EVLA Monitor and Control

Near-Term Software

Development Plan

Version 1.1.0

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/users/bsahr/EVLA/architecture_design/MandC_design/MandC_NearTerm_SW.doc

Revision History

Revision	Date	Author(s)	Description of Changes
1.0.0	March 25, 2005	Bill Sahr	Original Version, appeared under the title "EVLA Monitor and Control Transition Software Development Plan", gives task breakdowns for Phases 0 – III of the EVLA M&C Transition
1.1.0	April 15, 2005	Bill Sahr	WIDAR Board level tests, overview of Phases I – III, developers for Phase I – III tasks added

The material in this document on Phases 0 – III of the EVLA Monitor and Control transition software takes an earlier document as its starting point. The earlier document is "DRAFT VLA/EVLA Transition Observing System Development and Re-engineering Plan", Tom Morgan, 03 September 2004. A copy of that document is available on the Computing Working Documents web page:

http://www.aoc.nrao.edu/evla/techdocs/computer/workdocs/index.shtml

It is document # 37.

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D30x ICD (ver E) ready for software	Apr 14, 2005
D30x ver E formatter tested	May 05, 2005
D30x ver E MIB software ready	May 20, 2005
M301 hardware ready for software	May 27, 2005
M301 ready to install on antennas	Jun 08, 2005
Antenna 14, ready to participate in scientific observations*	Jun 23, 2005
Antenna 16 ready to participate in scientific observations	Jul 01, 2005
Antenna 13 ready to participate in scientific observations	Jul 08, 2005
Antenna 18 ready	Aug 22, 2005
Antenna 20 ready	Nov 16, 2005
And thereafter, new EVLA antennas will enter the array at a rate of one every 10 to 12 weeks.	

* “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 ready for operational use	(end of) Q2 2005
WIDAR PDR (after place-and-route of Station and Baseline boards)	mid-July 2005
WIDAR, Gbit Ethernet tests	mid-May 2005
WIDAR, Timecode Generator Board tests	mid-May 2005
WIDAR, Correlator Backend (CBE) prototype, install & test at DRAO	mid-May, 2005
WIDAR, Station boards, hardware available for tests	Aug 31, 2005
WIDAR, Baseline boards, hardware available for tests	Aug 31, 2005
WIDAR, Host Computers for prototype testing in-house	Aug 31, 2005
WIDAR, PC/104+ boards needed for testing in-house	Aug 31, 2005
Southwest Consortium (SWC) Long Wavelength Demonstrator Array (LWDA-1) installation	Q4 2005
LWDA-1, single station operation & verification	Q1 2006
LWDA-1, single baseline testing with 1 VLA antenna, software correlator	Q2 2006
LWDA-1, multiple baseline testing, VLA correlator	Q2 2006
LWDA-1, participation in VLA observing	Q3 2006
WIDAR Prototype Correlator on-the-sky testing at the VLA site	Q2 or Q3 2006
WIDAR Correlator CDR	Nov 2006

WIDAR Production Correlator, Limited Boards installation and testing at VLA site	Q1 2008
WIDAR Production Correlator, Limited Software installation	Q1 2008
WIDAR Production Correlator, on-the-sky testing of the Limited installation	Q1 2008
WIDAR Production Correlator, Start of Shared-Risk Observing	Q2 2008
WIDAR Production Correlator, Full installation & testing at VLA site	Q2 – Q4 2008
WIDAR Correlator, commissioning	Q4 2008 – Q2 2009
VLA Correlator retired (earliest possible date?)	Q2 2009
All VLA antennas converted to EVLA electronics (but not all EVLA receivers installed)	Q4 2010
EVLA receiver installation complete	Q2 2012

2 Planning Assumptions & Constraints

1. EVLA antennas will be used with the VLA Correlator.
2. VLA antennas will not be used with the WIDAR Correlator.
3. The current goal for retirement of the Modcomps is Dec 31, 2005.
4. If the Modcomps cannot be retired before the start of on-the-sky testing of the WIDAR prototype (Q2 or Q3 2006), then they may not be retired until on-the-sky testing of the WIDAR prototype has been completed.
5. A minimum of three (3) and preferably four (4) EVLA antennas must be made available for on-the-sky testing of the WIDAR prototype.
6. On-the-sky testing of the WIDAR prototype including monitor and control of the prototype and archiving of prototype output (or output from the associated prototype correlator backend) will be handled by the EVLA Monitor and Control system.
7. Archiving of output from the VLA Correlator will always be in the VLA archive format.
8. There will be sufficiently many EVLA antennas to support shared-risk observing. Given the current schedule for the production of EVLA antennas and taking the start of shared-risk observing as the start of Q2 2008, 16 – 18 EVLA antennas should be available.
9. There will be sufficiently many EVLA antennas to support scientific use of the WIDAR correlator once commissioning has been completed. Given current schedules and taking the completion of WIDAR commissioning as the start of Q2 2009, 21 – 23 EVLA antennas should be available.

3 Basic Objectives

3.1 EVLA Monitor and Control Transition

The plan for the transition from the VLA Control System to the EVLA Control System has been divided into four phases, with a major objective assigned to each phase. The high level summary of the phases and their objectives is:

- Phase 0
  - Support for EVLA antenna Hardware Development
- Phase I
  - Use of EVLA antennas in VLA Observing
- Phase II
  - Migration of functionality from the VLA Monitor and Control System to the EVLA Monitor and Control System
- Phase III
  - Rollover to EVLA Monitor and Control System. Retire the VLA Monitor and Control System.

Planning for the transition is constrained by the requirement that the VLA continue to operate as a scientific instrument during the transition. A possible qualification on this constraint is that it may be possible to declare one or two periods of reduced operations, perhaps of 2 to 3 months duration each. Given the lead time needed to notify the scientific community, it is unlikely that reduced observing will occur before Q1 or Q2 2006.

Components of the hybrid array

- EVLA antennas
- VLA antennas
- VLA Correlator
- WIDAR Prototype Correlator
- WIDAR Pre-Production (Limited) Correlator
- WIDAR Production Correlator

As hardware development proceeds, VLA antennas, the VLA Correlator, EVLA antennas, and some version of the WIDAR Correlator will all be present, at the same time, in the hybrid array.

3.2 WIDAR Correlator

3.2.1 WIDAR Board-Level Tests

The purposes of the WIDAR Board-Level tests are to

1. Demonstrate and validate the operation of the Gbps transmission scheme that will be used to connect the Station and Baseline Boards
2. Test and validate the Timecode Generator Board design
3. Test and validate the Station Board design

4. Exhaustively test the Correlator Chip
5. Test and validate the Baseline Board design
6. Test and validate a subassembly that interconnects a Timecode Generator Board with a Station Board, with a Baseline Board that is partially populated with Correlator Chips.

To state the obvious, this testing is a necessary step in developing the chip and board designs that will be used for production quantity manufacturing runs. Further, the final versions of the pre-production boards will be used to assemble the WIDAR Prototype Correlator that will then be tested in the laboratory at Penticton and used for on-the-sky testing at the VLA site.

3.2.2 Penticton and VLA Tests of the Prototype WIDAR Correlator

Very little can be said at this point in time concerning tests of the WIDAR Prototype Correlator. A test plan is not expected until mid-July 2005. Realistic task breakdowns of the software required to support the testing cannot be developed until a test plan is released. The current schedule calls for on-the-sky testing of the WIDAR prototype Correlator at the VLA in Q2 or Q3 2006. However, that schedule is contingent upon a large number of factors including the actual, as opposed to predicted, timeline of the WIDAR Board-Level tests.

4 Phase 0, EVLA M&C Transition, Q1 2005

4.1 Objective: Support for EVLA Antenna Hardware Development

The goal of this objective is to provide the software needed to support the development of the production versions of the hardware designs for the EVLA antenna subsystems.

4.1.1 Timeline: Support for EVLA Antenna Hardware Development

Q1 2005

As of late March 2005 the software for Phase 0 is basically complete. Some integration testing remains to be done, training for the VLA operators is scheduled to begin at the end of March, and written instructions need to be more fully developed.

Development of the production versions of the hardware for the EVLA antenna subsystems is currently scheduled to continue at least into the end of Q2 2005. Work to characterize the behavior of entire subsystems and EVLA antenna electronics as a whole will continue throughout all of 2005.

4.1.2 Task breakdown: Support for EVLA Hardware Development

Note that these tasks should not be understood as serial in time, but rather as ongoing parallel efforts. Bench testing of newly developed modules and design respins continues even while attempts to characterize a single antenna and the testing of multiple antennas proceeds. The tasks associated with each type of testing is, for the most part, a list of the software capabilities needed to begin that type of testing and to proceed with it in an effective manner.

1. Bench tests
    a. Basic MIB software to allow monitor and control of modules
    b. Labview interface to MIB-controlled modules
    c. Capture and archiving of module data, ad hoc system
2. Standalone testing of a single EVLA antenna
    a. Testing to be done by expert users
    b. Device browser
        i. Able to obtain monitor data from MIB-connected devices
        ii. Able to set control points (send commands) to MIB-connected devices
    c. At least a partial implementation of a control script language
    d. Observation Executor, interim version, capable of:
        i. Presenting a command line interface (CLI)
        ii. Running simple control scripts
        iii. Commanding modules in an EVLA antenna
        iv. Extension to new EVLA antenna modules and redesigned EVLA antenna modules

    e. Hand-written control scripts
    f. Capture and archiving of data from the antenna, prototype monitor data archive system
3. Testing of multiple EVLA antennas, with one another and with VLA antennas
    a. Testing to be done by expert users
    b. Device browser, as per item 2
    c. Fuller development of interim Observation Executor
        i. Still CLI driven
        ii. Sufficient functionality to achieve fringes with VLA antennas
    d. Hand-written control scripts
    e. Further refinement of monitor data archive
4. Antenna field tests. This item added to version 1.1 of the document to account for the time spent, chiefly by Ken Sowinski and Barry Clark on field tests of the antenna. For the most part, the field tests are not dedicated to debugging software, but rather to a characterization of the antenna electronic and electromechanical systems. Barry and Ken are significant contributors to EVLA M&C software. So, time spent on one activity is, in some sense and to some degree, time not spent of the other.
5. Routine support of testing of EVLA antennas
    a. Ability to control an EVLA antenna using a VLA Observe file or an EVLA control script
    b. GUI for interim Observation Executor
    c. Array operator execution of Observe files and control scripts via the Observation Executor GUI
    d. Bulk of devices and subsystems configured automatically via software. Manual device configuration via device browser only minimally necessary.
    e. Device browser, as per item 2
    f. Interim Observation Executor capabilities:
        i. Support for many of the capabilities specifiable via VLA Observe files
        ii. Job submission and first level subarray specification via a GUI
        iii. Automated conversion of observe files to control scripts
    g. Engineers and technicians able to configure antenna via Observation Executor GUI in support of testing
    h. Feedback to operators on EVLA antenna status (may still be fairly primitive)
    i. Feedback to operators on status of control script execution (may still be fairly primitive)
    j. Training for array operators
    Status: Scheduled to begin March 31, 2005
    k. Written instructions available (meaningful help screens count as written instructions)
    Status: In progress, not yet complete
    l. Routinely usable monitor data archive
6. Preparation for Phase I

    a. Decide on architecture/structure of production version of Observation Executor
7. Other
    a. Revisit/review/revise EVLA M&C Software Development Plan
    b. Begin EVLA M&C Design document to capture work done during Phase 0, and to help plan work to be done in subsequent phases.

5 Overview, Phases I – III, EVLA M&C Transition

The goal of Phases I – III of the EVLA Monitor and Control Transition is to move from a Modcomp-based VLA Control System, written in assembler, C, and Fortran to an EVLA Control System, written chiefly in C and Java, running on Intel-based computing platforms that use Linux as the operating system. At the conclusion of the transition, the Modcomp computers – Boss, Monty, and Spectre, will be retired. The current VLA Correlator controller and the array processor associated with the VLA Correlator will also have been replaced.

From the perspective of the EVLA Monitor and Control Software, the transition from the VLA to the EVLA began with the outfitting of the first test antenna with EVLA electronics, and ends with the conversion of the final VLA antenna to EVLA electronics in Q4 2010. Along the way there will be periods when

1. The VLA Control System and the embryonic EVLA Control System must intercommunicate and interoperate
2. The EVLA Control System assumes complete control – operating EVLA antennas, VLA antennas, and the VLA Correlator via the new correlator controller
3. The Southwest Consortium's Long Wavelength Demonstrator Array (LWDA-1) must be accommodated (Q4 2005 – Q3 2006)
4. The WIDAR Prototype Correlator must be integrated into the EVLA Control System, and must coexist with the VLA Correlator (Q2 or Q3 2006)
5. The WIDAR Correlator, Limited Edition must be integrated into the EVLA Control System, and must coexist with the VLA Correlator (Q1 2008)
6. Installation and testing of the full version of the WIDAR Correlator must be supported (Q2 – Q4 2008)
7. Simultaneous operation of the VLA Correlator and the full version of the WIDAR Correlator must be supported (Q2 2009)

Phases I – III of the EVLA M&C Transition encompass at least items 1, 2, and 3 of this list. The goal is to retire the Modcomps before the arrival of the WIDAR Prototype Correlator in Q2 or Q3 2006. To that end, the EVLA Computing Division has adopted a target date of December 31, 2005 for retirement of the Modcomps. That date is a self-imposed deadline, and it is quite possible that it will not be met. Even if that date is not met, there is still one additional quarter, Q1 2006, before the earliest anticipated arrival of the WIDAR Prototype Correlator. Slippage in the WIDAR Correlator schedules may provide a further grace period.

If the Modcomps cannot be retired before arrival of the WIDAR Prototype, then it is possible that decommissioning of the Modcomps will be delayed until after on-the-sky testing of the WIDAR Prototype is complete. However, it is not logically necessary to do so. The desire is simply to avoid unmanageably complex operations and development scenarios. If, on closer inspection, at a point closer in time to the actual events, it appears reasonable to overlap retirement of the Modcomps with on-the-sky testing of the WIDAR prototype, then both will be done at the same time. It is highly desirable to retire the Modcomps as soon as possible both to save the not insignificant costs of hardware and software maintenance for the Modcomps, and to free crucially needed software engineers from support and maintenance of the VLA Control System.

5.1 Overview, Phase I, EVLA M&C Transition

Phase I of the EVLA M&C Transition concentrates on

- The control of EVLA antennas via the interim Observation Executor
- Initial work on the final version of the Observation Executor
- Synchronization between the VLA and EVLA Control Systems
- Flagging of EVLA antennas
- EVLA Control System access to Antsol solutions, pointing offsets and phasing information, with reference pointing implemented for EVLA antennas
- Job submission for EVLA Antennas
- Initial work on the control of VLA antennas by the EVLA Control System
- Development of the software needed for EVLA antenna Checkout, Startup and Other Tests that is required even when the Modcomps are still present.
- Bringing the new VLA Correlator Controller to operational status

5.2 Overview, Phase II, EVLA M&C Transition

The focus points for Phase II of the EVLA M&C Transition are

- Control of VLA antennas and the VLA Correlator by the EVLA Control System, using the interim Observation Executor
- Iterative development of the final version of the Observation Executor
- The migration of flagging, the VLA DCAF, and writing of the VLA Archive records from the VLA Control System to the EVLA Control System
- Determination of focus and delays using the results provided by the Interim Antsol/Telcal
- Development of a design for the EVLA Telcal
- The development of EVLA-based data quality displays
- Operator tools for monitor and control, by the EVLA Control System, of VLA antennas and the VLA correlator
- Tipping under the control of EVLA-based software
- Focus and delay determination performed by EVLA-based software

5.3 Overview, Phase III, EVLA M&C Transition

For Phase III of the EVLA M&C Transition, the chief areas of concern are

- Rollover to use of the final version of the Observation Executor

- Preparation for integration of the LWDA-1 into the EVLA Control System
- Testing and refinement of the software developed in Phases I & II for EVLA-based flagging, a VLA DCAF, and an archive written in VLA format
- An initial implementation of EVLA Telcal
- Expanding the suite and capabilities of available operator tools
- Continued work on the Antenna Checkout, Startup, and Other Tests software needed when the Modcomps are retired
- Preparation for the WIDAR prototype correlator. Planning for this item awaits the availability of the test plan.
- Beginning the design and development work on EVLA components not addressed by the Transition, principally an EVLA DCAF and the EVLA Archive, or, at least, the interface to the EVLA Archive. It is possible that the start of work on an EVLA Telcal may also be postponed to Phase III.

5.4 Interim Antsol/Telcal

The Interim Antsol/Telcal merits a bit of additional discussion. The plan for the interim Antsol/Telcal is to move the Antsol functionality from the Modcomps to a computing platform (igloo) that is now a staging/spooling area for the VLA archive records. Antsol can be (and has been as of 4/2005) adapted to use this real-time stream of archive records as its input. The program that solves for pointing offsets can be similarly adapted. Igloo, the computer that receives the archive record data stream is a Linux-based system that can be made accessible to both the VLA and EVLA Control Systems. Relocating Antsol and pointing offsets calculation to igloo allows the Modcomps and the VLA Control system to be retired without perturbing the EVLA Control System's access to the antenna gains and pointing offsets. The EVLA Control System can operate indefinitely in this configuration, and it probably foreshadows the configuration that will be used for the EVLA Telcal.

5.5 Overview, Phases I – III, Summary Tables

Tables 1 and 2 on the following pages attempt to summarize major hardware target dates for the EVLA, and major points of software development for Phases I – III of the EVLA M&C Transition. Please note that the timescale for Table 1 is discontinuous.

	Q2 2005	Q3 2005	Q4 2005	Q1 2006	Q2 2006	Q3 2006	Q1 2008	Q2 2008	Q2 2009	Q4 2010	Q2 2012
EVLA Antennas, 4 IFs	1	4	5	6	7	9	17	18	23	All VLA antennas converted	All EVLA receivers installed
VLA Antennas	27	24	23	22	21	19	11	10	5	0	
VLA Correl, new Correl Cntrllr	operational (end of Q2 2005)	X	X	X	X	X	X	X	X		
Control & Monitor Processor (CMP)	Cmnd path to VLA ants, bb converters, flukes, etc		operational	X	X	X	X	X	X		
LWDA-1			installation	single station operation	baseline testing	participation in VLA observing					
WIDAR Prototype					on_the_sky testing (?)	on_the_sky testing					
WIDAR, Limited Edition							installation, on_the_sky tests	Shared-Risk observing			
WIDAR, Full Edition								begin installation and testing	Commissioning complete		

Table 1. Selected EVLA Hardware Target Dates

Table 2. Overview of Phases I – III, EVLA M&C Transition

	Phase I, Use of EVLA Antennas in VLA Observing	**Phase II, Migration of Functionality**	**Phase III, Retire VLA Control System**
	Q2 2005	**Q3 2005**	**Q4 2005**
Obs Executor, interim version	Cntrl of EVLA antennas	Cntrl of VLA antennas, Cntrl of VLA Correl	freeze development
Obs Executor, final version	Requirements, detailed design, determine degree of reuse of interim version code	Iterative development and testing of successive prototypes	Rollover to use of final version. Begin work to control LWDA-1
Antenna field testing	X	X	X
Flagging	EVLA antenna flags, Flagging info written by the Modcomps	EVLA & VLA flags, written by EVLA Control System	Test & refine
Interim Antsol/ Telcal	EVLA access to pointing offsets & phasing info	Focus & Delays for EVLA & VLA antennas	Operational. No further development.
EVLA Telcal	Little or no formal activity	Begin development of design	A prototype capable of being run against Interim Antsol/ Telcal for comparison of results
VLA DCAF	Written by the Modcomps	Written by the EVLA Control System (or an intermediary)	Test & refine
EVLA DCAF	No activity	No activity	Begin development of design
VLA Archive	Develop Modcomp independent format	Written by the EVLA Control System (or an intermediary)	Test & refine
EVLA Archive	No activity	No activity	Begin development of design

Table 2, continued

	Phase I, Use of EVLA Antennas in VLA Observing	**Phase II, Migration of Functionality**	**Phase III, Retire VLA Control System**
	Q2 2005	**Q3 2005**	**Q4 2005**
EVLA Operator Tools	Job submission, EVLA antenna status, Primitive Checker display. Data quality monitored from the Modcomps	Control script execution status, EVLA equivalents of F & D10 displays, EVLA Checker refined, Screens for EVLA & VLA antennas, VLA Correl, weather station	If resources available, begin work on Atmospheric Phase Interferometer and Water Vapor Radiometers.
MIB SW (EVLA Antennas)	Initial version of software for all modules, "In Use" flag, other items (see task breakdown)	Begin development of toolchain for the TC11IB that is not Wndows-based	TBD
CMP (VLA Antennas)	Command path to VLA ants, VLA monitor data to monitor data archive in EVLA format	EVLA style alerts for VLA antennas	Fully operational. The CMP will remain in the system until the VLA Correl is retired.
Device Browser	Access to all MPs & CPs for MIB-connected devices, high rate sampling saved to local computer file system	TBD	TBD
Monitor Data Archive	Fully qualified, fully descriptive device names, Search, list, plot multiple monitor points with one query	TBD	TBD
New VLA Correl Cntrllr	Operational. Controlled from the Modcomps	Configured and updated by EVLA Interim Obs Executor	Configured and updated by final ver of Obs Executor
Antenna Tests Chkout/Startup/Other	Develop items needed for the case of Modcomps still present (see task breakdown)	Focus, Tipping – further development. Begin development of software needed when Modcomps are retired.	Complete work on items needed when Modcomps are retired. Begin work on items needed when VLA Correl is retired.

6 Phase I, EVLA M&C Transition

6.1 Objective: Use of EVLA Antennas in VLA Observing

The primary objective of Phase I is to complete the software needed to enable the use of EVLA antennas in VLA scientific observations, while laying some of the groundwork needed to prepare for retirement of the Modcomps and the VLA Control system.

6.1.1 Relevant Milestones & Target Dates: Use of EVLA Antennas in VLA Observing

D30x ICD (ver E) ready for software	Apr 14, 2005
D30x ver E formatter tested	May 05, 2005
D30x ver E MIB software ready	May 20, 2005
M301 hardware ready for software	May 27, 2005
M301 ready to install on antennas	Jun 08, 2005
Antenna 14, ready to participate in scientific observations	Jun 23, 2005
Antenna 16 ready to participate in scientific observations	Jul 01, 2005
Antenna 13 ready to participate in scientific observations	Jul 08, 2005
Antenna 18 ready	Aug 22, 2005
Hardware verification, first fringes, antenna 14	?
Operations, Antenna Checkout, antenna 14	?
Scientific Commissioning, antenna 14	?

That an antenna is equipped with the needed electronics does not mean that the antenna is ready to participate in scientific observations. The hardware must be verified (engineering quality assurance), fringes obtained, basic operational antenna checkout procedures performed, and scientific commissioning must take place before the antenna can participate in scientific observations.

The assumption is that the first antenna, 14, to be ready to participate in scientific observations will also be the first antenna subjected to formal hardware verification, operational checkout, and scientific commissioning.

6.1.2 Timeline: Use of EVLA Antennas in VLA Observing

Q2 2005

Phase I software will be developed during Q2 2005. The core software must be ready for use by the time the first antenna is equipped with 4 IFs and either L304 or M301 style band switching. The current date for these hardware milestones is Jun 23, 2005. However, there is some optimism that it may be possible to better this date. Accordingly, the ECD will adopt the following dates:

- For the software needed to actually operate an EVLA antenna: mid-May 2005
- Support of hardware verification: end of May 2005. Actually, the software needed to support hardware verification is already complete. All that may be needed are some control scripts
- Support for antenna Checkout by Operations: end of June 2005

- Support for Scientific Commissioning: It is unclear if any software above and beyond that needed to operate an EVLA antenna as a part of the VLA is needed to support Scientific Commissioning.

6.1.3 Task Breakdown: Use of EVLA Antennas in VLA Observing

1. Observation Executor, interim version (Barry Clark)
    a. The main focus for the interim version of the Observation Executor for Phase I is the control of EVLA antennas
    b. Scan synchronization mechanism between the VLA Control System and the EVLA Control System
    Status (as of 3/21/05): Done
    c. Support for more of the capabilities specifiable via a VLA Observe file, including:
        i. Reference pointing (requires access to pointing offsets)
        ii. Phased array operation (requires access to phasing information)
    Overall Status (as of 3/21/05): See Bryan Butler's email of 26 Jan 2005 08:53:56, Subject: Re: status of phase I of transition plan. Most of the functionality needed for regular observing is supported. Reference pointing scans are supported, but application of pointing offsets to EVLA antennas is not yet possible. Phased array operation not yet supported.
    d. Integral obs2script (automatic conversion of (J)Observe files to control scripts)
    Status (as of 3/21/05): Mostly done, but additional testing and some extension required
    e. All devices and subsystems configured by Executor. Device browser not needed to configure EVLA devices for an observation.
        i. Deformatter board software
        Status (as of 3/21/05): Deformatter boards now present a MIB-like interface. A few tweaks and a bit of additional testing are needed.
    f. Improved feedback to operators on status of script execution
    g. Add DeviceListener thread to monitor antenna subsystems (see Barry Clark's posting to evla-sw-discuss of 1/5/2002, entitled "Design of the current EVLA real-time system)
    h. Update scan parameters supported (equivalent to a skip n 0)
    Status: Discussion of how to implement now ongoing
    i. Script stop supported
    Status: Code in place, but not yet tested
    j. Scan skip & scan extend supported, or equivalent functionality
        i. Skips and extends are difficult to implement. They do not map in a natural fashion to the structure of the Executor.
    k. Begin work needed to support configuration and control of VLA antennas
        i. Barry Clark has begun work on a loifsetup construct for VLA antennas

        ii. Methods for communicating with VLA antennas (see also the CMP)
    l. Begin work needed to support configuration and update of VLA correlator (new VLA Correlator Controller required for testing)
2. Observation Executor, final version (Observation Executor team: Butler, Benson, Cai, Moeser, Waters)
    a. Requirements
        i. Note: For testing, the final version of the Executor may need to support scan synchronization with the VLA Control System
    b. Detailed Design, including
        i. Specification of interfaces to
            1. Antenna Monitor and Control (AMCS)
            2. Correlator Monitor and Control (CMCS)
            3. Observation Scheduler
            4. Interim Antsol/Telcal if needed
            5. EVLA Telcal
            6. EVLA DCAF
    c. Determination of degree of reuse/refactoring of interim Observation Executor code
3. Antenna field testing (Clark, Sowinski)
    a. Significant amounts of time required from senior personnel also working on EVLA M&C software development
4. Flagging for EVLA antennas (Sowinski, Cai)
    a. Development of flags in EVLA Control System from MIB-generated alerts. (Implies flagging for EVLA antennas.)
    b. Transfer of flagging information to VLA Control System
    c. Merger of EVLA flagging with VLA flagging in the VLA Control System
    d. VLA Archive records annotated with EVLA and VLA flagging information by the VLA Control System (the Modcomps)

    Status (as of 3/21/05): Tests have demonstrated that the full path from an alert generated in a MIB to annotation of VLA Archive records written by the VLA Control System is functional. MIB alerts need additional work. The development of flags at a level higher than the MIBs needs work. More testing is needed.
5. Interim Antsol/Telcal (antenna gains, pointing offsets, phasing information, focus, delays) (Sowinski, Cai)
    a. EVLA access to pointing offsets and phasing information is required in this phase of software development.
    b. Begin work on focus determinations and the determination of delays by the EVLA Control System
        i. For EVLA antennas
6. EVLA Telcal (Sowinski, Cai)
    a. For Phase I, the focus will be on Interim Antsol/Telcal. EVLA Telcal will receive little formal attention during this period. However, its needs and design will be kept in mind while work proceeds on the Interim Antsol/Telcal.

7. VLA Data Capture and Format (VLA DCAF) (Sowinski, Cai)
    a. VLA archive records still created (formatted) by the VLA Control System (Boss, DUMP)
    b. VLA archive records still written by the VLA Control System (Boss)
    c. Develop a detailed design for migration of VLA DCAF (old DUMP) functionality from the VLA Control System, including task breakdowns and a schedule with milestones
    d. Document the design, task breakdown, and schedule
    e. Begin development
8. VLA Archive (Sowinski, Cai, Benson)
    a. Review the current VLA archive format for decisions and changes that must be made in order to write VLA format archive records in a Modcomp independent format.
        i. Develop a task breakdown for the changes to be made
        ii. Set milestones and schedule
        iii. Begin development
        iv. Document the decisions, task breakdown, and schedule

       Status (as of 3/21/05): Ken Sowinski has written and distributed an email (posted to evla-sw-discuss on 18 Feb 2005 08:43:22, Subject: the transition era VLA/eVLA archive record) that discusses the changes required in the VLA archive format to create a Modcomp independent version that can be written by the EVLA Monitor and Control System.
    b. Coordinate with other groups (AIPS, AIPS++ (?), others?) on changes in post-processing software needed to support changes in VLA archive format records
9. Operator tools (Moeser, Butler, Sowinski)
    a. Written instructions and help screens
        i. Written cookbook style instructions needed for common tasks
        ii. Continue development of help screens
    b. Job submission
        i. GUI interface to interim Observation Executor
           Status: Functional. Further development expected.
    c. Ability to monitor observation progress and status
        i. Specification of what is needed
            1. Status of control script execution for EVLA antennas
            2. Data quality displays that include EVLA antennas
               Status: The F and D10 displays are based on output from the VLA Correlator, and therefore provide feedback on EVLA as well as VLA antennas.
    d. Ability to monitor antenna status, EVLA antennas
        i. EVLA hosted Checker function for EVLA antennas
           Status (as of 3/21/05): Two Checker screens have been demonstrated. One captures current alert-on messages. The other is a history screen that provides a log of alert-on messages for which a matching alert-off message has been found. Work

may be needed on prioritization or other indicators of severity, color-coding, etc.

ii. Operator Screens
    1. Framework for general approach
    2. Specification of screens to be developed
    3. Prototypes for some significant subset of the screens
        a. Ability to monitor and control MIB-connected antenna devices (EVLA antennas)

e. Specification and documentation of the general approach to interfaces for non MIB-connected processes
    i. Executor, Checker, Flagger, others?
    ii. At least prototype GUIs for these processes

Status (as of 3/21/05): A general approach to these interfaces has been developed. It is web-based. GUIs for the Executor, Checker, and Flagger have been demonstrated. Documentation of the approach has been written, but is now somewhat obsolete and needs to be updated. The documentation has not yet been made publicly available. Much more field-testing of this approach to the interfaces is needed to be certain of its viability.

10. Device Browser (Moeser)
    a. Ability to access all attributes of all monitor and control points for MIB-connected devices (I.e., EVLA antennas)
    b. Ability to set all writeable attributes of MIB-connected devices (I.e., EVLA antennas)
    c. Annotation of plot scales
    d. Ability to sample monitor points at high sample rates and save data to local computer
11. Monitor data archive (Moeser, Benson)
    a. Monitor data accessible using fully qualified, fully descriptive device names that accurately reference the data source
    b. Ability to search for & list multiple monitor points with one query
    c. Ability to search and plot multiple monitor points with one query (?)
12. MIB software (Whiteis, Ben Frej)
    a. Module software as hardware becomes available
        i. T304/T305
        ii. L302 mods
        iii. D30x
        iv. M301
        v. F320
        vi. F317
    b. Get *.*.* disallowed as a MIB command
        i. Implementation
        ii. Update documentation (Service Port ICD)
    c. Addition of alert status in response to get commands for monitor point values
        i. Implementation

Status (as of 3/21/05): Implemented in release 0.20 of the MIB framework software (3/2005). Currently undergoing testing.

ii. Update documentation (Service Port ICD)

d. Addition of alert status to data port multicasts of monitor point values
   i. Implementation
      Status (as of 3/21/05): Implemented in release 0.20 of the MIB framework software (3/2005). Currently undergoing testing.
   ii. Update documentation (Data Port ICD)
e. "In Use" flag
   i. Initial implementation
   ii. Update documentation (Framework Software)
f. Upgrade to latest version of Nucleus OS
   i. Fix TCP_Retransmit bug
   ii. Make transition to latest version of Nucleus OS
   iii. Update old images for MIBs already in the field
g. Decision on upgrade to latest version of toolset
   i. Begin exploring a GNU-based toolchain ?

13. Control and Monitor Processor (CMP) (Ben Frej)
    a. VLA monitor data available in EVLA format
    b. VLA monitor data to EVLA monitor data archive
    c. Implementation of a command path to VLA antennas
       i. Low-level implementation within the CMP
       ii. Public interface to command path for use by external processes (such as the Observation Executor)
14. New VLA Correlator Controller (Sowinski, Rowen)
    a. Fully operational by the end of Q2 2005, controlled by Modcomp hosted software
15. Software support for Hardware Quality Assurance
    a. GUI interface to interim Observation Executor
       Status (as of 3/21/05): GUI is functional. Further development expected.
    b. Appropriate test scripts available
       Status: Done
    c. User training
       Status: Done
16. Software support for Antenna Checkout/Acceptance, Startup After Maintenance Day, Other Tests (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) (Sowinski, others – TBD)
    a. Items needed while VLA Control System (Modcomps) are still present
       i. Verify network connectivity to antenna
       ii. Round Trip Phase. Ability to verify that the antenna is synchronized to the 10 sec tick.
       iii. Ability to verify:

1. Control of feed heaters (initially by the F320 module, ultimately by the M302 utility module). Feed heaters to be available sometime in March 2005.
2. Data Sets. Proper operation of backend filters (dataset 5)
3. Focus/Rotation. Successful setup at all bands.
4. LO. Scripts needed for checkout of L301 & L302 settings at all bands
5. Cryo. F317 & F320. Verify that cryo temp < 20K, vacuum < 1u. Use device browser, perhaps with a special screen?
6. Front End (F317 & F320) default settings for all bands.

iv. 600 MHZ round trip phase. EVLA is optical. What needs to be checked and how will we do it?

v. Delays. Verify delays found for all IFs at all bands. No change with Modcomps and VLA Correlator, but Phase I is the right time to begin thinking about what we will do when the Modcomps are retired.

vi. Pointing1. Set first tilt terms & A7. Requires an interface to the parameters database. No other changes until WIDAR correlator.

vii. Focus, recommissioned antennas only. Verify focus found for all bands. New design and software needed.

viii. 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.

ix. Baselines, install after valid baseline run/analysis. Requires an interface to the parameters database.

x. Pointing2, install updated coefficients after valid pointing run/analysis. Requires an interface to the parameters database.

xi. Tipping. New software needed for EVLA antennas.

xii. Systest. Needs requirements and definition. Total Power and Synch Detector voltages must be monitored.

17. Software needed to support Scientific Commissioning
    a. It is not clear that any software beyond that already needed to integrate EVLA antennas into VLA observing will be needed.
18. Other (Sahr)
    a. Update and revise EVLA M&C Software Development Plan
    b. Update and revise EVLA M&C Design document

7 Phase II, EVLA M&C Transition

7.1 Objective: Migration of functionality from VLA Control System to EVLA Control System

The primary objective of Phase II is to substantially complete the migration of functionality from the VLA Control System to the EVLA Control System in preparation for retirement of the VLA Control System and the Modcomp computers. During this

phase of software development the EVLA Monitor and Control System needs to acquire the ability to

- Control VLA antennas as well as EVLA antennas
- Control the VLA Correlator

and

- The final version of the Observation Executor must achieve a level of functionality nearly equal to the current state of the interim version of the Observation Executor

7.1.1 Relevant Milestones & Target Dates: Migration of functionality from VLA Control System to EVLA Control System

New VLA Correlator Controller ready for operational use (end of) Q2 2005

7.1.2 Timeline: Migration of functionality from VLA Control System to EVLA Control System

Q3 2005

Control of VLA antennas by the EVLA Monitor and Control System should be an early goal for Phase II. By the end of this phase, the EVLA Monitor and Control System must be beyond the proof-of-concept stage for control of the VLA correlator by the EVLA Monitor and Control System, and the final version of the Observation Executor must be in a well-developed state.

7.1.3 Task Breakdown: Migration of functionality from VLA Control System to EVLA Control System

1. Observation Executor, interim version (Barry Clark)
    a. Support for most of the capabilities present in VLA Observe files
    b. Ability to configure, monitor, and control VLA antennas
        i. To the same degree as is possible for EVLA antennas
        ii. Integration of VLA system parameter database with the EVLA system parameter database
    c. At least a first implementation of the ability to configure & update the VLA Correlator via new correlator controller
2. Observation Executor, final version (Observation Executor team: Butler, Benson, Cai, Moeser, Waters)
    a. 1st prototype implementation - basic structure, limited functionality
    b. Iterative development and field testing of successive prototypes with increasing degrees of functionality
    c. Implementation of most of the functionality supported by the interim version of the Executor
3. Antenna field testing (Clark, Sowinski)
    a. Significant amounts of time required from senior personnel also working on EVLA M&C software development

4. Flagging (Sowinski, Cai)
    a. Able to develop flags for both EVLA and VLA antennas
    b. Transmission of flagging information for EVLA and VLA antennas from EVLA Control System to current site of VLA DCAF
5. Interim Antsol/Telcal (antenna gains, pointing offsets, phasing information, focus, delays) (Sowinski, Cai)
    a. Continue work on focus determinations and the determination of delays by the EVLA Control System
        i. For EVLA antennas
        ii. For VLA antennas
6. EVLA Telcal (antenna gains, pointing offsets, phasing, focus, delays) (Sowinski, Cai)
    a. Begin development of a design that factors Telcal into components of data input, computed solutions, and results output that will be adequate to the task of providing or supporting the determination of
        i. Complex antenna gains
        ii. Pointing offset determinations
        iii. Phasing information
        iv. Focus determinations
        v. Delays
7. VLA Data Capture and Format (VLA DCAF) (Sowinski, Cai)
    a. VLA DCAF functionality migrated from the VLA Control System
        i. EVLA Control System becomes source of information for VLA format archive record headers
        ii. VLA archive records formatted by EVLA Control System or by an intermediary that is independent of the VLA Control System
        iii. VLA archive records written by EVLA Control System or by an intermediary that is independent of the VLA Control System
8. VLA Archive (Sowinski, Cai, Benson)
    a. VLA archive records written in Modcomp independent format by EVLA Control System or by an intermediary that is independent of the VLA Control System
    b. Test for compatibility with post-processing software
9. Operator Tools (Moeser, Butler, Sowinski)
    a. Job Submission
        i. Should have been substantially completed in Phase I. Refinements in Phase II
    b. Ability to monitor observation progress and status
        i. Screen(s) giving status of control script execution implemented
        ii. Data quality displays implemented
            1. EVLA equivalents of the F and D10 displays
    c. EVLA hosted Checker functionality for EVLA and VLA antennas
    d. Screens to monitor and control
        i. EVLA antenna subsystems
        ii. VLA antenna subsystems
        iii. VLA correlator

        iv. Weather station
    e. More fully developed interfaces to non-MIB connected processes (Checker, Flagger, others)
10. Device Browser (Moeser)
    a. TBD
11. Monitor data archive (Moeser, Benson)
    a. TBD
12. MIB software (Whiteis, Ben Frej)
    a. Development of a toolchain (probably GNU-based) for the TC11IB processor that is not dependent upon the Windows operating system
        i. C/C++ compiler
        ii. Assembler
        iii. Linker/Locator
        iv. Debugger
        v. Image download
13. CMP (Ben Frej)
    a. Full implementation of EVLA style alerts for VLA antennas
14. New VLA Correlator Controller (Sowinski, Rowen)
    a. Configured and updated by interim Observation Executor
15. Software Support for Hardware Quality Assurance
    a. TBD, as needed
16. Software Support for Antenna Checkout/Acceptance, Startup After Maintenance Day, Other Tests (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) (Sowinski, others – TBD)
    a. Items needed for EVLA antennas to participate in VLA scientific observing (Phase I), that may require further work
        i. Focus. New design and software needed.
        ii. Tipping. New software needed for EVLA antennas
    b. Items needed when Modcomps are retired
        i. Delays. Verify delays found for all IFs at all bands. New design and software required when Modcomps are retired.
        ii. 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. Will new design and software be required after Modcomps retired?
        iii. Baselines, install after valid baseline run/analysis. New design and software required when Modcomps are retired.
        iv. Pointing2, install updated coefficients after valid pointing run/analysis. Will new design and software be required after Modcomps retired?
        v. Modcal & Tsys. Require work when Modcomps are gone.
        vi. Systest. Needs requirements and definition. Total Power and Synch Detector voltages must be monitored.
    c. Items needed when VLA correlator retired

i. Pointing1. Set first tilt terms & A7. New design and software required for WIDAR correlator.
ii. Pointing 2, install updated coefficients after valid pointing run/analysis. New design and software required for WIDAR correlator.
iii. P Band, check for fringes. New design and software required for WIDAR Correlator.
iv. Syscorrx – no changes until WIDAR, and then it only needs AIPS or whatever to know how to process correlator data
v. PN3db – as with Syscorrx
vi. RFI – will change with WIDAR
vii. P Band – changes with WIDAR. In what ways?
viii. 4 Band – as with P Band

17. Software needed to support Scientific Commissioning
    a. TBD, as needed
18. WIDAR Prototype Correlator (Morgan, others – TBD)
    a. Test plan to be released in mid-July 2005. Analyze with respect to software requirements and begin to plan the software development.
19. Other (Sahr)
    a. Review and revise EVLA M&C Software Development Plan
    b. Review, update, expand EVLA M&C Design document

8 Phase III, EVLA M&C Transition

8.1 Objective: Rollover to EVLA Monitor & Control System. Retire VLA Control System.

The primary objective for this phase is to make the switchover to control of the hybrid array by the EVLA Monitor and Control System. The bulk of Phase III should be spent on the validation of the EVLA Control System elements developed during Phases I & II. Planning for the further development of the EVLA Monitor and Control System must begin during this phase.

8.1.1 Relevant Milestones & Target Dates: Rollover to EVLA Monitor & Control System. Retire VLA Control System.

Southwest Consortium (SWC) Long Wavelength Demonstrator Array (LWDA-1) installation	Q4 2005
LWDA-1, single station operation & verification	Q1 2006
LWDA-1, single baseline testing with 1 VLA antenna, software correlator	Q2 2006
LWDA-1, multiple baseline testing, VLA correlator	Q2 2006
WIDAR Prototype Correlator on-the-sky testing at the VLA site	Q2 or Q3 2006

8.1.2 Timeline: Rollover to EVLA Monitor & Control System. Retire VLA Control System.

Q4 2005

If the schedule slips and the date for retirement of the VLA Control System and the Modcomp computers begins to slip toward the date for support of on-the-sky testing of WIDAR prototype (Q2 or Q3 2006), then retirement of the Modcomps may be deferred until testing of the WIDAR prototype has been completed.

The Long Wavelength Demonstrator Array (LWDA-1) has the potential to be a complicating factor during Phase III of development of the EVLA Monitor and Control transition software.

There have been discussions of declaring a period of reduced observing (less scheduled observing time) as the EVLA Monitor and Control System for the hybrid array becomes operational. Q1 2006 or the following calendar quarter, Q2 2006, might be appropriate times for a period of reduced observing.

8.1.3 Task Breakdown: Rollover to EVLA Monitor & Control System. Retire VLA Control System.

1. Observation Executor, interim version (Barry Clark)
    a. Freeze development of new capabilities
2. Observation Executor, final version (Observation Executor team: Butler, Benson, Cai, Moeser, Waters)
    a. Continue and complete iterative development and field testing of successive prototypes with increasing degrees of functionality
    b. Implementation of all functionality supported by interim version of the Executor
    c. Support for all of the capabilities present in VLA Observe files
        i. Excluding those capabilities, if any, which, as a matter of policy, will not be supported
    d. Side by side testing with interim version of the Executor
    e. All new functionality to be implemented in production version of the Executor, including
        i. Configuration, control, and update of the VLA Correlator via the new VLA Correlator Controller
        ii. As necessary, adaptation of EVLA antenna control functionality to the LWDA-1
            1. This work is likely to continue into Q1 2006
    f. Rollover to use of final version of Executor
3. Antenna field testing (Clark, Sowinski)
    a. Significant amounts of time required from senior personnel also working on EVLA M&C software development
4. Flagging, EVLA and VLA antennas (Sowinski, Cai)
    a. Testing

5. EVLA Telcal (antenna gains, pointing offsets, phasing, focus, delays) (Sowinski, Cai)
    a. A first implementation with sufficient functionality to run in parallel against the Interim Antsol/Telcal for comparison of results.
    b. Begin consideration of the expansion of the design and initial implementation to include additional requirements as per section 5.1 (Real-time Calibrator Analysis) of the EVLA e2e Science Software Requirements document
6. VLA Data Capture and Format (VLA DCAF) (Sowinski, Cai)
    a. Testing
7. EVLA DCAF
    a. Begin development of the design
8. VLA Archive (Sowinski, Cai, Benson)
    a. Testing
9. EVLA Archive
    a. Begin development of the design
10. Operator Tools (Moeser, Butler, Sowinski)
    a. Job Submission
        i. TBD
    b. Ability to monitor observation progress and status
        i. TBD
    c. If resources available, begin work on EVLA monitor and control of
        i. Atmospheric Phase Interferometer
        ii. Water Vapor Radiometers
        iii. Hardware and software development required
11. Device Browser (Moeser)
    a. TBD
12. Monitor data archive (Moeser, Benson)
    a. TBD
13. MIB software (Whiteis, Ben Frej)
    a. TBD
14. CMP (Ben Frej)
    a. Hopefully, at this point the CMP is fully operational and requires no further work. The CMP will remain in the system not just until the last VLA antenna is converted to EVLA electronics, but also until the VLA Correlator is retired. In addition to providing a monitor and control path for VLA antennas, the CMP provides the path to the VLA Correlator's baseband converters, to the flukes and to LO functions in the control building (antenna 0).
15. New VLA Correlator Controller (Sowinski, Rowen)
    a. TBD
16. Software Support for Hardware Quality Assurance
17. Software Support for Antenna Checkout/Acceptance, Startup After Maintenance Day, Other tests (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) (Sowinski, others- TBD)

c. Items needed when Modcomps are retired
    iii. Delays. Verify delays found for all IFs at all bands. New design and software required when Modcomps are retired.
    iv. 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. Will new design and software be required after Modcomps retired?
    v. Baselines, install after valid baseline run/analysis. New design and software required when Modcomps are retired.
    vi. Pointing2, install updated coefficients after valid pointing run/analysis. Will new design and software be required after Modcomps retired?
    vii. Modcal & Tsys. Require work when Modcomps are gone.
    viii. Systest. Needs requirements and definition. Total Power and Synch Detector voltages must be monitored.
d. Items needed when VLA correlator retired
    i. Pointing1. Set first tilt terms & A7. New design and software required for WIDAR correlator.
    ii. Pointing 2, install updated coefficients after valid pointing run/analysis. New design and software required for WIDAR correlator.
    iii. P Band, check for fringes. New design and software required for WIDAR Correlator.
    iv. Syscorrx – no changes until WIDAR, and then it only needs AIPS or whatever to know how to process correlator data
    v. PN3db – as with Syscorrx
    vi. RFI – will change with WIDAR
    vii. P Band – changes with WIDAR. In what ways?
    viii. 4 Band – as with P Band

18. Software needed to support Scientific Commissioning
    a. TBD
19. WIDAR Prototype Correlator (Morgan, others – TBD)
    a. Proceed as per plan developed during Phase II
20. Other (Sahr)
    a. Review and revise EVLA M&C Software Development Plan
    b. Review, update, expand EVLA M&C Design document

9 WIDAR Correlator

9.1 Objective: WIDAR Board-Level Tests

9.1.1 Relevant Milestones & Target Dates: WIDAR Board-Level Tests

Gbit Transmission Test

Gbit Test Plan document available	
(A formal test plan will not be written)	Not Applicable
Hardware testbed ready	Not Applicable
Bruce Rowen at Penticton for 2 weeks	
(depends on parts acquisition problem)	mid-May 2005
Software installed on testbed and ready for use	mid-May 2005
Finished assemblies available for testing	awaiting parts
Start of tests	mid-May 2005
Duration of tests	approx 1 week
End of tests	end of May 2005

Timecode Generator Board (TCGB) Tests

Timecode Generator Board test plan available	Apr 04, 2005
Hardware testbed ready	
(dependent upon parts deliveries)	mid-May 2005
Software installed on testbed & ready for use	mid-May 2005
Finished assemblies available for testing	mid-May 2005
Start of tests	mid-May 2005
Duration of tests	a few weeks
End of tests	end of May 2005
	or mid-Jun 2005

Station Board Prototype Tests

Station Board Test Plan document available	Apr 6, 2005
1st prototype board available for testing	Aug 31, 2005
Testbed ready, hardware & software	Aug 31, 2005
Start of tests	Sep 01, 2005
Duration of tests	6 to 9 months
End of test	Feb 2006 to May 2006

Baseline Board Prototype Tests

Baseline Board Test Plan document available	Mar 17, 2005
Prototype CBE ready, hardware & software	
(Tom Morgan at Penticton)	mid-May 2005
1st prototype board available for testing	Aug 31, 2005
Testbed ready, hardware & software	Aug 31, 2005
Start of tests	Sep 01, 2005
Duration of test	6 to 9 months
End of tests	Feb 2006 to May 2006

9.1.2 Discussion & Timeline: WIDAR Board-Level Tests

For all of the tests, the test software consists of, essentially, three components. First, one or more module access handlers (MAHs) are required. An MAH consists of a driver for a module plus a layer that sits above the driver that decodes XML packaged parameters for communication to the driver and encodes into XML quantities coming from the

driver. Most of the boards consist of multiple modules, so multiple MAHs are needed to fully test a board. The second component is the means by which the MAH and the test applications will communicate. The third software component is the test applications. Test applications consist of test application logic plus GUIs.

The number of GUI screens needed is large and some of the screens are quite complex. The Gbit Transmission test requires only a minimal hardware testbed and a Raw Register read/write GUI. The Timecode Generator Board test plan calls for only 3 GUIs. The Station Board test plan calls for over 30 GUIs, however many of them are quite similar to one another. The Baseline Board test plan specifies approximately 12 GUIs. The highest level of complexity per screen seems to lie with the Baseline Board GUIs.

The Gbit Transmission test is the simplest and most straightforward of the planned tests. The purpose of the test is to demonstrate that the 1 Gbps transmission technology used in the correlator to connect the Station Boards to the Baseline Boards actually works. The FPGA and connectors on the Timecode Generator Board (TCGB) will be used for the Gbit Transmission test. No testbed other than powered, cabled boards sitting on a bench is needed for this test. No formal test plan has been written for this test. The only software required for this test is a CMIB with an operating system plus:

1. an application and drivers sufficient to the task of loading the personality file into the FPGA on the TCGB via the PC/104 Monitor/Control (PCMC) mezzanine card, and
2. a simple Raw Register read/write capability to set up the device registers

The currently (as of Apr 8, 2005) scheduled start date for this test is mid-May 20005. Dates and schedules are a bit fuzzy because they are dependent upon parts deliveries that have been experiencing delays.

Next in complexity are the Timecode Generator Board tests. The schedule for the TCGB tests is roughly the same as the schedule for the Gbit Transmission test. It is possible to use the same boards (with different FPGA personalities loaded) and to interleave the Gbit Transmission test with TCGB testing.

For the prototype Station Board and Baseline Board, the goal is to begin tests on Sep 1, 2005. During most of the test regimen, these two boards will be tested separately and in parallel. Testing of a Station Board or boards interconnected to a Baseline Board will occur during the latter phases of bench tests. The major uncertainties for these tests are 1) completion of the board designs (place and route), and 2) the duration of the tests.

In order to meet the target dates, it is likely that additional manpower resources will be needed. Bruce Rowen of NRAO is the developer for the MAHs, and that work has been ongoing for some time now. Kevin Ryan of NRAO is working full time on the test applications/GUIs as of Apr 4, 2005. It is possible that Sonja Vrcic of DRAO may also contribute time to the development of test applications/GUIs and that some portion of an additional software engineer at DRAO may be made available for test application/GUI development.

Before additional manpower beyond that contributed by Bruce and Kevin can be used effectively, three elements must be in place.

1. The means by which the CMIBs and the test applications/GUIs will communicate.
2. The framework to be used for the creation of the GUIs – java applets, XML-based Java Swing descriptions, etc.
3. An agreement on a "common look and feel" for the GUIs.

The goals are to have item 1 up and running by April 29, 2005, item 2 specified by the same date, and a sample for item 3 ready for review either by the same date or shortly thereafter, say by May 6, 2005.

The task breakdown for the WIDAR Board-Level Tests will not attempt to list every GUI screen required for testing. The number and nature of the screens will probably change as development proceeds. The current specifications for the GUI screens are contained in the Test and Verification plans (TVPs) for the boards. The relevant test documents are:

1. EVLA Correlator Project Development and Test Plan, TVP Document: A25010N001, Revision: Draft, Brent Carlson, October 1, 2004, available at: http://www.drao-ofr.hia-iha.nrc-cnrc.gc.ca/science/widar/private/System.html
2. Timecode Generator Board, TVP Documents: A25151N0001, Revision: 1.0, Zhang Heng, April 4, 2005, available at: http://www.drao-ofr.hia-iha.nrc-cnrc.gc.ca/science/widar/private/Other_Boards.html
3. Station Board, TVP Document: A25040N0003, Revision: 0.0, Dave Fort, April 6, 2005, available at: http://www.drao-ofr.hia-iha.nrc-cnrc.gc.ca/science/widar/private/Station_Board.html
4. EVLA Baseline Board Prototypes, TVP Document: A25091, Revision: Draft, Brent Carlson, March 17, 2005, available at: http://www.drao-ofr.hia-iha.nrc-cnrc.gc.ca/science/widar/private/Baseline_Board.html

Some of the items for the task breakdown and some of the task status information in this document are taken from the spreadsheet version of DRAO's "EVLA Project Work Breakdown Structure, which can be found at:
http://www.drao-ofr.hia-iha.nrc-cnrc.gc.ca/science/widar/private/Management.html

9.1.3 Task Breakdown: WIDAR Board-Level Tests

1. CMIB <-> test application/GUI communications software
    a. Due: Apr 29, 2005 Developers: Bruce Rowen & Kevin Ryan Status: As of Apr 13, 2005, In Progress
2. Specification of GUI framework technology
    a. Due: Apr 29, 2005 Developer: Kevin Ryan Status: As of Apr 13, 2005, In Progress
3. Sample common look & feel for GUIs

a. Due: May 6, 2005 Developer: Kevin Ryan Status: As of Apr 13, 2005, In Progress

4. Gbit Transmission test software
    a. Software to load personality file into FPGA
        1. Due: May 2, 2005 Developer: Bruce Rowen Status: Done
    b. Raw Register read/write GUI
        1. Due: May 2, 2005 Developer: Bruce Rowen Status: Done
5. Timecode Generator Board test software
    a. MAH
        1. Due: mid-May 2005 Developer: Bruce Rowen Status: as of Apr 8, 2005, > 95% complete
    b. GUIs. Since only 3 GUIs have been specified for the Timecode Generator Board tests, they will be listed here.
        1. Board Top-Level GUI
            a. Due: mid-May 2005 Developer: Status: As of Apr 7, 2005, Not yet started
        2. Timecode Generator FPGA GUI
            a. Due: mid-May 2005 Developer: Status: As of Apr 7, 2005, Not yet started
        3. Raw Register read/write GUI
            a. Due: mid-May 2005 Developer: Status: As of Apr 7, 2005, Not yet started
6. Station Board Prototype Test Software
    a. Input MAH
    Due: Apr 4, 2005 Developer: Rowen Status: as of Apr 8, 2005, ~ 90% complete
    b. Delay MAH
    Due: Apr 13, 2005 Developer: Rowen Status: as of Apr 8, 2005, ~ 90% complete
    c. Autocorrelation MAH
    Due: Apr 25, 2005 Developer: Rowen Status: as of Apr 8, 2005, ~ 90% complete
    d. FIR Filter MAH
    Due: May 4, 2005 Developer: Rowen Status: as of Apr 8, 2005, ~ 90% complete
    e. Output MAH
    Due: May 9, 2005 Developer: Rowen Status: as of Apr 8, 2005, not yet started, awaiting RFS document
    f. Timing MAH
    Due: May 13, 2005 Developer: Rowen Status: as of Apr 8, 2005, ~ 90% complete
    g. VSI MAH
    Due: May 18, 2005 Developer: Rowen Status: as of Apr 8, 2005, not yet started, awaiting RFS document
    h. GUIs. Some minimal prioritization of the GUIs has been specified. Of the 30+ screens specified in the TVP, those needed soonest will be:

1. The CRC GUIs. The CRC GUIs are a group of 11 screens that display accumulated CRC errors for the inputs and outputs of the Input Chip, the Delay modules, the Autocorrelation Chip, the Filter Banks, and the inputs of the Output and Timing Chips.
2. A GUI or GUIs to display internal FPGA errors
3. A GUI to display Input Chip state count histograms
4. A GUI to display Filter Chip state count histograms

Due: Sep 1, 2005 Developer: Status:

7. Baseline Board Prototype Test Software
    a. Correlator Chip MAH
    Due: May 28, 2004 Developer: Rowen Status: As of Dec 13, 2004, > 90% complete
    b. Recirculation Controller MAH
    Due Date: May 31, 2004 Developer: Rowen Status: As of Dec 13, 2004, > 80% complete
    c. Ethernet Transmitter MAH
    Due Date: Nov 30, 2004 Developer: Rowen Status: As of Dec 13, 2004, > 65% compete
    d. LTA Controller MAH
    Due Date: Dec 1, 2004 Developer: Rowen Status: As of Dec 13, 2004, > 80% complete
    e. MCB Interface & Clock Selector MAH
    Due Date: Feb 16, 2005 Developer: Rowen Status: Likely that no software will be required.
    f. GUIs. As with the Station Board, the GUIs will not be specified in full in this document. Some minimal prioritization has been specified. In order of need:
        1. The Recirculation Controller GUI, in full
        Due: Aug 31, 2005 Developer: Status: As of Apr 8, 2005, not yet started
        2. The Correlator Chip GUI
        Due: Aug 31, 2005 Developer: Status: As of Apr 8, 2005, not yet started
        3. For the LTA, a Raw Register display with read/write capability would suffice.
        Due: Aug 31, 2005 Developer: Status: As of Apr 8, 2005, not yet started

9.2 Objective: Penticton and VLA tests of Prototype WIDAR Correlator

9.2.1 Relevant Milestones & Target Dates: Penticton and VLA tests of Prototype WIDAR Correlator

WIDAR Prototype Correlator on-the-sky testing at the VLA site Q2 or Q3 2006

9.2.2 Discussion & Timeline: Penticton and VLA tests of Prototype WIDAR Correlator

A date of mid-July 2005 has been set by DRAO for release of a test plan for the Prototype WIDAR Correlator.

9.2.3 Task Breakdown: Penticton and VLA tests of Prototype WIDAR Correlator

To be developed after release of test plan (scheduled for mid-July 2005)