INTEGRATED MANAGEMENT TOOL FOR CONTROLS SOFTWARE PROBLEMS, REQUESTS AND PROJECT TASKING AT SLAC

D. Rogind, W. Allen, W. Colocho, G. DeContreras, J. Gordon, P. Pandey, H. Shoaee
SLAC National Accelerator Laboratory, Menlo Park, California, U.S.A.

Abstract

The Accelerator Directorate (AD) Instrumentation and Controls (ICD) Software (SW) Department at SLAC, with its service center model, continuously receives engineering requests to design, build and support controls for accelerator systems lab-wide. Each customer request can vary in complexity from a small software engineering change to a major enhancement. SLAC’s Accelerator Improvement Projects (AIPs), along with DOE Construction projects, also contribute heavily to the workload. The various customer requests and projects, paired with the ongoing operational maintenance and problem reports, place a demand on the department that consistently exceeds the capacity of available resources. A centralized repository - comprised of all requests, project tasks, and problems - available to physicists, operators, managers, and engineers alike, is essential to capture, communicate, prioritize, assign, schedule, track, and finally, commission all work components. The Software Department has recently integrated request / project tasking into SLAC’s custom online problem tracking “Comprehensive Accelerator Tool for Enhancing Reliability” (CATER ) tool. This paper discusses the newly implemented software request management tool – the workload it helps to track, its structure, features, reports, work-flow and its many usages.

CONTROLS SOFTWARE WORKLOAD

The ICD Software Department, comprised of about 25 engineers, provides complete, long-term, robust, software engineering solutions for control of distributed accelerator systems lab-wide. The department responsibilities include host computing infrastructure, networking, relational databases, real-time embedded (and host-level) device, subsystem, and instrumentation control, process control, engineering/operational GUIs, and service oriented architectures. It also performs user support, upgrade and maintenance activities. The Software Department uses the EPICS (Experimental Physics Industrial Control System) toolkit and its extensions as the basis for most software engineering implementations. The department also fully supports the legacy SLAC Linear Collider (SLC) VMS-based Control system.

ICD Software Department personnel currently spend, on average, 25% of their time in support of LCLS and FACET program operations. All SW (along with other Hardware (HW)) Problems (or trouble reports) newly entered into SLAC’s CATER system are discussed at the daily 08:15 maintenance meeting and are usually assigned to a resource by a Lead within hours of creation. One software engineer per week, on a rotational basis, acts as a Controls Deputy (CD) liaison between LCLS Operations and the Software Department. The CD attends the daily meetings, work planning meetings, works and resides within the Control Room, and carefully helps to coordinate the weekly software releases.

For the remaining 75% of the time, software engineers perform development work which can be categorized as either a) customer requests or b) project work. Project work is typically funded and approved by the AIP or DOE (such as the LCLS II Construction Project). Until recently, customer requests were typically delivered verbally or via email to engineers; oftentimes the supervisor or lead remained unaware. Task scheduling and tracking then varied by individual or lead; commonly by a combination of memory, spreadsheets, lists, emails, and disparate project schedules. Both customers and supervisors had limited visibility into work planned, in progress, or accomplished. It remained difficult to assess whether additional resources were justifiable. Furthermore, the work was hard to prioritize and load balance without a centralized list of all department problems, requests, and project tasking.

PROBLEM TRACKING TOOL

The CATER Problem Tracking Tool in its current implementation has been in wide use across many organizations at SLAC since 2008. The reports and workflow drive all of the daily LCLS (now joined by FACET) Operations/Maintenance meetings, software and hardware problem and maintenance work tracking, and contribute to the planning of the weekly machine development/access days. CATER is Oracle based, developed with Application Express (APEX), and has one full time developer (outside of ICD) allocated due to ever increasing feature demands.

In order to take advantage of CATER’s existing user base, accounts, roles, relational database management, familiar work flow and familiar GUI, SW Requests (and their associated Tasks) were integrated alongside Problems into CATER in June, 2011. SW Requests are of two types: a) Customer, and b) Project Component. Additionally, a SW Job form was implemented which contains all fields required for software release approval and planning. This SW Job feature has proven very valuable for all software release types. Now for the first time, every software engineer has the capability of viewing all of their work – problems, requests, jobs, and project tasking in one place, via the CATER tool. Each user, upon logon, has a personalized dashboard on their home tab which displays all open assignments (Figure 5).
SOFTWARE REQUESTS AND TASKS

LCLS and FACET customers at SLAC are encouraged to login to the familiar CATER trouble reporting system and create a “New Software Request”. There is a constant high volume of customer requests that are small in scale, of limited complexity and involve several people tasked separately. The automated Request system has been particularly efficient for tracking these types of entries that might otherwise get forgotten or not receive the proper visibility. Engineers/Leads also create entries to capture customer requests and components of their project based work. Requests use the existing CATER Problems schema and workflow. Fields include: Title, Description, Status, Request Type (“Customer” or “Project Component”), Work Breakdown Description (funding source), Subsystem, Request Lead, Group (LCLS, FACET...), Customer Priority, Customer Need Date, Created by, Modified by, Created Date, Modified Date. There are buttons to Add Customer, Add SW Job, Add Task, and to Upload files.

A large Request, such as “Complete LCLS Fast Feedback Project” (Figure 1) may be further broken down into several Tasks, such as “Bunch Charge Feedback” (Figure 2), “Undulator Launch Feedback” etc. Each Task associates with a single resource and more detailed loading and scheduling information. Task fields include: Title, Assigned to, Effort, Task Priority, Task Skill Set, Start Date, End Date, % Complete, Description, Status, Created by, Created Date. There is enough information contained in the request /task database such that weekly reports and/or Gantt charts per individual or per project could be generated (future effort).

SOFTWARE JOBS

LCLS hardware maintenance / repairs and software releases which require machine access (no beam) are typically scheduled every other week during user runs, while software releases / physicist machine development opportunities requiring an operational machine are scheduled once per week. To help maintain very high LCLS machine availability, all software releases are carefully evaluated for risk / benefit and are detailed in a new SW Job form that includes fields: Job title, Resource, Time needed, Time Comment, Planned Start/Stop Date/Time, Access Requirements, Beam Requirements, Beam Comment, Invasive (Y/N), Invasive comment, Area, Subsystem, Test Plan, Back out Plan, Systems Required, Systems Affected, Risk/Benefit. Refer to Figure 3 for a sample SW Job. The SW Jobs submitted each week are reviewed and scheduled in a weekly meeting between the program physicist and Controls Deputy; there are typically 15-20 SW Jobs of varying complexity submitted per week for LCLS. The Controls Deputy plays a pivotal role, especially on release day(s), coordinating the various software engineers along with parallel operational and physicist activities. (Refer to Figure 4, Sample Controls Deputy Report.)
REPORTS

Once logged onto CATER, all users default to their Home tab (dashboard) that summarizes and links to all assigned open “Problems Assigned to Me”, “Requests and Tasks Assigned to Me”, and “Jobs Assigned to Me” (Figure 5). There are additional views associated with other tabs. The Search tab provides basic and advanced searches plus an interactive report builder to customize report column data and filters, such as All Customer Requests (224 in number) or All Project Requests. The Report tab has many canned reports including the Controls Deputy Report of SW Jobs up for weekly approval (Figure 4), Work Breakdown Structure Names/Priorities, etc. All reports export to MS Excel.

CATER WORK FLOW

Requests follow the same simple, four state, CATER workflow as Problems because a) it has been proven to work effectively, and b) users are familiar with it. All status transitions in the life of a Request/Problem trigger alerts to email distribution lists which always include software leads. All New Requests/Problems have status=New. Once assigned to a resource, status changes to “In Progress” (or “Scheduled Jobs when SW Jobs are active). When all associated SW Jobs and Tasks (/Solutions for Problems) are complete, the status changes to “Review to Close”. The Request/Problem is “Closed” by Leads with the appropriate closure privilege after careful review. The states, associated stakeholder review meetings, necessary reports, and email alerts during the life cycle of a Request/Problem are shown in Figure 6.
CONCLUSION

Results Achieved

- Customers may view all department work to a) direct prioritization; b) better understand why their requests may not have resources allocated, and c) track and aid progress.
- Supervisors/Leads/Staff are informed of all ongoing / upcoming work. Helps to catch potential issues early, prioritize workload, re-task staff, track status, and justify resource decisions

Lessons Learned

- The tool has been particularly useful for tracking the large volume of requests that are small in nature and/or of minor complexity, and require a few hours to a few days of many different resources.
- Integration of Jobs (software test/release plans) for Requests and Problems has been very efficient and well-received for planning and executing machine development days
- Simultaneous development of CATER using Oracle’s Application Express (APEX) proves challenging
- Releases for any new Request features are constrained by the normal CATER release cycle

What’s next?

- More training and enforcement of data entry
- Roll out to other organizations within ICD; SLAC
- More reporting – weekly reports, Gantt charting