Rubin Science Assembly

Thursday January 22 2026

Commissioning data and preparing for alerts



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VERA C. RUBIN OBSERVATORY

NSF U.S. National Science Foundation

U.S. DEPARTMENT of ENERGY | Office of Science

Today’s Agenda

9:00 am : Announcements

9:05 am: Getting ready for alerts

- Alert production basics
- Where to find the alert schema
- How to choose an alert broker

9:20 am: Commissioning Tutorial Notebooks

- 101_lsstcam_visits_database.ipynb
- 102_rubin_schedule_viewer.ipynb

Announcements

Rubin Update at AAS 247

- community.lsst.org/t/11446
- Director Bob Blum has posted a slide deck from the NOIRLab Town Hall

Early Operations Updates (Weekly)

- Rubin Community Forum, News Category: community.lsst.org/c/news

New FITS files released for DP1 (Jan 9)

- summary: community.lsst.org/t/11442
- only the headers are changed, to avoid errors with WCS approximations
- if you didn't notice the error in the first place, probably won't notice any changes

WebDAV file upload limit increased to 2GB (Jan 9)

- it is no longer capped at 100MB

Announcements

LSST Discovery Alliance Grant Proposal Deadline: Feb 17 2026

- https://lsstdiscoveryalliance.org/early-science-with-rubin-observatory/
- fast-turnaround funding to support scientific work relevant to early Rubin Observatory data products
- open to Principal Investigators based at U.S. academic institutions whose institutions can accept awards with no indirect costs

Rubin Community Workshop: July 27-31 2026, at SLAC

- Save the date in your calendars

Upcoming Rubin Science Assemblies →

- https://rubinobservatory.org/for-scientists/events-deadlines/events-rsa
- *currently arranging for broker talks and tutorials in the coming weeks*

- Jan 29, drop-in office hour
- **Feb 5, tutorial: The Babamul Broker**
- Feb 12, drop-in office hour
- **Feb 19, tutorial: The Fink Broker**
- **Feb 26, tutorial: The Lasair Broker**
- Mar 5, cancelled for staff event
- Mar 12, cancelled for staff event
- **Mar 19, tutorial: The Alerce Broker**
- **Mar 26, tutorial: The Points of Interest Broker**
- **Apr 2, tutorial: The Pitt-Google Broker**
- Apr 9, drop-in office hour
- Apr 16, tutorial: TBD
- Apr 23, drop-in office hour

Introduction to the Users Committee

The Rubin Users Committee is charged with:

1. Soliciting feedback from the community about the Rubin data products and Science Platform.
2. Recommending improvements in their twice-yearly reports to the Rubin Operations director.

Charge: rdo-051.lsst.io
Website: rubinobservatory.org/for-scientists/committees-teams/users-committee
Reports: available in the Rubin Community Forum (community.lsst.org/tag/users-committee)
Meetings: two formal meetings per year, which always start with an open community listening session
Contact: via email to RubinObs-Users-Committee@lists.lsst.org or via the Rubin Community Forum (go to Community.lsst.org and send a direct message to the @Users-Committee group)
Feedback: use the Google form at forms.gle/km4VS2r2uYrvJ2w58

The Rubin Users Committee looks forward to hearing from the Rubin science community.

Igor Andreoni	Dominique Boutigny	Alejandra Muñoz Arancibia	
Anupreeta More	Vincenzo Petrecca	Vicki Sarajedini	Matthew Holman
Darryl Seligman	Anja von der Linden	Matthew P. Wiesner	Michael Wood-Vasey

LINCC Frameworks Office Hours

LINCC Frameworks mission is to **enable scientists** by developing scalable and productionised **software/algorithms** in **collaboration** with broader community.

Office Hours provides users an opportunity to learn about or get support for LINCC Frameworks software.

When: Most Thursdays 1pm ET / 10am PT / 7pm CET (see LF Calendar)

Where: Zoom (zoom link)

Website

You can also submit questions via the #lincc-frameworks-qa slack channel and sign up for the LINCC mailing list for more updates (instructions).

LINCC Frameworks Projects

- Catalog storage and analysis (HATS, LSDB)
- Structured data / time series (nested-pandas)
- Photo-Z (supporting DESC's RAIL)
- Shift and stack moving object detection (KBMOD)
- Time series simulation (TDAstro)
- Machine learning support (Hyrax)
- General purpose tools (python project template)

Get ready for alerts

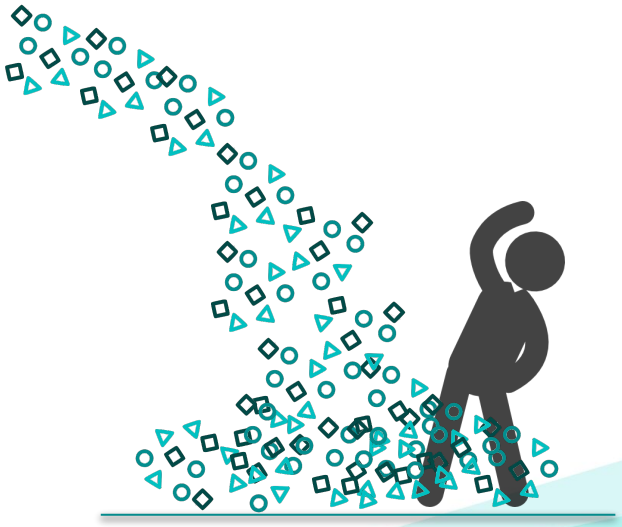
Produced by Rubin

Prompt Products

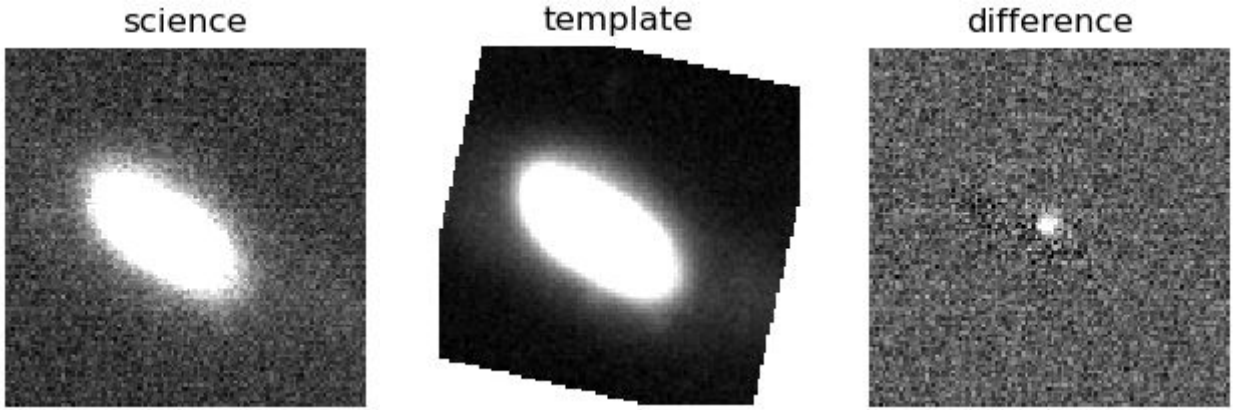
Near-real-time processed data released within minutes to days.

- **Alerts (within minutes):** Notifications of detected sky changes.
- **Catalogs (~24 hours):** Databases of information about detected objects.
- **Raw & Processed Images (~80 hours):** Available to data-rights holders.

Up to 10 million alerts per night distributed to alert brokers.



How “changes” are identified in real time



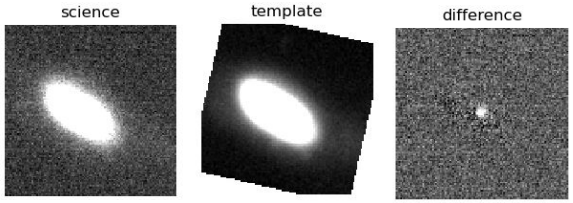
Above: a “detection triplet” with Rubin commissioning data for an unclassified time-domain event (an extragalactic transient) which was first discovered by the Zwicky Transient Facility.

Image Subtraction

Immediately after a new image is obtained and processed, an older (template) image is subtracted from it, to create a difference image.

An algorithm is then run on the difference image to detect sources – *positive or negative* – with a signal-to-noise ratio >5.

What is an “alert”, exactly?



One “alert” is issued for each difference image source detected with signal-to-noise ratio >5.

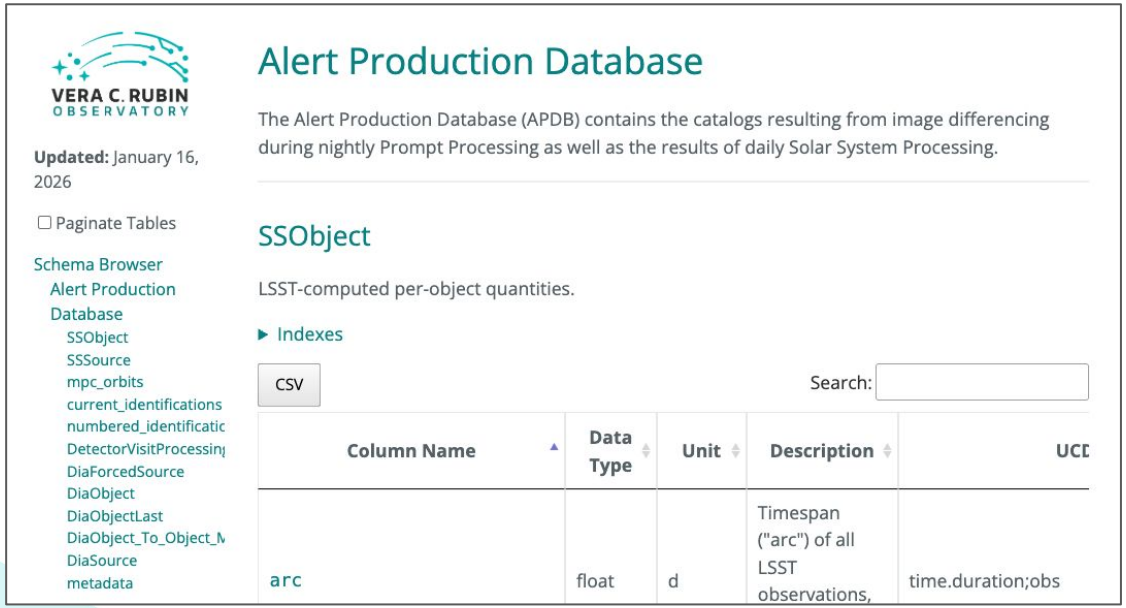
An “alert” is a machine-readable file that contains data for the detected source:

- the sky location (coordinates)
- measurements (magnitude)
- observational metadata (date, time, filter)
- 12-month history of past detections
- very small image cutouts


```
{diaSource:
 {"diaSourceId":611255759837069401,
  "visit": 202411080532,
  "detector": 42,
  "MJD": 60623.261598,
  "band": "r",
  "radec": {"ra": 53.1249,
            "dec": -27.7399},
  "raVar": 5.1,
  "decVar": 10.1,
  "ra_dec_Cov": 1.241,
  "x": 112.1,
  "y": 121.1,
  "xVar": 1.2,
  "yVar": 12.1,
  "x_y_Cov": 11.2,
  "snr": 41.1,
  "psfFlux": 1241.0},
 history: …
}
```

Alert Production Database (APDB) Schema

Repository: sdm-schemas.lsst.io/apdb.html



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Updated: January 16, 2026

☐ Paginate Tables

Schema Browser
- Alert Production Database
  - SSObject
  - SSSource
  - mpc_orbits
  - current_identifications
  - numbered_identificatic
  - DetectorVisitProcessin
  - DiaForcedSource
  - DiaObject
  - DiaObjectLast
  - DiaObject_To_Object_M
  - DiaSource
  - metadata

Alert Production Database

The Alert Production Database (APDB) contains the catalogs resulting from image differencing during nightly Prompt Processing as well as the results of daily Solar System Processing.

SSObject

LSST-computed per-object quantities.

▸ Indexes

CSV

Search:

Column Name	Data Type	Unit	Description	UCD
arc	float	d	Timespan ("arc") of all LSST observations,	time.duration;obs

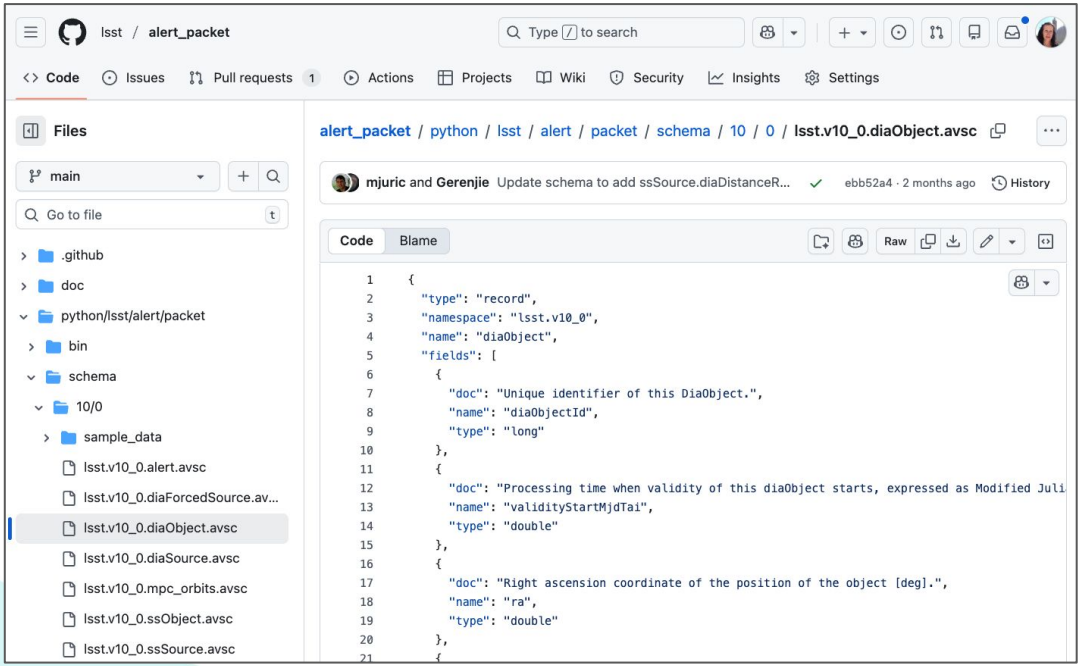
Familiarity with the schema is useful but not necessary to use alerts via the brokers.

The lightcurve characterization parameters (time-series features) that are computed after each new detection (e.g., Chi2, StetsonJ) are still in development.

See also ls.st/dmtn-118.

LSST avro schema (latest = v10.0)

Repository: github.com/lsst/alert_packet



Familiarity with the avro schema is also not necessary to use alerts via the brokers.

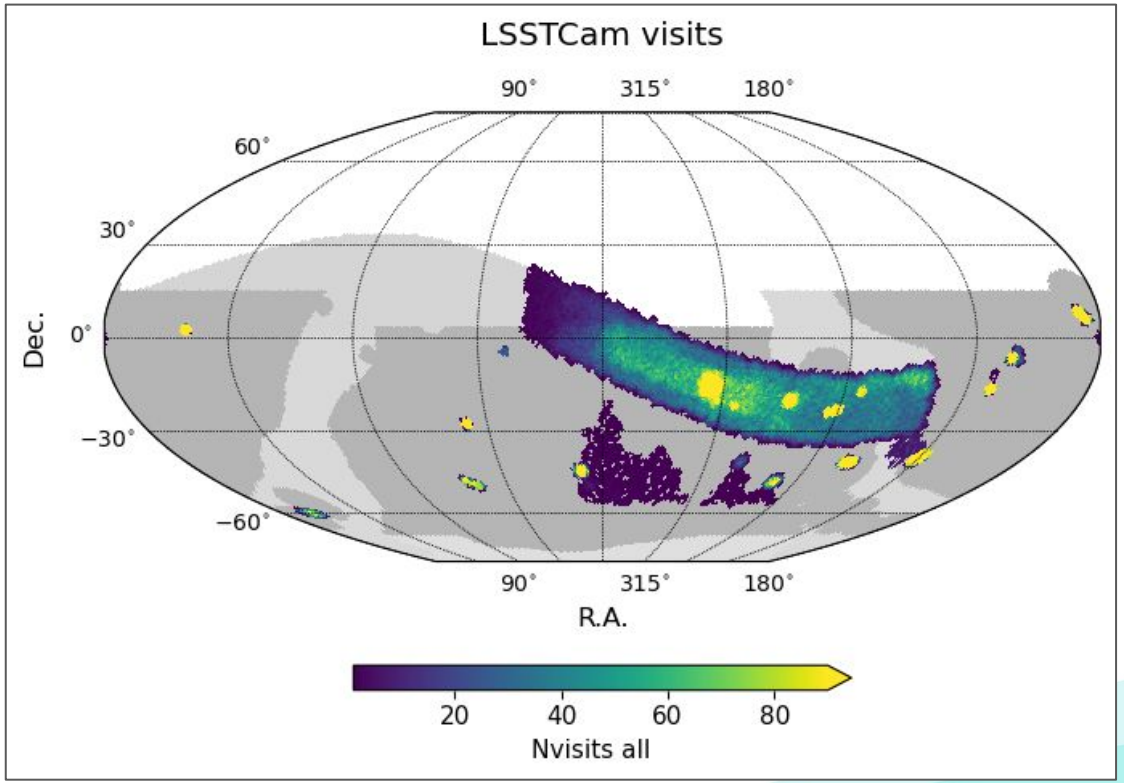
Sky regions with templates for early alerts

Alerts are anticipated to start streaming in February.

To start, alerts will be produced using Deep Drilling Field (DDF) templates only.

New template area is not anticipated before late March at the earliest.

See survey-strategy.lsst.io or ls.st/rtn-011 for more about the LSSTCam visits.



Navigating the Alert Stream

- **Alert brokers** — independent software systems that process & serve alerts to the community.
- Scientists access alerts via broker websites & can filter on their research area.
- Alerts are **world public**; data rights are not required to access and analyze alerts.


Alerce


Antares


AMPEL



Fink


Lasair


Babamul



Pitt-Google Broker

Alerts brokers offer a variety of services

ANTARES: antares.noirlab.edu

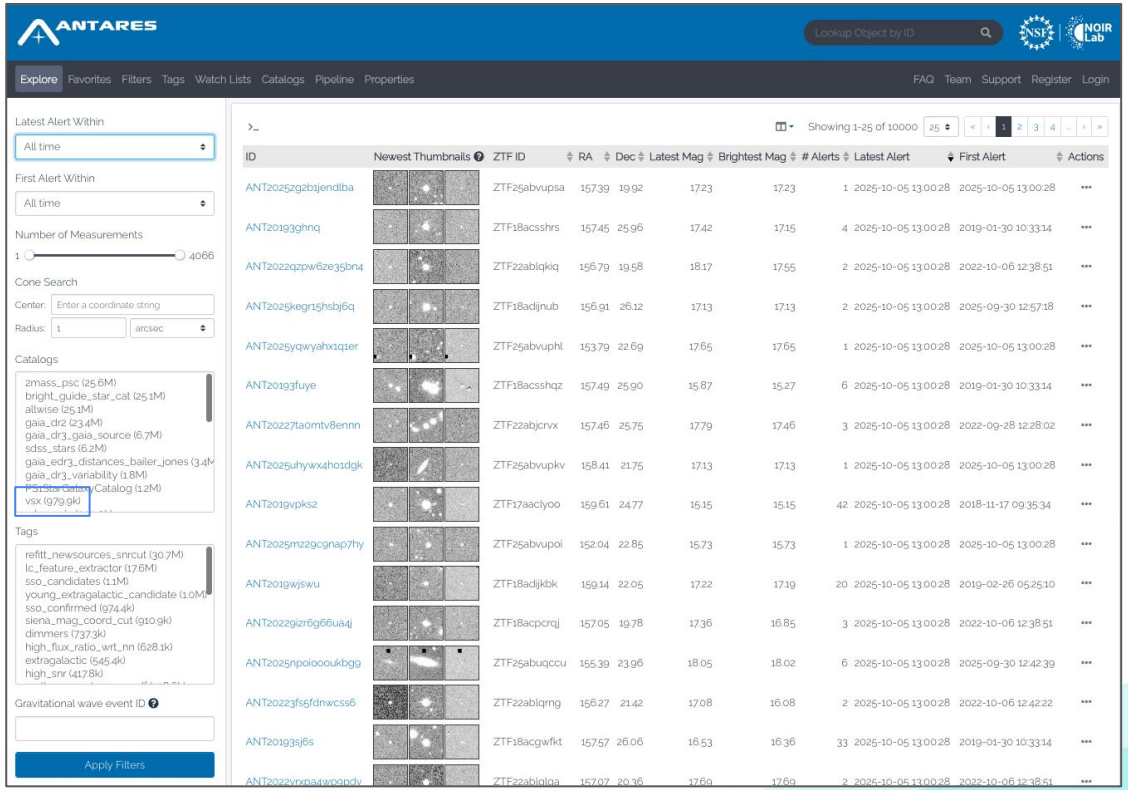
Browse the latest alerts.

Filter (query/search) by:

- Number and date of detections.
- Sky location (cone search).
- Cross-match to popular catalogs.
- “Tags”, based on alert properties.
  - SNR; color; rising/fading
  - variability parameters

Create an account in order to:

- make “Watch Lists” of stars of interest
- submit python code for a new “filter”



How to choose an alert broker?

Start at: rubinobservatory.org/for-scientists/data-products/alerts-and-brokers

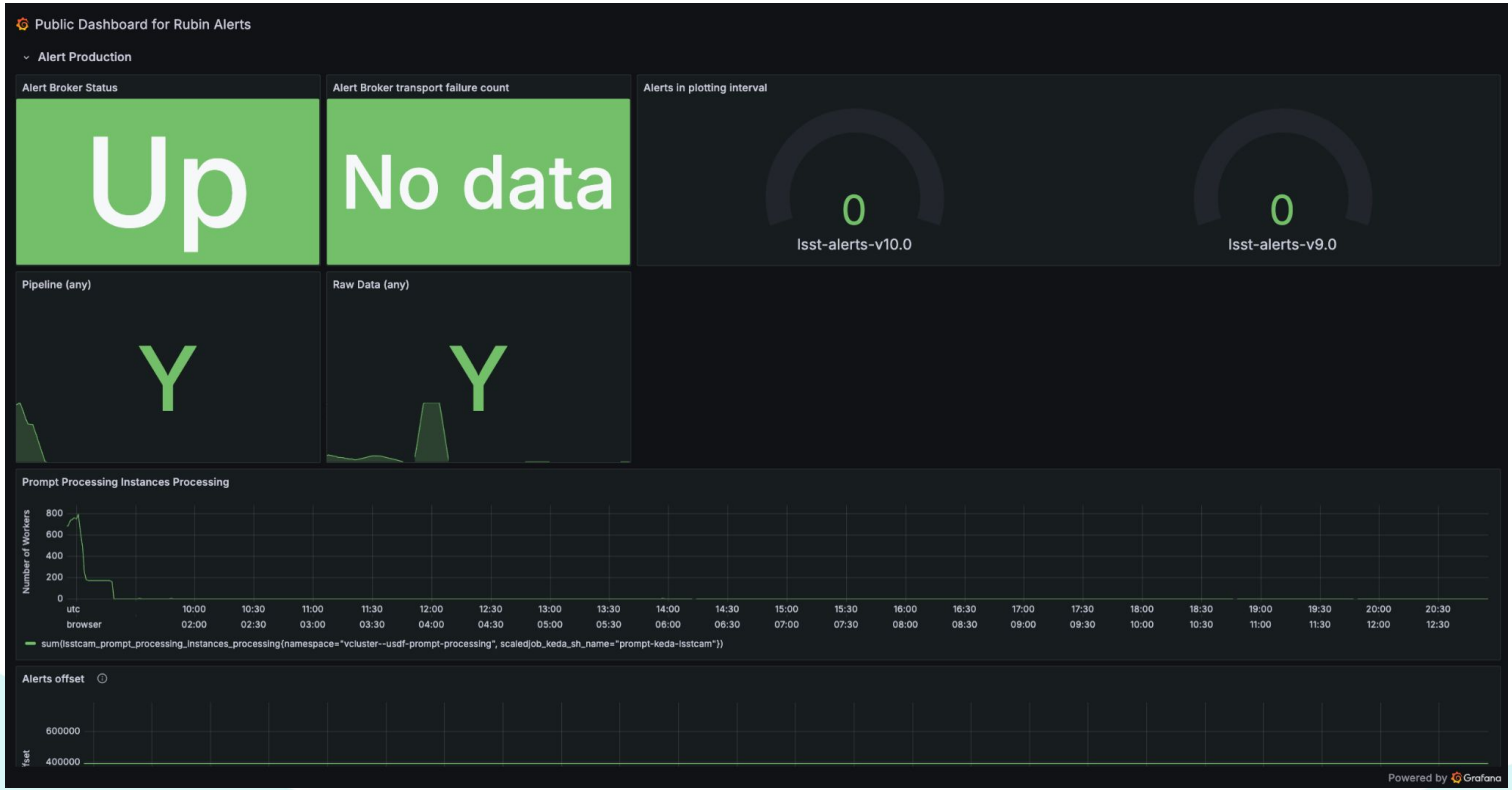
Integrating a broker's services into your scientific analysis can take a significant time investment. Start simple to learn about a broker's tools, interfaces, and science applications, and then iteratively build up your scientific analysis of LSST alerts.

Steps:

- browse the brokers' documentation and web-based user interfaces
- test the various interfaces and tools that brokers offer
- use the broker to identify subsets of current alerts relevant to your science goals
- engage with broker teams via their contacts and help services

Reminder: upcoming Rubin Science Assemblies will feature broker tutorials.

ls.st/alert-stream-status



screenshot Tue Jan 20 at ~1:00pm

this page is more for broker developers than users

Questions

Pause for questions about alerts before moving on to the commissioning metadata & scheduler viewer tutorials.

Commissioning metadata tutorials

Together we will work through:

- 101_lsstcam_visits_database.ipynb
- 102_rubin_schedule_viewer.ipynb

First, navigate to the RSP at data.lsst.cloud and log in.

extra slide

extra slide

