

BEYOND AN ELECTRONIC LOGBOOK*

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Abstract

The advantages of an electronic logbook over a paper logbook have been well-established by presenters at various conferences: multiple simultaneous access, readily attached supporting documentation, easy searchability. At Jefferson Lab, we view these benefits as a start rather than an end. Instead of a being a static repository for operational history, the electronic logbook should actively inform machine operations. We take advantage of a decision early in development to make our operational problem reporting system integral to the electronic logbook. Log entries requiring attention of system experts are dispatched directly from within the logbook. And more importantly, the follow-up and resolution of those same problems is also captured in the electronic logbook. The interface for making log entries is being extended to query the logbook database immediately when a new problem report is initiated and to search for similar resolved entries in the past. If close matches are found, they are presented to the person making a new entry. We hope that in many cases, this readily-accessible display of prior resolutions will allow the entry maker to solve many problems on-the spot and obviate the need to dispatch the problem to a system expert.

INTRODUCTION

The Electronic Logbook (E-Log) is a well-established tool at accelerator facilities around the world[1,2,3], used by both operations staff and experimenters to document their work. People have concocted many clever ways to use E-Logs in ways not possible with paper logbooks: programs that automatically feed data into the E-log, templates that guide the user through making certain types of entries, utilities that capture and label screens for inclusion, etc.

At Jefferson Lab, an electronic logbook has been in use, in some form or another, since 1996. The earliest version was simply a file-system directory containing html documents and an html index page. The current version is a system of scripts, xml files, and Oracle database. Each day, on average, more than 200 entries are added to the main operations logbook alone. From mundane to critical, these entries document the daily course of operations: crew chief shift summaries, changes to the beam parameters, incoming requests from the experiment halls, outgoing calls to on-call personnel, changes to hardware, changes to software configuration, problems encountered, problems resolved, and so on.

This paper will focus on recent changes made to the Jefferson Lab E-log system to make it a better tool for tracking and resolving operational problems.

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OPERATIONS PROBLEM REPORTS (OPS-PRS)

The Quest for Efficiency

As is probably the case at other institutions, Jefferson Lab faces ever-increasing demands from its customers to improve efficiency. In many instances, the demand for greater efficiency can be directly translated as a demand for more beam-time usable for Physics experiments and less time spent offline fixing problems and then restoring the accelerator to its previous running state.

One way to reduce the amount of accelerator downtime each year is to reduce the amount of time it takes to fix problems when they arise. It is our supposition, that used effectively, the E-Log can in some cases reduce the time it takes to accurately diagnose and fix a problem by making available a history of previous solutions. Figure 1 illustrates an ideal cycle of an E-Log problem report whereby prior solutions improve future operations

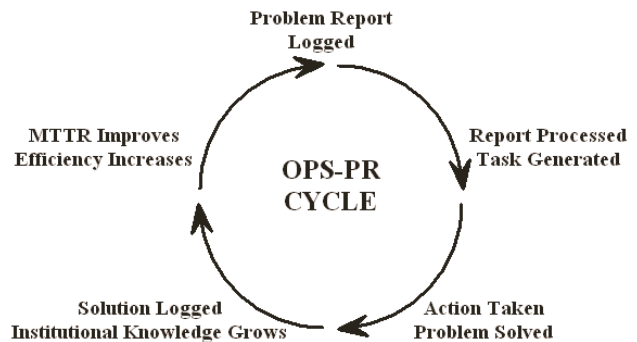


Figure 1: Ideal life cycle of an Operations Problem Report (OPS-PR) log entry.

Tracking Downtime

The 2001 overhaul of the Jlab E-log system converted the original file-based logbook into a database-driven system. The flexibility of using database tables to store log information made it possible to incorporate functionality that hitherto had been in separate applications: downtime reporting and problem reporting/tracking system.

As shown in Figure 2, problem reports (OPS-PRs) in the Jlab E-Log consist of an ordinary log entry describing the problem (including attachments, screenshots, references to previous entries, etc.) and a few extra fields (typically selected via drop-down menus in a GUI) to identify which area of the accelerator is affected, which component, and if applicable what predefined type of problem. A DOWNTIME Log entry is an extension of the OPS-PR entry type that includes additional fields to

record the length of time it took to correct the problem and then restore beam for Physics. Once an OPS-PR or DOWNTIME log entry has been submitted, email notification is automatically dispatched to technicians or system experts recorded in the database as responsible for maintaining the problematic component.

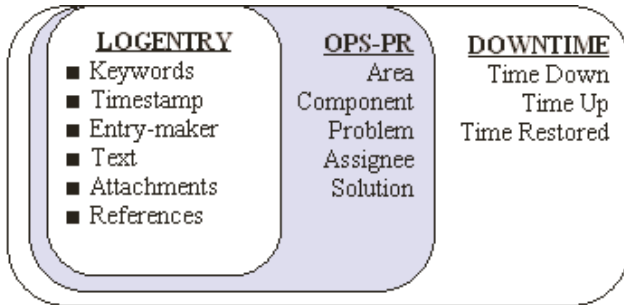


Figure 2: Different types of entries.

The expert to whom the OPS-PR is assigned or who receives the notification email may add updates to the log entry detailing the results of investigation into the problem report. If the initial classification of the problem was incorrect, he or she may reassign the OPS-PR to another group or individual. An OPS-PR is marked closed once the issues therein have been resolved and documented.

Knowledgebase

The accumulated problem solutions provide a knowledgebase that can be consulted in the future. Users can open up a web browser and search for similar occurrences. In practice, technicians trying to solve a problem may do this, but because it requires extra steps (open browser, navigate to logbook query page, retrieve list of log entries, read through them, etc.), the logbook does not tend to be consulted as a source of real-time troubleshooting advice when things start to go wrong in the control room.

Our first plan was to interject those previous solutions as unsolicited advice by modifying the tool called DTlite used most frequently by operators to make entries. When the Operator pressed the submit button to create a new OPS-PR, the software would automatically look for previously-closed problem reports that matched the currently selected component and/or problem and present those for review before proceeding.

Two shortcomings quickly became apparent with this approach. First, its intrusiveness made it unpopular with operators (who make the majority of OPS-PR entries when the machine is running) who were consulted about the proposal because it would require additional time to click past an extra screen every time they made an entry. Second, we discovered that many of the solutions entered in the database to close OPS-PRs were not very helpful. Entries such as “Fixed.”, “Part Replaced”, “Rebooted”, and “Not enough information.” It didn’t make much sense to present the operator with a list of such dubious “solutions” every time he or she made an entry.

GUIDANCE

With the afore-mentioned issues in mind, we devised an alternative scheme. We would still make prior solutions available in real-time, albeit less intrusively, but we would also create a tool that would let system experts give operators explicit trouble-shooting guidance for accelerator components via the logbook.

Goals

We reasoned that we could improve usage of the E-Log (and indirectly have a positive impact on operations) in two ways

1. We would encourage system experts, those who solve problems, to write better solutions, with more emphasis on the diagnostic steps. We would make the extra effort required to write more thorough solutions worthwhile by giving them a tool for explicitly making their advice available to operations.
2. System experts would be able to encourage entry-makers to make better problem reports by using the same guidance tools to give not only trouble-shooting advice, but entry-making advice. The system expert could tell the entry-maker what supporting information (screens, output of diagnostic programs, etc.) to include when logging a problem with a particular component.

Implementation – Creating Guidance

A web page for creating guidance is now available from the web page used by experts to update and close OPS-PRs (Figure 3). With a single click, the contents of the OPS-PR solution field can be turned into the basis for a guidance document.

OPS-PR Update page

Action: UPDATE

Assignee: Lariou, Theo

Area: Other

Component: Electronic Logbook

Problem: Will not Connect

Merge with: Log Number here

Email Options: Assigned System owner(s) Logbook entry maker(s) Crew Chiefs Others

Solution/Note: Create Guidance

Check box at left to make elog entry after submitting OPS-PR update

Submit Changes

Figure 3: An OPS-PR solution can easily be used as the basis for a new guidance document.

Creating OPS-PR guidance is straightforward and done from a web page. First the user indicates to which components the guidance will apply, then chooses a

format (text, url, program, see Table 1.) and then enters his/her text and presses submit.

Table 1: Types of OPS-PR guidance.

Text	Plain or HTML-formatted advice to be displayed directly (Figure 5 is an example). Could be troubleshooting advice or of instructions on what information to capture
URL	The web address of a guidance document (trouble-shooting guide, ops procedure document, etc.)
Program	A diagnostic program or script to be executed and the output of which should be included in the log entry. A person using DTlite interface (a tcl program used by operators to make log entries) will be able to press a button to execute the specified program and automatically include its output in the log entry.

Implementation –Using Guidance

Figure 4 shows part of the DTlite interface that operators use most frequently to make log entries. The Components selection menu is expanded and it is seen that some entries (Beam Position Monitors and its subcategories) have the letter (G) in front of them.

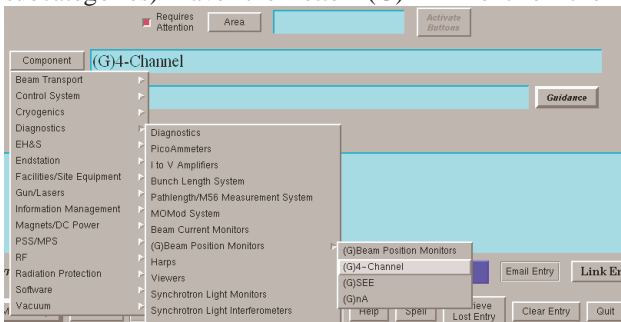


Figure 4: A (G) beside a component name in DTlite indicates that guidance is available for troubleshooting or making a better log entry.

This visual cue indicates that Guidance is available by pressing the Guidance button to the right after making the component selection. After the user selects a component, he or she presses the Guidance button to retrieve available guidance from the database. Figure 5 illustrates the presentation of the Guidance data after it has been retrieved.

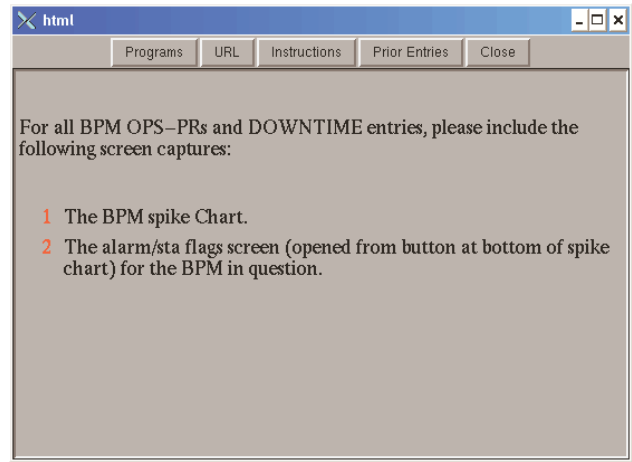


Figure 5: Advice from the system owner for making OPS-PRs about a Beam Position Monitor (BPM). Buttons at the top of the dialog provide access to further guidance including prior OPS-PR solutions for BPM problems.

It is presented in a window with separate tabbed panes displaying the different types of guidance. In addition to Guidance explicitly created by System experts, one of the tabs displays recent OPS-PR solutions that might be relevant.

A SMARTER LOGBOOK

The Guidance feature described in this paper was put into service only weeks before the PCaPAC2005 conference so it is too early to draw conclusions about its effectiveness at measurably reducing accelerator downtime.

We are confident however that giving system experts a tool to advise entry-makers about what details to capture when reporting a problem about a system will result in a better knowledgebase and more productive use of experts' time when responding to problem reports.

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