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CASA task “importfitsidi” requirements and design


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Prepared By:		
Name and Signature	Organisation	Date
Dirk Petry	ESO/ALBiUS	30/04/10
Approved by:		
Name and Signature	Organisation	Date
Paola Andreani	ESO	
Nick Elias	ESO	
Mark Kettenis	JIVE/ALBiUS	
Robert Laing	ESO/ALBiUS	
Huib Jan van Langevelde	JIVE/ALBiUS	

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1 Summary

A new task is to be developed for CASA tentatively scheduled for release 3.1.

The main use case is:

Enable processing of VLBI data coming from the EVN.

Other use cases are: enable processing of VLBI data coming from other networks such as the VLA and eMERLIN.

Generally, the latest FITS-IDI standard will be supported as described in AIPS memo 114r (Greisen et al. 2009).

2 Overall design and data flow

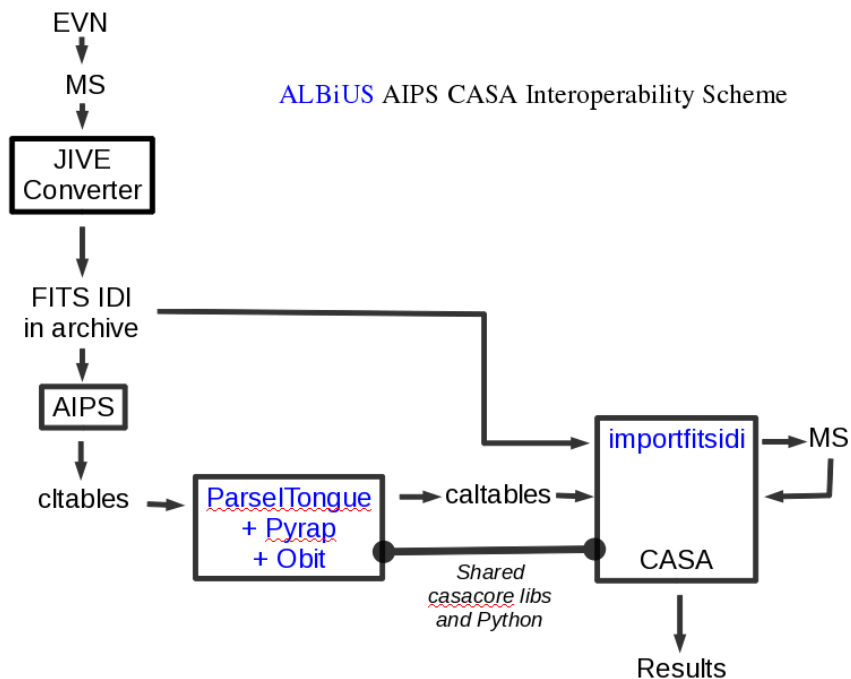



Figure 1: The proposed workflow for EVN data analysis with CASA and external add-ons to be developed at JIVE

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The task "importfitsidi" will read the FITS IDI archive format of the EVN and convert it into a CASA Measurement Set on disk. This is where its scope ends. As illustrated in figure 1, this, together with the CASA caltables generated by an application to be developed at JIVE, will enable CASA to process EVN data.

3 Task User Interface

The CASA task importfitsidi will use the same nomenclature as other similar tasks, e.g. importuvfits. The short description given by `help importfitsidi` in casapy will be as follows:

Convert FITS-IDI visibility file into a CASA visibility file (MS).

Keyword arguments:

```
fitsidifile -- name of the input file
              default: none
```

```
vis    -- MS name,
          default: none
```


```
async -- Run asynchronously
          default = false; do not run asynchronously
```

4 Implementation

The outdated FITS-IDI classes already contained in casacore will be updated to follow AIPS Memo 114r (see references). Details of this will still have to be determined.

The implementation will then follow the standard CASA scheme. The class `casa::MSFitsIDI` presently in `casacore/msfits/MSFits` will contain most of the necessary additional C++ code to perform the conversion. In the ms tool, a new method ```fromfitsidi`" will be created which will use the class `MSFitsIDI`. Then the task ```importfitsidi`" will be created based on the `ms.fromfitsidi()` method.

The parameters of the ```fromfitsidi`" method will be:

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```
ms.fromfitsidi(...)
```

```
    Create a measurement set from a fits-idi file
```

```
    --- --- --- --- --- --- Parameters --- --- --- --- ---
```

```
    msfile:  Filename for the newly created measurement set
```

```
    fitsidifile: fits-idi file to read
```

```
    nomodify: open for read access only - true
```

```
    lock:    lock the table for exclusive use - false
```

The method will report an error if there is an MS already attached to the ms tool.

4.1 Minimal requirement Tables

The following tables shall be read by CASA importfitsidi: UV_DATA, ARRAY_GEOMETRY, ANTENNA, FREQUENCY, SOURCE (these are the ones used by the EVN).

4.2 Additional tables, time permitting


If sufficient development time is available (see timeline section of this document), the following additional (optional) FITS-IDI tables will also be read and interpreted: BASELINE, MODEL_COMPS, INTERFEROMETER_MODEL, FLAG, PHASE-CAL, GAINCURVE.

5 Testing

JIVE shall provide a set of at least five test cases each with the necessary input data (two have already been provided). If possible, also VLBA data will be included in the tests.

The developer will create a unit test script for the tool method and the task based on these example cases and perform testing until he is convinced that the tool performs as expected.

After first unit testing, the developer will hand over the software to JIVE who will perform tests as they see fit to confirm the correctness of the code.

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6 Timeline

- 5 May 10: Finish initial design and Python coding. Start implementation of C++ code.
- 6 May 10: Meet with Steve Bourke (JIVE) to discuss possible problems of the implementation.
- 11 May 10: Meet with Kumar Golap and Tak Tsutsumi to discuss insertion in CASA and aspects of reusing the already existing FITS IDI classes.
- 1 June 10: Finish preliminary implementation. Start unit testing.
- 15 June 10: Hand over task to people at JIVE for testing.
- July 10: Release of importfitsidi as part of CASA 3.1.

References

Greisen, E.W., 2009, “The FITS Interferometry Data Interchange Convention -- Revised (AIPS Memo 114r)”, <http://fits.gsfc.nasa.gov/registry/fitsidi/AIPSMEM114.PDF>

Kemball, A.J. & Wieringa, M.H., 2000, “MeasurementSet definition version 2.0”, <http://aips2.nrao.edu/docs/notes/229.ps.gz>