



# The evolution of Observing Tools at ESO

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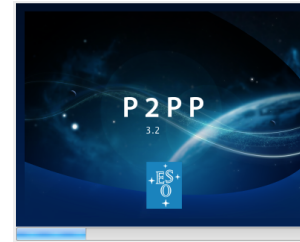
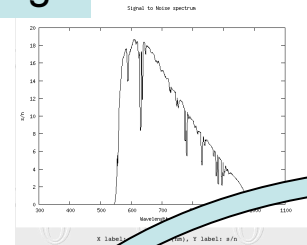
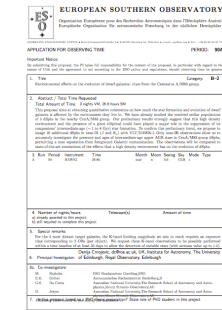
ESO, Garching: Thomas Bierwirth, Dario Dorigo, Paula Santos,  
Beatrice Amarandei, Fabio Sogni, Yves Yung, Ignacio Vera  
ESO, Chile: Thomas Szeifert, Steffen Mieske



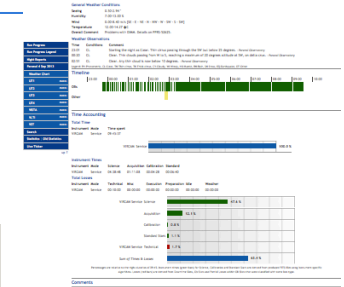
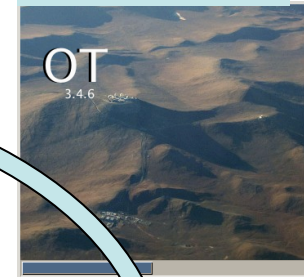


# Data flow end-to-end tools

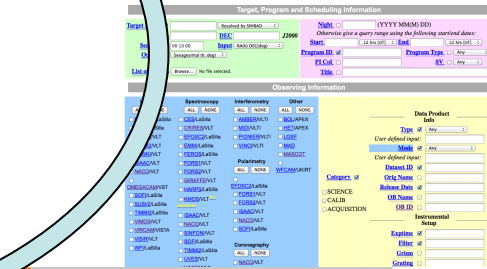
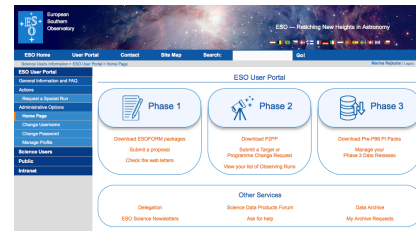
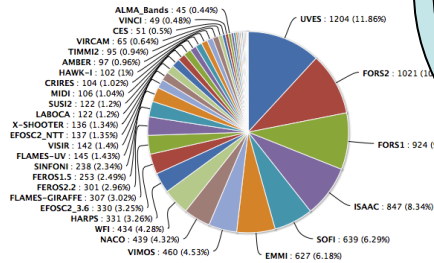
## Proposals handling & Long-term scheduling



## Observation preparation, execution & reporting

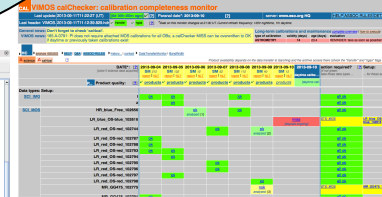
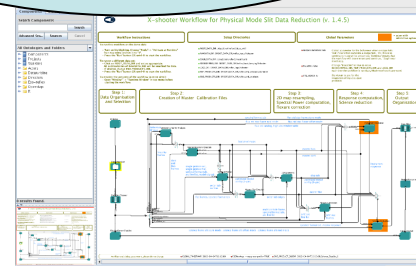


No. of papers per instrument  
Source: telib  
Query: published:1



## Science return: Data Products & Publications

Sort	Column	Constraint	Unit	Description	UCD
	SP_ID			ESO Data set identifier	meta:meta.main
	OBJECT			Object designation	meta:td
	TARGNAME			Target designation	meta:td
	RAJ2000		deg	Telescope pointing (J2000 equinox)	pos.eq:meta.main
	DEJ2000		deg	Telescope pointing (J2000 declination)	pos.eq:meta.main

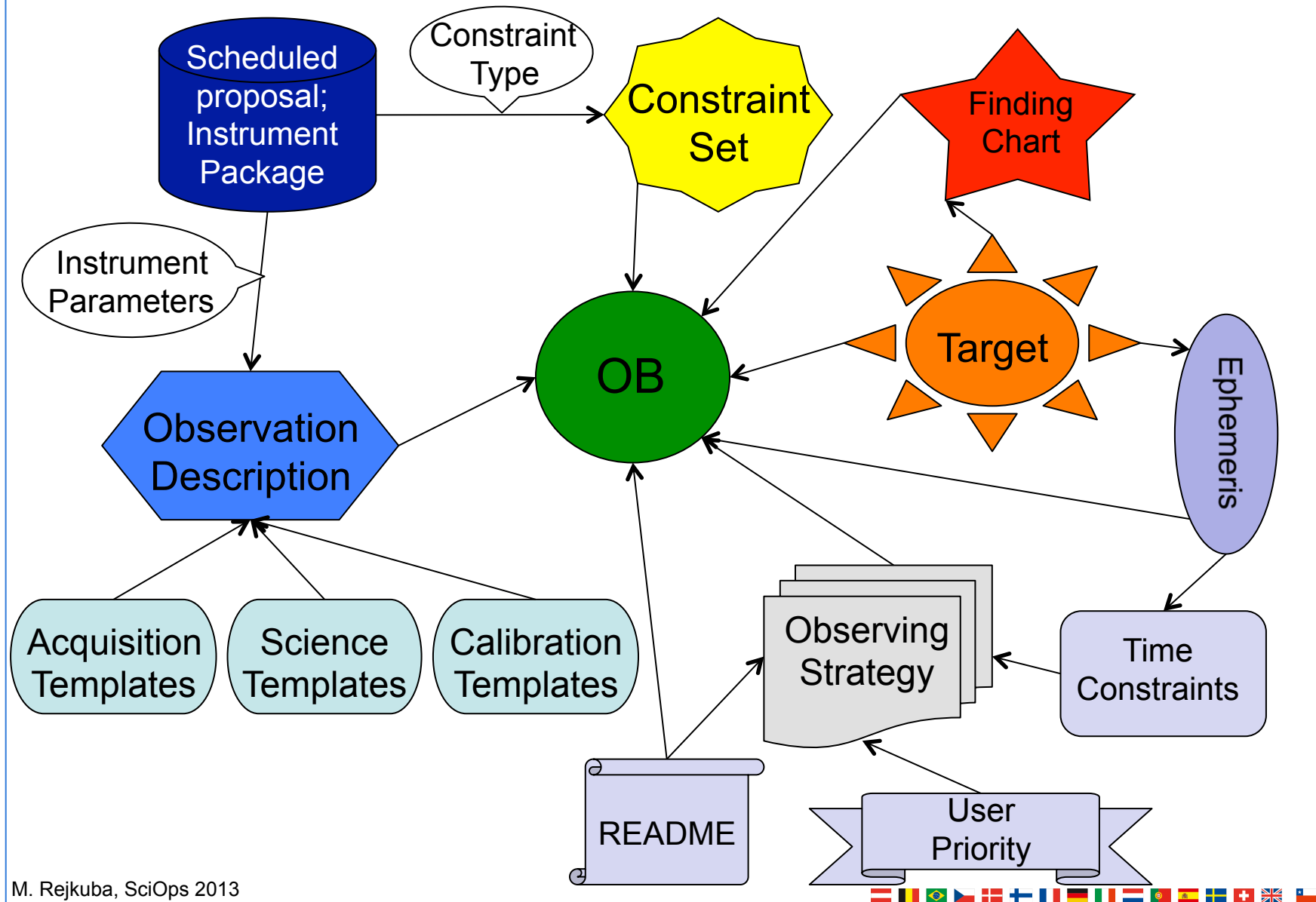


## Post-observation: archive, quality control, data reduction pipelines





# Service Mode observing material





## Phase 2 material preparation: P2PP

- ◆ Preparation and submission: Phase 2 Proposal Preparation Tool (aka P2PP)
  - version 1 (tcl/tk) → version 2 (java) incl. README+FC+Eph
- ◆ Basic units Observation Blocks (OBs)
  - ✓ Instrument package (templates, EVM, ETRM, COSMO)
  - ✓ Observation Description, README, Finding Charts, Ephemeris file
- ◆ User Support Department: Phase 2 material review & approval

Poster by  
S. Mysore

The screenshot shows the P2PP V.2.13 software interface. The title bar reads "P2PP V.2.13 60.A-9252(I)/SM/FLAMES". The interface includes a toolbar with icons for New, Duplicate, Verify, View, Attach FC, Readme, and p2pp-submit. A dropdown menu shows "All" and "Period". On the right, there are icons for "No CCS" and "Direct".

The "Folders" pane on the left shows a tree structure of folders, with "60.A-9252(I)/SM/FLAMES" selected. The "Summaries" pane on the right shows a table of observation blocks.

Name	Dbaseld	Status	Target	OD	CS	Acquisition	FindingCh...	Ephemeris...
N1754-2	0	(P)artial...	NGC1754_c...	commed8	cluster	FLAMES_co...	(1) 073.B...	
N1754-1	0	(P)artial...	NGC1754_c...	commed8	cluster	FLAMES_co...	(1) 073.B...	
N1754-0	0	(P)artial...	NGC1754_c...	commed8	cluster	FLAMES_co...	(1) 073.B...	
N1754	0	(P)artial...	NGC1754_c...	commed8	cluster	FLAMES_co...	(1) 073.B...	



# At the telescope: observing tool OT

## ◆ Medium Term Scheduling

- Observing Queues
- Web pages – observing runs overview

ToO Run	Observer	Instrument	Priority	Status	Remarks	Total: 2 OBs in repository	ToO: local accounting
088_B-0349(D)	Felzing			ToO			15 done (of 16 OBs) 14.02 hrs done (of 14.96 hrs)
088_D-0447(A)	Gieren	CHILEAN	Special Calibs	Time Critical			8 done (of 8 OBs) 6.32 hrs done (of 6.32 hrs)
088_D-0638(A)	Fransson				Special Remarks		2 done (of 16 OBs) 2.00 hrs done (of 17.99 hrs)
088_A-0885(A)	Becker						
088_C-0940(C)	Jehin		Special Calibs	ToO	Special Remarks	Total: 11 OBs in repository	ToO: local accounting
088_D-1019(B)	Gustafsson		Special Calibs				0 done (of 4 OBs) 0.00 hrs done (of 0.60 hrs)
* Rank class B:							
088_B-0260(A)	Gallagher		Special Calibs		Special Remarks		8 done (of 12 OBs) 6.20 hrs done (of 9.00 hrs)
088_D-0292(B)	Cacciari			Time Critical	Special Remarks		0 done (of 4 OBs) 0.00 hrs done (of 2.33 hrs)
088_D-0433(A)	Van Winckel						20 done (of 45 OBs) 19.85 hrs done (of 45.00 hrs)

## ◆ Short Term Scheduling

- observing queues: 3 rank classes x 3 instruments
- calibration and maintenance queues
- short term scheduling – astronomers



## ◆ Night Reports sent daily via e-mail

- User Support Department
  - manual OB status updates
- Quality Control Group

```

MELIPAL (UT3) NIGHT REPORT - 2010-07-24
=====
Shift leader       : F. SELman
Telescope operator : A. Parraguez
Weather officer   : A. Parraguez
Day astronomer    : R. Sanchez
Night astronomer  : S. Mieske
Visiting astronomer : NA

+-----+
Night statistics
+-----+

Night start : 23:33
Night end   : 10:01
Night length: 10:27

Instrument Mode ----- Time spent
-----
ISAAC Service           08:12
VIMOS Commissioning    02:16

Instrument Times:
Instrument Mode ----- Science Acqui Calib Stand
-----
ISAAC Service           02:44 00:00 00:00 00:18
VIMOS Commissioning    00:00 00:00 00:00 00:00

Others / Comments:

Total Losses:
Instrument Mode ----- Technical Weather Misc
-----
ISAAC Service           01:20 00:00 00:00
VIMOS Commissioning    00:00 00:00 00:00

Instrument Mode ----- Execution Preparation Idle
-----
ISAAC Service           00:00 00:00 00:00
VIMOS Commissioning    00:00 00:00 00:00
    
```

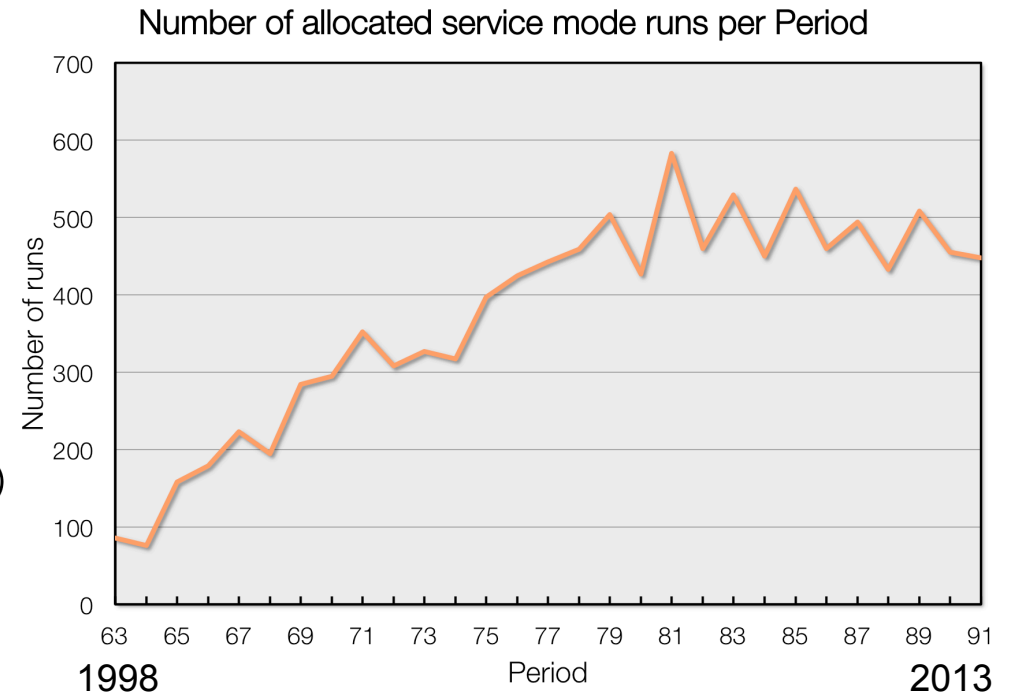
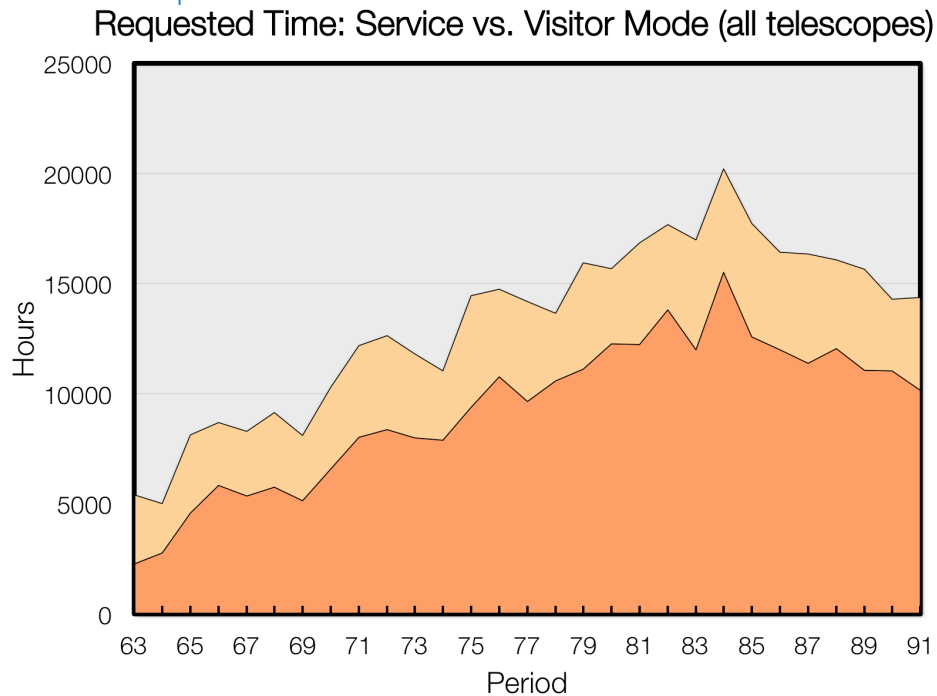




# VLT+VLTi visitor vs. service mode

## ◆ Service Mode at ESO:

- ~70% of the requested and allocated time



- ~450 new observing runs every semester





# Observing Tools version 3

## ◆ Why new observing tools?

- Primary driver: Public Surveys (VISTA & VST telescopes)
- Few but very large programmes:
  - Thousands of OBs (VVV submission for P91: 6712 OBs!)
  - No astronomer at the telescope during night (drive telescope + instrument, select next observation, perform QC, log observations, problem reporting)

## ◆ Why changing tools for VLT and VLTI?

- Minimize errors, optimize the scheduling, increase efficiency
- Observation strategy in free text format README file
  - observations must be spaced by at least 3 days (**time link**)
  - OB1 and OB2 must be taken together (**concatenation**)
  - complete all observations of target A before starting B (**groups**)
- Manual time accounting, obs. logging, OB status updates



# Observing Tools version 3

- ◆ **Observation preparation tool: P2PP3**
  - Design of computer literate observing strategy
  - Phase 2 delegation
  
- ◆ **Observing Tool for Service Mode: OT3**
  - Effective ranking engine
  - Integrated reporting
  
- ◆ **Observation reporting tool: NLT & gNLT**
  - Automatic harvesting of observation slots; telescope statistics
  - E-mail subscription to observations notification
  
- ◆ **New Operations Databases**
  - Full replication Garching ↔ Paranal





# P2PP3

- ◆ Design of complex long-term observing strategy
- ◆ Most of the observation instructions are encoded in the OBs and the scheduling containers (linked OB execution)
- ◆ Generation of hundreds of similar OBs for surveys
- ◆ Phase 2 delegation

The screenshot shows the P2PP 3.2 software interface. The main window displays a table of observing runs under the heading "Observing Runs". The table has columns for Name, Priority, Contrib. to Gro, Abs. Time Interval, Earliest After Prev., and Latest After Prev. The data is organized into a tree structure under the folder "60.A-9252(I)/SM/FLAMES".

Name	Priority	Contrib. to Gro	Abs. Time Interval	Earliest After Prev.	Latest After Prev.
60.A-9252(I)/SM/FLAMES					
OB N1754	✓ 5		0		
G clusters	2				
OB N1754	✓	40	0		
OB N1754_2	✓	20	0		
OB N1754_3	✓	10	0		
OB m4	✓	50	0		
T variables	1				
OB M4	✓		1		
OB M4_2	✓			015d 00:00	030d 00:00
OB M4_3	✓			015d 00:00	030d 00:00
OB M4_4	✓			015d 00:00	030d 00:00
OB M4_5	✓			030d 00:00	050d 00:00
OB M4_6	✓			006d 00:00	015d 00:00



# Scheduling Containers: P2PP3 → OT3

## ◆ CONCATENATIONS

- Set of observations that **must** be executed back-to-back (“super observing block”)
- Example: science + standard star calibration

## ◆ TIME-LINKS

- **Relative** time dependencies between observations with a minimum and possibly also maximum time-delay
- Ideal for time-monitoring

## ◆ GROUPS

- Preferentially execute all observations from one group before starting execution of another group

- ◆ Observing queues & execution sequence
- ◆ Observations filtering and ranking → short term schedule
- ◆ Observations logging: QC0 grade triggers status update with immediate database replication Paranal-Garching
- ◆ Reports – e.g. up-coming time-critical observations
- ◆ OB database browser

Open OB report results

PDFReport Panels Readme View

OB's Verify night Verify concatenations Failed OB's Upcoming time-critical OB's

OB filter Container filter Filter start time Event filtering

Filter start time From 2013 Sep 07, 21:40 To 2013 Sep 08, 21:40

Telescope UT3 Show OB's

OB id	Name	Container id	Start time	Instrument	Status
833044	MOS_F02_P05_LRRED_1		2013-09-08T07:53:50	VIMOS	C
960132	Q1623-BX543_2		2013-09-07T23:32:01	ISAAC	C
961192	HD163296_phase4	961181	2013-09-08T01:53:56	ISAAC	C
961251	HD190073_phase4	961240	2013-09-08T03:29:22	ISAAC	C
961307	VV_Ser_phase4	961296	2013-09-08T00:58:39	ISAAC	C
969033	HD203030B - H_2	969052	2013-09-08T02:31:12	ISAAC	C

Selected OB, "events" stack

OB id 960132 Instrument ISAAC

Target Q1623-BX543

Event 8  
Status C Grade A Time 2013-09-08T00:40:07 Host P/wu  
Public OB executed under dr conditions. Nevertheless the telluric finished after conditions changed to THN.

Event 7  
Status X Grade Time 2013-09-08T00:40:04 Host P/wu

Event 6  
Status S Grade Time 2013-09-07T23:32:01 Host P/wu

Observing Tool 3.4.6

File Queues Reports Finding Charts Readme Ephemeris File

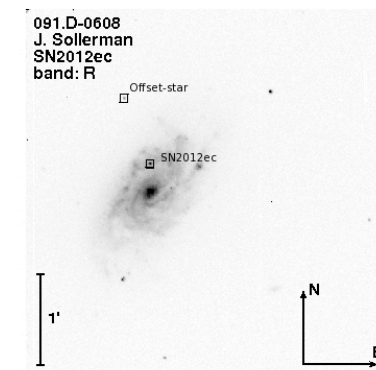
OT Queues

Execution Sequence All Queues Open Queues

Query Break Move To Top Move Up Move Down Display Finding Charts View Display Text

OB ID	Sta...	OB name	Instrument	RA	Dec	Exec.time	Prog.ID
868428	+	SN2012ec_XS_2	XSHOOTER	02:45:58.820	-07:33:45.080	00:58:49.000	091.D-0608
936401	+	GRB070729_x1	XSHOOTER	03:45:16.020	-39:19:20.600	00:41:11.000	091.D-0908
868424	+	SN2012ec_XS_1	XSHOOTER	02:45:58.820	-07:33:45.080	00:58:49.000	091.D-0608
833044	+	MOS_F02_P05_LRRED_1	VIMOS	02:45:58.820	-07:33:45.080	00:58:49.000	091.D-0608

25065473 OB Name=SN2012ec\_XS\_2 FindingChart Name=091.D-0608.001.jpg Mode=Original size





# Short term scheduling

## ◆ Step 1: Observations Filtering

- seeing, airmass, sky transparency, moon
- image quality as a function of airmass & filter ( $\lambda$ )
- wind, AO friendly atmosphere, availability of laser or masks
- sidereal time, absolute time (include long-term schedule)
- **Result:** Observable vs. Non-observable queue

## ◆ Step 2: Observations Ranking

- scientific ranking of the programme (OPC rank class)
- combined probability of the realization of observing constraints → observability class
- time critical score + setting target score
- user priority, group score, group contribution
- **Result:** ranked list + rank justification



# Short term scheduling

ORANG DB server:acdb.hq.eso.org:2025 Telescope: UT2

OBS Readme Ephemeris File Reports Finding Charts OB Reports Options

SMTS.UVES.TODAY  
SMTS.UVES.TOO.TODAY  
SMTS.XSHOOTER.TODAY  
SMTS.XSHOOTER.TOO.TODAY

UT Time: 2013-09-11T04:54:23 To Now

Duration: 4 hours Exec at Start-Time

Rank Rows: 2000

Weather-Conditions

Seeing: [0.70 .. inf.] 0.2 1.0 1.5 inf

Wind: -180 -90 0 90 180

Sky: Photometric

AO atmosphere: no AO possible

PWV: 1.9 mm. 0.1 1 2 3 4 5 6 7 8 9 10 inf

Visibility-Constraints

Air-Mass: 0

Sidereal: 0 min. 0 5 10 15 20 25 30

Twilight: -30 -20 -10 0 10 20 30

Sun: -18 deg. -25 -18

Moon:  Moon

FLI: 0

Rank VLT

Observable OB (21) Non observable OB (428) Report of executed OBs

Selected Columns

OB name  Prog.ID  P/P factor  PI  Target   
 RA  Dec  Instrument  Seeing  Twilight   
 Sky tran.  Airmass  FLI  MoonDis  Strehl   
 ExecTime  Opt.elem.  Rank class  QC grade  Readme vrs.   
 Readme status  Sidereal Min  Sidereal max  Baseline  Ephemeris file   
 User Pr.  OB comment  PWV  ATM  Mask Status   
 Mask Slot  Mask Channel  Mask Barcode  Container name  Rank

Query Break Clear Execution Sequence Copy Export... OB Report... Finding Charts View

Rank...	Status	Cont...	OB name	RA	Dec	Instrum...	Seeing	Sky...	FLI	Pr
1+			Abell119-1	00:57:12.050	-01:24:28.200	FLAMES	0.800	2CLR	0.500	091.B
1+			Abell119-2	00:57:12.050	-01:24:28.200	FLAMES	0.800	2CLR	0.500	091.B
1+			Abell119-3	00:57:12.050	-01:24:28.200	FLAMES	0.800	2CLR	0.500	091.B
2+			CAL-Feige110-Q0158-Night1	23:19:58.397	-05:09:56.207	XSHOOTER	2.000	2CLR	0.700	089.B
2+			CAL-Feige110-Q0158-Night2	23:19:58.397	-05:09:56.207	XSHOOTER	2.000	2CLR	0.700	089.B
3+			SN2012ec_XS_2	02:45:58.820	-07:33:45.080	XSHOOTER	1.000	2CLR	0.400	091.D
3+			SN2012ec_XS_3	02:45:58.820	-07:33:45.080	XSHOOTER	1.000	2CLR	0.400	091.D
4+			GRB070729_x1	03:45:16.020	-39:19:20.600	XSHOOTER	1.000	3THN	0.600	091.D
4+			GRB070729_x1_2	03:45:16.020	-39:19:20.600	XSHOOTER	1.000	3THN	0.600	091.D
4+			GRB070729_x1_3	03:45:16.020	-39:19:20.600	XSHOOTER	1.000	3THN	0.600	091.D
5 M		G	LP772-56_2	03:23:52.820	-17:18:21.100	UVES	1.400	2CLR	0.700	091.D

Filtered rows: 21

Container Info Rank Justification for 931454 Ob Tree View: Abell119-1

RA | DEC: 00:57:12.050 | -01:24:28.200 degrees  
 AIRMASS AT START: 1.16 | LST AT START [hhmmss]: 23:34:16 | LAMBDA FILTER: 543.00  
 REQUESTED CONSTRAINTS(1): Airmass: 001.70 | Seeing: 0.800 | Seeing(@600nm): 0.717 | Seeing(@600nm,AirmassLimit): 0.745  
 REQUESTED CONSTRAINTS(1): FLI: 0.50 | Sky Transparency: 2CLR | Moon Angular Distance: 60 | ATM: no constraint | PWV not defined.  
 EXECUTION TIME [hhmmss]: 01:20:00.000  
 FILTER NAME: 'L543.1' FILTER VALUE: '543'  
 LST AT DUSK [hhmmss]: 18:32:09  
 Sky transparency probability for p\_sky  
 ATM in ranking: no constraint  
 PROBABILITIES: p\_z: 0.843 | p\_sidereal: 1.000 | p\_sky: 0.800 | p\_fli: 0.641 | p\_set: 1.000 | p\_seeing: 0.445 | p\_ao: 1.000 | p\_total: 0.193  
 TIME RANK: 100.00%



# Next Generation Night Log Tool

- ◆ Web based tool
- ◆ Automatic observation logging – user can add comments and assign observing mode or time loss
- ◆ Automatic problem reporting
- ◆ Nightly Statistics – telescope/instrument times
  
- ◆ Customized Reports for users & links to the Archive
- ◆ Subscription to e-mails with PDF night reports
- ◆ Run Progress pages – access to Phase 2 and data delegates

Run Progress

Run Progress Legend

up ↑

## How large is an early type galaxy halo?

Run Code	Instrument	Mode	Allocated Time	Moon	Seeing	Run State	Progress
290.B-5040(B)	ISAAC @ UT3	Service	5.0 hours	No Restrictions	0.6	OPEN	<div style="display: flex; align-items: center;"> <div style="width: 40px; height: 15px; background-color: #90EE90; border: 1px solid black; margin-right: 5px;"></div> <div style="width: 40px; height: 15px; background-color: #ADD8E6; border: 1px solid black; margin-right: 5px;"></div> <div style="margin-left: 5px;"> <p>OBs 2 of 5 OBs, 40.0%</p> <p>1.7 of 5h, 33.8%</p> </div> </div>

### OB Summary

[OB Details >](#)

OB ID	Date	from > to	OB Name	Grade	Weather
955265	23 / 24-Mar-2013	06:48:59 > 07:33:22	N5128_F7_J1	A	
955269	1 / 2-Apr-2013	08:53:00 > 09:39:00	N5128_F7_J2	C	
955269	19 / 20-Apr-2013	02:44:43 > 02:57:57	N5128_F7_J2	X	
955269	20 / 21-Apr-2013	05:04:16 > 05:50:57	N5128_F7_J2	A	

### OB Details

**OB 955265** | 24 Mar 2013 06:48:59 > 07:33:22 | 00:44:23 | Service Mode |

**A**

Instrument ISAAC  
 Name N5128\_F7\_J1  
 Target NGC 5128-F7  
 PI Marina Rejkuba  
 Run 290.B-5040(B)  
 Container Group 955264

Public Comments

Weather ACD

Constraint	Fulfilled	Requested
Seeing	Yes	0.6
Sky Transparency	Yes	THIN
Airmass	Yes	1.4
FLI	Yes	1.0
Moon Distance	Yes	40
Fringe Quality	n/a	
Ellipticity	n/a	
I.Q. variation	n/a	

**OB 955269** | 02 Apr 2013 08:53:00 > 09:39:00 | 00:46:00 | Service Mode |

**C**

Instrument ISAAC



# Concluding remarks

- ◆ Tools development in a running environment
  - ◆ Iterative, incremental development approach – feedback!
  - ◆ Staged deployment – include experience from operations
  - ◆ Documentation, knowledge & skills
  - ◆ Very positive feedback: external and ESO users
- “I don’t understand how we could run service mode before”

The image displays three overlapping screenshots from the ESO operations environment. The leftmost window is P2PP 3.2, showing a table of observing runs with columns for Name, Local Id, ESO Id, Status, Target, OD, and CS. The middle window is the ORANG DB server interface, showing a report for telescope Abell119-1 with columns for Rank, Status, Cont., OB name, RA, Dec, and Instrument. The rightmost window is the NLT - Telescope Report web interface, featuring a 'Time Accounting' section with a table of instrument modes and times, and a 'Run Progress' section with a bar chart showing 40.9% for XSHOOTER Visitor and 52.9% for XSHOOTER Service.

Instrument	Mode	Time spent
XSHOOTER	Visitor	04:05:19
XSHOOTER	Service	05:17:34
UVES	Service	00:37:36

Instrument	Mode	Progress
XSHOOTER	Visitor	40.9%
XSHOOTER	Service	52.9%
UVES	Service	6.3%

