

Burst Advocates training

Technical implementation details

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with the collaboration of

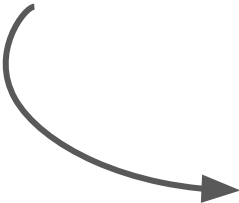
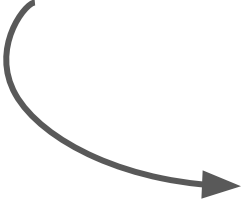
Kamshat Tazhenova (CEA), Nicolas Dagoneau (CEA), Stéphane Schanne (CEA), Tatyana Sadibekova (CEA), Chrystel Moreau (LAM), Stéphane Basa (LAM), Arnaud Claret (CEA), Bertrand Cordier (CEA), Li-Ping Xin (NAOC), Mo Zhang (NAOC)



SVOM 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



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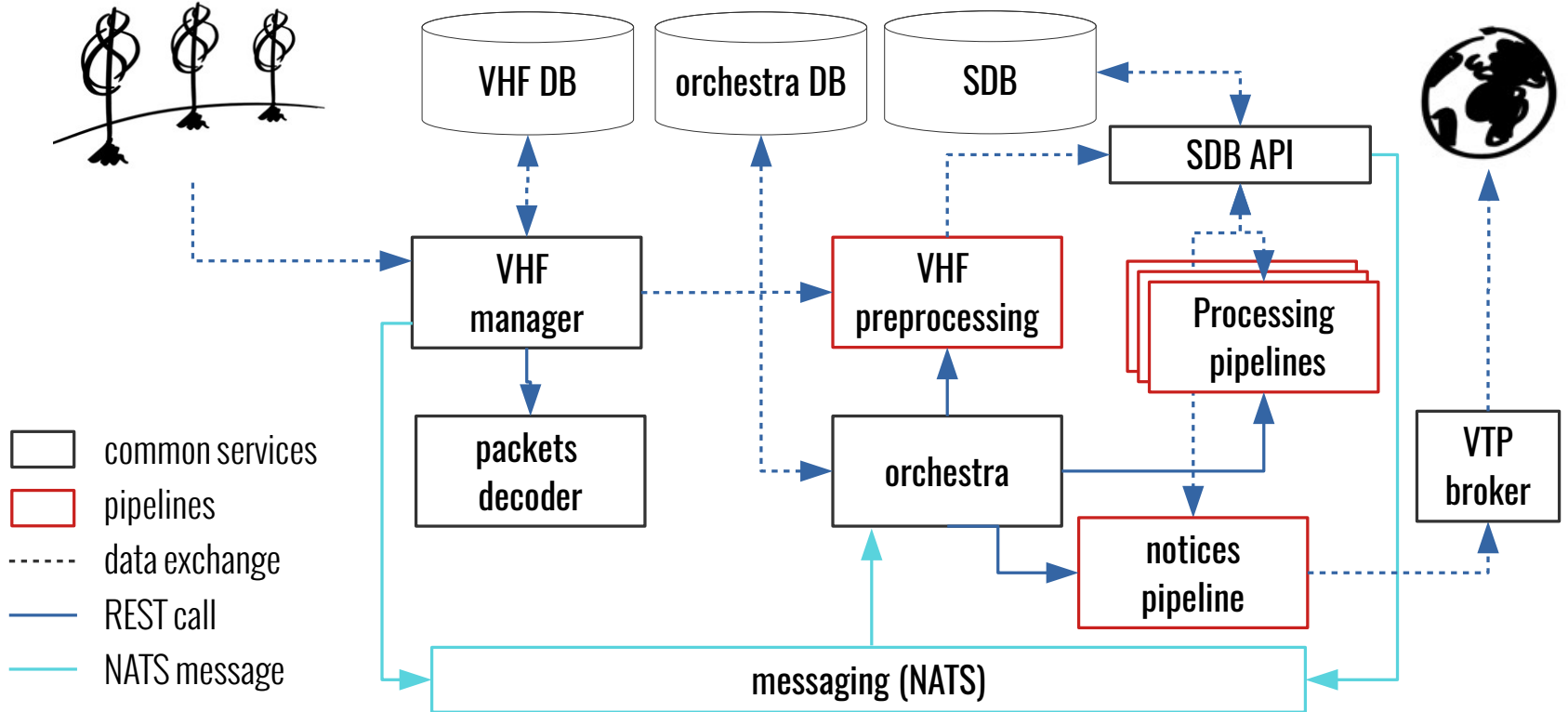
Objectives

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

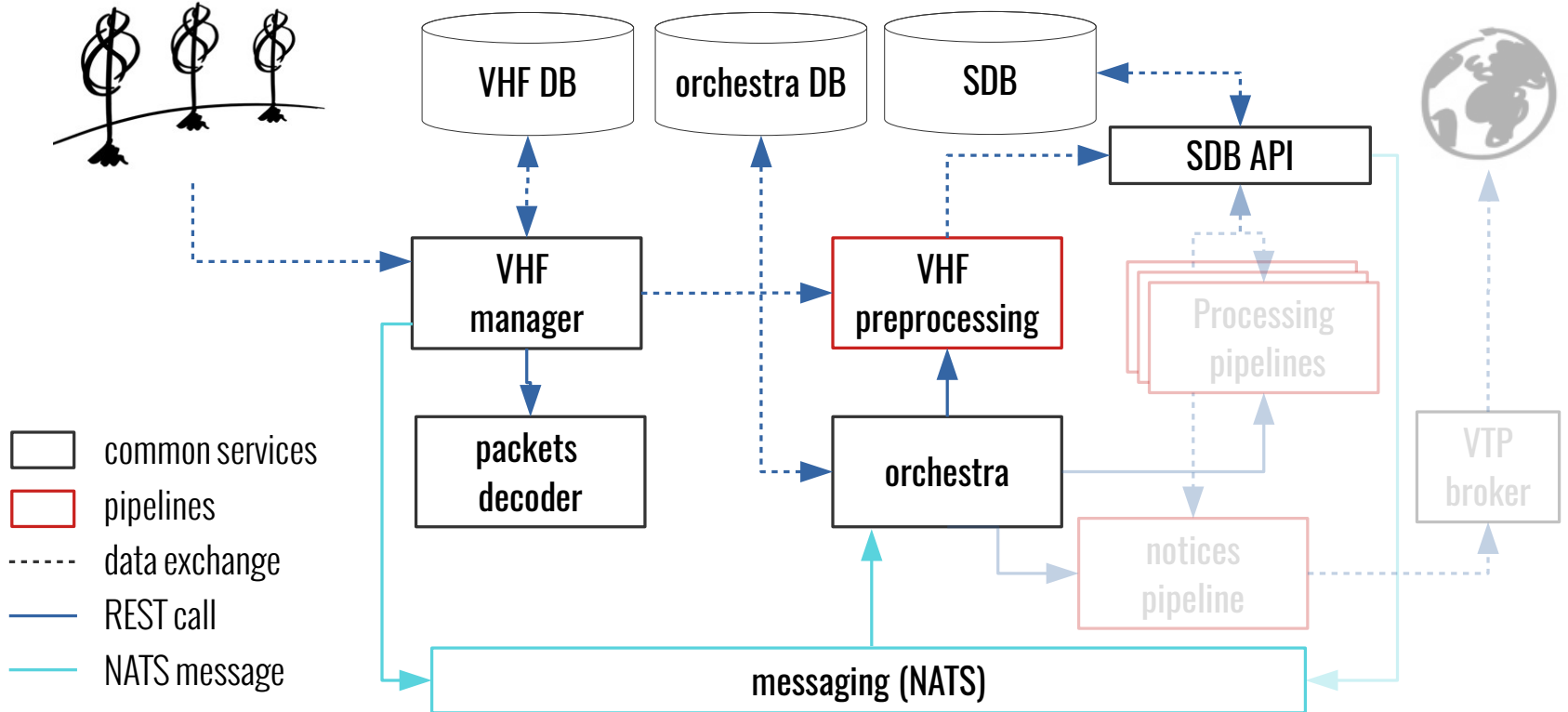
Overview of the complete VHF data flow:





FSC real-time alert processing

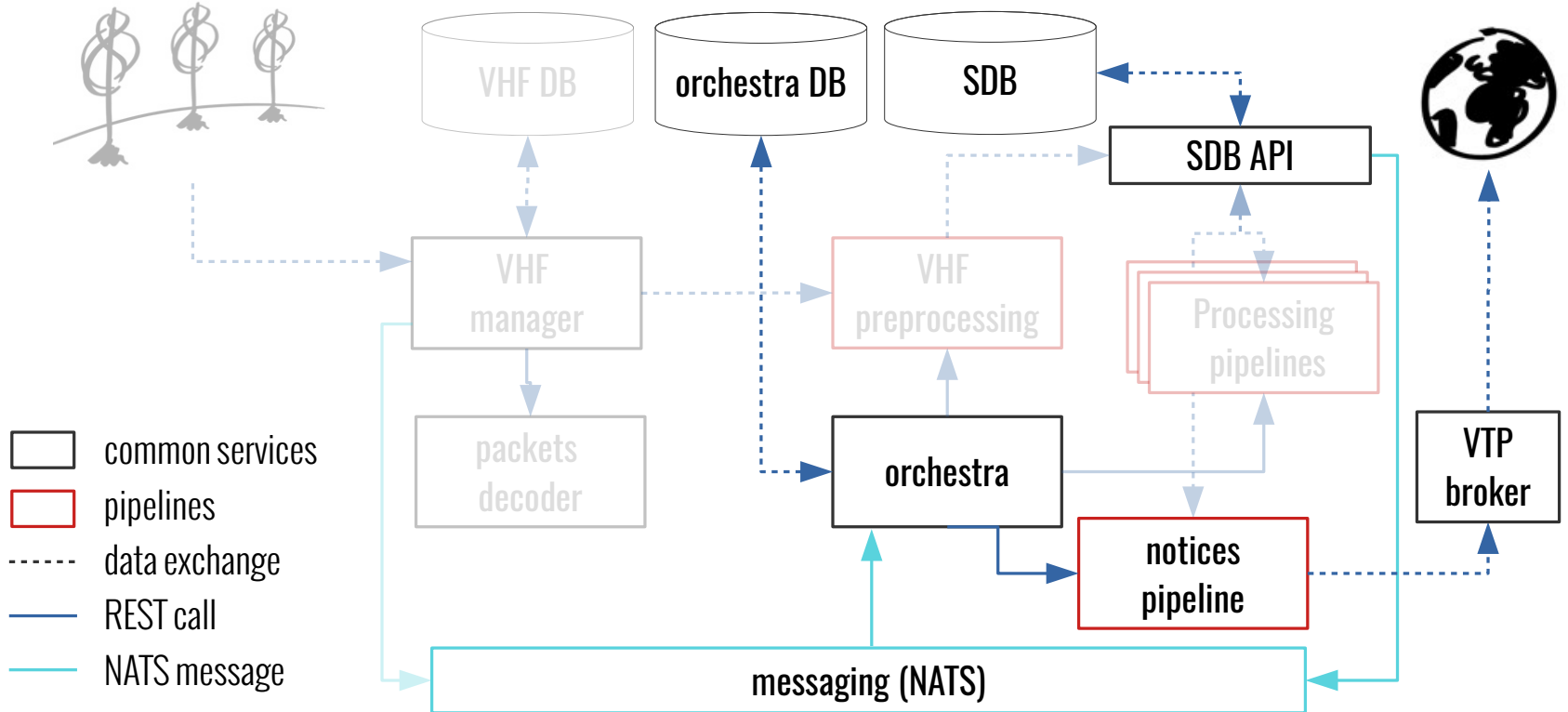
Focus on the preprocessing step :





FSC real-time alert processing

Focus on the notices generation step :





FSC VHF Manager

The vhfmggr 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 ifsc tools (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)

The screenshot displays the 'Orchestrator webUI' interface. At the top, it shows the SVOM logo, the title 'Orchestrator webUI', and navigation tabs for 'PROCESS TABLE' and 'GRAPH'. The user 'FSC' and email 'henri.louvin@cea.fr' are logged in. A left sidebar contains 'Utilities' and 'Filter Data' sections. The 'Filter Data' section includes dropdowns for 'Date' (set to 'All time') and 'Process', and input fields for 'BurstID' (containing 'sb21070855'), 'ObsID', and 'PassID'. Below this is a 'Status' legend with radio buttons for 'running', 'queued', 'failed', 'complete', and 'vanished'. The main area features a 'PROCESS TABLE' with a search bar and a refresh button. The table lists process details with columns for DATE, PROCESS, BURSTID, OBSID, PASSID, STATUS, and PIPELINE. Each row includes three action icons: view, refresh, and delete. A pagination control at the bottom right shows '12' items per page and '1' page.

DATE	PROCESS	BURSTID	OBSID	PASSID	STATUS	PIPELINE	
2021-07-08T13:34:24	NI_NOTICE	sb21070855	2567973542	--	complete	notices_creator	
2021-07-08T13:34:12	NI_NOTICE	sb21070855	2567973542	--	complete	notices_creator	
2021-07-08T13:34:05	OBTLOC_ECL	sb21070855	2567973542	--	complete	vhfpreproc_obtloc	
2021-07-08T13:33:59	NI_NOTICE	sb21070855	2567973542	--	complete	notices_creator	
2021-07-08T13:33:52	OBTLOC_ECL	sb21070855	2567973542	--	complete	vhfpreproc_obtloc	
2021-07-08T13:33:51	OBTLOC_ECL	sb21070855	2567973542	--	complete	vhfpreproc_obtloc	



FSC preprocessing pipeline

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

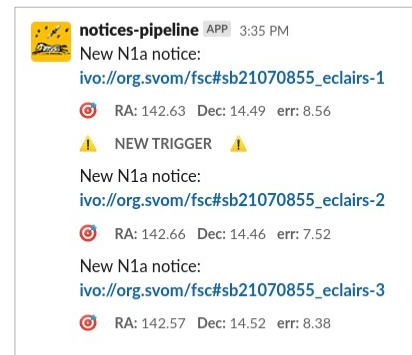
- Is triggered **by the orchestrator** when data is available in VHF-DB
- Uses the BURST_ID to **retrieve data from the VHF-DB** in decoded JSON format
- Retrieves the **latest data model from the SDB** for the products associated to the retrieved VHF data
- **Creates FITS products** using the latest 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)

The screenshot displays the web interface for the FSC notices broker. The top navigation bar includes the SVOM logo, the text "VOEvent Notices", and menu items "TABLE", "ALADIN", and "CREATOR". On the right side of the header, it shows "FSC" and the user "henri.louvin@cea.fr".

The main content area is divided into a left sidebar and a central table. The sidebar, titled "Utilities", contains "Basic Filters" with the following options:

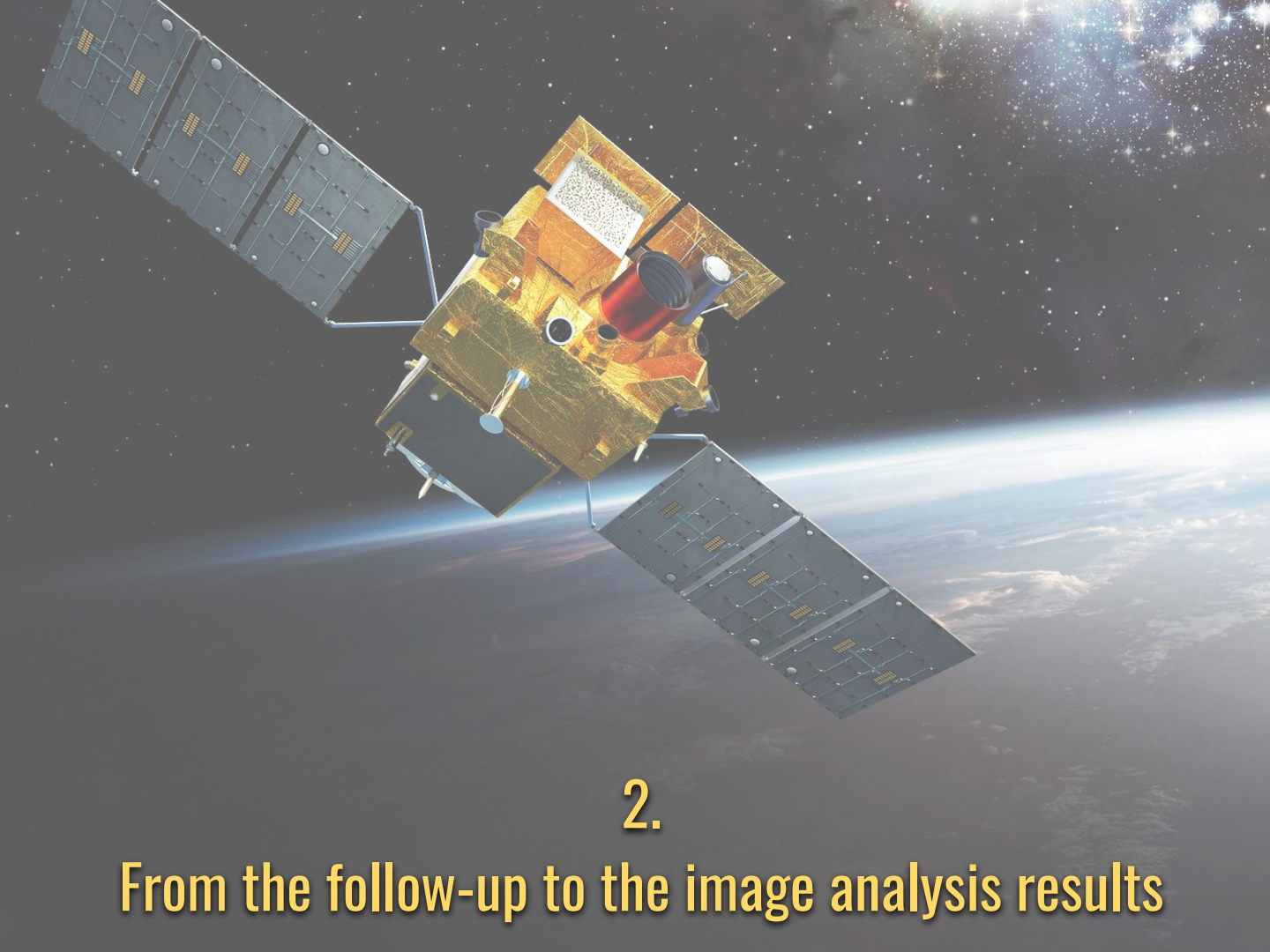
- Date: "All time" (dropdown)
- Cone: "RA", "Dec", "rad." (radio buttons)
- Pattern: "sb21070855" (input field)
- Role: "observation" (selected), "utility", "test" (radio buttons)

A "Submit" button is located at the bottom of the filters. Below the filters is an "All Filters" section.

The central table displays a list of notices. At the top of the table area, there is a refresh icon and a search input field labeled "Search". The table has the following columns: "AUTHORED", "IVORN", "ROLE", "RA", "DEC", "ERR", and "TIME". Each row includes three action icons: a left arrow, a refresh icon, and a download icon.

AUTHORED	IVORN	ROLE	RA	DEC	ERR	TIME	
2021-07-08T15:23:25	ivo://org.svom/fsc#sb21070855_eclairs-3	observation	142.57	14.52	8.38	2021-07-08T15:23:24	
2021-07-08T15:23:25	ivo://org.svom/fsc#sb21070855_eclairs-2	observation	142.66	14.46	7.52	2021-07-08T15:23:24	
2021-07-08T15:23:25	ivo://org.svom/fsc#sb21070855_eclairs-1	observation	142.63	14.49	8.56	2021-07-08T15:23:24	

At the bottom right of the table area, there is a "12" dropdown menu and a blue notification icon.



2.

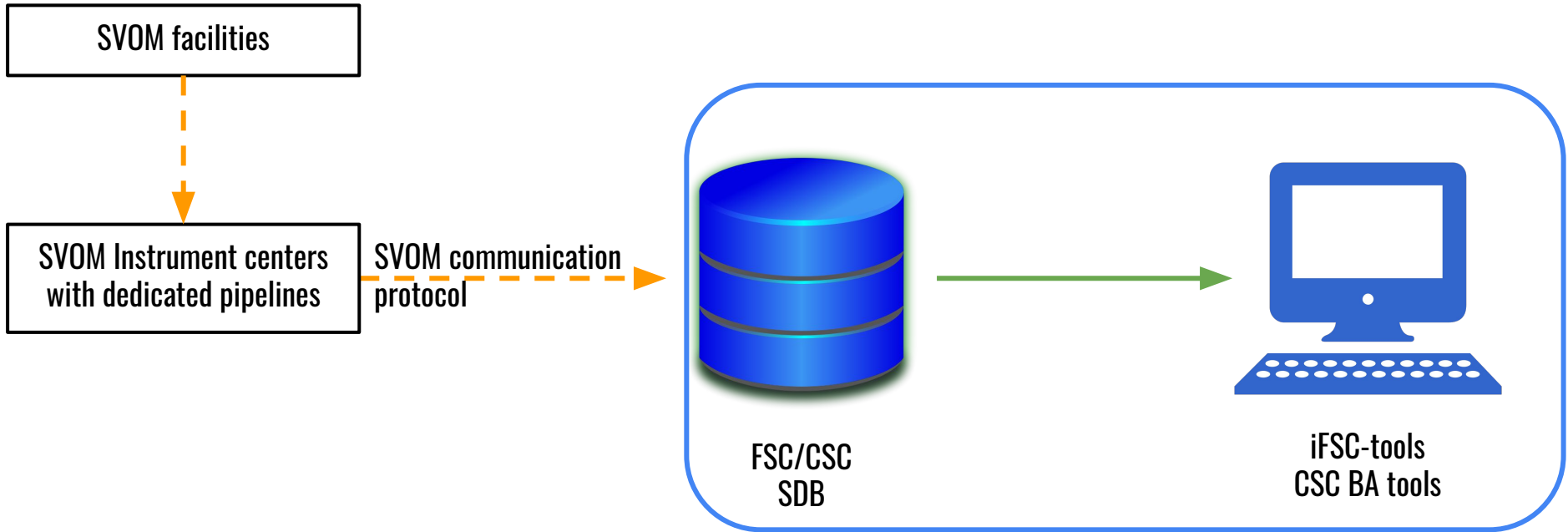
From the follow-up to the image analysis results



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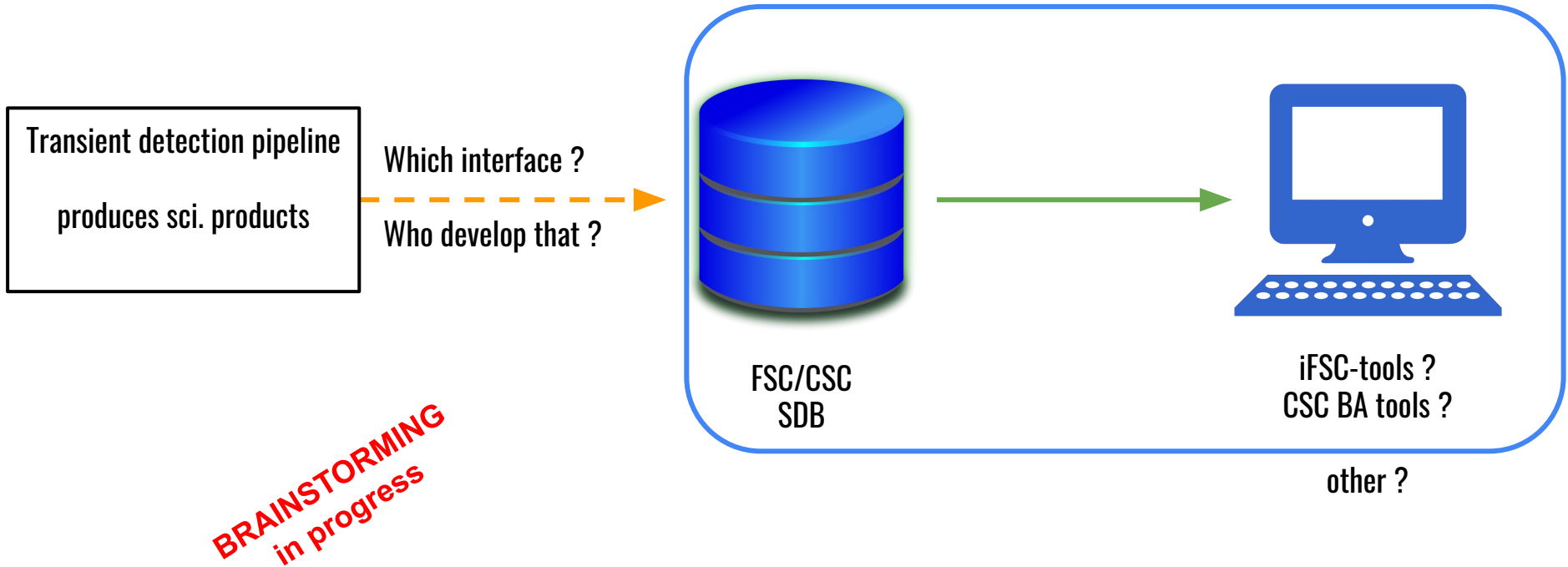


The SVOM scientific products from the image analysis of SVOM facilities



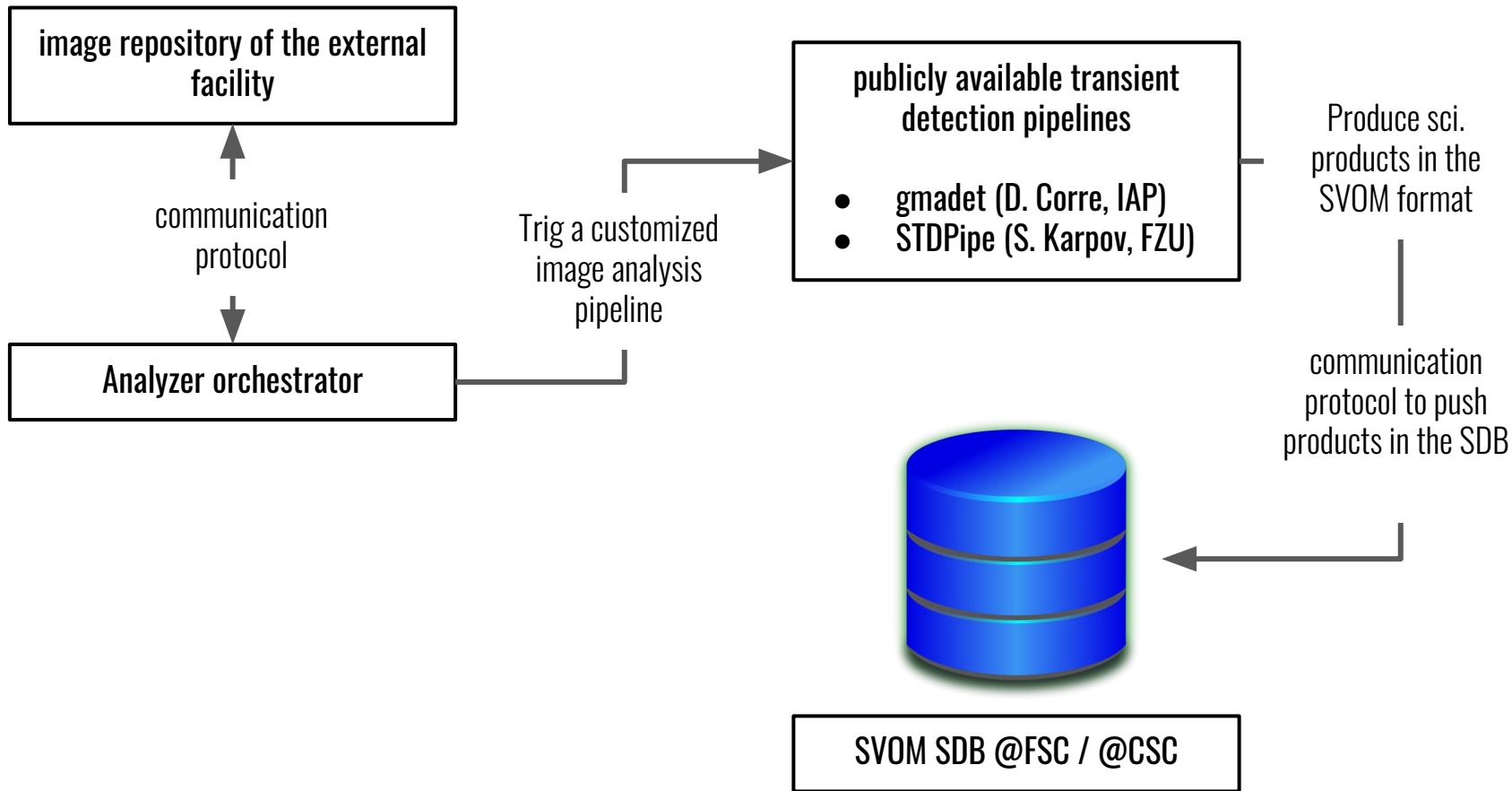


Creating SVOM scientific products from the analysis of external partners images



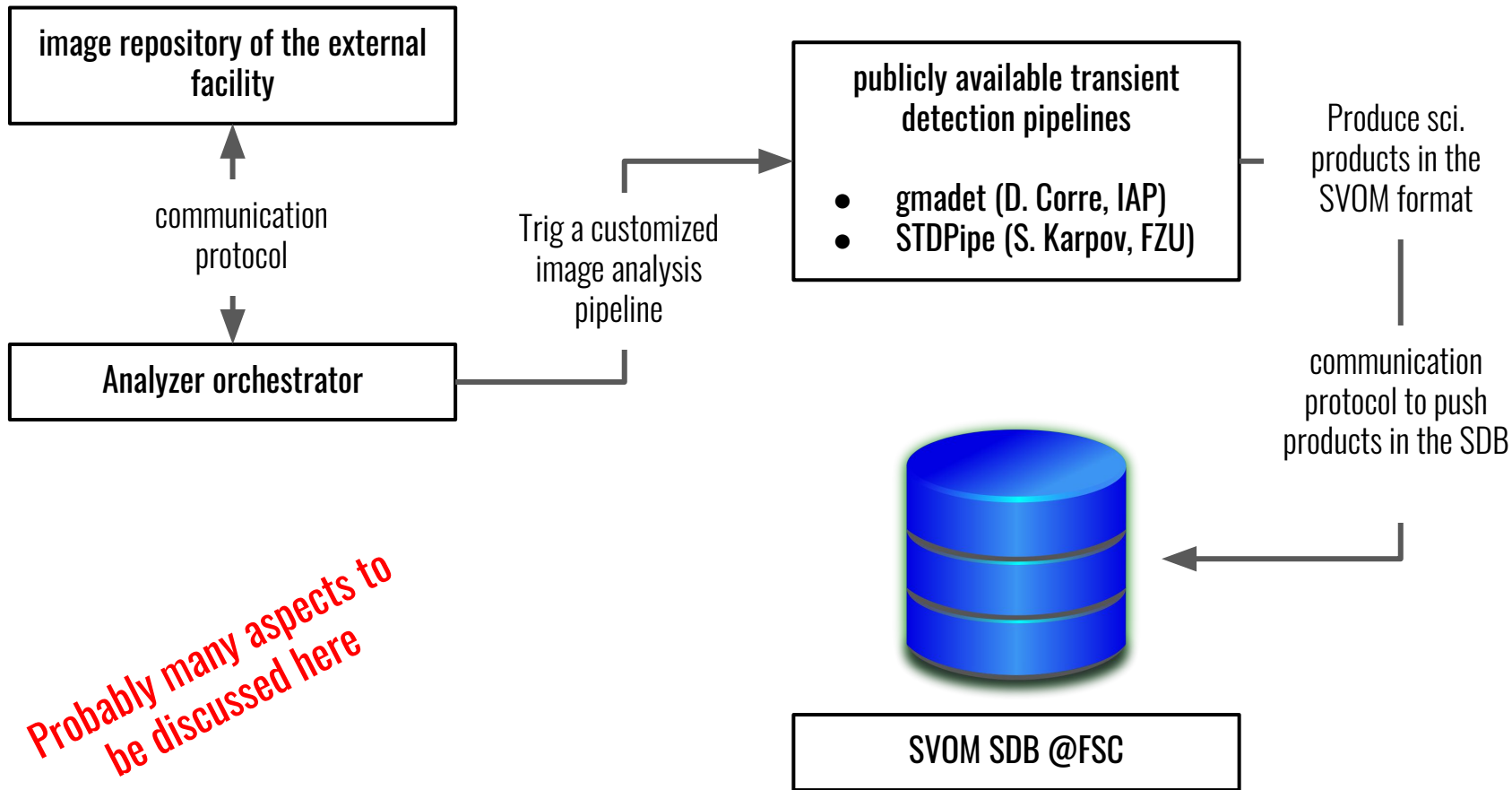


Proposal for external partners (at least for photometric data)





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



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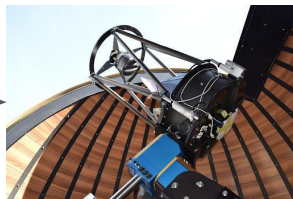
The SVOM/IRiS working environment

Alert sequence loop



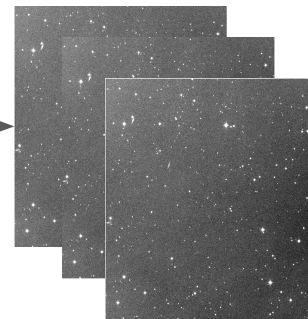
French Science Center
contact: H. Louvin

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

To debrief

slack

live discussion when an
alert sequence is started



H. Louvin, S. Basa & D. Turpin

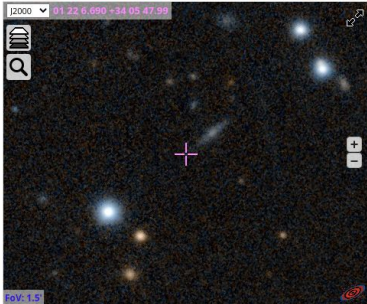
The follow-up target

SN21acea (ZTF21acisqde) : SNIa ($r_{\text{peak}} \sim 18.5$) detected on 2021-10-24 08:57:07.20 by ZTF



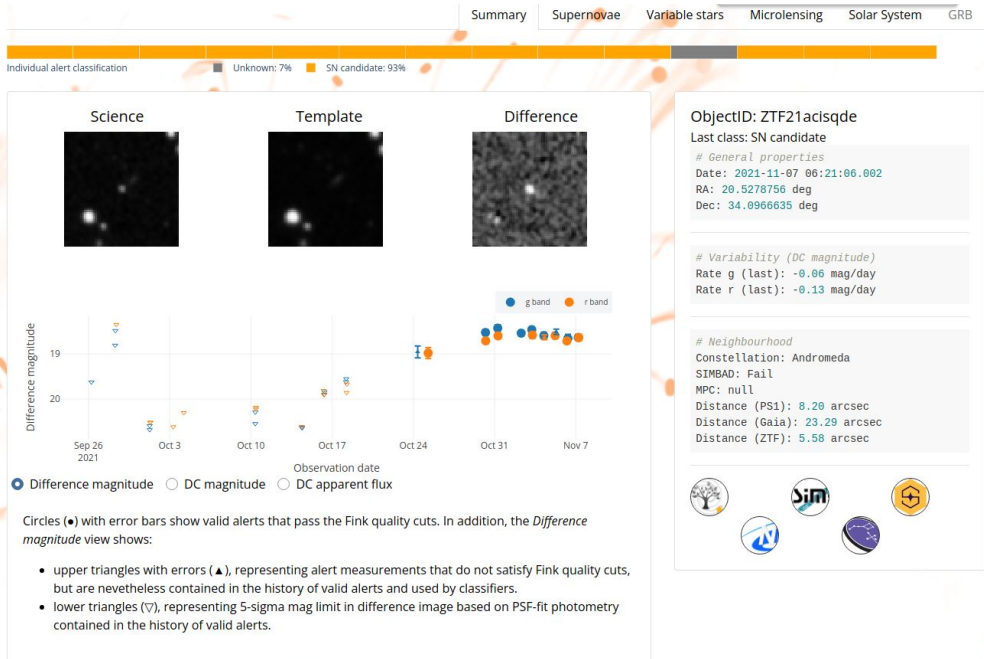
science portal

ZTF21acisqde



Inspect alert data

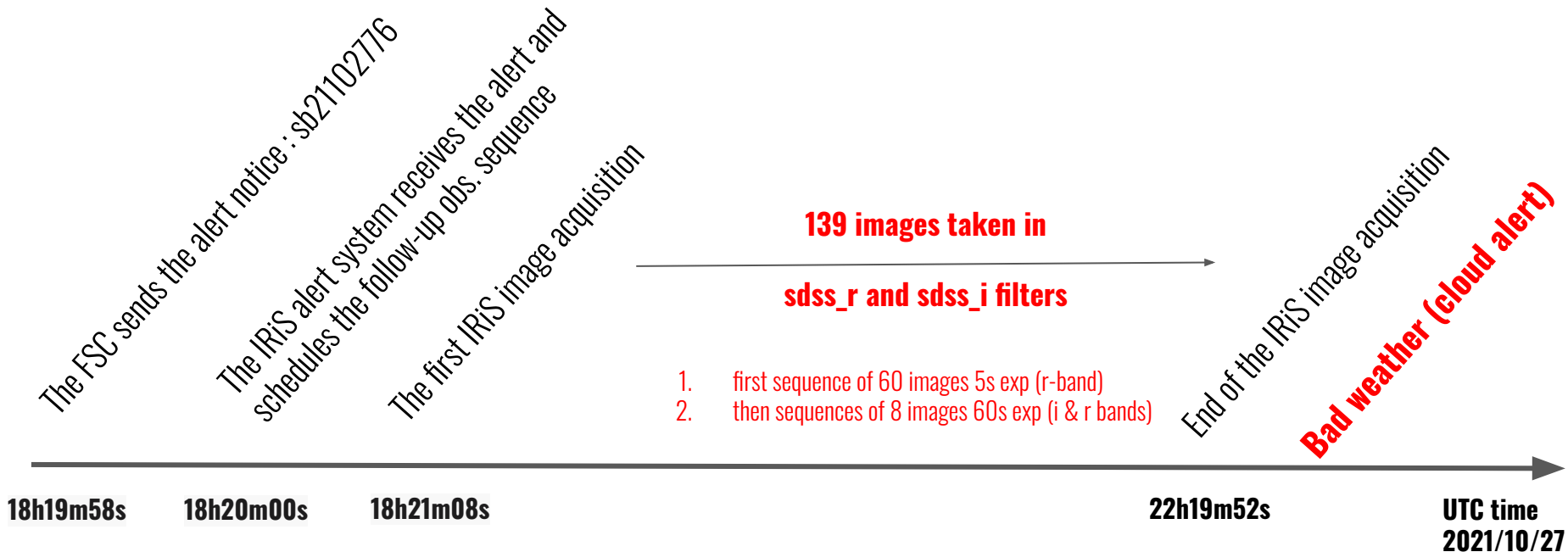
Get object data





The SVOM/IRiS first real test

On 2021, 27th October 20h18 UTC
a SVOM/IRiS alert sequence has been initiated

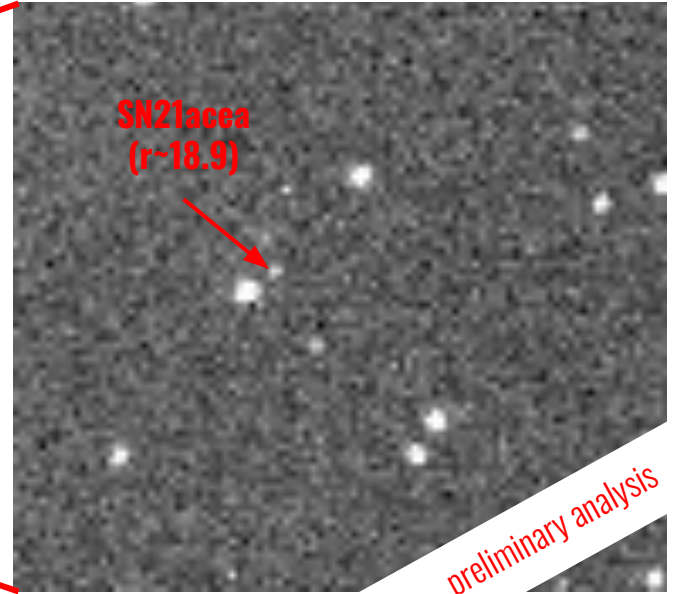
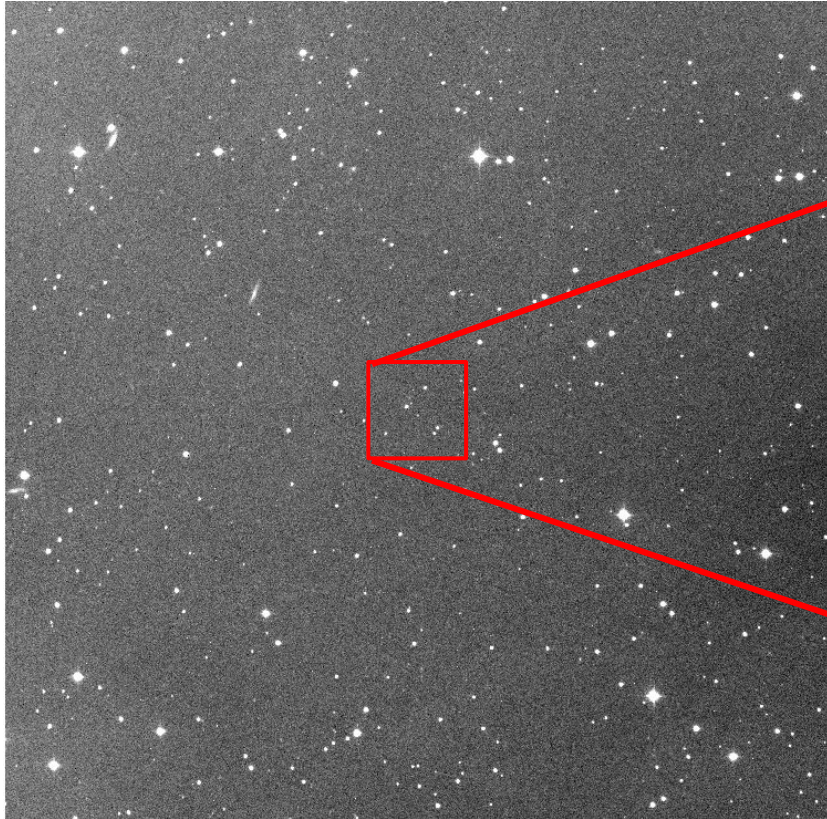




The SVOM/IRiS first observational results

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)**