AMPEL

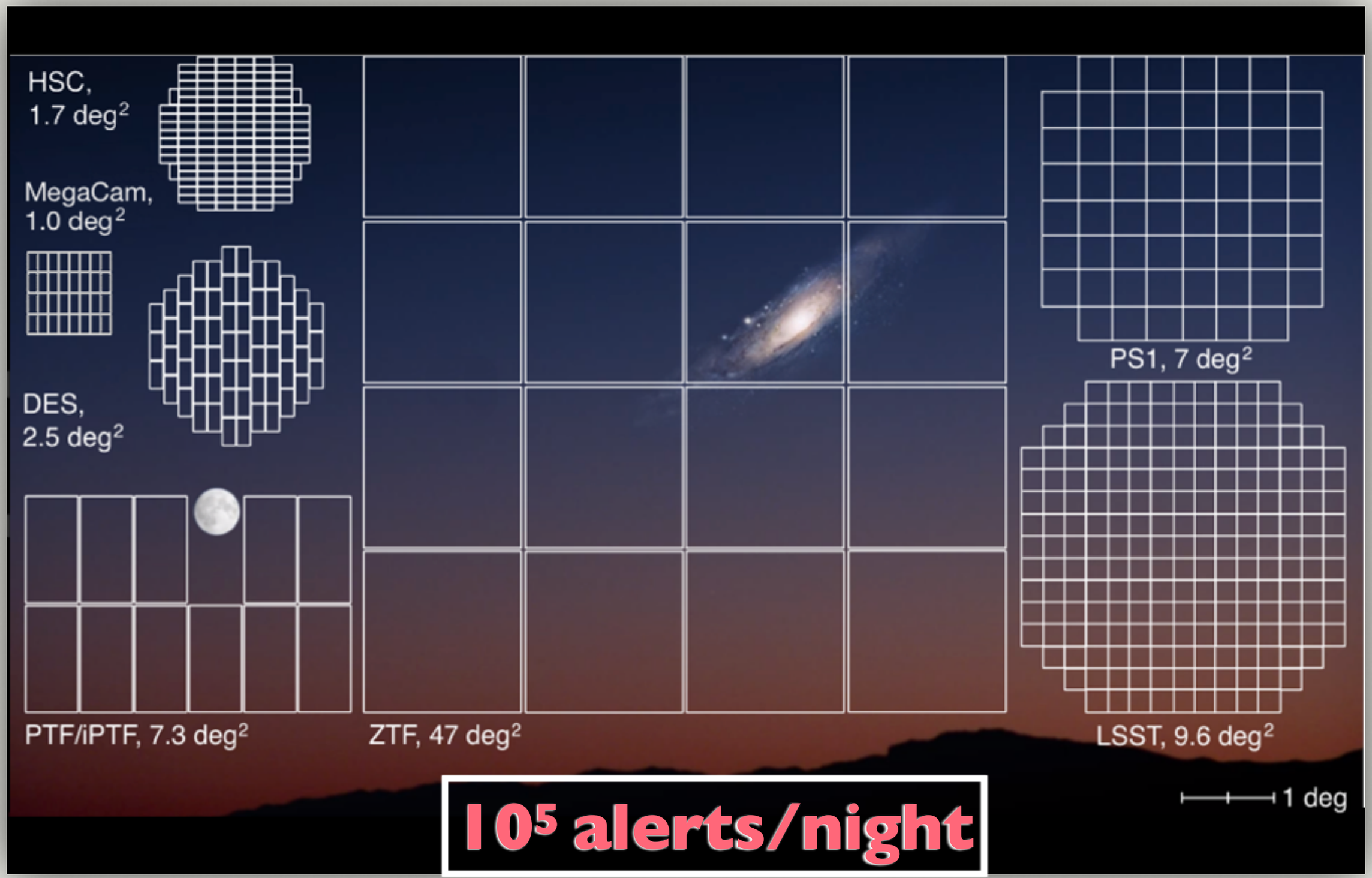
Valéry Brinnel

Humboldt Universität zu Berlin

AG 2019

INTRODUCTION

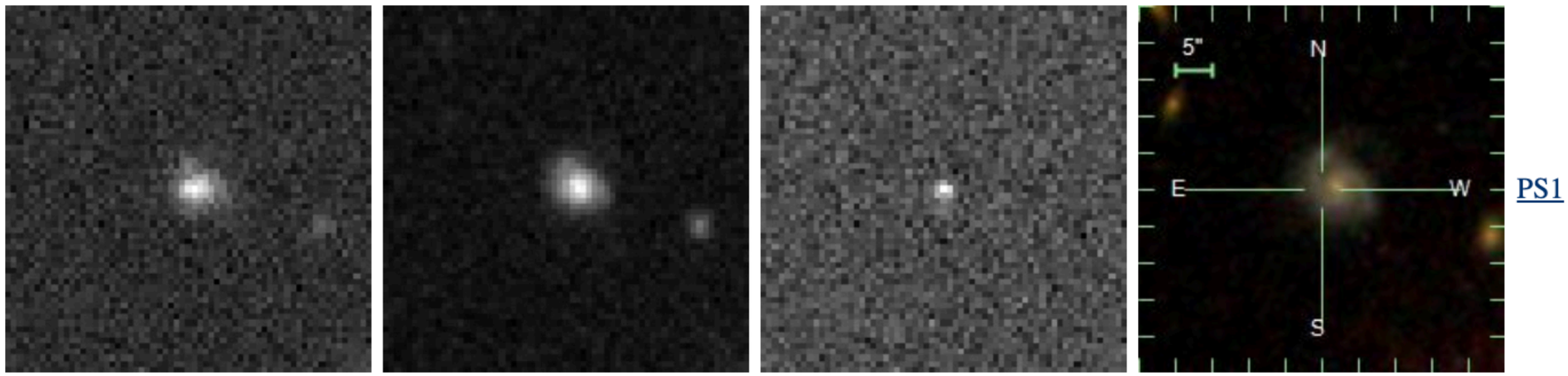
MOTIVATION


HSC,
1.7 deg²
MegaCam,
1.0 deg²
DES,
2.5 deg²
PTF/iPTF, 7.3 deg²
ZTF, 47 deg²
PS1, 7 deg²
LSST, 9.6 deg²
1 deg
10⁵ alerts/night

SCANNING

05:10:27
(2019-06-27)

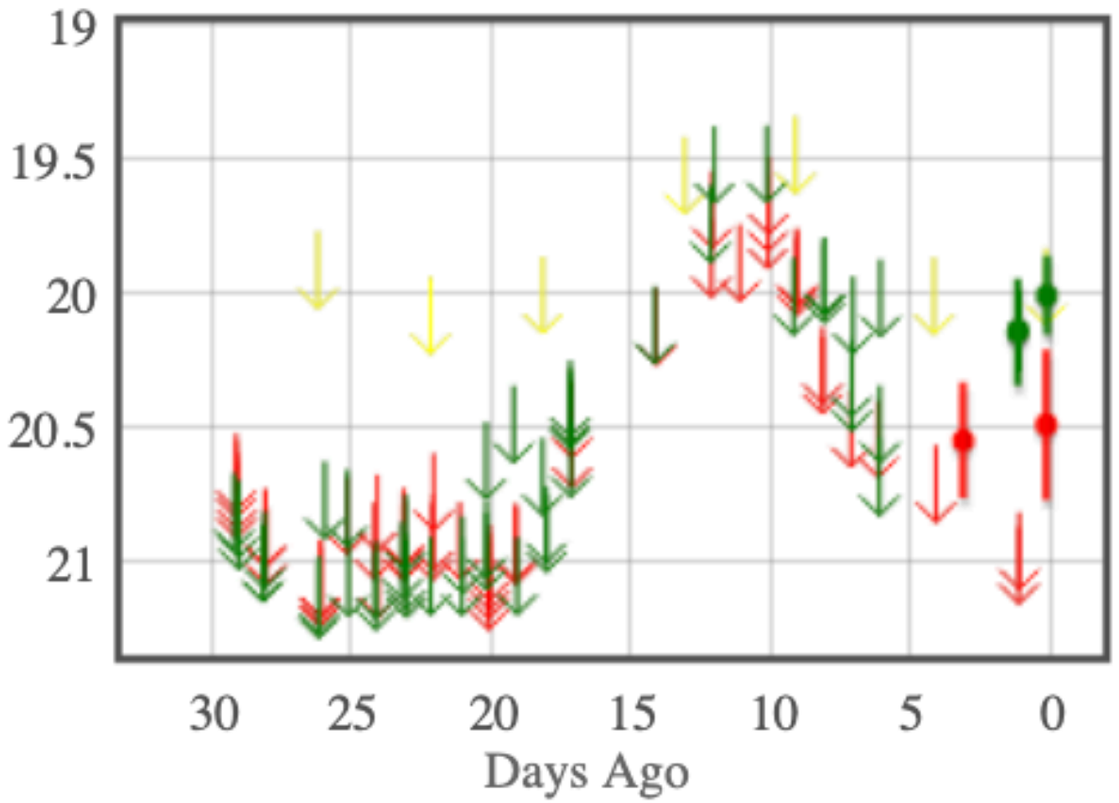
05:21:42
(2019-06-27)



PS1

Infant Supernovae

saved_by_id: False
latitude: 58.1797
magap_min_magpsf: -0.322
elongation: 1.0355
magpsf: 20.0049
distpsnr3: 4.6755
distpsnr2: 2.3301
distpsnr1: 0.7266
ZOGY_scorr: 12.8101
sgscore1: 0.5000
rb_score: 0.9300
PS1_psf_r-mag: -999.0000
host_ZTF_ref_PSF_r-mag:
mag_difference: -99.0000
time_difference: 0.0195
host_r-i: -1018.7423
host_g-r: 0.0000
FWHM: 2.7800
jdstarthist: 2458658.7364
jd: 2458661.7156



ID: ZTF19abbtdhp
NOT SAVED
Mag_new: 19.95
Coordinate: 238.03858 27.62142
RB Score: 0.47429

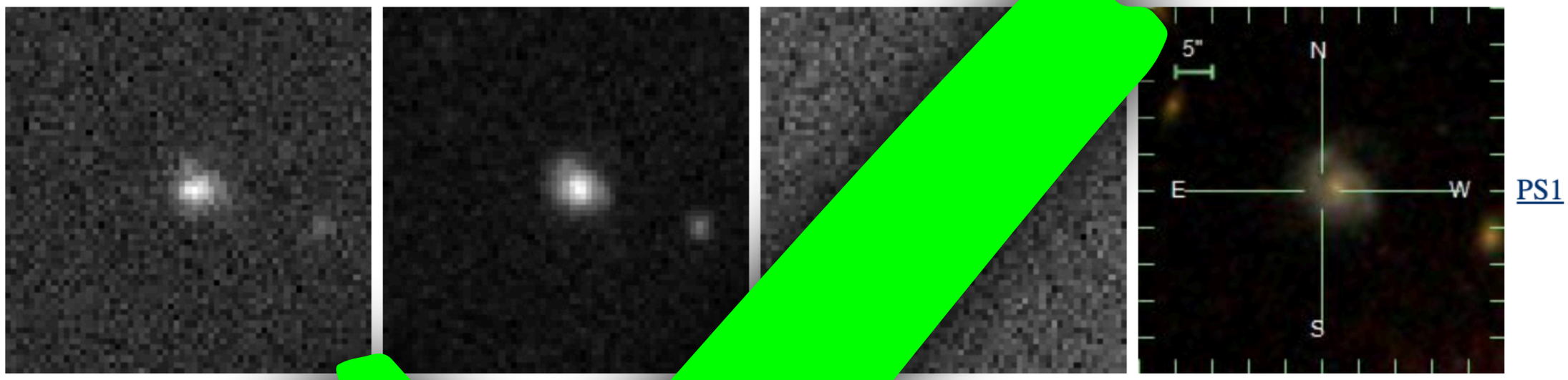
Infant Supernovae
Save

Infant Supernovae
Remove

SCANNING

05:10:27
(2019-06-27)

05:21:42
(2019-06-27)



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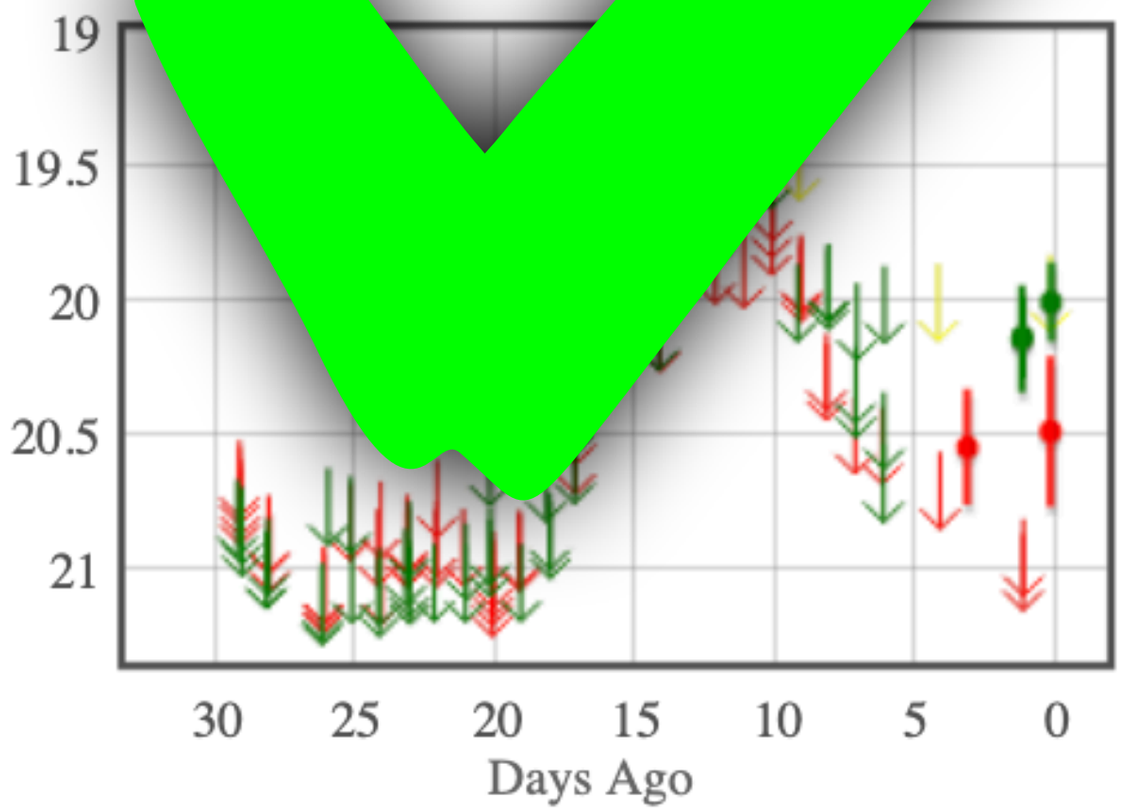

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Infant Supernovae
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Infant Supernovae
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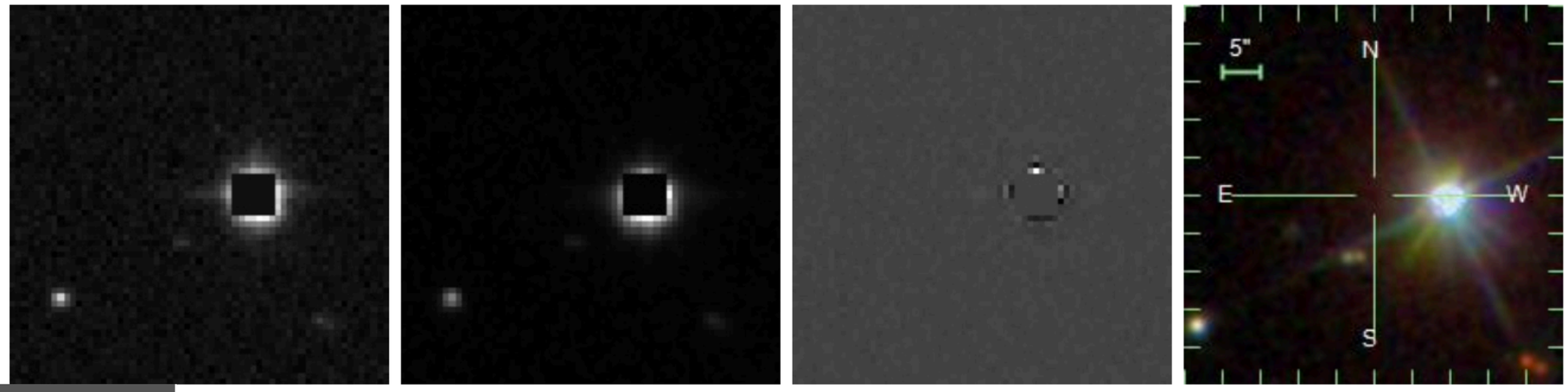
SCANNING

04:28:44
(2019-06-27)

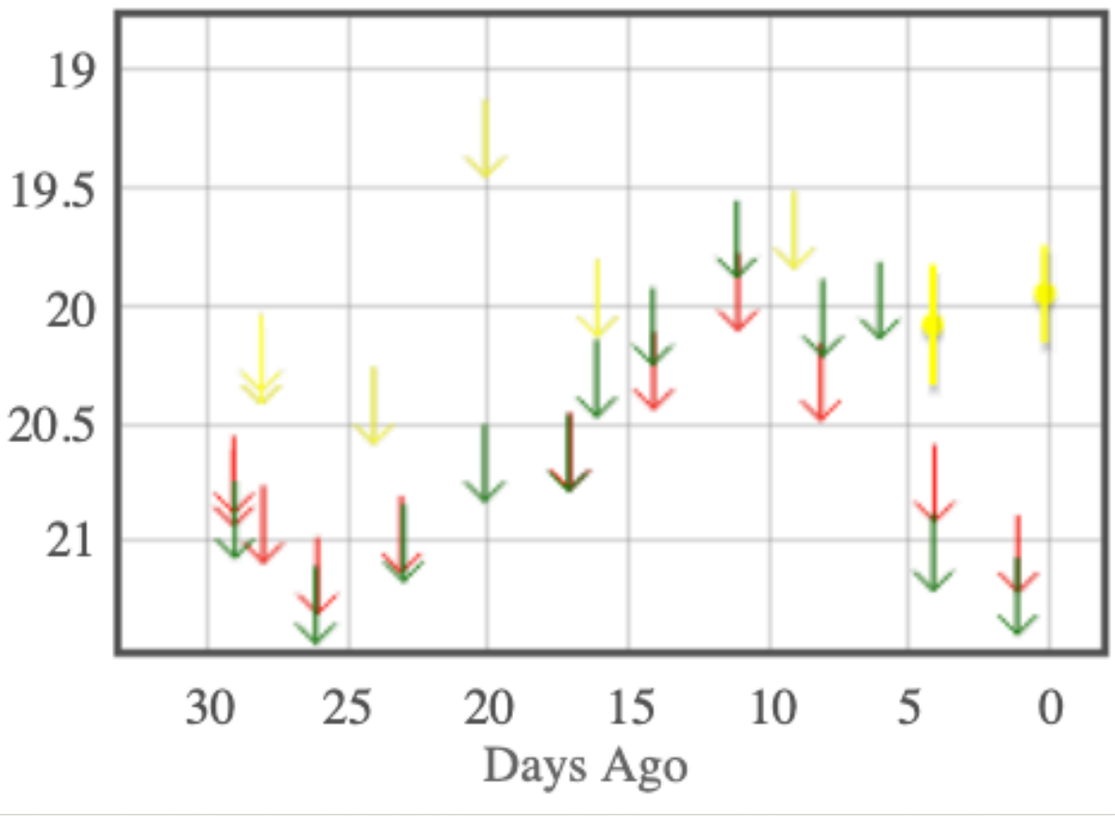
04:38:55
(2019-06-27)



PS1

Infant Supernovae

saved_by_id: False
latitude: 50.1080
magap_min_magpsf: -0.6701
elongation: 1.2421
magpsf: 19.9495
distpsnr3: 8.5345
distpsnr2: 8.4837
distpsnr1: 7.5709
ZOGY_scorr: 7.9095
sgscore1: 0.5000
rb_score: 0.4743
PS1_psf_r-mag: -999.0000
host_ZTF_ref_PSF_r-mag: 20.7170
mag_difference: -99.0000
time_difference: -3.0450
host_r-i: -1017.4964
host_g-r: 0.0000
FWHM: 2.7000
jdstarthist: 2458657.6869
jd: 2458661.6866



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Infant Supernovae

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Infant Supernovae

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SCANNING

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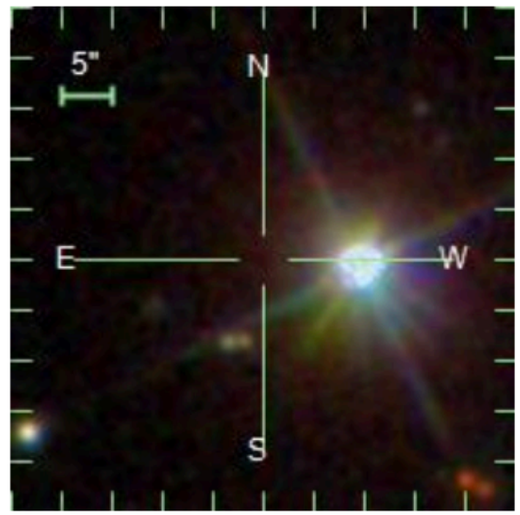

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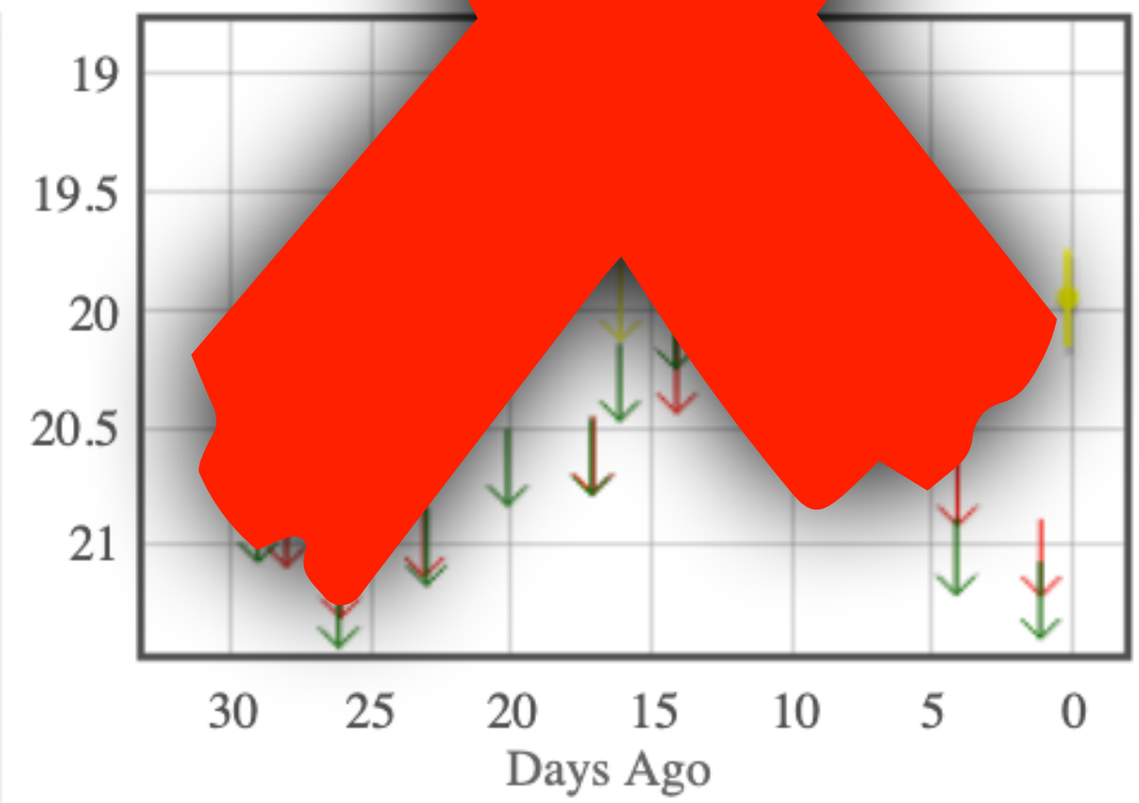

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Infant Supernovae

Save

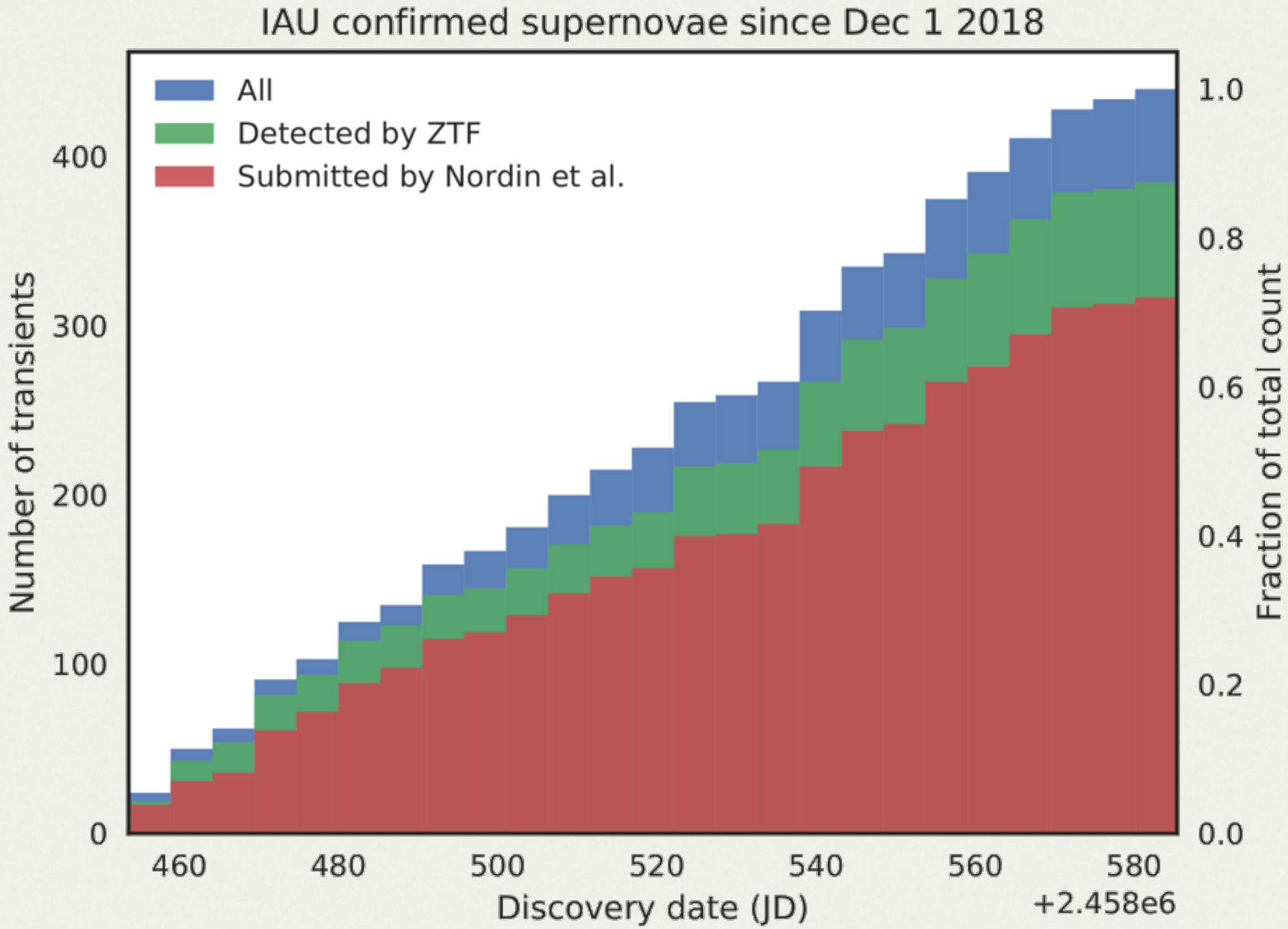
Infant Supernovae

Remove

MOTIVATION

- **Automatisation**

AMPEL NOW



Nordin et al. 2019

MOTIVATION

- **Automatisation**
- **Multi-messenger**
  - **Neutrino**
  - **GW**

AMPEL NOW

TITLE: GCN CIRCULAR
NUMBER: 25616
SUBJECT: LIGO/Virgo S190901ap: Candidates from the Zwicky Transient Facility
DATE: 19/09/02 14:32:28 GMT
FROM: Mansi M. Kasliwal at Caltech/Carnegie <mansikasliwal@gmail.com>

Erik Kool (OKC), Robert Stein (DESY), Yashvi Sharma (Caltech), Viraj Karambelkar (Caltech), Mansi Kasliwal (Caltech), Daniel Perley (LJMU), Valery Brinnel (HU Berlin), Jakob Nordin (HU Berlin), Shreya Anand (Caltech), Michael Coughlin (Caltech), Leo P. Singer (NASA GSFC), Igor Andreoni (Caltech), Gaurav Waratkar (IITB), Harsh Kumar (IITB), Maitreya Khandagale (IITB), Kunal Deshmukh (IITB), Varun Bhalerao (IITB), G. C. Anupama (IIA), Dougal Dobie (USyd/CSIRO), Brad Cenko (NASA GSFC), Tomas Ahmuda (UMD), Eric Bellm (UW), Albert Kong (NTHU), Anna Franckowiak (DESY), Pradip Gatkine (UMD)

On behalf of the Zwicky Transient Facility (ZTF) and Global Relay of Observatories Watching Transients Happen (GROWTH) collaborations

We observed the localization region of the gravitational wave trigger S190901ap (LVC et al. GCN 25606, GCN 25614) with the Palomar 48-inch telescope equipped with the 47 square degree ZTF camera (Bellm et al. 2019, Graham et al. 2019). The tiling was optimally determined and triggered

https://gcn.gsfc.nasa.gov/gcn3/25616.gcn3

AMPEL

Bad transient

Take a closer look

Do something... now!

PEOPLE

J.Nordin
(PI)

V. Brinnel
(core)

J. van Santen
(operations)

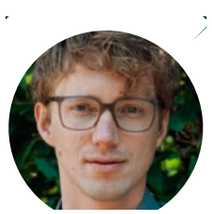
M. Giomi
(catalogs)

L. Rauch

M. Rigault

R. Stein

N. Miranda



S. van Velzen

C. Ward

U. Feindt

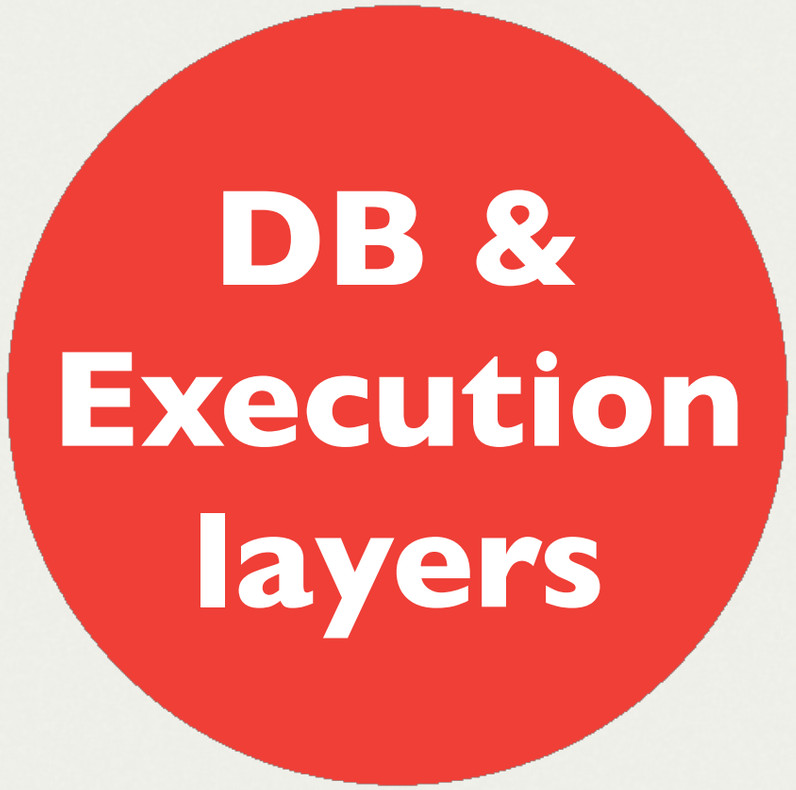
STRUCTURE

STRUCTURE

- **Execution layers (*tiers*)**

- **Channels**

STRUCTURE



EXECUTION LAYERS

- **Ampel has 4 *tiers***
- **Independently scheduled**
  (strictly speaking not a *pipeline*)
- **Each tier has a different purpose**

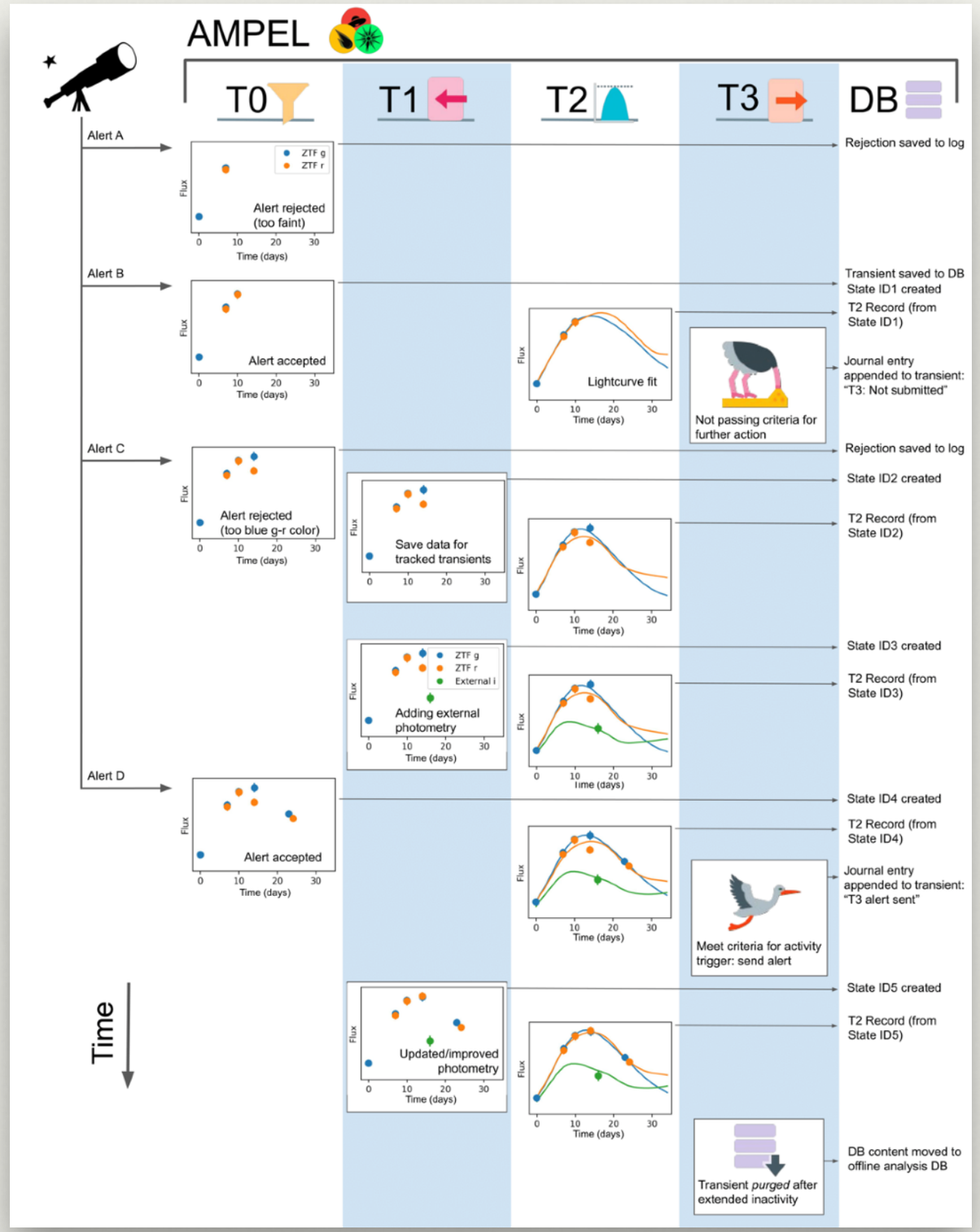
EXECUTION LAYERS

Tier	General	
0	Add	
1	Combine	
2	Augment	
3	React	

EXECUTION LAYERS

Tier	General	ZTF
0	Add	Filter & save alerts
1	Combine	Create states
2	Augment	Evaluate Priority
3	React	React

EXECUTION LAYERS



AMPEL

T0

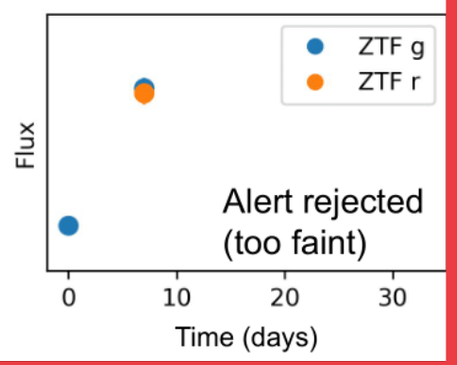
T1

T2

T3

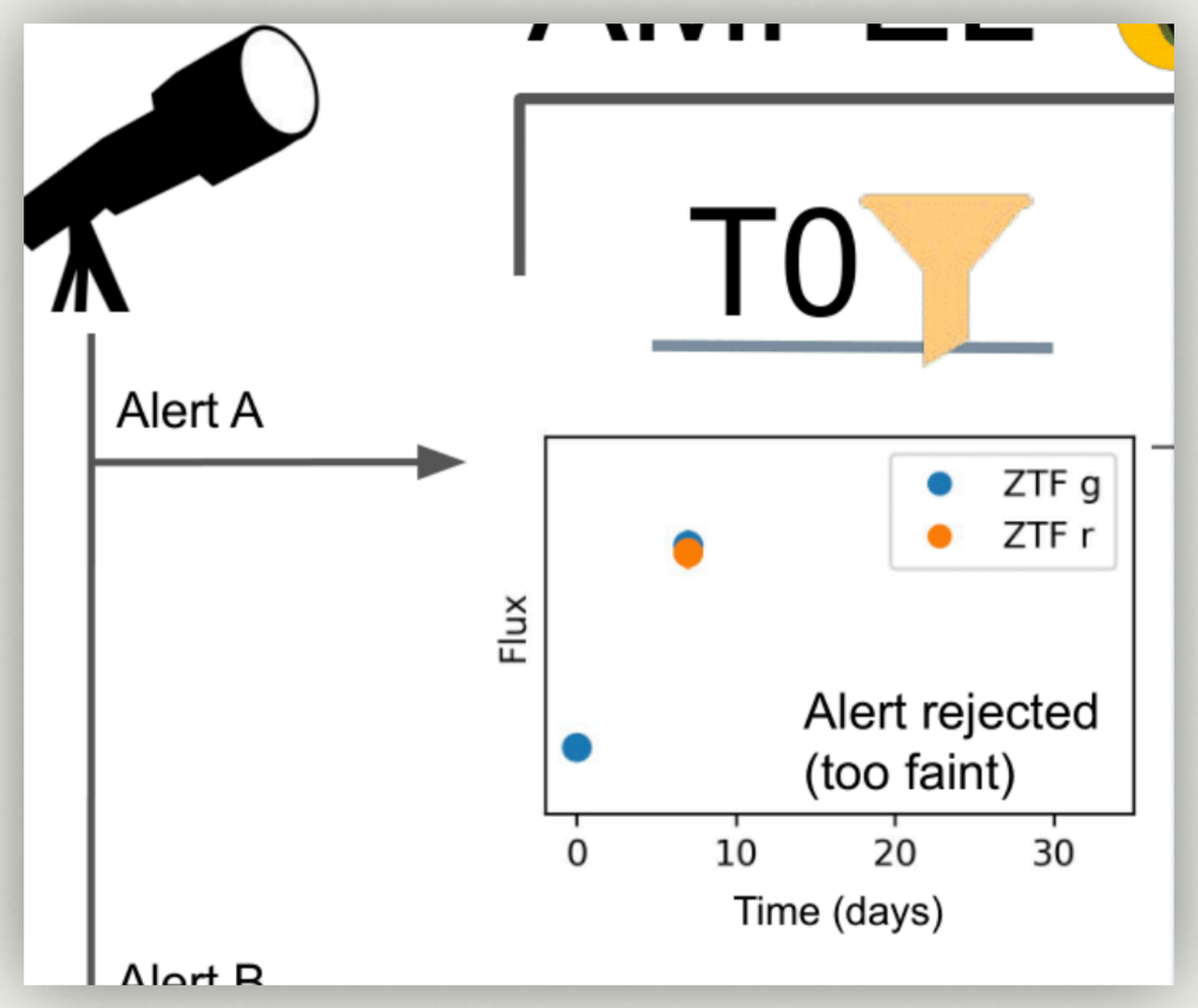
DB

Alert A



Rejection saved to log

EXECUTION LAYERS

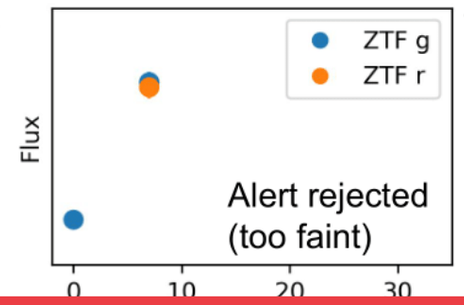


Rejection saved to logs

AMPEL

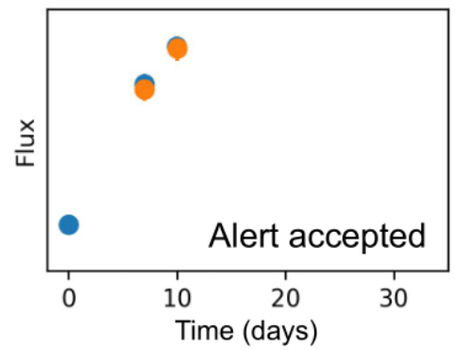
T0 | T1 | T2 | T3 | DB

Alert A



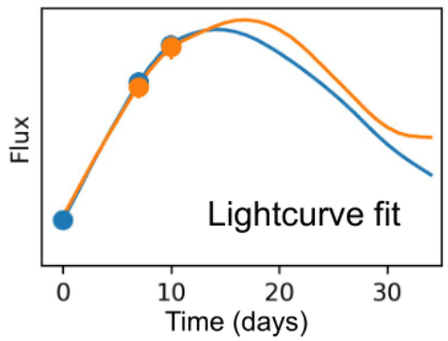
Rejection saved to log

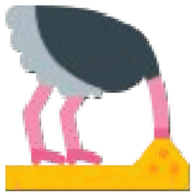
Alert B



Transient saved to DB
State ID1 created

T2 Record (from State ID1)

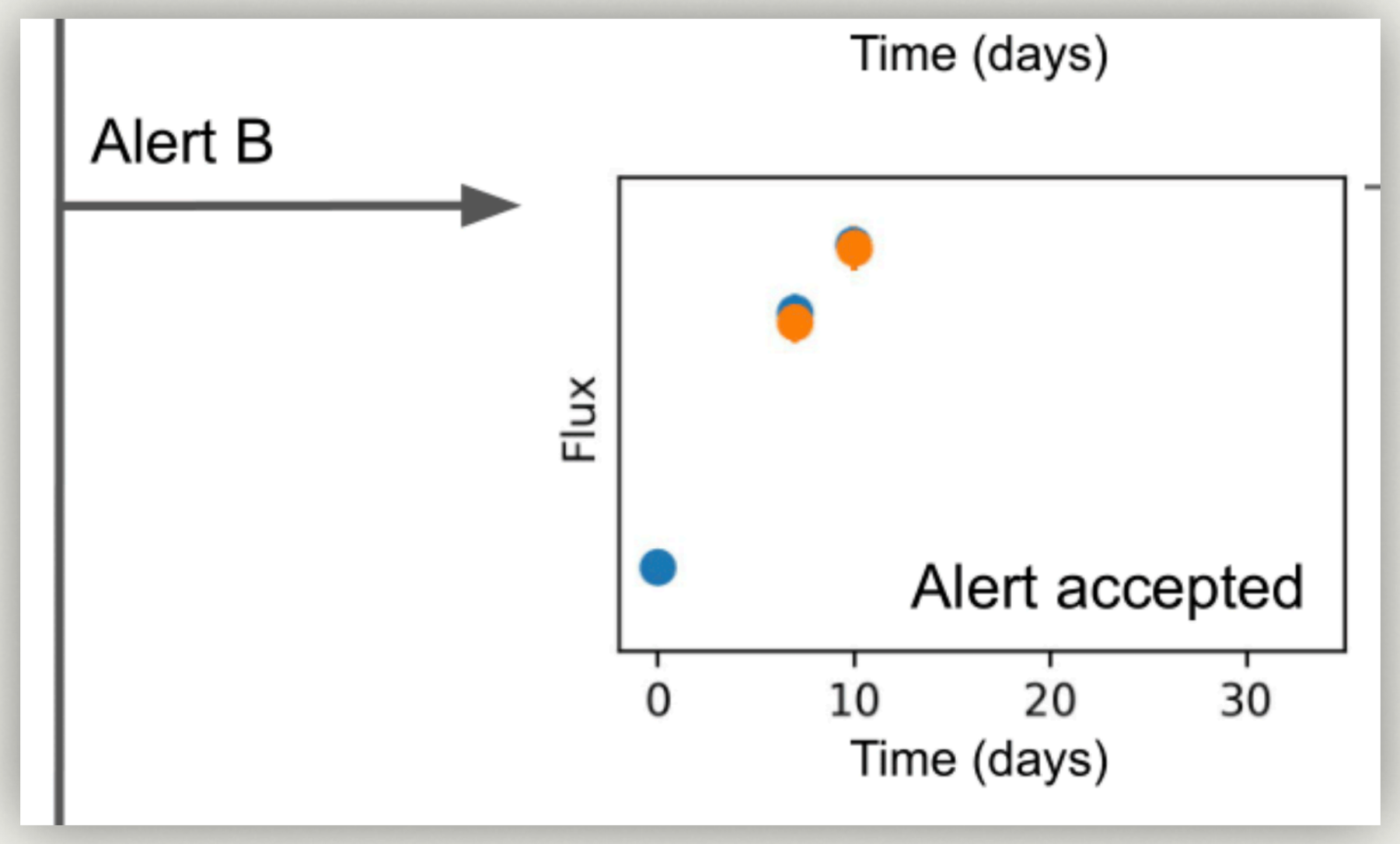




Not passing criteria for further action

Journal entry appended to transient: “T3: Not submitted”

EXECUTION LAYERS

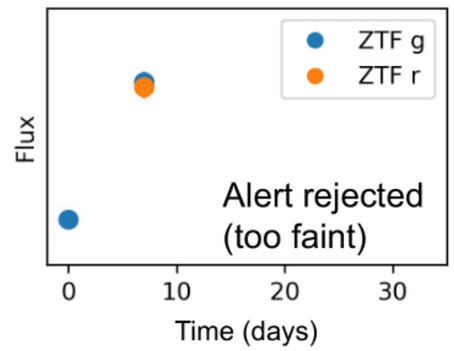


Alert passes filter criteria

AMPEL

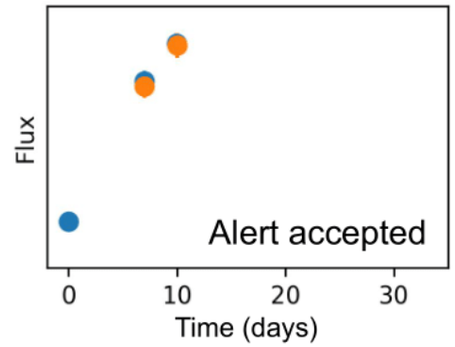
T0 | T1 | T2 | T3 | DB

Alert A



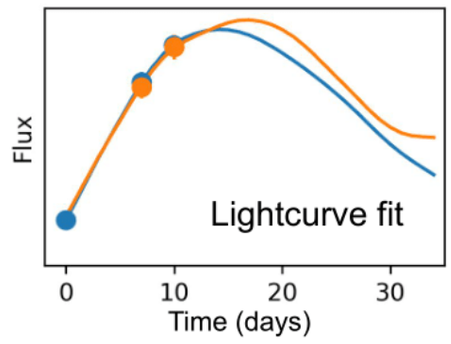
Rejection saved to log

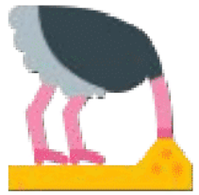
Alert B



Transient saved to DB
State ID1 created

T2 Record (from State ID1)

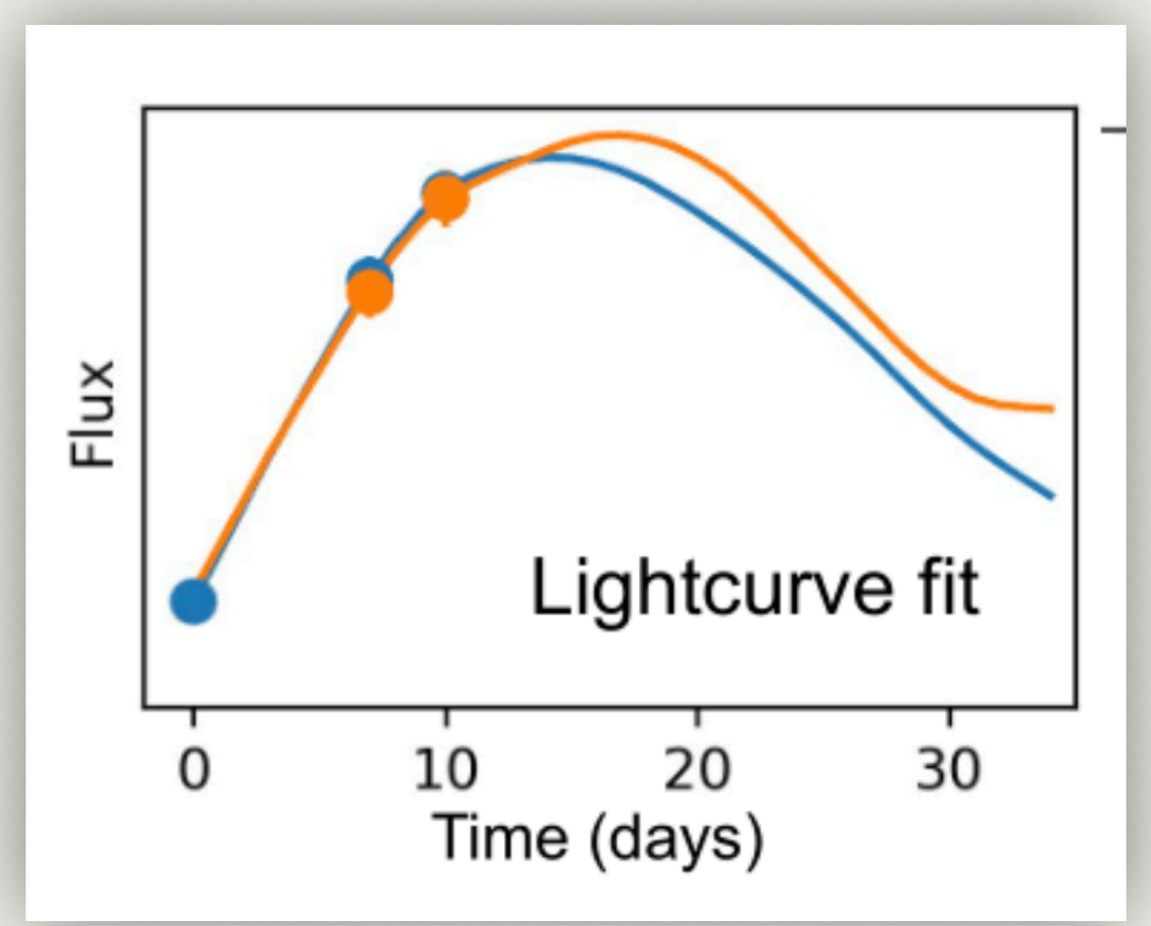




Not passing criteria for further action

Journal entry appended to transient: “T3: Not submitted”

EXECUTION LAYERS

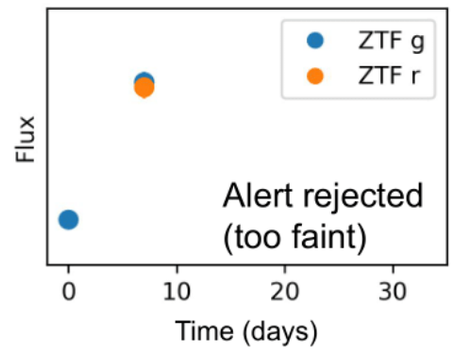


T2 unit *SNCOSMO* is run

AMPEL

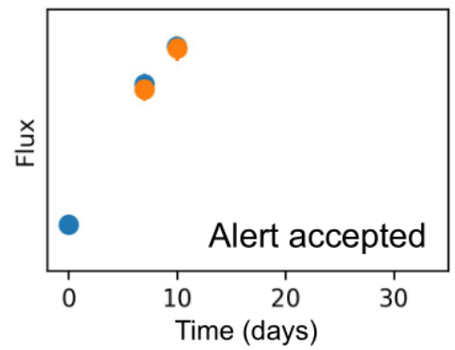
T0 | T1 | T2 | T3 | DB

Alert A

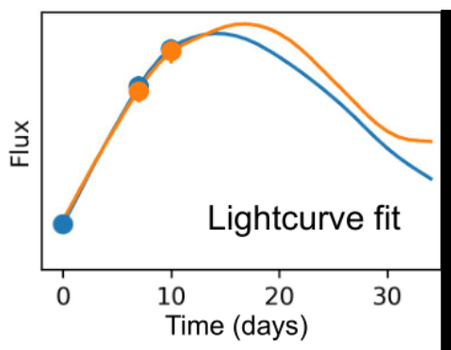


Rejection saved to log

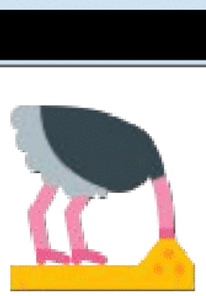
Alert B



Transient saved to DB
State ID1 created



T2 Record (from State ID1)



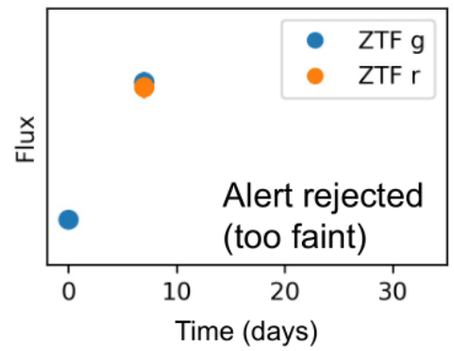
Not passing criteria for further action

Journal entry appended to transient: "T3: Not submitted"

AMPEL

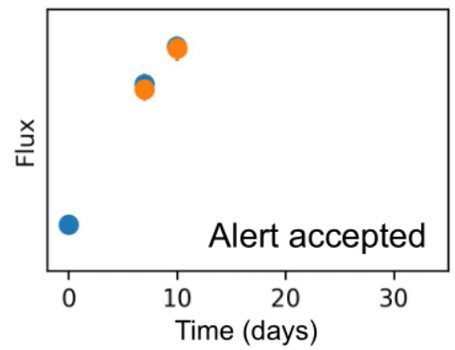
T0 | T1 | T2 | T3 | DB

Alert A



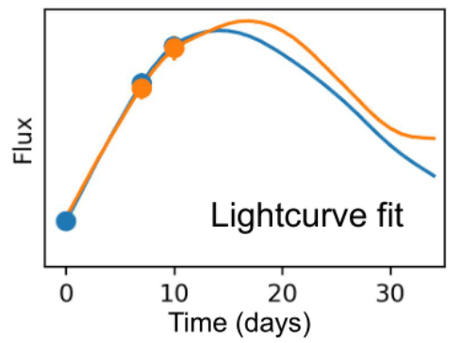
Rejection saved to log

Alert B



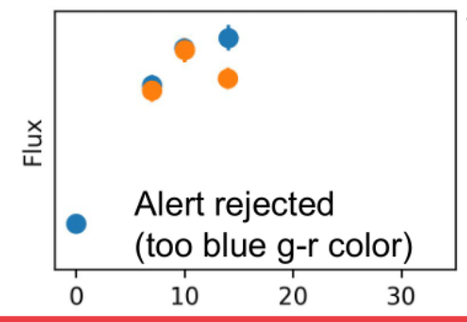
Transient saved to DB
State ID1 created

T2 Record (from State ID1)

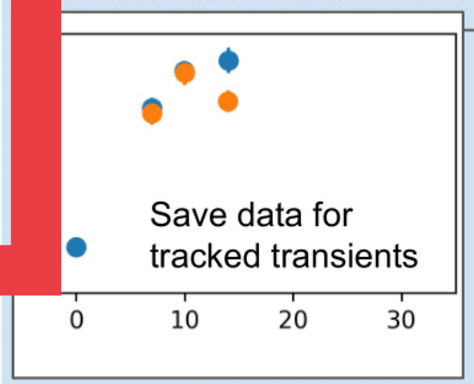


Journal entry
appended to transient:
“T3: Not submitted”

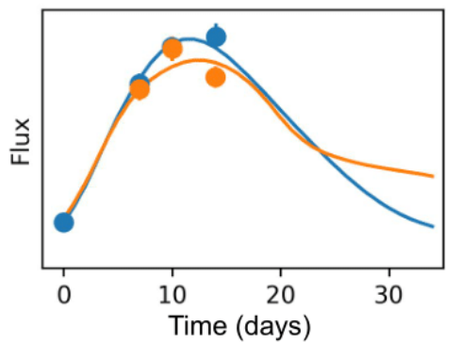
Alert C



Rejection saved to log

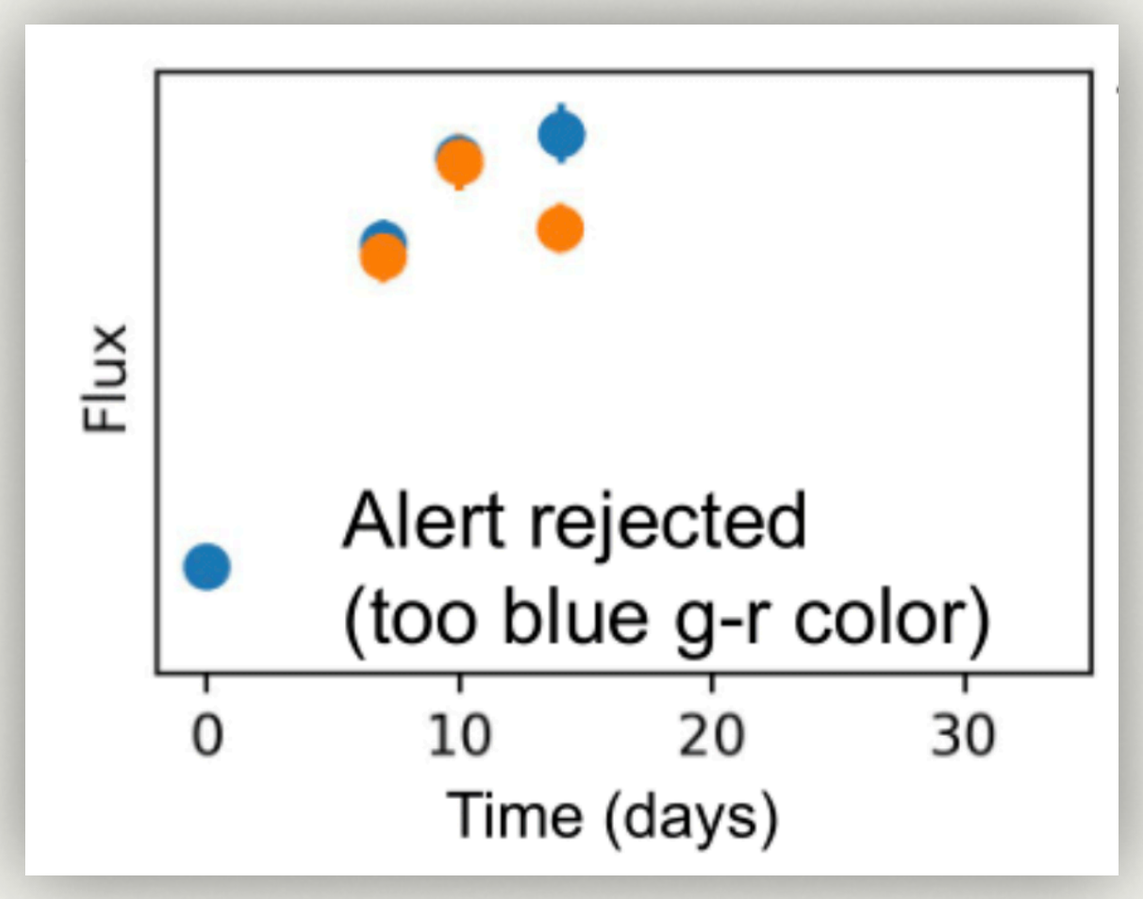


State ID2 created



T2 Record (from State ID2)

EXECUTION LAYERS



Filter rejects alert but …

AMPEL

T0 T1 T2 T3 DB

Alert A

ZTF g
ZTF r
Flux

Rejection saved to log

Alert B

Alert is accepted nonetheless because the transient already exists in the DB

Alert C

Flux

Alert rejected
(too blue g-r color)

0 10 20 30
Time (days)

Flux

Save data for
tracked transients

0 10 20 30

0 10 20 30
Time (days)

Rejection saved to log

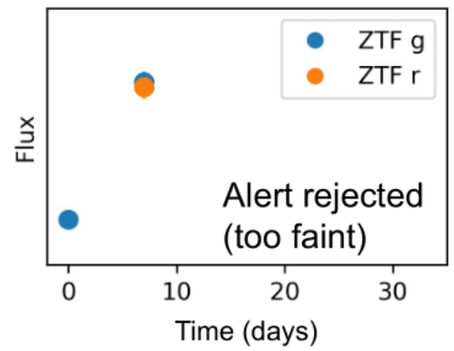
State ID2 created

T2 Record (from
State ID2)

AMPEL

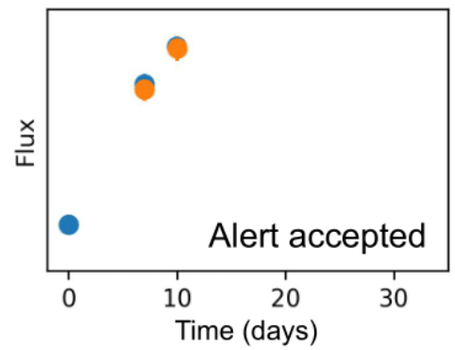
T0 | T1 | T2 | T3 | DB

Alert A



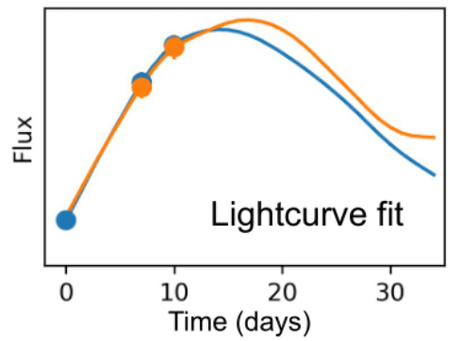
Rejection saved to log

Alert B



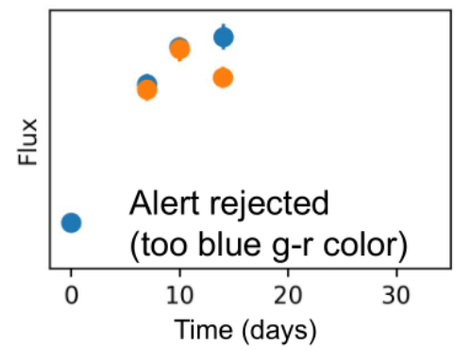
Transient saved to DB
State ID1 created

T2 Record (from State ID1)

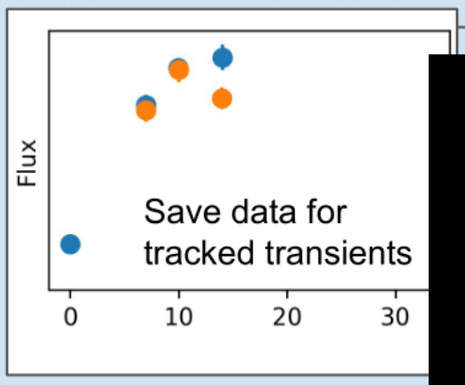


Journal entry
appended to transient:
“T3: Not submitted”

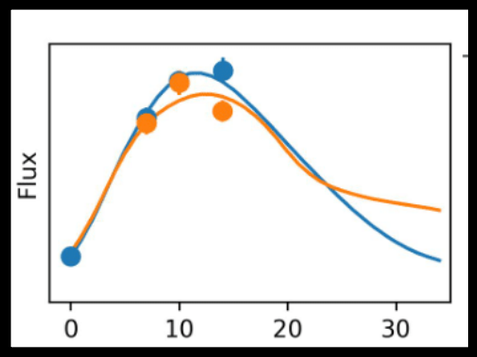
Alert C



Rejection saved to log

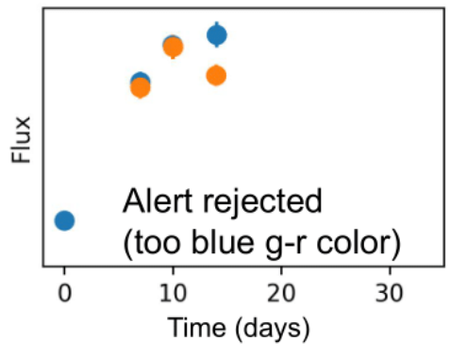


State ID2 created

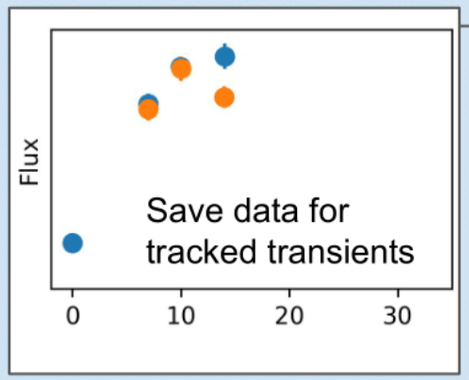


T2 Record (from State ID2)

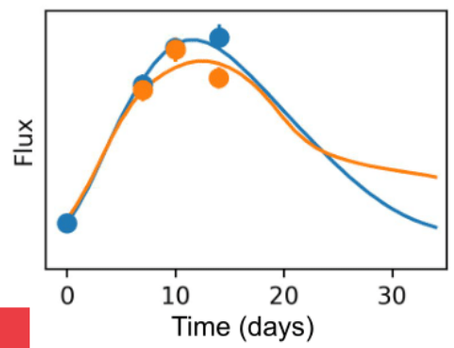
Alert C



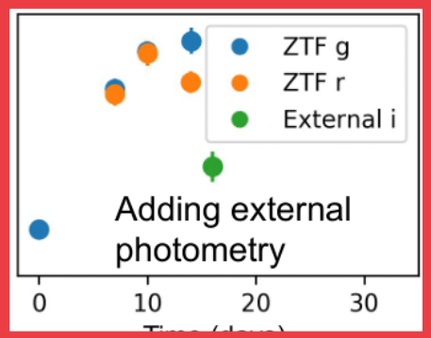
Rejection saved to log



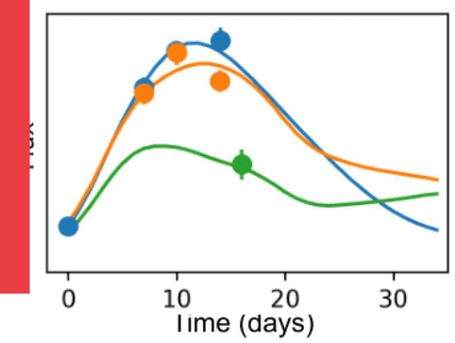
State ID2 created



T2 Record (from
State ID2)

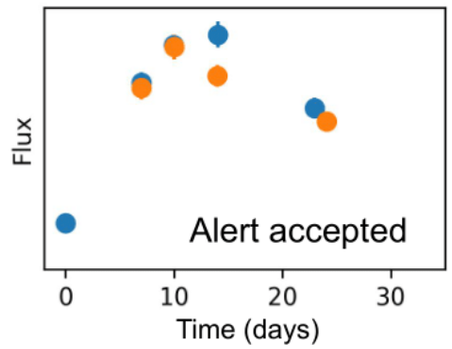


State ID3 created

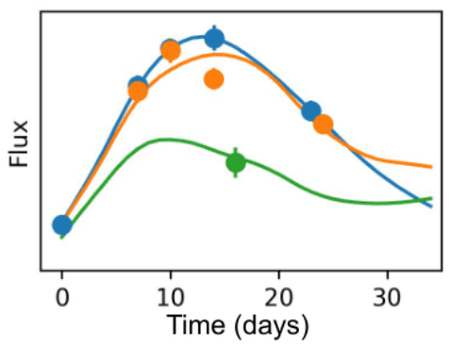


T2 Record (from
State ID3)

Alert D



State ID4 created



T2 Record (from
State ID4)

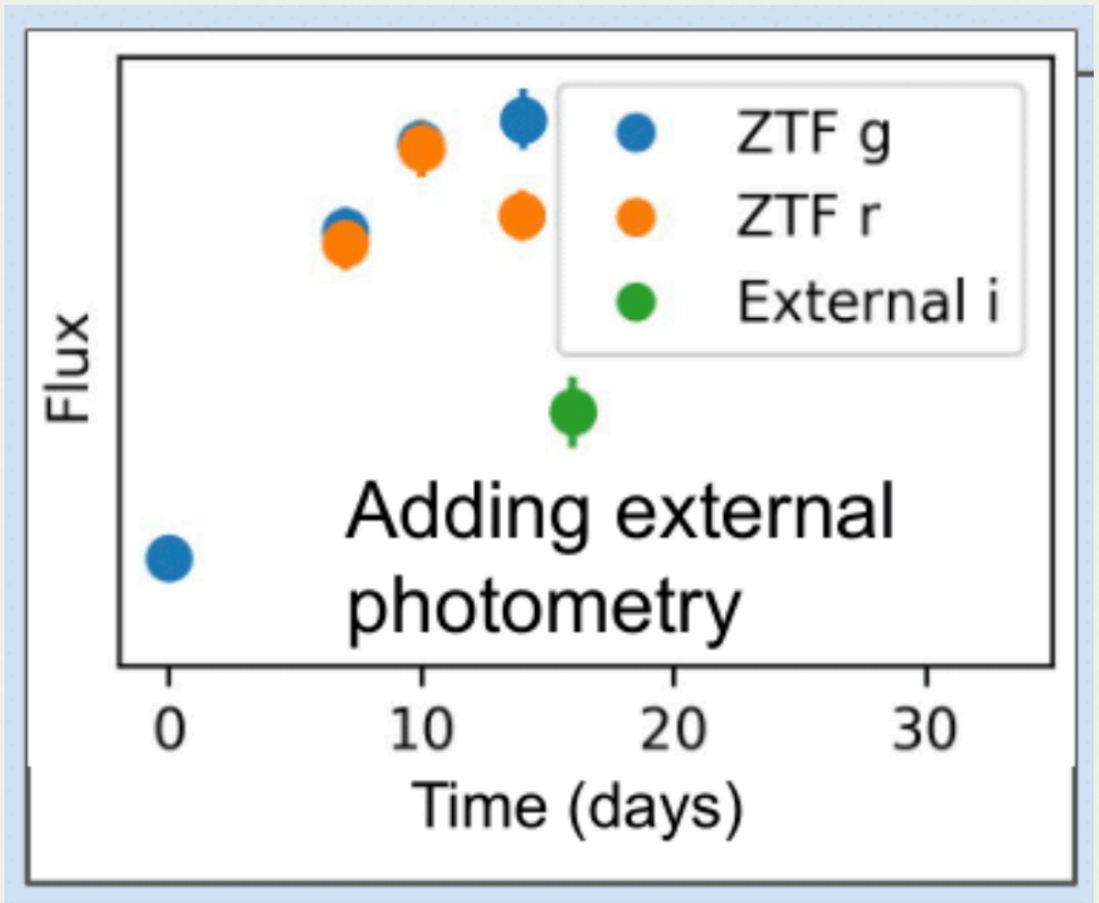
Journal entry
appended to transient:
“T3 alert sent”

Time

State ID5 created

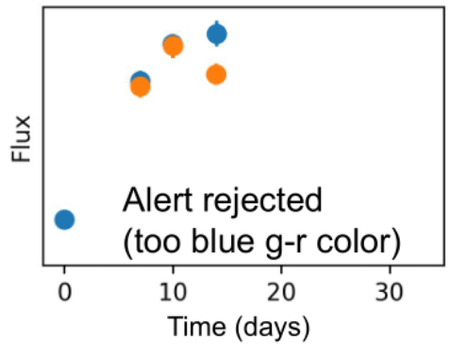
T2 Record (from
State ID5)

EXECUTION LAYERS

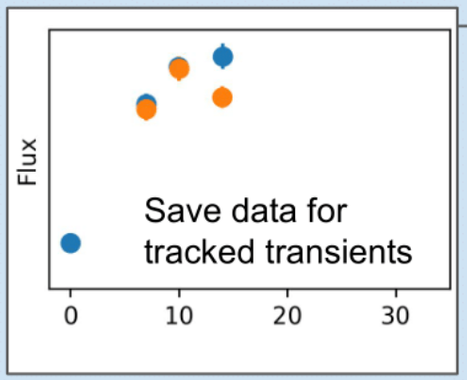


Create new state with external photometry

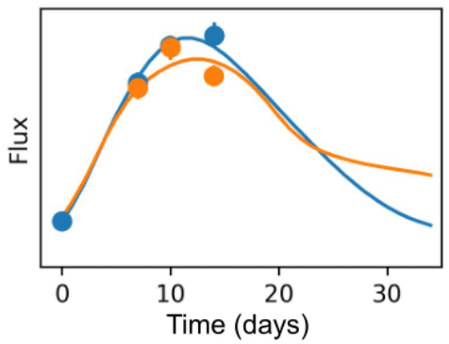
Alert C



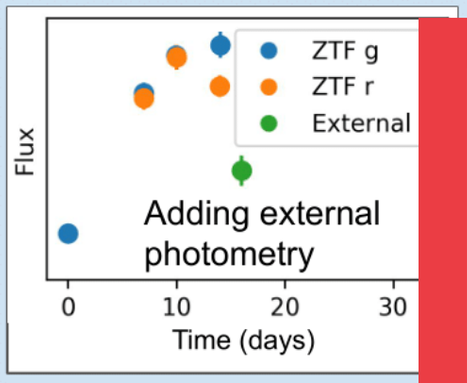
Rejection saved to log



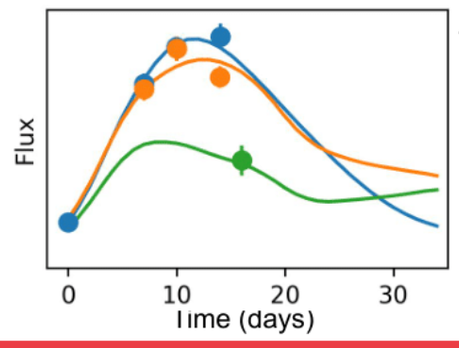
State ID2 created



T2 Record (from State ID2)

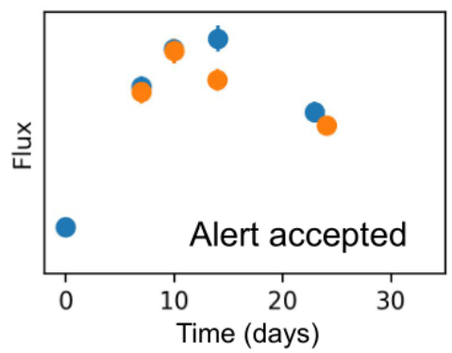


State ID3 created

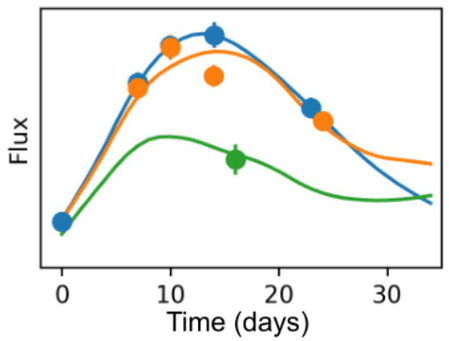


T2 Record (from State ID3)

Alert D

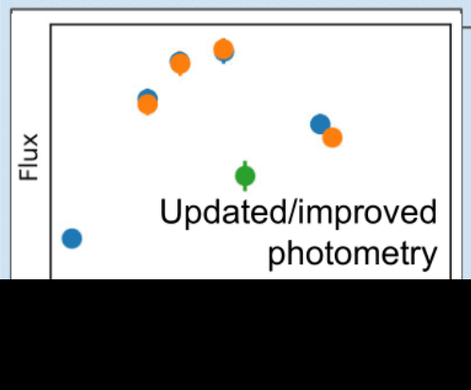


State ID4 created

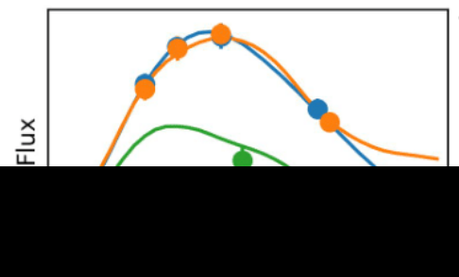


T2 Record (from State ID4)

Journal entry appended to transient: “T3 alert sent”



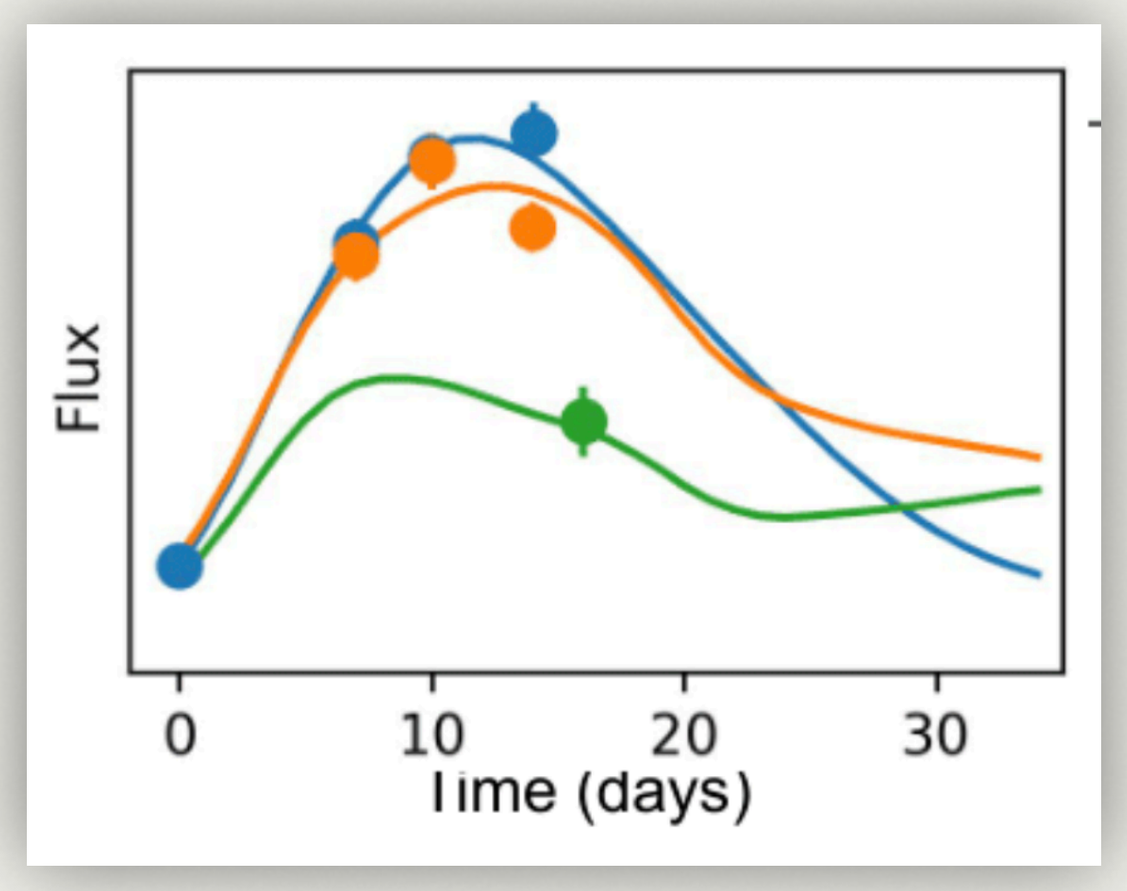
State ID5 created



T2 Record (from State ID5)

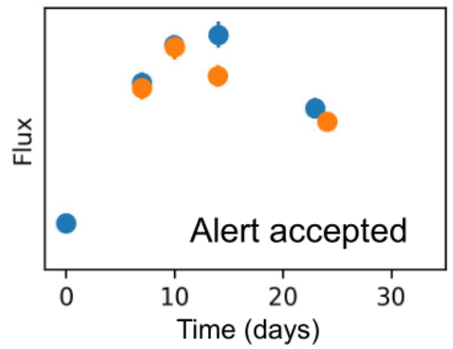
Time

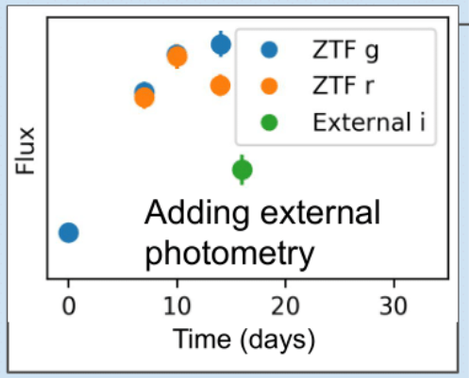
EXECUTION LAYERS

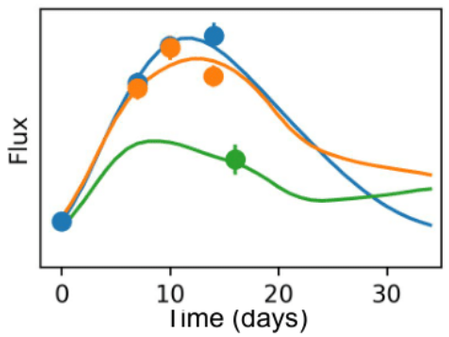


For which we fit lightcurve templates (T2)

Alert D





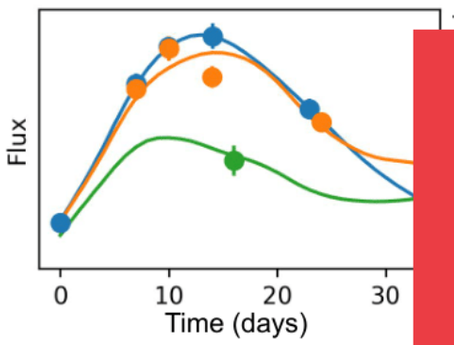


State ID3 created

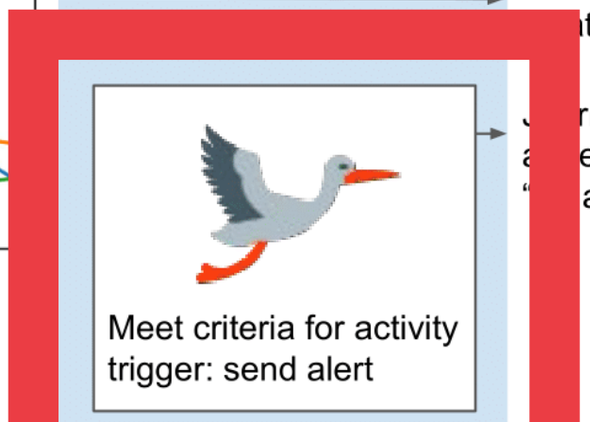
T2 Record (from State ID3)

State ID4 created

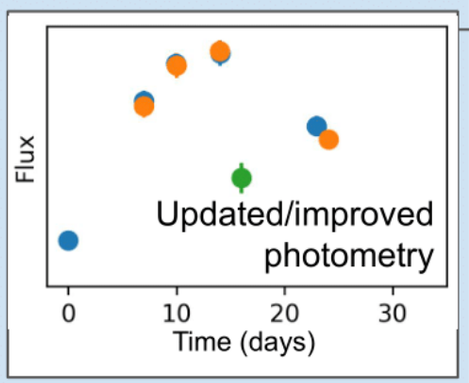
T2 Record (from te ID4)

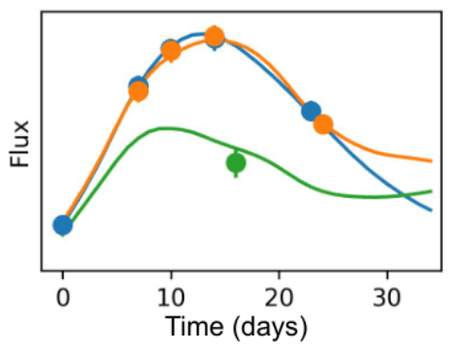


rnal entry
ended to transient:
alert sent”

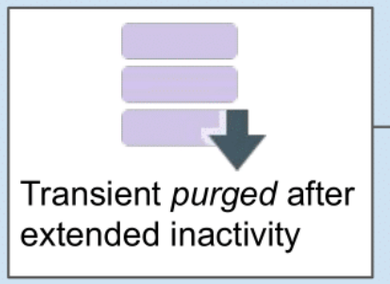


te ID5 created





T2 Record (from State ID5)



DB content moved to offline analysis DB

Time

CHANNEL

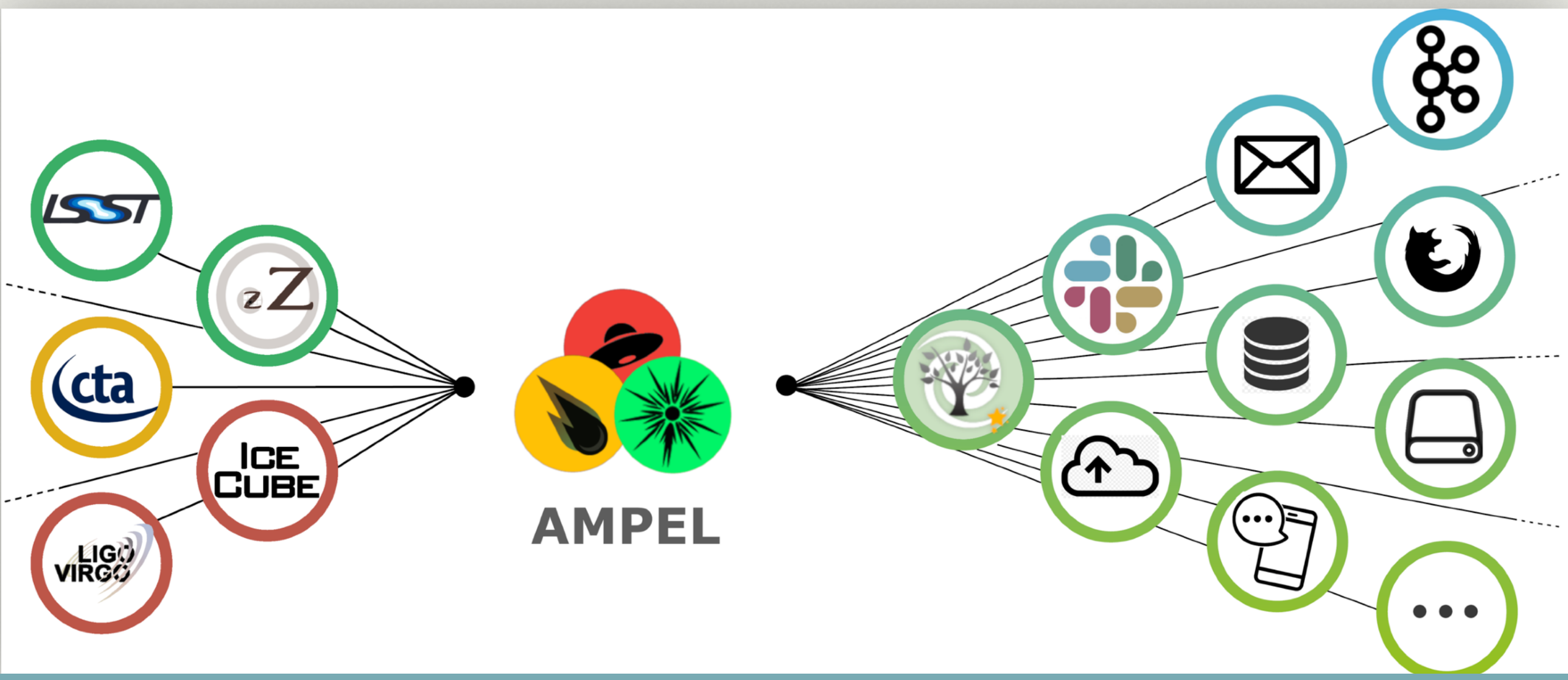
- **Sets the following parameters:**
  - **Which instruments ?**
  - **Which filter ?**
  - **Which T2 units ?**
  - **Which T3 units ?**

DEFINE YOUR AMPEL

- **How transient(s) should be analysed**
- **What are your outputs**

Ampel applies "analysis schema" consistently to a real-time data

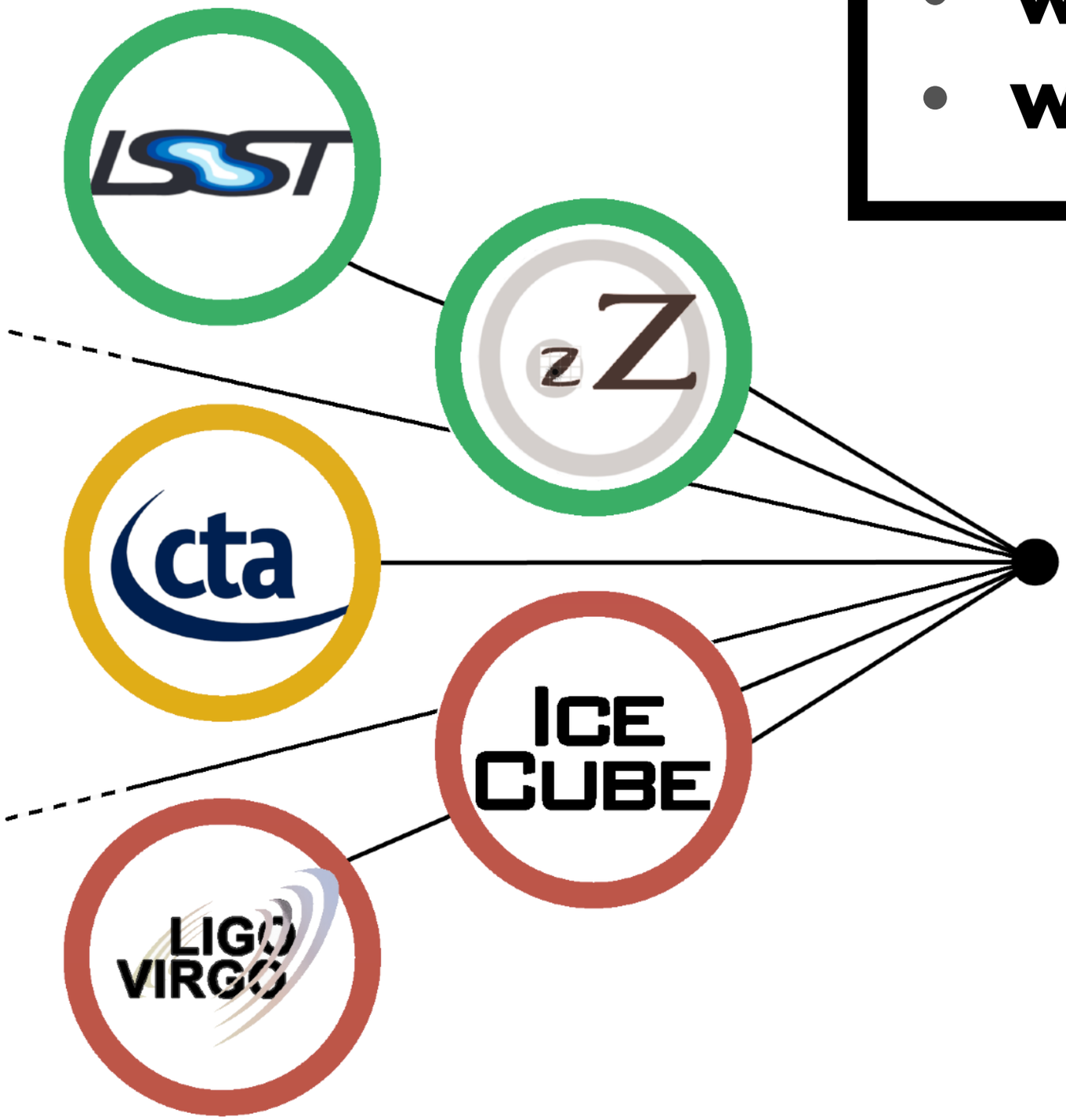
AMPEL



T0 T1/T2 T3

T0 channel config

- **which instruments?**
- **which filters?**

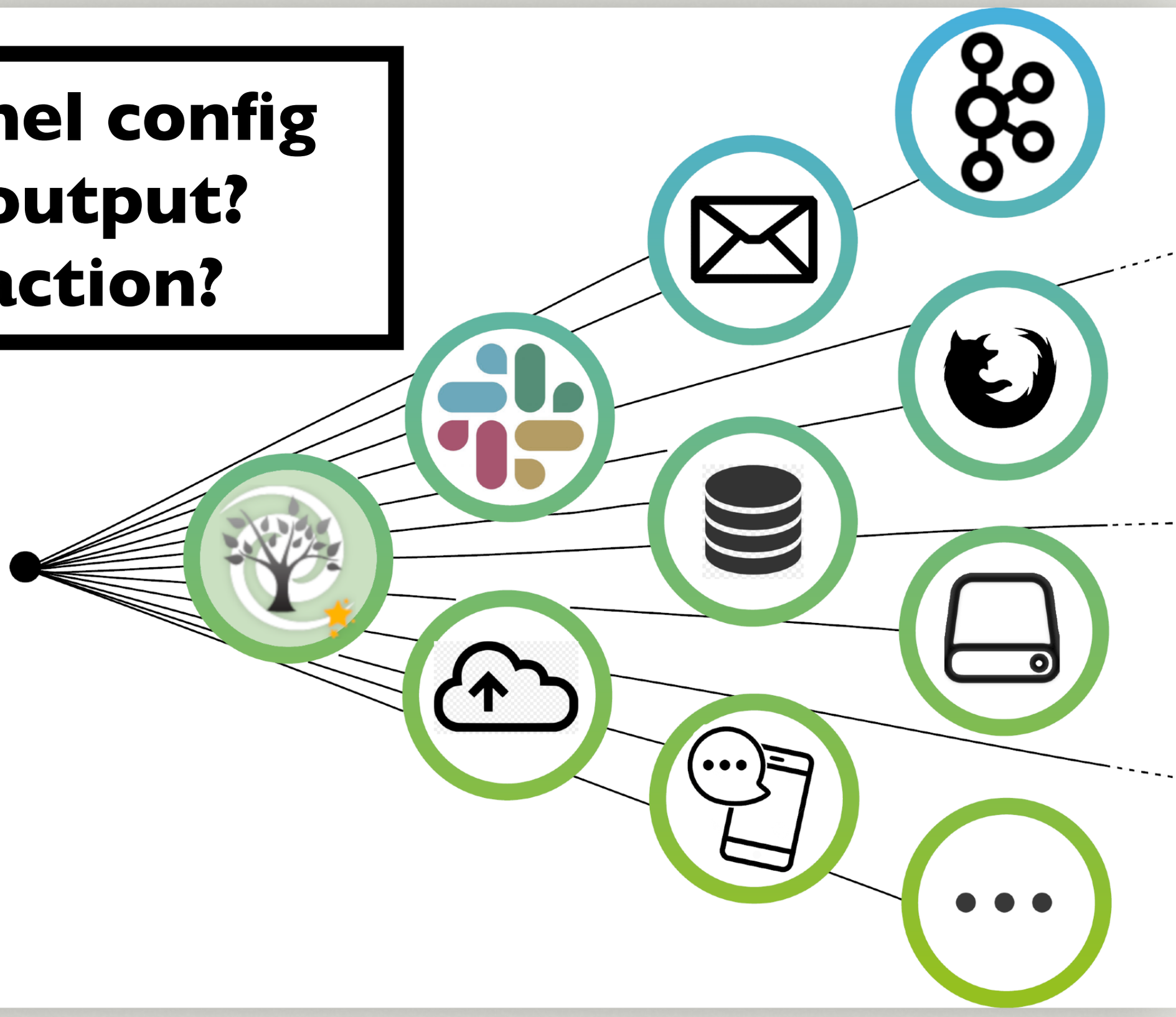


AMPEL

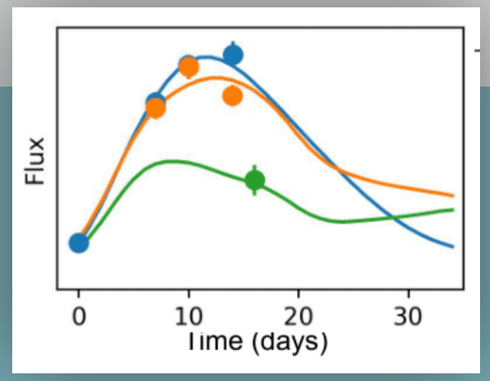
T3 channel config

- **which output?**
- **which action?**

AMPEL



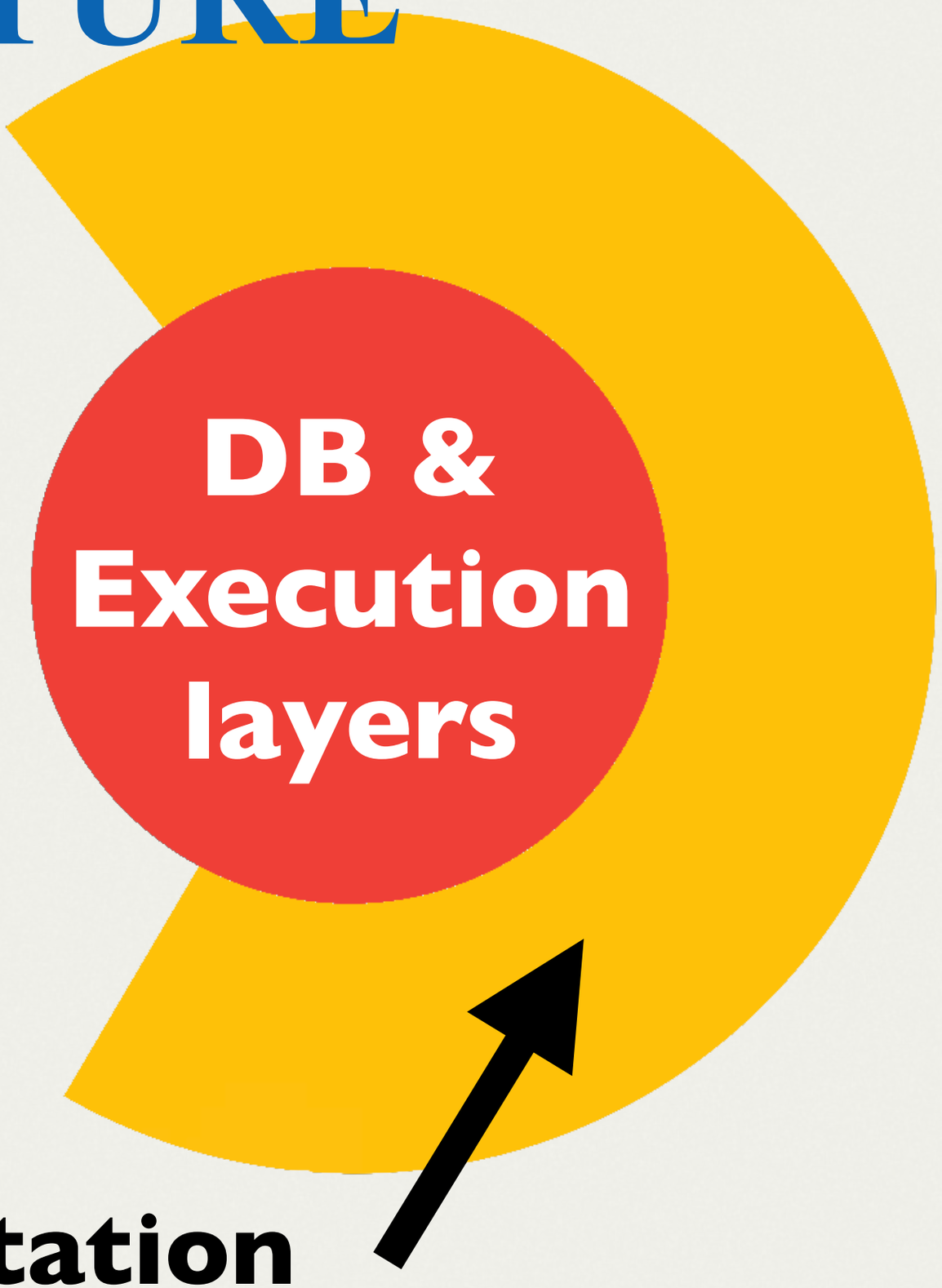
YOUR AMPEL



Lightcurve param

+ *host info* + *Redshift* …

STRUCTURE



Python implementation

PYTHON IMPLEMENTATION

- **Abstract classes regulate input / output**
- **Ampel units stored in GitHub repositories**
- **Ampel-core + Ampel-base is ~20K lines of code**

CONTRIBUTED UNITS

AmpelProject / **Ampel-contrib-HU** Private

Unwatch 13 | Star 0 | Fork 0

Code | Issues 4 | Pull requests 1 | Projects 0 | Wiki | Security | Insights | Settings

Branch: **master** **Ampel-contrib-HU** / ampel / contrib / hu / t2 / **T2SNCosmo.py** Find file | Copy path

jvansanten T2SNCosmo: back off on errno 24 41fbf42 9 days ago

5 contributors

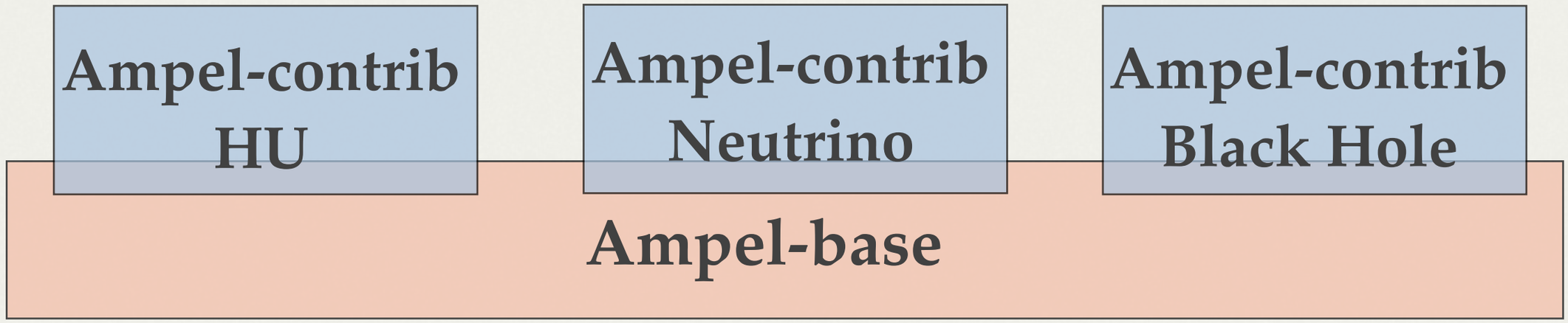
Exec File | 386 lines (321 sloc) | 14.3 KB Raw | Blame | History

```
1  #!/usr/bin/env python
2  # -*- coding: utf-8 -*-
```

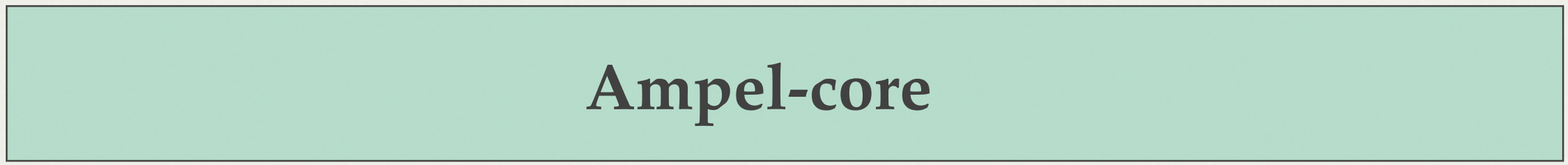
Contributions

Light curve fitter

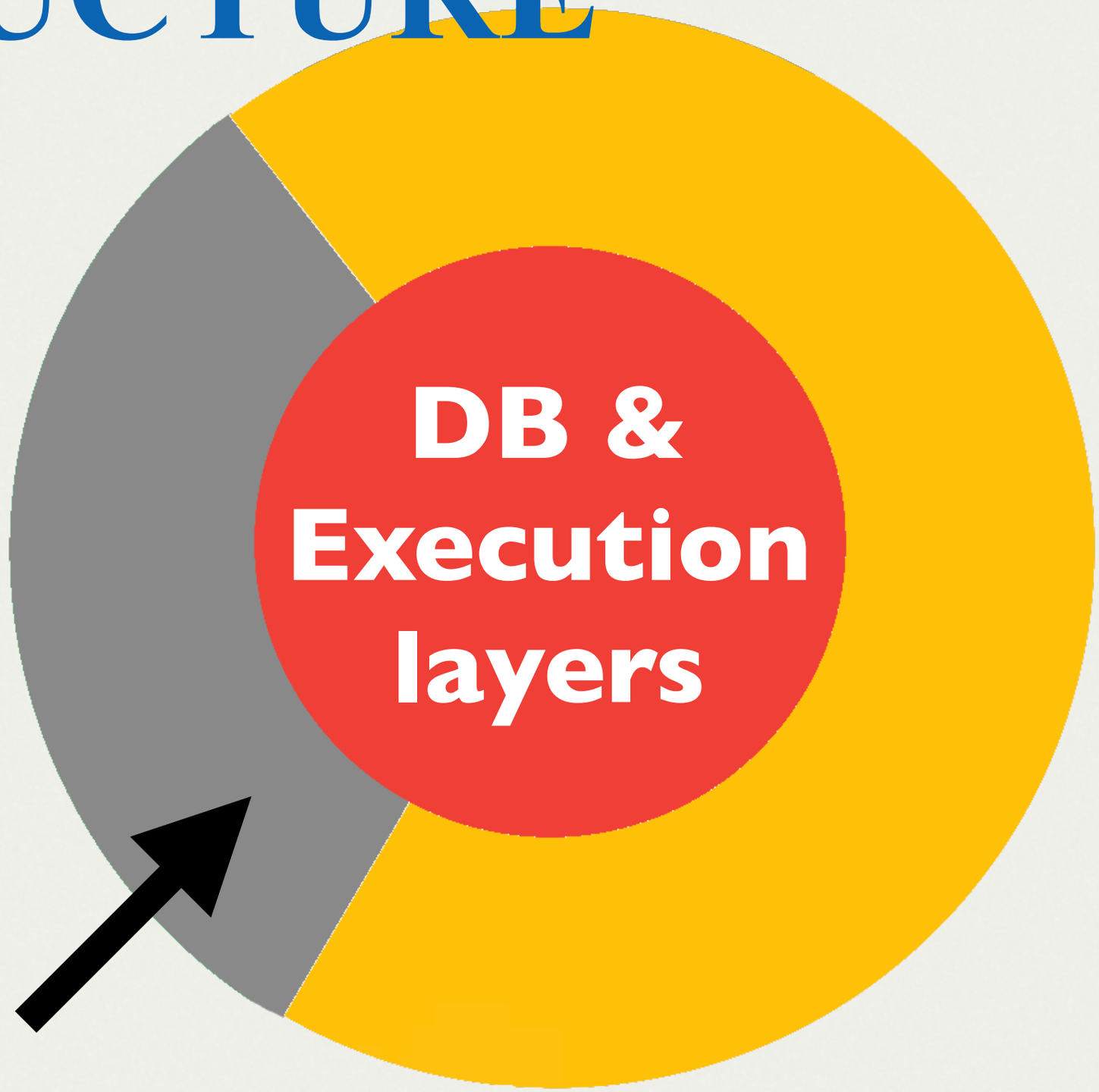
CODE REPOSITORIES



Internal

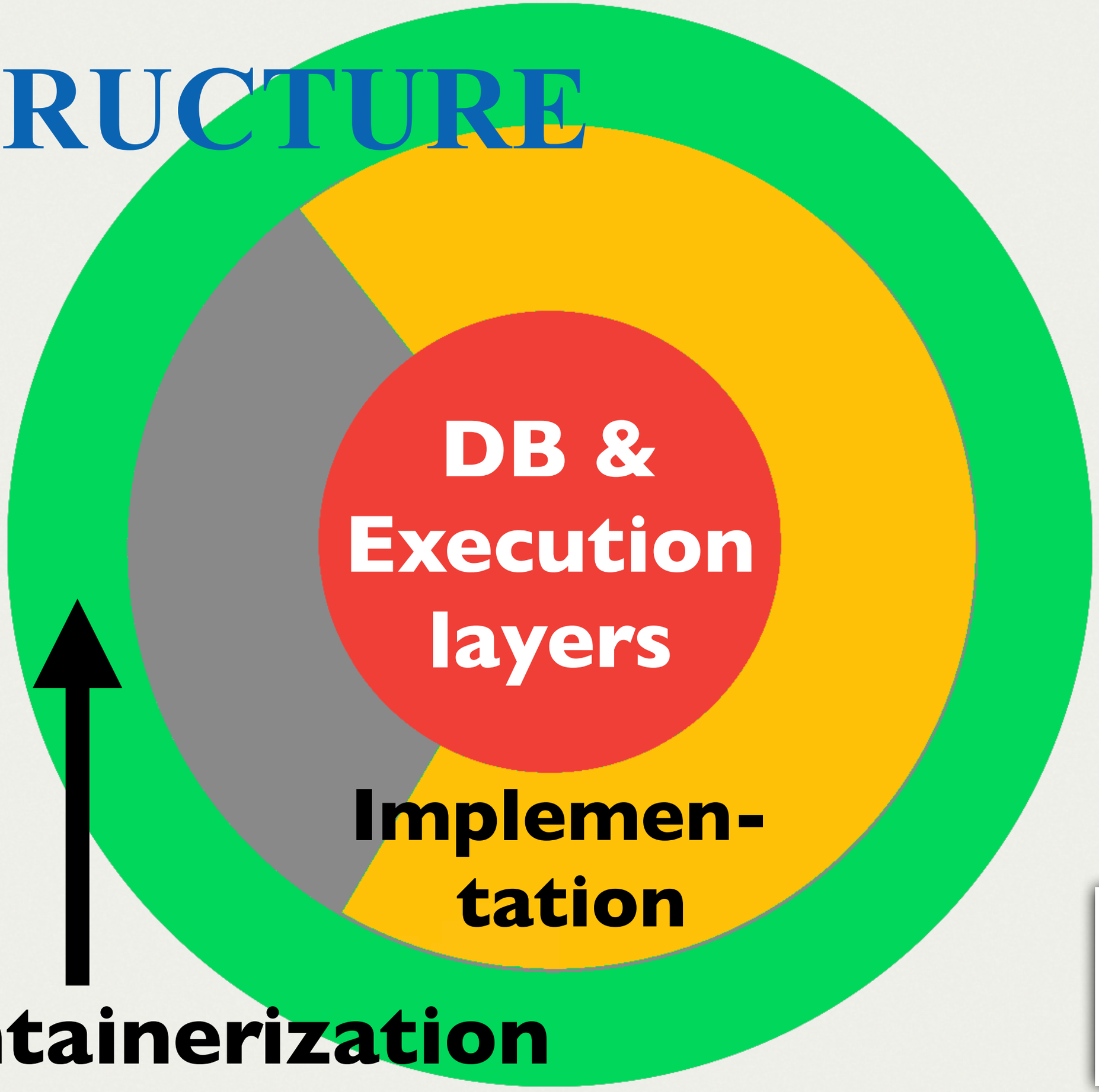


STRUCTURE



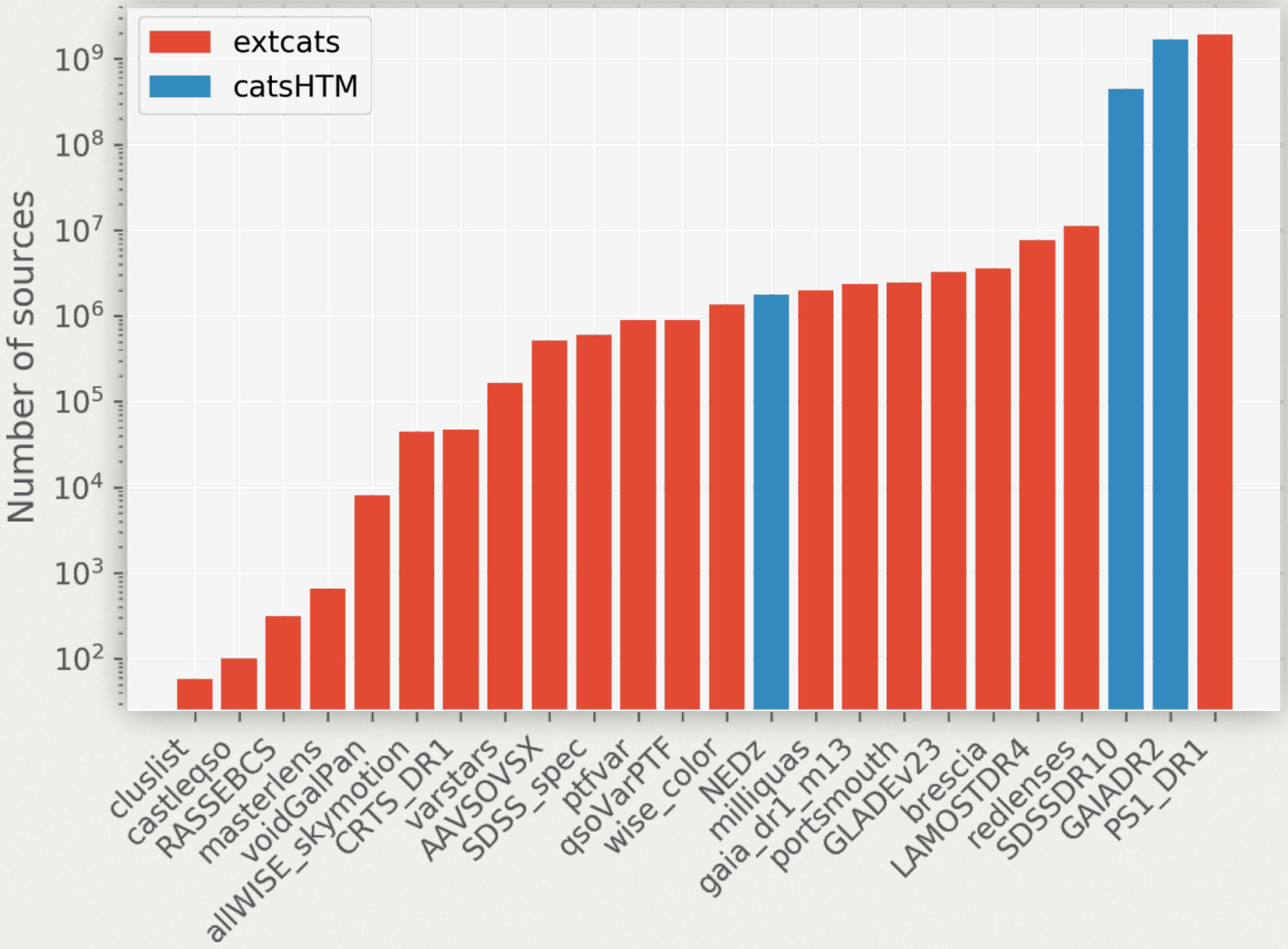
Other implementation are possible

STRUCTURE

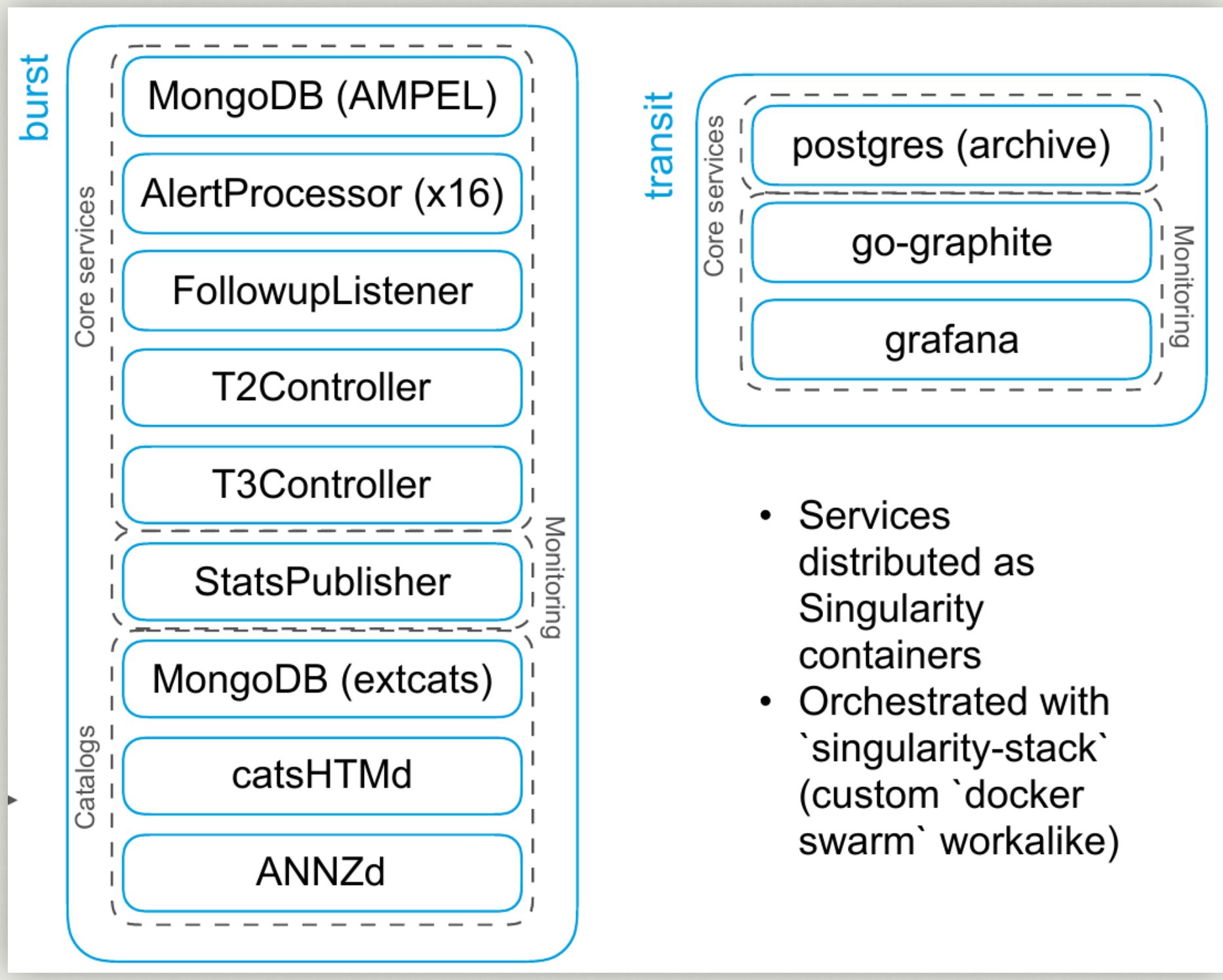


LIVE AMPEL

CATALOGS


extcats
catsHTM
Number of sources
10^9
10^8
10^7
10^6
10^5
10^4
10^3
10^2
cluslist
castleqso
RASSEBCS
masterlens
voidGalPan
allWISE_skymotion
CRTS_DR1
varstars
AAVSOVSX
SDSS_spec
ptfvar
qsoVarPTF
wise_color
NEDz
milliquas
gaia_dr1_m13
portsmouth
GLADEv23
brescia
LAMOSTDR4
redlenses
SDSSDR10
GAIADR2
PS1_DR1

THE AMPEL STACK



- Services distributed as Singularity containers
- Orchestrated with `singularity-stack` (custom `docker swarm` workalike)

THE AMPEL STACK

WHY BOTHER?


COST
BENEFITS

AMPEL

COSTS: *TIME*

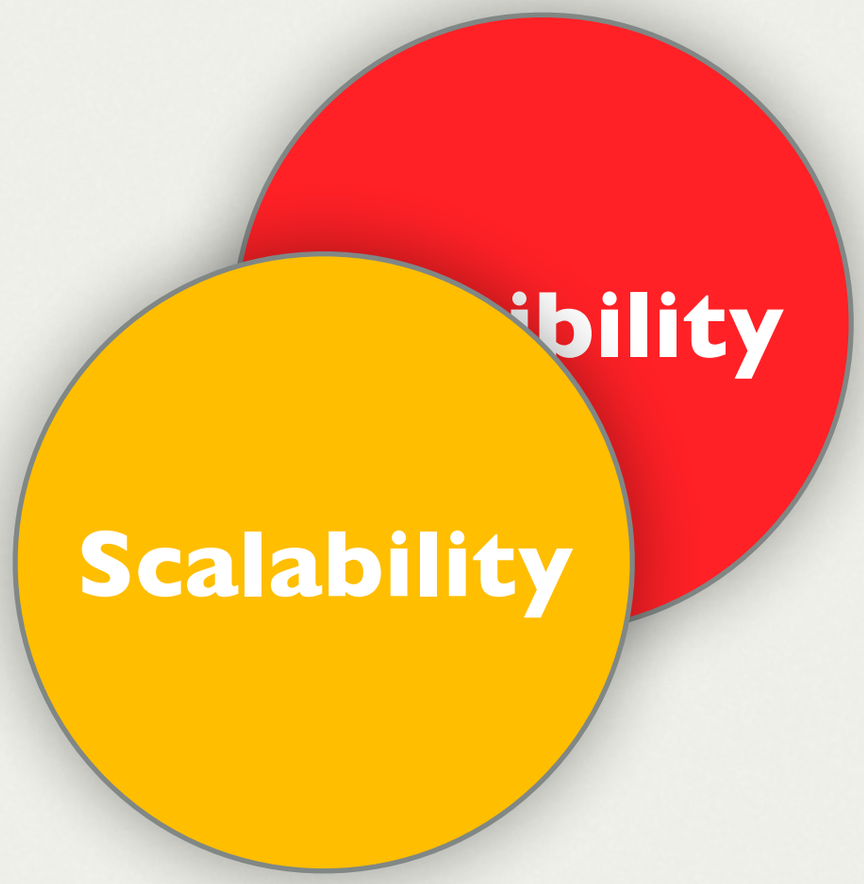
- **Understand how AMPEL works**
- **Break down your analysis in adequate independent units**

AMPEL

BENEFITS:

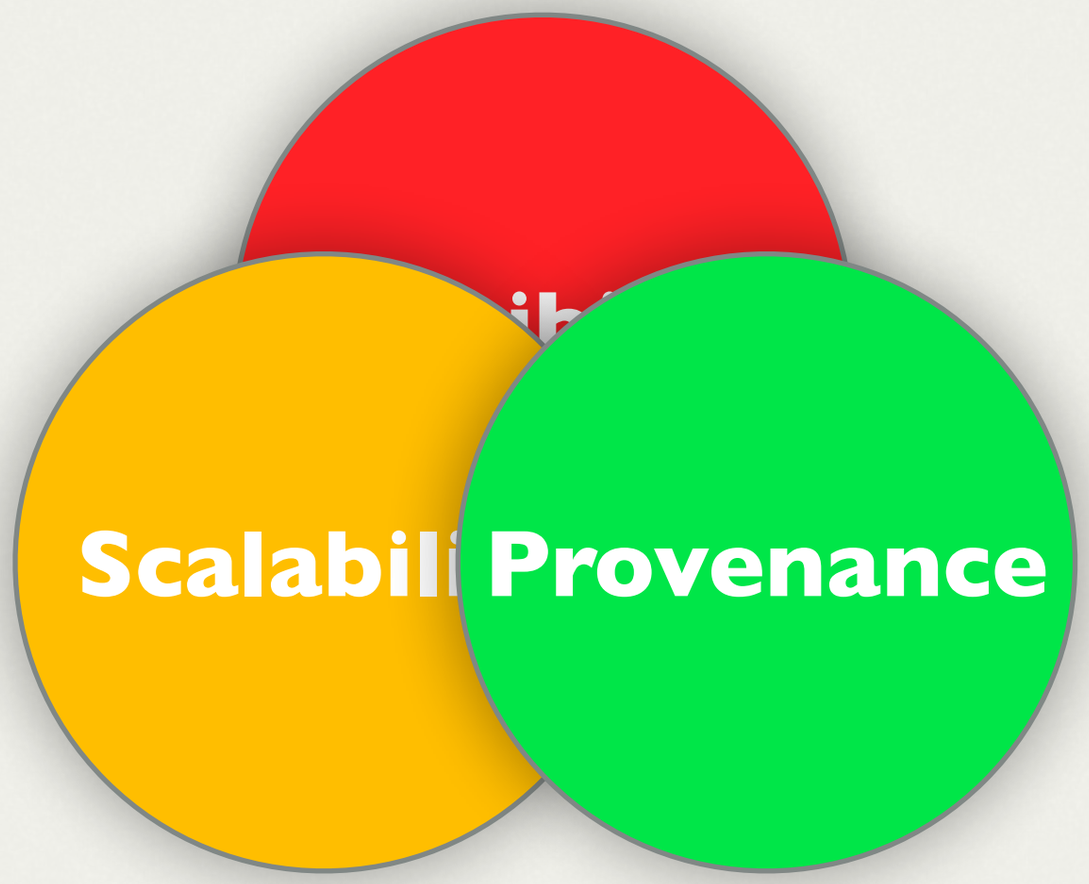
AMPEL

BENEFITS:



AMPEL

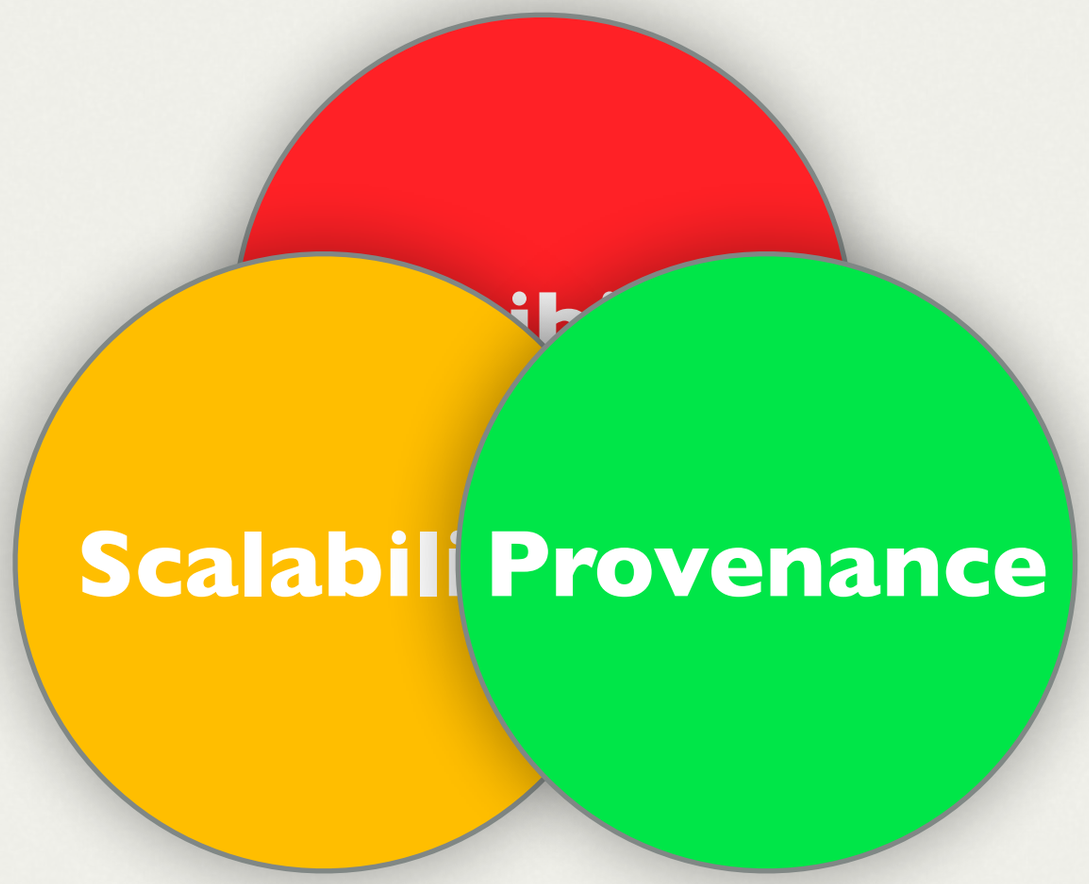
BENEFITS:



AMPEL

BENEFITS:

Speed



No need to handle alert streams

Repeatability

Re-use community work

JOIN US!

GETTING IN

LEVEL: *USER*

- **Define your own channel**
  - **Use existing units**
  - **Define run configurations**

https://github.com/AmpelProject/Ampel-contrib-sample

ampel-info@desy.de

GETTING IN

LEVEL: *CONTRIBUTOR*

- **Write (and share) T2 / T3 units**

https://github.com/AmpelProject/Ampel-contrib-sample

ampel-info@desy.de

GETTING IN

LEVEL: *BUILDER*

- **Help us further developing core and instrument plugins**

https://github.com/AmpelProject/Ampel-contrib-sample

ampel-info@desy.de

THANKS

A&A in press

https://arxiv.org/abs/1904.05922