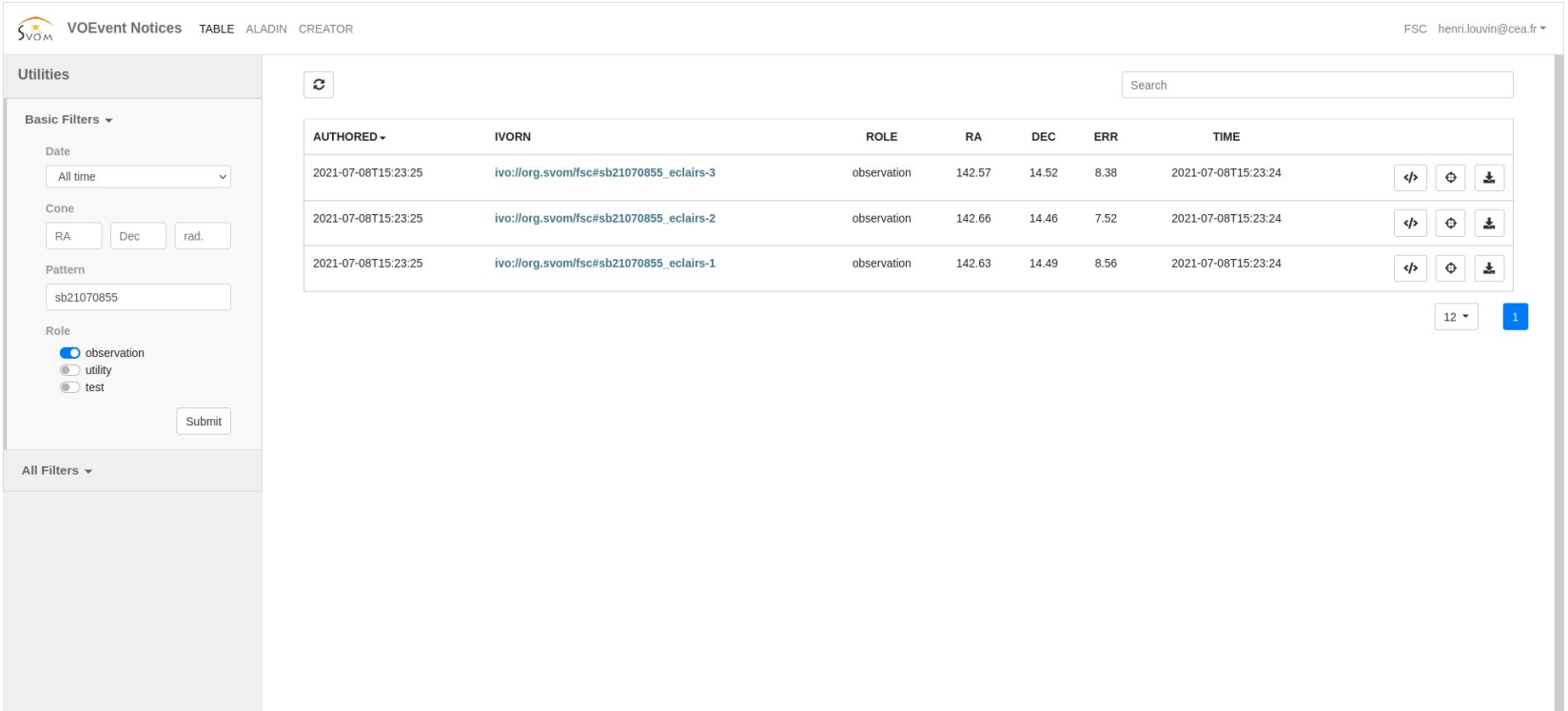
The notice pipeline is responsible of producing notices in VOEvent format

- Is triggered **by the orchestrator** when Q1 products are available in SDB
- Uses the BURST_ID to **retrieve data from the SDB** in FITS format. In the case of an ECLAIRs alert loop, uses TT_ECL, QPO_ECL and QCL_ECL
- Generates notice(s) in **VOEvent format**
- **Broadcasts notices** using VTP protocol on a Comet broker located within FSC
- Stores broadcasted notices **in a dedicated voeventdb**
- Sends a message on the **Slack channel #voevent-notices** when new notices are broadcasted



FSC notices broker

All notices broadcasted through the FSC broker are visible on the notices webUI : https://fsc.svom.org/notices/ (with access-control and permission handling)



2.
From the follow-up to the image analysis results

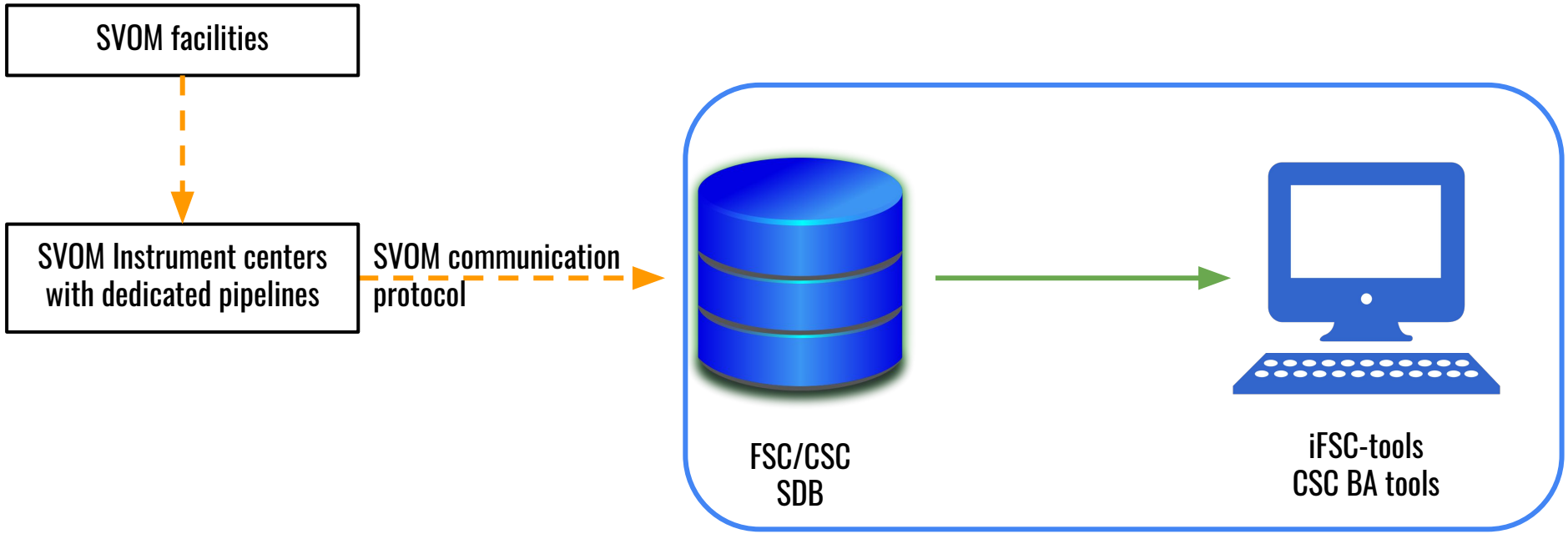
SVOM

cea

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

SVOM workshop @OHP
Nov, 8th 2021

The SVOM scientific products from the image analysis of SVOM facilities



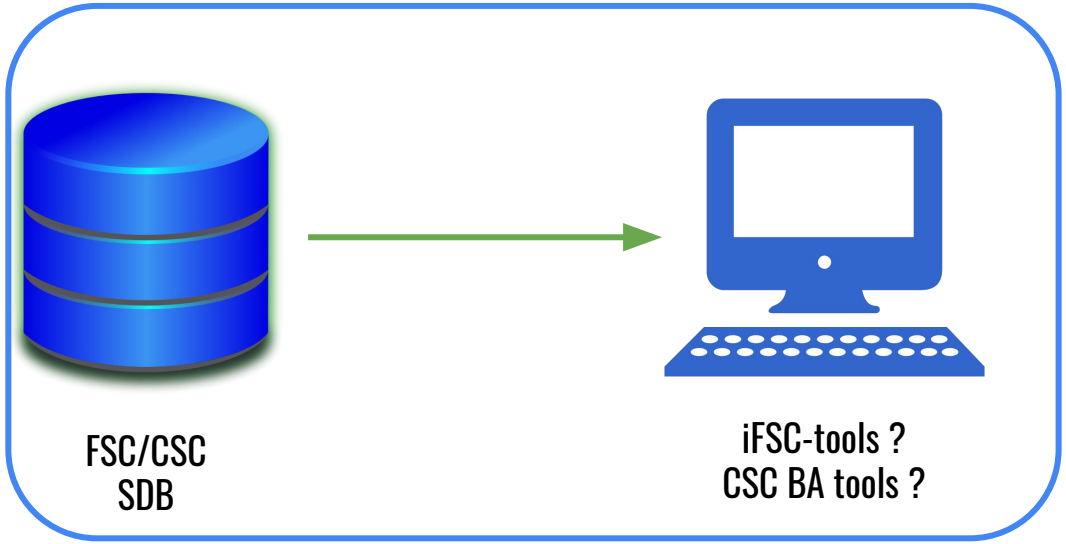
Creating SVOM scientific products from the analysis of external partners images

Transient detection pipeline

produces sci. products

Which interface ?

Who develop that ?



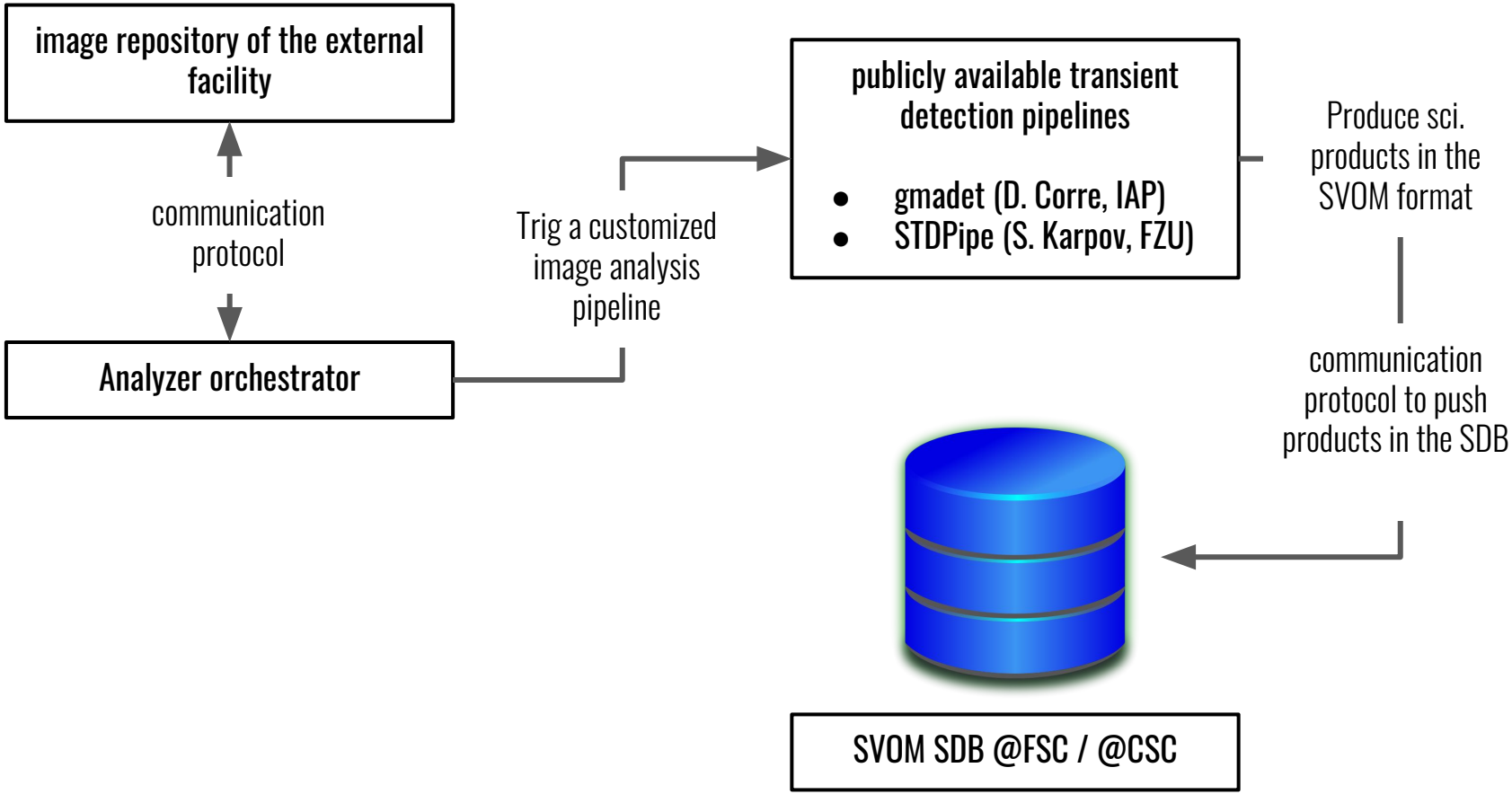
FSC/CSC
SDB

iFSC-tools ?
CSC BA tools ?

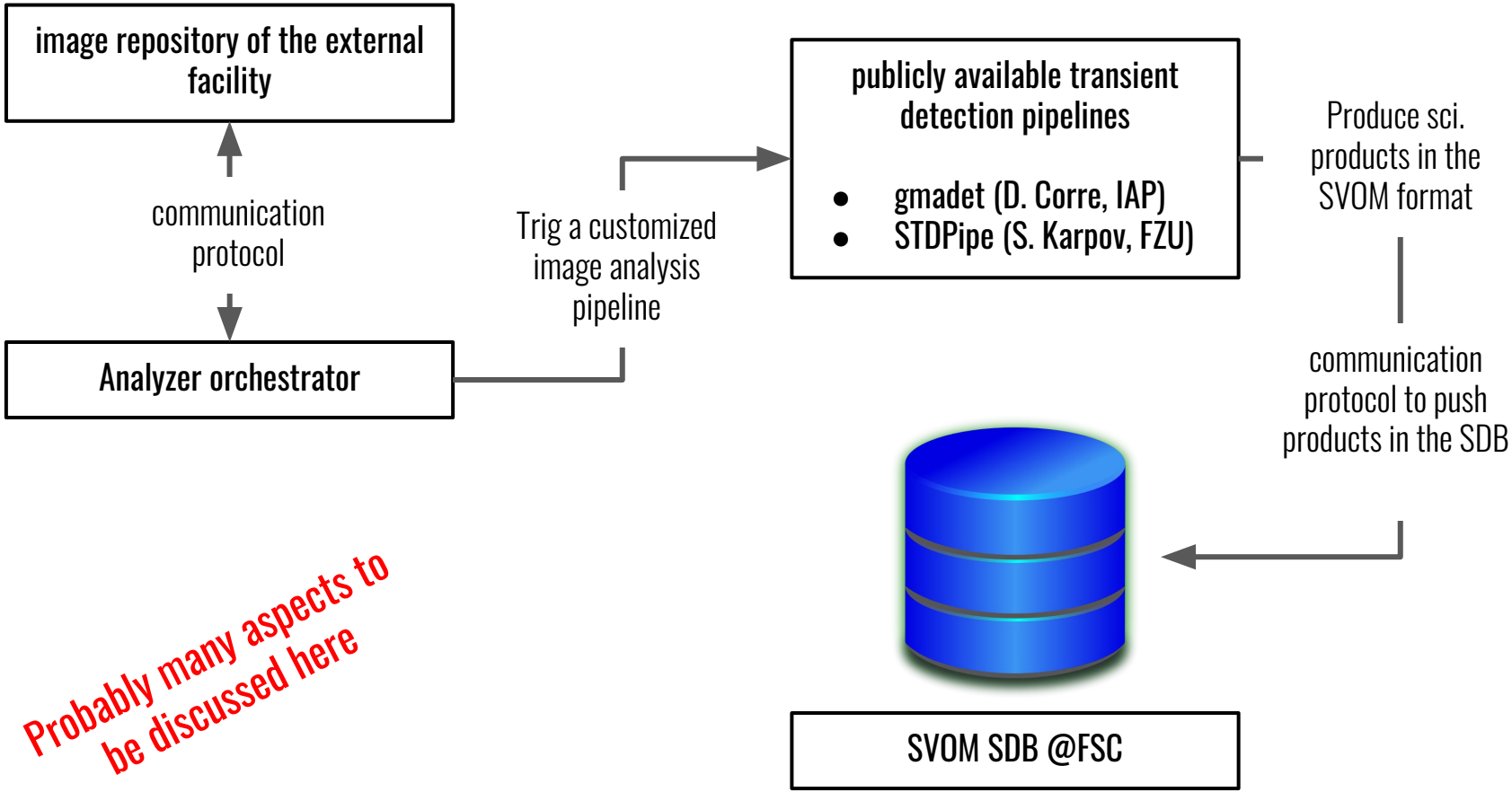
other ?

BRAINSTORMING
in progress

Proposal for external partners (at least for photometric data)



Proposal for external partners (at least for photometric data)



Transient detection pipelines functionalities (gmadet / STDPipe)

functionality	gmadet (D. Corre, IAP)	STDPipe (S. Karpov, FZU)	Software / default catalog references
image pre-processing	✗	✗	
astrometric calibration	✓	✓	SCAMP, Astrometry.NET
photometric calibration	✓	✓	PanSTARRS, NOMAD, GAIA, USNO, etc.
image stacking	✓	✓	SWarp, Montage
Source extraction	✓	✓	Sextractor
catalog crossmatching	✓	✓	PanSTARRS sub-images, HiPs service CDS
image subtraction	✓	✓	Hotpants
cosmic-ray filter	✓	✓	LAcosmic,
Minor Planet checker	✓	✓	SkyBot, MP checker
Real/Bogus CNN filter	✓	✗ (TB integrated)	O'TRAIN

3.
A first try with the IRiS telescope @OHP

SVOM

cea

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

SVOM workshop @OHP
Nov, 8th 2021

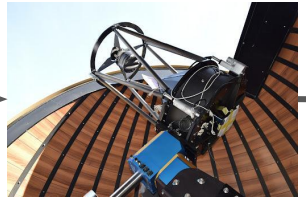
The SVOM/IRiS working environment

Alert sequence loop

French Science Center
contact: H. Louvin

FSC broker

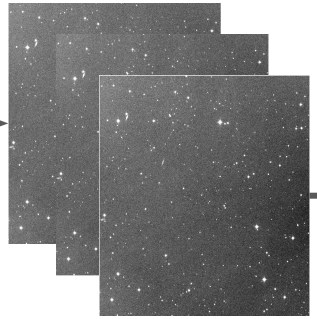
sends alert (VOE)



The IRiS telescope system
contact: S. Basa

follow_up obs

of svom sb21XXXX burst alert



The SVOM/IRiS image repo
contact: S. Basa & IRiS team

Image analysis pipeline
contact : D. Turpin

Communication tools

zoom

slack

To debrief

live discussion when an alert sequence is started

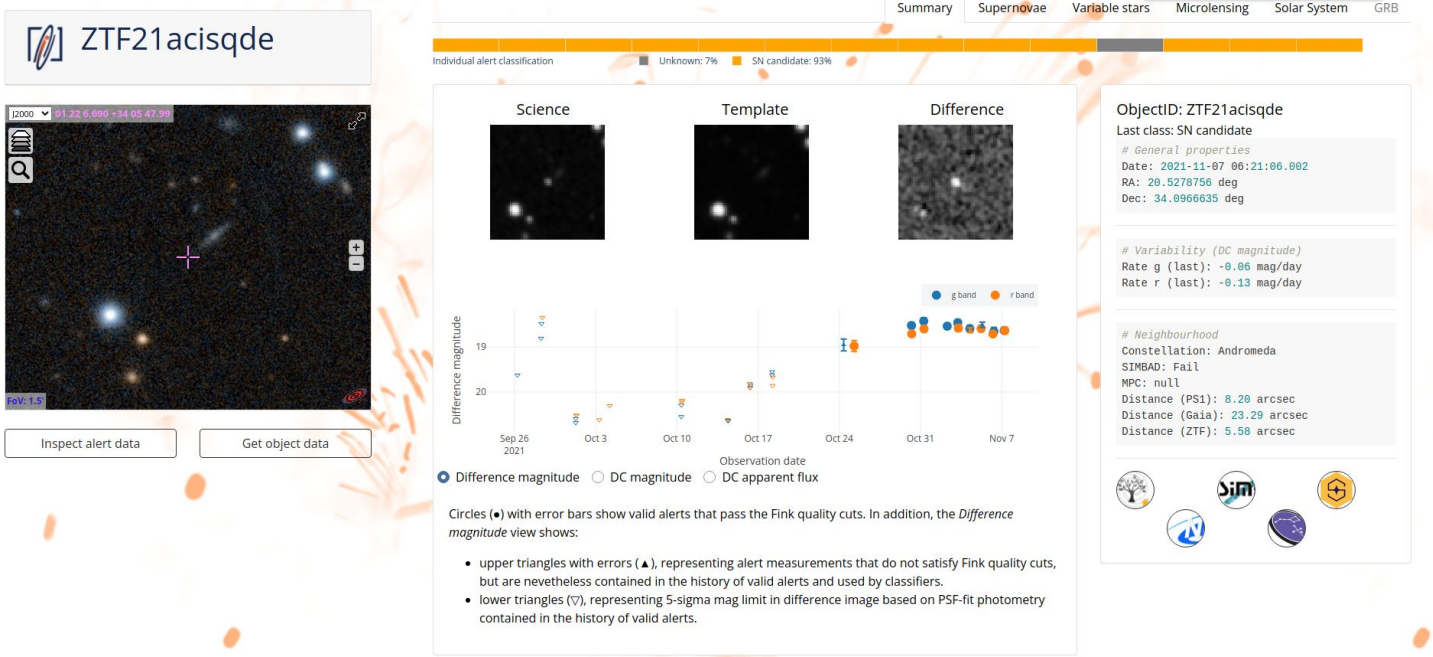
H. Louvin, S. Basa & D. Turpin

The SVOM/IRiS first real test

The follow-up target

SN21acea (ZTF21acisqde) : SNIa (r_peak ~ 18.5) detected on 2021-10-24 08:57:07.20 by ZTF

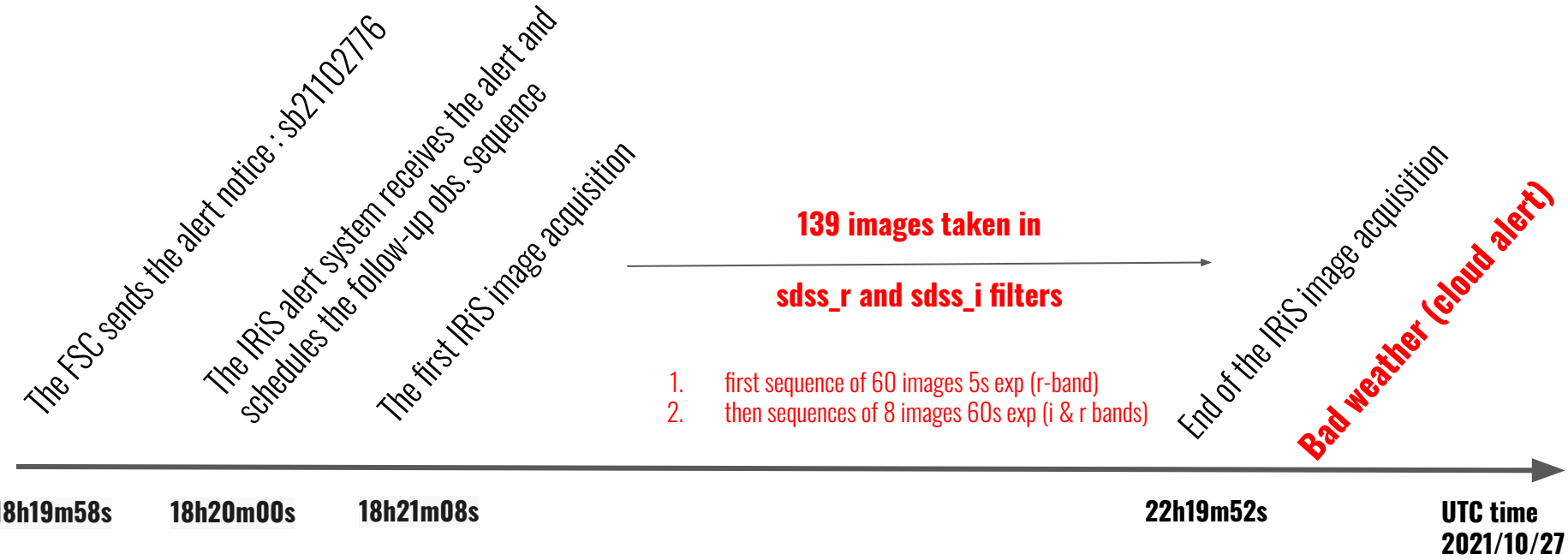
FINK science portal



The SVOM/IRiS first real test

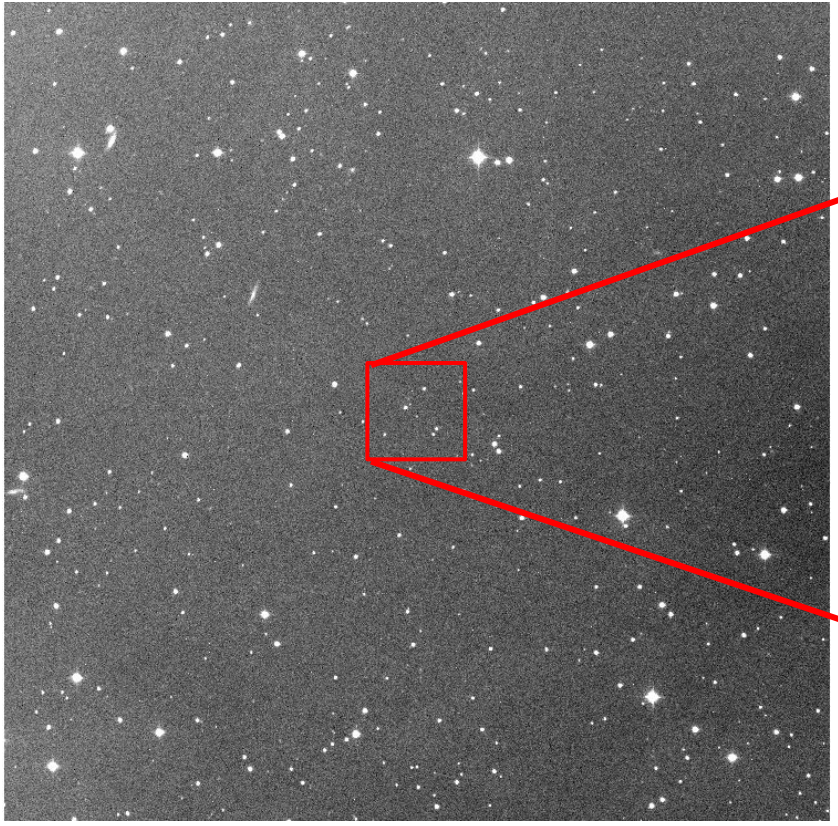
On 2021, 27th October 20h18 UTC

a SVOM/IRiS alert sequence has been initiated

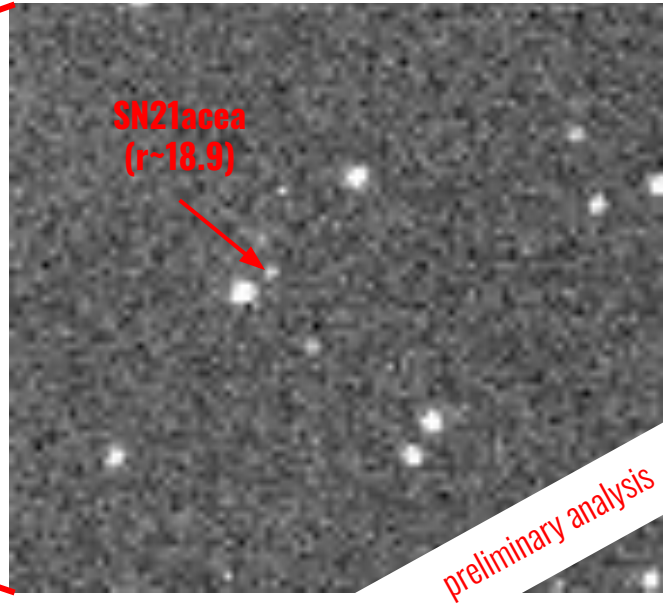


The SVOM/IRiS first observational results

sb21102776 (SN21acea) IRiS follow-up obs
stack of 8 min exposure



SN21acea
is detected in 5 stacks of 8min of exposure



A notebook is under dev. to perform those analysis more automatically
(well as most as possible)