

VLBA OPERATIONS MEMO NO. 15

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The VLBA Array Monitor and Control System - 19920308 -----

This document, along with other related information and further reading is available in the VLBA section of the Information System as item ARRY,OPS,CH7.

The VLBA Array Monitor and Control System provides a wide range of services that allow personnel to control and monitor all events on the array. It allows everything from the close monitoring of individual module voltages to array-wide control of major antenna functions such as pointing and parking. The system also gives personnel the ability to perform many functions at any combination of antennas with single commands. Lastly the system generates and delivers all monitor data collected by the logging routines at the station computers to the AOC in Socorro, which is then used to provide "real time" monitoring of the array, and the "off-line" generation of observing information for observers and the correlators.

INTERNET/Sockets -----

The Array Monitor and Control System is made up of programs and functions that run on both the station computers and the array control computer VLBACC. All communication between the antennas and the AOC are carried out over the conglomeration of wide area networks known as "Internet". Pie Town is the exception. It communicates using the TCP/IP (Transmission Control Protocol/Internet Protocol) family of protocols over just a leased phone line.

Sockets are a software version of a string and two cans. A function in the "client" computer initiates a socket connection request to a program, called a daemon, on the "server" computer. Its the daemons job to listen for client requests and establish the connection between the client and server. Once this connection has been established the programs on either end are able to pass data back and forth between themselves until the link is broken or terminated. As many connections or "channels" can be established at the same time as the communications equipment (and the users patience) can handle.

OBSERVING SYSTEM -----

The Observing System is the last link in the control chain and the first link in the monitor chain. All equipment talks to, and is controlled by the Observing System. The Observing System is made up of numerous tasks which read the observing file created by the observer, keep the antenna pointing in the correct direction, and make the tapes spin at the right time. When monitoring equipment it is the Observing System which handles converting all of the "numbers" generated by the equipment to voltages, speeds, and positions. The Mondata Routines are part of the Observing System.

MONDATA ROUTINES -----

The Monitor Data Routines are various tasks of the Observing System whose "output" is written to the monitor data stream. All of the output is collectively known as "monitor data". Each of these tasks generate records. Each record is a specific "type". Each record type contains a specific set of information. The following is a list of the major tasks that generate monitor data and the type of records each generates.

- NEWD - This task handles getting all of the equipment set up in accordance with the observing file and the wishes of the observer. It generates controll records which reflect the "observing state" of the site equipment. This includes information such as the astronomical source name and position, the synthesizer settings, the front end band in use, which data channel was connected to which tape track, and so on.
- FLAGER - This task monitors various "big picture" items that could affect the astronomical data quality and then generates flager records which contain bits indicating which conditions are "bad". The items monitored include the antenna pointing error, subreflector position error, synthesizer lock status, recorder head position error, and

others.

- LOGGER - The LOGGER task controls the collection of periodic monitor data from a list of points contained in the observing system software. It generates monitor2 records which contain items like the weather every 15 minutes, the front end cryo temperatures every 30 minutes, the BBC total and switched powers every 30 seconds, etc.
- CHECKER - This task does all of the monitoring of voltages, temperatures, positions, equipment states, etc., and generates "checker messages" when any of these items are "out of spec". The task also generates records that indicate when an out of spec condition clears. The current list of these messages may be displayed using the SCREEN program or VLDIS.
- Others - There are many other tasks which generate comment type records in order to inform personnel of various equipment conditions and errors.

All of these tasks write their data to a common buffer in the station computer's memory. The task USEDISK looks at this buffer and, using the USENET task, sends the monitor data from the station computer, using a socket connection, to the NETMON program running on VLBACC.

NETMON

NETMON is a daemon-type program that is started by VLBACC's operating system shortly after VLBACC finishes booting up. Its job is to act as a server and listen for the antennas to make socket connection requests. Once a connection has been established NETMON collects the monitor data sent by USEDISK and directs the data to disk files on VLBACC.

MONDATA FILES

The files created by NETMON are known as the monitor data files. One file is created per antenna per UT day. Each antenna has its own directory on the /mdata disk of VLBACC. If the date is June 23, 1993, NETMON will create a file named 1993JUN23.dat in each antennas directory. These files (and the monitor data) are binary and are read and decoded by several different programs.

VLGET

One of the programs which read the monitor data files is VLGET. This program is started by VLBACC's operating system shortly after VLBACC is booted up. The program reads all of the monitor data files it can find for the current UT day (one per antenna that is sending back monitor data) and "reforms" the data. This process involves extracting numbers and data of interest from the data that is not so interesting, converting raw data numbers to voltages, levels, speeds, etc. VLGET reads the incoming data as it's added to the files which allows the data to be accessed in close to real time. Events written to the monitor data stream at the antennas generally end up in the monitor data files and then extracted by VLGET in a matter of seconds. The data that is extracted is made available for display by placing it into several shared memory segments in VLBACC.

SHARED MEMORY

VLGET "reserves" three chunks of VLBACC's core memory when it is started. These chunks of memory are known as shared memory segments. When started, other programs can attach to this memory and "read" the contents. As VLGET reads the monitor data files it writes data to these segments which then makes this data immediately available to any program that is reading the memory.

Each of the three segments contains different types of information. The Data Segment contains all of the information that is displayed by the VLDIS data displays. These include the weather, equipment status flags, source name, observation stop times, etc. The Checker Segment contains all of the checker message information needed by the Checker Display in VLDIS. The Graph Segment contains all of the information needed by the Graph Display in VLDIS.

VLDIS

VLDIS is a program that runs on VLBACC in which many different displays can be started to give the user an array-wide view of the array status. VLDIS attaches to and reads the shared memory segments created by VLGET.

RLOGIN

Between UNIX systems a user can start up a remote login session, or "rlogin". This allows the user to talk to the remote computers operating system just as if they had logged in directly to the remote computer.

RSCREEN/RSCREEND/SCREEN

Through the SCREEN program on the station computers personnel can examine all points monitored in the remote site equipment. Getting to the screens is accomplished by running the RSCREEN program on VLBACC or ZIA, and telling the program which antenna to connect to. Through Internet and sockets the RSCREEN program establishes a connection with the corresponding antennas' RSCREEND program which starts a copy of the SCREEN program for the user. From this point on the the RSCREEND program goes back to waiting for another SCREEN request, and the RSCREEN program on VLBACC handles the communications between the SCREEN program and the users terminal. All display information is generated by the SCREEN program on the station computer.

RCMD/RCMDD

The RCMD/RCMDD set of programs give personnel the ability to execute "remote" commands on the station computers. These commands may be issued to any combination of, or all of the antennas at the same time. The RCMD program on VLBACC accepts the input from the user, checks it over and then formats the command which is sent to the RCMDD daemon running on the station computers using Internet sockets.

The types of commands supported are:

- Antenna control-POINT, PARK, STOW...
- File copying and removing
- Initiation of equipment test routines
- Station computer rebooting
- Various equipment control

There are currently over 20 commands with more in the works.

VLBA ARRAY MONITOR AND CONTROL SYSTEM



