

Scheduling on the Low Frequency Array (LOFAR) telescope

An advanced graphical scheduling tool to create, interact and optimize schedules for the LOFAR telescope

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ADASS XXI – Paris, November 6-10, 2011

- LOFAR system overview
- Scheduler operational requirements
- Scheduler software requirements
- Design choices and implementation
- What does it look like?

LOFAR super-terp (6 core stations) 360m diameter

ASTRON



LOFAR System overview

- 41 sensor stations
- 10-90MHz (LBA), 110-250MHz (HBA)
- Baselines of up to 1500km
- Blue Gene real-time processing
- CEP-II cluster of 100 processing nodes
- 2 petabyte temporary storage
- Parallel observations
- High speed optical fiber network



Scheduler operational requirements

- Storage capacity prediction and planning
- Support parallel observations
- Schedule processing pipelines and link them to the data generating observations
- Capability to reserve system resources
- Automatic constraints & conflicts resolving
- Early feedback on wrong specifications
- Hardware failure monitoring and adaptation
- Option of manual override for all resources
- Publish schedule on the web

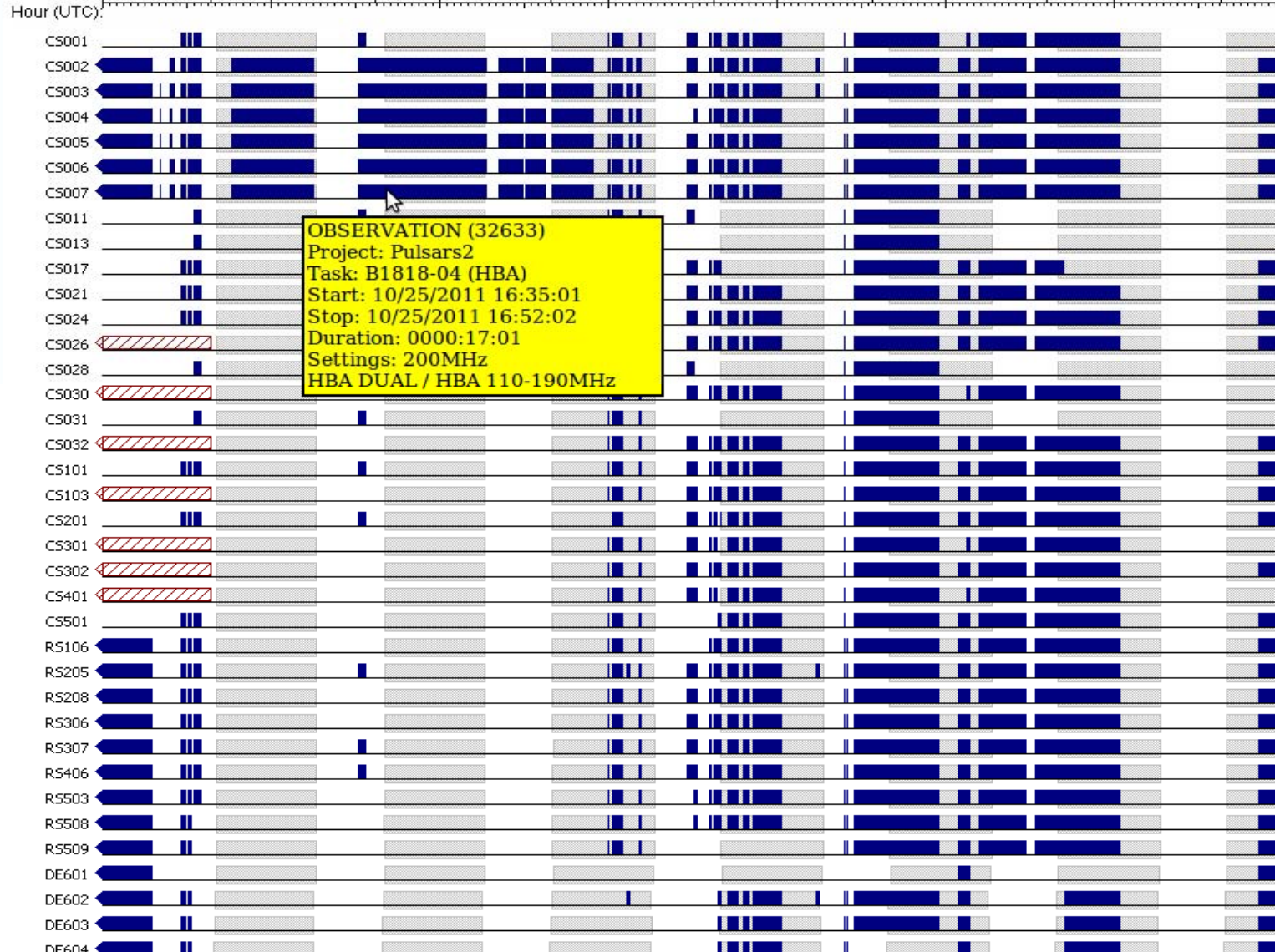
- Strong visualisation needs due to schedule complexity ->

LOFAR Schedule for week 43 (2011)

Change date (UTC): Friday 28 Oct 2011 13:28

Mon 24 Oct, 2011 | Tue 25 Oct, 2011 | Wed 26 Oct, 2011 | Thu 27 Oct, 2011 | Fri 28 Oct, 2011 | Sat 29 Oct, 2011 | Sun 30 Oct, 2011

October 2011



<< [today](#) >>

October 2011						
Mo	Tu	We	Th	Fr	Sa	Su
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Scheduler software requirements (continued)

- Cross-platform (linux, windows, macintosh)
- Possibility to schedule world-wide
- Object Oriented, data abstraction & data-hiding
- Postgress and MySQL connectivity
- Fast execution and schedule optimization

- Application core developed in object oriented C++
- Qt4 cross-platform framework for GUI and interfaces
- Model-view-controller design
- Strong visualization and graphical interaction
- (Development in open-source Eclipse IDE)

The LOFAR Scheduler, what does it look like?

File Edit Actions SAS Connect Settings View Cleanup Help

Graphic schedule view

Zoom in Zoom out Now Status color mode

Hour (UTC): Mon 31 Oct, 2011 Tue 1 Nov, 2011 Wed 2 Nov, 2011 Thu 3 Nov, 2011 Fri 4 Nov, 2011 Sat 5 Nov, 2011 Sun 6 Nov, 2011 Mon 7 Nov, 2011 Tue 8 Nov, 2011

CS001 CS002 CS003 CS004 CS005 CS006 CS007 CS017 CS021 CS024 CS026 CS030

Table schedule view

	task ID ^	SAS ID	MoM
49	33	33269	38098
50	32	33271	38100
51	31	33265	38084
52	30	33264	38086
53	29	33263	38088
54	28	33262	38090
55	27	33255	38076
56	26	33267	38096
57	25	33247	37865
58	24	33245	37863

Schedule Station settings Station beams Processing Storage Extra info

Total storage size: 82.3 GB Manual selection Correlated

Total bandwidth required: 191.8 Mbit/s # Nodes Minimum: 5 # Nodes Assigned: 6

of data files: 100

Data products:

Location	Filename
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Storage node Partition Total Size Free Space

- locus001 (Status ...
 - /data 20.0 TB 1.1 TB
- locus002 (Status ...
 - /data 20.0 TB 2.5 TB
- locus003 (Status ...
 - /data 20.0 TB 4.8 TB
- locus004 (Status ...
 - /data 20.0 TB 4.8 TB
- locus005 (Status ...
 - /data 20.0 TB 14.6 TB
- locus006 (Status ...
 - /data 20.0 TB 4.7 TB
- locus007 (Status ...
- locus008 (Status ...
 - /data 20.0 TB 4.6 TB
- locus009 (Status ...
 - /data 20.0 TB 14.6 TB

Cancel Add

Storage resource view

Schedule loaded from /home/jong/test14.pro #S:4, #US:10, #INACT:67, #RES:0, #ERR:9, #PL:0 0%

The LOFAR Scheduler

- Is flexible and uses LOFAR to its fullest potential
- Generates schedules that maximize scientific value
- Makes sure LOFAR is reliably and stable operated
- Fully supports parallel observations
- Is still being developed further to support new types of observations & processing pipelines