

SOFTWARE TOOLS FOR OPERATIONS AND MAINTENANCE PLANNING AT JEFFERSON LAB*

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Abstract

Time for maintenance, repair and testing is a precious commodity. A queue of pre-planned work is critical to taking advantage of unplanned repair downtime to squeeze in extra work. Jefferson Lab has a web-based tool called ATLis (Accelerator Task List) that collects work plans and routes them for review. By means of templates, requests for software installation and beam studies are also planned through ATLis. The entire list of ATLis work plans is available to all authenticated users who may append comments and additional information to any task at any time. ATLis is also integrated into the Operations Electronic Logbook and Operations Reporting system, so it is possible to see at a glance if a work plan is pending in ATLis to address an outstanding problem report. Following the successful adoption of ATLis by the Operations department, the software has been installed for and adapted to the work planning of additional groups at Jefferson Lab including Cryogenics and the Free Electron Laser.

INTRODUCTION

Historically, scheduling and coordination of accelerator hardware maintenance work was managed by the Operability Manager. “Beam Studies” (tests performed by Accelerator Physicists to better characterize and understand machine behavior) were coordinated by the Program Deputy and software installation and upgrading were left to the Controls Software Group. Each group operated under its own procedures: the Operability Manager tracked work with a spreadsheet and weekly meetings; the Program Deputy read through stacks of printed beam test plans; the Software Group used a web page.

Over time, weaknesses in and among the groups’ work planning processes arose. Miscommunication would lead to hardware being installed before software was ready and vice-versa. Vagueness in the approval process could result in unexpected, unauthorized configuration changes. And then in 2001, regularly scheduled maintenance days were scrapped in favor of attempting to do much maintenance opportunistically – in other words, when the accelerator had to be brought down for repairs in one region, non-repair maintenance work would take place in other sectors. The resulting scheduling unpredictability put too much strain on the informal and disparate planning processes.

Therefore, in 2002 Accelerator Division Management assembled a team drawn from the Operability, Operations, Engineering and Controls Software groups, to address configuration control and find a way to improve maintenance approval and tracking process. By 2003, the team concluded that a common web-based planning system could meet the needs of all three groups and yield the following benefits:

1. Unified task approval process
2. Better Communication
3. Unambiguous approval status
4. Online history of all completed work
5. Integration with other web-based tools

THE ACCELERATOR TASK LIST

Introducing ATLis

The resulting application, dubbed ATLis (short for Accelerator Task List) was put into use in January 2004. Written in PHP, it stored its information in an Oracle database and had a simple interface of only a few different screens and forms. Minimal training was required to acquaint users with its operation and uptake occurred rapidly.

The default view of ATLis for new users is shown in figure 1: a two-column web page consisting of a main panel that display a list of tasks and a left sidebar containing a menu of links for selecting predefined sets of tasks, and below that a form that can be used to generate customized task listings.

The user can click on any task title to retrieve full details, including work description, hazard identification worksheet, file attachments, etc. If the task involves software or beam test plan steps, then those details are also present. Any comments that have been appended to the task are shown, as is a dialog box for posting new comments and updating the status of the task.

Finally, there is a form page for documenting a new task. The form in its entirety is quite large, however, the number of required fields is kept minimal and the user has an option to save the form and complete it later. Checkbox controls allow the form to expand to include optional software test plan (file paths, rollback version info, etc.) and beam test plan (required energy, termination point, etc.) specific details.

Unified task approval process

When the user opts to submit an ATLis task for approval, it follows the process shown in the flowchart of Figure 2. The Operability Manager grants ultimate task approval, however in the case of Beam Test plans or Software Test plans, he awaits sign-off

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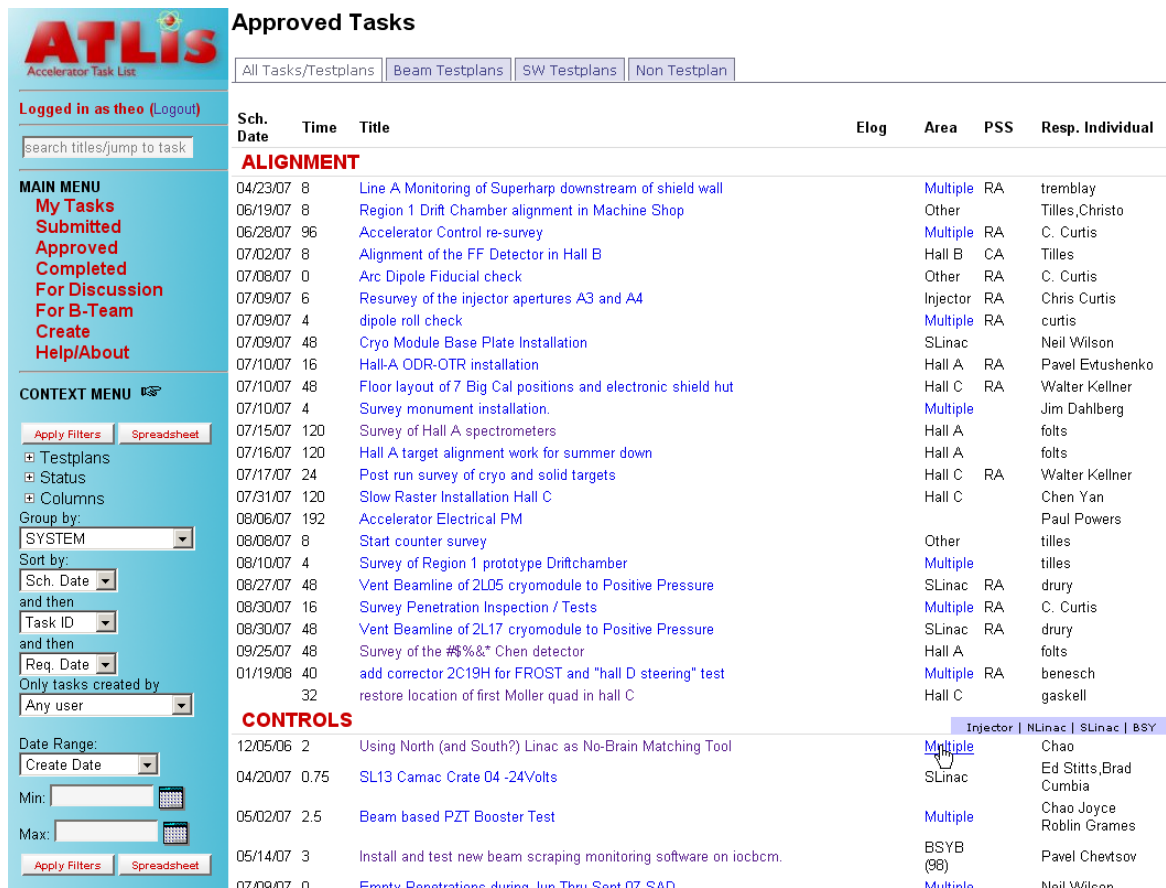


Figure 1. Primary ATLAS screen showing Approved tasks grouped by system in larger right column and a menu of actions in the left sidebar.

from the Operations and Controls Software groups before doing so. The three previously independent approval processes (hardware, software, beam studies) have thus been merged.

When the Operability Manager approves a maintenance task he either schedules it to take place during one of the two or three scheduled accelerator downtime (SAD) periods that occur each year or to leave the task on standby to be scheduled opportunistically during unscheduled downtime.

Beam test plans (and some software test plans), as their name implies, generally require use of the electron beam and generally cannot be conducted during a shutdown or when the machine is offline because of hardware failures, therefore they pass through to the Program Deputy to be scheduled as part of an Operations shift.

Better Communication

Work that spans multiple systems or involves coordination among different departments and teams is most prone to communication break-downs, so ATLAS makes it simple to keep everyone necessary abreast of planned work. The ATLAS administrator can associate staff with hardware systems, with areas of the accelerator, or even create ad-hoc notification groups. The individuals thus identified automatically receive notification of new tasks, comments, or approval status changes.

If a recipient of such an email notification has concerns about the proposed work, he can communicate this to the Operability Manager as well as the other system owners by using the comment form attached to the ATLAS task. The comment will in turn be forwarded via email to the complete set of system owners, area designees, the task creator, Operability Manager, etc.

Unambiguous approval status

There is no longer ambiguity in the approval status of a task. The complete list of approved tasks is available on the web to the entire laboratory.

Online History of all Completed Work

Tasks marked as completed remain in the database and can be viewed online much the same as upcoming work. An option to "Save as New" makes it simple to recycle an existing task when similar work must be repeated.

The repository of completed tasks can be a useful trouble-shooting aid. When things don't work properly following a maintenance period, it's often useful to review what was changed recently and list of recently completed ATLAS tasks can provide clues. Was a power supply just replaced and perhaps wired backwards, was new software installed, etc.?

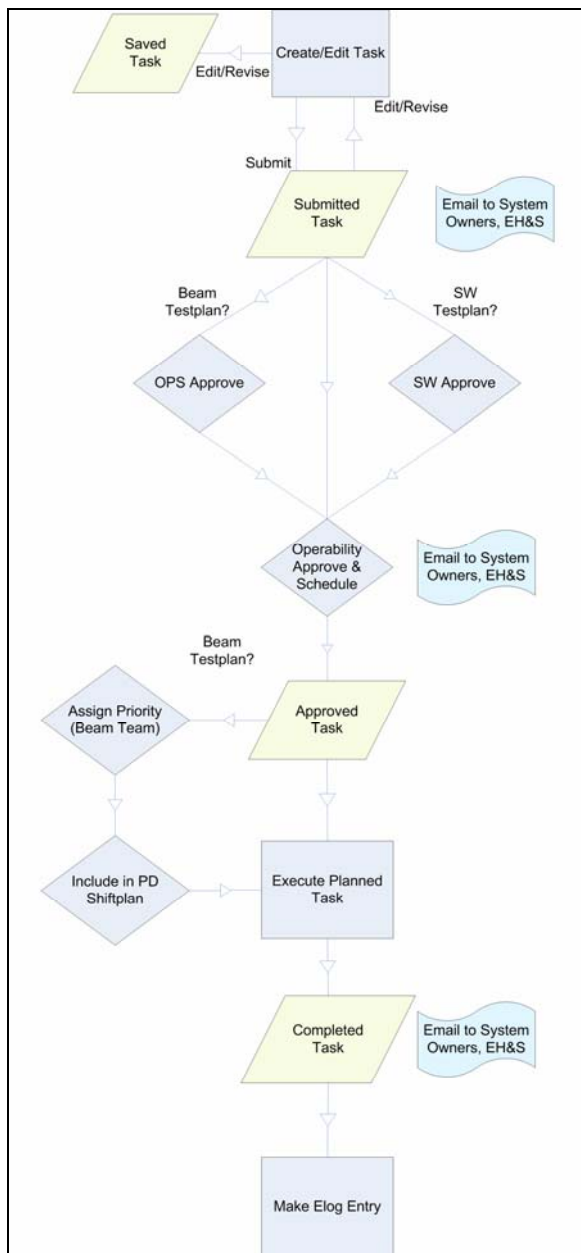


Figure 2 Common approval process for all tasks and test plans

Integration with other Web-based tools

Many tasks in ATLis are planned to address some deficiency noted by Operations staff via the Electronic Logbook and Operations Problem Reporting (OPS-PR) tools. Technicians can now link the OPS-PR to the ATLis work plan they have submitted to address it. The OPS-PR status is set to *ATLIS* indicating that resolution of the problem depends upon scheduling and completion of an ATLis work plan. The status of the linked ATLis task is shown in the OPS-PR detail and a link allows the user to see the details of the work that will be performed. Furthermore, when the linked ATLis task is closed, the OPS-PR is also closed automatically without a separate step by the technician.

ATLis has also streamlined the job of the Program Deputy. When planning each 8-hour Operations shift using the web-based tool designed for that purpose, the list of approved, prioritized test plans is offered as a simple menu of checkbox selections requiring no more than a mouse click to incorporate into a shift plan.

THE FUTURE

Expanding adoption

ATLis was originally designed to support operation of the CEBAF accelerator at Jefferson Lab, however its success there has encouraged adoption by other groups at the lab (Free Electron Laser, Cryogenics, Test lab, and more) for the purpose of managing their own work planning.

Adapting ATLis for use by other groups at the lab has proved to be a straightforward matter of installing the software into a new directory, replicating the database tables, identifying the user(s) who will approve tasks, and then customizing the Systems and Areas lists.

ACKNOWLEDGMENTS

The ATLis application as it exists today has evolved with the input and participation of numerous Jlab staff, including Tom Oren, Ron Lauze, Mike Spata, Noel Okay, Karen White, Michele Joyce, and many others.

REFERENCES

- [1] J. Ludwig, "Maintenance at Jefferson Lab", Workshop on Accelerator Operations, March 2003