Review of SSS Readiness for EVLA Shared Risk Observing
June 5, 2009

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Executive Summary

The review committee met June 5, 2009 at the Domenici Science Operations Center. Significant written material, as well as the presentations, was made available well in advance of the review.

Our principal conclusion is that the SSS team is well positioned to support EVLA Shared Risk Observing (SRO), and we do not believe it presents a significant risk to the SRO schedule. There is a theoretical worry that since the formal requirements are out of date that a new requirement could change this statement, however pragmatically we do not consider this to be likely. There is significant labor contingency (from staff members working on non-SRO activities) within the SSS team itself.

The overall design of the SSS applications seems to be sound, and the processes used to implement the software are generally good. We do however note that the level of unit testing is variable across SSS layers and could be improved.

Acceptance processes for the software are not yet defined within the EVLA project. To avoid painful last minute surprises we recommend that a program of acceptance by non-SSS team members be defined.

While the requirements for SRO demand the most urgent attention, we suggest that the entire set of requirements for SSS be examined along with the remaining EVLA/SSS budget and schedule. We have some concerns that not all items (e.g., the novice user aspects) are achievable by the end of EVLA construction.

We were impressed by the evident dedication, enthusiasm, and productivity of the SSS team, and wish them well in what is sure to be a busy and exciting year.

Charges to the Review Panel

1. Are the detailed scientific and technical requirements for SSS software for SRO complete and adequate?

No.

Findings:

- An extensive set of requirements for SSS software exists and was presented for review. This document dates back to 2002 and version 1.6 was prepared in 2005.

For each requirement a timescale (A through E) and a priority (1=essential, 2=important and 3=desirable) are included. Timescale D corresponded to SRO, which was originally scheduled for 2009 Q3.

- An Excel spreadsheet is available that contains each requirement listed in the document above, separated into the SSS components PST (proposal submission tool), OPT (observation preparation tool), OST (observation scheduling tool) and AAT (archive access tool).
- Approximately 50% of these requirements have been met by SSS tools that are currently developed, and a larger fraction of the requirements have been partially addressed. Approximately 60% of the funds for SSS software development have been spent.
- Many of these requirements are not relevant for the Shared Risk Observing (SRO) stage of the project. One cannot simply use the timescale designation and examine only those requirements for timescale A-D. This would include requirements that aren't necessarily needed for successful Shared Risk Observing.
- A process has just begun to go through the Excel spreadsheet of requirements, noting which ones are relevant for Open Shared Risk Observing and which ones are relevant for Resident Shared Risk Observing. In addition, the status of all requirements will be noted.

Comments:

- Given the limited timeframe remaining prior to SRO proposal submission (tools released on 9/1/2009) and SRO observation preparation for successful programs (tools available on 1/11/2010 coincident with retiring of VLA correlator), it is critically important to gather all relevant requirements to enable a clear picture of the implementation needs.
- The emergence of unexpected and costly new requirements this late in the process would be a significant schedule risk for the project, but this seems unlikely given the pragmatic outlook of the participants.

Recommendations:

a. We recommend that the EVLA software and science team bring the ongoing SRO requirements gathering exercise to completion as rapidly as possible.

b. We recommend that the entire ensemble of SSS requirements be evaluated against the remaining EVLA construction project. We have some concerns that they may not all be achievable, in which case some re-planning (e.g., deferring to operations or hiring additional staff with contingency) would be appropriate.

2. Will the design selected for implementation meet the requirements?

The committee could see no difficulties with the present design and implementation.

Findings:

- The design is object-oriented and layered. The implementation is mostly in Java.

The implementers have been very careful to ensure that there is little or no interaction between packages at the same level and that lower levels are not dependent on (or aware of) higher levels.

- The number of classes in the lower levels exceeds the number of classes in the main applications (OPT, SCT, RCT). This indicates a high level of code reusability between applications.
- The lowest level contains several third-party Java packages available in the public domain.

Comments:

- The problems with the third-party software are outweighed by the savings in manpower writing and testing the code.
- Some later aspects (e.g., related to novice users) have been little considered to date. It is possible that there could be unanticipated issues.

Recommendations:

a. When the construction-phase requirements are clarified, we recommend that they be analyzed for design impacts.

3. If there are interfaces between software tools and to any other EVLA subsystem, are they defined adequately and completely?

No.

Findings:

- No documents describing interfaces were presented.
- Roughly, the software systems needed for successful EVLA operations were described as PST -> OPT -> OST -> M&C -> AAT -> DP. This panel was given the charge of reviewing PST, OPT, OST, and AAT. The quick-look pipeline is deprecated.

Comments:

- The operation of the EVLA clearly depends on successful interfacing of all of the systems.
- The panel was informed about formal interface and interchange agreements with external groups. Some of these are well known and extensive (e.g., the Science Data Model and the Binary Data Format; the Correlator Virtual Interface).
- The apparent lack of documents describing internal EVLA software interfaces is a concern. Although the various software groups work together well, the documents will be needed for future maintenance, development, and deployment.

Recommendations:

a. The EVLA project should produce documents defining and describing the software interfaces between the various EVLA software subsystems.

4. Has adequate attention been given to how the software tools will be produced and maintained?

The software development processes seem to be appropriate for the SSS team.

Findings:

- The SSS group meets regularly with users to determine development priorities and to get advice on user options.
- Issue tracking uses JIRA. Source code control uses Subversion. The builds are done using Maven 2.
- Although there are over 600 closed tickets in the JIRA system, there are over 200 outstanding ones. Many of these date from 2007 and were updated during the last week of March 2009.

Comments:

- The comments in the code can be simply extracted into class documentation.
- There do not appear to be general documents summarizing the class modules within a given code layer.
- Although there are some good unit tests in place, these do not provide test coverage to all functions. These are run daily. It was estimated that only about 20% of code functions are tested in the daily tests.
- Acceptance testing for modules and applications is not extensive.

Recommendations:

a. Unit testing for existing and newly submitted code should cover a higher percentage of the member functions.

b. Acceptance testing by other group members and by external testers should be standard.

5. Is the schedule for the delivery of the software tools for SRO understood, properly resourced, and achievable?

Yes.

Findings:

- The VLA will be shut down from January 11, 2010 and Shared Risk Observing with the WIDAR correlator will begin March 1, 2010. During that period the

VLA correlator will be decommissioned. Since proposals for the SRO will be solicited on October 1, 2009, the PST must have sufficient WIDAR configuration information for proposers to create their proposals. Other parts of the SSS are not required until the start of SRO.

- During the presentations, it was apparent that the group management has a good understanding of the firm requirements for SRO.
- Operation of the EVLA is dependent on the delivery of acceptable changes to the PST by the contractor OpenSky. The risk of this is low. Furthermore, the back-up plans (manual entry of information by observer or support staff) will be usable in the case of non-delivery.
- The OPT has been used extensively with transition observing using classical VLA modes instead of WIDAR options. Although this came at the cost of some throw-away effort, it has allowed extensive early testing and led to a reliable and familiar tool for the test observers.
- The main risk for the OPT is that the full spectrum of WIDAR modes will take too long to implement in the RCT.
- Most observing will require only a few WIDAR configuration modes. Although a small number of modes will support most observing requests, many other modes will be needed for commissioning observations.
- The model for scheduling is well defined. Although the current Dynamic Scheduling system appears to be a heterogeneous hodge-podge, overall it works well, except for a few "edge" effects and is a good fallback in case the system cannot be improved in time.
- Although the group is small, there are a sufficient number of people in other groups and in the SSS working on non-critical tasks who could be cross-trained to help meet the targets.
- The team is proceeding with OPT by developing an interface that allows for very general and flexible configuration of WIDAR. The OSRO "modes" will be added thereafter by placing restrictions on the user's ability to configure WIDAR.
- The team noted that OPT readiness is unlikely to impact RSRO where resident users are planning to use the EVLA in new modes, because it is even possible to create observing scripts through a more hands on, manual process (that is being used today with the WIDAR0 correlator). OPT development will simplify this process, making it easier for users to prepare their observations, but is not a direct barrier to using the EVLA in novel modes.

Comments:

- Although a small number of modes will be needed to support science observing, a larger suite will be needed to support the needs of the commissioning scientists.
- For the eventual completion of the EVLA, the staffing might be too lean to complete the full SSS implementation while supporting SRO for users.

Recommendations:

a. The EVLA project should define the small number of WIDAR configurations which will provide adequate support for most observations.

6. Other issues

Findings:

- The morale of the SSS developers is good.
- There is a close coupling between the SSS developers and the NRAO scientific users.
- Significant effort into improving the target management for the group has been implemented recently, although it appears that various support issues may have invalidated a significant fraction of it.
- The staff positions for the SSS developers will carry forward in to EVLA operations.

Comments:

- The EVLA software targets should be focused on critical new capabilities rather than programmatic targets. These targets should be understandable by stakeholders and given to the EVLA project management for tracking.
- The EVLA project management is to be commended for ensuring that SSS developer positions will be available in the NRAO operations budget beyond the completion of construction.

Recommendations:

a. The requirements need to be kept updated with buy-in from EVLA management.

b. Milestones and targets for EVLA software capabilities should be tracked by EVLA project management.

c. The group needs a more formal acceptance procedure using staff from outside the group.

d. Support for novice users of the full EVLA should receive attention.

e. Documentation of the EVLA software systems, their interconnection, their interdependency, and the control and data flow should be created.

7. Post-review information

We understand that one of the software developers left after the review. Although this diminishes the total software effort available until a replacement is hired, we still think that our conclusions are correct; although there is now clearly a lower margin of contingency.