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ISTITUTO NAZIONALE
DI ASTROFISICA

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ON BEHALF OF THE SOXS CONSORTIUM

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THE SOXS OPERATION MODEL

OUTLINE

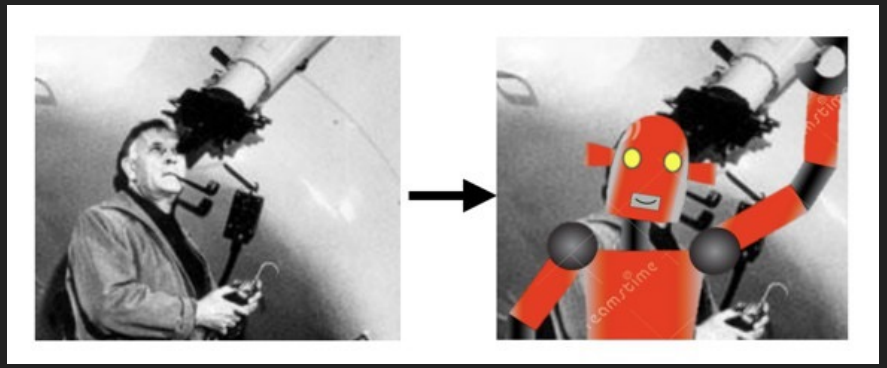
- The envisioned observing night
- Architecture and targets
  - What are targets / Pre-approval
  - Marshall Urgent
  - ESO OBs
- The scheduler:
  - Science Team interface
  - Scheduling algorithm
  - Automated night management

WARNING

- A lot of work in progress (testing, prioritisation of the targets, robustness of the code…)
- This is a new model for operation, tuning will be required.
- Comments welcome !

GENERAL CONCEPT – WHAT WE NEED TO DO

- Full automation of the scheduling process
- Providing a schedule of observable targets
- Optimization of the observation quality and time at the telescope
- Reliable automated decisions for management of unforeseen events
- Operation tracking
- Flexibility

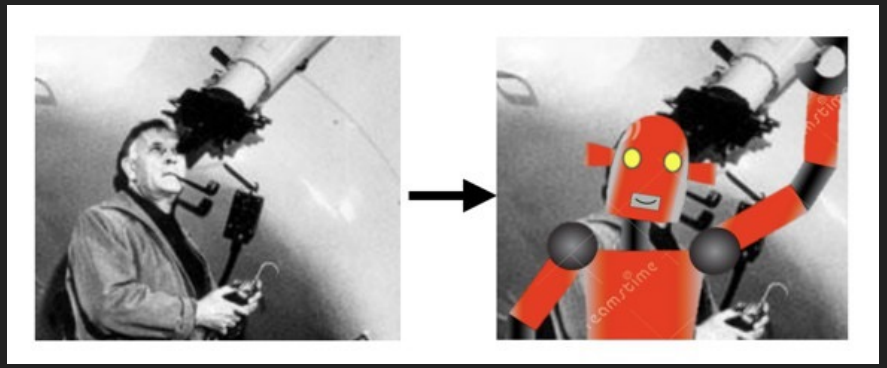


GENERAL CONCEPT

- **50 %** of the time for the **GTO** (transients, time domain Astrophysics). **ToO**

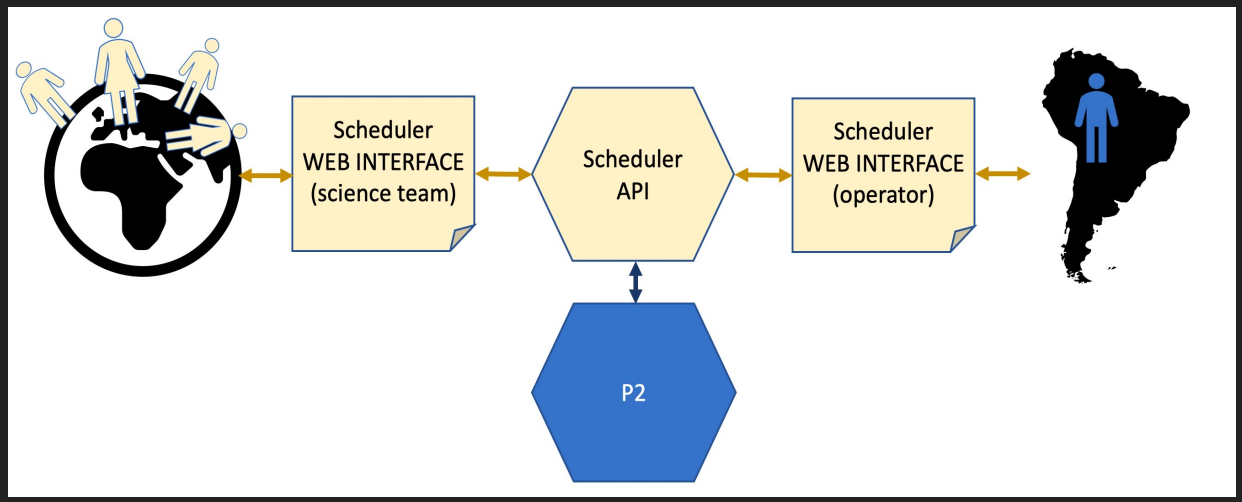
- **50 %** of the time for the **ESO proposals** (any kind of sources, even ToO).

- **Observing time shared within the same conditions (e.g. weather).**



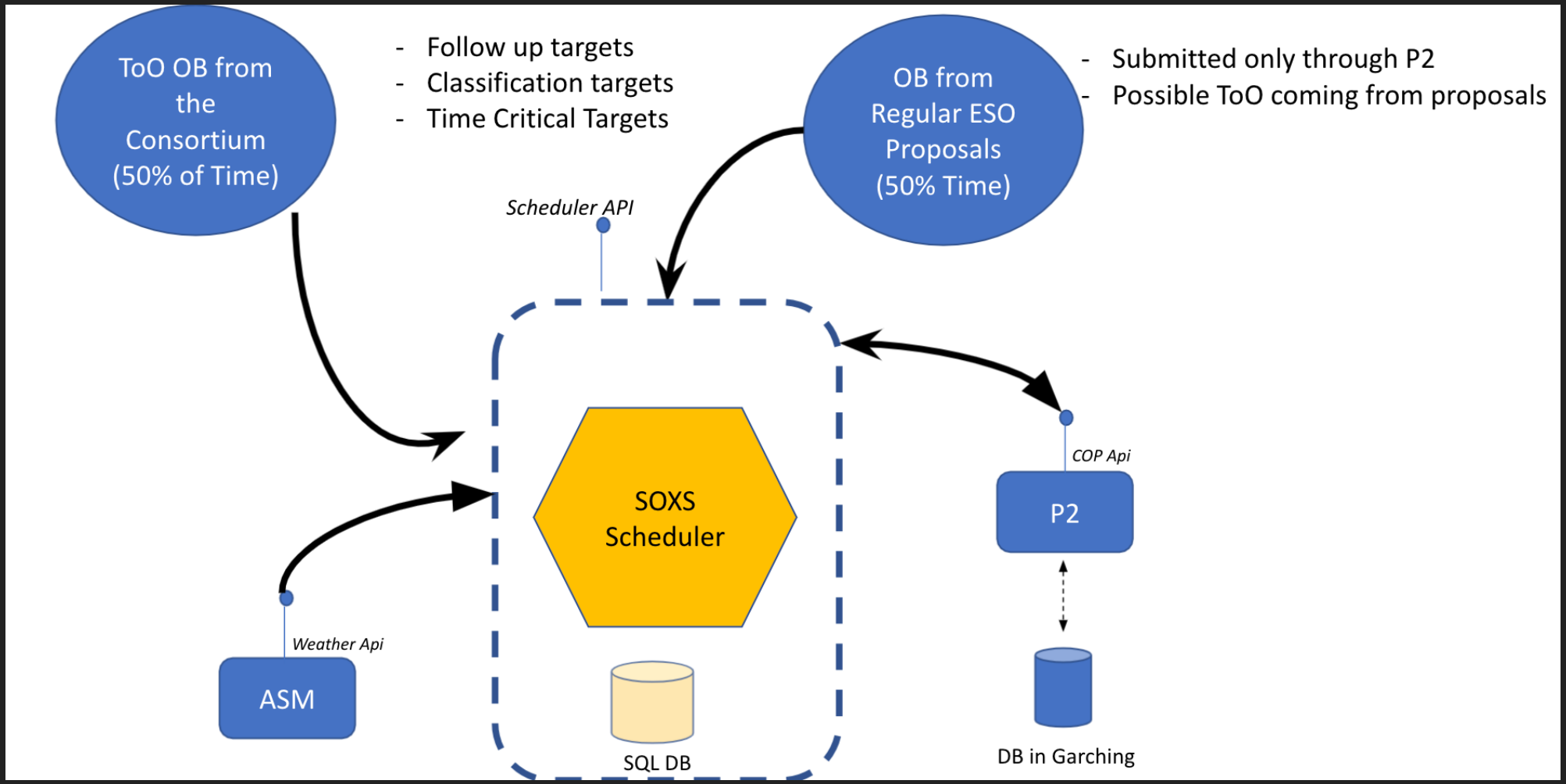
OBSERVING NIGHT

- We work on ToOs and regular ESO proposals, with schedule decided daily
- **No astronomer on the mountain**, the scheduler will do all the work of selecting targets, respond on weather changes, urgent targets, etc.
- The Science Team will gather online during the European afternoon to approve the proposed schedule

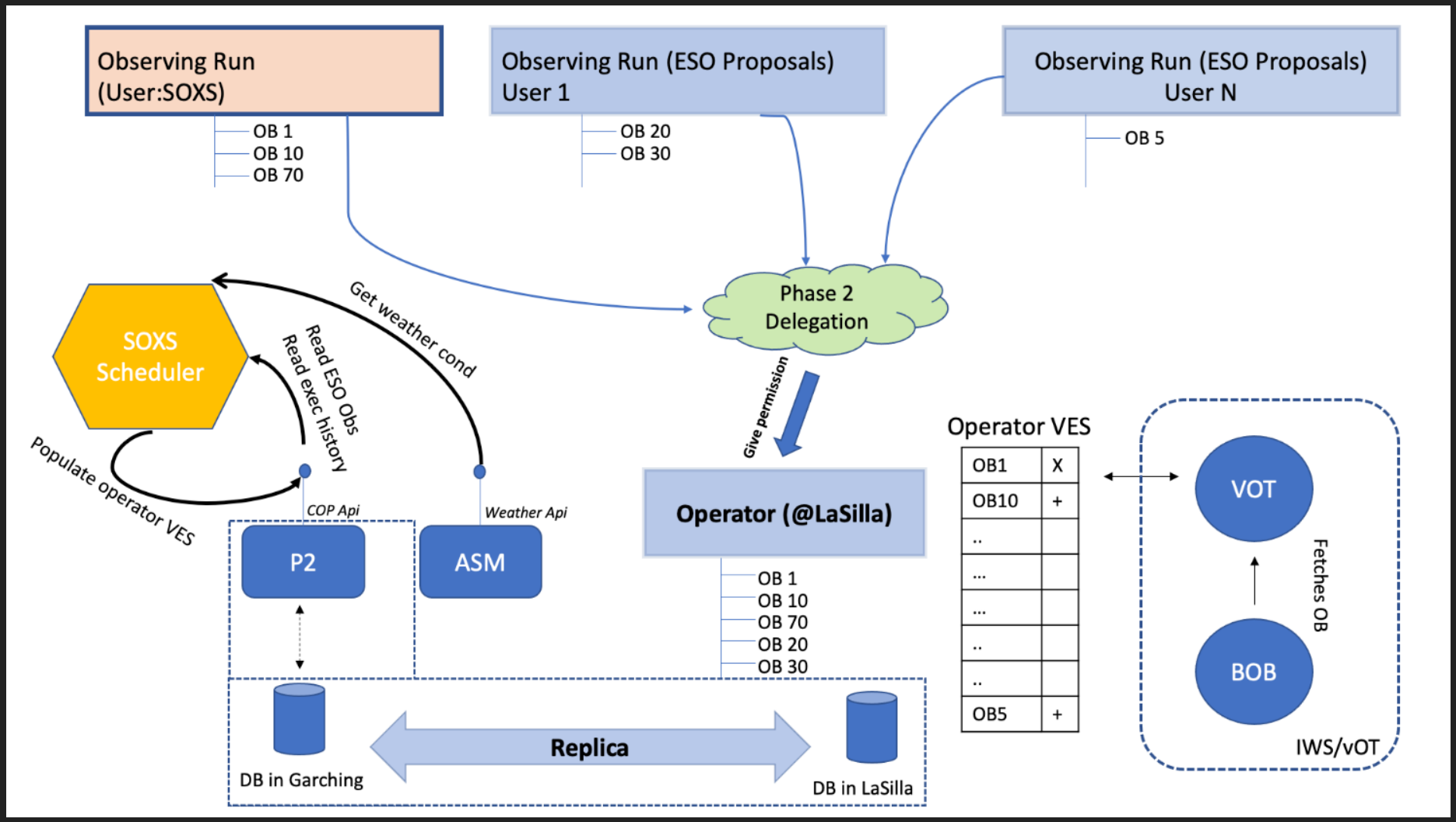


ARCHITECTURAL OVERVIEW

Architectural Overview



Architectural Overview



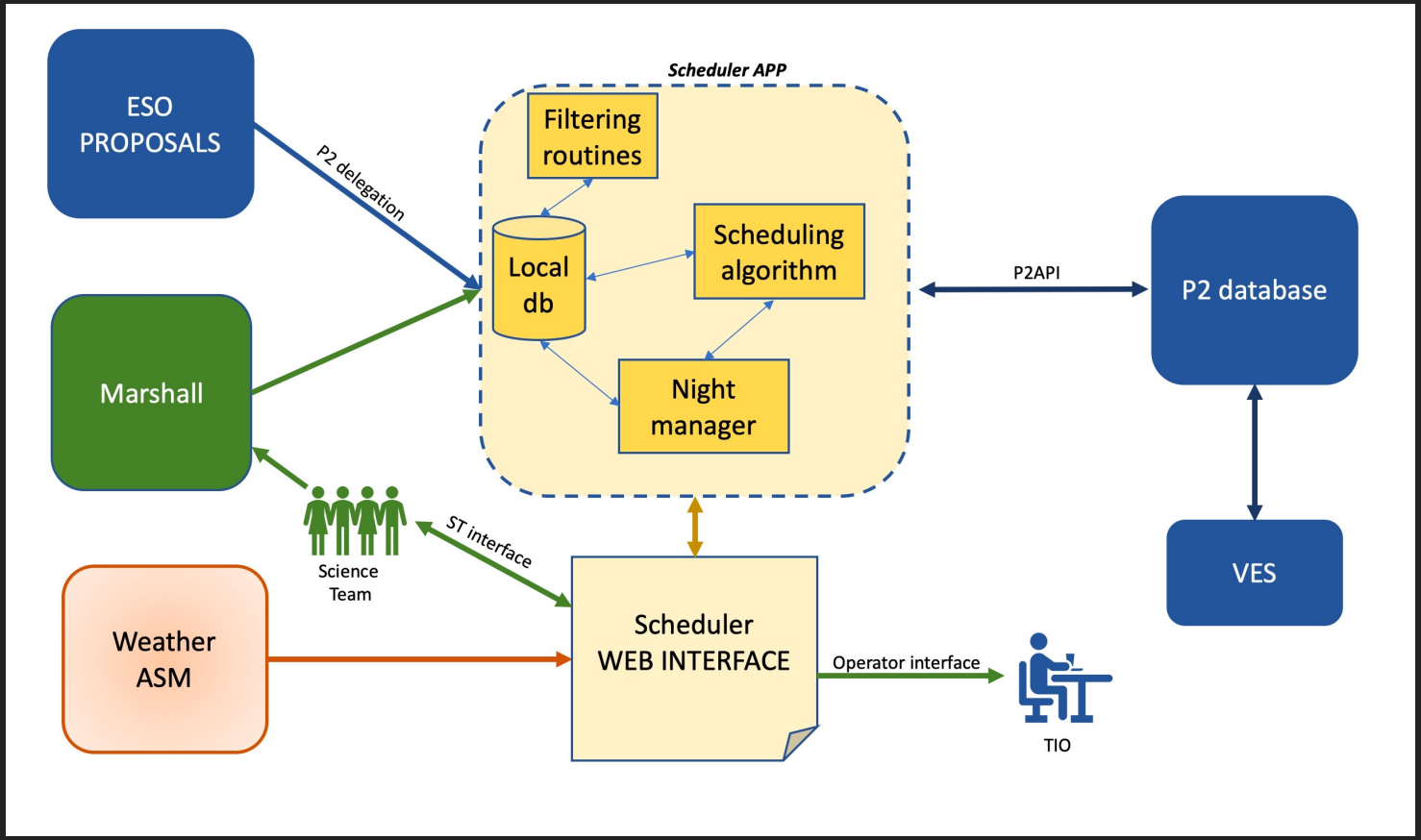
WHAT ARE OUR TARGETS ?

- For the GTO, we will refer to three categories of targets: Classification, follow-up, urgent
- All of these will fall within our (well defined) science cases
- To request a follow-up observation, PIs will need to submit a mini-proposal to our Scientific Committee
- Swift procedure with clean guidelines

- For the regular ESO proposals, we will refer generic to OBs.

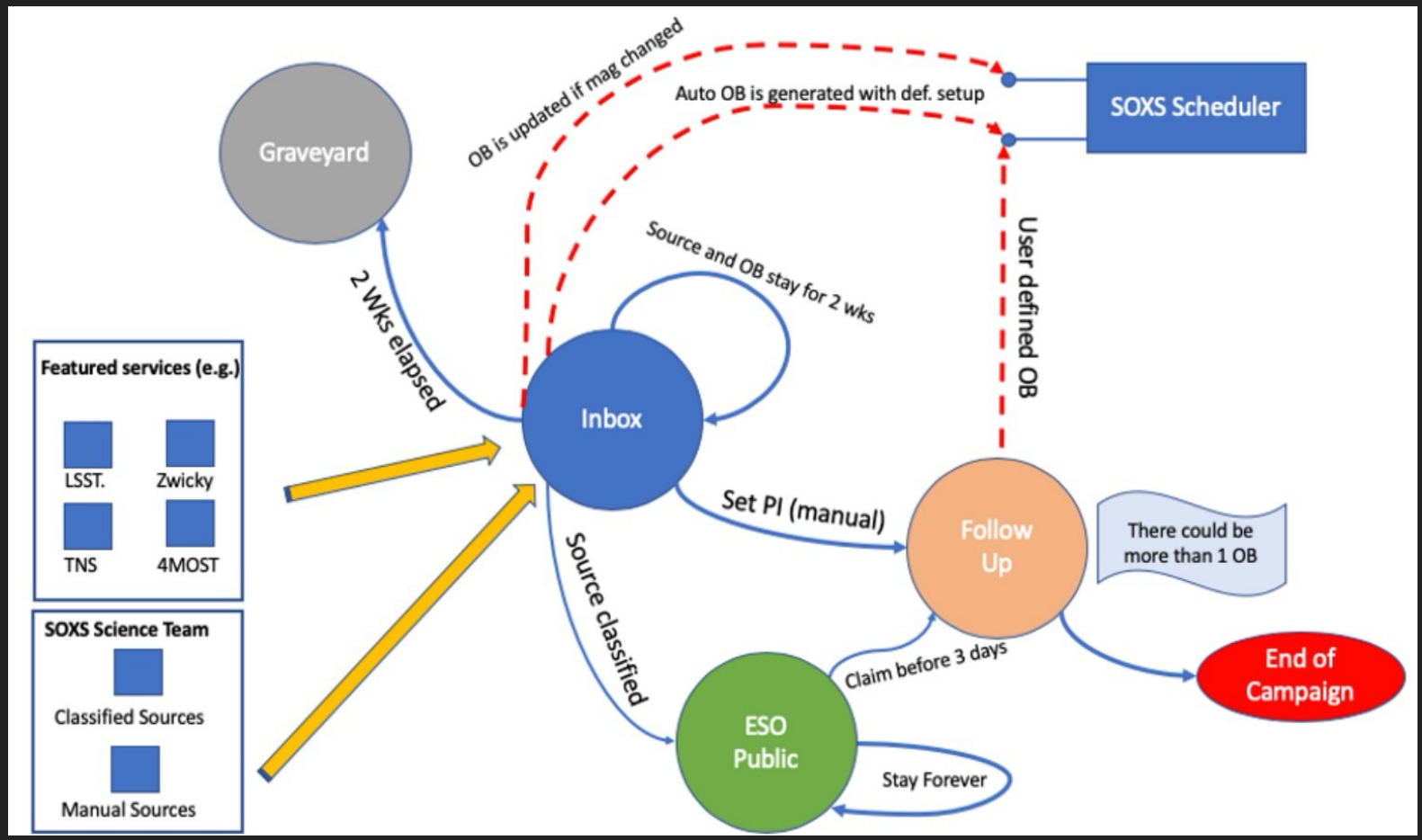
THE SCHEDULER

- Fed by Marshall and ESO p2DB
- Several routines distribute the workload
- Synched to P2 with automatically



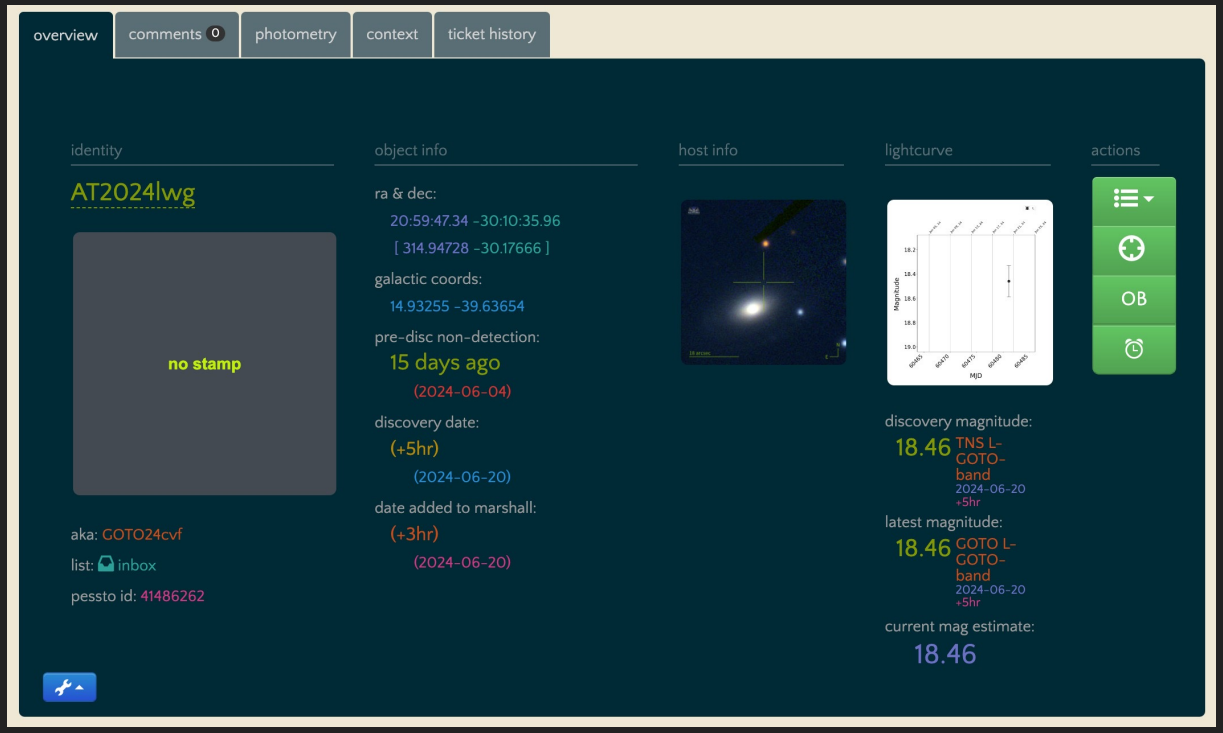
GTO SOURCE WORFLOW USE CASE SCENARIO

GTO SOURCE WORKFLOW



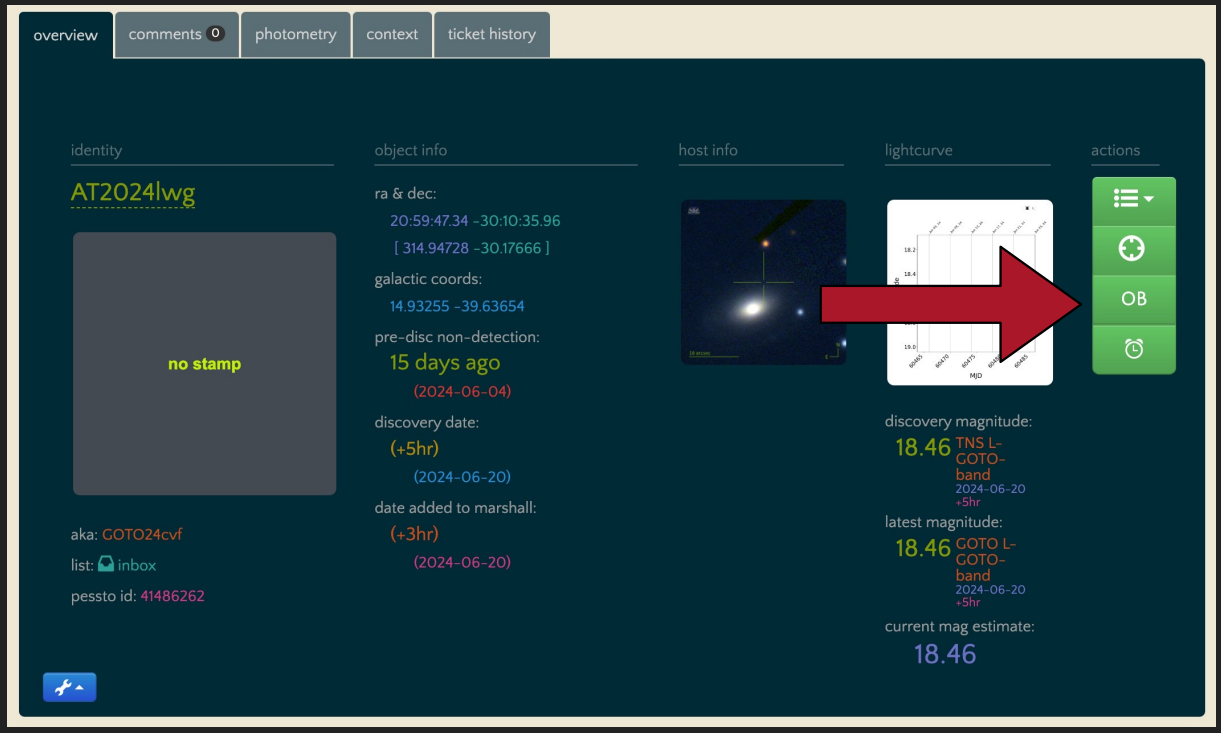
MARSHALL

- The Marshall aggregates all of the info from new/old transients
- Sends Classification OBs/ Updates automatically to the scheduler



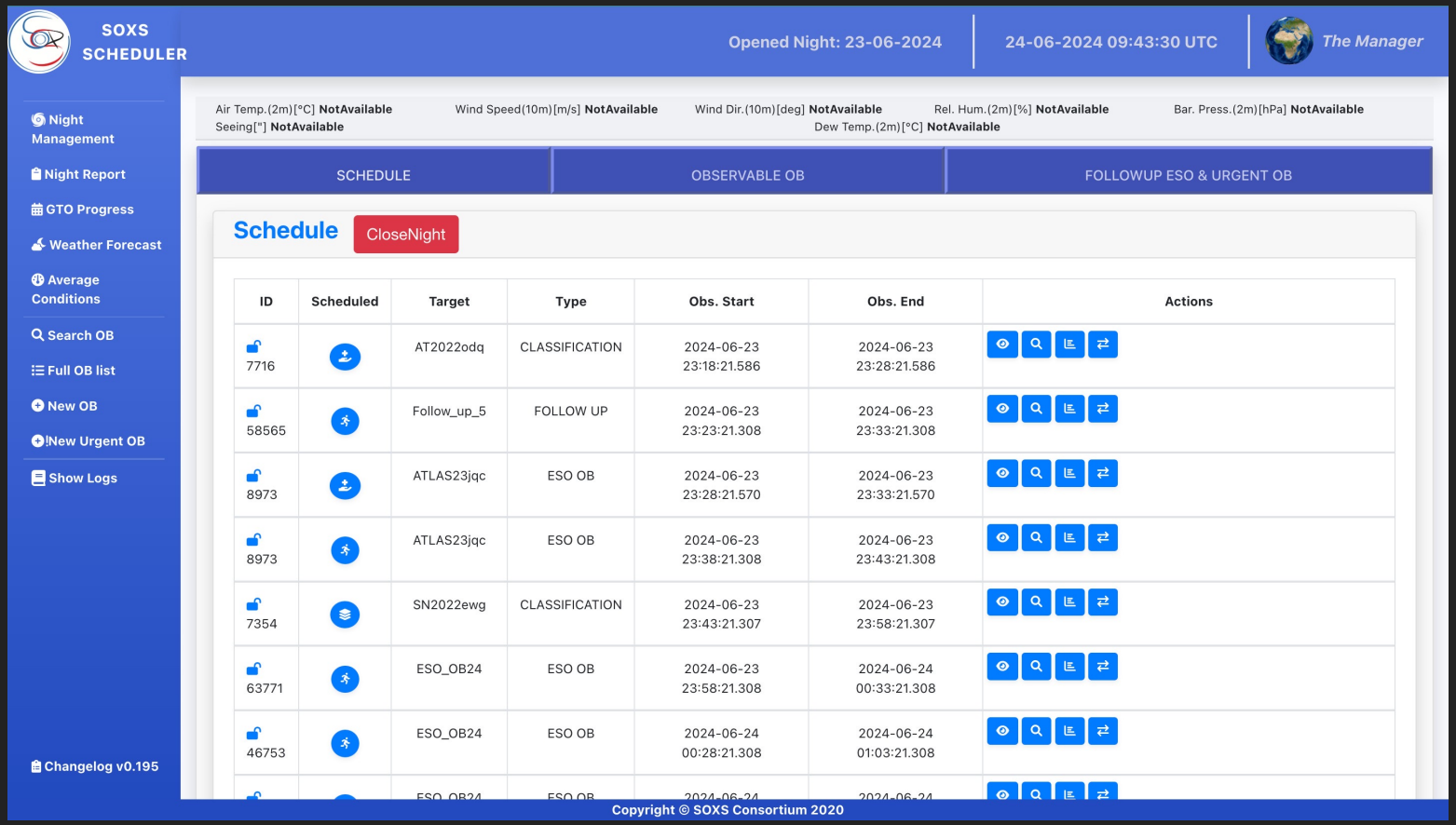
MARSHALL

- The follow up requests will be created from the SOXS Marshall
- Will either create them ex-novo, or claiming a classification target/a known source
- These will be sent to the Scheduler DB (our own)



THE SOXS SCHEDULER

SCIENCE TEAM INTERFACE



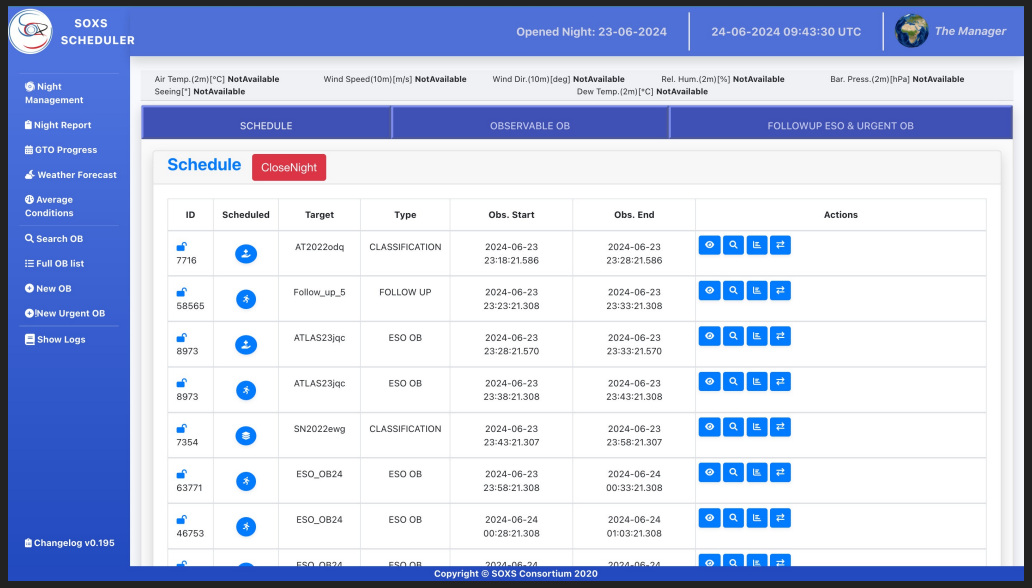
MANY USER-FRIENDLY TOOLS

The scheduler interface has many tool to aid the science team during their operations, mainly to:

- Modify the proposed schedule
- View the OB specifics
- View the Guaranteed Time of Observation status
- View weather forecasts

SCHEDULING

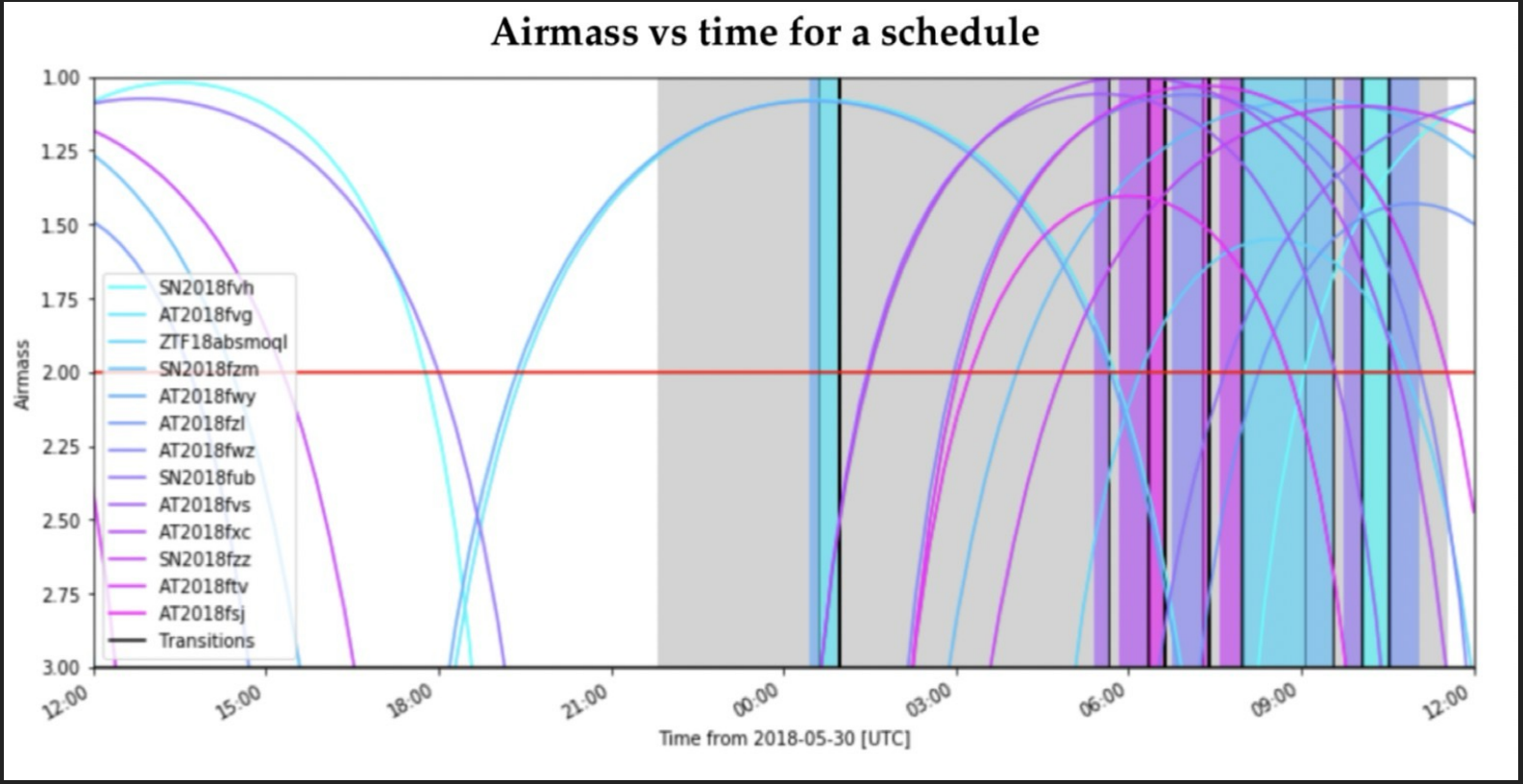
- “Static” schedule
- 2 algorithms
- Follow up OBs with Priority Scheduler from Astroplan
- Classification targets with GGF
- Still TBD, we may open up other possibilities



SCHEDULING ALGORITHMS

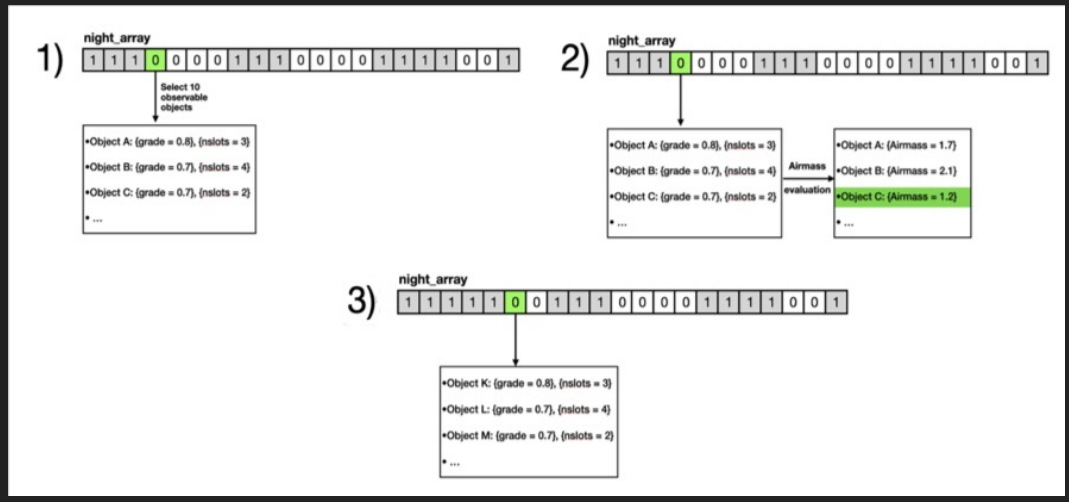
PRIORITY SCHEDULER

- Sorts and schedules by priority
  - Optimizes constraints with 1 minute time-grid



GRADED GAP FILLER

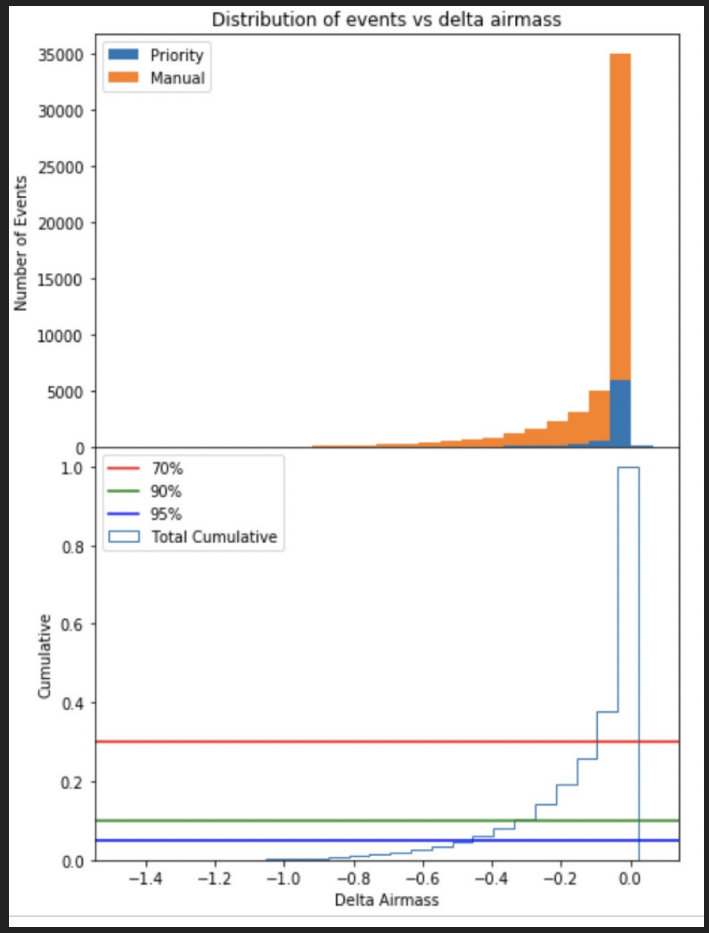
- During filtering, every OB is associated with a "grade"(based on current ESO probabilities on airmass, FLI, etc.)
- The algorithm is greedy, finds a hole in the schedule and wants to fill it
- Chooses 10 targets with highest grade, checks their constraints for that hole
- Winner gets scheduled



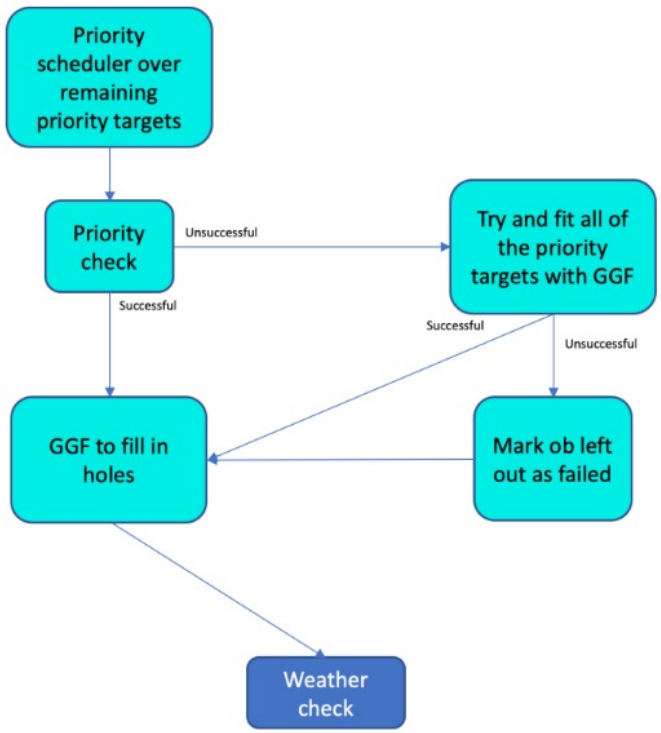
CAN WE TRUST THOSE ALGORITHMS ?

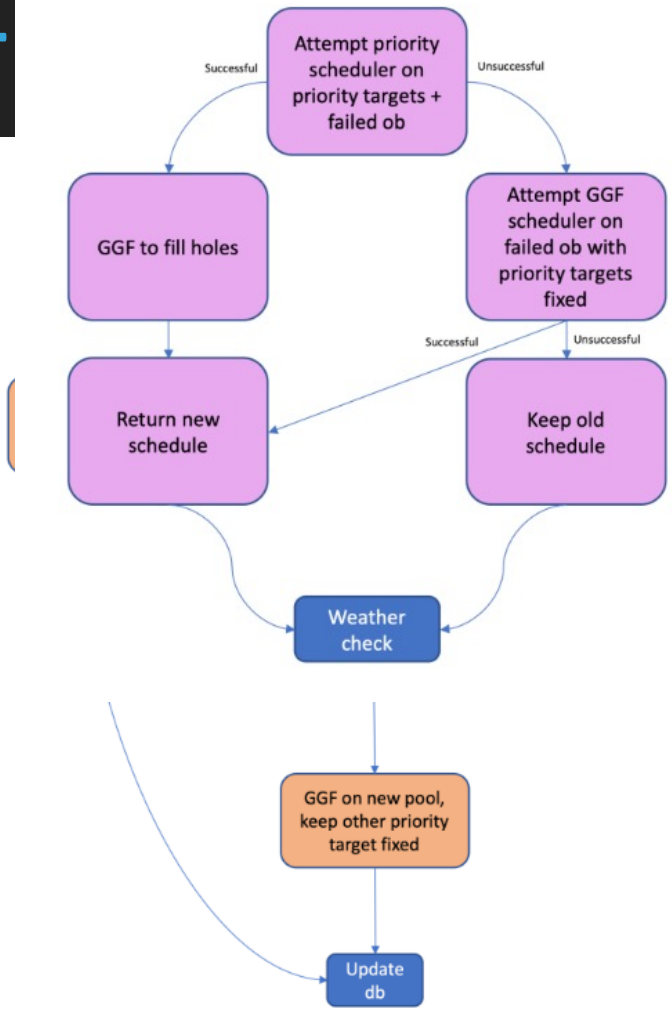
Can we trust those algorithm?

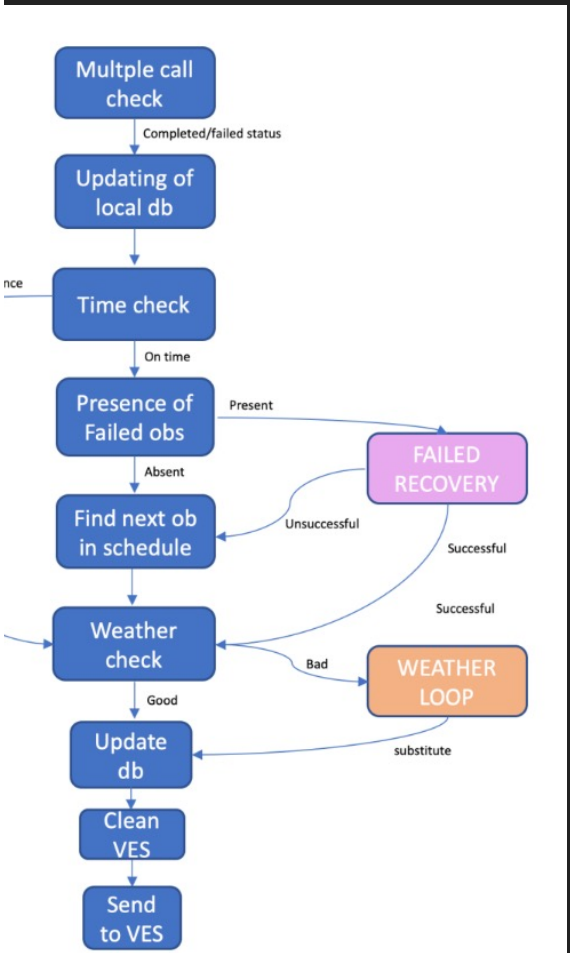
- Our first Monte Carlo simulations, with the 2018 ePESSTO data
- 40 different nights simulated, with 100 schedules per night
- 90% of events are scheduled at airmass less than 0.3 from their best -> deg



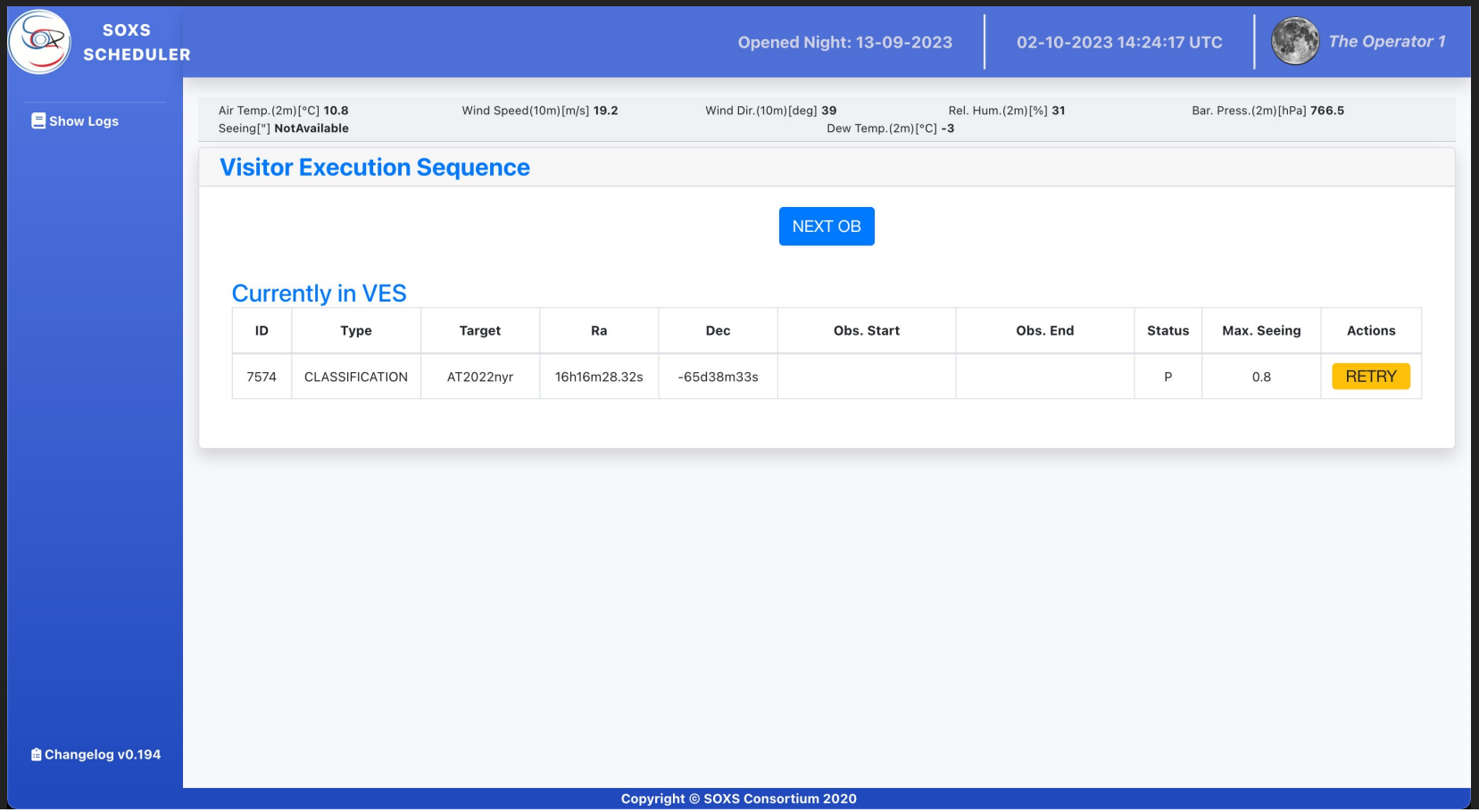
NIGHT MANAGEMENT







THE OPERATOR INTERFACE



REAL CASE USE AND TEST

- System tested successfully **end-to-end** in La Silla Sept 2024
- Anoter run should happen during the next September with the idea to improve the stability of the system and the code.
- **Plus**: The scheduler logic for SOXS operation is completely decoupled by design. Improvements, change of the logic and ways to manage the OBs can be performed completely from Europe

Thanks!