

MK3TOOLS & NetCDF

storing VLBI data in a machine independent array oriented data format

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Abstract:

In the beginning of 2002 the International VLBI Service (IVS) has agreed to introduce a Platform-independent VLBI exchange format (PIVEX) which permits the exchange of observational data and stimulates the research across different analysis groups. Unfortunately PIVEX has never been implemented and many analysis software packages are still depending on prior processing (e.g. ambiguity resolution) done by CALC/SOLVE. Thus we introduce MK3TOOLS which handles MK3 databases without CALC/SOLVE being installed. It uses the NetCDF format to store the data and since interfaces exist for a variety of programming languages (FORTRAN, C/C++, JAVA, Perl, Python) it can be easily incorporated in existing and upcoming analysis software packages.

MK3TOOLS:

In Dec. 2006 we have started to write routines in C++ which allow reading and writing MK3 databases independent of the machines Endianess and without having CALC/SOLVE installed. These routines are pooled under the name MK3TOOLS and are extended with the functionality to translate MK3 databases to/from NetCDF format. In future MK3TOOLS will include small routines for manipulating (adding, multiplying, deleting) MK3 databases directly. Additionally it is planned to add features for reading log-files, which will close the gap in the pipeline between the correlator and the database (version 1).

NetCDF:

The NetCDF (network Common Data Form) is a set of software libraries and machine-independent data formats that support the creation, access and sharing of array-oriented scientific data. Moreover it is freely available and easy to implement in nearly any programming language since interfaces for popular languages are already prepared by the user community. In order to represent the content of the MK3 database we have set-up the following guidelines:

- the full MK3 database name (including the version) is used to name the NetCDF format (without ending)
- each LCODE table (1,2,3) is stored separately in a NetCDF file, (the ending of the file will denote the table number)
- each LCODE is translated to a NetCDF variable, having the same format and dimensions as in the MK3 database
- the LCODE description is added as an attribute to the corresponding variable

Moreover the usage of NetCDF provides some attractive features:

- the database management is done by NetCDF
- easy and clear interfaces exist
- an optional flag marks MK3 database consistent data -> also additional information (e.g. system temperatures, bandpass filter characteristics, etc.) can be added. Although such information is not supported in analysis packages now, it might be of importance for the future- the history table is kept in separate file
- NetCDF viewer and tools exist which allow easy data inspection and manipulation

Proposed processing chain:

Figure 1 shows the proposed processing chain from the correlator to the analyst. The MK3 databases can be either generated directly from the correlator or data are written to NetCDF format. In the latter case the MK3 database can be generated from the NetCDF using the MK3TOOLS. The user will not be affected by this change, since there is full compatibility between NetCDF and the MK3 database. Thus the analyst can either download the MK3 DB or use the NetCDF files, depending on the choice of his analysis package.

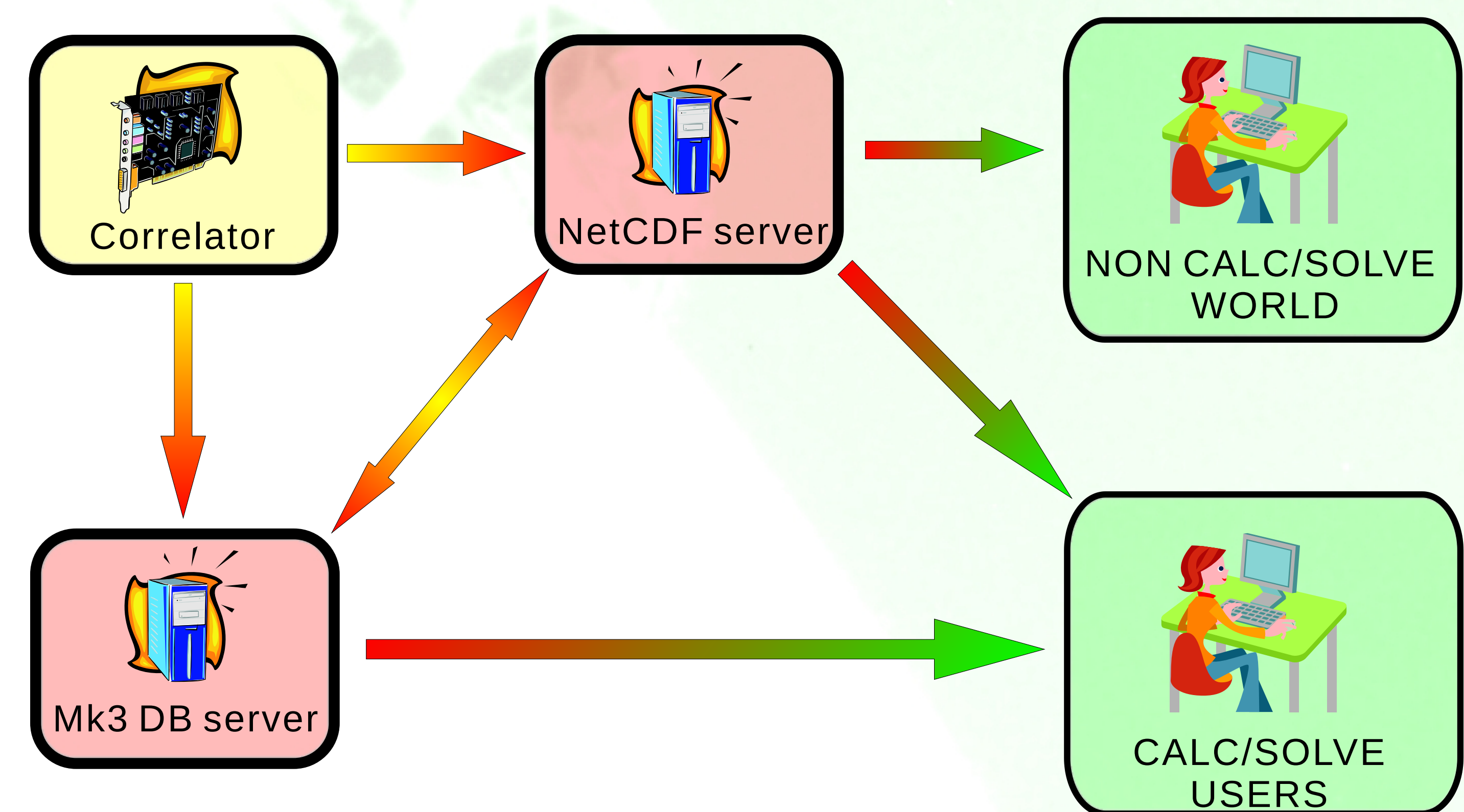


Figure 1: Proposed processing chain

Outlook:

Coding of MK3TOOLS, providing the complete chain from the correlator to the database, is expected to finish end of June. Currently K5 correlator output is supported only, but an interface to any post-correlator format is possible. Moreover it is planned to open a web-based service that allows the user to convert a MK3 database to NetCDF and vice versa. This might encourage analysts to include more information to their software packages that has not been accessible due to shortened data formats (e.g. the archaic NGS format).

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References:

NetCDF: <http://www.unidata.ucar.edu/software/netcdf/>

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