



# ***IA2 : Archives & VO***

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Trieste 01/04/2014





# Outline

- Current goals & projects;
- Standards followed;
- LBT Archive architecture
- New project: NADIR
- NADIR Data Model
- NADIR Configurability
- A Science Gateway
- VO services @ IA2
- GAPS experience
- Data curation, access and DOI
- IA2 in data management

Trieste 01/04/2014





Centro Italiano Archivi Astronomici (IA2) main goals are :

- provide Archiving systems;
- data availability;
- data curation and preservation;
- distribution over several geographical sites;
- providing services and tools (TWiki, work-flow, etc..);
- data publication in the VO



of *Astronomical Data*

IA2 manages data of several PROJECTS.  
Mainly they come from:

- TELESCOPES (raw; INAF ground based)
- SURVEYS (raw and/or calibrated)
- SIMULATIONS (ITVO)





# IA2 Projects

Current status:

| Project Name        | Project Type           | Data Type         | Data Amount |       | UI | VO                  | 1yr User Access |           |
|---------------------|------------------------|-------------------|-------------|-------|----|---------------------|-----------------|-----------|
|                     |                        |                   | Archive     | DB    |    |                     | UI              | VO        |
| LBT ✓✓✓✓            | Telescope              | image / spectra   | 10TB        | 320MB | ✓  | SIA                 | 2.5K            | 47k       |
| TNG ✓✓✓✓            | Telescope              | image / spectra   | 3TB         | 1.2GB | ✓  | SIA                 | 12k             | 55k       |
| GAPS                | Survey (TNG)           | image / spectra   | 850MB       |       |    | ✓(TNG), TWiki, Yabi |                 |           |
| Asiago ✓✓✓ < 1yr    | Telescopes             | image / spectra   | 400GB       | 290MB | ✓  | (TAP)               | 700             | (70)      |
| PESSTO              | Survey (NTT)           | image / spectra   | 7GB         | 1MB   | ✓  |                     |                 |           |
| hosted services     |                        |                   |             |       |    |                     |                 |           |
| WGE SDSS redshifts  | data mining            | catalogue         |             | 8GB   |    | SCS / TAP           |                 | 11k / 170 |
| Planck              | early release          | catalogue         |             | 8MB   |    | SCS                 |                 | 49k       |
| TIRGO               | IR camera              | image             | (Arcetri)   | 100MB |    | SIA                 |                 | 13k       |
| WINGS < 1yr         | Survey                 | image / catalogue | 26GB        | 700MB |    | SIA / SCS           |                 | 11k / 10k |
| INAF-IAPS EPN < 1yr | dust particles (NASA)  | catalogue         |             | 2MB   |    | TAP                 |                 | 1k        |
| ITVO                | Theoretical Simulation | mixed             | 1TB         | 1MB   | ✓  |                     | 70              |           |

Under development:

| Project Name  | Project Type    | Data Type      | Data Amount |  | UI | VO | 1yr User Access |  |
|---------------|-----------------|----------------|-------------|--|----|----|-----------------|--|
| RADIO         | Array/antennas  | Images/spectra |             |  | ✓  | ✓  |                 |  |
| SKA.TM.OBSMGT | Observing tools | Meta-data      |             |  |    |    |                 |  |

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# Standards followed

IA2 at the moment manage Astronomical Data mainly in FITS format (Flexible Image Transport System) for images and spectra and GADGET2 for simulations. Current projects implies also the management of Hierarchical FITS and MBFITS formats. IA2 host also survey pipeline and related products and provides support to a survey dedicated TWiki.

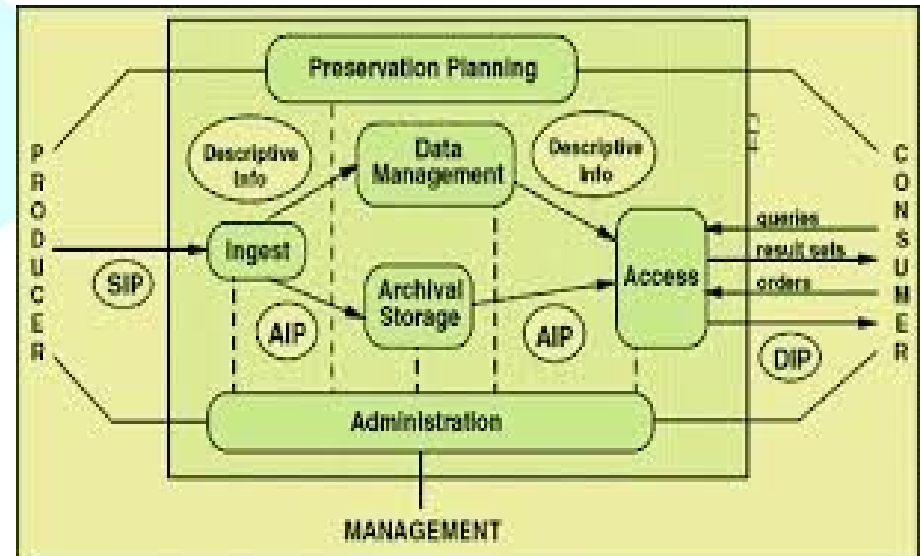
- **IA2 archives follows the directives of OAIS (Open Archival Information System) standard:**
  - data are logically split in **data descriptors** and **data content**.

## Data descriptors

```

fv: Header of lbc.20140110.005826.fits[0] in /home/mdm/Desktop/LB/test_file
File Edit Tools
Search for: [ ] Find Case sensitive? Yes
SIMPLE = T / File conforms to FITS standard
BITPIX = 16 / Bits per pixel
NAXIS = 0 / Number of axes
EXTEND = T / FITS dataset may contain extensions
BZERO = 32768.0 / real
BSCALE = 1.0 / real
NEXTEND = 4 / Number of extensions
DATE_OBS= '2014-01-10T00:58:26.855' / Starting date of the observation
GAIN = 1.75000 / ADU conversion factor (electrons/ADU)
RDNOISE = 12.00000 / Read Out Noise in e-
ORIGIN = 'LET Observatory' / data origin
SATURATE= 65536 / Data value at which saturation occurs
EXPTIME = 0.000 / Total Exposure Time (s)
TEXPTIME= 0.000 / Telemetry Exposure Time (s)
FILENAME= 'lbc.20140110.005826.fits' / Name of the FITS file
OBJECT = 'BinoBias' / Identifier observation title
OBS_ID = 'lbc1389315449' / unique observation ID
OBSRA = '00:55:07.674' / current R.A. in hours
OBSDEC = '+32:37:07.45' / current Dec. in degree
OBSEPOCH= 2000.00000 / coordinates epoch of OBSRA and OBSDEC
  
```

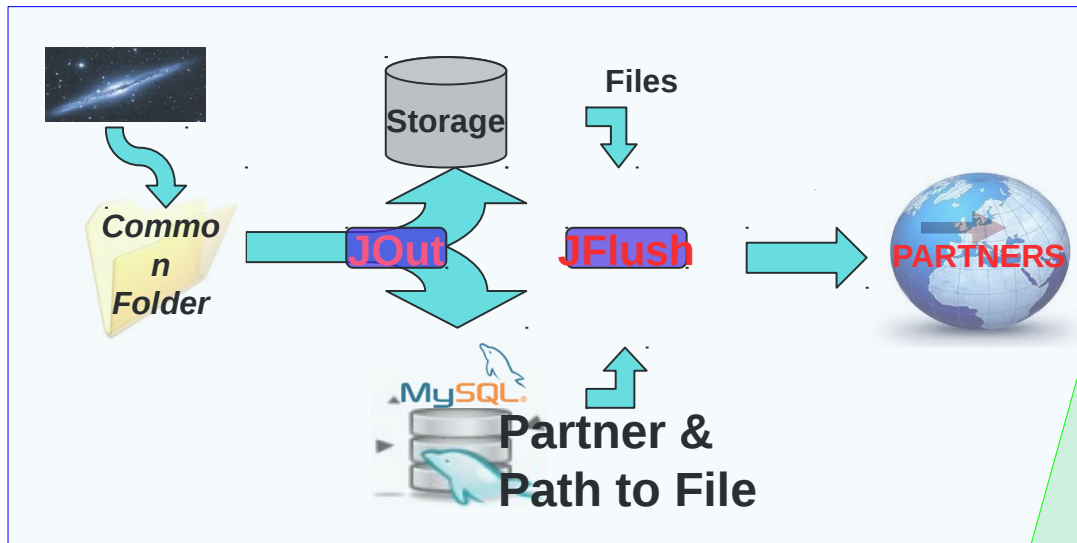
## Data Content



- **IA2 as a service follows the IVOA standards directives** and expose several VO services and several User Interfaces VO compliant.

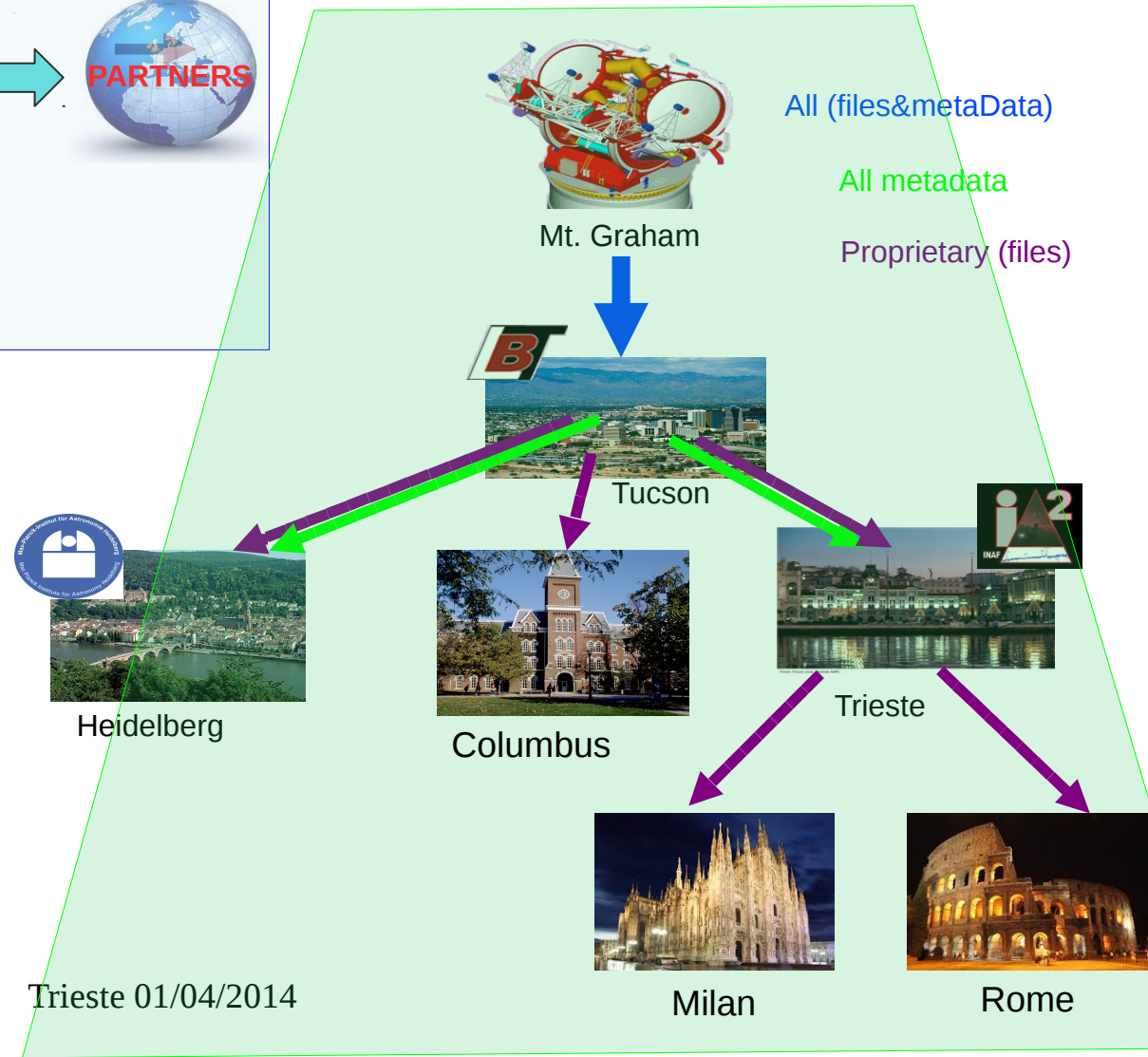


# LBT @ IA2



OAIS standard implementation

Data distribution policy







## IA2 Archives new Project:



build with

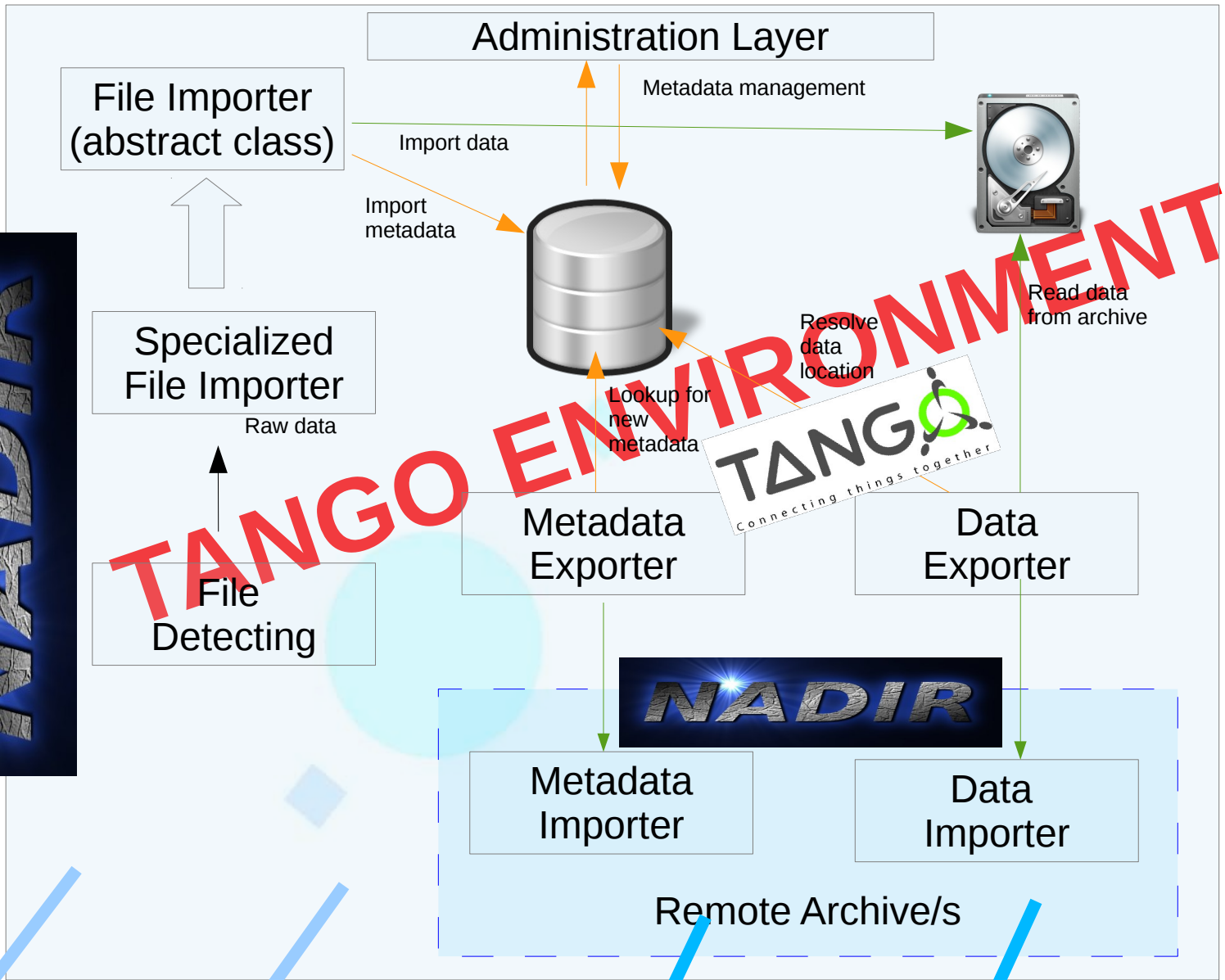


Issues to solve:

- Meta-data information could change in:
  - Contents;
  - Format types;
  - Keywords.
- Data formats:
  - Extensive use of ASCII and PH for calibrated data
  - FITS is not the only astronomical format (HDF5, PDS, MBFITS etc..)
  - Standards are evolving
- Consistency in meta-data content both into the file and database in case of value correction
- Data models should be, as much as possible, code independent
- Code re-usability and configurability
- Scalability in both serial and parallel ways
- Consistency over several distributed archives and secure differentiation.

**NADIR** is one configurable and flexible software that *answer the challenging problem of archiving software reuse and scalability thanks also to TANGO.*





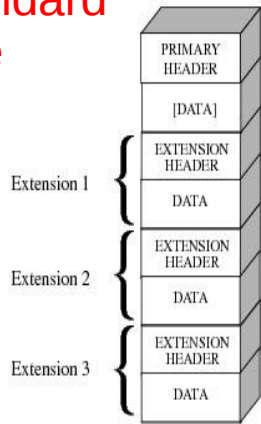
**TANGO ENVIRONMENT**  
Connecting things together





# Starting from FITS

FITS standard structure



Primary HDU

Two different examples:

fv: Summary of lbc.20140110.005826.fits in /home/mdm/Desktop/LBT/test\_files/lbc

| Index                      | Extension | Type  | Dimension   | View               |
|----------------------------|-----------|-------|-------------|--------------------|
| <input type="checkbox"/> 0 | Primary   | Image | 0           | Header Image Table |
| <input type="checkbox"/> 1 | LBCCHIP1  | Image | 2304 X 4608 | Header Image Table |
| <input type="checkbox"/> 2 | LBCCHIP2  | Image | 2304 X 4608 | Header Image Table |
| <input type="checkbox"/> 3 | LBCCHIP3  | Image | 2304 X 4608 | Header Image Table |
| <input type="checkbox"/> 4 | LBCCHIP4  | Image | 2304 X 4608 | Header Image Table |

fv: Summary of lbc.20090118.201012.fits in /home/mdm/Desktop/LBT/test\_files/lbc

| Index                      | Extension | Type  | Dimension   | View               |
|----------------------------|-----------|-------|-------------|--------------------|
| <input type="checkbox"/> 0 | Primary   | Image | 0           | Header Image Table |
| <input type="checkbox"/> 1 | LBCCHIP1  | Image | 2304 X 4608 | Header Image Table |
| <input type="checkbox"/> 2 | LBCCHIP2  | Image | 2304 X 4608 | Header Image Table |
| <input type="checkbox"/> 3 | LBCCHIP3  | Image | 2304 X 4608 | Header Image Table |
| <input type="checkbox"/> 4 | LBCCHIP4  | Image | 2304 X 4608 | Header Image Table |

fv: Header of lbc.20140110.005826.fits[0] in /home/mdm/Desktop/LBT/test\_files/lbc

```

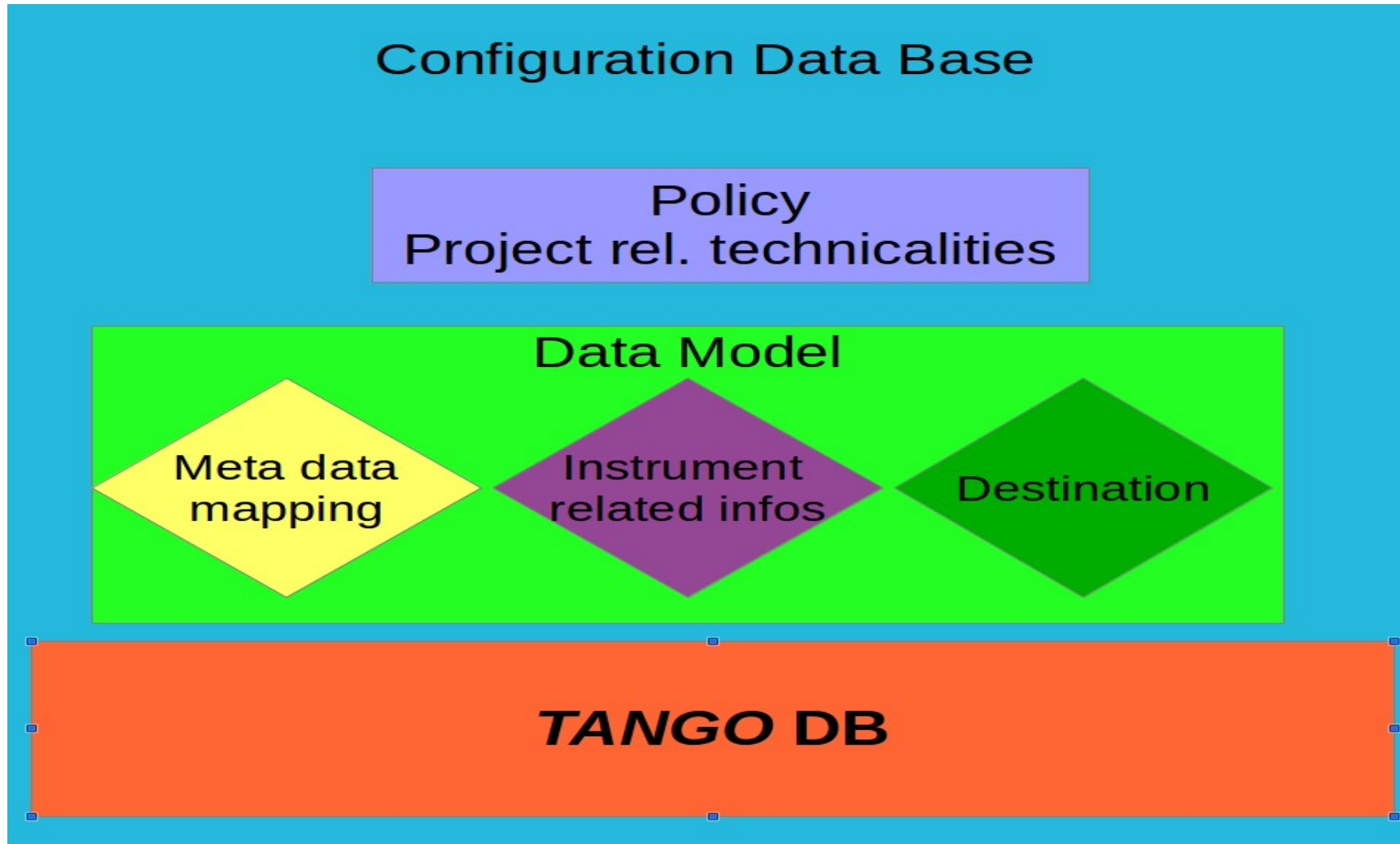
File Edit Tools
Search for: Find Case sensitive? Yes

SIMPLE = T / File conforms to FITS standard
BITPIX = 16 / Bits per pixel
NAXIS = 0 / Number of axes
EXTEND = T / FITS dataset may contain extensions
BZERO = 32768.0 / real
BSCALE = 1.0 / real
NEXTEXT = 4 / Number of extensions
DATE_OBS= '2014-01-10T00:58:26.855' / Starting date of the observation
GAIN = 1.75000 / ADU conversion factor (electrons/ADU)
RDNOISE = 12.00000 / Read Out Noise in e-
ORIGIN = 'LBT Observatory' / data origin
SATURATE= 65536 / Data value at which saturation occurs
EXPTIME = 0.000 / Total Exposure Time (s)
TELEXTIME= 0.000 / Telemetry Exposure Time (s)
FILENAME= 'lbc.20140110.005826.fits' / Name of the FITS file
OBJECT = 'BinoBias' / Identifier observation title
OBS_ID = 'lbc1389315449' / unique observation ID
OBSRA = '00:55:07.674' / current R.A. in hours
OBSDEC = '+32:37:07.45' / current Dec. in degree
OBSEPOCH= 2000.00000 / coordinates epoch of OBSRA and OBSDEC
PMRA = 0.000 / Proper motion for R.A. in arcsec/hour
PMDEC = 0.000 / Proper motion for DEC. in arcsec/hour
PROPID = 'biascheck' / proposal identification
OS_NUM = 1 / Observing Sequence Number ID Template
LBCOBSID = 'ob1389315449' / Observing Block ID
LBCOBSNAM= '10Bias_Bino_Checko' / Observing Block ID
PARTNER = 'calibration' / Observer Name
PI_NAME = 'bias' / P.I. Name
MJD_OBS = 56667.04059 / MJD start
UTC_OBS = '00:58:26.86' / UT at start
LST_OBS = '00:56:48' / ST at start
AIRMASS = 1.00000 / Airmass at start (from TCS)
LBTLAT = 32.7013 / Latitude of the telescope [deg]
LBTLONG = -109.8890 / Longitude of the telescope [deg]
LBTLELEV = 3221 / Elevation of the telescope above sea level [m]
ZD = -0.00003 / Zenithal distances in degrees (from TCS)
HA = '+00:00:43.92' / Telescope Hour Angle (from TCS)
PA_PNT = -0.00260 / Position Angle of the pointing [deg]
ROTANGLE= 73.18051 / Rotator Angle [deg]
PARANGLE= 73.17790 / Parallactic Angle [deg]
TELAZ = '90:00:13.78' / Az angle at start N=0,E=+90 (from TCS)
TELALT = '+90:00:00.12' / Alt angle at start (from TCS)
TELRA = '00:55:07.674' / actual R.A. in hours (from TCS)
TELDEC = '+32:37:07.45' / actual DEC. in degrees (from TCS)
EQUINOX = 2000.0 / Standard FK5 [years]
RADECSYS= 'FK5' / Coordinate reference frame
PIXSCAL = 0.22400 / Pixel scale [arcsec/pixel]
PIXSIZE = 13.50000 / Pixel size [microns]
DITHSEQ = 1 / Number sequence of dithering
DITHOFFX= 0 / Offset in X for the dithering [arcsec]
DITHOFFY= 0 / Offset in Y for the dithering [arcsec]
TELESCOP= 'LBT-SX' / Telescope name
INSTRUME= 'LBC BLUE' / Instrument name ('LBC-BLUE' or 'LBC-RED')
FILTER = 'U-BESSEL' / Filter
IMAGETYP= 'zero' / Observation category
LBCFWHM = -3600.00 / FWHM value in arcsec from LBC trackers
LBTPRES = 686 / Ambient air pressure [mbar] (from TCS)
LBTTRHUM = 46.20 / Ambient relative humidity [%] (from TCS)
LBTTEMP = -4.4 / Ambient temperature [Celsius] (from TCS)
LBTWDIR = 166.0 / Ambient wind direction [deg] (from TCS)
LBTWSPD = 5.8 / Ambient wind speed [m/s] (from TCS)
GUSTAT = 'starting' / Status of autoguider
DETECTOR= 'EEV-BLUE' / Name of detector ('EEV-BLUE' or 'EEV-RED')
LBCPIPEC= / Command to be executed on the image
LBCNCHIP= 4 / Number of active chips in LBC camera
LBCCHIP1= 1 / 1st chip status (1=on 0=off)
LBCCHIP2= 1 / 2nd chip status (1=on 0=off)
LBCCHIP3= 1 / 3rd chip status (1=on 0=off)

DATE_OBS= '2014-01-10T00:58:26.855' / Starting date of the observation
    
```

2014

# NADIR *DATAMODEL*





# NADIR Configuration

| id | host      | port | user | password | schema_name  | table_name | storage_path | dir_name |
|----|-----------|------|------|----------|--------------|------------|--------------|----------|
| 4  | localhost | 3306 | user | password | lbt_metadata | warning    | /mnt/storage | warning  |
| 5  | localhost | 3306 | user | password | lbt_metadata | luci       | /mnt/storage | luci     |
| 7  | localhost | 3306 | user | password | lbt_metadata | lbc        | /mnt/storage | lbc      |
| 8  | localhost | 3306 | user | password | lbt_metadata | mods       | /mnt/storage | mods     |
| 9  | localhost | 3306 | user | password | lbt_metadata | pis        | /mnt/storage | pis      |
| 10 | localhost | 3306 | user | password | lbt_metadata | irt        | /mnt/storage | irt      |

## Instrument mapping

| id | name     | fits_key | fits_value        | fits_date | dest_id | comment |
|----|----------|----------|-------------------|-----------|---------|---------|
| 4  | Warning  | NONE     | NONE              | NONE      | 4       |         |
| 5  | Lucifer  | INSTRUME | Lucifer           | DATE      | 5       |         |
| 6  | Lucifer2 | INSTRUME | LUCI2             | DATE      | 5       |         |
| 7  | LBCBlue  | INSTRUME | LBC_BLUE          | DATE_OBS  | 7       |         |
| 8  | LBCRed   | INSTRUME | LBC-RED           | DATE_OBS  | 7       |         |
| 9  | MODSBlue | INSTRUME | MODS1B            | DATE-OBS  | 8       |         |
| 10 | MODSRed  | INSTRUME | MODS1R            | DATE-OBS  | 8       |         |
| 11 | Pisces   | INSTRUME | PISCES            | DATE      | 9       |         |
| 12 | IRT      | INSTRUME | IRTC 2 - Xeva 538 | DATE      | 10      |         |

| id  | column_name | column_type | fits_key_hdu | fits_key_pri | fits_key_sec | mandatory | dest_id | comment |
|-----|-------------|-------------|--------------|--------------|--------------|-----------|---------|---------|
| 127 | DATE_OBS    | varchar     | 0            | DATE_OBS     | DATE_OBS     | 0         | 7       |         |
| 117 | DEC         | varchar     | 0            | OBSDEC       | OBSDEC       | 0         | 7       |         |
| 115 | EXPTIME     | double      | 0            | EXPTIME      | EXPTIME      | 0         | 7       |         |
| 110 | EXP_ID      | varchar     | 0            | FILENAME     | FILENAME     | 0         | 7       |         |
| 124 | FLT_ID      | varchar     | 0            | FILTER       | FILTER       | 0         | 7       |         |
| 129 | INSTRUMENT  | varchar     | 0            | INSTRUME     | INSTRUME     | 0         | 7       |         |
| 122 | LBCOBID     | varchar     | 0            | LBCOBID      | LBCOBID      | 0         | 7       |         |
| 111 | NAXIS1      | decimal     | 0            | NAXIS1       | NAXIS1       | 0         | 7       |         |
| 112 | NAXIS2      | decimal     | 0            | NAXIS2       | NAXIS2       | 0         | 7       |         |
| 121 | OBID        | varchar     | 0            | LBCOBFIL     | LBCOBFIL     | 0         | 7       |         |
| 119 | OBJECT      | varchar     | 0            | OBJECT       | OBJECT       | 0         | 7       |         |
| 118 | OBJNAME     | varchar     | 0            | OBJNAME      | OBJNAME      | 0         | 7       |         |
| 123 | OBNAME      | varchar     | 0            | LBCOBNAM     | LBCOBNAM     | 0         | 7       |         |
| 113 | OBSERVER    | varchar     | 0            | OBSERVER     | OBSERVER     | 0         | 7       |         |
| 126 | OBS_TYPE    | varchar     | 0            | IMAGETYP     | IMAGETYP     | 0         | 7       |         |
| 130 | PARTNER     | varchar     | 0            | PARTNER      | PARTNER      | 0         | 7       |         |
| 131 | PINAME      | varchar     | 0            | PI_NAME      | PI_NAME      | 0         | 7       |         |
| 120 | PROPID      | varchar     | 0            | PROPID       | PROPID       | 0         | 7       |         |
| 116 | RA          | varchar     | 0            | OBSRA        | OBSRA        | 0         | 7       |         |
| 128 | TELESCOPE   | varchar     | 0            | TELESCOP     | TELESCOP     | 0         | 7       |         |
| 125 | TEMPERAT    | double      | 0            | CCDTEM       | CCDTEM       | 0         | 7       |         |
| 114 | USER_ID     | varchar     | 0            | LBCUSER      | LBCUSER      | 0         | 7       |         |





# Result for meta-data

fv: Header of lbcbl.20140110.005826.fits[0] in /home/mdm/Desktop/LB...test\_files/lbc...

File Edit Tools Help

Search for:  Find Case sensitive? Yes

```

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BSCALE = 1.0 / real
NEXTEND = 4 / Number of extensions
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GAIN = 1.75000 / ADU conversion factor (electrons/ADU)
RDNOISE = 12.00000 / Read Out Noise in e-
ORIGIN = 'LBT Observatory' / data origin
SATURATE = 65536 / Data value at which saturation occurs
EXPTIME = 0.000 / Total Exposure Time (s)
TEXPTIME = 0.000 / Telemetry Exposure Time (s)
FILENAME = 'lbcbl.20140110.005826.fits' / Name of the FITS file
OBJECT = 'BinoBias' / Identifier observation title
OBS_ID = 'lbcbl389315449' / unique observation ID
OBSRA = '00:55:07.674' / current R.A. in hours
OBSDEC = '+32:37:07.45' / current Dec in degrees
OBSEPOCH = 2000.00000 / coordinates epoch of OBSRA and OBSDEC
PMRA = 0.000 / Proper motion for R.A. in arcsec/hour
PMDR = 0.000 / Proper motion for DEC in arcsec/hour
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LBCOBSNAM = '10Bias_Bino_Checko' / Observing Block ID
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LBTLONG = -109.8990 / Longitude of the telescope [deg]
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DITHOFFX = 0 / Offset in X for the dithering [arcsec]
DITHOFFY = 0 / Offset in Y for the dithering [arcsec]
TELESCOP = 'LBT-SX' / Telescope name
INSTRUME = 'LBC_BLUE' / Instrument name ('LBC-BLUE' or 'LBC-RED')
FILTER = 'U-BESSEL' / Filter
IMAGETYP = 'zero' / Observation category
LBCFWHM = -3600.00 / FWHM value in arcsec from LBC trackers
LBCPRES = 686 / Ambient air pressure [mbar] (from TCS)
LBTTRHUM = 46.20 / Ambient humidity [%] (from TCS)
LBTTEMP = -4.4 / Ambient temperature [Celsius] (from TCS)
LBTWDIR = 166.0 / Ambient wind direction [deg] (from TCS)
LBTWSPD = 5.8 / Ambient wind speed [m/s] (from TCS)
GUISTAT = 'starting' / Status of GUI
DETECTOR = 'EUV-BLUE' / Name of detector ('EUV-BLUE' or 'EUV-RED')
LBCPIPEC = 'zero' / Command executed on the image
LBCNCHIP = 4 / Number of chips in LBC camera
LBCCHIP1 = 1 / 1st chip (on 0=off)
LBCCHIP2 = 1 / 2nd chip (on 0=off)
LBCCHIP3 = 1 / 3rd chip (on 0=off)

```

DATE\_OBS = '2014-01-10T00:58:26.855' / Starting date of the observation

| exp_id                        | ra_c         | dec_c        | object      | propid    | temperat | obs_type | date_obs                | telescope | instrument | partner     | piname |
|-------------------------------|--------------|--------------|-------------|-----------|----------|----------|-------------------------|-----------|------------|-------------|--------|
| lbcbl.20140110.005826.fits.gz | 00:55:07.674 | +32:37:07.45 | BinoBias    | biascheck | -86.2    | zero     | 2014-01-10T00:58:26.855 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.005900.fits.gz | 00:56:04.021 | +32:37:07.94 | BinoBias    | biascheck | -86.2    | zero     | 2014-01-10T00:59:00.253 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.005933.fits.gz | 00:56:37.574 | +32:37:08.24 | BinoBias    | biascheck | -86.2    | zero     | 2014-01-10T00:59:33.682 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.010007.fits.gz | 00:57:11.033 | +32:37:08.53 | BinoBias    | biascheck | -86.2    | zero     | 2014-01-10T01:00:07.080 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.010041.fits.gz | 00:57:45.191 | +32:37:08.84 | BinoBias    | biascheck | -86.2    | zero     | 2014-01-10T01:00:41.150 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.010114.fits.gz | 00:58:18.798 | +32:37:09.14 | BinoBias    | biascheck | -86.2    | zero     | 2014-01-10T01:01:14.735 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.010148.fits.gz | 00:58:52.303 | +32:37:09.44 | BinoBias    | biascheck | -86.2    | zero     | 2014-01-10T01:01:48.149 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.010241.fits.gz | 01:36:45.401 | +32:43:44.73 | BinoBias    | biascheck | -86.2    | zero     | 2014-01-10T01:02:41.854 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.010315.fits.gz | 02:47:03.683 | +31:23:41.75 | BinoBias    | biascheck | -86.1    | zero     | 2014-01-10T01:03:15.252 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.010349.fits.gz | 02:47:03.682 | +31:23:41.75 | BinoBias    | biascheck | -86.1    | zero     | 2014-01-10T01:03:49.650 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.091149.fits.gz | 11:25:49.157 | +13:59:35.09 | focus field | V-BESSEL  | -85.9    | FOCUS    | 2014-01-10T09:11:49.449 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.091338.fits.gz | 11:25:49.157 | +13:59:35.10 | focus field | V-BESSEL  | -85.8    | FOCUS    | 2014-01-10T09:13:38.962 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.091528.fits.gz | 11:25:49.156 | +13:59:35.08 | focus field | V-BESSEL  | -85.8    | FOCUS    | 2014-01-10T09:15:28.334 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.091658.fits.gz | 11:25:49.157 | +13:59:35.10 | focus field | V-BESSEL  | -85.8    | FOCUS    | 2014-01-10T09:16:58.968 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.091824.fits.gz | 11:25:49.156 | +13:59:35.09 | focus field | V-BESSEL  | -85.7    | FOCUS    | 2014-01-10T09:18:24.115 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.092230.fits.gz | 11:25:49.156 | +13:59:35.07 | focus field | V-BESSEL  | -85.6    | FOCUS    | 2014-01-10T09:22:30.646 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.100311.fits.gz | 11:25:49.157 | +13:59:35.08 | focus field | V-BESSEL  | -84.8    | FOCUS    | 2014-01-10T10:03:11.320 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.100501.fits.gz | 11:25:49.157 | +13:59:35.10 | focus field | V-BESSEL  | -84.7    | FOCUS    | 2014-01-10T10:05:01.360 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.100648.fits.gz | 11:25:49.154 | +13:59:35.06 | focus field | V-BESSEL  | -84.7    | FOCUS    | 2014-01-10T10:06:48.932 | LBT-SX    | LBC_BLUE   | calibration | bias   |
| lbcbl.20140110.100821.fits.gz | 11:25:49.159 | +13:59:35.12 | focus field | V-BESSEL  | -84.7    | FOCUS    | 2014-01-10T10:08:21.427 | LBT-SX    | LBC_BLUE   | calibration | bias   |

# Deployments

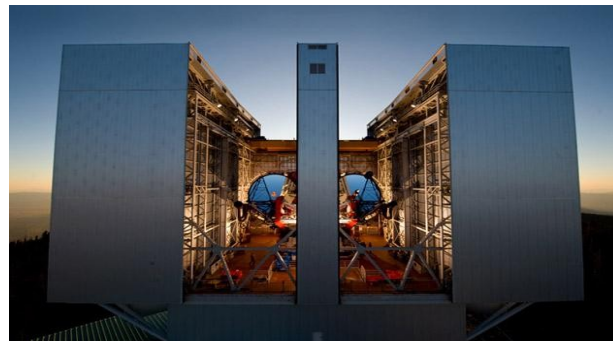
- **First deployment in INAF** → December 2013  
**V**irtual Observatory **E**ducational **S**ervice **P**ublisher  
And **A**rchive Application



- **Second deployment in INAF** → March 2014  
**M**edicina and **N**oto **R**adio **A**rchive (test bed)



- **First deployment in USA** → February 2014  
**L**arge **B**inocular **T**elescope **D**istributed **A**rchive  
**Mnt. Graham (AZ) - Tucson (AZ)**





# But an archive is not only that...

Archive means having raw, science ready products (calibrated data, catalogs and so on..) possibly VO compliant and/or accessible by VO services (it doesn't matter if the archives are local or remote). So:

- \* **data interfaces**
- \* **vo services**
- \* **work-flows / pipelines**
- \* **data access, curation and preservation (DOI / SSO)**

The archive front end is a Science Gateway!

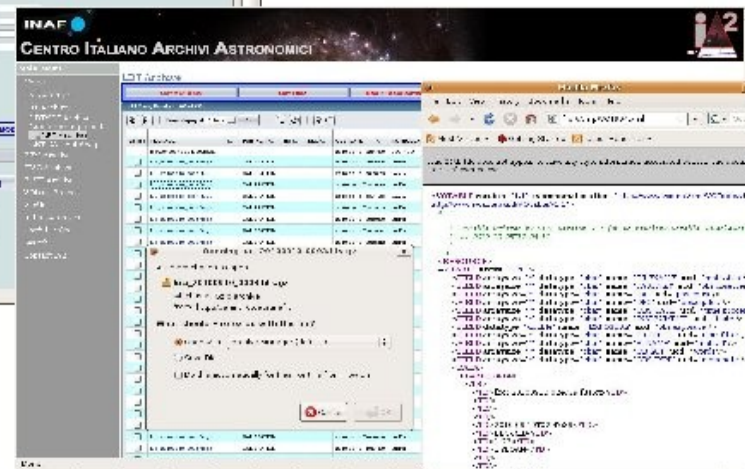
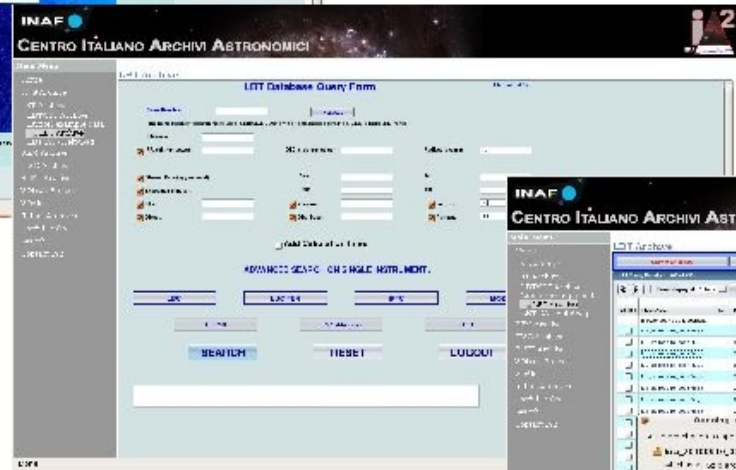
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# IA2 on the WEB

LBT Web Application



A new interface management system is under development so every hint is welcome!!

i.e.

- Image preview;
- VOTable SAMP binding;
- Multi-threading downloads

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# But an archive is not only that...

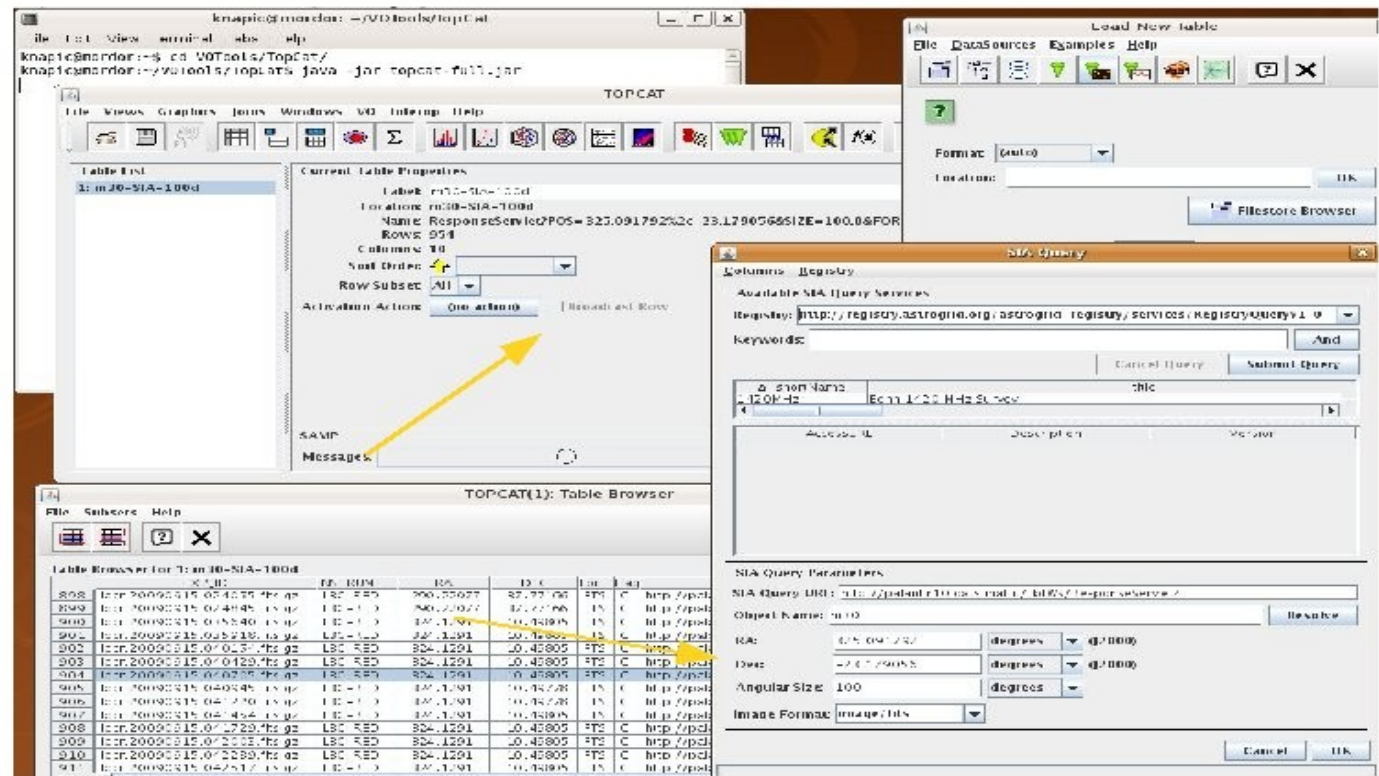
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# IA2 on the VO

## VO Service & TopCat



The screenshot shows the TopCat interface with a table browser and an SIA Query dialog box. The table browser displays a table with columns for RA, DEC, and other astronomical coordinates. The SIA Query dialog box is open, showing the SIA Query Parameters section with fields for RA, Dec, and Angular Size.

| RA  | DEC             | RA               | DEC             | RA               | DEC             | RA               | DEC             | RA               | DEC             |
|-----|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| 808 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 809 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 902 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 903 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 904 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 905 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 906 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 907 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 908 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 909 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 910 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |
| 911 | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s | 05° 42' 39.48" N | 12h 20m 09.515s |

IA2 VO tools are ready to publish:

- \* public data (both raw and calibrated);
- \* catalogs;

What is publishing into the VO?  
What's the VO?



# Interoperable e-Infrastructure



e-Infrastructure refers to a combination and interworking of digitally-based technology (hardware and software), resources (data, services, digital libraries), communications (protocols, access rights and networks), and the people and organisational structures needed to support modern, internationally leading collaborative research be it in the arts and humanities or the sciences.



# VO @ IA2

## Services:

- SIAP (Simple Image Access Protocol) Services
- Cone Search services
- SSAP (Simple Spectral Access Protocol) services
- TAP (Table Access Protocol) services
- EPN TAP (EuroPlanet TAP)
- VO standard compliant Graphical User Interfaces

## Resources:

- › VO Services Registry hosting
- › Educational VO compliant Resources
- › CoSADIE VO Schools (learn the VO)

## Tools:

- ✓ VODance – VO compliant data publication tool
- ✓ Powered IA2TAP – VO compliant catalogs publication tool



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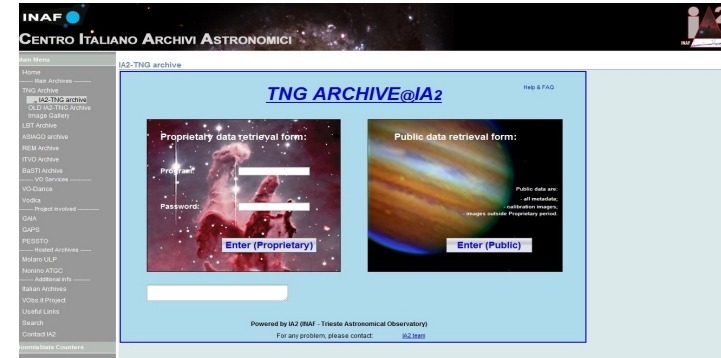




# Data reduction @ IA2: the GAPS experience

GAPS requests:

1. Strong **interaction** with HARPS-N@TNG private data;
2. Customizable **re-process** of GAPS data with appropriate spectral line mask and option/s;
3. Perform **queries** on additional meta-data content;
4. A **repository** where **to access, synchronize, share and search** for interesting data;
5. A flexible and collaborative **tool to manage additional info** about the project and the observations.





# Lesson Learned with GAPS

Observation results **are not only** raw or calibrated data:

- Time series
- Catalogs
- New masks
- Alternative reduced data
- Scientific and ancillary data shared via Owncloud
- Data researchable and downloadable from wiki pages too and linked to night logs (collaborative tool)

References:

YABI : <https://bitbucket.org/ccgmurdoch/yabi/overview>  
OWNCLOUD : <http://owncloud.org/>  
TWIKI : <http://twiki.org/>

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The archive front end is a Science Gateway!

# Easy access to your data

Additional tool for TNG Observatory will be a **Grouping** software. It will allow a contributed management and distribution of programs credentials and privileges. It is also the first step to the SSO (Single Sign On) technology adoption (under development).



Grouper is an enterprise access management system designed for the highly distributed management environment and heterogeneous information technology environment common to Universities. It could work on top of Identity managers like IDEM (for the Italian counterpart) and is compatible with SHIBBOLET.

## DOI (Digital Object Identifier):

DOI is a character string used to uniquely identify an object such as an electronic document. The **DOI** for a document is **permanent**, whereas its location and other meta-data may change. Referring to an on-line document by its DOI provides more stable linking than simply referring to it by its URL, because if its URL changes, the publisher need only update the meta-data for the DOI to link to the new URL.



## References:

GROUPER : <http://www.internet2.edu/products-services/trust-identity-middleware/grouper/>

IDEM : <https://www.idem.garr.it/en/>

SHIBBOLET: <http://shibboleth.net/>

DOI: <http://www.doi.org/>

# What IA2 can do:

## IA2 can actually provide:

- Archiving system (raw and calibrated) with NADIR;
- Data curation;
- Graphical User Interfaces;
- VO compliant data and catalogs publication;
- Work-flow system for pipelines management;
- Data sharing area;
- Collaborative tools

## What IA2 will provide in the near future:

- New Graphical User Interfaces;
- Grouping tools and SSO technology;
- Science Gateway (StarNet project collaboration) with most of the more performance visualization tools like VISIVO
- DOI system adoption





***Thank you for your attention!!!***

***Cristina***  
***in behalf of IA2 team***

Trieste 01/04/2014







# VESPA for SVAS: a test bed for EDUCATIONAL

SVAS: archive & VO

- Educational service for astronomical images
- Prototyping INAF Robotic Telescope Network data access
- Registry for educational resources

**NADIR** + **VESPA** + **VODANCE** = **EDU service**

VESPA is in charge to user registration, test file submission interface, data model creation and **validation** of educational (non professional) data coming from (potentially) all educational or amateur sources. NADIR is in charge of ingest and rely to VO-DANCE for the data publication in the VO.



The screenshot shows the VESPA web interface. The main content area displays a form for adding a new instrument. The form title is "Apogee camera for the C14 telescope". The form fields include: name (Apogee camera for the C14 telescope), shortname (C14), description (SVAS night observations CCD camera), and a checkbox for "Connected services" which is checked for "SVAS Educational SIAP service". A "Save metadata" button is at the bottom of the form. To the right, a modal window titled "Please provide the necessary data" is open, containing input fields for Organization name, Username, Password, Email address, Organization address, and Telephone number, with "Sign up" and "Cancel" buttons at the bottom. The footer of the interface contains logos for various astronomical organizations: EUPRO2007, CERN, INAF, and WICKET.