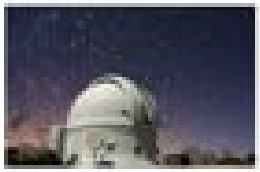
A tool for understanding transient populations

Jakob Nordin

Alert system – the bigger picture



Archive

Mini broker

ipac

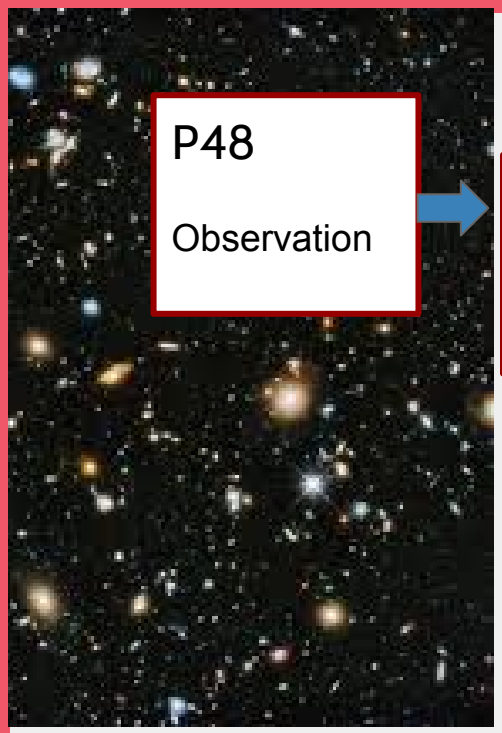
Spark

Broker

Archives

Archive

ZTF Real-time



P48

Observation

IPAC

Processing

UW

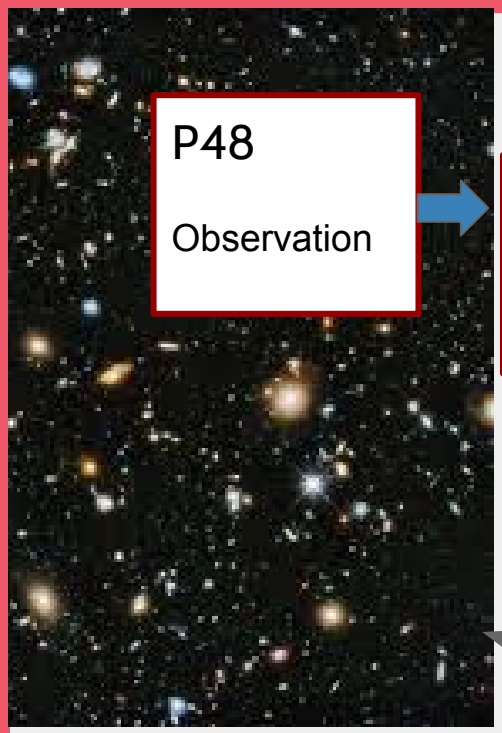
Filters

User

Scanning
Marshal

Spectrum
Discovery!

ZTF Real-time



P48

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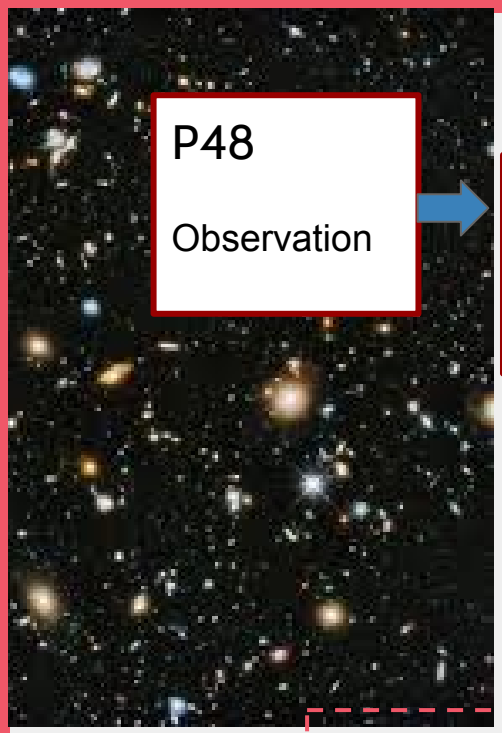
?

Where are all my friends?

Sample selection

- **Real-time**
- **Forced photometry of selected candidates?**



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ZTF Real-time

"background"

Simulate selection ( )

Continuous transient monitoring
Photo-z, photometric typing, lightcurve
Consistent flagging of smoothly rising objects as they reach peak

Follow-up selection
Magnitude limit?

Daily or off-line

Sample science use

Cosmology

- SNIa are not standard
- Accurate cosmology requires knowing rates of intrinsic variation

Counterparts (GW/ν)

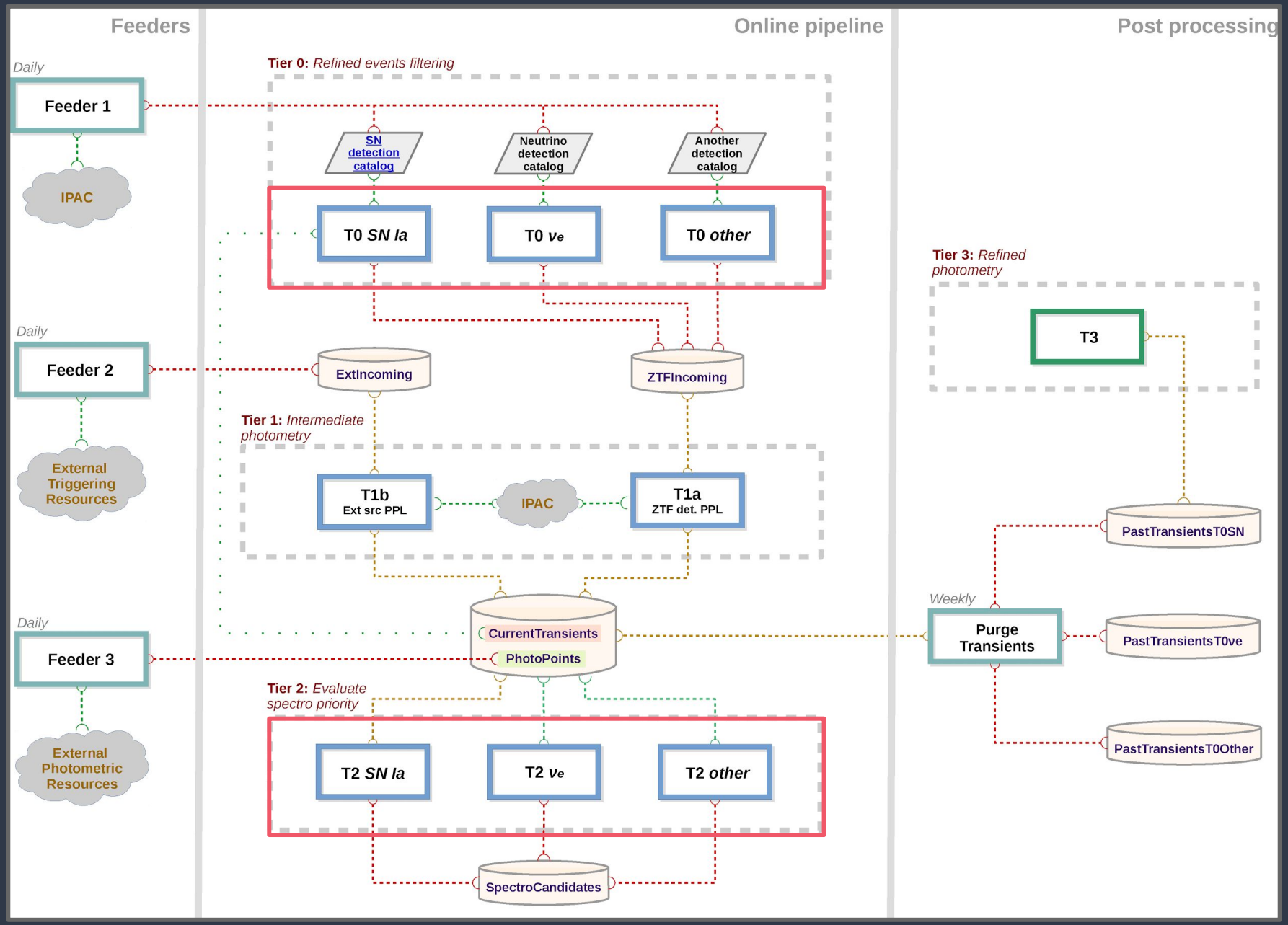
- Most triggers not followed
- Understanding nature of GW/ν requires off-line analysis of all
- Cross correlating samples close to sources with “background”

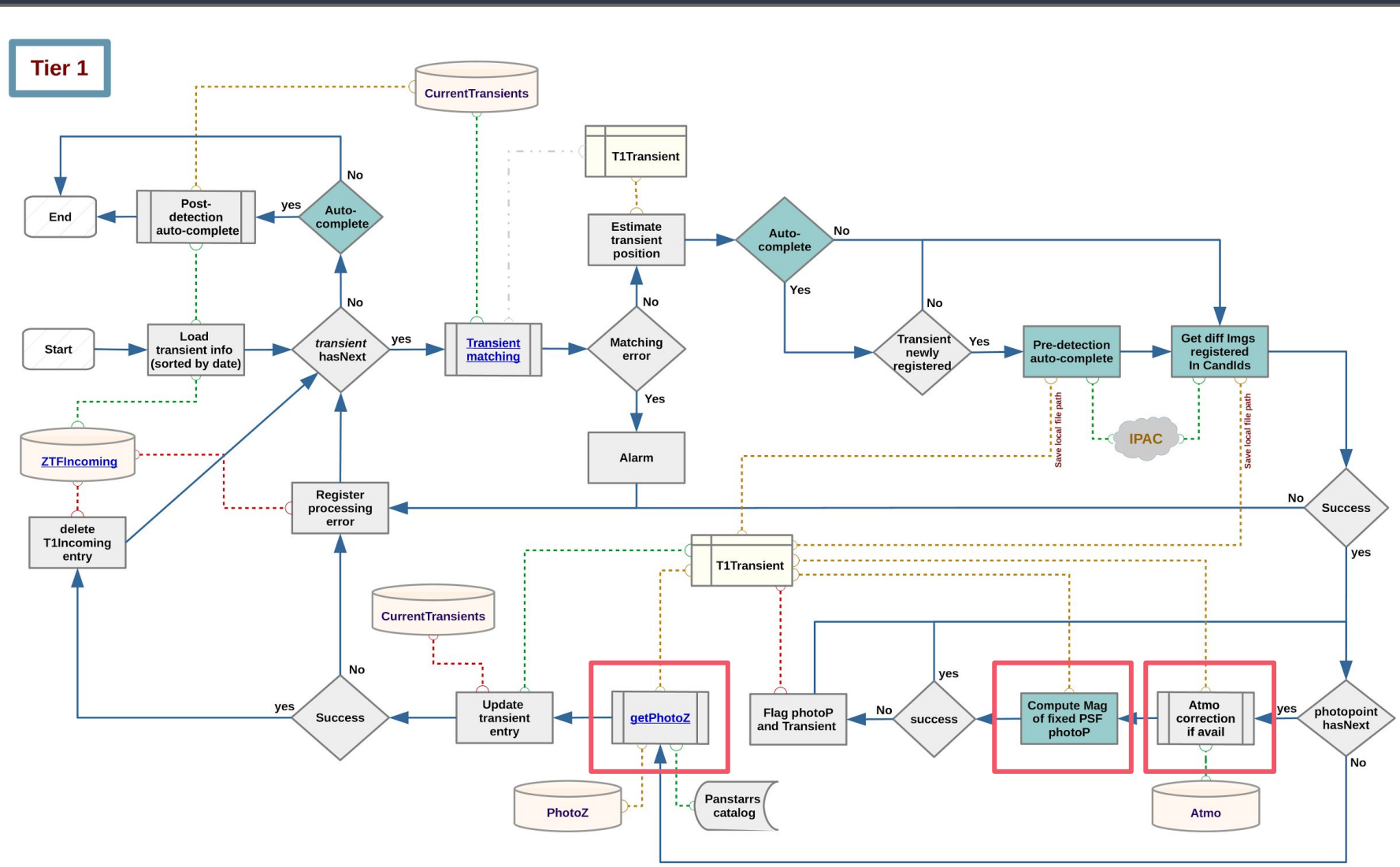
Legacy / photometric typing

- What lightcurves & types agree with X,Y,X?
- In a certain volume, what transients to expect?

Post-processing tasks

- Interaction with UW filters, connection to previous candidates
- Monitoring of all live transients
- Automatic spectroscopic triggers (or assisted/tracked)
- (final, forward model, photometry)


Feeders
Online pipeline
Post processing
Daily
Feeder 1
IPAC
Daily
Feeder 2
External Triggering Resources
Daily
Feeder 3
External Photometric Resources
Tier 0: Refined events filtering
SN detection catalog
Neutrino detection catalog
Another detection catalog
T0 SN Ia
T0 νe
T0 other
ExtIncoming
ZTFIncoming
Tier 1: Intermediate photometry
T1b Ext src PPL
IPAC
T1a ZTF det. PPL
CurrentTransients
PhotoPoints
Tier 2: Evaluate spectro priority
T2 SN Ia
T2 νe
T2 other
SpectroCandidates
Tier 3: Refined photometry
T3
PastTransientsT0SN
Weekly
Purge Transients
PastTransientsT0ve
PastTransientsT0Other

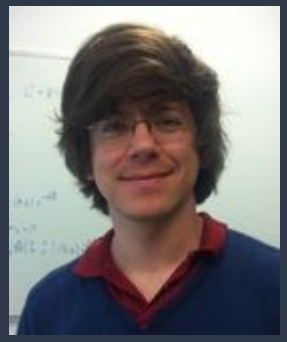

Tier 1
CurrentTransients
T1Transient
End
Post-detection auto-complete
yes
Auto-complete
No
Estimate transient position
Auto-complete
No
Yes
Start
Load transient info (sorted by date)
transient hasNext
yes
Transient matching
Matching error
No
Yes
Transient newly registered
No
Yes
Pre-detection auto-complete
Get diff Imgs registered In CandIds
ZTFIncoming
Alarm
IPAC
Save local file path
Save local file path
Register processing error
No
Success
delete T1Incoming entry
T1Transient
CurrentTransients
No
yes
Success
Update transient entry
getPhotoZ
Flag photoP and Transient
No
success
yes
Compute Mag of fixed PSF photoP
Atmo correction if avail
yes
photopoint hasNext
No
PhotoZ
Panstarrs catalog
Atmo

ZTF Census of the Universe?

- Monitor all transients with 3 (?) consecutive (?) detections
- Compile photometry
- Where possible (smooth lightcurve) predict peak
- Spectroscopically type everything below some magnitude cut (18.5?, 19?).
- Compare Uli's simulation for g/R<18.5.
  - Each night: 1.3 Ia, 0.14 Ib/c, 1 IIn, 1 IIP

Berlin pipeline crew

- Jakob Nordin
- Valery Brinnel
- Matteo Giomi
- Jakob van Santen
- Ludwig Rauch



DESY

HUMBOLDT-UNIVERSITÄT ZU BERLIN

Outlook

A ZTF broker for multiply detected transients

Implemented at DESY Zeuthen (Berlin) as
Docker containers

- any version of the code can be exactly reproduced at any time
- all necessary SW distributed

Allows implementation of a simple selection function:

- Magnitude limit for slowly varying transients at peak
- Complete survey of triggered candidates
- Online target recommendations for any follow-up facility