

Tools and Services

For the Rubin Follow-up Ecosystem



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slides: R. Street, J. Nation

Accessibility
& scheduling
of telescope
facilities



Observatory
operations

Open Observatory
Control System

Running
observing
programs

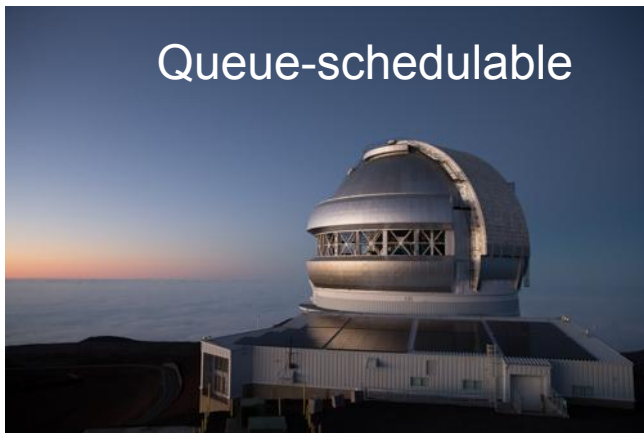




Astrophysical Events Observatories Network

Collaboration between observatory operators

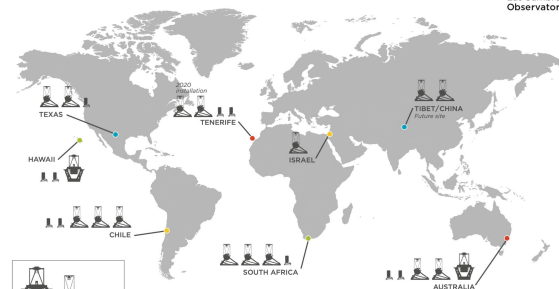
Queue-schedulable



Programmably-accessible



GLOBAL TELESCOPE NETWORK





Astrophysical Events Observatories Network

Dynamic queue scheduling enables all forms of observations

Target-of-opportunity

Long-term monitoring

Fixed-time-window

Flexible-window



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Dynamic queue scheduling enables all forms of observations

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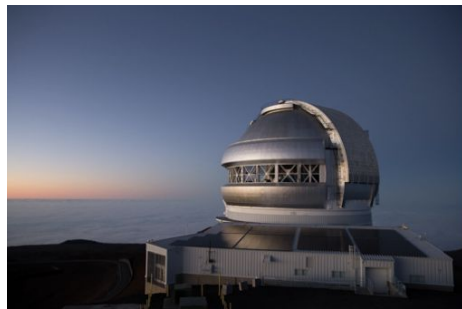
Observation Request Interface

Web-based user interface

Application Programming Interface



Astrophysical Events Observatories Network



- Common standard protocols for requesting observations and sharing status information regarding facility, weather, and observation execution
- Designed to be simple to implement and as inexpensive as possible
- Observatory can implement own software, OpenOCS, or use LCO system
- Does not require automation of observatory
- Partners retain control of allocating time on their facilities



For further information

Technical description of interfaces:

[Street et al., 2020, “The Astronomical Event Observatory Network \(AEON\)”, SPIE, 1144925.](#)
[Nation et al. 2020, “Making AEON a reality using APIs: experience integrating LCOGT and SOAR”, SPIE, 114522N](#)

Observatory websites:

LCO: <https://lco.global/aeon>

SOAR/NOIRLab: <http://www.ctio.noirlab.edu/soar/content/soar-aeon-home-page>

Gemini: <http://www.gemini.edu/>

Observatory Control System

<https://observatorycontrolsystem.github.io/>

[Observatory Control System](#) [Home](#) [API Documentation](#) ▼

Observatory Control System

Open source software for an API-driven observatory

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 - Configuration Database
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 - Science Archive

With the field of astronomy undergoing a revolution in data volume and automation, many observatories around the world are beginning to update their systems to take advantage of modern web technologies. However, producing a fully-featured and maintainable Observatory Control System (OCS) is an expensive undertaking! Las Cumbres Observatory successfully operates a network of 20+ robotic telescopes around the world, driven entirely by APIs. The software that enables this has been bundled up and open-sourced, the goal of which is to increase the rate of adoption of APIs in astronomical observing and to share the knowledge gained in the process of building the software so that the entire community benefits.

What does an API-driven Observatory Control System accomplish?

Astronomers can:

- Submit requests to observe a target, track the states of those requests, and cancel requests if their needs have changed
- Be notified once their observation is complete
- Download their science data

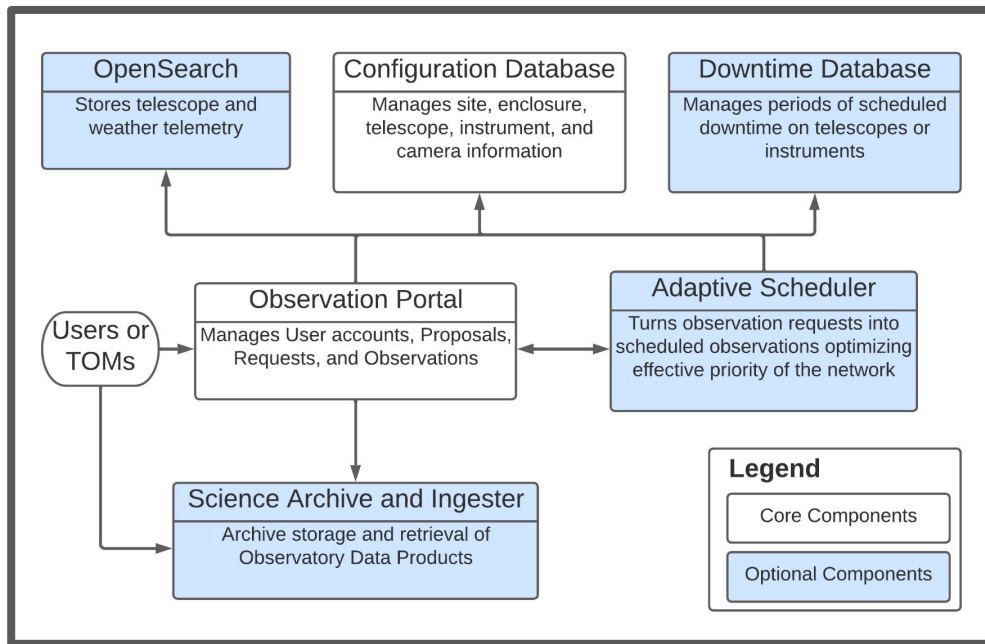


OCS Applications

<https://observatorycontrolsystem.github.io/>

Features:

- Python libraries and Django backends
- VueJS component library and sample frontends
- Flexible architecture of mandatory and optional applications

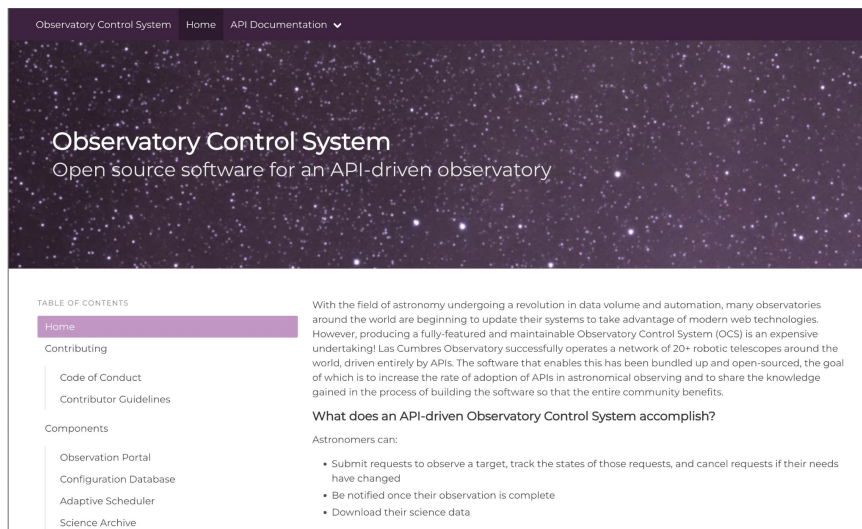


Observatory Control System

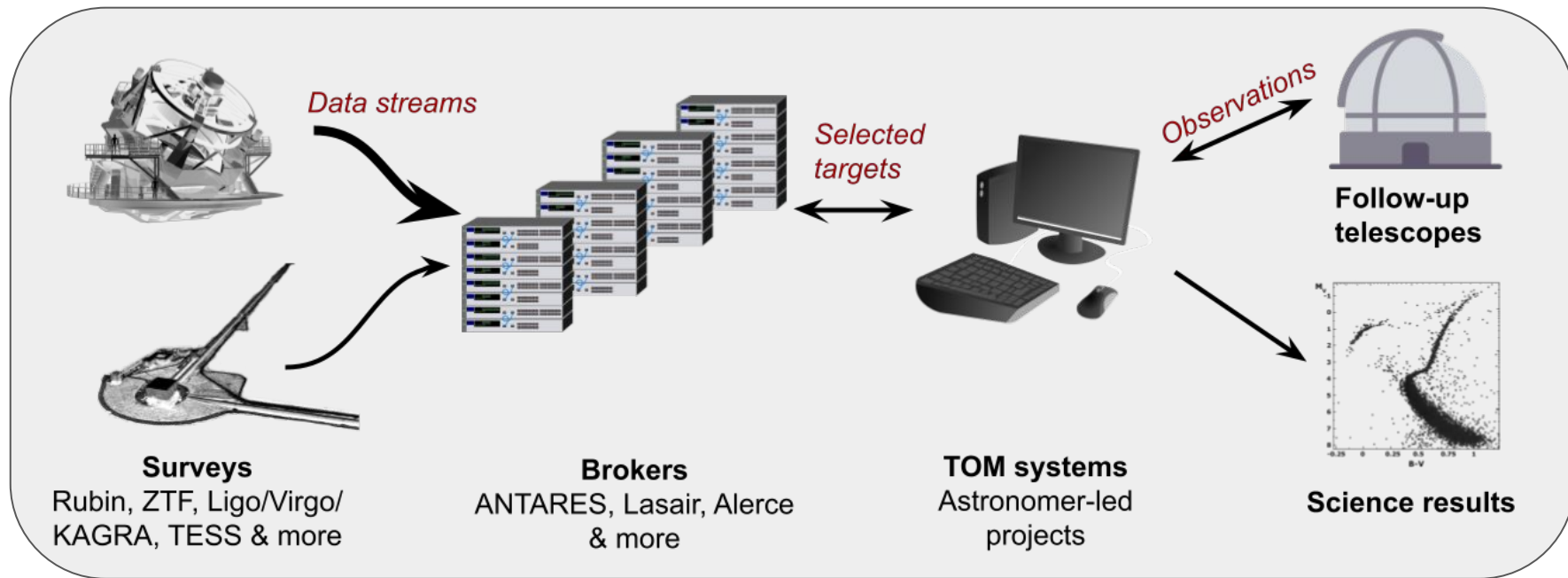
For further information

Full documentation can be found at:

<https://observatorycontrolsystem.github.io/>



Target and Observation Manager Systems (TOMs)



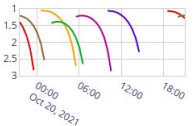
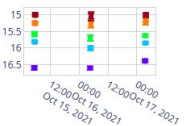

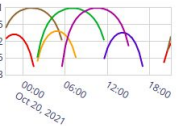
Target and Observation Manager Systems

Targets

927 Targets Create Targets Update Broker Data Export Filtered Targets

« 1 2 3 4 5 6 7 8 9 10 11 12 ... »

Add/Remove from grouping Add Remove

Name	RA	Dec	Classification	Redshift
<input type="checkbox"/> + SN 2021aaqf	21:54:44.121	-13:05:7.688	SN Ia 91T-like	0.045
				
No photometry for this target yet. No spectra for this target yet.				
<input type="checkbox"/> + AT 2021abko, SN 2021abko	02:02:7.186	+23:33:1.730	SN Ia	0.0159
  				
<input type="checkbox"/> + ZTF20aaprrgg, AT 2021aayn	04:08:4.700	-06:18:0.853	SN Ia	0.087

Name

Cone Search

RA, Dec, Search Radius (degrees)

Target Grouping

Science Tag

Cone Search (Target)

Target Name, Search Radius (degrees)

Redshift

min

max

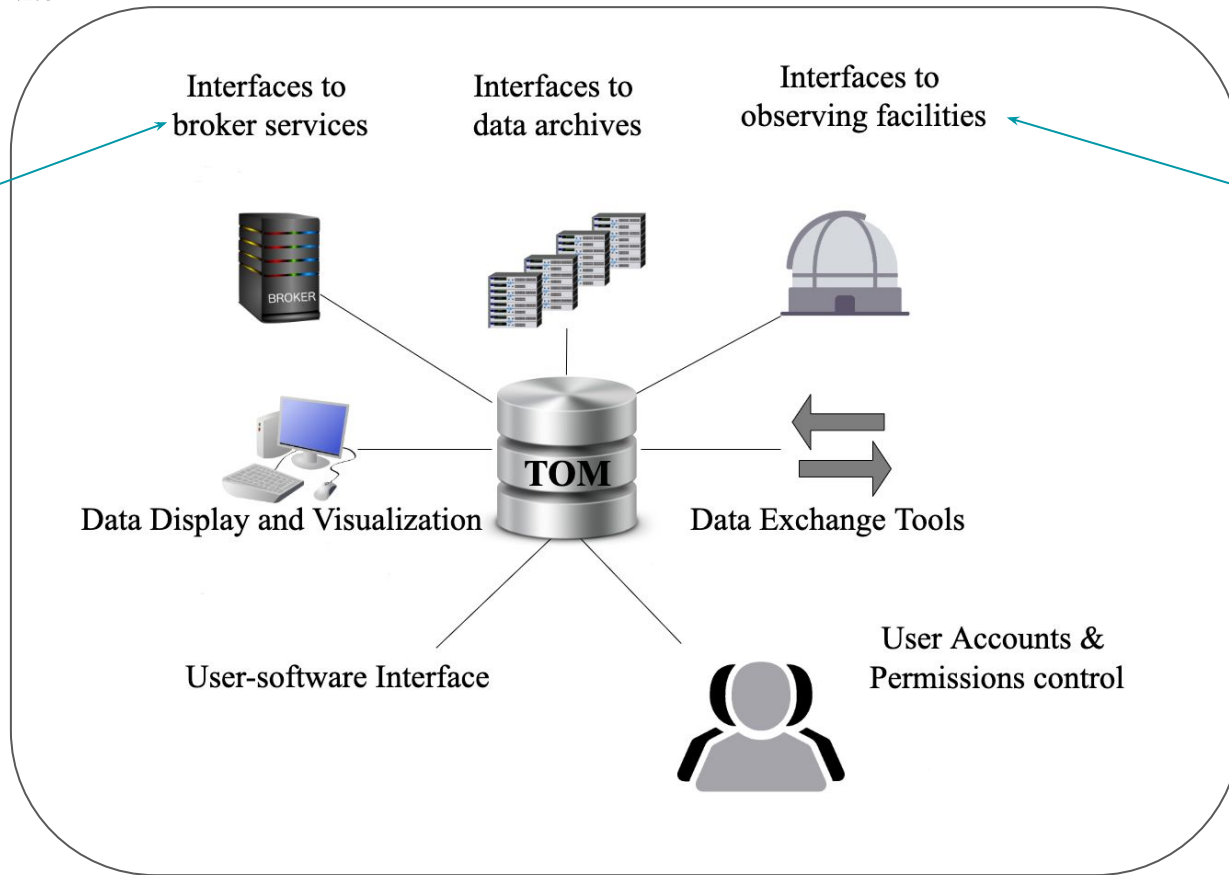
Classification

Tweet

Reference

Target and Observation Manager Systems

ANTARES
Alerce
Fink
Lasair
And more



Gemini
SOAR
LCO
Liverpool
Telescope

More to be
added soon,
including
SALT, Swift

Accessibility
& scheduling
of telescope
facilities



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