

# Alertsim - Serbian contribution to the LSST

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# Belgrade group

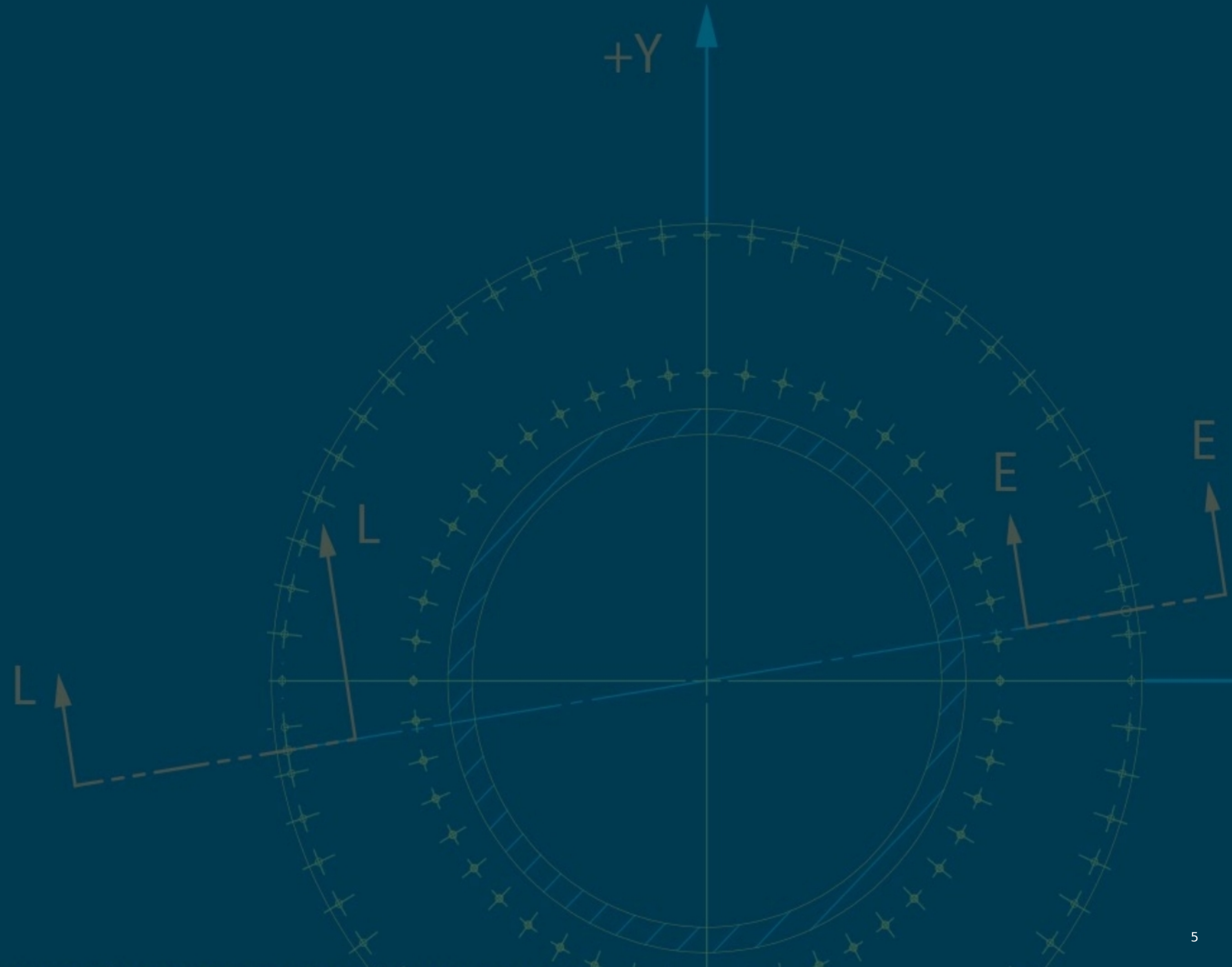
- We got involved fairly -early - interest in '09/'10
- MOA's for 4 PI in 2013
- Veljko Vujčić (CS – CEP/esper); Miodrag Malović (EE, Walsh, period-shape detection); Yana Khusanova (astromundus) obs\_sofi; Vladimir Srećković (databases&services); Jovan Aleksić (astronomy);
- Background stellar atmospheres, stellar flares, use of HPC in astronomy + VO and astroinformatics

# LSST movie



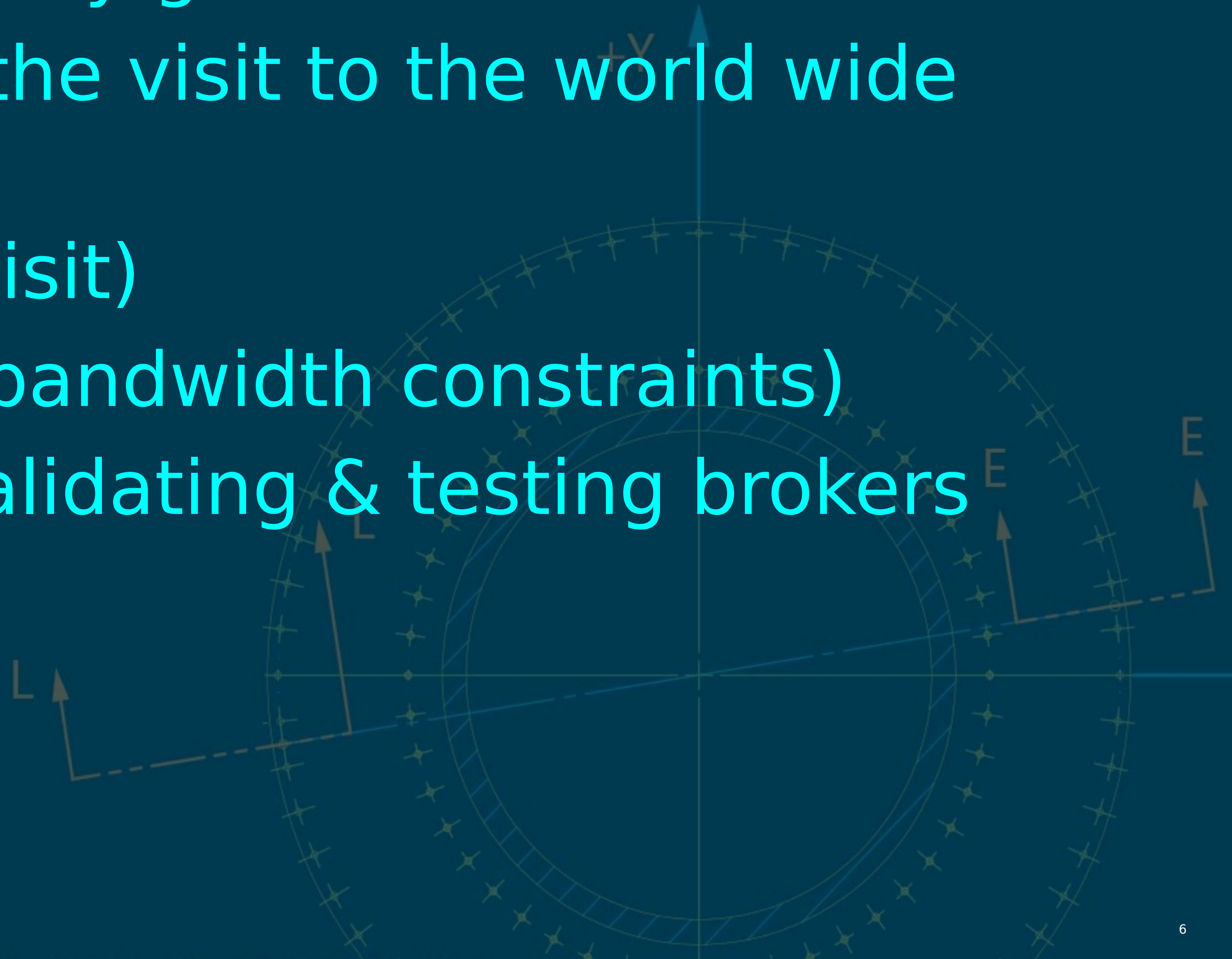
- [/home/darko/enigma\\_1189\\_n25\\_n3001.mp4](#)

Thx to Lynne Jones and Peter Yoachim – LSST Simulation group



# AlertSim

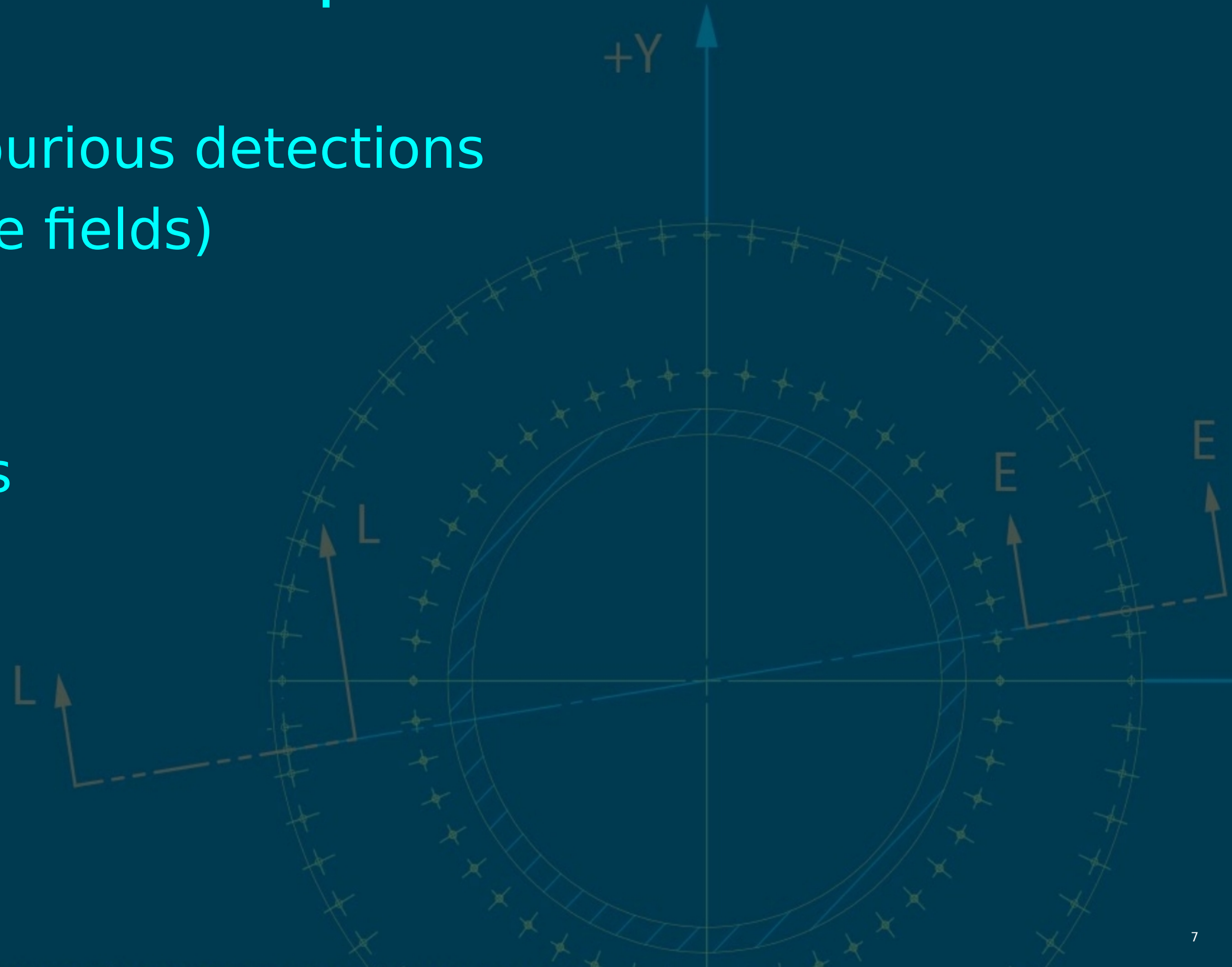
- Alerts - Level 1 (nightly) data products
- Anything that changes on sky goes in alert
- Release 60 seconds after the visit to the world wide community
- Expect many alerts (10k/visit)
- 2-4 public brokers (due to bandwidth constraints)
- Simulator necessary for validating & testing brokers



# AlertSim - requirements



- Generating realistic streams of LSST transient alerts
- Simulating various failures or exceptional/extreme operations modes:
  - Unexpectedly large numbers of spurious detections
  - Large number of detections (dense fields)
  - Disruptions of event stream
  - Corruption of event stream
  - Network connectivity interruptions

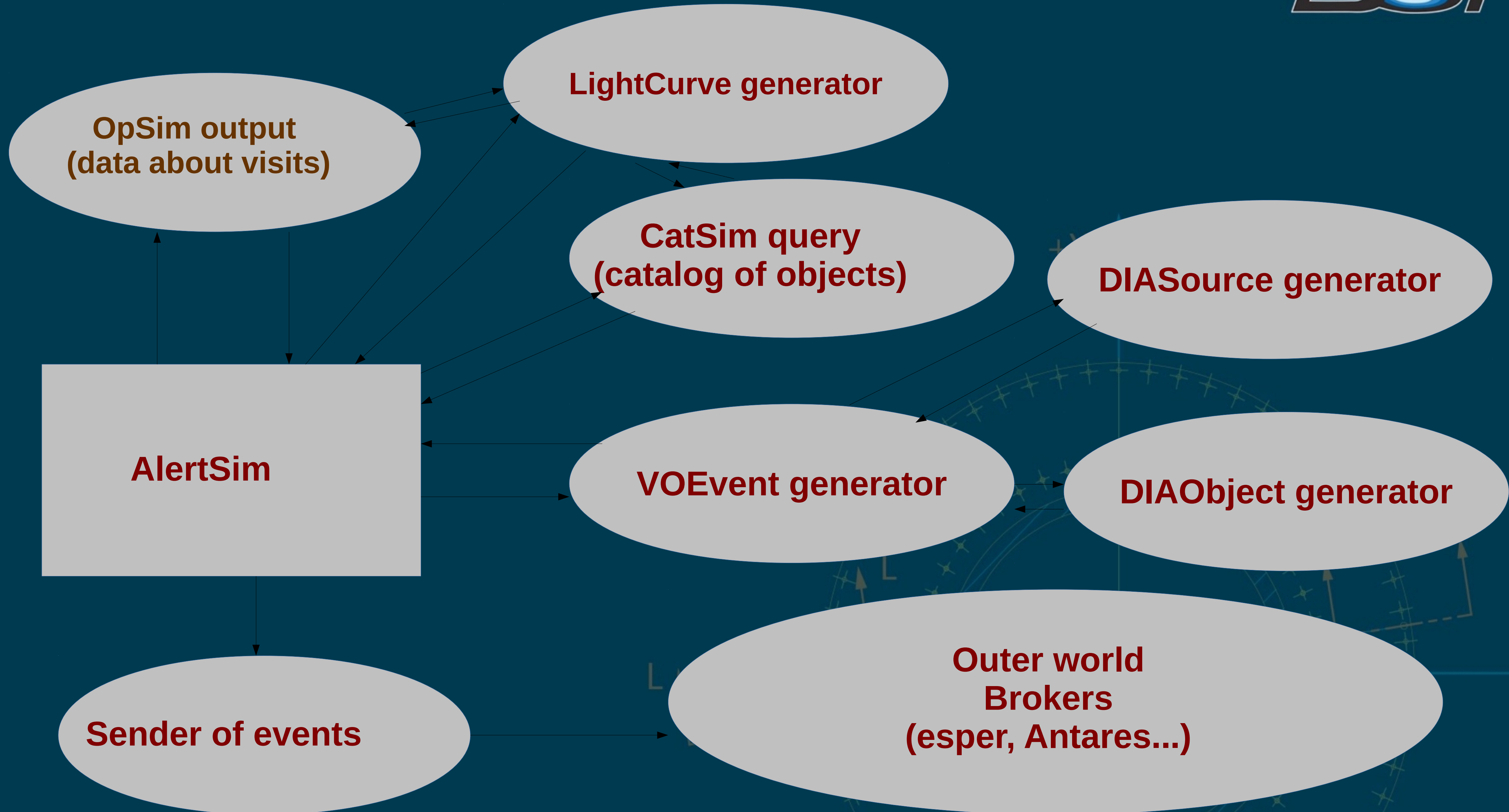


# AlertSim - requirements

- Provide facilities to ease troubleshooting problems with broker end-points
  - configurable, automated and capable of keeping provenance
  - Written following LSST software standards, conventions and development processes and executable on LSST Data Access Center hardware
- 
- Developed in coordination with capabilities provided by LSST Simulations group and DM team

# AlertSim - prototype

- First 'alert' end 2014
- Python based using low level functions from socket (allows not only TCP/IP but multicast or similar – idea is to use streaming capabilities for alert stream)
- Query to opsim output and catsim database and generate alerts and DIASources
- Pack alerts to VOEvent (requirement about standard – could be changed )
- VOEvent XML shema... very impractical
- Make it a service...





# AlertSim - service



- Basic idea is to provide brokers (Antares etc.) heads up playground
- (we had to calculate too many light curves for Antares...)
- Django based (experience with VAMDC!)
- Easily adaptable for machine queries (requests)!
- Simple form to fill to choose:
  - ip address and port
  - Different local or remote opsim databases
  - Different catsim tables
  - Parameters for querying databases

# AlertSim - service



- History calculated from opsim and variability mixin inside catsim (slow, problems with single magnitude...)
- Pack history(ical light curves) in diasource chunks (or emit complete diasources)
- Necessary connection to UW databases (is it wise to have it as a service??)
- For how long we want service to run?
- Note that we connect mainly to the stellar stuff - galaxies & sso in the future



# AlertSim - problems

- Lot of hacks to achieve service - problems with environment variables end setting up eups from outside the shell
- Queries may return huge outputs
- should we make lcg a separate package? Problems with distribution sky for particular types of objects.....
- Older routers may cut messages (need to repeat or divide)
- Proxy problems - ports are closed
- VOEvent/XML does not like mages
- Possible to encode images in XML - but consider separate mechanism
- (problems are good - force us to think outside of the box)

# AlertSim and DM end-to-end simulations

- Connection with results of end-to-end simulations
- Idea is to generate simulated images out of what is in catsim (using phosim or galsim and some level of noise)
- Process those images with LSST Stack (imdiff on simulated or other images)
- DM Stack should in (not too distant) future become capable of generating alerts or at least DIASources for detected features
- If DMstack sends us DIASource(s) we are able to pack it in VOEvent format and forward it further...

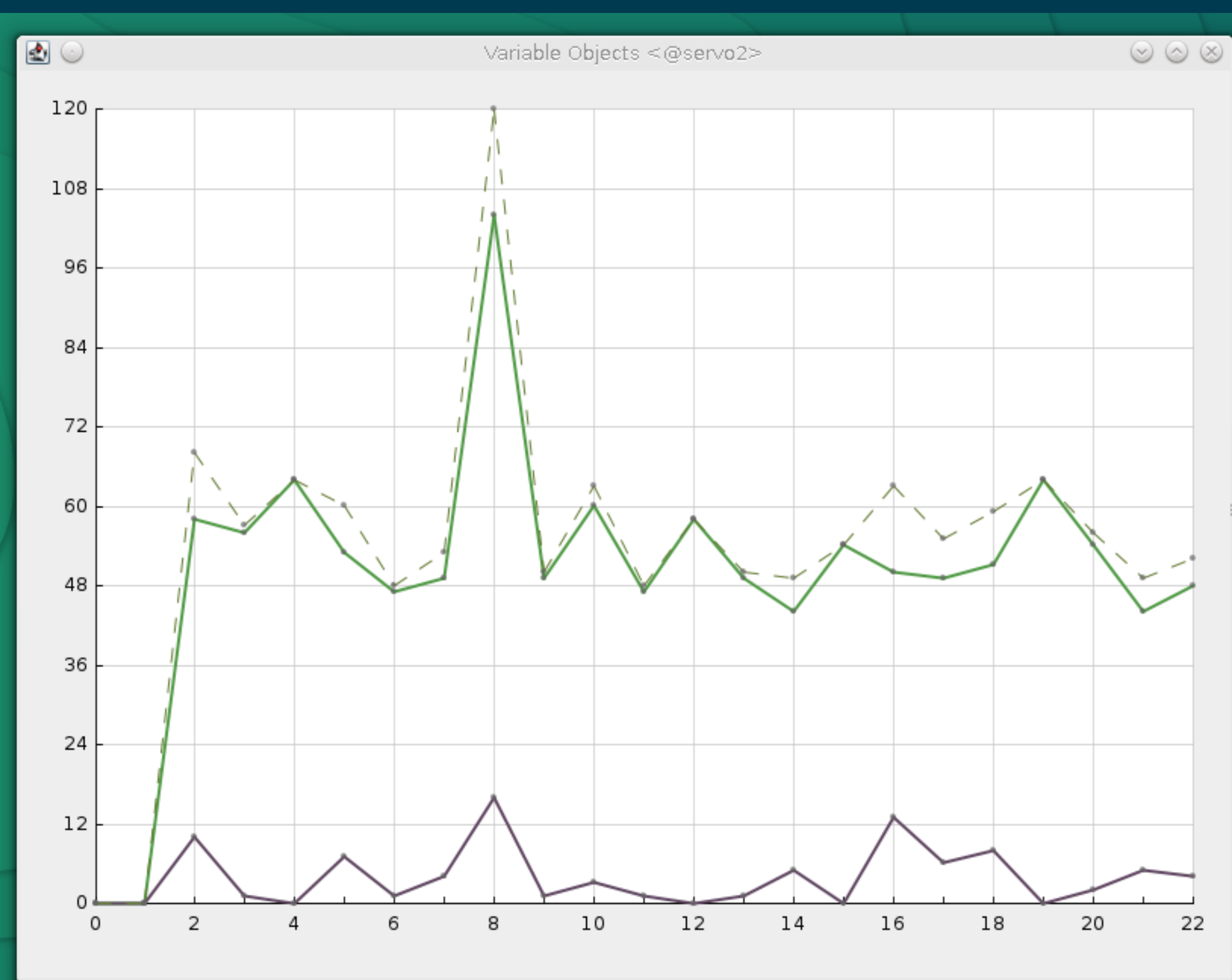
# AlertSim - todo

- Cutouts – i.e. force galsim to do small patches
- Esper – playing with aggregates and other functionalities (control of what is happening)
- Collect engineering simulated data (through opsim or otherwise) and use in decision making process or at least simulate and test several byte quality stamp??
- Detecting readiness of clients (at the moment we ignore – just emit)
- Parallelization (brute force vs. clever)
- Build DSL (and classifiers) on top of esper which will be understandable to astronomers and make their life easy in LSST era

# AlertSim – demo of service

- Control parameters
- We use RRLyrae/allstars
- sending and receiving xml
- Esper
- ```
python example_parser.py -c "allstars" -r "1.75" -oc "(night between 21 and 210 and fieldra between 1.3 and 1.5 and fielddec between -0.32 and -0.01 and filter like 'r' )" -cc "rmag between 10 and 30 and varParamStr not like 'None'" -ip 147.91.240.29 --no_header
```

```
darko@servo9.aob.rs:~ <2>
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
Number of events from this visit : 52. Time from first to last event 68.148956 or
r 1.310557 per event
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
zzz False
```



```
veljko@servo2:...space/voevent-test
ename": "rrly_lc/RRab/1895734_per.txt", "tStartMjd": 3.348832344077652e+004, "var
MethodName": "applyRRly"}
[java] 20:46:21,195 INFO [VOEventListener] Lyrae!
[java] 20:46:21,195 INFO [VOEventListener] true_positive! ra: 1.502853 dec
: -0.102618 delta_u: 0.969320
[java] TPCount: 1151 FPCount: 0 FNCCount: 95
[java] Completeness: 0.923756 Contamination: 0.000000 {"pars":{"fil
ename": "rrly_lc/RRab/359035_per.txt", "tStartMjd": 3.346232030145854e+004, "varM
ethodName": "applyRRly"}
[java] 20:46:24,218 INFO [VOEventListener] Lyrae!
[java] 20:46:24,218 INFO [VOEventListener] true_positive! ra: 1.509062 dec
: -0.107374 delta_u: 1.379028
[java] TPCount: 1152 FPCount: 0 FNCCount: 95
[java] Completeness: 0.923817 Contamination: 0.000000 {"pars":{"fil
ename": "rrly_lc/RRc/2233809_per.txt", "tStartMjd": 3.360160548803787e+004, "varM
ethodName": "applyRRly"}
[java] 20:46:24,239 INFO [VOEventListener] Lyrae!
[java] 20:46:24,239 INFO [VOEventListener] true_positive! ra: 1.510099 dec
: -0.100660 delta_u: 1.326530
[java] TPCount: 1153 FPCount: 0 FNCCount: 95
[java] Completeness: 0.923878 Contamination: 0.000000 {"pars":{"fil
ename": "rrly_lc/RRab/2993853_per.txt", "tStartMjd": 3.349017733880840e+004, "var
MethodName": "applyRRly"}
```

```
simsuser@gateway3:~
darko@servo9:~> ssh servo3
Password:
Password:
Read from socket failed: Connection reset by peer
darko@servo9:~> ssh servo3
Password:
Last failed login: Tue Feb 23 19:57:53 CET 2016 from 75-144-26-73-sfba-ca.
mcastbusiness.net on ssh;notty
There was 1 failed login attempt since the last successful login.
Last login: Tue Feb 23 19:56:17 2016 from 75-144-26-73-sfba-ca,hfc.comcast
ss.net
Have a lot of fun...
darko@servo3:~> ssh -L 51433:fatboy-private.phys.washington.edu:1433 simsu
tey,astro.washington.edu
bind: Address already in use
channel_setup_fwd_listener: cannot listen to port: 51433
Could not request local forwarding.
Last login: Mon Feb 22 02:09:10 2016 from servo3.aob.rs
[simsuser@gateway3 ~]$
```





**EMIT VOEVENT STREAM FROM ALERTSIM**

Opsim table:

output\_opsim3\_61

Catsim table:

All stars

Opsim constraint:

lra between 1.3 and 1.5 and fielddec between -0.32 and -0

Catsim constraint:

rmag between 10 and 30 and varParamStr not like 'None'

Radius:

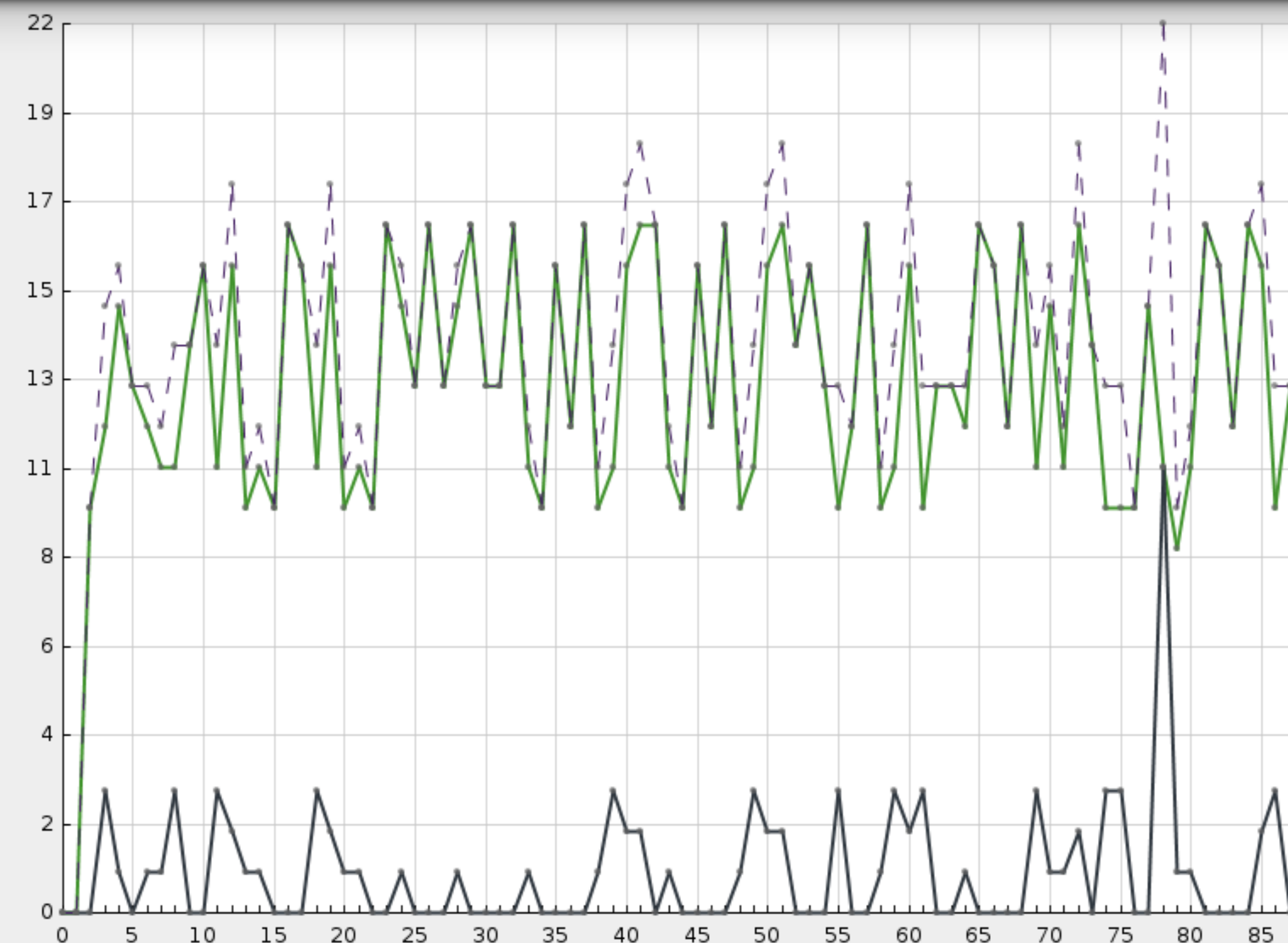
1.75

**Maintained by Darko Jevremović. Questions or Comments?****[Click here to send an email.](#)**

```

[ java]          </Time>
[ java]          <Position2D>
[ java]            <Value2>
[ java]              <C1>1.290246</C1> <!-- RA -->
[ java]              <C2>-0.132507</C2> <!-- Dec -->
[ java]            </Value2>
[ java]          <Error2Radius>0.010000</Error2Radius>
[ java]        </Position2D>
[ java]      </AstroCoords>
[ java]    </ObservationLocation>
[ java]  </ObsDataLocation>
[ java] </WhereWhen>
[ java] <Citations>
[ java]   <EventIVORN cite="followup">ivo:lsst.org/resource#89474</EventIVORN>
[ java]   <EventIVORN cite="followup">ivo:lsst.org/resource#89475</EventIVORN>
[ java] </Citations>
[ java] <Description></Description>
[ java] </voe:VOEvent>
[ java] 10:40:20,770 INFO [VOEventListener] Lyrae!

```



ght=10

 stsw/m  
 and 30  
 ight be  
 32 and

# Few things to remember

- Alertsim is(will be) capable to provide near realistic service of LSST alert stream
- Good starting point to train different brokers, classifiers... or students
- More functionalities will come with time
- So talk to us - [darko@aob.rs](mailto:darko@aob.rs) [veljko@aob.rs](mailto:veljko@aob.rs) if you want to use the service or would like to see some specific features
- Complete talk recorded at [lsst@europe2](https://www.youtube.com/watch?v=mtE0BvBTXMU&feature=youtu.be)
- <https://www.youtube.com/watch?v=mtE0BvBTXMU&feature=youtu.be>