



The Status of

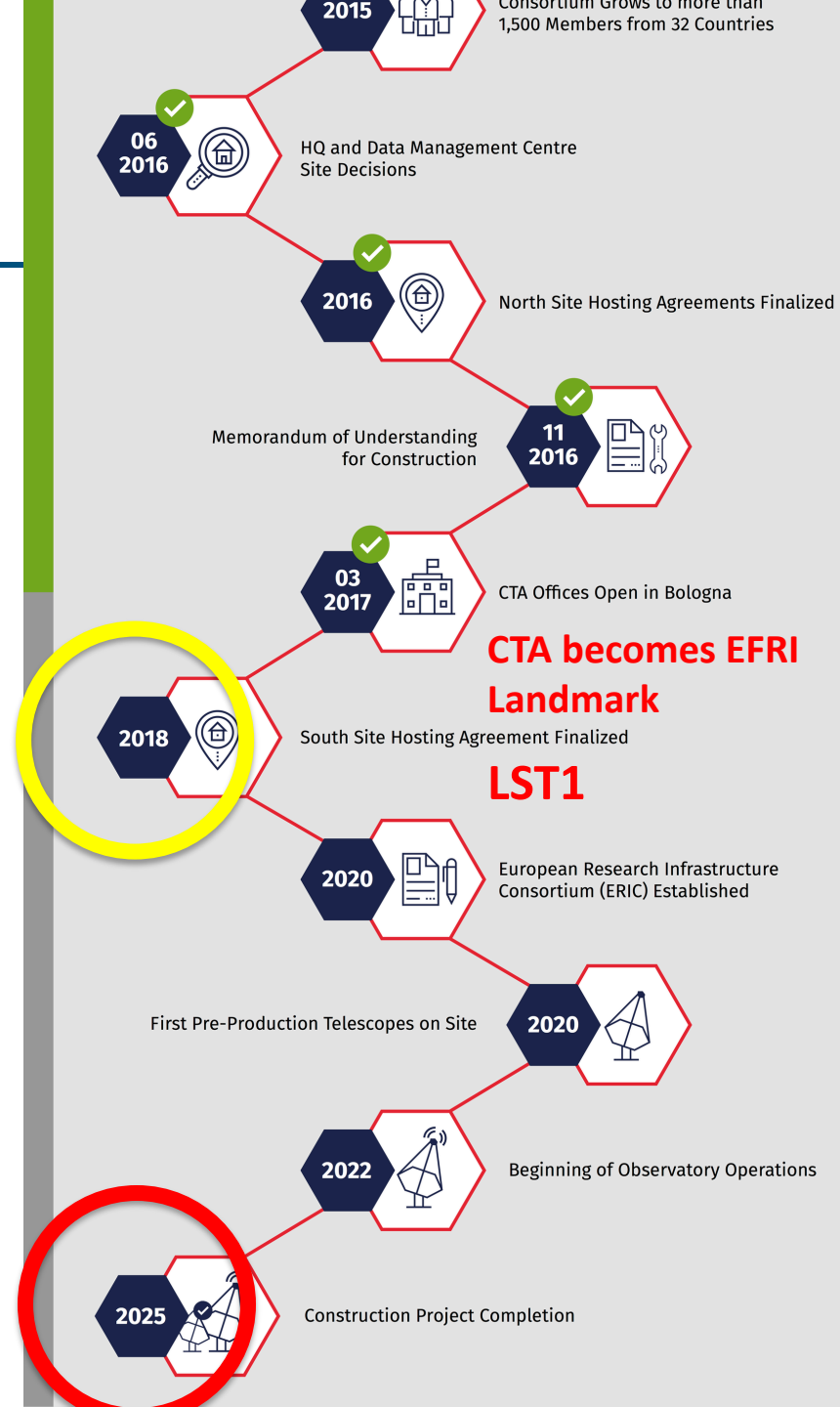
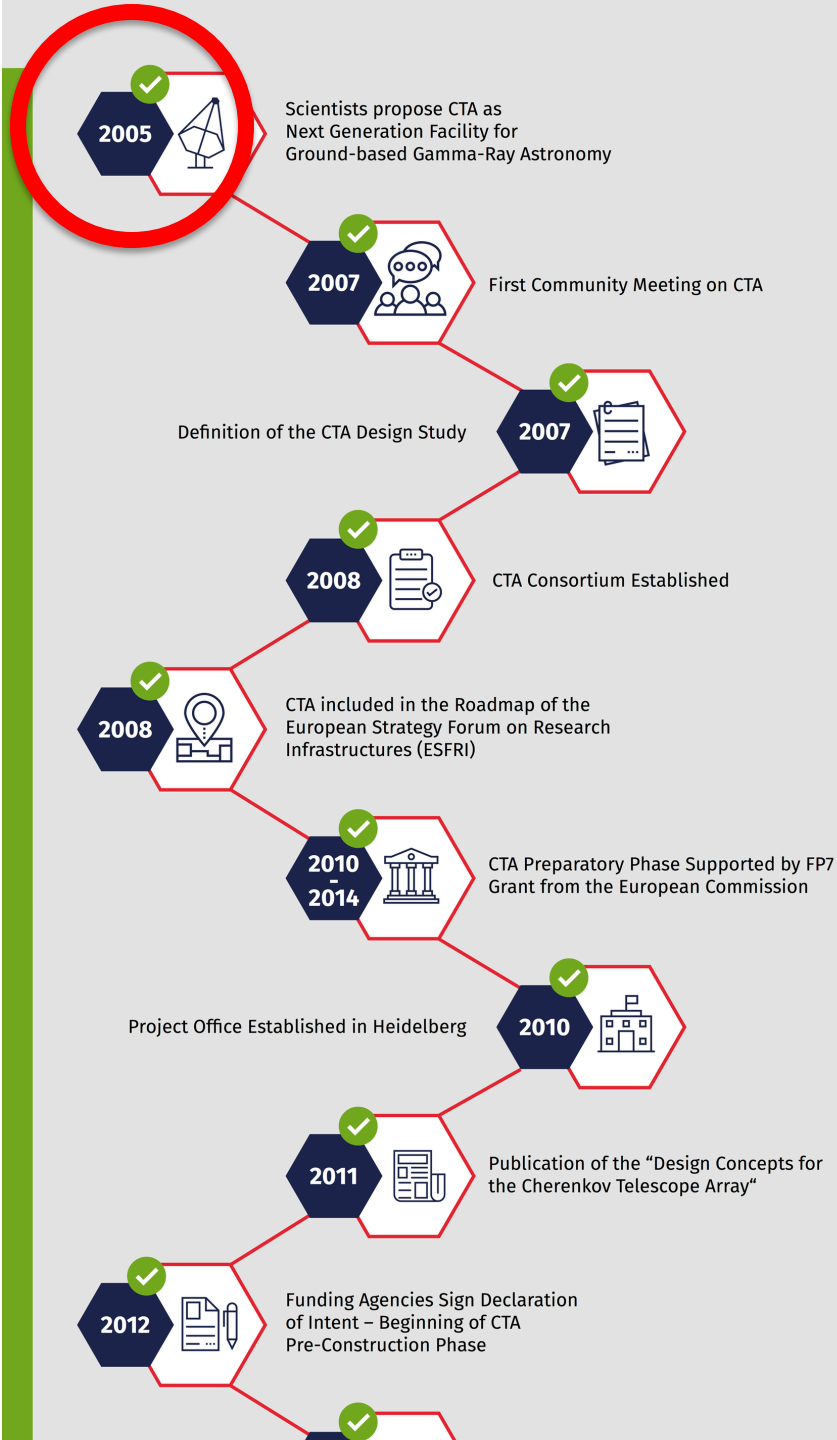
Matthias Fuessling, CTA Observatory

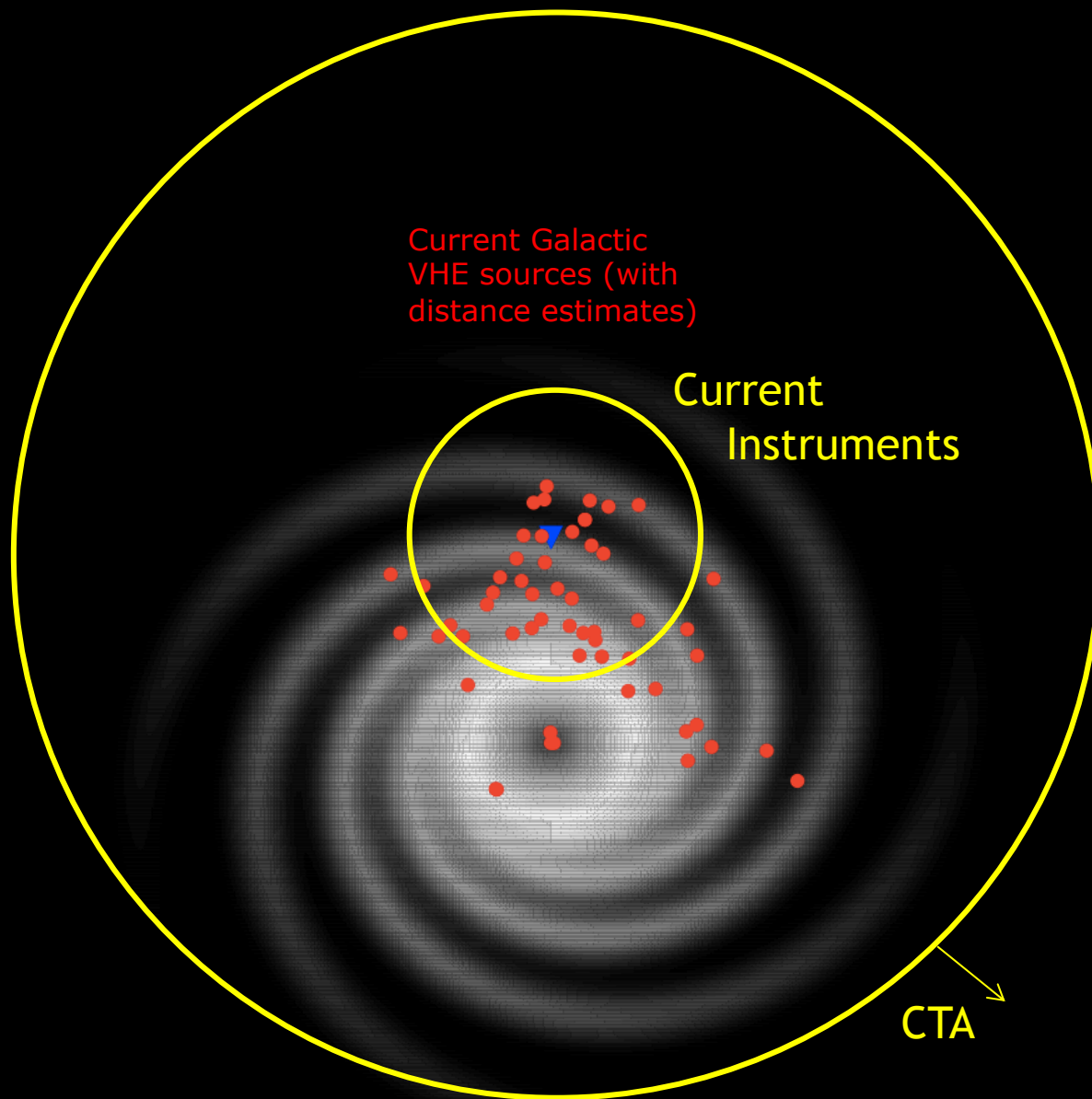


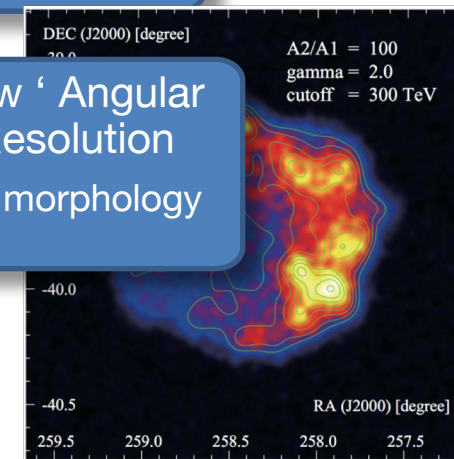
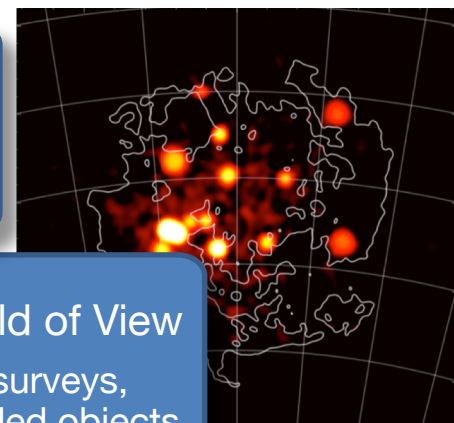
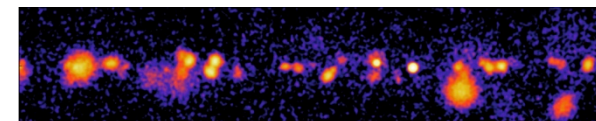
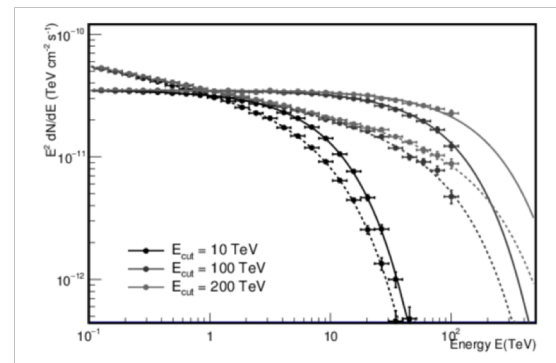
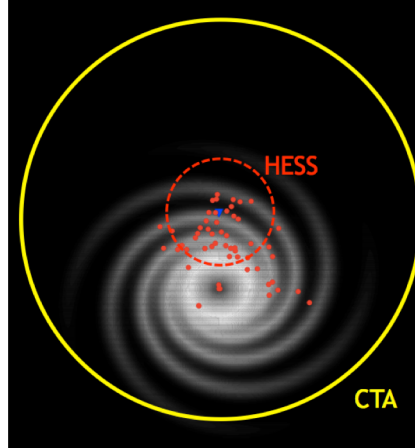
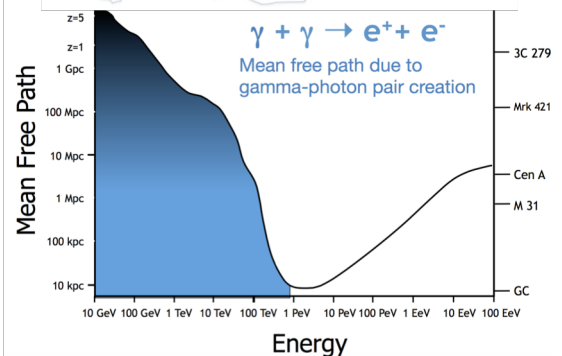
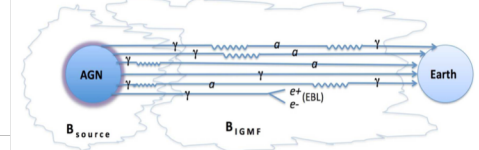
ESCAPE Kick-off Meeting
7-8 February 2019,
CNRS-LAPP, Annecy



ESCAPE
European Science Cluster of Astronomy &
Particle physics ESFRI research Infrastructures







10 x Sensitivity,
Large Collection
Area
→ all topics

Energies up to
300 TeV
→ Pevatrons

8° Field of View
→ surveys,
extended objects

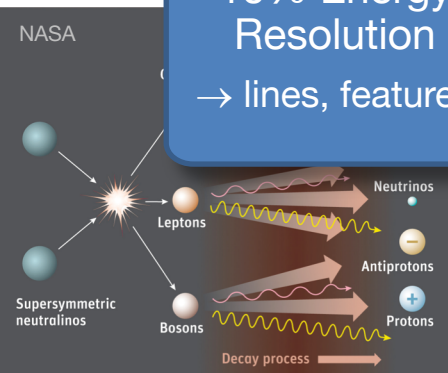
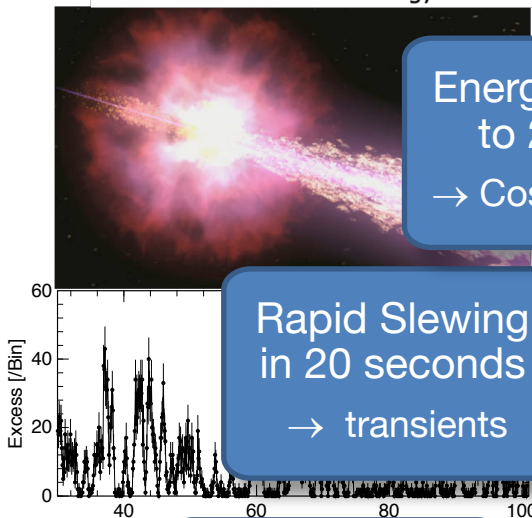
Few ' Angular
Resolution
→ morphology

cta
cherenkov telescope array

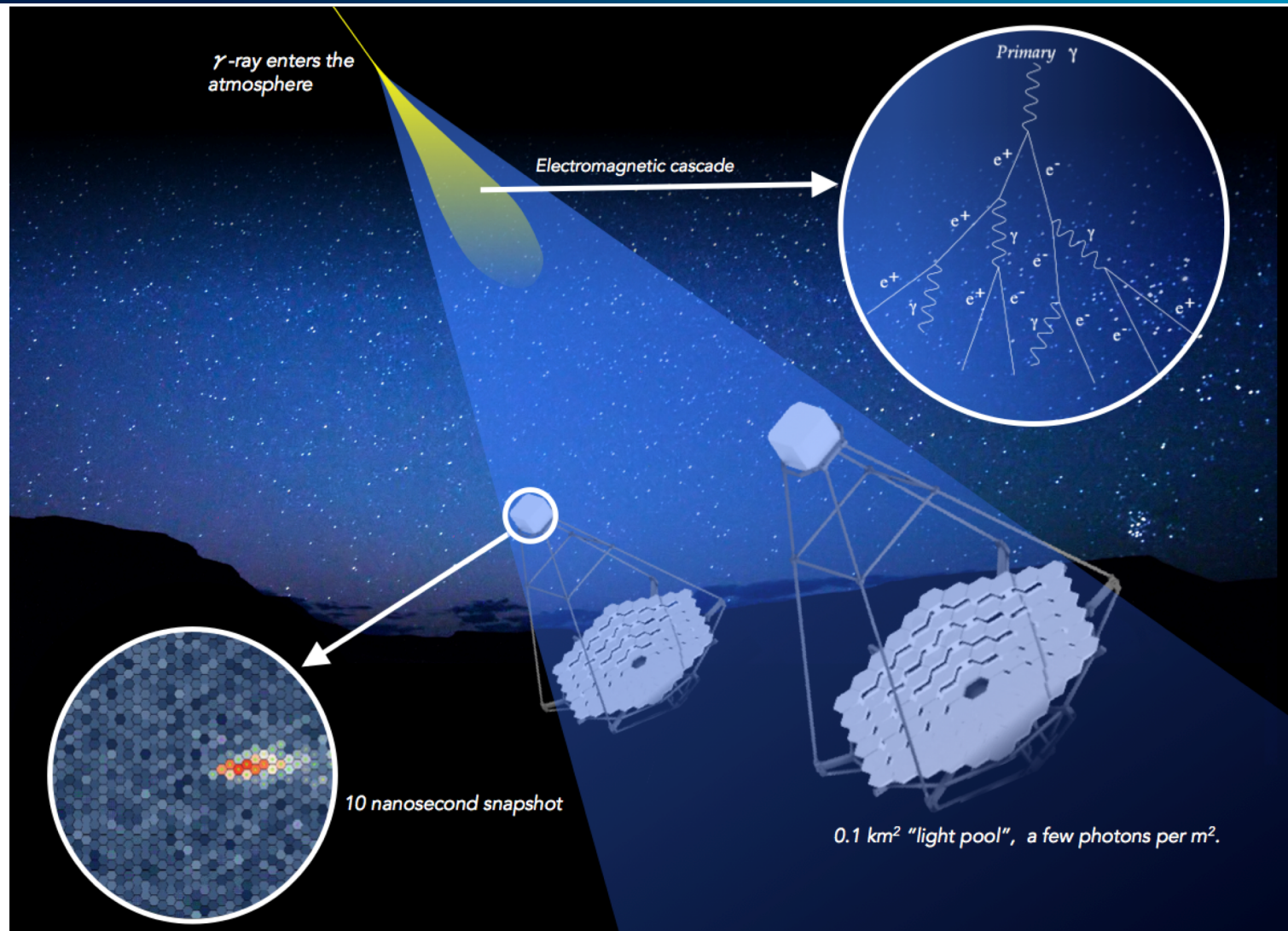
Energies down
to 20 GeV
→ Cosmology++

Rapid Slewing
in 20 seconds
→ transients

10% Energy
Resolution
→ lines, features



DETECTION PRINCIPLE



CTA TELESCOPE PROTOTYPES

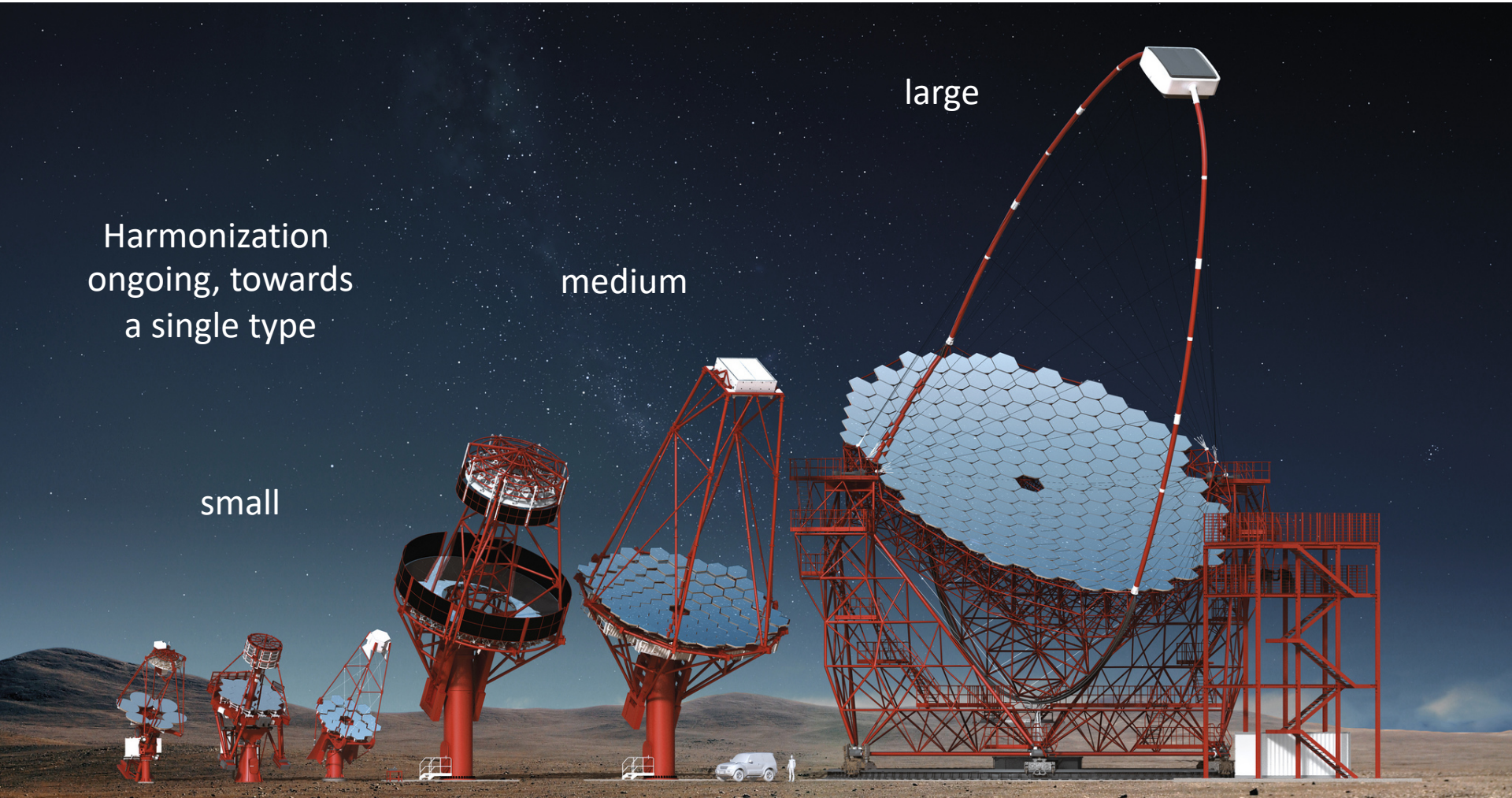


Harmonization
ongoing, towards
a single type

small

medium

large



ALL-SKY COVERAGE WITH A NORTHERN AND A SOUTHERN SITE



North+South

>60° zenith
45°-60°
30°-45°

Known sources:

★ TeVCat

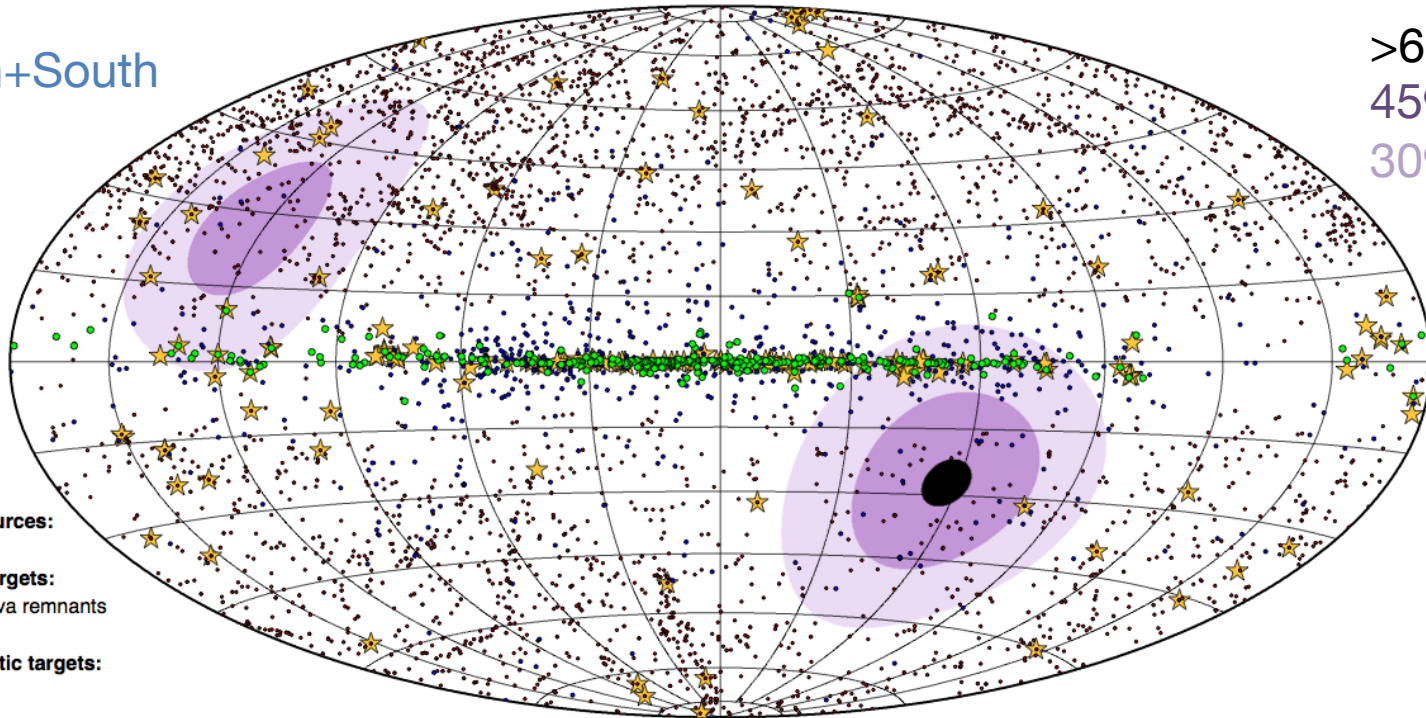
Galactic targets:

● Supernova remnants

● Pulsars

Extragalactic targets:

● Blazars



South

Known sources:

★ TeVCat

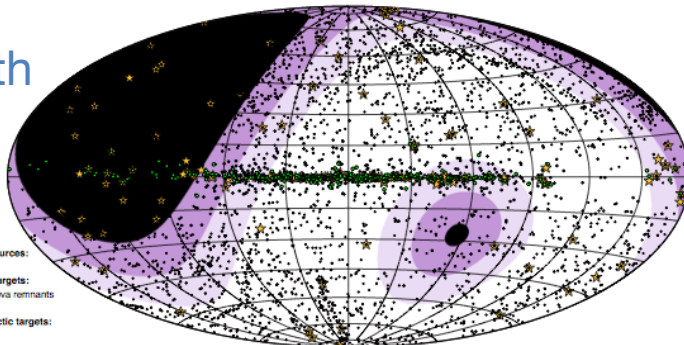
Galactic targets:

● Supernova remnants

● Pulsars

Extragalactic targets:

● Blazars



North

Known sources:

★ TeVCat

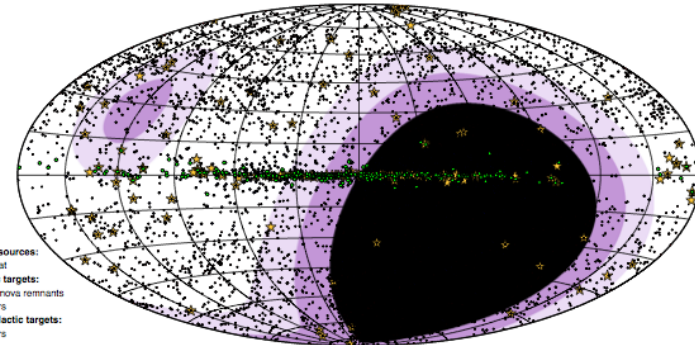
Galactic targets:

● Supernova remnants

● Pulsars

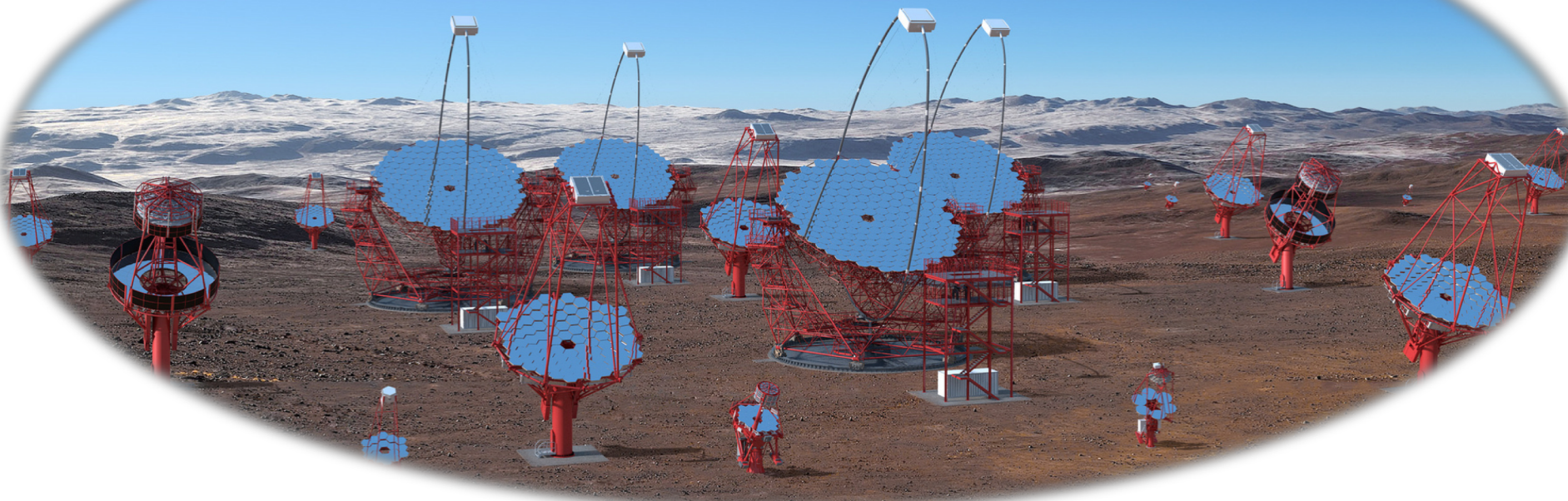
Extragalactic targets:

● Blazars





WHO: CTAC & CTAO



THE CTA CONSORTIUM (CTAC)



31 Countries
203 Institutes
1451 Members



THE CTA OBSERVATORY (CTAO)

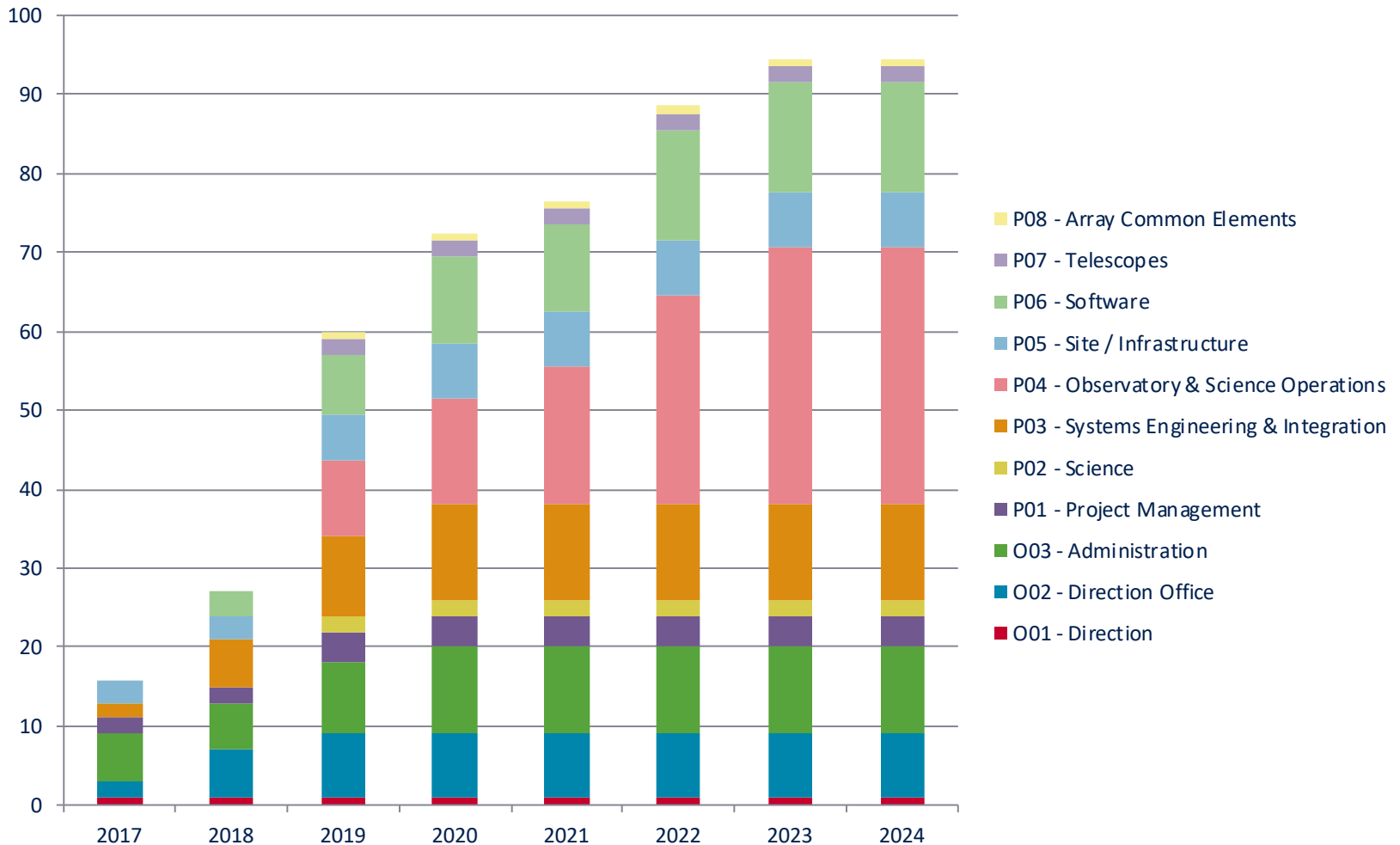


- In 2014, the CTA Observatory GmbH was founded as interim legal entity, located at Heidelberg, under German law
 - To prepare the CTA implementation (select and prepare two array sites + Science Data Management Centre)
- The final legal entity for full construction, a *European Research Infrastructure Consortium* (ERIC), is being set up under European Union law (early 2020?)
- Bologna (Italy) selected as HQ; Project Office is moving to Bologna and is steadily growing
- The *Science Data Management Centre* (SDMC) will be built up at DESY in Berlin-Zeuthen (Germany), in a new building



Artist's
conception

RAMP-UP OF THE CTA OBSERVATORY



CTA SITES: ARRAYS, HEADQUARTERS, DATA CENTER



- A Guest Observer Facility
 - For the **first time** in this waveband
 - Existing instruments are run as experiments
 - Annual cycles, TAC ranking, long-term schedule
 - Proposal preparation support, tracking, helpdesk +
 - Public science data archive
 - After proprietary period
- Two Telescope Arrays – one Observatory
 - Inter-site coordination
 - Uniform approach to science operations

-
- Users will receive their data fully calibrated in FITS format, and be provided analysis tools
 - After a one-year proprietary period, data are open
 - During 1st decade, available observation time split roughly evenly between Key Science Projects (in particular surveys) and open time

 - Main Challenges
 - Sub-array operation, wide field of view, instrument response generation, background modelling, rapid alert generation and response, data volume, science operations during construction
 - CTA is a Software instrument
 - Software plays a critical role in all steps of the Observatory

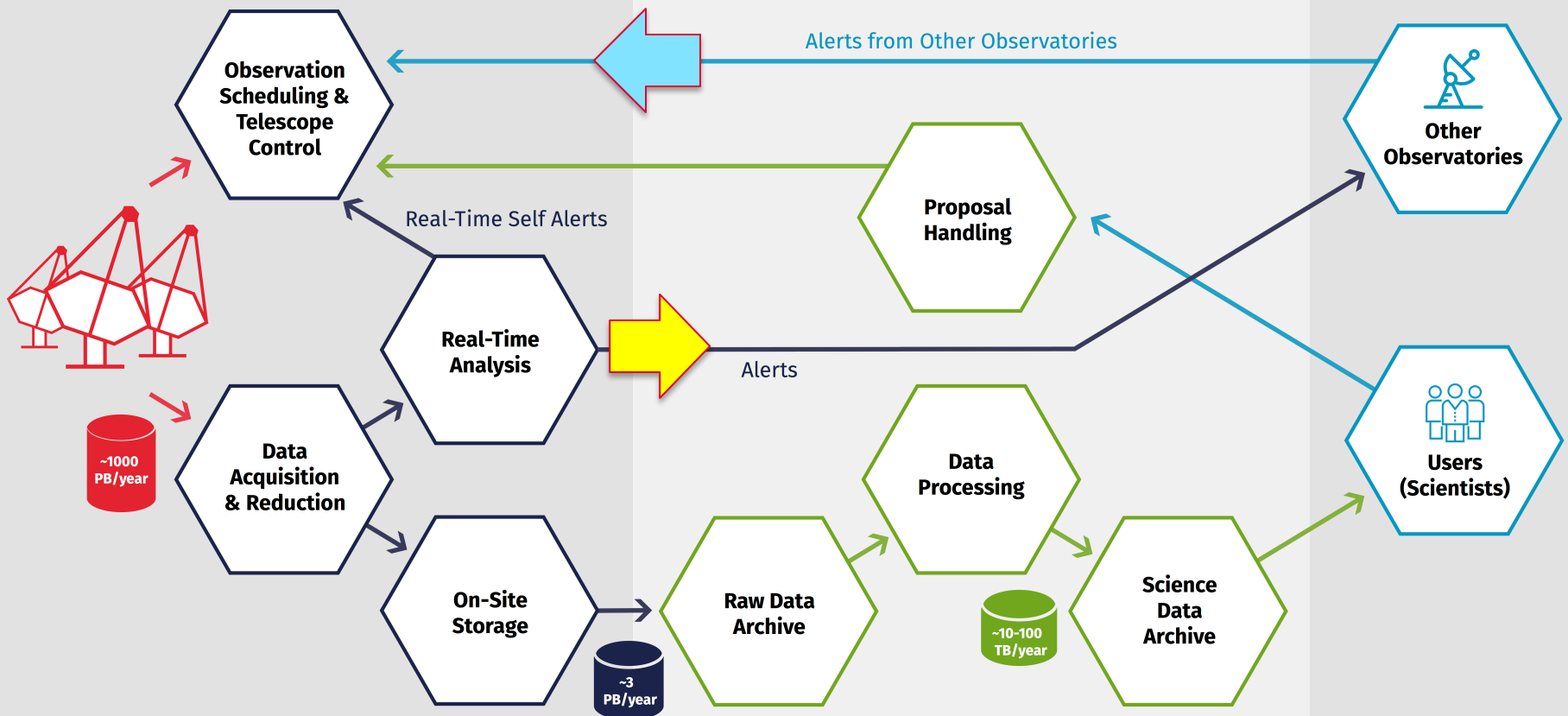
CTA SYSTEM ARCHITECTURE & INFORMATION FLOW



On Site

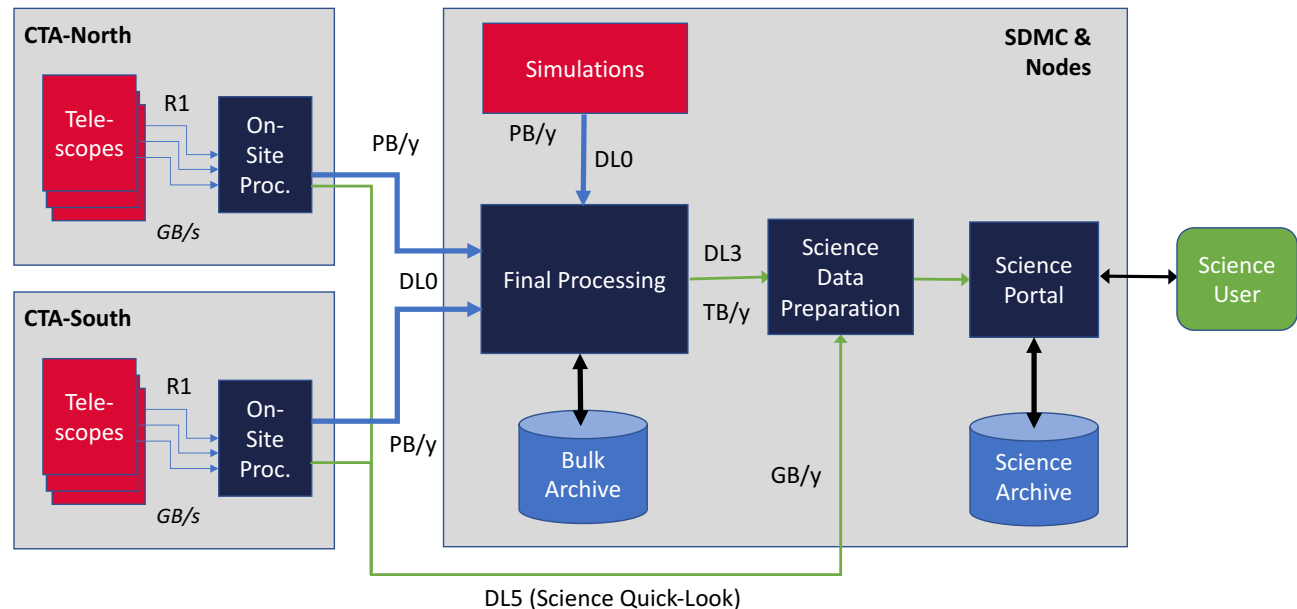
Off Site

Outside World



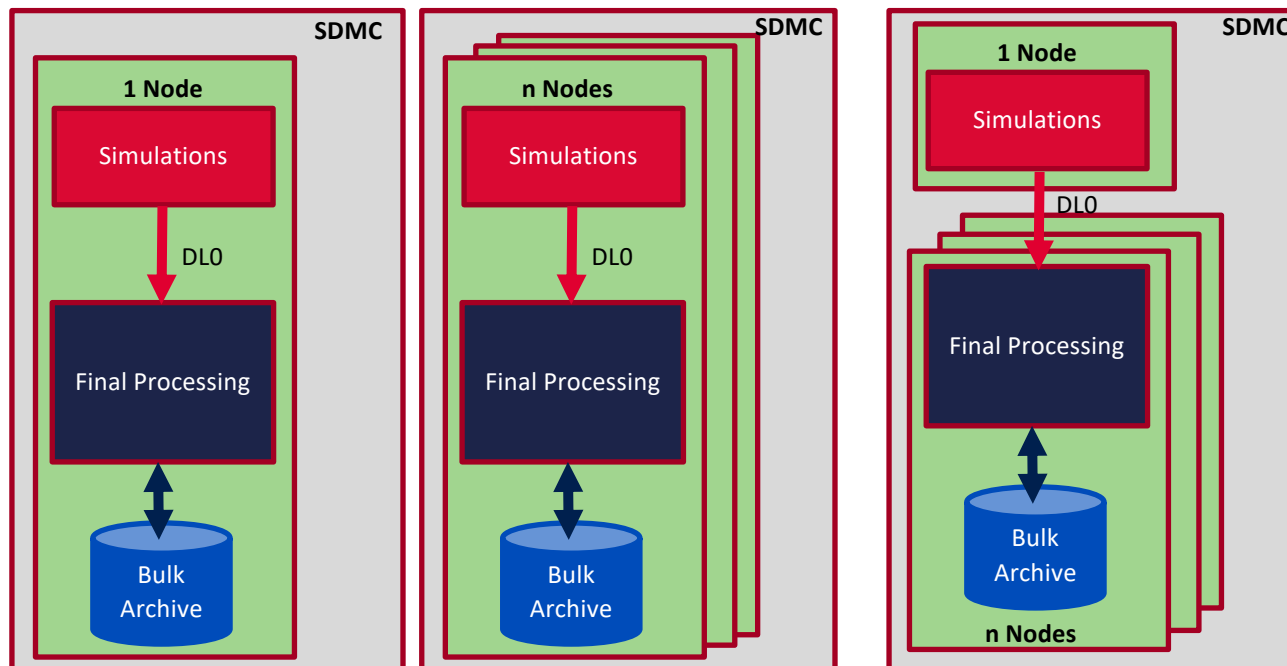
DATA FLOW & ANALYSIS CATEGORIES

- Three main analysis categories
 - Timescales of near real-time and next-day for quicklook and science alerts, months for final products
 - Involves strict data quality assurance and verification of data products
- Strong data reduction along the processing steps
 - From PB/y (at raw data level) to GB/y (high-level science data)
- Open access through Science Portal
 - access to science archive, to science analysis tools
 - Exploration of quicklook data products



MODELS FOR DATA PROCESSING AS PART OF SCIENCE OPERATIONS

- Different computing models under investigation for CTAO
 - Centralised vs. distributed model
 - Under responsibility of SDMC



DATA CHALLENGES

- Large-Scale Data Processing and Simulations
 - Annual reprocessing of data
- Long-Term Preservation of Data Products and SW tools for lifetime of the Observatory
 - 30 years lifetime of the Observatory
- Open Access to data, data products and SW tools following FAIR principles
- As an observatory, strong commitment towards Science User Support

SUMMARY



- CTA will work as an open Observatory
 - User services and support in the core
 - CTA requires well designed software systems in order to manage its almost 120 telescopes as a single efficient system
 - Data Challenges
 - Several PB/y raw data to be handled
 - High-quality science data products and software tools
 - CTA software is entering the construction phase
- CTA participating in all work packages of ESCAPE to contribute, to learn, to share
- And last but not least ...

1ST CTA SCIENCE SYMPOSIUM



- Being organized for 6 to 9 May 2019 in Teatro Duse, Bologna
- Registration opened on 14 Jan 2019
- More info and registration at www.cta-symposium.com
- Open CTA to astro-particle & multi-messenger astronomy

