VLBA Correlator Memo No. 100

Correlator Software Status, November 1990*

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Abstract

A status report for the real-time software project for the VLBA Correlator for the period mid-September to mid-November 1990 is given. During this period the logic of the interactions between tasks was developed further, and more functionality was added to the tape task. The error logging facility was greatly expanded in functionality, and now includes a task-specific CPU time measurement ability. The station task was further refined; dual-model ability was added.

Contents

*Draft version was distributed for the Wed14Nov90 Correlator teleconference.

1 Tasks

The tasking and component structures are still essentially as they were shown in the figure and table in the September 1990 report.

1.1 stnTask

Additional features have been added to the **stnTask**. E.g., model-switching ability has been added, with user-specified dwells on two sources in units of the integration cycle of 131 msec. The delay-model evaluation code has been strengthened.

1.2 tapeTask and tapeMntTask

Tape task code was merged with the rest of the Correlator code during this period and brought fully under NSE. Various tape monitor screens have been developed. Near the end of the period it became possible to *write* Mark-III test tapes using PBD-1 in our lab and read them back using the "mini-decoder" unit. PBD-2 is unable to fully perform this test, and its problems were being investigated at the end of the period.

1.3 ctskPerror (Error Logging)

Tasks call function **ctskPerror** with arguments of error-level, error-number, message-format, and one or more variable arguments for the format statement. The log file written to the Sun disk via NFS contains precision time stamps in units of tickcount, wall-clock seconds, CPU seconds and job time (original observe time in MJD) for active jobs, plus a number of other task-specific values. The log format was very much improved during this period. The Group has come to depend on the logs for recording high-speed task activity from groups of tasks. The task-specific CPU time measurement capability of the error logging is a special strength of this package.

1.4 Event Cluster code

The Correlator software depends on an event flag cluster package to propagate not only time signals from the hardware racks (the 7.6 Hz ticks) but also to synchronize a variety of tasking actions. The design and implementation of the package were reviewed during the period. The design was judged

to be good enough but several loopholes in the logic were identified and corrections applied, especially in the watchdog timeout implementation.

2 Meetings

Members of the Group participated in numerous special meetings during the period, in addition to the Group's regularly scheduled Monday morning meetings.

2.1 vxWorks Eastcoast User Group Meeting

Three members of the Group (DCW, JEH, RDG) attended the Eastcoast meeting of the vxWorks Users Group on 13-14 September. The principal topic of discussion was a description of features in the next release, 5.0. Features that will be useful to the Correlator include generic SCSI driver, much more sophisticated semaphores, improved watchdog timeouts and new resource recovery capabilities at task termination. We anticipate switching to 5.0 in 1Q91.

2.2 Code "Walk-Throughs"

During this period the Correlator Group has held five special "walk-through" sessions to review the station component (twice), the tape component (twice) and the "ctsk" component. These sessions have had two purposes:

- to assure that team members understand the design intent and content of components other than those that are their direct responsibility, and
- to find bugs, critique coding style and detect misunderstandings of desired functionality.

So far the team members have judged that the sessions are indeed meeting these goals.

2.3 RT Software Coordination Teleconferences

During this period the Correlator Group and the Monitor & Control Group held three teleconferences to coordinate management and development of code that is shared between the projects. Discussions have also extended into more general questions, in particular the logs to be recorded by the antenna control system and passed to the Correlator system.

2.4 LTA Filter Discussion

The Correlator Group reviewed the question of the low-pass digital filter on 24 October. Ray Escoffier described a proposed implementation of the hardware, in which a 32-point FIR [Finite Impulse Response] digital filter unit would be between the LTA [Long-Term Accumulator] and the DMA interface to the RT computers. Software implications were reviewed, and it was agreed that this approach (special-purpose digital filter) would be implemented, and the software group dropped the suggestion of an AP for the filter function.

2.5 Archive Format Discussion

Members of the Correlator Group met with members of the AIPS Group on 09 November to discuss the strategy and tactics for the VLBA archive and distribution formats. (The distribution format will be FITS, of course, and the archive format will be effectively identical to it, in a logical sense.) It was agreed that the VLBA will use the FITS "3-D Binary Table" extension for visibilities rather than the traditional "random-groups" extension. The difference between these two FITS styles lies in the headers, the data streams being *identical* in almost all cases. This technical change has been discussed extensively during the past year and there is agreement that it has several advantages. The AIPS task(s) for visibility loading will be augmented to read the new extension, and will retain the ability to read the old format. The new format will provide more flexibility in recording mixtures of data in different observing modes. A variety of auxiliary tables will be included in the FITS files to convey delay models, stations, channels, etc. Phil Diamond agreed to produce a memo documenting the format conventions to be implemented in the Correlator and AIPS codes.

There was an extensive discussion of the Van Vleck correction, and no consensus was reached on the approach to be taken, or on whether the Correlator or the post-processor should apply it.

3 Bar Codes

A study of bar code options has begun.