Dec 2017
Andy Lawrence
Trieste

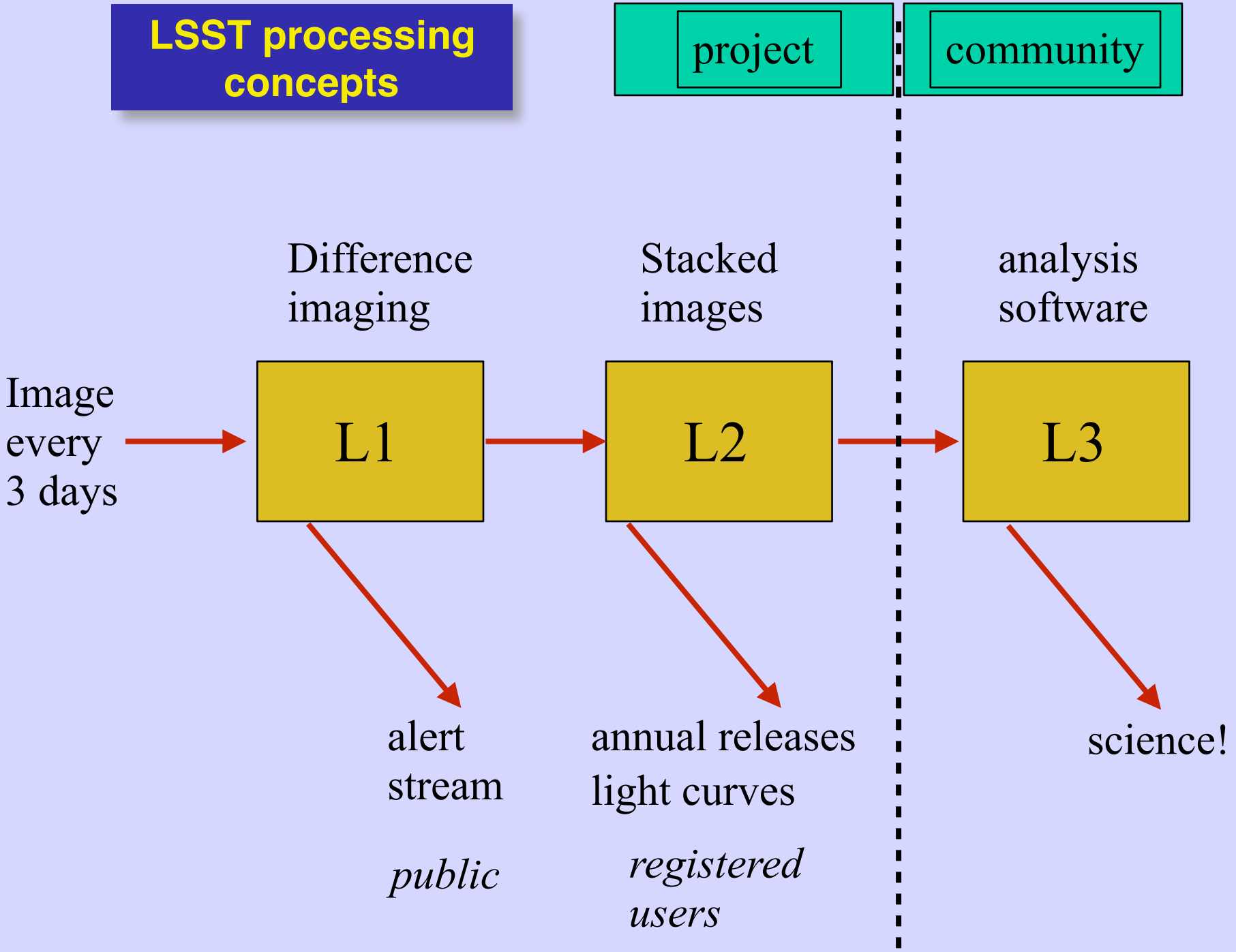
- Status of LSST
- Overview of LSST data processing
- European involvement in LSST
- UK DAC plans
- VO related issues

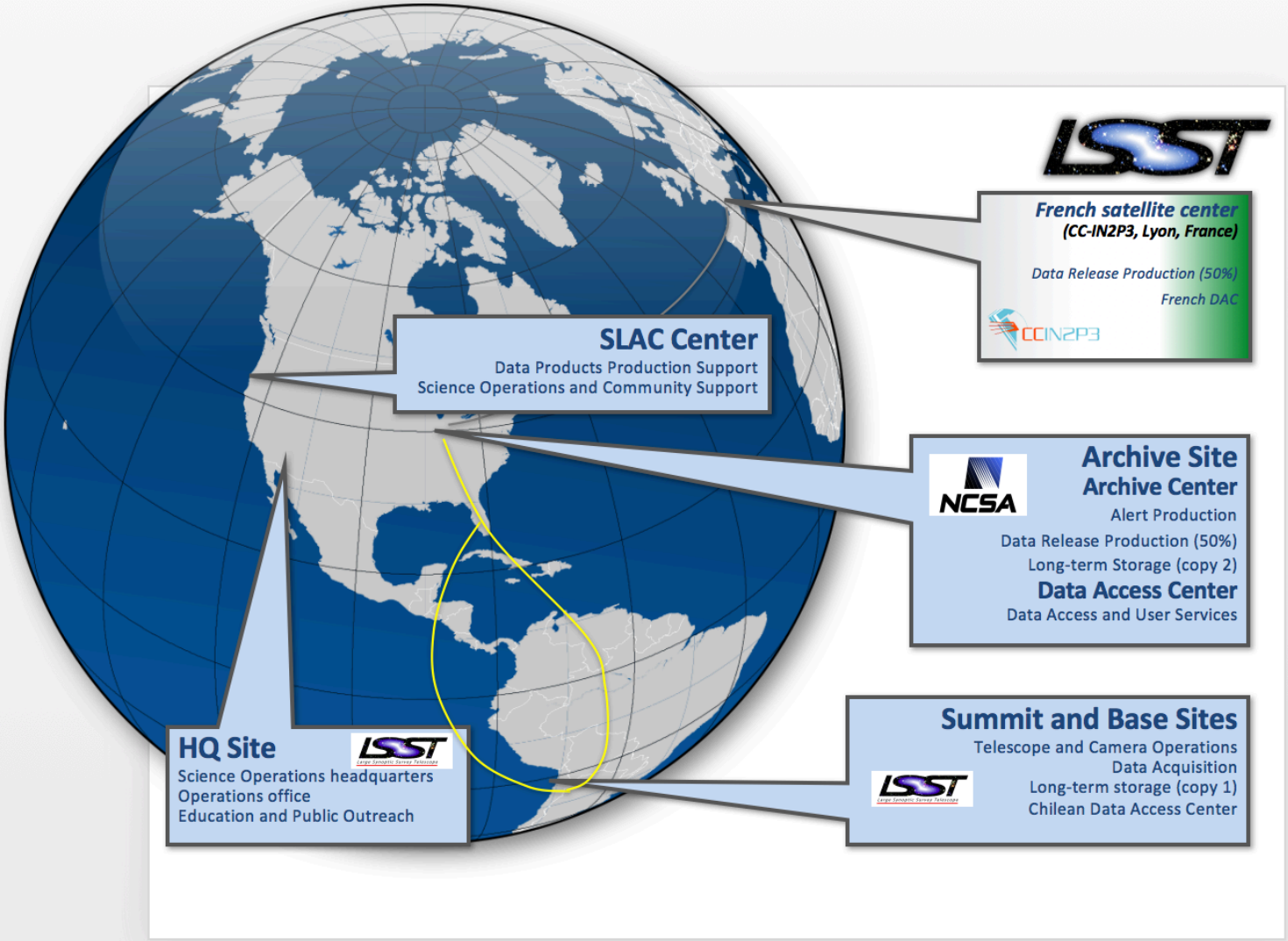
LSST getting real

current schedule

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

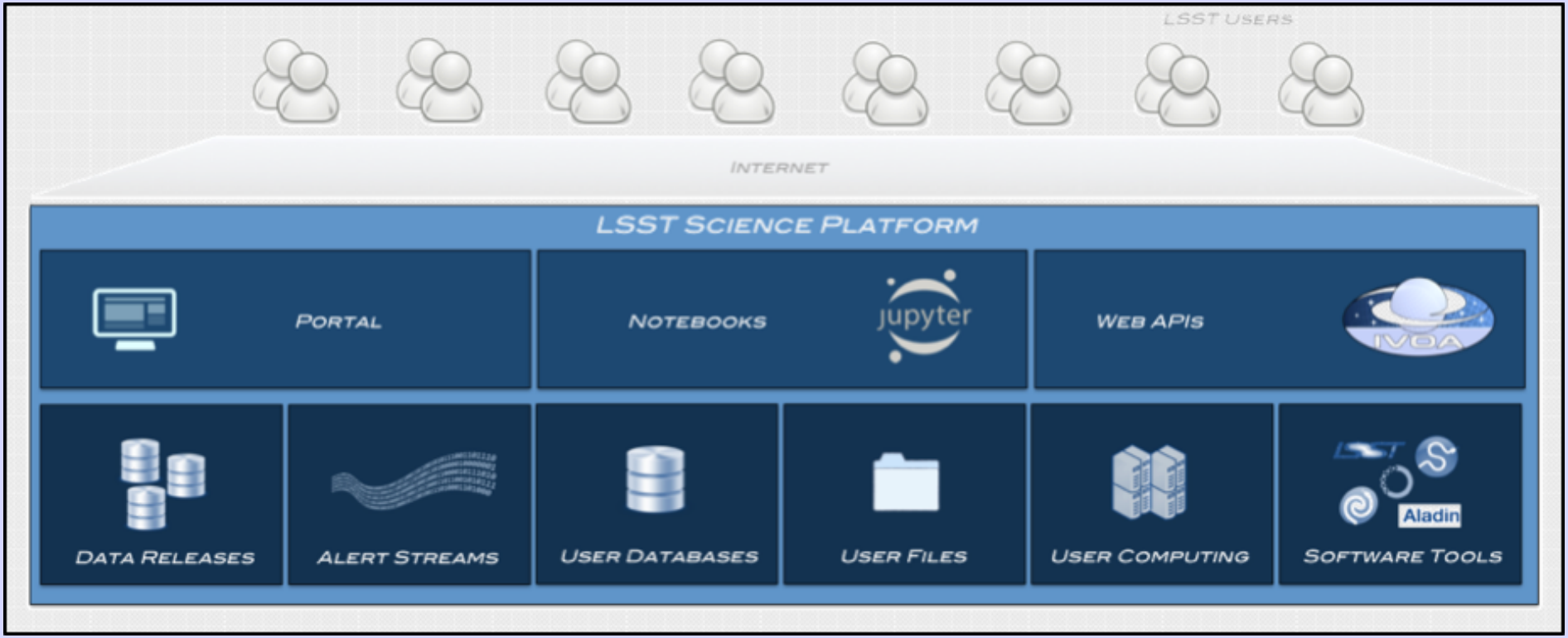
LSST processing concepts





+ UK DAC

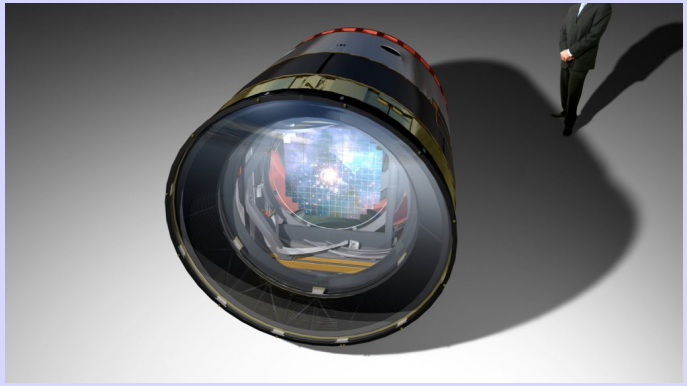
Locations



Multiple access styles

France IN2P3

~ 100 PIs



camera co-development

L2 co-processing and
2nd Archive centre

UK STFC

~ 100 PIs

LSST:UK Science Centre

operations subscription

UK DAC
L3 s/w development

assorted institutions

LSST-corp
subscription

- 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 — *funded, underway*
  - prototype DAC
  - L3 science areas studies
- Phase B construction 2019-2023 — *provisional funding reviewed 2018*
- Phase C/D operations 2023-2033

UK DAC plans*

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

- 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 →

likely specialisations:

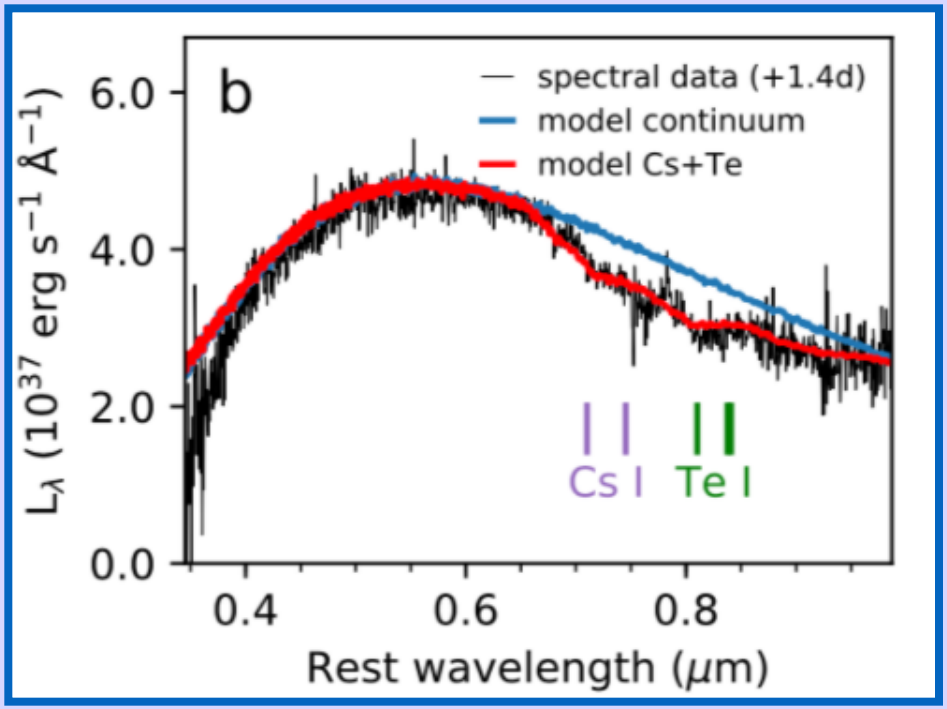
pixel datamining (eg Euclid synergy)
Multiwavelength and VO integration
Broker and Time Domain service

PESSTO experience

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

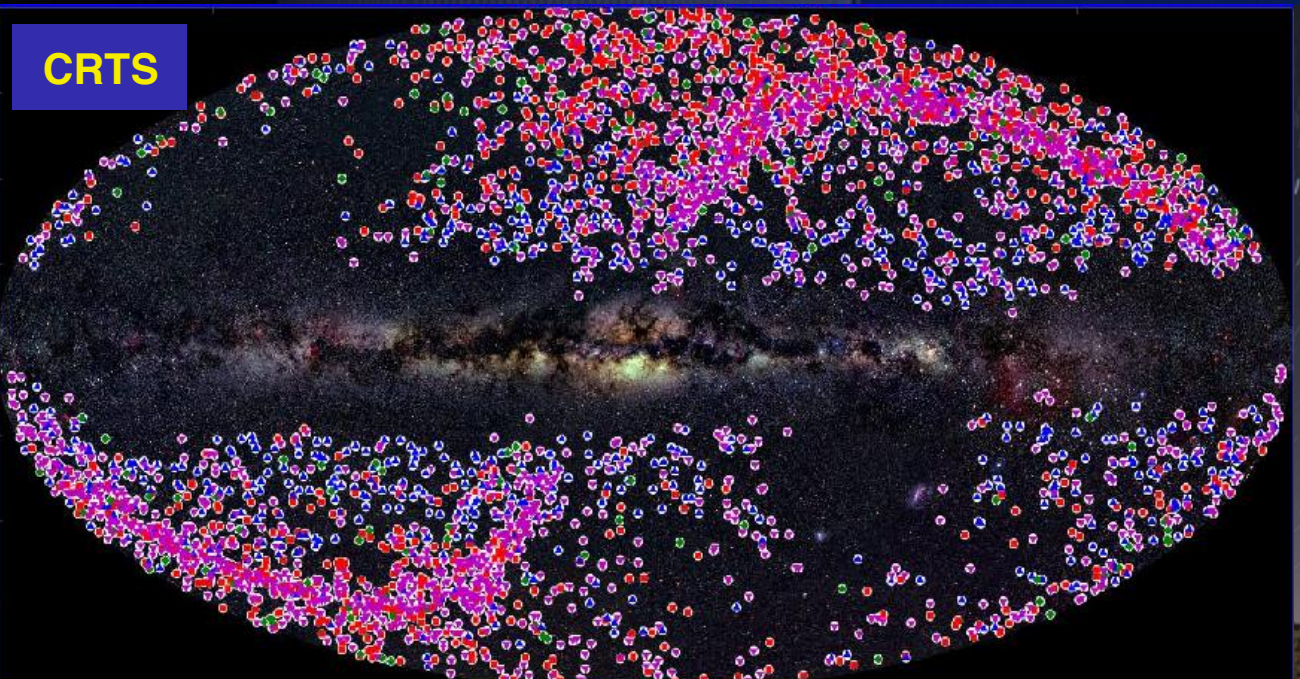
One of the first spectra of GW170817 !!



PS1
PS2
ATLAS

Live streams

CRTS



PTF

home confirmed good possible attic eyeball garbage custom Find Object logout andy.lawrence

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 00.22 (o-o)	58097.29454	18.467	o	58097.30995	18.201	o	0.858	0.997	AT2017itq	0.303
3864741	1133936230112855900	ATLAS17nph	AT2017ivh	13:39:36.25	-11:28:55.8	SN	Dec. 10, 2017	—	fading 00.11 (o-o)	58092.63014	16.317	o	58096.62439	16.427	o	0.461	0.870	—	0.348
3819433	1235117551075800400	ATLAS17noz	AT2017ivf	23:51:17.54	+07:58:01.5	SN	Dec. 9, 2017	—	fading 00.12 (o-o)	58096.27536	18.977	o	58096.29633	19.099	o	0.163	0.857	—	0.796
3793628	1003035151013100400	ATLAS17npa	AT2017ivg	00:30:35.16	+01:31:00.3	SN	Dec. 9, 2017	—	fading 00.04 (o-o)	58096.29970	18.703	o	58096.32085	18.744	o	0.696	0.833	—	0.615
3792279	1133905300201730200	ATLAS17nnn	AT2017ivb	13:39:05.30	-20:17:29.9	SN	Dec. 8, 2017	—	fading 00.20 (o-o)	58095.64537	16.768	o	58095.66019	16.969	o	0.900	0.993	—	0.524
3789714	1122444530371[illegible]45000	ATLAS17nnr		12:24:44.53	-37:18:45.5	SN	Dec. 8, 2017	—	fading 00.78 (o-o)	58091.61928	17.327	o	58095.65091	18.11	o	0.814	0.924	AT2017gqa	0.417
3754651	1063629090302540[illegible]00	ATLAS17nnw	AT2017ivc	06:36:29.07	-30:25:42.6	SN	Dec. 8, 2017	—	rising 01.10 (o-o)	58067.54517	18.585	o	58095.49554	18.042	o	0.859	0.843	—	1.023
3752330	1223334240131541300	ATLAS17nny	AT2017iuz	22:33:34.26	-13:15:42.2	SN	Dec. 8, 2017	—	fading 00.18 (o-c)	58082.26293	18.942	c	58095.24300	18.454	o	0.196	0.328	—	0.449
3752329	1223318620371907600	ATLAS17nnk	AT2017iuy	22:33:18.64	-37:19:07.2	SN	Dec. 8, 2017	—	rising 00.12 (o-o)	58095.24438	18.434	o	58095.25770	18.268	o	0.362	0.740	—	0.59
3749634	1043141620210852200	ATLAS17[illegible]ni	AT2017iuv	04:31:41.63	-21:08:52.1	SN	Dec. 8, 2017	—	fading 00.18 (o-o)	58095.40763	18.311	o	58095.43602	18.3	o	0.750	0.926	—	0.625
3748354	1023325210201210900	ATLAS17nnh	AT2017iuw	02:33:25.12	-20:12:09.1	ORPHAN	Dec. 8, 2017	—	rising 00.22 (o-o)	58043.46033	17.598	o	58095.38016	17.719	o	0.964	0.991	—	0.408
3748034	1015819300282314100	ATLAS17nno	AT2017iva	01:58:19.26	-28:23:14.9	UNCLEAR	Dec. 8, 2017	—	fading 00.32 (o-o)	58091.32713	18.165	o	58095.36092	18.529	o	0.542	0.725	—	0.568
3746870	1001017050404059600	ATLAS17noe		00:10:17.05	-40:40:59.8	SN	Dec. 8, 2017	—	rising 00.46 (o-o)	58067.34004	18.958	o	58095.30731	18.568	o	0.361	0.735	AT2017imj	0.76
3746496	1205647970322644500	ATLAS17nne	AT2017iut	20:56:47.87	-32:26:44.5	SN	Dec. 8, 2017	—	fading 00.37 (o-o)	58095.19555	17.725	o	58095.21451	17.858	o	0.732	0.525	—	0.743
3736498	1062740031472945200	ATLAS17nnf	AT2017iuu	[illegible]:27:40.09	+47:29:45.7	ORPI													
3732946	1051149661672913400	ATLAS17nng		05:1[illegible]:49.37	+67:29:15.1	SN													
3635874	1111044381045048700	ATLAS17nmu		11:10:44[illegible]:54	+04:50:50.6	SN													
3634229	1104713231001214600	ATLAS17nmr	AT2017itx	10:47:13.27	[illegible]00:12:13.9	SN													
3616943	1033331971031124400	ATLAS17nmo	AT2017ito	03:33:31.98	+03[illegible]:24.2	UNC													

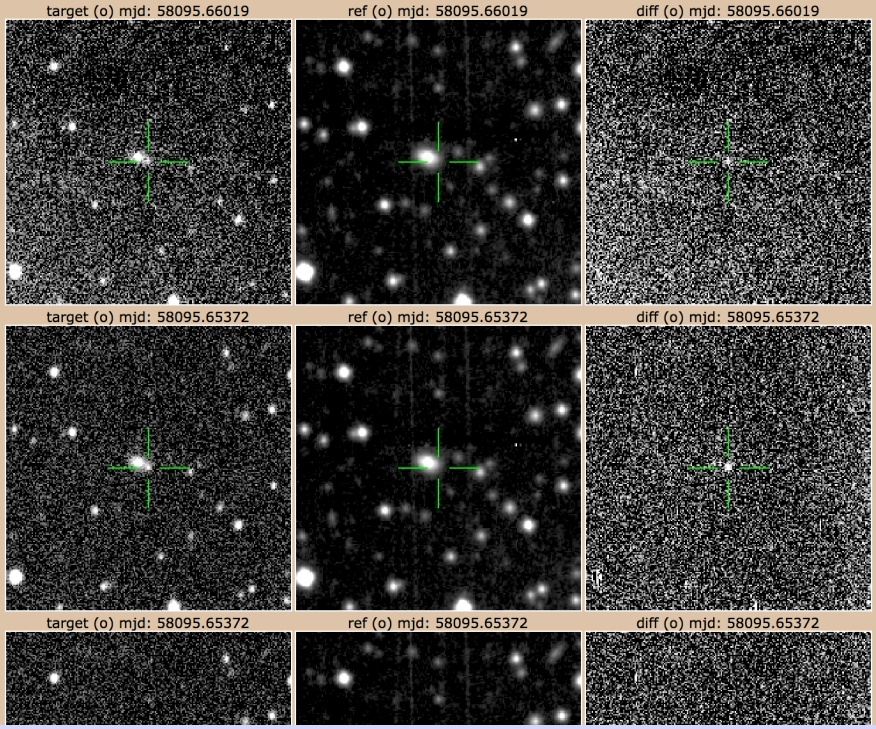
4216 204.77198 -20.29178 16.893 0.0 7090.48 6143.59 0.0 2.7 93.8 2 57.21 0 999 0 0 0 0 0 0 0 -1 -112.0 4.4 — 58097.6625886 02a58097o0986o 17.92 — 30.0 o T

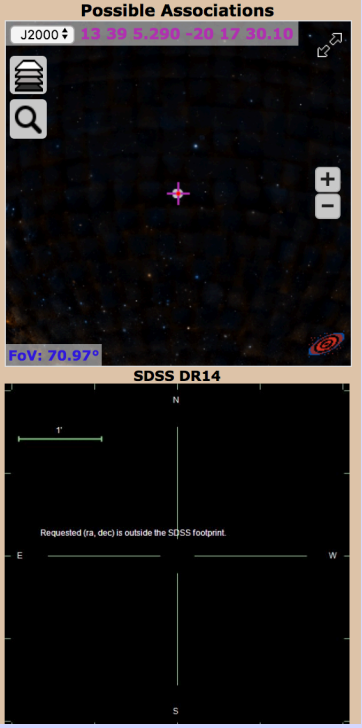
ATLAS processing

millions of
raw events/night

automated filtering
==> thousands

context + eyeballing
==> hundreds

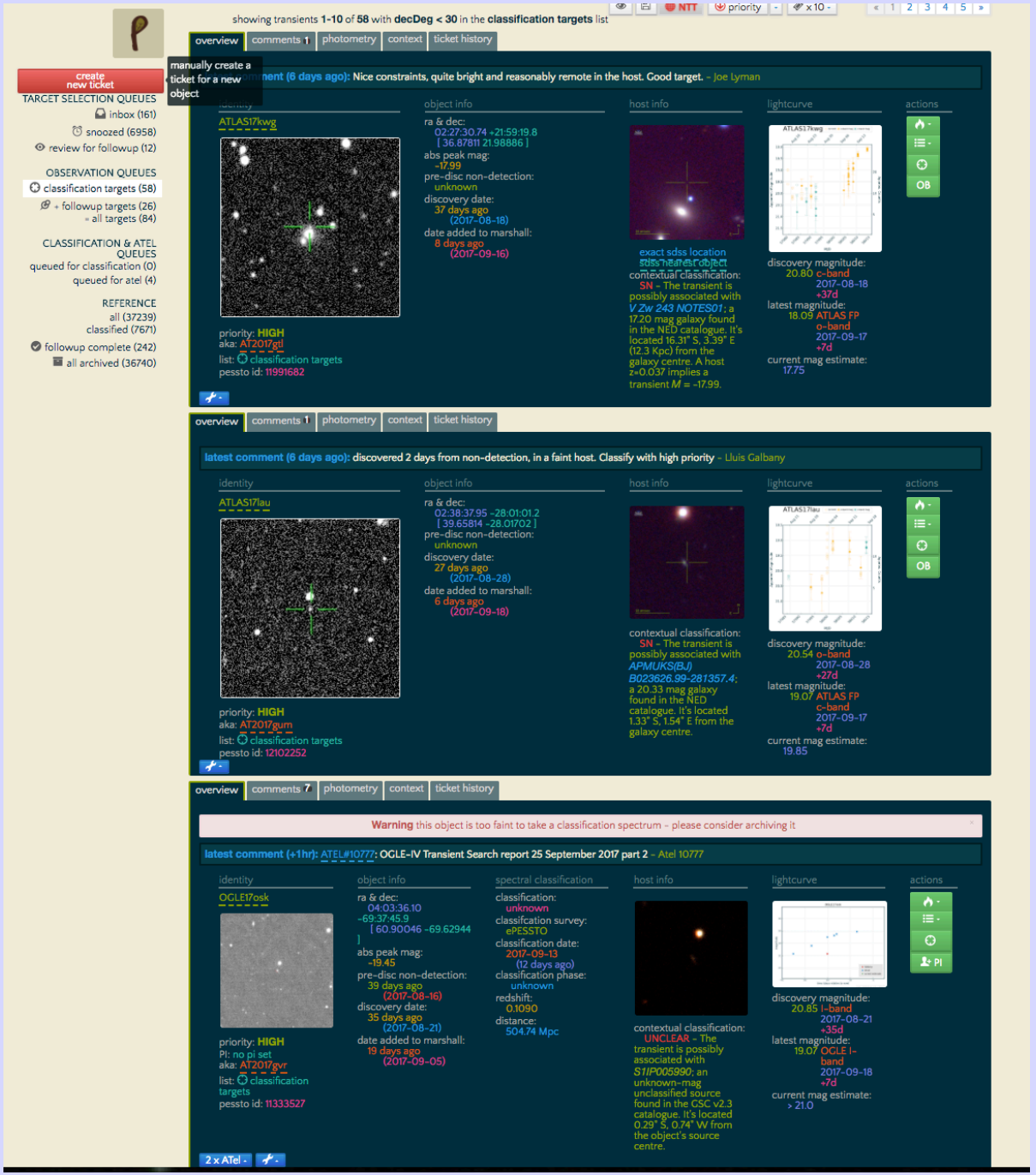




PESSTO Marshall

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

manual queue re-organisation



already processing at LSST rates

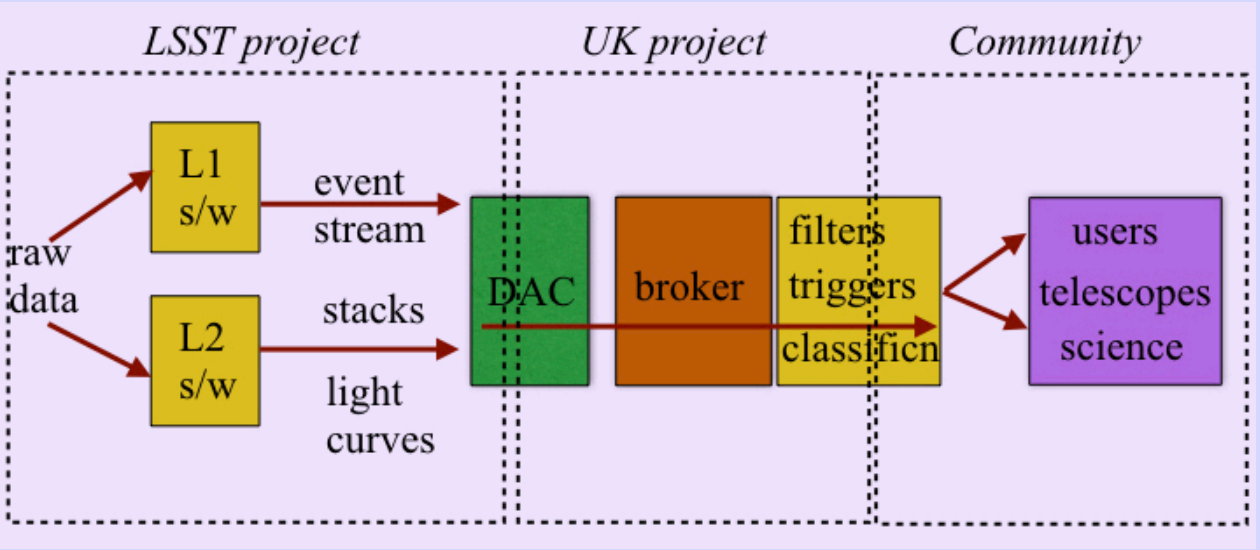
so what next?

→ open

→ plug-and-play

→ multi-purpose

UK DAC overview

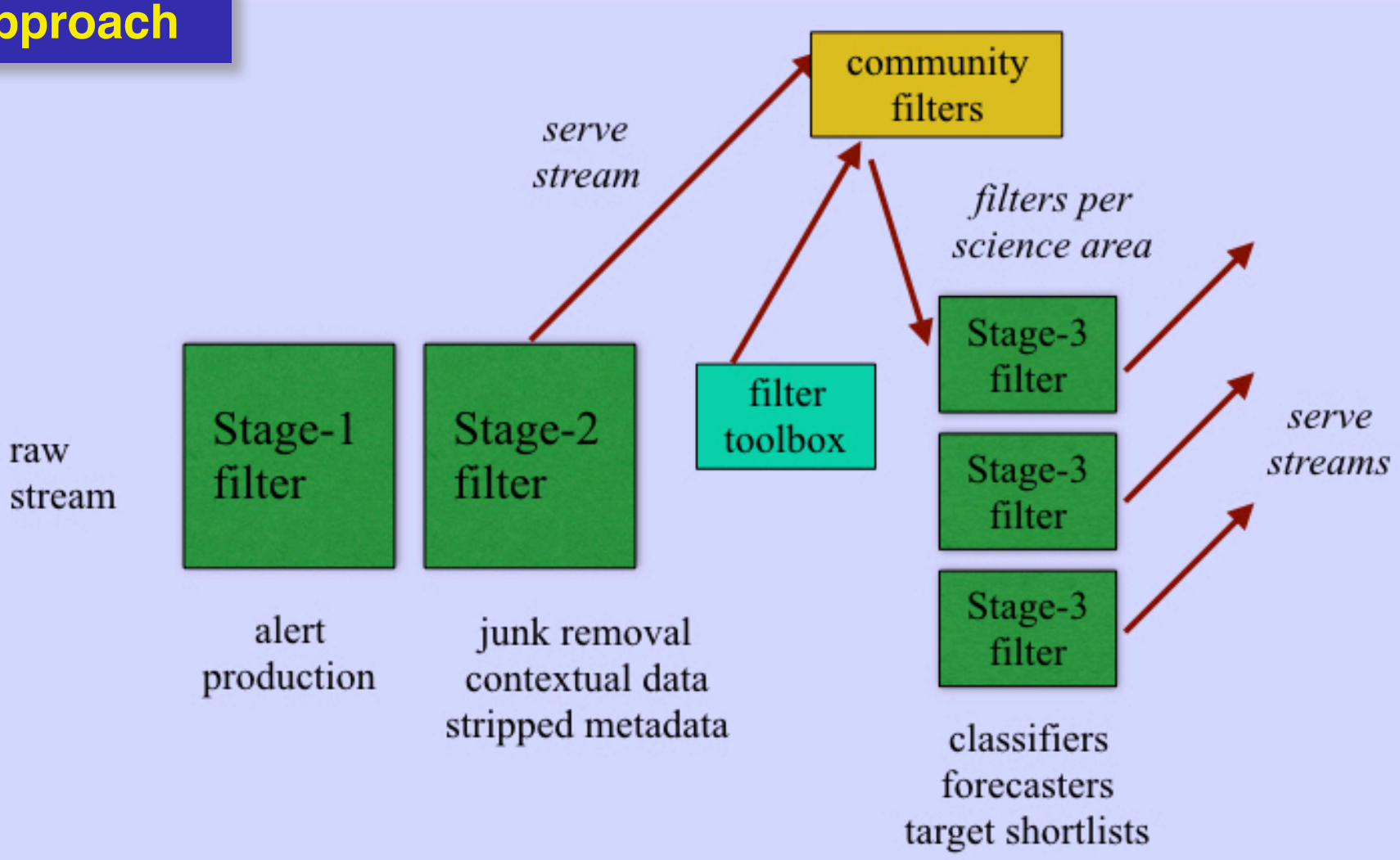


need:

- 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

Likely approach: *absorb* *AVRO/Kafka*
emit *VOEvent /VTP*

VO issues

light curves

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

under recurring debate at IVOA….

VO issues

time series tools

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

the right tool may be key
to deciding standards requirements