LSST:UK Science Centre

Lasair planning process

Lasair Tech Review March 2020

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LSST:UK

- Phase A: Development   2015-2019
- Phase B: Commissioning   2019-2023
- Phase C: Early opns   2023-2027
- Phase D: Standard opns   2027-2033

- Working prototype: ZTF data
- Several technical planning docs
- Established fortnightly meeting process
- Iterative design
- Deliberately conservative technology

real science tool

Lasair-ZTF key features

Technology

- Kafka
- MySQL
- Python glue
- Sherlock
- Django
- Jupyter

Facility

- static queries
- "streaming" queries
- watchlists
- rich added context
- scriptable interface

Phase B workpackages

WP1 Management

WP2 DAC
WP2.2 Data Ingestion and publication
WP2.3 Alert handling infrastucture
WP2.4 DAC platform

operate as a combined project

WP3 DEV
WP3.2 Lasair event broker

Lasair Sci. Reqs.

- **R2.01 A searchable database containing all the LSST alerts**

- **R2.02 Light-curves:** assimilate all diaSource alerts in diaObjects: providing interactive webpages (linked to database), plots, ability to select ranges, and to submit user added points.

- **R2.03 Postage stamps:** all LSST detections and most recent non-detections. Plus multi-colour images from LSST and multiple other surveys.

- **R2.04 Massive catalogue cross-match:** with star, galaxy, AGN, x-ray, radio catalogues, using Sherlock, and machine learning.

- **R2.05 Crossmatch to all previously known transients:** e.g. supernovae, gamma ray-bursts, TDEs, x-ray and radio burst sources

- **R2.06 A database query platform and user-owned storage:** Both a SQL query form and a Jupyter platform.

- **R2.07 Real time cross match** to multiple other time domain surveys at various wavelengths.

- **R2.08 Spectroscopic and/or photometric redshifts:** and hence absolute mags, from other catalogues

- **R2.09 Classification from light curves:** Combine all the above and 24hr-48hr lightcurve information to probabilistically classify all transients as : supernova – kilonova – GRB – Tidal Disruption Event – AGN – XRB – CV – eruption star – microlens – orphan

- **R2.10 Multi-messenger cross-matching:** Probabilistic association with GW and neutrino sources, based on public LIGO and Ice Cube information, and potentially other sources.

- **R2.11 Provide a stream of transients to external collaborations:** such as 4MOST and SOXS programmes.

- **R2.12 Provide users with a means to upload a "Watch-list":** of up to 10^6 objects, including adjustable search radius, and the means to trigger on magnitude variations.

- **R2.13 Collect a detailed list of additional user requests:** and implement these where possible.

Deliverables	Milestones
• PM9: D3.2.1 SHERLOCK Version 2.0 Event Classifier (Mar 2020)	• PM9: MS3 (WP 3.2) Lasair 2.0 inc. SHERLOCK
• PM16: D2.3.1 Lessons learned on setup of ancillary catalogues for cross-matching ZTF alert stream (Oct 2020)	• PM21: MS11 (WP3.2) Lasair 3.0 inc. "tech preview" of web interface and tools
• PM33: D3.2.2 Lasair User Documentation (Mar 2022)	• PM33: MS17 (WP3.2) Lasair 4.0: final web interface and user docs
• PM38: D2.3.2 Design of infrastructure for Lasair (Aug 2022)	• PM38: MS19 (WP2.3) Infastructure for Lasair (receive and process LSST stream)
• PM45: D3.2.3 Design and implementation of web front-end for LASAIR - public and the data-rights version. (Mar 2023)	• PM45: MS23 (WP3.2) Lasair 4.0 for non-proprietary data

Methodology

- Four Year top-level plan
- Six monthly Cycle Plans
- Fortnightly progress meetings
- Updateable schedule
  including external events

initially wiki based
now moving to Github issue tracking / Kanban
*to improve visibility*

*evolved a little
since top level plan*

- Lasair 2.0 = mature Lasair-ZTF release

- Keep this operating
  with minimal changes for ~1 year

- Meanwhile design and test Lasair-LSST

- evolve or duplicate?

- Build and submit Community Broker Proposal

- Define meaning/content of Sherlock 2.0 release

- Define meaning/content of Lasair 2.0 release
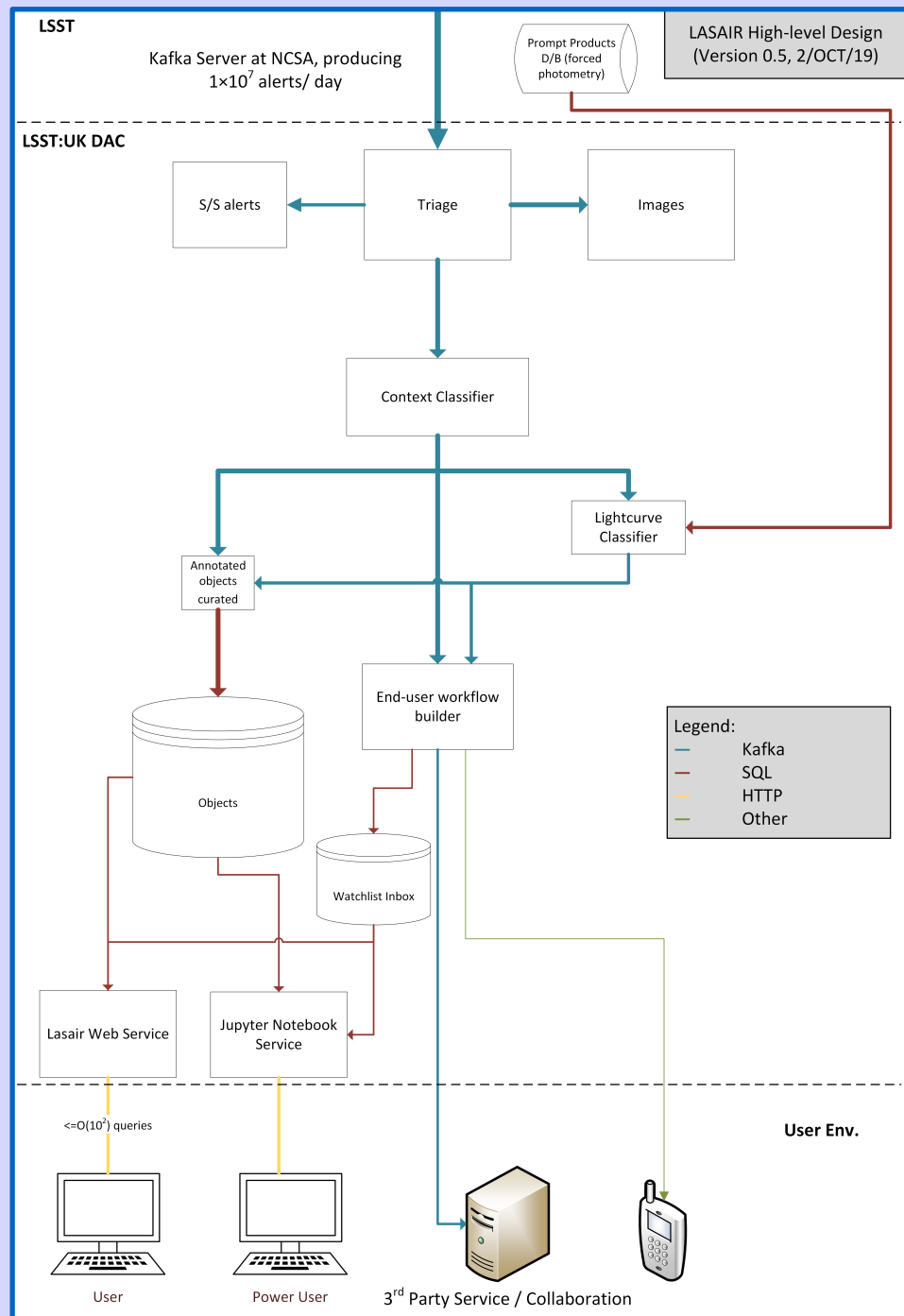
- Define and undertake Technology Review
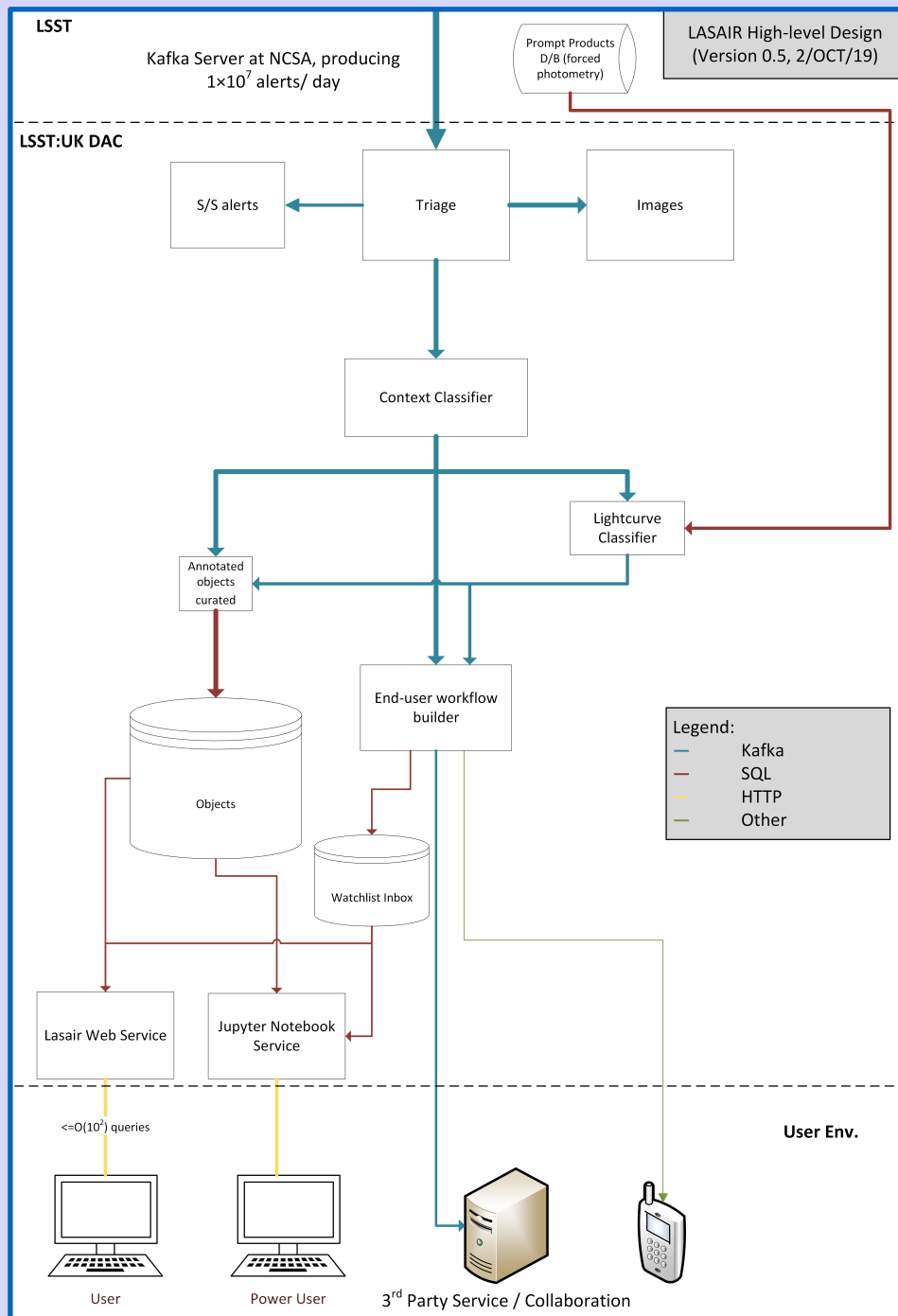
Design steps

(1) Technology-free design

(2) Identify components

(3) Identify technology issues

(4) Technical design

look ahead

C1-2   • Community Broker Proposal

C2   • Finish Lasair/Sherlock 2.0 release

C2   • Further tests

C2-3   • Full Technical Design

C3   • Decide nature of "Lasair 3.0"

C6   • Operational Lasair-LSST