

MK3TOOLS — Seamless Interfaces for the Creation of VLBI Databases from Post-Correlation Output

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Abstract. MK3TOOLS have been developed in order to allow any user to create, read or modify geodetic VLBI 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. A seamless and unattended processing chain from the correlator to the analyst could be realized for the Japanese K5 system. Applications like ultra-rapid UT1 measurements and automated ambiguity resolution benefit from MK3TOOLS as shown here.

1. Introduction

Driven by the need to replace the out-dated interfaces between the K5 correlator output and MK3 databases a set of utilities, named MK3TOOLS, written in C++ have been developed. Basically, MK3TOOLS are a collection of programs which allow to read/write MK3 databases without binding the CALC/SOLVE libraries and are written in a way which allows to obtain the same results, independent of the machines Endianess. The Network Common Data Format (NetCDF) has been chosen as an intermediate data format to which all information is written before MK3 databases are created. This enables easy editing and data manipulation without detailed knowledge about the MK3 database structure.

2. Description

Currently the MK3TOOLS include the following modules:

- READKOMB: reads K5 post-correlator output together with log-file information, applies known ambiguity shifts, computes ionosphere correc-

tions, outputs information to NetCDF files;

- WRITEMK3: translates the information stored in a NetCDF file into a consistent MK3 database, adds history information;
- READMK3: translates a MK3 database into a NetCDF file;
- WRITENGS: translates the content of a NetCDF file in a NGS card.

Interfaces to bandwidth synthesis output from the MK5 system as well as support for the VSI2000 correlator are planned for the near future. Additionally, MK3TOOLS contain a collection of SHELL (BASH), AWK and Python scripts which allow to manipulate NetCDF files and carry out small tasks like the extraction of relevant information from log-files. Fig. 1 summarizes how the different programs interact with each other.

3. Application Examples

3.1. Ambiguity Resolution with OCCAM

Until now OCCAM users have been relying on prior analysis from CALC/SOLVE which mainly included the resolution of ambiguities and the computation of ionosphere corrections. When MK3TOOLS are used together with OCCAM it is possible to resolve X- and S-band ambiguities, use this information to update the NetCDF files and compute the ionosphere corrections (Fig. 2).

3.2. Automated Processing of Ultra-Rapid UT1 Experiments

MK3TOOLS enable unattended analysis of ultra-rapid UT1 experiments, providing results within a few minutes after the last scan has been recorded. Using the ambiguity resolution strategy described above and running OCCAM, controlled by scripts, it is now possible to completely automate ultra-rapid e-VLBI experiments including observation, data-transfer, correlation and analysis without human interaction. First tests in Feb. 2008 in cooperation with the Geographical Survey Institute (GSI) and Onsala Space Observatory have shown that accurate automatized estimates of UT1 can be obtained when MK3TOOLS are utilized to within the processing chain [1].

4. Outlook

Since interfaces to NetCDF are existing for a variety of popular programming languages new analysis packages can be written without detailed knowledge about the database structure. Moreover it is possible to store additional information (e.g. source maps, antenna specs, troposphere corrections, ...) which are not considered in the MK3 database structure, but

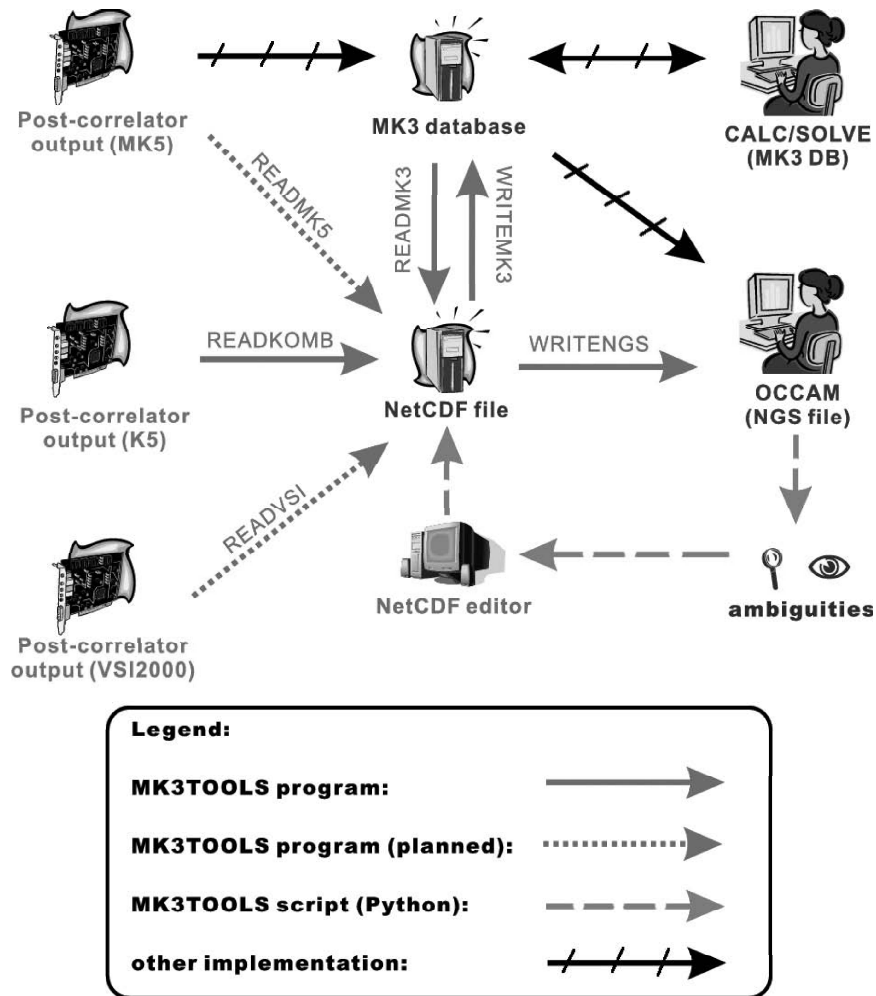


Figure 1. Interaction of MK3TOOLS with existing VLBI components

might be of interest for a newly designed analysis software. Additionally NetCDF editors and viewers enable experts from different scientific disciplines to add/extract relevant information to/from the databases and help to improve geodetic/astrometric results. New database structures are currently being discussed by a dedicated working group (WG4) within the IVS. Thus, the experiences gained from the development of MK3TOOLS might be useful for the design of the new format which handles observations of the VL2010 systems. Moreover it is anticipated the MK3TOOLS can also be useful to ensure a smooth and consistent transition from the current databases to the new format.

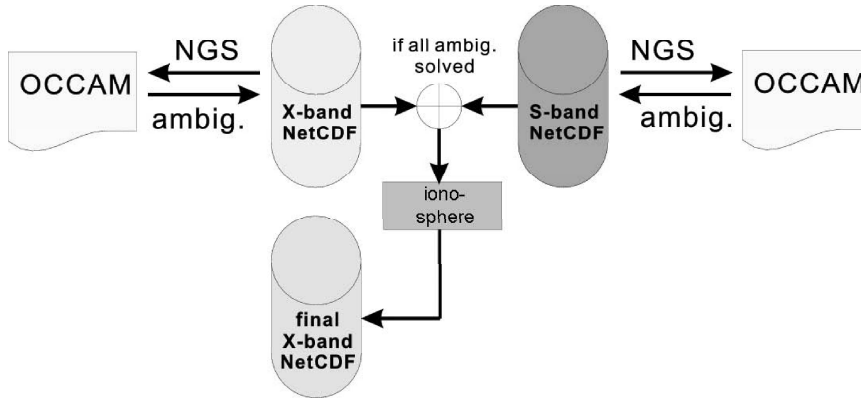


Figure 2. Ambiguity resolution with MK3TOOLS and OCCAM

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References

- [1] Koyama, Y., M. Sekido, T. Hobiger, et al. Developments of Automated Data Processing System for Ultra Rapid dUT1 e-VLBI Sessions. This volume.