LOFAR Transient Detection Pipeline

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Agenda

- Transient detection
- Pipeline layout
- Software
Transients Detection

- Static sources are boring
- Transient – something that changes
- Huge amount of data – automation
The data

- 1 datacube per second
- 10 frequency bands
- In the future 10 images per second
- In the future 4 different polarization
- Non stop
Transient detection Pipeline

- Extract metadata
- Quality check
- Source extraction

Database

Association  Detection  Classification
- The glue
- Distributing computation
- Image processing
- Statistics
- Source extraction
- Database interactions
Distributed Computation

- Home made library
- SSH based
- Difficult to debug
- Difficult to profile
- Doing research on Celery and Hadoop
Database

- Move calculation to the data
- Highly structured
- Independent data
- Naturally separable by sky coordinates

- ~100 TB/year
- 10,000 insert/second
MonetDB

- Relational
- Column store DB
- Fast
- Auto tuning!
- Developers next door (CWI)
Challenges

- Debugging queries
- MonetDB still in active development
INSERT INTO tempbasesources
(xtrsrc_id,
datapoints,
I_peak_sum,
I_peak_sq_sum,
weight_peak_sum,
weight_I_peak_sum,
weight_I_peak_sq_sum)
SELECT b0.xtrsrc_id,
b0.datapoints + 1 AS datapoints,
b0.I_peak_sum + x0.I_peak AS i_peak_sum,
b0.I_peak_sq_sum + x0.I_peak * x0.I_peak AS i_peak_sq_sum,
b0.weight_peak_sum + 1 / (x0.I_peak_err * x0.I_peak_err) AS weight_peak_sum,
b0.weight_I_peak_sum + x0.I_peak / (x0.I_peak_err * x0.I_peak_err) AS weight_i_peak_sum,
b0.weight_I_peak_sq_sum + x0.I_peak * x0.I_peak / (x0.I_peak_err * x0.I_peak_err) AS weight_i_peak_sq_sum
FROM basesources b0,
extractedsources x0
WHERE x0.image_id = @imageid
AND b0.zone BETWEEN CAST(FLOOR((x0.decl - @theta) / x0.zoneheight) AS INTEGER)
AND CAST(FLOOR((x0.decl + @theta) / x0.zoneheight) AS INTEGER)
AND ASIN(SQRT((x0.x - b0.x)*(x0.x - b0.x)
+(x0.y - b0.y)*(x0.y - b0.y)
+(x0.z - b0.z)*(x0.z - b0.z)
) / 2)
/
SQRT(x0.ra_err * x0.ra_err + b0.ra_err * b0.ra_err
+x0.decl_err * x0.decl_err + b0.decl_err * b0.decl_err)
< @assoc_r;
MonetDB and Python

• We maintain the MonetDB Python API

• http://pypi.python.org/pypi/python-monetdb/

• Problems? Ask me :)}
Djonet

- MonetDB backend for Django
- https://github.com/gijzelaerr/djonet

- brew install monetdb
- pip install python-monetdb djonet

- Contributions are welcome!
VO events

- Standardized language
- Report observations of astronomical events
- Hey world, check this supernova out over there
- http://comet.transientskp.org
Visualisation

• Web interface
• Django!
• Not public (yet)
More

- http://www.transientskp.org/
- http://www.lofar.org/
- http://www.aartfaac.org/
Questions?