Keck Adaptive Optics Note 733

Control System Software Reviewer Report

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May 31, 2010

Leading up to the more formal Preliminary Design Review (PDR) scheduled for mid-June 2010, the NGAO development team conducted a series of 'mini-reviews,' each focused on a specific subcomponent of the design. At one of these mini-reviews, held on April 16 2010, NGAO control system software was presented (Tsubota and Morrison) and reviewed (Conrad, Cromer, Dekaney, and Gavel).

On the afternoon following the review, the review panel issued the following preliminary report to the design team via email:

> *The review panel for today's mini-review (John Cromer, Don Gavel, Rich Dekany, and myself) congratulate the team on a design which is near-PDR level and well thought out. Comments from the panel include "skillful and comprehensive" and surprising quickness at "coming up to speed."*
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> *We will send a more comprehensive report by the end of next week, but in the meantime, we offer these immediate thoughts while they are fresh in our minds:*
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> *Although the design team is gaining an ever-improving grasp of the requirements, the panel recommends that several meetings be held with the system engineering team, to be sure that the information being provided by that group is reaching intended recipients. Similarly, the series of meetings regarding interface to the science operations tools, which began Monday of this week, should continue.*
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> *As to whether the design presented meets the requirements, generally: yes; however, several implementation suggestions were made by the panel (these will be covered in more detail in our final report). Also (although this is more in the category of follow-up to the August review on infrastructure), there remains concern over whether KCSF network performance will present a problem for this system.*
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> *Lastly, as to whether this design is complete, technically feasible, and cost effective: We agree with the assessment of approximately 70% complete, yes it is technically feasible, and, lastly, regarding cost effectiveness, we reserve judgment pending better understanding of the requirments as above.*
>
> *Generally, great job, and paraphrasing the words of one reviewer: "We are confident that the design team can accomplish this task!"*

Following are detailed, more technical, comments and suggestions related to the design as presented:

1. Slide 7 (SR-30) suggested that the 180-second time, from previous-observation to science-start, was unreasonable due to inherent variability in slew time. Reviewers noted that NGAO documented requirements estimate slew to be 60s; thus the requirement stipulates 120s from end-of-slew to science start.
2. Slide 7 (KS-52) notes component restart may be required to recover from loss of network connections. Reviewers noted that this operation should be automatic; and, further, that the current EPICS-based system gracefully handles this case.
3. When presenting slide 8 (MSCS), presenters noted MSCS may 'morph' into something different (following SciOps tools discussions with Lyke & Conrad). Reviewers encouraged continuation of these discussions following PDR.
4. Considerable discussion followed the presentation of a relational database (RDB) proposal for maintaining system configuration. Although most reviewers saw the advantage of a formal, searchable, representation for configuration, there was concerned that time scales had not been carefully considered. For example, a per-garget parameter, such as frame rate or gain, must be handled in an entirely different manner (regarding defaults, persistence, etc) than a per-night parameter (e.g., estimated sodium layer altitude) versus a per-run parameter (e.g., centroid origins for the DM established during per-run daytime calibrations).
5. Regarding the future decision between DDS and ICE, reviewers noted that ICE is connection-based and thus avoids the need to re-invent a block-until-complete mechanism (as would be required were DDS selected for fundamental interprocess communication). Note that efforts to add a 'bridge' for block-until-complete (connection-based) communication to the existing, EPICS, pub-sub-only, system for inter-process communication, has introduced unnecessary complexity (i.e., arbitrary, sometimes overly long, sleep commands to avoid race conditions) into some areas of current Keck control systems.
6. During discussion of device control, reviewers felt the designers should fully understand the difference between device-stop (power off) versus halt (servo in place). The latter is key for situations involving equipment and personnel safety, as well as positional accuracy required for operational setups.
7. Also during the device control discussion, the 40 hz rate requirement was explored. The consensus seemed to be that this was largely an historical requirement. Reviewers noted that, as long as programmers developing clients utilizing this event stream could 'decimate' the rate when necessary (and that the high rate did not impose any undue constraints on selecting processor hardware), then the high, 40 hz, rate would not pose a problem.
8. An important discussion of fundamental philosophy, regarding at what layer in the control system high-level knowledge of the observing mode was appropriate, followed the presentation of the 'setMode' operation. Reviewers suggest that this knowledge be maintained above the device level. For example, the rotator device should be commended to operate in either fixed-pupil or fixed-field mode, with no knowledge of the higher level set-up (e.g, NGS versus Laser) dictating that mode. Reviewers also provided a related suggestion: The 'named position'

mechanism used at the device layer within current Keck control systems should be maintained.