EVLA Monitor and Control

Transition Software

Development Plan

Version 2.0.1

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Revision History

Revision	Date	Author(s)	Description of Changes
2.0.0	13Jan2006	Bill Sahr	Original for version 2.0.0
2.0.1	29Mar2006	Bill Sahr	Reworked outline of topics, more material on due dates
2.0.1	01May2006	Bill Sahr	Final update before posting to web

This document is an update to and further development of "EVLA Monitor and Control Transition Software Development Plan", Version 1.0.0, Bill Sahr, 03/25/2005 which is document #40 on the EVLA Computing Working Documents web page:
http://www.aoc.nrao.edu/evla/techdocs/computer/workdocs/index.shtml

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Ant 16 ready to participate in scientific observations*	July 20, 2005
Ant 14 ready to participate in scientific observations	August 25, 2005
Ant 18 ready to participate in scientific observations	May 2006
Antenna 24 fully outfitted with production versions of the EVLA antenna hardware designs	end of Q2 2006

* "Ready to participate in scientific observations" implies 4 IFs and computer-controlled band selection, be it L304 style switching or M301 controlled switching.

New VLA Correlator Controller operational and under the control of the Modcomp-based VLA Control System	Q2 2006
New VLA Correlator Controller under control of the EVLA Monitor and Control System	Q3 2006
Prototype WIDAR correlator chips delivered to DRAO	June 2006
Prototype Baseline board delivered to DRAO	June 2006
Prototype Station board delivered to DRAO (parts availability issue)	June-Sep 2006
Start of Prototype board tests	June 2006
Southwest Consortium (SWC) Long Wavelength Demonstrator Array (LWDA, 16 elements):	
Single baseline testing, software correlator	Q3 2006
Multiple baseline testing, VLA correlator	Q4 2006
WIDAR Correlator CDR	Q2-Q3 2007
WIDAR Prototype Correlator, start of on-the-sky (OTS) testing at the VLA site	Q3 2007
WIDAR Correlator, board installation, commissioning & testing	Q2 2008 thru Q3 2009
WIDAR Correlator, start of Shared Risk Observing	Q2 2010
All VLA antennas converted to EVLA electronics (but not all receivers installed)	Q4 2010
EVLA receiver installation complete	Q2 2012

2 EVLA M&C

2.1 *Transition System*

The term "Transition System" is used to refer to that version of the EVLA Monitor and Control System that will be used to control the hybrid array. By hybrid array is meant the mixture of hardware that consists of EVLA antennas, VLA antennas, and the VLA Correlator. The hybrid array will also be required to accommodate the Long Wavelength Demonstrator Array, the prototype WIDAR correlator, and the simultaneous presence of the full WIDAR correlator with the VLA correlator.

As of May 2006 the current state of the EVLA Monitor and Control System software is that it is ready to support the participation of EVLA antennas in scientific observations. The EVLA Monitor and Control System can accept either handwritten jython control scripts or Observe files (as produced by JOBSERVE), translate the Observe files into control scripts, and pass the scripts to an Executor, which configures and controls the EVLA antennas in coordination with the VLA Monitor and Control System to produce scientific data. Alerts for abnormal conditions in the EVLA antennas are produced. Monitor data for EVLA antennas is generated, archived, and can be retrieved. User Interface software that provides for job submission, monitoring of observations and antenna status, weather conditions, and low level device status exists, and is in use on a daily basis. Flagging of EVLA antennas is possible. The basic flagging information is developed within the EVLA Monitor and Control System, and then transmitted to the VLA Monitor and Control System where it is combined with other flagging information and written as part of the archive records. Software is now in place to solve for the complex gains of EVLA antennas, which will allow data quality indicators to be developed, and the implementation of reference pointing is complete.

Software sufficient to the task of allowing the VLA Operators to perform standard operational checkout procedures on an EVLA antenna is not yet complete. Also, it should be noted that virtually none of the functionality described above exists in a complete, or mature, or final form. For example, the software that converts Observe files into control scripts supports about 80% of the functionality that can be specified in an Observe file. Another notable lack is that a real-time monitor data stream (as opposed to the archive monitor data stream) coming from the antennas has not been enabled (the code is in place) because no use is currently made of monitor data in real-time. Operator screens for all EVLA antenna subsystem do not yet exist (there are screens for some of the subsystems), the monitoring of EVLA antenna status is limited to the display of alert messages, and flagging does not catch transient events. There are other lacks, but the intent here is to be illustrative, not exhaustive.

The EVLA Monitor and Control System as of March 2006 requires the Modcomp-based VLA Control System for operation of the hybrid array. To reach the point where it will be possible to retire the Modcomps and the VLA Control System software, one must add to the EVLA Monitor and Control System 1) the ability to monitor and control VLA antennas, 2) the ability to monitor and control the VLA correlator, coupled with distribution of the VLA correlator output within the EVLA Monitor and Control System, and 3) the ability to

form and write VLA format archive records. Once these capabilities have been added to the EVLA Monitor and Control System, it will be possible to turn off the VLA Monitor and Control system.

The current schedule for these milestones for the EVLA Monitor and Control System is:

- monitor and control of VLA antennas – end of Q2 2006
- monitor and control of VLA correlator – end of Q3 2006 or Q4 2006
- distribution of VLA correlator output within the EVLA Monitor and Control System – end of Q4 2006
- formation and writing of VLA format archive records – end Q4 2006 or end of Q1 2007
- parallel operation & testing: EVLA M&C System vs. VLA Control System – Q1 2007 or Q2 2007

It may be possible to compress this schedule. The end of Q4 2006 is the most optimistic date for turning off the Modcomps. A much more likely date is the end of Q2 2007. If subsequent analysis proves it to be desirable, retirement of the Modcomps and the VLA Control System may be deferred until on-the-sky testing of the prototype WIDAR correlator is complete – mid Q4 2007.

The ability to monitor and control VLA antennas is chiefly a matter of further development of the Interim Observation Executor (section 2.1.1) and the Control and Monitor Processor (the CMP, section 2.1.3.2.1). The ability to monitor and control the VLA correlator, and to distribute the visibility data, requires completion of the new correlator controller (section 2.1.4.1.1) and development of the visibility pipe (section 2.1.4.1.2). Forming and writing the archive record requires implementation of the VLA DCAF software component (IDCAF, section 2.1.7). Additionally, further improvements in the monitoring of antenna and correlator status (alerts, section 2.2.3 and user interfaces, section 2.1.9) and a more robust and more fully developed ITelCal (section 2.1.6) are also needed.

2.1.1 Observation Executor, interim version (IExec)

Developer(s): Barry Clark

Description: The Observation Executor accepts a control script (currently written in jython) and executes it. Execution implies control of the hardware – sending commands to EVLA antennas, VLA antennas, and the VLA correlator.

Status: Control of EVLA antennas is largely complete. It is sufficient to support the participation of EVLA antennas in scientific observations for most normal observing. Control of VLA antennas is well along, lacking implementation of only a few commands that depend on precise timing within the waveguide cycle. Completing the task of controlling VLA antennas will require work not only on the Executor, but also on the CMP (see section 2.1.3.2.1 Control and Monitor Processor (CMP)). Control of the VLA correlator has not yet begun, and cannot be started until the new correlator controller is operational.

Currently, the Executor has no realtime listener thread, i.e., it does not listen for or make use of monitor data in real time. Among other things, this statement implies that it does not know if the actual state of an EVLA antenna conforms to the commanded state.

Time to complete: The Interim Observation Executor is an ongoing development task with multiple dependencies on other software and hardware components. Further development of the Interim Observation Executor will continue at least through CY2006 and may extend well beyond that date.

Comments:

1. IExec does not currently conform to the desired high level architecture and design for the EVLA. The chief departure of IExec from the desired architecture and design is that it does not partition its functionality in such a manner as to provide a separate, network addressable antenna object. The long term plan is to either replace IExec with or transform it into a final version of the Observation Executor that does conform to the high level design and architecture. The final version of the Observation Executor is not needed to retire the VLA Monitor and Control System.

2.1.1.1 IExec: Partial listing of tasks yet to be done

2.1.1.1.1 *Reference Pointing*

As of March 2006, IExec supports reference pointing. Further testing is needed.

2.1.1.1.2 *Round Trip Phase (RTP) Correction*

2.1.1.1.3 *Phased Array Operation*

2.1.1.1.4 *Configuration & Control of VLA Antennas*

As of April 2006, substantially completed. Only a few commands that are dependent upon precise timing within the waveguide cycle remain to be implemented.

2.1.1.1.5 *Configuration and Update of VLA Correlator*

Requires the new correlator controller. Current date for new correlator controller operational is sometime during Q2 2006. Tentative date for controlling the VLA Correlator from the EVLA Monitor and Control System is sometime in Q3 2006.

2.1.1.1.6 *Subarrays, 1st & 2nd level*

Need to develop and test the capabilities for:

- Multiple 1st level subarrays
- Control script based 2nd level subarraying
- Combinations of 1st and 2nd level subarraying

2.1.1.1.7 *All Devices & Subsystems Configured by Executor*

2.1.1.1.7.1 Deformatters

2.1.1.1.7.2 Formatters

2.1.1.1.8 *DeviceListener Thread*

See Barry Clark's posting to evla-sw-discuss of 1/5/2002 entitled "Design of the current EVLA real-time system". In that posting he describes a "DeviceListener Thread" whose function will be to monitor the "observing" multicast group for the purpose of constructing a description of the state of each antenna. Knowledge of the antenna's state can then be used for a variety of purposes including the issuance of alerts for antennas whose current state do not conform to their commanded state, automated attempts to bring a nonconforming antenna into the proper state, etc.

2.1.1.1.9 *Ability to update a control script from the parameters database*

Without being required to stop and then restart the script.

2.1.1.1.10 *Script Stop*

Currently, a script stop is honored only at source changes.

2.1.1.1.11 *Scan Skip & Scan Extend*

Difficult to implement as these functions do not map in a natural way to the structure of the Executor. Status unchanged since April 2005. Basically, waiting to see if this functionality is needed.

2.1.1.1.12 *Configuration and Control of the WIDAR prototype correlator*

No work done as of March 2006. The test plan for on-the-sky (OTS) testing of the prototype correlator was issued on March 10, 2006.

2.1.1.1.13 *Interface to Limited and Final versions of the WIDAR correlator*

If all goes according to plan, it will be the final version rather than the interim version of Observation Executor that will be required to control the Limited and Final versions of the WIDAR correlator.

2.1.2 Obs2script

Developer(s): Bryan Butler

Description: Obs2script converts VLA Observe files to EVLA control scripts.

Status: Largely complete. Obs2script handles 80% - 90% of the functionality that can be specified in an Observe file. As of April 2006, obs2script does support reference pointing but does not yet support most of the other special "modes" such as phased array, focus finding, etc.

Time to complete: Approximately 1 man month of actual work spread over an as yet unspecified period of elapsed time.

Comments:

1. Generally, complementary changes/additions are required for obs2script and the Observation Executor – the Executor must implement methods to support a

particular functionality, and then obs2script must be modified to recognize a request for that functionality and to call the appropriate methods in the Executor.

2. Eventually, obs2script will be replaced by the EVLA Observation Preparation Tool (OPT). The OPT will directly generate EVLA control scripts. No conversion step will be needed.

2.1.3 Antenna Monitor & Control (AMCS)

2.1.3.1 EVLA Antennas

2.1.3.1.1 *MIB-based Devices*

Developer(s): Pete Whiteis, Hichem Ben Frej

Description: Subsystems in EVLA antennas communicate with the outside world via a custom, inhouse designed single board computer known as a module interface board (MIB). In some cases, the highest level hardware control loop is also implemented on the MIBs.

Status: For most of the antenna subsystems, development of the module hardware and the accompanying MIB software is complete. A few modules are still under development.

Time to complete: The list of modules still under development is as follows:

1. Formatter Board (a.k.a. Digital Transmission System (DTS) board)
2. L302 LO synthesizer. Hardware, firmware and software changes have been made to eliminate phase jumps. The first of these revised L302 units was installed in an antenna late in April 2006.
3. F317 Front End Controller. Software and hardware debugging is ongoing as of May 1, 2006.
4. M301 Switch Module – software requires a full functional test before the modules are installed in antennas. Currently, the needed testbed is scheduled for completion in mid-May 2006, with the first M301 to be installed on an antenna by the end of May 2006.
5. M302/303 Utility Module – hardware functional tests to be completed early May 2006, software to be completed in mid-May 2006, with the first M302/303 installed on an antenna in late May 2006.
6. T304/T305 Downconverter with Total Power Detectors – the software is complete excepting the mechanism for auto level setting. Auto level setting should be complete by the end of May 2006, or by mid-June 2006.

Comments:

1. Antenna 24 is now slated to be the first EVLA antenna to receive a full complement of the final versions of the EVLA antenna hardware designs. It is hoped that the outfitting of antenna 24 will be completed by late-May or mid-June 2006.

2. There is a need to develop a toolchain (compiler, assembler, linker, loader, debugger, etc) for the TC11IB-based MIBs that is not dependent upon a particular version of Windows.

2.1.3.2 VLA Antennas

2.1.3.2.1 *Control and Monitor Processor (CMP)*

Developer(s): Hichem Ben Frej

Description: A combination of hardware and software that provides a means by which the EVLA Monitor and Control System has access to the monitor data stream coming from VLA antennas, and can send commands to VLA antennas.

Status: Largely complete. Still some development work needed in the area of commands whose correct operation is dependent upon precise timing within a waveguide cycle.

Time to complete: No current estimate. Testing over a long period (months) under a wide variety of circumstances is needed to ensure robustness.

Comments:

1. Benchmarking is required to determine if the CMP, as currently implemented, is fast enough to handle the queuing of commands for all VLA antennas not converted to EVLA antennas at the time full operational use of the CMP is required. If not, then either the performance of the current hardware and software must be increased, or the low level processor that is responsible for command queuing must be replaced by a faster board.

2.1.4 Correlator Monitor & Control

2.1.4.1 VLA Correlator

2.1.4.1.1 *New VLA Correlator Controller*

Developer(s): Ken Sowinski, Bruce Rowen

Description: The new VLA correlator controller replaces the current correlator controller, the current (and very old and obsolete) array processor used to perform the FFT of the raw correlated data, and provides an Ethernet-based control path to the correlator controller. The Ethernet-based control path is crucial. Since both the VLA Control System and the EVLA Monitor and Control System computers have access to the network, the new correlator controller can be controlled by either system, allowing for rollover from one to the other. Without the new correlator controller, the EVLA Monitor and Control System has no path by which it can access and control the VLA correlator.

Status: Largely complete. The new correlator controller is nearly operational. It will be deployed in two phases – first, under control of the VLA Control System, and then control of the VLA correlator will shift to the EVLA Monitor and Control System.

Time to complete: It is expected that the new correlator controller will be operational and controlled by the Modcomp-based VLA Control System during Q2 2006. Control of the VLA correlator is scheduled to shift from the VLA Control System to the EVLA Monitor and Control System during Q3 2006.

Comments: None

2.1.4.1.2 *Data Output Path (Visibility Pipe)*

Developer(s): Ken Sowinski, Bruce Rowen (with Bill Sahr, Barry Clark, Bryan Butler)

Description: The "visibility pipe" is the term used to describe the means by which the visibility data developed in the array processor that is a part of the new correlator controller for the VLA Correlator will be distributed within the EVLA Monitor and Control System.

Status: Still in the very early design stages. No fewer than 4 different possible approaches have been suggested. The four possibilities have been discussed and prioritized from least to most desirable, and investigation of the two top ranked possibilities is underway as of early March 2006.

Time to complete: end of Q4 2006

Comments: None

2.1.4.2 WIDAR Prototype Correlator

A test & verification plan (TVP) for on-the-sky (OTS) testing of the EVLA prototype correlator was released by DRAO on 10March2006. (document # A25010N0005, "EVLA Correlator Prototype On-The-Sky Test Plan [TVP]", 10Mar2006, on the DRAO web page: http://www.drao-ofr.hia-iha.nrc-cnrc.gc.ca/science/widar/private/System.html) and discussion of the software needed to support OTS testing was a topic at the Correlator face-to-face meeting of April 4-5, 2006. At this point a list of the needed software does not yet exist. At the face-to-face meeting, work assignments were agreed upon that should result in:

1. An estimate of the output data rates and volumes to be expected from the prototype correlator
2. A list of software that will be needed for the prototype correlator
3. An update of the TVP for OTS testing to include a section on software requirements

2.1.5 Flagging

Developer(s): Ken Sowinski, Chunai Cai

Description: Flagging is the process whereby the data for one or more antennas over one or more correlator integration periods is flagged as "bad" based upon the detection of events by the monitor and control system. This flagging information is written as a part of the archive records for use by post-processing software.

Flagging under the transition system takes two forms – one while the Modcomp-based VLA Control System is still writing the archive records, with a different approach used once writing of the archive records is done by the EVLA Monitor and Control system.

While the VLA Control System has responsibility for writing the archive records, the flagging of EVLA antennas is a two part process. First, a standalone flagging process within the EVLA Monitor and Control System collects alerts (and eventually monitor data) that it uses to develop the flags on EVLA Antennas. Next, the flags for the EVLA antennas are transmitted to a process in the Modcomps (VLA Control System) that adds them to an array that is accessible to the VLA flagging process. When the VLA flagger task next runs it will create flags for both EVLA and VLA antennas.

Once the task of writing the (VLA format) archive record passes from the VLA Control System to the EVLA Control System, flagging can be done entirely within the EVLA Monitor and Control System. The first step will be identical to the process described above – an EVLA flagging process will monitor alerts and monitor data for both EVLA and VLA antennas, and develop the needed flagging information. However, the flagging information will then be transmitted to another EVLA software component – the Interim Data Capture and Format (IDCAF) process. IDCAF will have responsibility for formatting and writing the archive records.

Status: The first form of the flagging process - that which interoperates with the Modcomp-based VLA Control System is largely complete. The full path, including the writing of archive records that include flagging information for EVLA antennas has been demonstrated to work.

Time to complete: For refinement of the version of flagging that interoperates with the VLA Control System – mid Q3 2006. Flagging done entirely within the EVLA Monitor and Control System depends upon the development of IDCAF (section 2.1.7). The full development of IDCAF is not expected to be completed until the end of Q4 2006 or even the end of Q1 2007.

Comments:

1. There is a currently unresolved design issue concerning the capture and flagging of transient EVLA antenna events for the case of the VLA Control System writing the archive records.

2. Once an overall architecture for alerts, logging, and flagging within the EVLA Monitor and Control System has been designed and implemented, the then current flagging process may have to be rewritten to conform to it.

2.1.6 VLA Telcal (Interim or ITelCal)

Developer(s): Ken Sowinski, Chunai Cai

Description: ITelCal intercepts the visibilities and performs the calculations needed to derive telescope calibration quantities. The quantities derived include raw self-cal (complex antenna gains, i.e. Antsol), reference pointing offsets, involvement in the calculation of global pointing model coefficients, focus settings, and delay settings.

Status: The complex antenna gains and reference pointing offsets portions of the program are complete, including multicast of the results as XML messages. Calculation of the global pointing model coefficients, focus settings and delay settings have been demonstrated as standalone programs, but they have not yet been integrated into ITelCal. There is a bug which sometimes causes the program to crash when the data volume is high.

Time to complete: No current estimate

Comments: None

2.1.7 VLA DCAF (Interim or IDCAF)

Developer(s): Ken Sowinski, Chunai Cai, Barry Clark, Bryan Butler

Description: DCAF is an acronym for Data Capture and Format. Interim DCAF is the transition system version of the software responsible for gathering together the visibilities plus relevant meta-data to form the archive records that are written to disk. Data from the VLA Correlator will always be written in the current VLA Archive format.

Status: This software component is in a very early stage of development. A conceptual design exists, plus a few code fragments. An agreed upon list of things to be done exists.

Time to complete: end of Q4 2006 or end of Q1 2007

Comments:

1. This component of the transition software will probably be the last element developed among those components needed to retire the Modcomp-based VLA Control system.

2.1.8 VLA Archive (EVLA-hosted)

Developer(s): Ken Sowinski

Description: This item is not software, but rather an investigation into and analysis of the minimal set of changes to the VLA Archive format that must be made to accommodate the EVLA Monitor and Control System.

Status: Basically complete. The results of the investigation are contained in a series of emails written by Ken Sowinski and published on evla-sw-discuss. See 1) The transition era VLA/EVLA archive record, 18Feb2005, 2) Considerations toward an interim DCAF, 05Jul2005, and 3) VLA archive records after the Modcomps, 03Aug2005.

2.1.9 User Interfaces, Transition System

2.1.9.1 VLA Antenna Screens

Developer(s): Rich Moeser

Description: A text-based program named AOI (Array Operator Interface) is the user interface presented by the VLA Control System for control of VLA antennas. An EVLA equivalent of AOI will be needed for control of VLA antennas by the EVLA Monitor and Control System.

Status: The infrastructure for getting information from and sending commands to VLA antennas is already in place in the form of the CMP (section 2.1.3.2.1). The AOI screens must be reviewed to determine which of them are actually needed and then equivalent EVLA screens constructed on top of the existing infrastructure.

Time to complete: No current estimate

Comments: None

2.1.9.2 VLA Correlator Screen(s)

Developer(s): Bruce Rowen, Ken Sowinski

Description: With the current (old) VLA Correlator Controller running under the control of the Modcomp-based VLA Monitor and Control System, there is a Baseband display (Modcomp-based software) that shows correlator derived self products. Additionally, the VLA Monitor and Control software produces a number of messages about lost communications and other errors.

The new VLA Correlator Controller (section 2.1.4.1.1) uses the VLBA rscreens package to provide a number of displays related to correlator functioning and health, including the aforementioned self products. Rscreens is a socket based package. The rscreens code executes on the MVME167 processor that is a part of the new correlator controller, with the results available to any terminal window on an Ethernet capable workstation. This approach in no way depends on the Modcomp-based VLA Control system. It will work equally well for the VLA Control System and for the EVLA Monitor and Control System.

Status: The needed displays/screens are ready. Operator training on the interpretation of the displays will be needed.

Time to complete: The time needed to train the operators.

Comments: None

2.1.9.3 EVLA-hosted Data Quality Displays - for the VLA Correlator

Developer(s): Ken Sowinski

Description: At a minimum, data quality displays providing the same functionality as the VLA Control System F/D10 displays should be available in the EVLA Monitor and Control System.

Status: There is a system, named igloo, that serves as a collection point for the real-time visibility data stream (in VLA Archive format). Igloo is currently a component of the VLA Monitor and Control System. Igloo will remain when the Modcomp-based VLA Control system is retired. It will become a part of the transition version of the EVLA Monitor and Control System, continuing to serve as a collection point for the real-time visibility data stream. While the current F/D10 displays are Modcomp-based software, a version of the F/D10 program that runs in igloo on the real-time data stream has been developed. This new version of F/D10 does not yet have all the details of the Modcomp-based F/D10, but it does work and can be extended.

Time to complete: No current estimate

Comments: None

2.1.9.4 EVLA-hosted Data Quality Displays – ITelCal

Developer(s): Chunai Cai

Description: This item references software whose purpose is to display the complex antenna gains and the pointing offsets produced by the VLA TelCal (ITelCal) software (section 2.1.6). When ITelCal is expanded to produce focus and delay determinations, this software will be expanded to include the display of those results.

Status: The version that displays the complex antenna gains and pointing offsets is complete and will be included in the next release of the EVLA operator software (April-May 2006).

Time to complete: Is paced by the further development of ITelCal

Comments: None

2.2 *Global Design Issues*

2.2.1 Parameters Database

Developer(s): Barry Clark, Chunai Cai, Pat Van Buskirk

Description: The parameters database is to the EVLA Monitor and Control System as the System Files are to the VLA Monitor and Control System. It contains unvarying or slowly varying elements, such as pad locations and pointing model coefficients that are necessary to the conduct of an observation. These values are usually read during the interpretation of a script and passed to the Observation Executor. In some cases the Observation Executor may directly consult the parameters database.

Status: Working sufficient well to conduct observations. Not all of the needed information, especially information that may be needed by IDCAF to form archive records, is present in the parameters database. This fact is not a problem at this time because archive records are currently written by the VLA Monitor and Control System. Also, work is needed on interfaces to and the automation of the update of the values in the parameters database. For example, an effort is currently underway to fully automate the process of producing new pointing model coefficients and updating the parameters database with the new values.

Time to complete: An ongoing development effort. Adding all necessary elements to the parameters database will probably continue through most of CY2006. The development of interfaces for the examination and manual update of parameter values and the automation of the update of various parameters will doubtless continue over an even longer period.

Comments:

1. The use of a parameters database creates opportunities for the accumulation of history, the analysis of trends, the automation of update procedures, and the reduction of transcription errors that are impossible or impractical for the VLA Monitor and Control System.

2.2.2 Monitor Data – Archive & Retrieval

These two tasks of archiving and retrieval are treated jointly.

Developer(s): Rich Moeser, John Benson, Chunai Cai, Pat Van Buskirk

Description: The monitor data archive consists of three major components – a filler program (aka Monarch), a database that accepts monitor data, and an interface that can be used to retrieve data from the database.

Status: As of March 2006, a functioning monitor data archive with a web-based retrieval capability has existed for approximately 2 years. Neither the archive nor the retrieval

interface are considered to be in their final form. The problem of ingest rate, for 27 EVLA antennas, each EVLA antenna having about 7 times (2100 vs. 300) the number of monitor points as a VLA antenna, is not considered to be solved. Work is ongoing in all of these areas.

Time to complete: Ongoing development will probably continue for several years. The next version of the monitor data archive and retrieval interface, offering better disk space management, improved search speeds, and a new data retrieval interface will probably be operational, as a prototype, sometime in Q3 2006.

Comments:

1. Multiple approaches are being considered for the issue of ingest rate. First and foremost will be to compile a list of all monitor points and their archive rates for review by the Electronics Division.
2. A pruning program has been used to reduce overall data volume. It had some success and some problems. One of the problems was that it could not keep pace with the rate of expansion of the database. Another problem is that the database is still perturbed rather frequently in a manner that interferes with the operation of the pruning program. Over the long term, once the archive is more stable, pruning may prove to be useful.

2.2.3 Alerts (a.k.a. Checker)

Developer(s): Rich Moeser & Bryan Butler

Description: Alerts are messages that describe abnormal conditions. These conditions may be specific to a device, or they may be generated by a purely software entity, such as an antenna object, on the basis of monitor data &/or other alerts.

In the EVLA Monitor and Control System, alerts are multicast. In the transition system, an alert server subscribes to the alert multicast domain, manages what is and is not currently in an alert state, does lookups of alert description, action, and severity, and presents an http front end to clients that wish to request this information. Currently, the only clients are the alerts portion of the Array Operator Screen, and the Alerts Ancillary Screen.

In the final version of the EVLA Monitor and Control System, the architecture for the distribution of the alerts will be a 4 component hierarchical structure consisting of alert sources, intermediate alert servers, a central alert server and clients. The clients will handle the display of alert messages to operators (Checker), flagging, and the logging of alerts. (See the EVLA Monitor and Control Software Design document for further information.)

Status: The transition system version of the alerts system is largely complete. Some filtering capabilities and a few other enhancements remain to be implemented. The high level design of the final version of the alerts system is well along, but many details remain to be settled, and no implementation of the design exists.

Time to complete: For the transition system, not more that a few weeks work spread over a yet undetermined period of elapsed time. For the final system, no estimate of time to complete has yet been made.

Comments:

1. Completion of the transition system version is not felt to be pressing as it already offers good functionality.

2.3 *User Interfaces, Transition & Final System*

This section discusses User Interfaces that may change in terms of the details of the content from the transition version to the final version of the EVLA Monitor and Control System, but whose overall appearance and functionality will remain the same. For example, while the Array Operator Screen will provide information about both VLA antennas and EVLA antennas during transition, its basic functions of job submission and high level monitoring of the overall condition of the array and the progress of an observation will not change.

2.3.1 Array Operator Screen

Developer(s): Rich Moeser

Description: The Array Operator screen will be the primary interface screen for operators. Figure 1 gives a snapshot of the Array Operator screen as it existed on 03March2006. In its current state it allows operators to submit control scripts for execution (left hand portion of the screen), see messages from the Executor (bottom center), provides time in multiple formats (upper right), weather data (center right), alerts (lower right) and a central area that provides some status and other information on the antennas.

Status: The Array Operator Screen already provides sufficient functionality to allow control scripts to be submitted to operate EVLA antennas for testing and for participation in scientific observations. Considerable enhancement and further development is planned.

Time to complete: Development of the Array Operator Screen will be an ongoing effort.

Comments:

1. The intent is that the Array Operator Screen will evolve into a very dense, information-rich display.

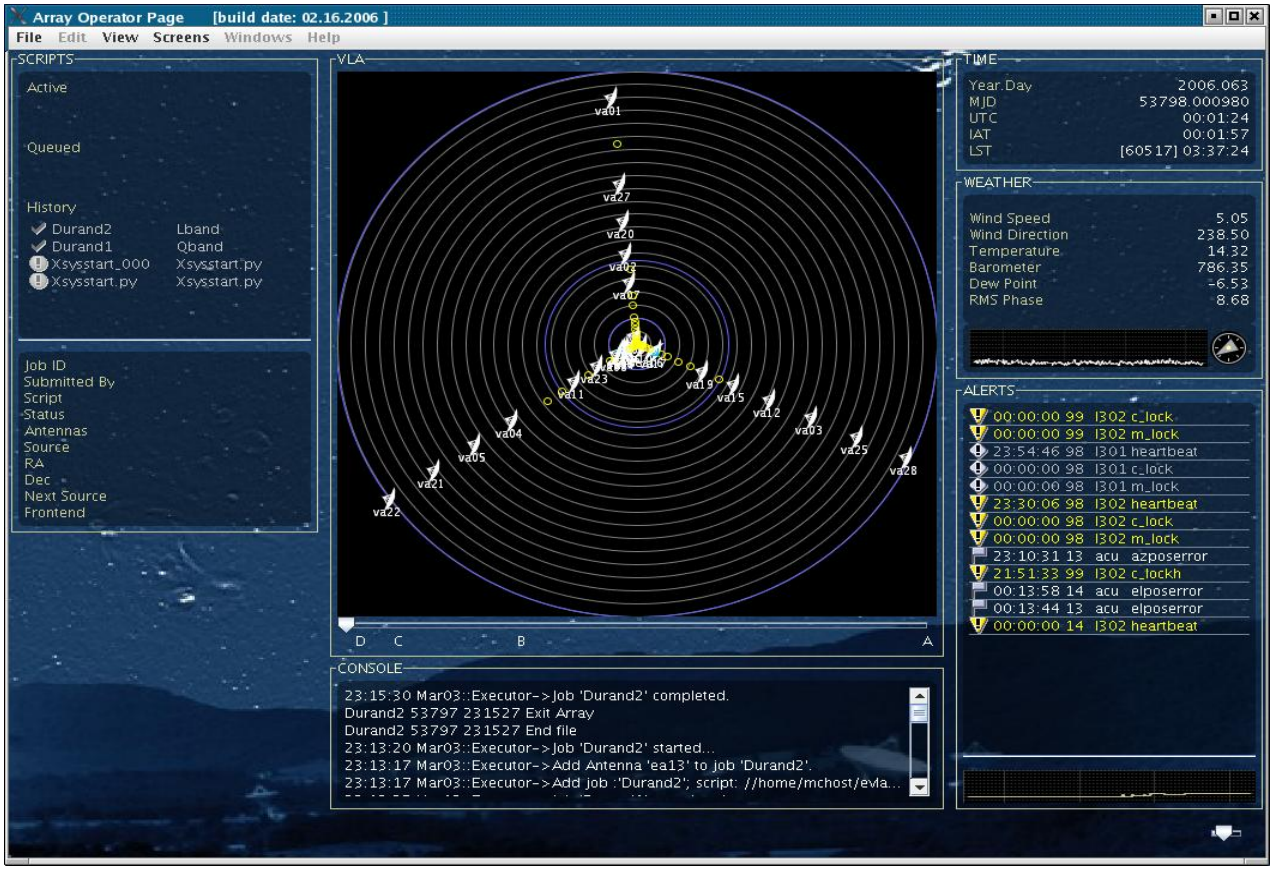

Figure 1 Array Operator Screen

2.3.2 Ancillary Screens (Screenlets)

Developer(s): Rich Moeser

Description: The job submission (scripts) portion, the weather portion, and the alerts portion of the Array Operator Screen are available as standalone screenlets.

Status: As additional portions of the Array Operator Screen are defined and deployed, those portions will also be made available as standalone screenlets.

Time to complete: An ongoing effort.

Comments: None

2.3.3 Module/Subsystem Screens

Developer(s): Rich Moeser

Description: Module/Subsystem screens are screens dedicated to providing customized monitor and control of a particular module or subsystem in an EVLA antenna.

Status: Eventually, module &/or subsystem screens will be developed for all major modules &/or subsystems in the EVLA antennas. Currently module screens exist for the

ACU, the L301 Synthesizer, and the F320 Transition Front End Controller. A set of screens is under development for the M302/303 Utility module, and meetings are beginning to discuss screens for the LO system.

Time to complete: The time to complete depends on need, demand, and the pace of hardware development. These screens are a lower priority item.

Figure 2 ACU screen

2.3.4 Device Browser

Developer(s): Rich Moeser

Description: Displays a list of all monitor points and commands points, all attributes and the value of a selected monitor point, and provides real-time plots of the values of multiple monitor points for one or more devices.

Status: Basically complete. May need some enhancements for display of VLA antenna devices as development of the CMP progresses.

Time to complete: The device browser was one of the first user interfaces developed. It is already fairly mature. Minimal time will be needed for further development.

Comments:

1. A very capable piece of software. A sample screen shot is given in below.

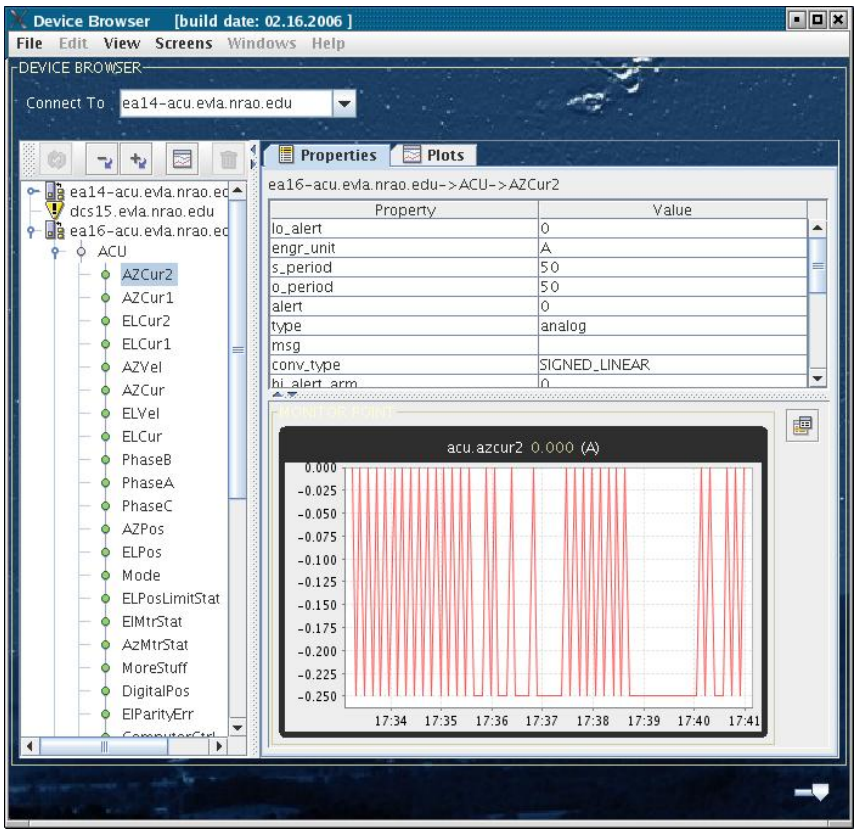

Figure 3 Device Browser Screenshot

2.4 *Software Support for Antenna Checkout/Acceptance, Startup After Maintenance Day, Other Tests*

Developer(s): Bryan Butler, Ken Sowinski, Pat Van Buskirk, Peggy Perley, others as needed and appropriate

Description: These items consist of tests and checks run by the operators to confirm that an antenna is ready for operational use.

Status: A list based on material supplied by Pat Van Buskirk and Ken Sowinski was developed during Q1 2005. (See "VLA Antenna Checkout for Operations, EVLA Notes/Questions", by Pat Van Buskirk, 1/12/2005, and an email from Ken Sowinski, 15 Jan 2005 16:42:15, Subject: Transition Software list) That list is now undergoing review and further revision by Peggy Perley and Bryan Butler.

Time to complete: It is expected that the bulk of the items needed to support antenna checkout and antenna acceptance will be completed by the end of Q2 2006.

2.4.1 Items needed while VLA Control System (Modcomps) are still present

1. Verify network connectivity to antenna
2. Ability to verify:
    a. Round Trip Phase: that antenna is synchronized to the 10 sec tick

b. Control of feed heaters
c. Data Sets: proper operation of backend filters (dataset 5)
d. Focus/Rotation. Successful setup at all bands.
e. LO: Scripts needed for checkout of L301 & L302 settings at all bands
f. Cryo, F317 & F320: verify that cryo temp < 20K, vacuum < 1u
g. Front End (F317 & F320) default settings for all bands.

3. 600 MHZ round trip phase. EVLA is optical. Thought must be given to what needs to be checked and how will we do it.
4. Tipping. New software needed for EVLA antennas
5. Delays. Verify delays found for all IFs at all bands. (Delay determinations made by ITelCal.)
6. Focus, recommissioned antennas only. Verify focus found for all bands. (Focus determinations made by ITelCal.)
7. Pointing1. Set first tilt terms & A7. Requires an interface to the parameters database. No other changes until WIDAR correlator.
8. Pointing2. Install updated coefficients after valid pointing run/analysis. Requires an interface to the parameters database.
9. Baselines - install after valid baseline run/analysis. Requires an interface to the parameters database.
10. L Band, recommissioned antennas only. Check crossed-hand polarizations. Available via D10 display or data analysis via AIPS. Should be changed to check all receivers.
11. Systest. Needs requirements and definition. Total Power and Synch Detector voltages must be monitored.

2.4.2 Items needed when Modcomps are retired

1. L Band, recommissioned antennas only. Check crossed-hand polarizations. A new design and software may be required after Modcomps are retired.
2. Baselines, install after valid baseline run/analysis. New design and software required when Modcomps are retired.
3. Modcal & Tsys. Require work when Modcomps are gone.

2.4.3 Items needed when VLA correlator retired

1. Pointing1. Set first tilt terms & A7. New design and software required for WIDAR correlator.
2. Pointing 2, install updated coefficients after valid pointing run/analysis. New design and software required for WIDAR correlator.
3. P Band, check for fringes. New design and software required for WIDAR Correlator.
4. Syscorrx – no changes until WIDAR, and then it only needs AIPS or whatever to know how to process correlator data.
5. PN3db – as with Syscorrx
6. RFI – will change with WIDAR
7. P Band – changes with WIDAR

8. 4 Band – as with P Band