

Observatory Tools

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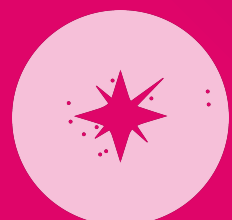


Outline

- The Observatory Science Operations (OSO) software suite:
 - OSO workflow, progression of information through the suite.
 - OSO tool roll as part of the running the telescopes.
- Technological choices
- Where are we right now?

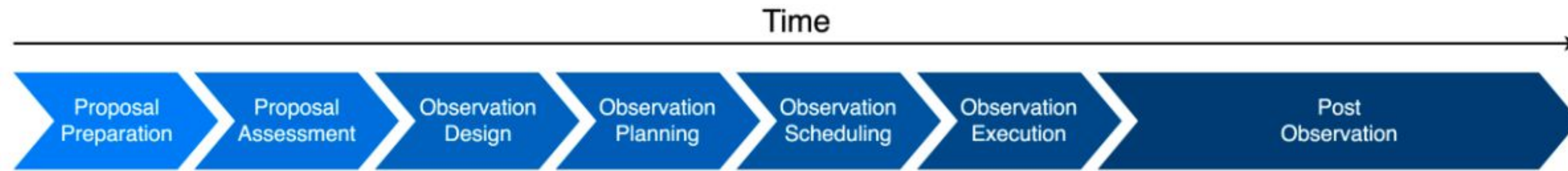


Observatory Science Operations (OSO) software

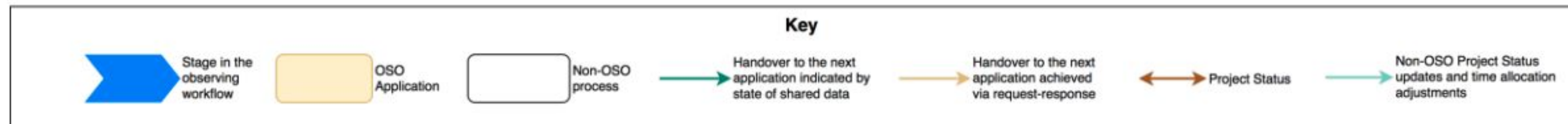
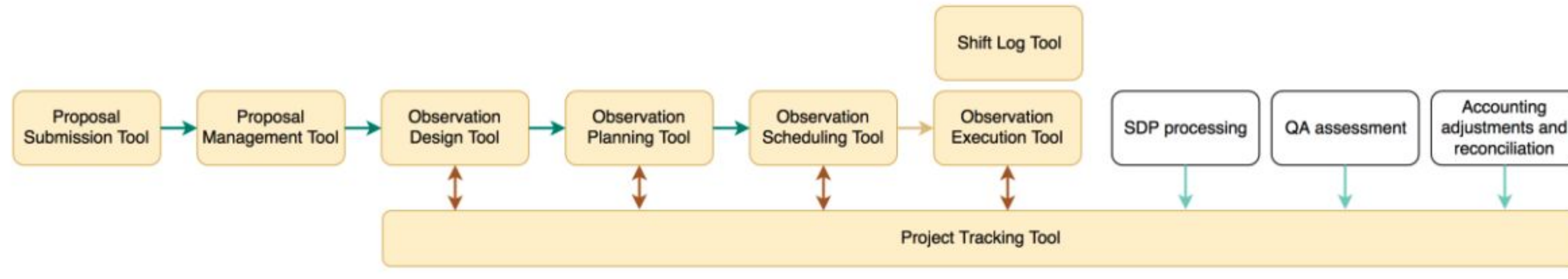


OSO Overview

Astronomer with an SKAO observing Proposal



Astronomer with an SKAO data product

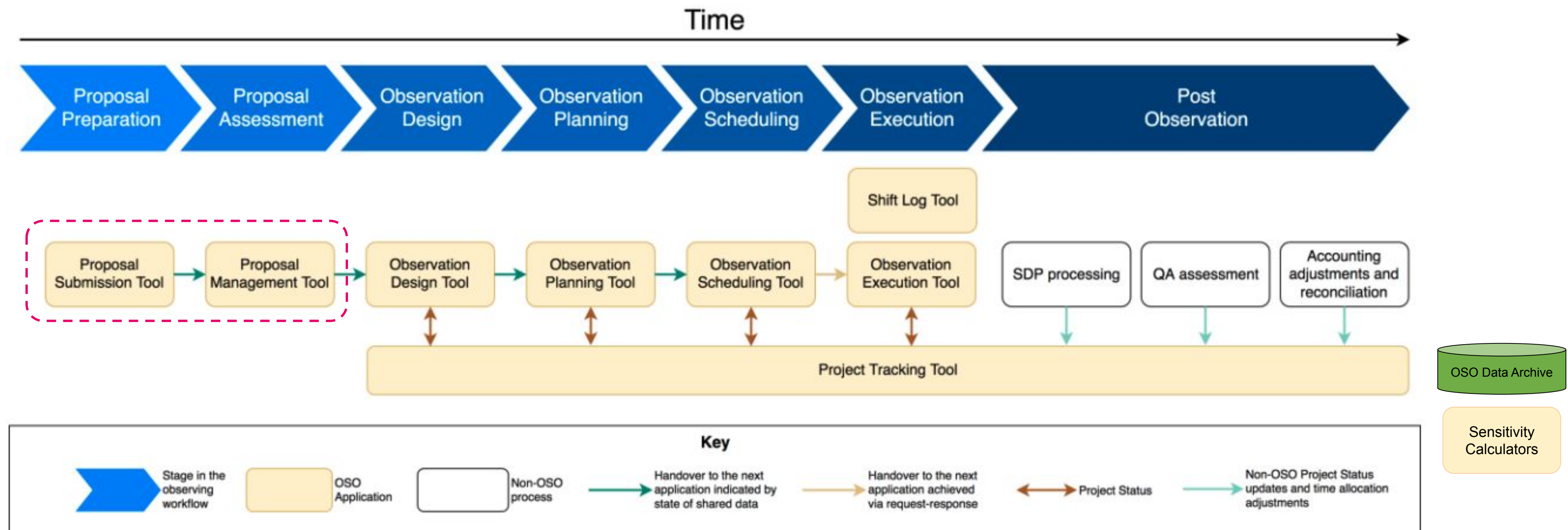


- Above gives the current planned suite of tools which will comprise the OSO tool set.



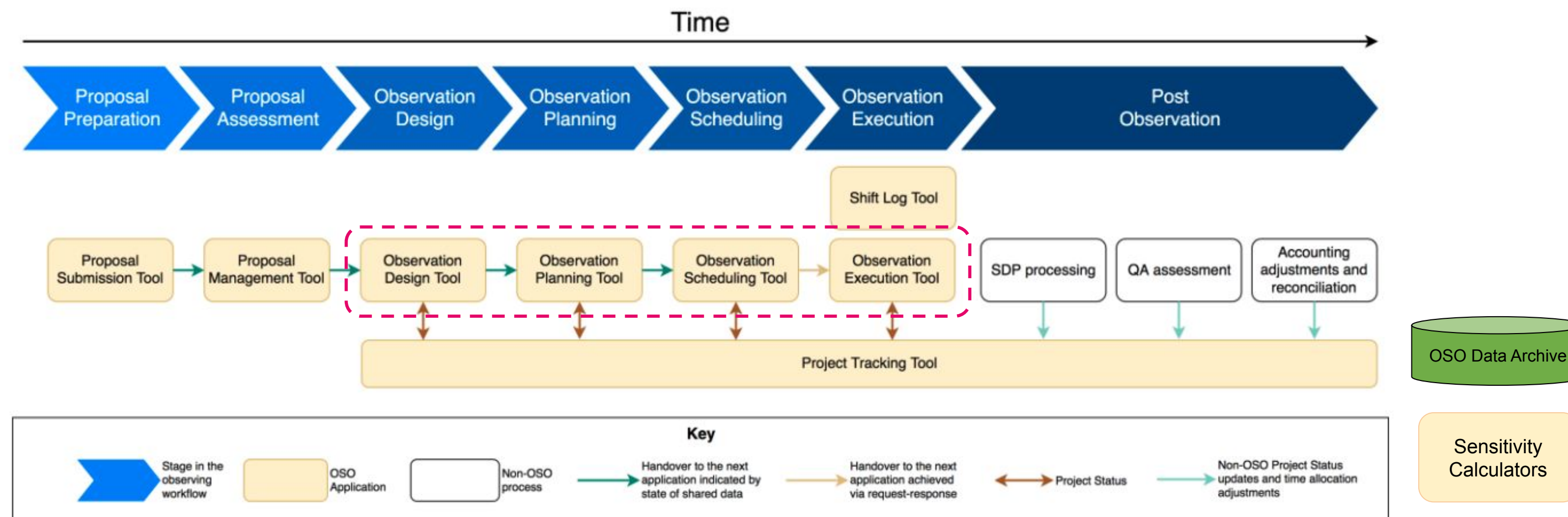
Observatory Tools: Proposal Handling

Tool	Purpose	Unit of work	User(s)	Location(s)
Proposal Submission Tool (PST)	Creation and submission of observing proposals for a specific science case by individuals or teams within the Scientific User community.	Observing Proposal	Scientific Users (Principal Investigators and Co-Investigators)	Global Headquarters (GHQ)
Proposal Management Tool (PMT)	Proposal review and ranking by Time Allocation Committees	Observing Proposal	Time Allocation Committees SKAO Operations staff	GHQ



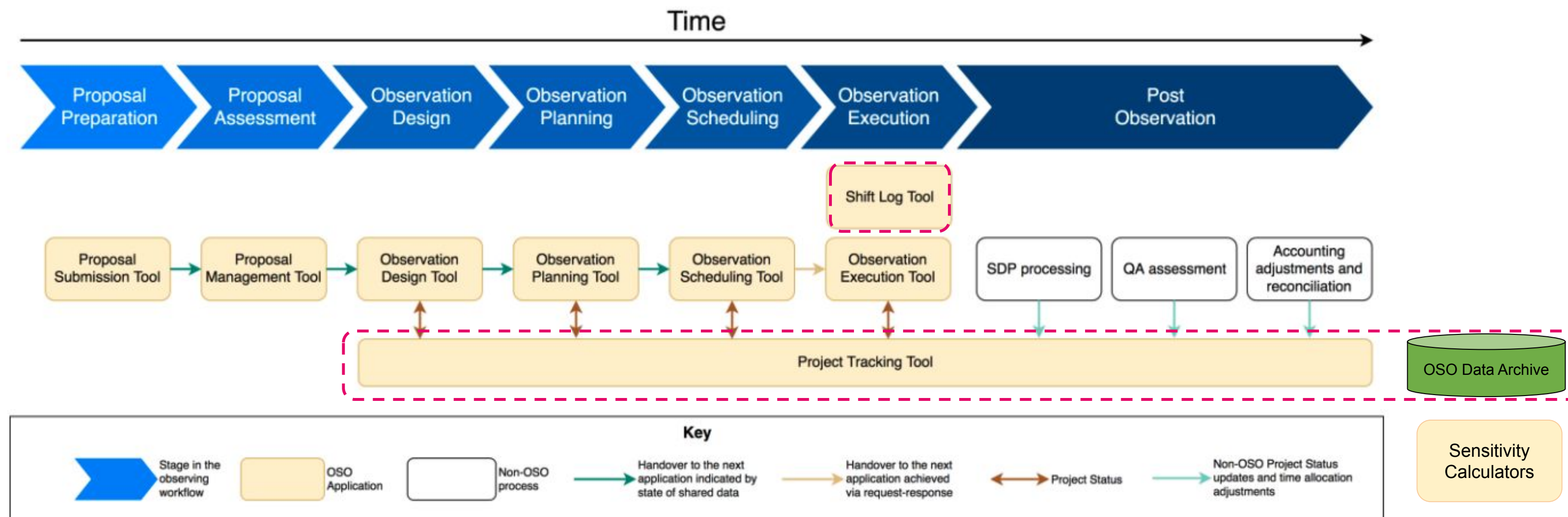
Observatory Tools: Observation Handling

Tool	Purpose	Unit of work	User(s)	Location(s)
Observation Design Tool (ODT)	Conversion of requested observing configuration and data processing needs into a Scheduling Block , for approved proposals. Scheduling Blocks (SBs) contain sufficient information to conduct an observation & subsequent processing but are free of time specific information.	Scheduling Block	SKAO Operations staff	GHQ, LOW, MID
Observation Planning Tool (OPT)	Creates a 'long timescale' executable and prioritised observing plan (timescales of months to full observing Cycle). Models resource availability (excluding maintenance time etc), predicted weather patterns and SDP processing availability.	Scheduling Block	SKAO Operations staff	GHQ
Observation Scheduling Tool (OST)	Creates a 'near real time' executable observing schedule based on the priority and resource availability on the timescale of days to weeks. Includes late binding information, such as specific calibrators, observation start time in the SB.	Scheduling Block	SKAO Operations staff	LOW, MID
Observation Execution Tool (OET)	Primary Role: converts the contents of a Scheduling Block into a set of instructions to be executed on the telescope, via the monitoring and control system. SBs can be run multiple times will generate unique instances of the SB on each run. An execution block will be generated which will track what was exactly was executed in each instance. Secondary Role: Provide a simulator interface to develop and test control scripts.	Scheduling Block (Execution Block)	SKAO Operations staff	GHQ (simulator), LOW, MID



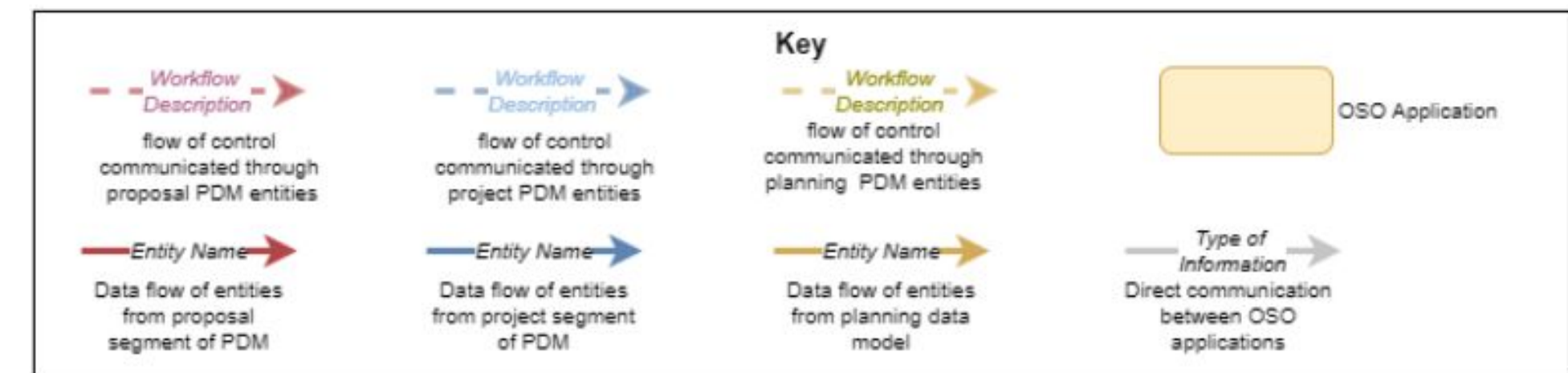
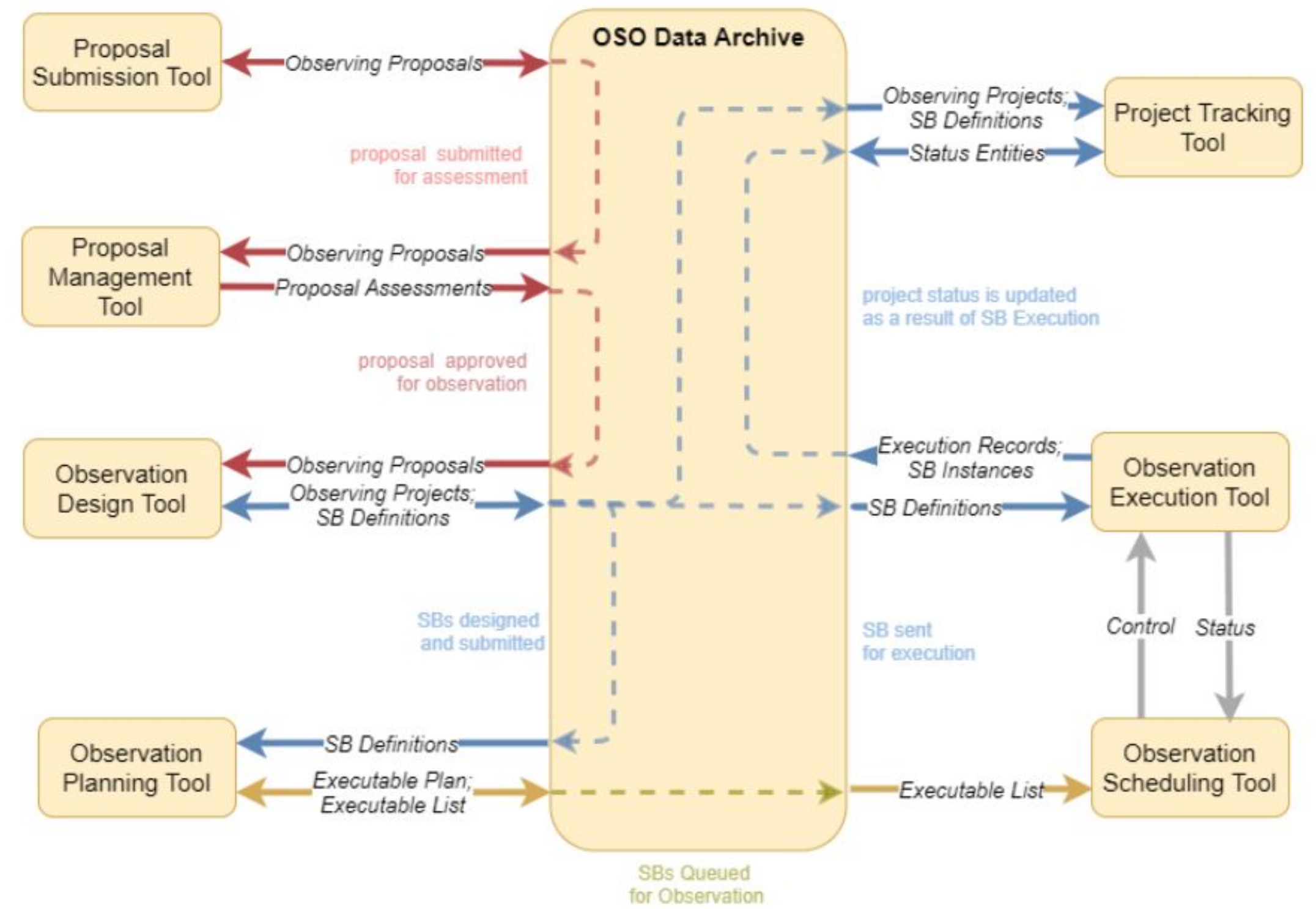
Observatory Tools: Observation Storage & Tracking

Tool	Purpose	Unit of work	User(s)	Location(s)
OSO Data Archive	Data archive, handling and storing the multiple units of work needed at all stages of the Observing process. <See next slide>	Observing Proposals, Scheduling Blocks, etc.	Directly: SKAO Operations staff Indirectly: Science Users	GHQ, LOW, MID
Shift Log Tool	Gather and collate 'major' events occurring during an Operators shift. Some information will be automated, (e.g. high level OET/TMC commands) and some manual entry from the Operator themselves. Offline analysis of the	Shift log	SKAO Operations staff	LOW, MID
Project Tracking Tool	To track the state of all planned, partially executed and completed projects from the Observatory. Will record number of executions, remaining observing time, data processing status etc.	Observing Project	SKAO Operations staff	GHQ, LOW, MID



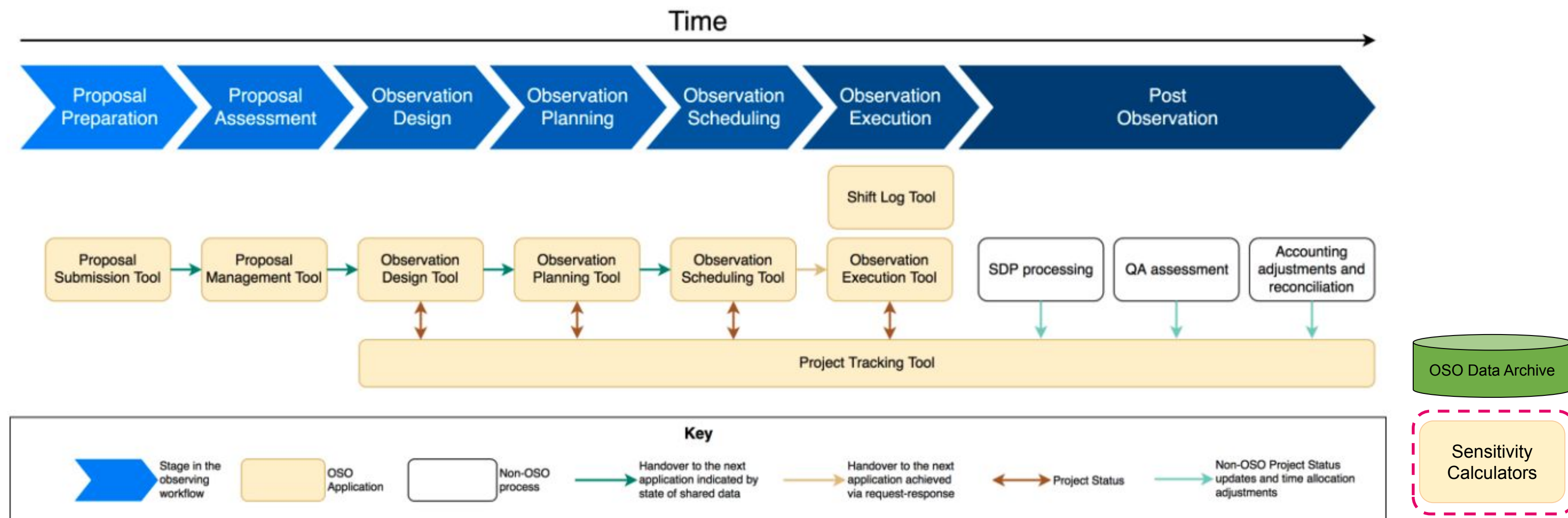
OSO Data Archive

- The OSO Data Archive is a fundamental component of the OSO suite.
- Connects the OSO software tools and allows the transfer of data through the system.
- Stores all required information.
- Will be mirrored across the 3 sites to ensure redundancy.



Sensitivity Calculators

Tool	Purpose	Unit of work	User(s)	Location(s)
MID Sensitivity Calculator	Calculate expected sensitivities for a give source, array configuration, spectral frequency tuning etc for MID. for use as supporting evidence in Observing Proposal. Advanced mode for SKAO Operations Staff, to compare real instrumentation against theoretical sensitivity values.	.Calculation output values	Scientific Users (Principal Investigators, Co-Investigators, Archive users) SKAO Operations staff	GHQ
LOW Sensitivity Calculator	Calculate expected sensitivities for a give source, array configuration, spectral frequency tuning etc for LOW telescope. for use as supporting evidence in Observing Proposal. Advanced mode for SKAO Operations Staff, to compare real instrumentation against theoretical sensitivity values.	Calculation output values	Scientific Users (Principal Investigators, Co-Investigators, Archive users) SKAO Operations staff	GHQ

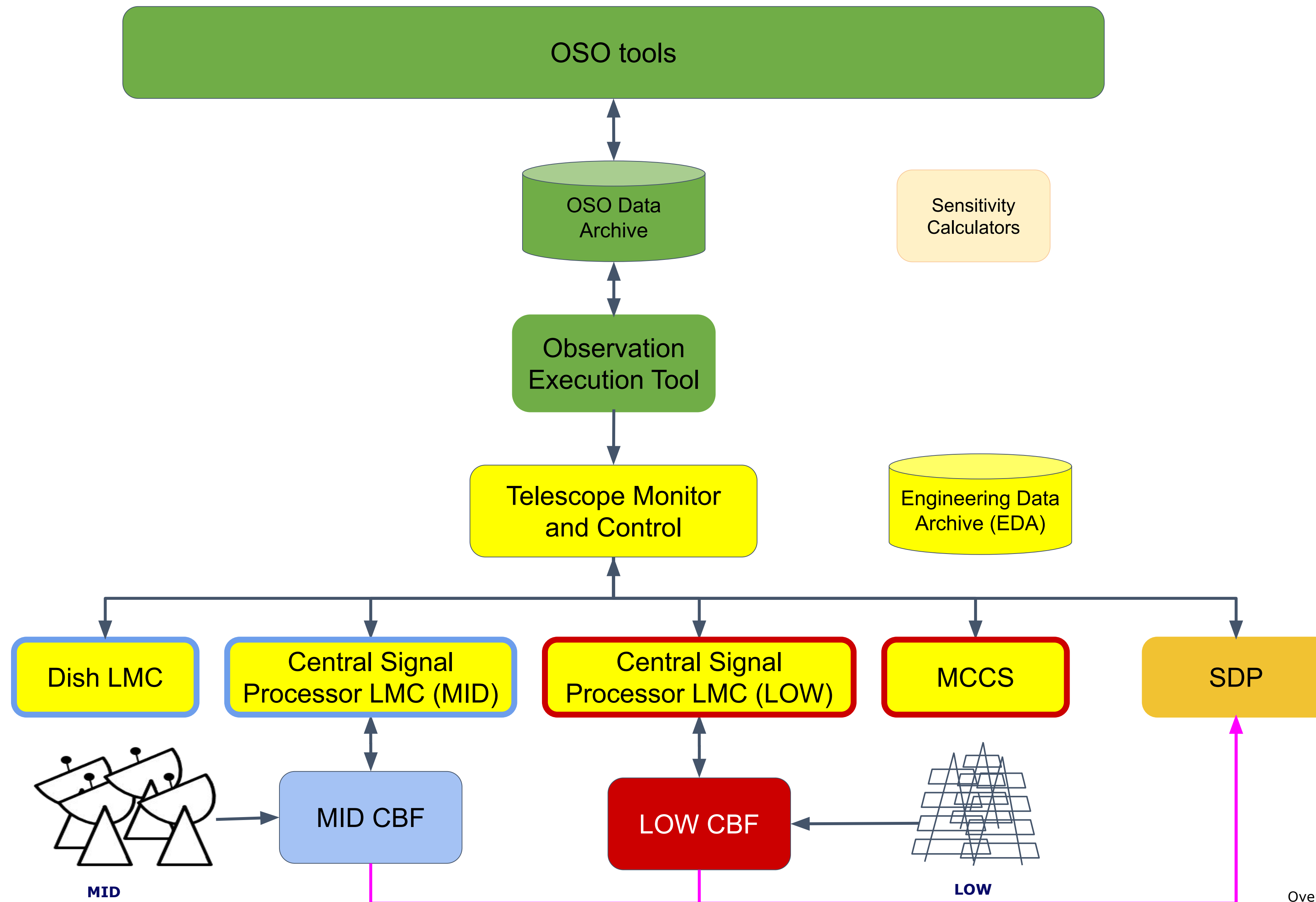


That's a lot of tools!

- There has been an intentional break-down software products to fulfil a specific functionality.
- This provides better modularity and ease of future upgrade.



Where does OSO sit in the larger system?



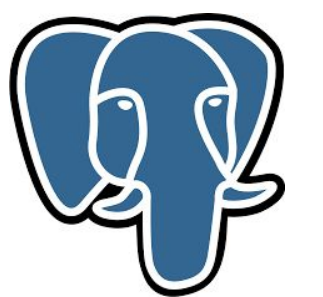
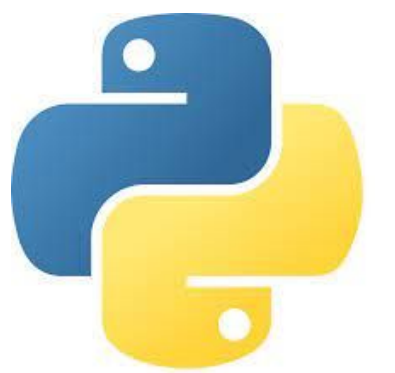
Overly simplified for visual simplicity.

Building OSO tools & Where are we now?



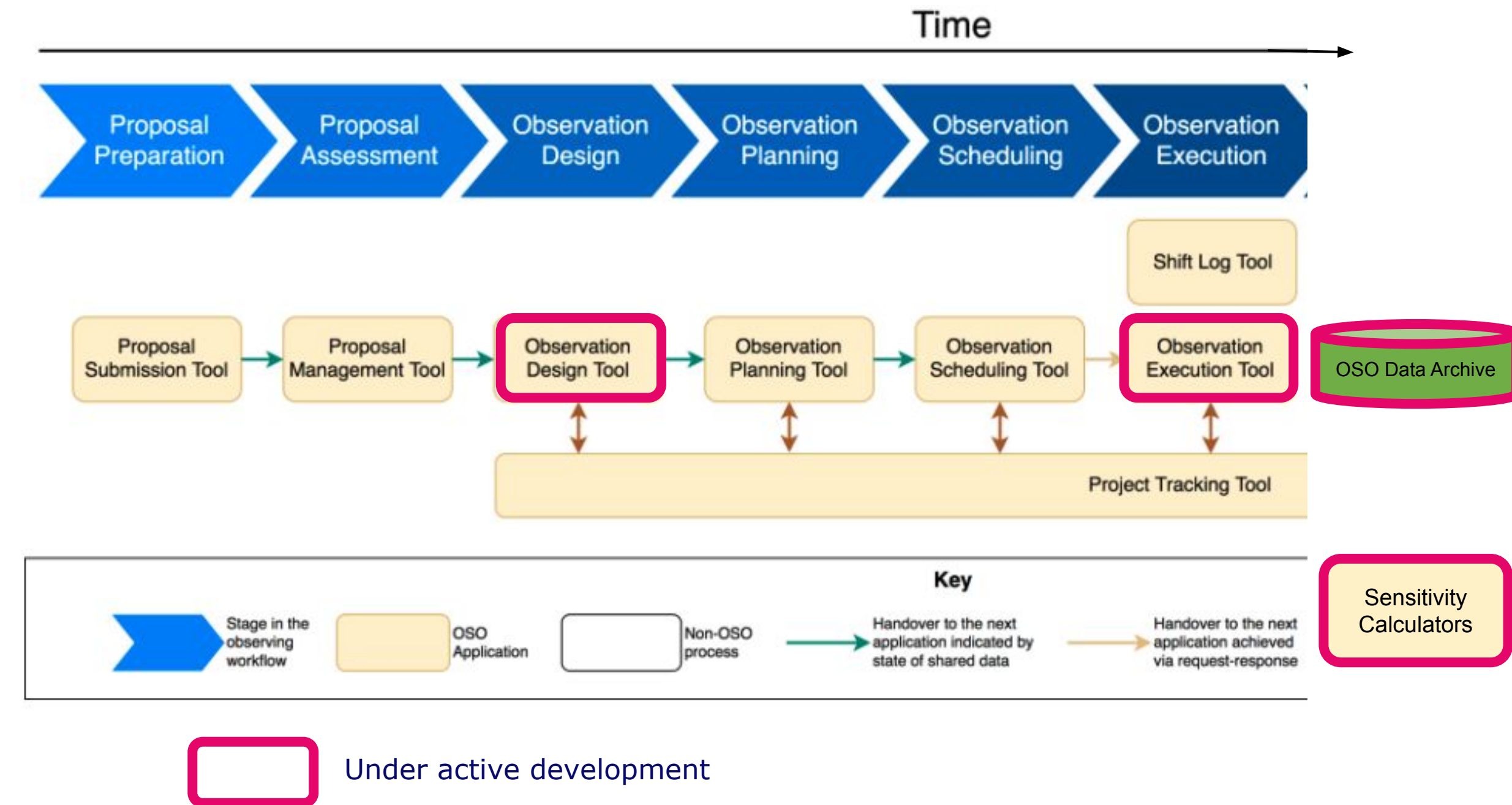
Building the OSO tools

- Early on the decision was made that OSO tools will share their basic architecture.
- Front-end (*user facing*): Will be web based and use robust web-standards e.g. [Angular](#). This is commonly used development platform for used astronomy UIs at various telescopes.
- Back-end (*computation, information processing*): Will be in [Python](#). SKAO's preferred development language and easily understood by Astronomers.
- Databases (*ODA*): Initial deployment with [PostgreSQL](#).
- From the Science User perspective all interactions with the OSO tools (e.g. Project Submission, Sensitivity calculators) will be via web-based interfaces.



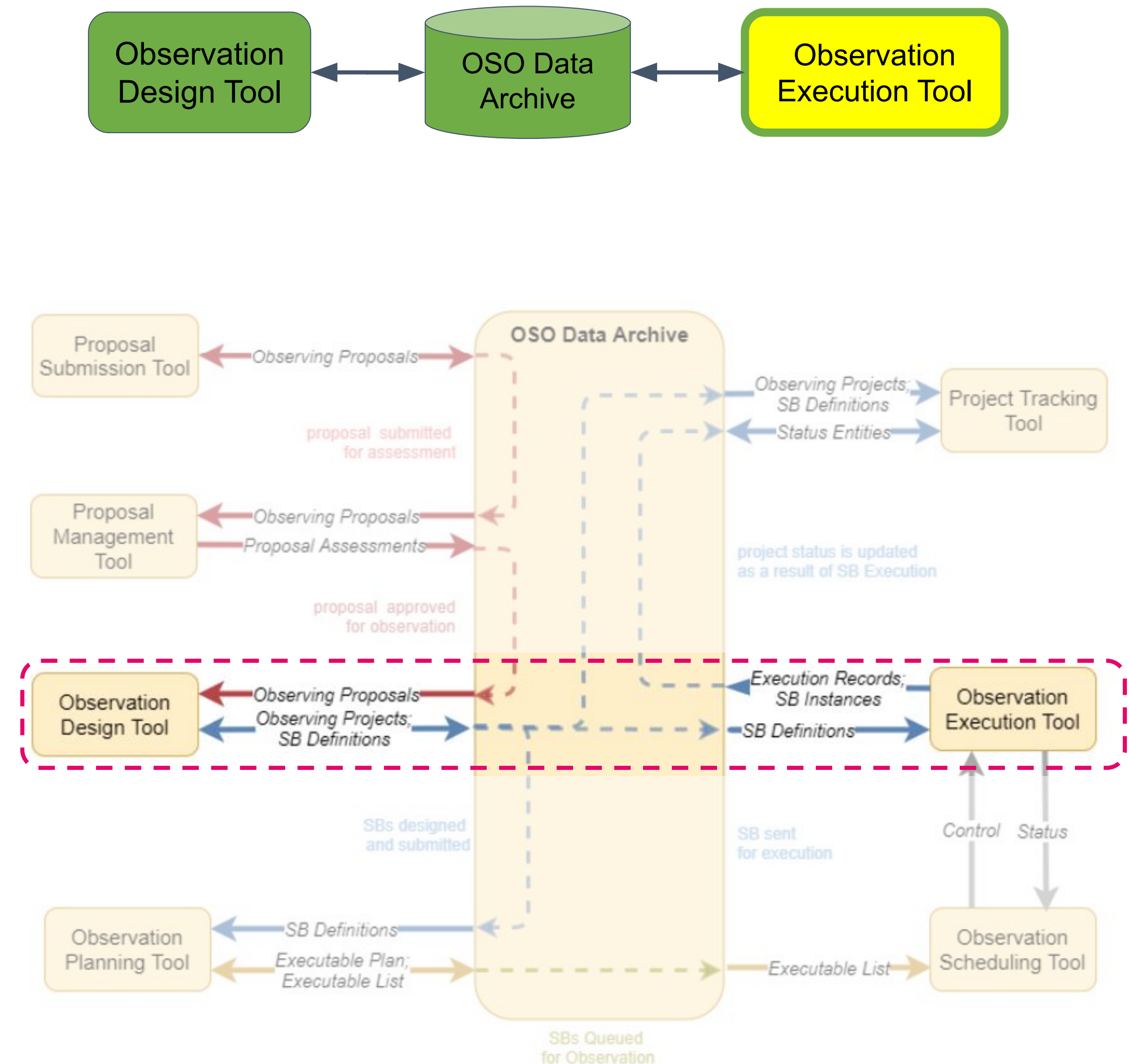
Current Status

- It is not planned that Scientific Users will propose for observing time on the SKAO telescopes for a number of years, as such development is focussed on the Observation Design and Execution capabilities at present.
- As time proceeds we will build tools as the requirement for them becomes apparent.
- From the user/astronomer perspective we are developing software approximately backwards through the timeline.



Minimum Viable OSO

- The currently developed OSO tools allows us to create the minimum viable OSO tool set.
- This is target for use by the Commissioning Scientists and early array operators (before PI lead science).
- Consists of the ODT, OSO and OET.



Observation Design Tool: Early Look

The screenshot shows a web browser window displaying the SKAO Observation Design Tool. The browser's address bar shows the URL [http://localhost:3000/scheduling-block-editor](#). The page title is "SKAO Observation Design Tool". The main content area is titled "Scheduling Block Editor" and contains several sections:

- Scheduling Block Type:** A dropdown menu with "ska_mid" selected. Below it is a "Select a type" label.
- Scheduling Block Information:** A text input field containing "sbd-fake-27092022-00002". Below it is a note: "This is an auto generated unique ID".
- Activities:** A list of activities with expandable details:
 - Details:** Expand for more information
 - Allocate:** Expand for more information
 - Observe:** Expand for more information
- SDP Configuration:** Includes buttons for "ADD SDP CONFIGURATION" and "DELETE SDP CONFIGURATION".

At the top right of the editor, there are three buttons: "NEW", "LOAD", and "SAVE".

Please ignore the black border, it is just to make it easier to see



Sensitivity Calculator

- First version of MID Sensitivity Calculator is currently under End-User testing at SKAO GHQ.
- <quick demonstration>
- Will become public in the near future.
- LOW Sensitivity Calculator will begin development in the next few months, based upon the technology used for MID.



Credits:

- Thanks to the Buttons Team (UK-ATC) who have developed the majority of the OSO tools.
- Alan Bridger, OSO Software Architect.
- Pamela Klaassen, OMC (OSO) Product Manager.



iThanks!
¿Any Questions?

*We recognise and acknowledge the
Indigenous peoples and cultures that have
traditionally lived on the lands on which
our facilities are located.*

SKAO

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Minimum viable scheduling block

There are SBs, SBIs and SBDs, with a record of the resources used, targets pointed at (etc) captured in an EB.

