

GSFC Technology Development Center Report

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Abstract

This report summarizes the activities of the GSFC Technology Development Center (TDC) for 2005, and forecasts planned activities for 2006. The GSFC TDC develops station software including the Field System, scheduling software (SKED), hardware including tools for station timing and meteorology, scheduling algorithms, operational procedures, and provides a pool of individuals to assist with station implementation, check-out, upgrades, and training.

1. Technology Center Activities

The GSFC IVS Technology Development Center (TDC) develops hardware, software, algorithms, and operational procedures. It provides manpower for station visits for training and upgrades. Other technology development areas at GSFC are covered by other IVS components such as the GSFC Analysis Center.

The current staff of the GSFC TDC consists of John Gipson, Ed Himwich, employed by NVI, Inc, and Chuck Kodak, employed by Honeywell.

The remainder of this report covers the status of the main areas of development that are currently being pursued.

2. Field System

The GSFC TDC center is responsible for development, maintenance, and documentation of the Field System (FS) software package. The FS provides equipment control at VLBI stations. It interprets the .snp schedule and .prc procedure file (both, as prepared by DRUDG from the .skd schedule). The FS controls the antenna, data acquisition hardware, and related ancillary equipment needed for making VLBI measurements. All major VLBI data acquisition backends are supported. The FS is customizable to allow it to control station specific equipment. It is used at all the IVS network stations (over 30) and also at many stations that do VLBI only for astronomical observations. The only major observatories not using it are the VLBA and VERA.

During this period some of the new features that were released in FS version 9.8 were:

1. "systests" system test utilities developed and released
2. Mark IV decoder garbled response and time-out problems fixed
3. PFMED able to handle long procedure lines
4. numerous small bug fixes and improvements were added

In the next year, several other improvements are expected, among these are: (1) a complete update to the documentation and in a more modern format that will be easier to use; (2) conversion of the FORTRAN source to use the g77 compiler, this will enable use of the source level debugger, *gdb* for development and field debugging; (3) use of *fsvue* or Real VNC for network operation; (4) *chekr* support for Mark 5A systems; (5) use of the Mark IV decoder for phase-cal extraction in the field; and (6) support for periodic firing of the noise diode during observations.

3. DRUDG and SKED

The GSFC TDC is responsible for the development, maintenance, and documentation of SKED and DRUDG. These two programs are very closely related, and operate as a pair for the preparation of the detailed observing schedule for a VLBI session, and its proper execution in the field. In the normal data flow for geodetic schedules, first SKED is run at the Operation Centers to generate the .skd file that contains the full network observing schedule. Then stations use the .skd as input to DRUDG for making the control files and procedures for their station. During 2005 many changes were made to both SKED and DRUDG.

3.1. SKED

SKED is the program used to generate geodetic VLBI schedules. Several major enhancements were made to SKED this year.

1. SKED was ported to run under Linux. For the most part this work was done by Alexey Melnikov (see his report in this volume). J. Gipson assisted in verification and debugging. There is now a single unified source code for both HP and Linux. The Linux version of SKED typically runs several times faster than the HP-UX version. We aided many centers in successfully installing the Linux version of SKED.
2. Covariance optimization was a feature that was introduced in SKED in the mid-1990s, but had not been used in many years. This was resurrected and improved with numerous bugs fixed. Solve simulation studies involving schedules generated using covariance optimization indicate improvement of up to 20% in EOP.
3. The interface used to select stations, sources and observing modes was drastically re-written, simplified and unified. The same source code is now used in displaying and selecting all of these items. You can now use the cursor keys to move around, instead of instead of "j-k-l-m". For stations which have several different kinds of equipment you can choose which kind you want to use.
4. Previously if you changed stations in any way, you had to reselect the frequency because SKED did not know what frequency sequence you were using. SKED was made smarter so that in most cases it can determine this by comparing the information in the schedule file with that in the catalogs. If it can determine the correct mode unambiguously, you no longer need to select the frequencies. If it cannot determine the mode, it prompts the user to reselect it.
5. A graphical user interface was written using the open source and freely available Tcl/Tk scripting program. This interface is still under internal testing, but will be released next year.
6. Both SKED and DRUDG were made Mark 5 aware. Mark 5 is now a valid recorder type in SKED. The primary advantage of generating the schedule using Mark 5 is that you do not have to budget for tape changes or rewinds.
7. SKED was modified so that you can exclude stations for part of the schedule. This feature is useful because some stations, particular Kokee and Wettzell, will be unavailable for part of the experiment because they are participating in Intensives. Previously the scheduler had

to manually exclude the stations. Now all they need to do is specify when the stations are unavailable, and SKED will do the rest.

3.2. DRUDG

Several minor changes were made to DRUDG.

1. DRUDG continued to be changed as the Mark 5 specifications evolved. For example, an FTP option was introduced in the “disk2file” command.
2. DRUDG is now Mark 5 aware. If a schedule is generated using the Mark 5 recorder in SKED, DRUDG will handle this correctly.
3. DRUDG will now print Mark 5 labels using the log file.
4. DRUDG now supports Dymo printers.