

Dec 2017
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Trieste

- Status of LSST
- Overview of LSST data processing
- European involvement in LSST
- UK DAC plans
- VO related issues



LSST getting real

current schedule

First ComCam images	May 2020
First LSSTCam images	Feb 2021
SV mini-surveys	Jun 2021
Full operations	Oct 2022

LSST processing concepts

project

community

Difference
imaging

Stacked
images

analysis
software

Image
every
3 days

L1

L2

L3

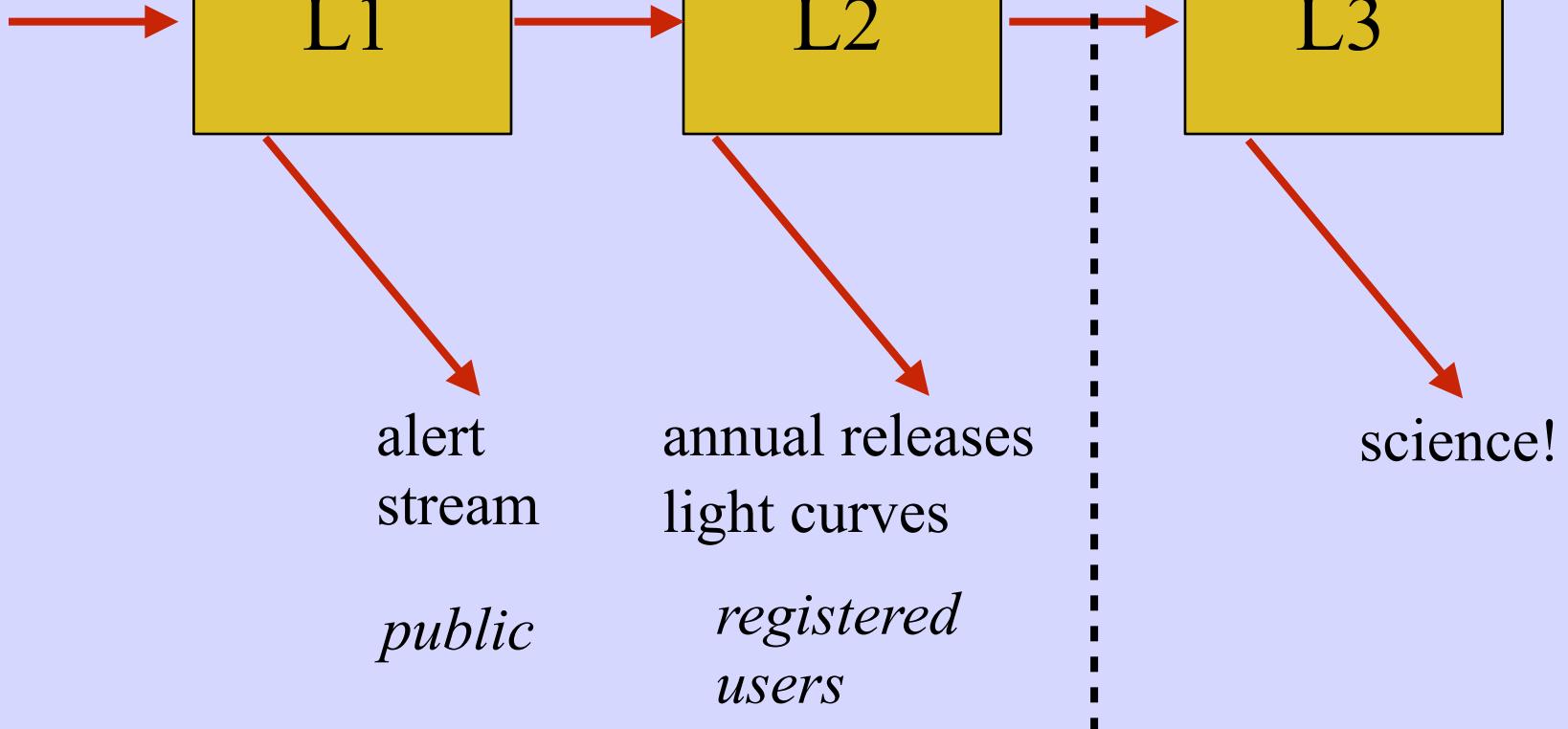
alert
stream

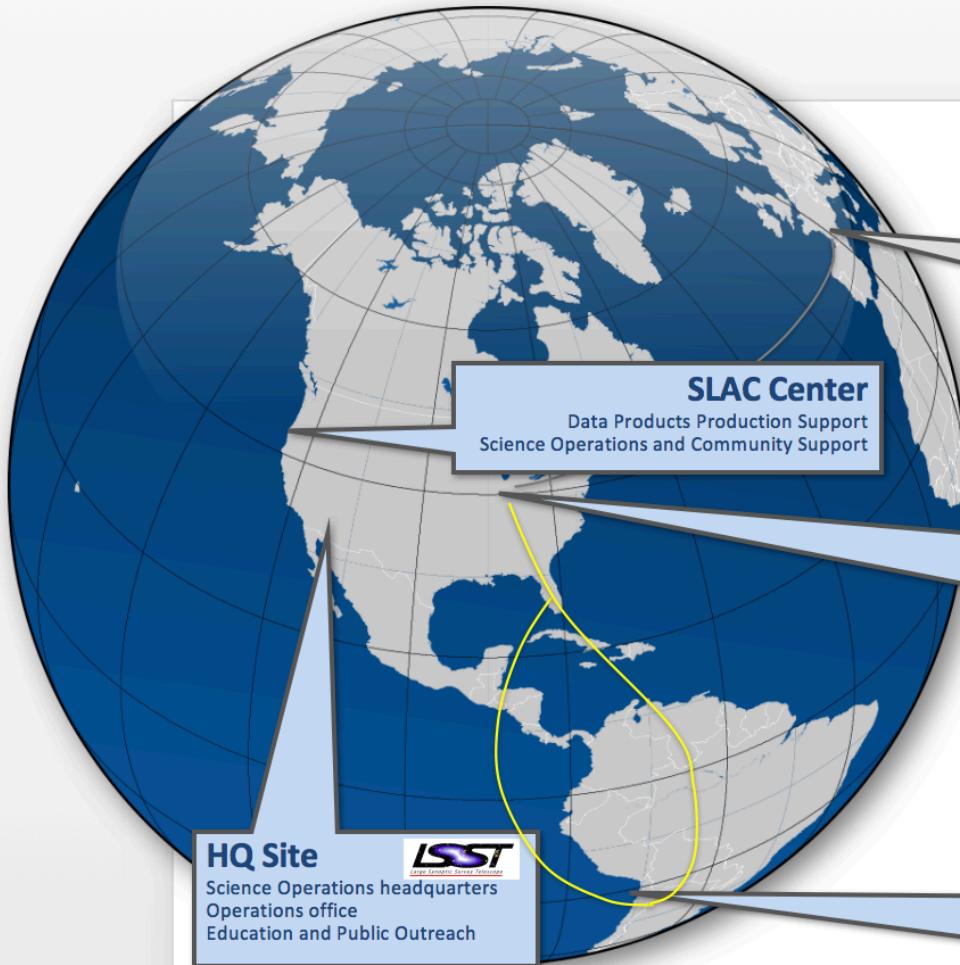
annual releases
light curves

science!

public

*registered
users*





French satellite center
(CC-IN2P3, Lyon, France)

Data Release Production (50%)
French DAC



+ UK DAC

Archive Site
Archive Center



Alert Production
Data Release Production (50%)
Long-term Storage (copy 2)
Data Access Center
Data Access and User Services

HQ Site

Science Operations headquarters
Operations office
Education and Public Outreach



Summit and Base Sites



Telescope and Camera Operations
Data Acquisition
Long-term storage (copy 1)
Chilean Data Access Center

Locations



INTERNET

LSST SCIENCE PLATFORM



PORTAL



NOTEBOOKS



WEB APIs



DATA RELEASES



ALERT STREAMS



USER DATABASES



USER FILES



USER COMPUTING

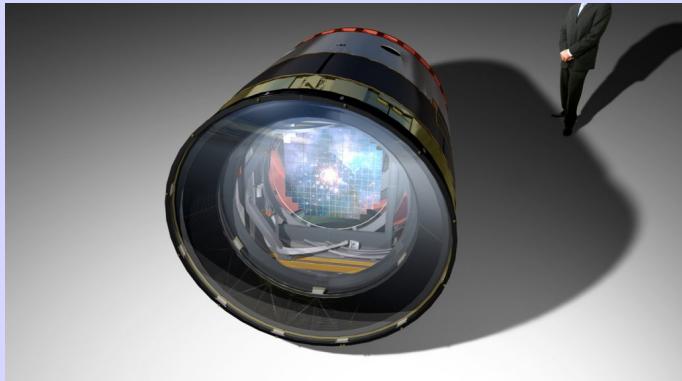


SOFTWARE TOOLS

Multiple access styles

**France
IN2P3**

~ 100 PIs



camera co-development

L2 co-processing and
2nd Archive centre

**UK
STFC**

~ 100 PIs



operations subscription



**assorted
institutions**

LSST-corp
subscription

UK DAC
L3 s/w development



- funded by STFC
 - 35 partner universities
 - Project Lead: Bob Mann, Edinburgh
 - Project Scientist: Stephen Smartt, Belfast
-
- MOA with LSST Sept 2015 *subscription agreed for 100 PIs*
 - Phase A study 2015-2019
 - prototype DAC *funded, underway*
 - L3 science areas studies
 - Phase B construction 2019-2023 *provisional funding reviewed 2018*
 - Phase C/D operations 2023-2033

UK DAC plans*

- L2 data from Lyon Archive centre
 - L1 alert stream from NCSA
-
- clone core facilities of US DAC
 - add infrastructure for UK priorities
 - add L3 s/w for UK priorities

*take a look
at this*



*provisional: internal UK competition underway for structure and Phase B workpackages

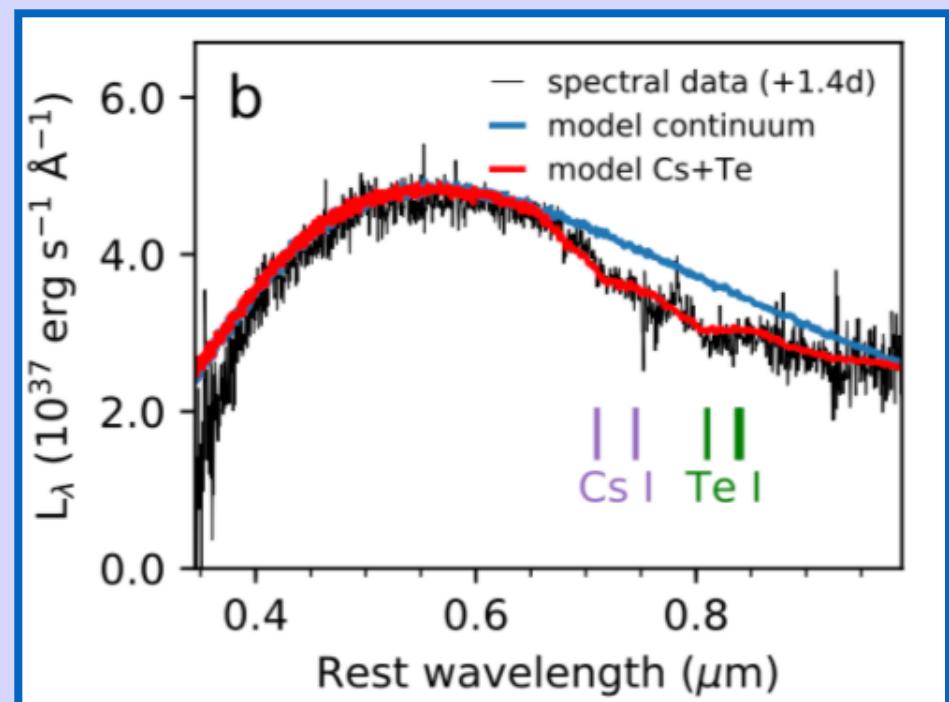
likely specialisations:

pixel datamining (eg Euclid synergy)
Multiwavelength and VO integration
Broker and Time Domain service

Hundreds of SNe classified/monitored

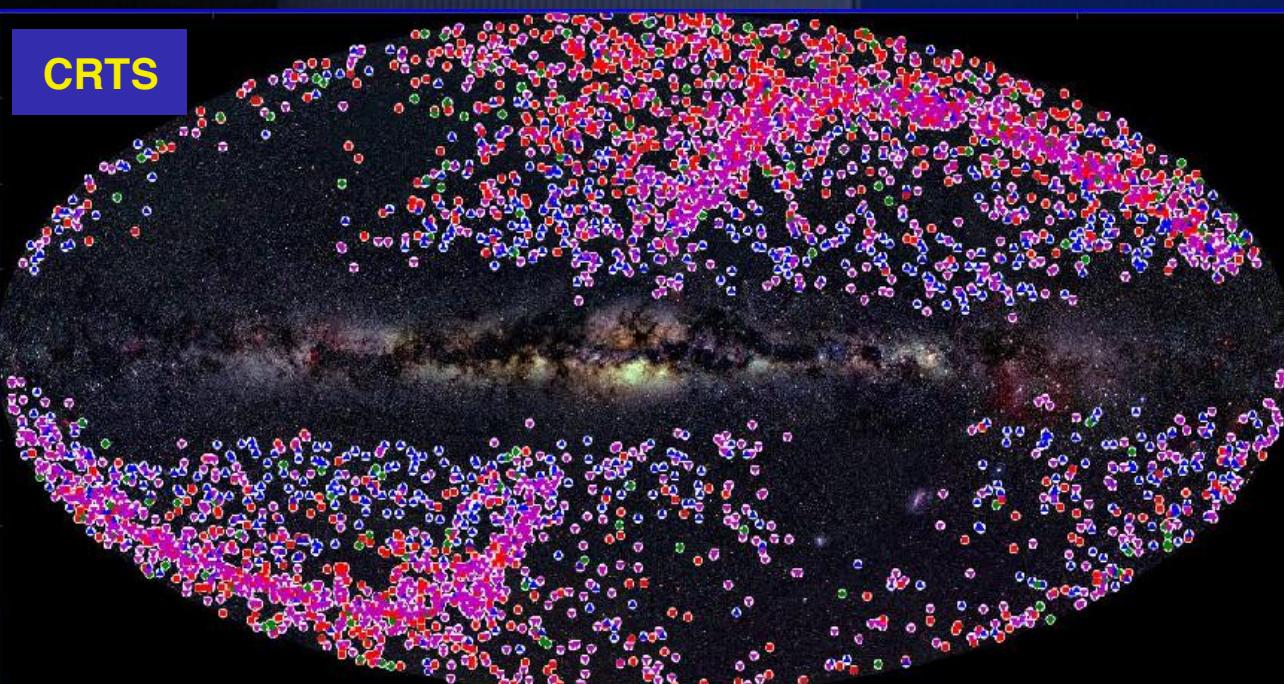
- Europe wide science consortium
- Processing millions of nightly transients in Belfast
- Filtered by machine learning + Target Alert Team
- Context classification provided
- Fed to spectroscopy: 10N/month on NTT
- Also follow-up other public alerts

One of the first spectra
of GW170817 !!



PS1
PS2
ATLAS

Live streams



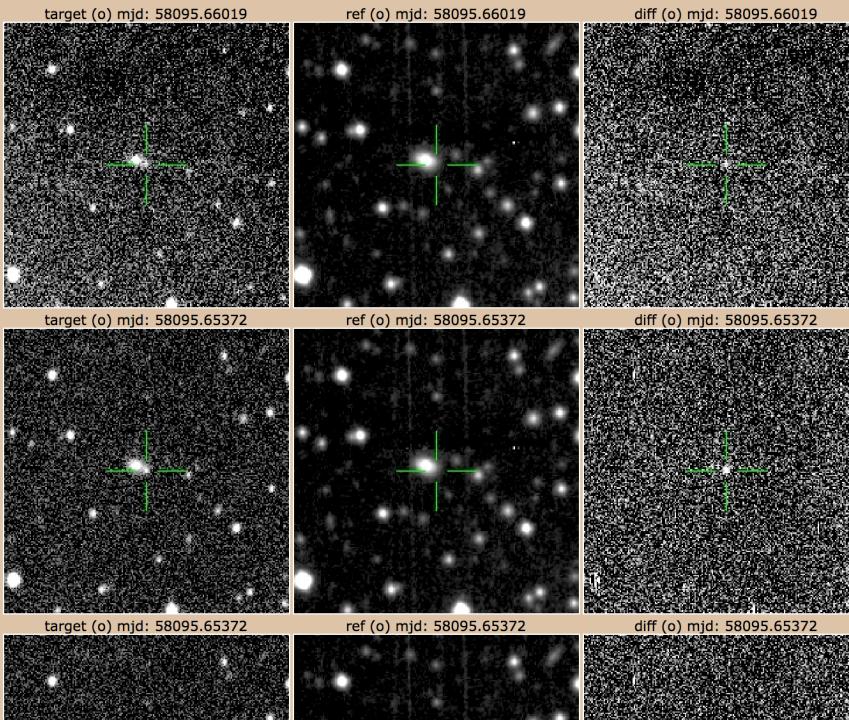
Good Candidates (469)

rank	id	atlas designation	other designation	ra	dec	Context Classification	Flag Date	Spectral Type	current trend	earliest mjd	earliest mag	earliest filter	latest mjd	latest mag	latest filter	RB Factor	RB Factor ₂	External Crossmatches	rms																	
3880315	1233702981154914300	ATLAS17npe		23:37:02.94	+15:49:14.1	SN	Dec. 10, 2017	—	rising 0.22 (o-o)	58097.29454	18.467	o	58097.30995	18.201	o	0.858	0.997	AT2017ltq	0.303																	
3864741	1133936230112855900	ATLAS17nph	AT2017vh	13:39:36.25	-11:28:55.8	SN	Dec. 10, 2017	—	fading 0.11 (o-o)	58092.63014	16.317	o	58096.62439	16.427	o	0.461	0.870	—	0.348																	
3819433	1235117551075800400	ATLAS17noz	AT2017vf	23:51:17.54	+07:58:01.5	SN	Dec. 9, 2017	—	fading 0.12 (o-o)	58096.27536	18.977	o	58096.29633	19.099	o	0.163	0.857	—	0.796																	
3793628	1003035151013100400	ATLAS17npa	AT2017vg	00:30:35.16	+01:31:00.3	SN	Dec. 9, 2017	—	fading 0.04 (o-o)	58096.29970	18.703	o	58096.32085	18.744	o	0.696	0.833	—	0.615																	
3792279	1133905300201730200	ATLAS17nnn	AT2017vb	13:39:05.30	-20:17:29.9	SN	Dec. 8, 2017	—	fading 0.20 (o-o)	58095.64537	16.768	o	58095.66019	16.969	o	0.900	0.993	—	0.524																	
3789714	112244453037145000	ATLAS17nnr		12:24:44.53	-37:18:45.5	SN	Dec. 8, 2017	—	fading 0.78 (o-o)	58091.61928	17.327	o	58095.65091	18.11	o	0.814	0.924	AT2017gqa	0.417																	
3754651	106362909030254000	ATLAS17nnw	AT2017ivc	06:36:29.07	-30:25:42.6	SN	Dec. 8, 2017	—	rising 0.10 (o-o)	58067.54517	18.585	o	58095.49554	18.042	o	0.859	0.843	—	1.023																	
3752330	1223334240131541300	ATLAS17nnx	AT2017luz	22:33:34.26	-13:15:42.2	SN	Dec. 8, 2017	—	fading 0.18 (o-c)	58082.26293	18.942	c	58095.24300	18.454	o	0.196	0.328	—	0.449																	
3752329	1223318620371907600	ATLAS17nnk	AT2017luy	22:33:18.64	-37:19:07.2	SN	Dec. 8, 2017	—	rising 0.12 (o-o)	58095.24438	18.434	o	58095.25770	18.268	o	0.362	0.740	—	0.59																	
3749634	1043141620210852200	ATLAS17nni	AT2017luv	04:31:41.63	-21:08:52.1	SN	Dec. 8, 2017	—	fading 0.18 (o-o)	58095.40763	18.311	o	58095.43602	18.3	o	0.750	0.926	—	0.625																	
3748354	1023325210201210900	ATLAS17nnh	AT2017luw	02:33:25.12	-20:12:09.1	ORPHAN	Dec. 8, 2017	—	rising 0.22 (o-o)	58043.46033	17.598	o	58095.38016	17.719	o	0.964	0.991	—	0.408																	
3748034	1015819300282314100	ATLAS17nnn	AT2017lva	01:58:19.26	-28:23:14.9	UNCLEAR	Dec. 8, 2017	—	fading 0.32 (o-o)	58091.32713	18.165	o	58095.36092	18.529	o	0.542	0.725	—	0.568																	
3746870	10010170504059600	ATLAS17noe		00:10:17.05	-40:40:59.8	SN	Dec. 8, 2017	—	rising 0.46 (o-o)	58067.34004	18.958	o	58095.30731	18.568	o	0.361	0.735	AT2017imj	0.76																	
3746496	1205647970322644500	ATLAS17nnne	AT2017lui	20:56:47.87	-32:26:44.5	SN	Dec. 8, 2017	—	fading 0.37 (o-o)	58095.19555	17.725	o	58095.21451	17.858	o	0.732	0.525	—	0.743																	
3736498	1062740031472945200	ATLAS17nnf	AT2017luu	16:27:40.09	+47:29:45.7	ORP	4216	204.77198	-20.29178	16.893	0.0	7090.48	6143.59	0.0	2.7	93.8	2	57.21	0	999	0	0	0	0	0	-1	-112.0	4.4	—	58097.6625886	02a58097o09860	17.92	—	30.0	o	T
3732946	1051149661672913400	ATLAS17ng		05:11:49.37	+67:29:15.1	SN	4216	204.77198	-20.29178	16.893	0.0	7090.48	6143.59	0.0	2.7	93.8	2	57.21	0	999	0	0	0	0	0	-1	-112.0	4.4	—	58097.6625886	02a58097o09860	17.92	—	30.0	o	T
3635874	1111044381045048700	ATLAS17nmu		11:10:44.54	+04:50:50.6	SN	4216	204.77198	-20.29178	16.893	0.0	7090.48	6143.59	0.0	2.7	93.8	2	57.21	0	999	0	0	0	0	0	-1	-112.0	4.4	—	58097.6625886	02a58097o09860	17.92	—	30.0	o	T
3634229	1104713231001214600	ATLAS17nmr	AT2017ltx	10:47:13.27	-00:12:13.9	SN	4216	204.77198	-20.29178	16.893	0.0	7090.48	6143.59	0.0	2.7	93.8	2	57.21	0	999	0	0	0	0	0	-1	-112.0	4.4	—	58097.6625886	02a58097o09860	17.92	—	30.0	o	T
3616943	1033331971031124400	ATLAS17nmo	AT2017lto	03:33:31.98	+03:11:24.2	UNC	4216	204.77198	-20.29178	16.893	0.0	7090.48	6143.59	0.0	2.7	93.8	2	57.21	0	999	0	0	0	0	0	-1	-112.0	4.4	—	58097.6625886	02a58097o09860	17.92	—	30.0	o	T

millions of
raw events/night

automated filtering
==> thousands

context + eyeballing
==> hundreds



PESSTO Marshall

observers presented with “tickets” with complete contextual information and annotations

manual queue re-organisation

showing transients 1-10 of 58 with decDeg < 30 in the classification targets list

overview | **comments 1** | **photometry** | **context** | **ticket history**

create new ticket

TARGET SELECTION QUEUES

- inbox (161)
- snoozed (6958)
- review for followup (12)

OBERVATION QUEUES

- classification targets (58)
 - + followup targets (26)
 - all targets (84)

CLASSIFICATION & ATEL QUEUES

- queued for classification (0)
- queued for atel (4)

REFERENCE

- all (37239)
- classified (7671)

followup complete (242)

all archived (36740)

identity
ATLAS17kgw

object info

ra & dec: 02:27:30.74 +21:59:19.8 [36.87811 21.98886]
abs peak mag: -17.99
pre-disc non-detection: unknown
discovery date: 37 days ago (2017-08-18)
date added to marshall: 8 days ago (2017-09-16)

host info

lightcurve
ATLAS17kgw

actions

discovery magnitude: 20.80 c-band 2017-08-18
latest magnitude: 18.09 ATLAS FP o-band 2017-09-17 +7d
current mag estimate: 17.75

latest comment (6 days ago): Nice constraints, quite bright and reasonably remote in the host. Good target. – Joe Lyman

overview | **comments 1** | **photometry** | **context** | **ticket history**

identity
ATLAS17lau

object info

ra & dec: 02:30:19.795 -28:01:01.2 [-99.65914 -28.01782]
pre-disc non-detection: unknown
discovery date: 27 days ago (2017-08-28)
date added to marshall: 6 days ago (2017-09-18)

host info

lightcurve
ATLAS17lau

actions

discovery magnitude: 20.54 o-band +27d
latest magnitude: 19.07 ATLAS FP c-band 2017-09-17 +7d
current mag estimate: 19.85

latest comment (6 days ago): discovered 2 days from non-detection, in a faint host. Classify with high priority – Luis Galbany

overview | **comments 7** | **photometry** | **context** | **ticket history**

identity
OGLE17osk

object info

ra & dec: 04:03:36.10 -69:37:45.9 [60.90046 -69.62944]
abs peak mag: -19.45
pre-disc non-detection: 39 days ago (2017-08-16)
discovery date: 35 days ago (2017-08-21)
date added to marshall: 19 days ago (2017-09-05)

spectral classification

classification: unknown
classification survey: ePESSTO
classification date: 2017-09-13 (2 days ago)
classification phase: unknown
redshift: 0.1090
distance: 504.74 Mpc

host info

lightcurve
OGLE17osk

actions

discovery magnitude: 20.89 c-band 2017-08-21 +35d
latest magnitude: 19.07 OGLE I-band 2017-09-18 +7d
current mag estimate: > 21.0

Warning this object is too faint to take a classification spectrum – please consider archiving it

latest comment (+1hr): ATEL#1077: OGLE-IV Transient Search report 25 September 2017 part 2 – Atel 1077

overview | **comments 7** | **photometry** | **context** | **ticket history**

identity
OGLE17gvr

object info

ra & dec: 04:03:36.10 -69:37:45.9 [60.90046 -69.62944]
abs peak mag: -19.45
pre-disc non-detection: 39 days ago (2017-08-16)
discovery date: 35 days ago (2017-08-21)
date added to marshall: 19 days ago (2017-09-05)

spectral classification

classification: unknown
classification survey: ePESSTO
classification date: 2017-09-13 (2 days ago)
classification phase: unknown
redshift: 0.1090
distance: 504.74 Mpc

host info

lightcurve
OGLE17gvr

actions

discovery magnitude: 20.89 c-band 2017-08-21 +35d
latest magnitude: 19.07 OGLE I-band 2017-09-18 +7d
current mag estimate: > 21.0

contextual classification: UNCLEAR – The transient is possibly associated with S11PO05990; an unknown-mag unclassified source found in the GSC v2.3 catalogue. It's located 0.29° S, 0.74° W from the object's source centre.

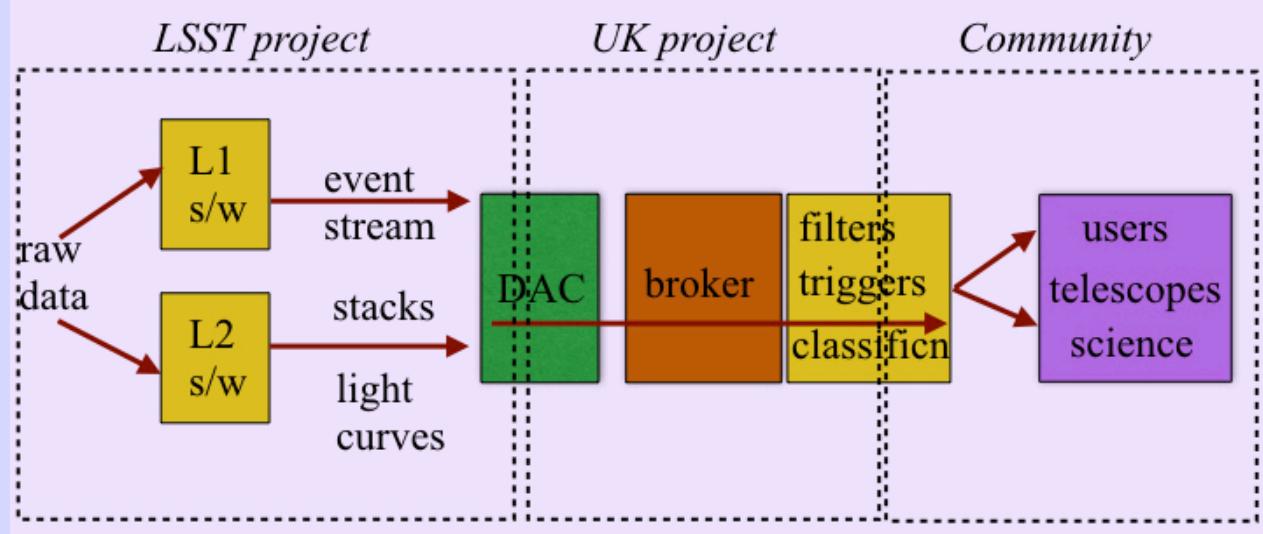
2 x Atel | **ATLAS**

already processing at LSST rates

so what next?

- open
- plug-and-play
- multi-purpose

UK DAC overview

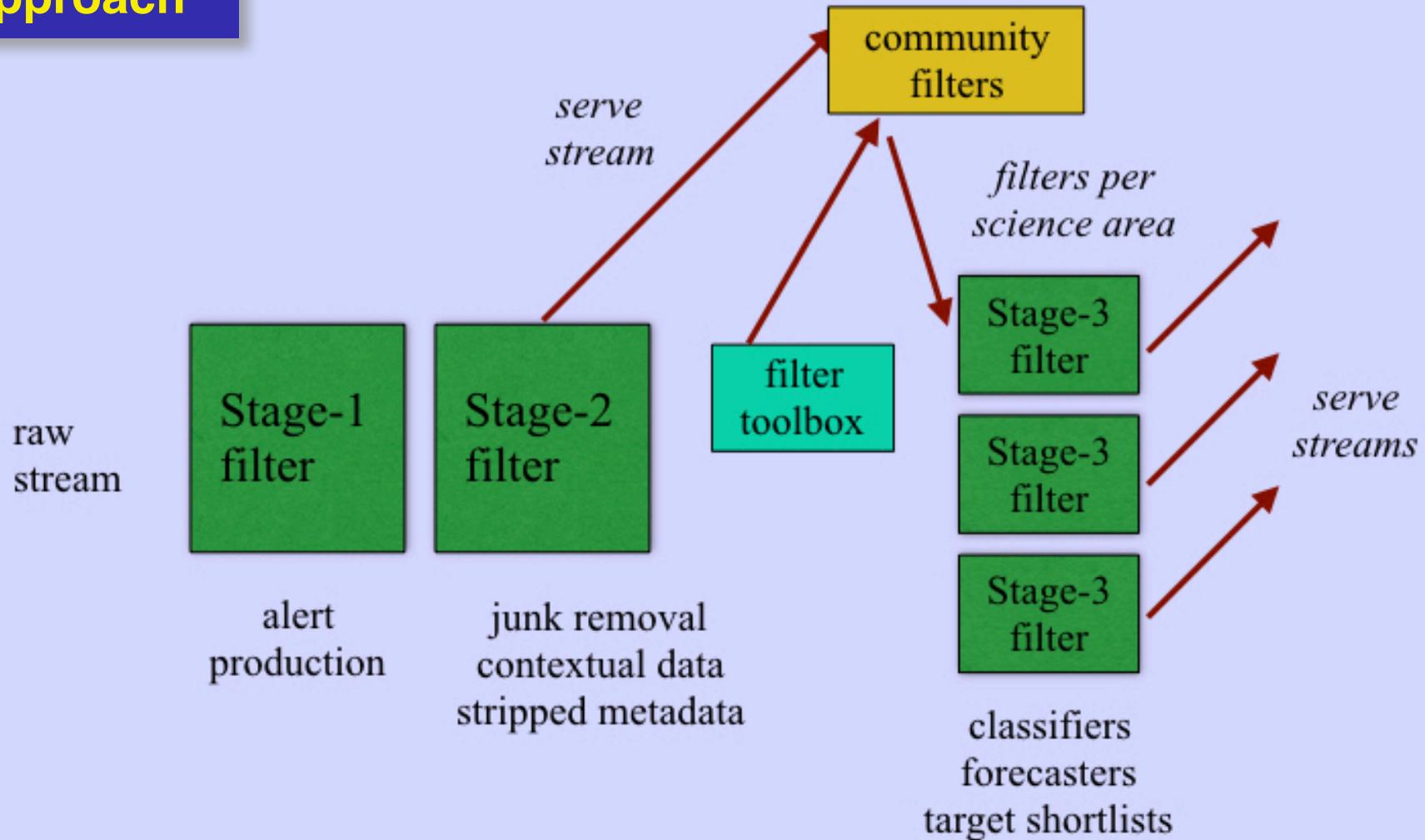


need:

- main broker
- infrastructure for L3 sub-brokers
- classification software
- automated context provision
- ability to track “watch-list”
- forecasters / triggers
(transients, outbursts, dippers)
- feed-through to follow-up

Lasair

multi-stage approach



VO issues

event format/transport

IVOA standard: VO Event VTP

*much invested software
and practice*

LSST proposal: AVRO
Kafka

*we have experimented
with Kafka streams*

VO issues

light curves

- Adapt SSA/SSAP
- Develop new Time Series standard suite

under recurring debate at IVOA....

- Python notebooks + time series library
- Use Topcat
- Use SPLAT
- Develop new tool

*the right tool may be key
to deciding standards requirements*