Alertsim - Serbian contribution to the LSST

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- We got involved fairly early - interest in '09/'10
- MOA's for 4 PI in 2013
- Veljko Vujčić (CS – CEP/esper); Miodrag Malović (Walsh, period-shape detection); Yana Khusanova obs_sofi; Vladimir Srećković (databases&services); Jovan Aleksić (astronomy);
- Background stellar atmospheres, stellar flares, use of HPC in astronomy + VO and astroinformatics
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 schema... very impractical
• Make it a service...
AlertSim

OpSim output (data about visits)

CatSim query (catalog of objects)

LightCurve generator

DIASource generator

DIAObject generator

VOEvent generator

Outer world Brokers (esper, Antares...)

Sender of events
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)
• Paralelization (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 RR Lyrae/allstars
- Sending and receiving XML
- Esper
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...
• More functionalities will come with time
• So talk to us – darko@aob.rs veljko@aob.rs