

JIVE/EVN use case



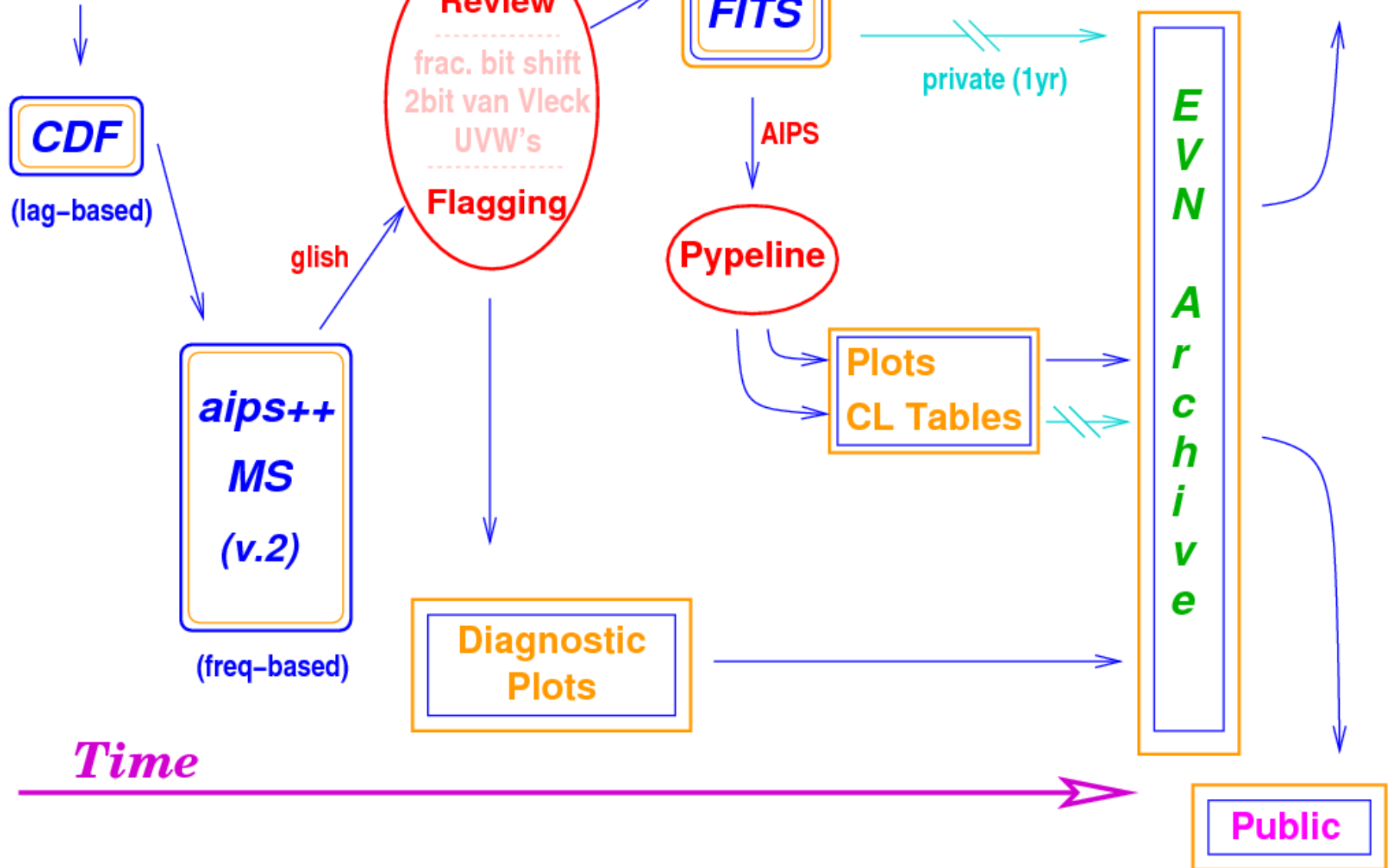
Image by Paul Boven (boven@jive.eu). Satellite image: Blue Marble Next Generation, courtesy of Nasa Visible Earth (visibleearth.nasa.gov).

Arpad Szomoru

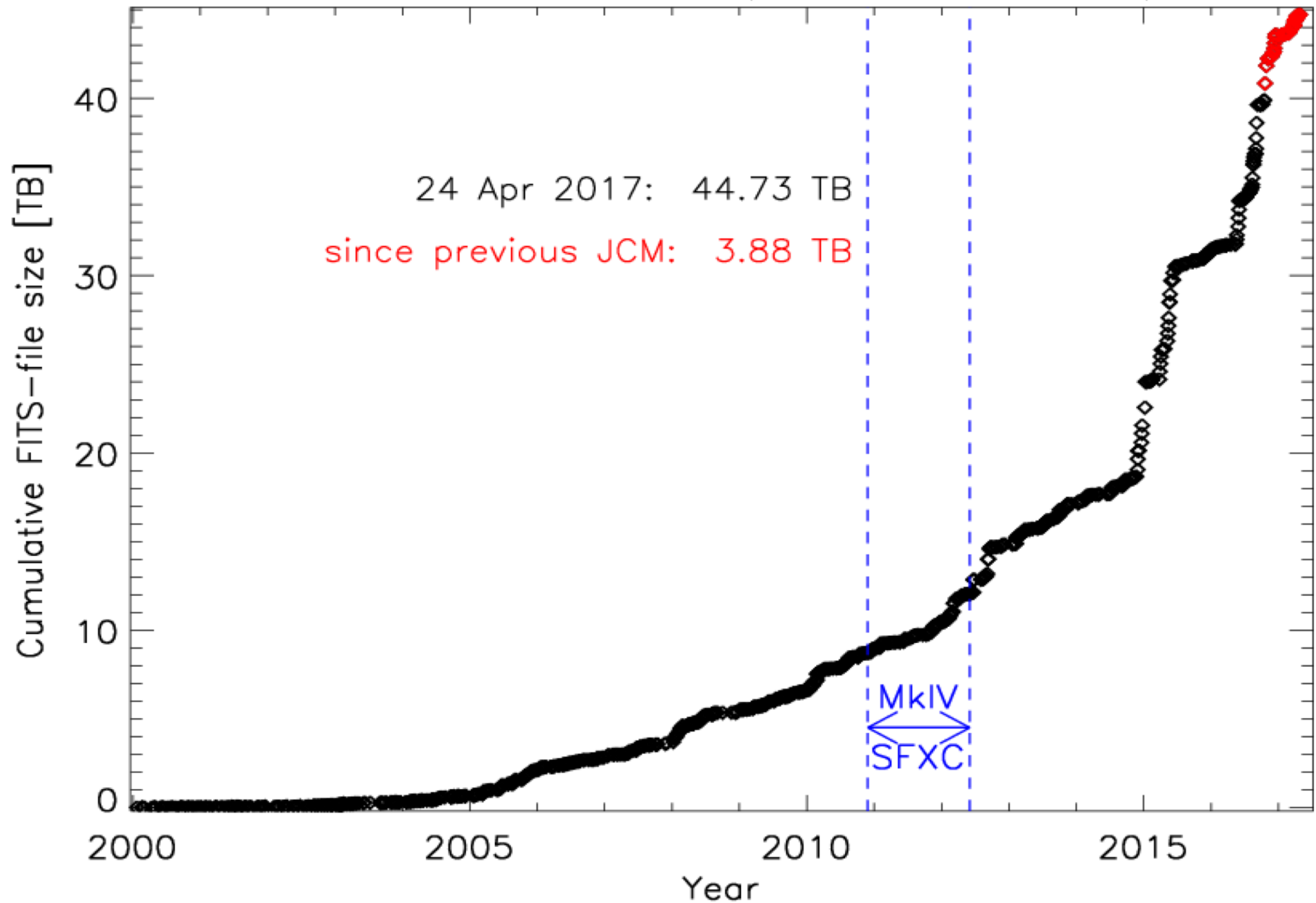
Post-correlation data flow



Correlator



EVN Archive Growth (user experiments)



EVN archive interface



www.jive.eu/select-experiment

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Select experiment

EVN Data Archive at JIVE

Select EVN experiment: N14C3

Select a source/position from EVN experiment N14C3

RA	Dec	Source	Table	Table ID
05:44:31.2	23:03:00.0	3C 273	1	1

JIVE

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www.jive.nl/standard-plots?experiment=N14C3_141022

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Standard plots

EVN Standard Plots of experiment N14C3

Exp. Name	N14C3	Obs. Date	141022
P.I. Name	Goddi	Completion Date	150106
Description	Network Monitoring Experiment	Distribution Date	150128
Wavelength	6cm	Release Date	
Stations	EWBjDnNTrSvZbDShHhYs	Support Scientist	Surcis

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EVN Correlator

www.jive.nl/pipeline?experiment=N14C3_141022&pass=n14c3

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Pipeline

EVN User Experiment Pipeline Feedback of N14C3

A description of the pipeline is available from the [pipeline homepage](#).

- A series of plots produced by the pipeline which should be useful in assessing the antenna performance and data quality in each experiment. (see [pipeline description](#) for details).
- A set of calibration tables (in FITS format) produced by the pipeline. These can be down-loaded and applied to the data provided by the EVN correlator. (see the EVN Data analysis guide, available [here](#)).
- A history file associated with the data processed by the pipeline and a summary table 2 provides the a priori amplitude calibration and CL table 3 provides phase calibrators).
- The parabolic pipeline script can be found [here](#).
- In addition, the original pipeline script is made available, together with first order corrections (etc).

To download all the pipeline products use: [GNU wget](#) (if [manual](#)).

It can be obtained from the web, if not available.

To get all pipeline products, copy next line to your commandwindow:

```
wget -445 -t1 -r -nd http://archive.jive.nl/exp/N14C3_141022/pipe-A "n14c3"
```

Pipeline products of experiment N14C3

Product	Availability
Pipeline plots	
AIPS calibration tables (FITS Format)	
AIPS history file	
Short summary of CL/SN table contents	
Input parameters for script	
Associated EVN calibration	
Associated VLBA / VLA / GBT file	(Not available)
UVFLG flagged data	
UVFLG Band-edge Flagging	(Not available)
The pipeline log file	
Pipeline-calibrated UV FITS files	

EVN Correlator

Correlator overview

- e-VLBI
- Operations
- Software
- Status

EVN Data Archive

- Archive home
- Archive introduction
- Browse catalogue
- Search archive

www.jive.nl/fitsfiles?experiment=N14C3_141022

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Fitsfiles

EVN fitsfiles of experiment N14C3

Access status: public

Download: Use right mousebutton -> Save target.

If the connection is slow, try [GNU wget](#) (if [manual](#)).

It can be obtained from the web, if not available.

A file selection can be made by filling in the wildcard after the -A option.

To get all fitsfiles of experiment copy next line to your commandwindow:

```
wget -445 -t1 -r -nd http://archive.jive.nl/exp/N14C3_141022/fits-A ""
```

The checksum file can be used to verify the checksum of all datafiles using:

```
md5sum -c n14c3.checksum (on unix systems).
```

Filename	Length x 10 ⁹ bytes
n14c3.checksum	0.000000098
n14c3_1_1.ID1	1.937810880
n14c3_1_1.ID2	0.908015040

EVN Correlator

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Searching in the EVN archive



Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://archive.jive.nl...ts/avo/fitsfinder.php

archive.jive.nl/scripts/avo/fitsfinder.php

Fits Archive EVN Correlator at JIVE

Fitsfinder permits users to find data on the basis of selection criteria including sourcename and position.

Show fields		Select value's		Sort fields	
P. Investigator <input checked="" type="checkbox"/>	Frequency <input checked="" type="checkbox"/>	P. Investigator <input type="text" value="Any"/>	<input type="text" value="Any"/>	P. Investigator <input type="checkbox"/>	
Experiment <input checked="" type="checkbox"/>	Channel width <input type="checkbox"/>	Experiment <input type="text" value="Any"/>	<input type="text" value="Any"/>	Experiment <input type="checkbox"/>	
Source name <input checked="" type="checkbox"/>	Freq. channels <input type="checkbox"/>	Source name <input type="text" value="Any"/>	<input type="text" value="Any"/>	Source name <input checked="" type="checkbox"/>	
RA <input checked="" type="checkbox"/>	Nr bands <input type="checkbox"/>	Polarization <input type="text" value="Any"/>	<input type="text" value="Any"/>	RA <input type="checkbox"/>	
DEC <input checked="" type="checkbox"/>	Bandwidth / IF <input type="checkbox"/>	Find sources in Circle <input type="checkbox"/> Box <input type="checkbox"/>	Find sources in frequency range:	DEC <input type="checkbox"/>	
Equinox <input checked="" type="checkbox"/>	Total Width <input type="checkbox"/>	RA (hh:mm:ss) <input type="text" value="12:00:00"/>	<input type="text" value="Any band"/>	Observ. date <input checked="" type="checkbox"/>	
File name <input type="checkbox"/>	Stations <input type="checkbox"/>	DEC (dd:mm:ss) <input type="text" value="00:00:00"/>	<input type="text" value="P-band 90,49 cm"/>	Frequency <input checked="" type="checkbox"/>	
File length <input type="checkbox"/>	Polarization <input type="checkbox"/>	Radius (degr) <input type="text" value="180"/>	<input type="text" value="L-band 21,18 cm"/>	Total Width <input type="checkbox"/>	
File startdate <input type="checkbox"/>	Integr. time <input type="checkbox"/>	Offset degr RA,DEC <input type="text" value="180"/> <input type="text" value="90"/>	<input type="text" value="S-band 13 cm"/>	Freq. channels <input type="checkbox"/>	
File starttime <input type="checkbox"/>	Total time <input type="checkbox"/>		<input type="text" value="C-band 6,5 cm"/>	Integr. time <input type="checkbox"/>	
File enddate <input type="checkbox"/>	Observ. date <input checked="" type="checkbox"/>		<input type="text" value="X-band 2 cm"/>	Total time <input type="checkbox"/>	
File endtime <input type="checkbox"/>			<input type="text" value="K-band 1 cm"/>	Polarization <input type="checkbox"/>	

Buttons: Show list, Plot list, Typed Input, Info, Defaults, Reset

- 2 types of data
- Correlation: gets thrown away, about 1.5 PB per session, 256 MB files
- Post-correlation: see archive plot, files of 2 GB. UV data in archive, calibration, imaging done by user

- First use case: archive in EOSC, searchable trough VO, tools like CASA in Jupyter workbooks, pipelines
- All addressed in WP3, 4 and 5

- Keep voltage data, re-correlation as service, wide field, multiple phase centers, search for FRBs

Processed data



- Correlation produces UV data
 - UV data are calibrated, not-publication ready images made
 - Stored in archive in FITS format (UV data, only very few images)
 - Files of 2GB
- Proprietary period of 1 year
 - PI can download data for further processing and imaging
 - Password protected
- After one year anyone can access the data
 - Does not happen terribly often though
 - Data is fairly FAIR, however the R could be improved upon

Processed data: future?



- Archive in EOSC
 - Possibility to feed back data
 - New data reductions, publications
 - Modernised, more user-friendly pipelines
 - Minimal re-computing
- Data reduction in EOSC using Jupyter-like notebooks
- Archive integrated in VO

Raw data



- Three sessions of several weeks per year
 - Roughly 1.5 PB raw voltage data is generated per session
 - First stored at stations, automatically e-shipped to JIVE after each separate observation ends
 - Using home-grown transfer software and UDT
 - Although we also still ship disk packs!
 - File size 256 MB, fuse system
- 10 - 20 times per year real-time e-VLBI, without any data recording
 - Straight from telescopes into correlator
 - Same software, but UDP (small amounts of packet loss acceptable)
- After correlation and validation of final product raw data are deleted (typically few months after observations)
- Total amount could easily be doubled (higher sensitivity)
 - Storage (and price of it) only limiting factor

Raw data: future?



- Keep raw data (forever of course)
 - After initial correlation according to original proposal
- In EOSC (of course)
- Offer correlation as a service
 - After proprietary period
 - Multiple phase centers
 - Real wide-field imaging
 - Search for Fast Radio Bursts

- Demonstrator should be feasible

WP3: mostly provide the tools that will be made available through the EOSC

- Analysis of functionality that is still needed to make CASA a complete VLBI data reduction package
- Implementation of missing functionality
- Integration of CASA6 in Jupyter or similar notebook
- Further work on containerization of software
- Creation of a VLBI data reduction pipeline suitable for the EOSC

Make radio data (starting with our EVN archive) accessible through the VO

- Investigating the handling of radio astronomical data in the VO
- The definition of a VO interface to the EVN archive
- Determine what metadata will be needed
- The design of a supporting database schema
- The implementation of web services and a database

Provide the tools and workflows that will make the software developed in WP3 accessible through the EOSC

- Analysis of the functionality of the JIVE archive
- Enable re-running pipelines with different parameters
- Archiving of new processing of data
- Enable feedback from users to archive
- Create a central control of information flows at JIVE