

Training Control Room Accelerator Physicists

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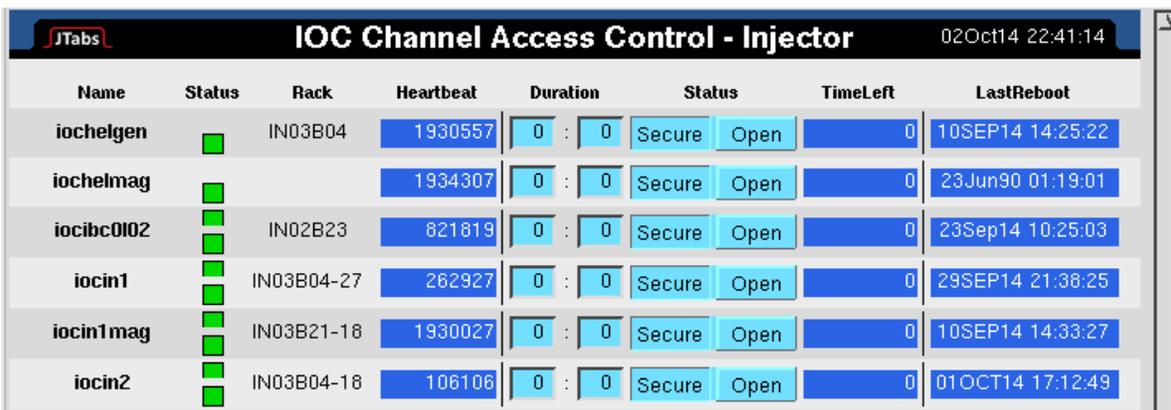
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Abstract

Re-training control room staff after a major accelerator upgrade is already a considerable challenge, but add in required training for Accelerator Physicists, a limited training development budget, and no training-tracking mechanism, and the task becomes even more daunting. Using “Just-in-Time” training provided by System Experts and existing on-line training, two different training paths were created: one for Accelerator Operators and another for Accelerator Physicists. Content was developed and stored on an independent server, while tracking of course completion was done using the already-established Jefferson Laboratory Training Department database

Background

The EPICS control system includes the ability to use access security which allows IOC PVs to be protected against unauthorized modification. With access security turned on an unauthorized user can be prevented from modifying the contents of Process Variables (PVs). At the Jefferson Lab Continuous Electron Beam Accelerator Facility (CEBAF) this channel access security is used to prevent anyone who is not a qualified operator from manipulating accelerator controls during beam operation. Access security control also allows certain controls to only be operated by qualified Crew Chiefs. During down periods channel access security can be opened to allow maintenance personal to operate their equipment. Access control on individual IOCs can be opened at any time by the operation staff to allow system experts to troubleshoot problems or assist with operations. Access control security is controlled through the users id account.



Name	Status	Rack	Heartbeat	Duration	Status	TimeLeft	LastReboot	
iochelgen		IN03B04	1930557	0 : 0	Secure	Open	0	10SEP14 14:25:22
iochelmag			1934307	0 : 0	Secure	Open	0	23Jun90 01:19:01
iocibc0102		IN02B23	821819	0 : 0	Secure	Open	0	23Sep14 10:25:03
iocin1		IN03B04-27	262927	0 : 0	Secure	Open	0	29SEP14 21:38:25
iocin1mag		IN03B21-18	1930027	0 : 0	Secure	Open	0	10SEP14 14:33:27
iocin2		IN03B04-18	106106	0 : 0	Secure	Open	0	01OCT14 17:12:49

Illustration 1: EDM Channel Access Control Screen

During normal operation some controls, such as beam inhibits, are limited to accelerator crew chiefs through channel access security. This is designed to prevent an operator from disabling a protective function and running, for example CW beam, when Beam Loss Monitors (BLMs) are masked. BLMs are often masked for steering up an accelerator section with Tuned Beam. By requiring a Crew Chief Override of Beam Mode we can ensure that all requirements for CW beam operation are met before allowing CW beam.

During the 12GeV commissioning the commissioning plan called for accelerator physicists to support control room shifts to provide technical assistance to the operation staff on a continuing basis.

Under previous operational procedures accelerator physicists would be supported by individual operators who would provide access to the control system through their own log in. It was desirable that accelerator physicist have access to the control system through their own userid accounts. However it was determined by management that if additional individuals were going to be given the ability to manipulate accelerator controls that it was necessary to ensure that they possessed a minimum level of training in accelerator safety and operation protocols prior to being given similar access to operation staff.

Of the group of accelerator physicist who were to deliver support during the commissioning period only about a third had any experience in control room operations. Even that group did not presently have channel access security control, though a few had acted as operators or crew chiefs during the original CEBAF commissioning activities in the 1990s. It was necessary to get all of these individuals up to speed in the areas of accelerator safety and operational protocols.

To accomplish this task a subset of the the training required of new operators was utilized. The program was intended to ensure that anyone who was operating accelerator controls while beam was running would have a minimum level of familiarization with requirements and procedures to allow them to safely perform their tasks.

This new training program called Machine Access Control or MAC allows non-Operations staff to have access to accelerator controls similar to qualified Operators. With a few exceptions this gave accelerator physicists access to all of the accelerator controls normally operated by the accelerator staff. As for others operating the accelerator from the Machine Control Center (MCC) Control Room they were expected to notify the Accelerator Crew Chief of their activities and coordinate their efforts with the Operation Staff.

Machine Access Control Training Curriculum	
Course #	Course Name
MCC101	Introduction to MCC
MCC103	MCC Operations Manual
MCC104	Accelerator Operations Directives
MCC-107	Introduction to the JLab Computer Network
MCC110	Operator Screens
MCC111	General Tools Screen
MCC112	Log books and log entries
MCC131	Input Output Controllers (IOC)
MCC132	Archiver
MCC139	SRF Control Screens
MCC145	Channel Access Control
MCC148	The Operator's Workstation
MCC-702.08	AOD Supplement (Just in Time)
MCC-702.19	Operations Safety (Just in Time)
ADM008	Machine Access Control Briefing
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Training Curriculum

The training curriculum used a subset of already existing New Operator Training courses supplemented by specially created Just In Time courses. These courses are online courses created and managed in Moodle. Moodle (Modular Object Oriented Dynamic Learning Environment) is a free, online Learning Management system used by education facilities, including schools and universities, which enables the creation of training courses. Courses can include quizzes. They are modular, self-paced and created an individual course record for every student.

The New Operator Training is a set of self-paced Moodle modules designed to prepare new operators for shifts in the MCC Control Room. Every new operator must complete this set of training modules prior to being given open channel access security in the EPICS control system. The purpose of the training is to provide knowledge of basic safety guidelines, basic machine control manipulation knowledge of EPICS and control room protocol. Several Just In Time training courses were created to supplement the standard courses to include information just for the commissioning period.

Many of the physicists who would be supporting commissioning had knowledge in some aspects of the MAC course. All had the option to simply test out on the individual Moodle modules, but most reviewed materials and then took the quiz.

Support and Response

The need for the program was fully supported by Operations management. The Director of Accelerator Operations, who was one of the accelerator physicists who would be rendering support during commissioning, himself completed the MAC course. Written operations procedures, embodied in a special commissioning addendum to the Accelerator Operation Directives made participation in the program mandatory for any non-Operator who would be working in the MCC control room to support commissioning. 27 physicists signed up for the program and 24 have completed the curriculum and provided support during 12 GeV Commissioning of the CEBAF accelerator. There were minimum negative attitudes about the curriculum from students, not doubt brought about by the high level of support among management for this program. The only significant complaint was the lack of time to complete the courses, though the vast majority of those who initially signed up managed to finish in time to provide support. The three who did not were assigned to assist with commissioning support after the activity started and were not able to complete training prior to the end of the commissioning period. Those who took the courses were substantially more knowledgeable than the the new hire operations staff for whom the courses were originally designed. In some cases they were more knowledgeable in some areas than those who had composed the courses. That resulted in a fair amount of feedback that was used to make improvements and corrections to the course material. Several physics students related that they were impressed with the amount of information operators were required to know and remember to be efficient. The greater span of knowledge of machine operations have resulted in some of the physicists becoming more effective when on-call and in developing their test plans in conducting beam study tasks.

Summery

The physicist training program for control room operations was successful. Leadership support is one of the factors that made the program successful. Physicists became more effective in understanding control room protocol and safety parameters. Training courses were improved due to physicist feedback. Operator/physicist relationship improved due to accelerator physicists having a better understanding of what operators know. Operations were safer, both due to physicist having a better understanding of safety requirements and by having an additional trained staff member in the control room. Better scientists test plans based on better understanding of control room protocol and machine operation.

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