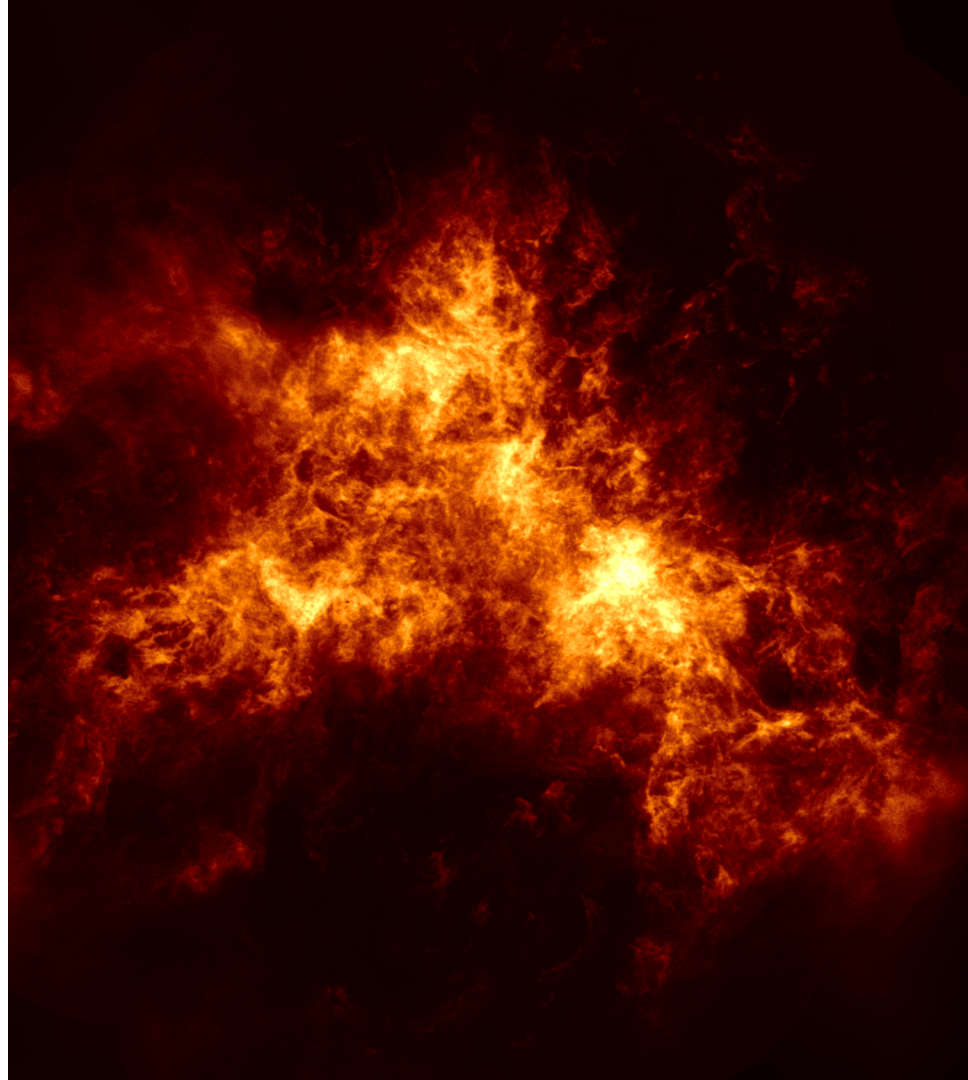




CSIRO Radio Archives and the VO

James Dempsey | 11 Oct 2019





Australia Telescope Online Archive

- Archive for Australia telescope Compact Array (and others)
- Data formats:
 - Visibilities (RPFITS)
 - Spectral Line (SDFITS, HDF5)
- VO Protocols:
 - TAP, SIA2, SCS
 - Direct download





Parkes Pulsar Data Archive

- Holds pulsar data from Parkes
- Data formats:
 - Time series (PSRFITS)
- VO Protocols:
 - TAP, SCS
 - Direct download

Credit: CSIRO

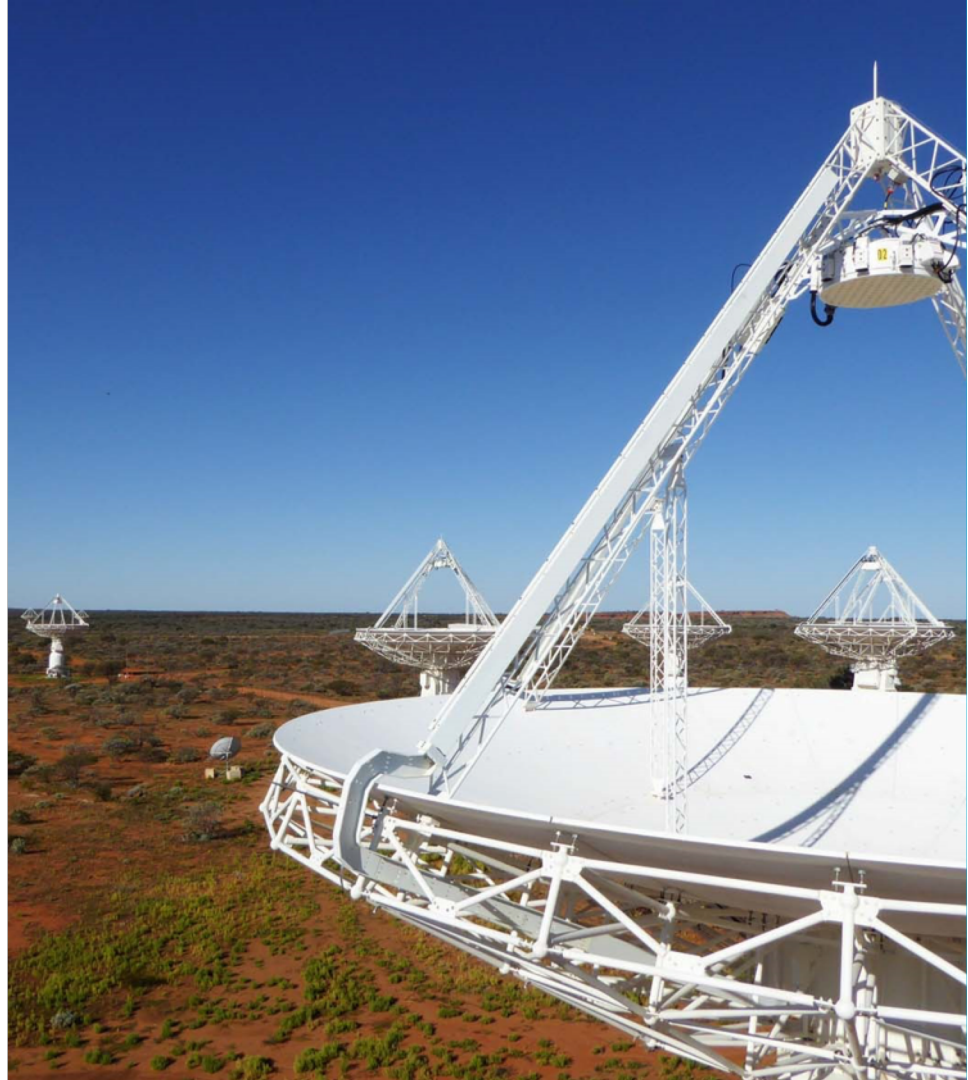




CSIRO ASKAP Science Data Archive

- Archive for Australian Square Kilometre Array Pathfinder
- Data formats:
 - Images & Image cubes (FITS)
 - Spectra (FITS)
 - Catalogues (VOtable)
 - Visibilities (CASA Measurement Sets)
- VO Protocols:
 - TAP, SIA2, SSA, SCS
 - DataLink, SODA

Credit: CSIRO





CASDA VO Tools

- Used on all three archives
- Built to be used anywhere
- Remote database access via TAP, SCS, Datalink, SIA2, SSA
- Requirements:
 - Java 8
 - Postgres database (pgsphere optional)
 - Web container (e.g. tomcat)
- Interactive configuration
 - Discover table structure, create metadata
 - Config stored in yaml file which can be edited

VO Tools Configuration Page

Configuration text in YAML format

```
IConfiguration
endPoints:
  TAP:
    options: !Map
      tap.job.name.prefix: psrda_vo_req_
      tap.data.access.url: https://data.csiro.au/psrdavo/tap/jobResults/
      tap.max.running.jobs: 4
      tap.max.records: 20000000
      tap.async.base.url: /tap
      tap.async.description: UWS for PSRDA
      tap.async.job.list.name: async
      tap.language.name: ADQL
      tap.language.version: 2.0
      tap.language.description: ADQL 2.0
      tap.output.format.mime: text/xml
      tap.output.format.alias: votable
      tap.retention.period.default: 432000
      tap.retention.period.hard: 432000
      tap.execution.duration.default: 360000
      tap.execution.duration.hard: 360000
      tap.sync.timeout: 20
      tap.async.timeout: 36000
      tap.output.limit.hard: 20000000
      log.timezone: UTC
      tap.votable.xsl:
      tap.examples.url:
    tables:
      - psrda.pulsar_obs
  SCS:
    options: !Map
      scs.output.format.mime: text/xml
      scs.outputFormat.alias: votable
      scs.max.radius: 10
      scs.max.records: 20000
      scs.test.ra: 180.0
      scs.test.dec: -30.45
      scs.test.schema: ivoa
      scs.test.catalog: ivoa.obscore
      scs.test.verbose: 1
      scs.test.extras:
    tables:
```

CURRENT

EXPLORE

APPLY

Allowed change level

None

Visibilities

- Raw data (may be calibrated)
- Records all baselines over time
- Each file may contain multiple:
 - Pointings
 - Frequency blocks
 - Polarizations
- Major formats:
 - CASA measurement sets
 - Miriad uv
 - RPFITS

Time	Source Name	Antennas Calcode	Spectral Channels	Wideband Channels	Freq Config	Record No.
19MAY25:19:01:54.9	1934-638	c 6	16388	0	1	4369
19MAY25:19:46:04.9	0252-712	c 6	16388	0	2	25621
19MAY25:19:48:44.9	0043-7041	n 6	16388	0	2	26629
19MAY25:20:19:24.9	0252-712	c 6	16388	0	2	41749
19MAY25:20:22:04.9	0043-7041	n 6	16388	0	2	42757

[...]

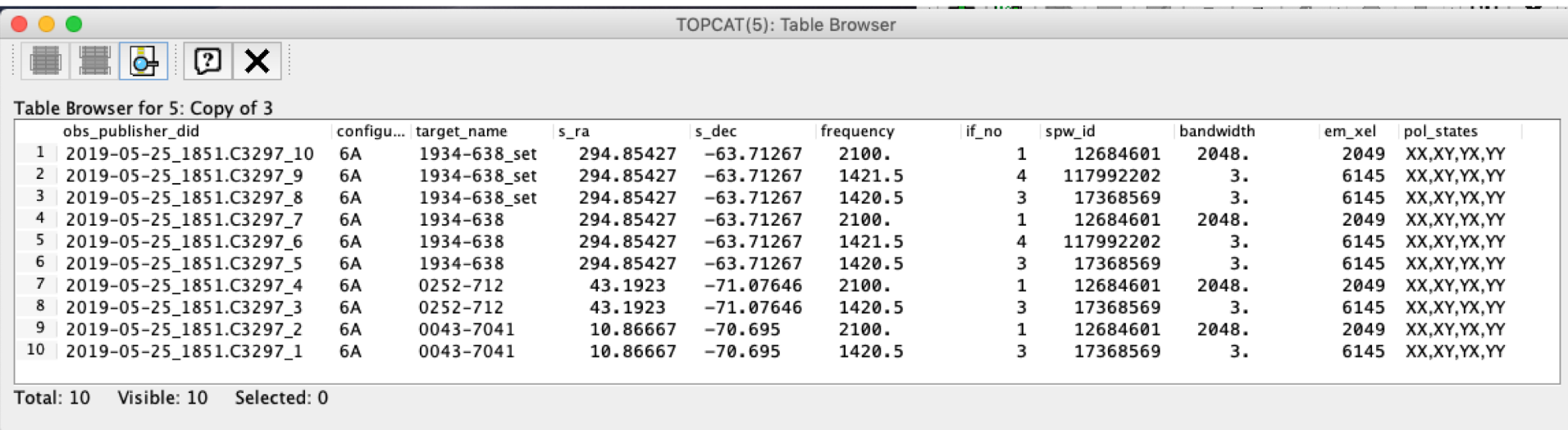
Frequency Configuration 1

Channels	Freq(chan=1)	Increment	Restfreq	IFChain
2049	3.12400	-0.0010000	0.00000 GHz	1
6145	1.42100	-0.0000005	0.00000 GHz	1
2049	3.12400	-0.0010000	0.00000 GHz	2
6145	1.42200	-0.0000005	0.00000 GHz	2

The input data-set contains the following polarizations:
There were 39921 records of polarization YX
There were 39921 records of polarization XY
There were 39921 records of polarization YY
There were 39921 records of polarization XX

Visibilities in ATOA

- Data listed in ObsCore
- Multiple rows per visibility file
 - Split by source/freq



TOPCAT(5): Table Browser

Table Browser for 5: Copy of 3

	obs_publisher_did	configu...	target_name	s_ra	s_dec	frequency	if_no	spw_id	bandwidth	em_xel	pol_states
1	2019-05-25_1851.C3297_10	6A	1934-638_set	294.85427	-63.71267	2100.	1	12684601	2048.	2049	XX,XY,YX,YY
2	2019-05-25_1851.C3297_9	6A	1934-638_set	294.85427	-63.71267	1421.5	4	117992202	3.	6145	XX,XY,YX,YY
3	2019-05-25_1851.C3297_8	6A	1934-638_set	294.85427	-63.71267	1420.5	3	17368569	3.	6145	XX,XY,YX,YY
4	2019-05-25_1851.C3297_7	6A	1934-638	294.85427	-63.71267	2100.	1	12684601	2048.	2049	XX,XY,YX,YY
5	2019-05-25_1851.C3297_6	6A	1934-638	294.85427	-63.71267	1421.5	4	117992202	3.	6145	XX,XY,YX,YY
6	2019-05-25_1851.C3297_5	6A	1934-638	294.85427	-63.71267	1420.5	3	17368569	3.	6145	XX,XY,YX,YY
7	2019-05-25_1851.C3297_4	6A	0252-712	43.1923	-71.07646	2100.	1	12684601	2048.	2049	XX,XY,YX,YY
8	2019-05-25_1851.C3297_3	6A	0252-712	43.1923	-71.07646	1420.5	3	17368569	3.	6145	XX,XY,YX,YY
9	2019-05-25_1851.C3297_2	6A	0043-7041	10.86667	-70.695	2100.	1	12684601	2048.	2049	XX,XY,YX,YY
10	2019-05-25_1851.C3297_1	6A	0043-7041	10.86667	-70.695	1420.5	3	17368569	3.	6145	XX,XY,YX,YY

Total: 10 Visible: 10 Selected: 0

ObsCore – Columns for Visibilities

Column	Description
Configuration	Instrument configuration (e.g. which array was in use)
Frequency	Centre frequency (MHz)
If_num	Intermediate frequency number (frequency band id)
Spw_num	Set up number (Spectral window)
Bandwidth	Em_size in frequency units (MHz)
Number_scans	Number of scans (in file)
Time_scans	Total time on scans at this freq (min)
Data_flag	Data flag, 999 – non science data

Summary

- VO features on all three CSIRO astronomy archives
- Same CASDA VO Tools library used in each
- VO replaces the need for separate APIs
- Visibilities need special consideration in ObsCore
 - Extra columns for configuration
 - Multiple rows per file to describe contents



Thank you

CSIRO Information Management & Technology

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