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| SUBJECT: | Fermilab Assessment Manual – Chapter 4 Independent QA Assessment Procedure – Form 2 | NUMBER: | 3902.1004 FORM 2 |
| RESPONSIBILITY: | Quality Assurance Manager | REVISION: | 001.2 |
| APPROVED BY: | Head, Office of Quality and Best Practices | EFFECTIVE: | 12/09/2010 |

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| Fermilab Independent QA Assessment Report | |
| Assessment Number & Title: 11-IA-QA-005 CD Suspect/Counterfeit Item (S/CI) Version: 001 And Inspection and Acceptance Testing | |
| Date(s) of Assessment: 01/31/11 – 02/18/11 | |
| Performing Organization: Office of Quality & Best Practices | |
| Assessed Organization(s): Computing Division (CD): <ul style="list-style-type: none"> Future Programs And Experiments: <ul style="list-style-type: none"> • Detector Instrumentation • Fast Timing, Control and Support Scientific Computing Facilities: <ul style="list-style-type: none"> • High Performance Parallel Computing Facilities • Facility Operations • CMS Computing Facilities • Data Movement and Storage Fermilab Experiments Facilities Lab And Scientific Core Services: <ul style="list-style-type: none"> • Enterprise Services Operations (Windows and Unix Server Services) • Network and Virtual Services • Information System | |
| Report content The main body of this report contains the following sections: <ul style="list-style-type: none"> • Assessment Activities & Scope • Scope Limitations • Activities Reviewed Within this Assessment • Description of the Implementation & Effectiveness of Observed Activities • Conclusions • Findings • Observations & Recommendations • Commendable Practices Assessment Activities & Scope: The implementation & effectiveness of Inspection and Acceptance Test and S/CI controls applied by the CD departments listed above were examined via interview, document review and observation relative to the Integrated Quality Assurance (IQA) Suspect/Counterfeit Item (S/CI) Program 1006, and Controlling Suspect/Counterfeit Items Procedure 1006.1001. Scope Limitations: The scope of this assessment was limited to those activities or services associated with S/CI and Inspection and Acceptance Testing within Fermilab’s Computing Division. Procurement, software development | |

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activities and IQA section 8.5 “Control of Measuring and Test Equipment (M&TE)” were not within the scope of this assessment.

Activities Reviewed Within this Assessment:

During the course of this assessment the following S/CI and Inspection & Acceptance Testing activities were reviewed, and when possible, observed:

- Inspection and acceptance testing of:
 - printed circuit boards and their components
 - fiber optic and copper cables
 - networking elements
 - data storage tape components
 - computer farm components
 - R&D detectors instrumentation and computing components
 - high performance network component testing and inspection
 - CMS storage arrays
 - computers and computer peripherals
 - business and computing infrastructure applications
 - Windows and Unix server services
 - System testing of the network elements and cables
- Component testing of fabricated electronic pieces
- First article acceptance testing of purchased equipment
- Control of nonconforming items
- S/CI Coordinator activities

Description of the Implementation & Effectiveness of Observed Activities:

Inspection and Acceptance Testing:

The requirements for IQA Chapter 8, Inspection and Acceptance Testing are met and effectively implemented within the CD organizations assessed. Although no evidence of noncompliance within the selected IQA criteria was observed, a number of observations were identified. The assessment team interviewed 18 individuals in 3 out of 4 quadrants including the following departments: Networking, Unix server, CMS, Experimental Facilities Data Storage (LTO4 and LTO5) and Facilities. The level of inspection and testing performed is commensurate with the risk associated with product failure and the complexity, importance and cost of the product. The higher the risk and more complex the product, the more comprehensive are the inspections and tests conducted.

Although procurement was not within the scope of this assessment, it was demonstrated that the Scientific Computing Facilities use a proactive approach to standardizing their annual large-scale purchase of computing equipment. Similar processes are followed for significant purchases, making incoming inspection easier and more consistent.

The Lab and Scientific Core Services quadrant’s Information Systems departments have some of the highest risk products, such as Electronic Business Suite (eBS) containing the software application for payroll. This department is responsible for testing of commercial off-the-shelf software. The inspection and test procedures are well established and documented. The tests are clearly tied to well defined requirements. The Information Systems Department incorporates requirements, test plans (File 01), test procedures, test execution (File 02), test results (File 03), and problem reports (File 04), into the Project

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Tracking Application (PTA). The PTA allows easy access and management of the all relevant information including the change management process flow dated 20110208 (File 05) and facilitates reuse of test cases and plans.

In order to select the best vendor the Scientific Computing Facilities quadrant compiles product specifications and selects vendors based on technical capabilities and cost. An example of this is the High Performance Parallel Computing Facilities (HPC) department’s Lattice Quantum Chromodynamics (LQCD) project procurement strategy (File 06). This strategy contains seven steps which include reviewing testing done by vendors and acceptance or rejection of the delivered systems based on acceptance testing done by Fermilab. The Acquisition Strategy for the Lattice QCD Computing Project Extension (File 07) documents the procurement strategy.

The LQCD project uses technical specifications to create test cases. An example is Attachment A, Fermilab US Lattice QCD Cluster Technical Specification, FY2010 (File08) which includes a Fermilab Vendor Configuration Sheet. This section includes a configuration worksheet which specifies the tests the vendor must execute and requires their test results.

Initial acceptance testing for HPC consists of running LQCD benchmark test procedures on all cores of each node, all nodes in a given rack and finally at the cluster level. Acceptance test procedures for the Ds Cluster are attached as File09. Test results are used to identify compliance with the requirements such as, BIOS, networking and other hardware issues as well as middleware issues. File10 contains test results for the Ds Cluster. Any discrepancy is reported back to the vendor by opening a Fermilab Service Desk ticket which is tracked to closure, (File11). HPC also uses a Tracking Wiki, or “TWiki”, to report all of the problems or events on a given node and their respective solutions or comments (File 12).

The Detector Instrumentation group within the Future Programs and Experiments quadrant performs analog and digital design and testing for electronics hardware and firmware. Their activities include R&D of fiber optics for high bandwidth data transfer such as Versatile Link, a joint project between CERN, Oxford University and Southern Methodist University (SMU). The assessment team reviewed and observed lab work for the test and acceptance of a Zarlink receiver. Since this is an R&D project, the researcher and customers for this product meet to review and understand the requirements and test results. The current test procedures were authored and edited by CERN. The accumulated test data is locally documented and the results are shared with other R&D organizations. Documentation for SFP+ component testing including specifications, test bed set up, and test results for SPF+ transceivers are attached (File 13) and the WP_2_TestPlan_2008 is attached (File 14).

This department also designs and orders printed circuits boards (PCBs) and flex boards. Netlist is an electronic design tool used to generate schematics for PCBs which are sent to manufacturers. PCBs are tested for connectivity by the vendor in compliance with the design netlist. Upon receipt, boards are visually inspected to verify compliance with requirements. Design parameters including solder mask, plating quality and drill registration are verified using an optical inspection station according to persons interviewed. Non-conformities (Files 15 and 16) are communicated to the vendor.

Suspect Counterfeit Items:

The requirements of IQA Chapter 10, Suspect/Counterfeit Items, Controlling Suspect/Counterfeit Items Procedure, 1006.1001 and Suspect/Counterfeit (S/CI) Items Program, 1006 have not been fully and

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effectively implemented within the CD departments assessed.

To ensure S/CI items are prevented from entering Fermilab and quality items and services are received, all individuals interviewed indicated that they purchase from reputable organizations, manufacturers, and authorized distributors. Although necessary, this practice only partially satisfies S/CI program requirements.

Only 3 of 18 interviewees and 9 of about 300 CD staff members have received S/CI training.

Two persons responsible for purchasing and incoming inspection of products did not know who their S/CI coordinator was. Four of seven interviewees who perform incoming inspection indicated that upon finding a suspect item they would contact and/or return the item to the vendor. The S/CI coordinator did not know the reporting process, could not identify the S/CI program management contacts, was unaware of the requirement to use purple paint to identify S/CI items installed in a system where it is not possible to use S/CI tags, and was not informed of recent non-conforming transceivers found in CD.

IQA Chapter 8 Inspection and Acceptance Testing, section 3.1 paragraph 1 states:

“Divisions/sections/centers are responsible for control of nonconforming items, Controls include identification, documentation, evaluation, segregation (when practical), item disposition (reject, repair, rework, use-as-is), and notification to affected organization.” An interviewee indicated that a transceiver which was identified and evaluated as non conforming was disposed of. There was no required documentation or notification provided for this item. The item was retrieved from disposal and the assessment team requested CD to apply the required quality controls.

Conclusions:

The CD departments in the scope of this assessment employ an effective system of inspection and acceptance test controls to ensure that the proper level of evaluation is performed on incoming products and items. A variety of methods are used to ensure that quality items are received including purchasing from manufacturers and authorized dealers, incoming visual inspection and test. The level of control is commensurate with the complexity of items being appraised, with sufficient formality being used for the more complex items being received.

Suspect/Counterfeit Item program requirements have not been successfully implemented within all of the CD departments assessed. Overall, lack of awareness and current training, even to the level of the S/CI coordinator was evident, as described in finding 1, below.

Findings:

1. The requirements of IQA Chapter 10, Suspect and Counterfeit Items, Suspect/Counterfeit Item (S/CI) Program 1001 and Administrative Procedure, Controlling Suspect/Counterfeit Items Procedure 1006/1001 have not been fully and effectively implemented within the CD departments assessed.

Integrated Quality Assurance, 1001, Chapter 10, Suspect/Counterfeit Items, section 10.2 paragraph 1 states: “Line management is responsible for identifying individuals requiring S/CI training, [using ITNA questions] ensuring they receive this training, and providing necessary resources for implementing the S/CI program.” Only 3 out of the 18 interviewees who are responsible for purchasing and incoming

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inspection of products and 9 out of about 300 CD's staff members have received SC/I training.

IQA Chapter 10 Suspect/Counterfeit Items, section 10.2 paragraph 4 states: "All personnel are informed of the risks associated with S/CI and the S/CI reporting process." Suspect/Counterfeit Item (S/CI) Program paragraph 4 section 5 under the responsibilities of the Supervisors, Construction Coordinators, and Task Managers, also states "... Ensure that S/CI-related information is flowed down to all employees, subcontractors and users working under their direction as appropriate..." Two persons responsible for purchasing and incoming inspection of products did not know who their S/CI coordinator was. Four of seven interviewees who perform incoming inspection indicated that upon finding a suspect item they would contact and/or return the item to the vendor. The S/CI Coordinator did not know the reporting process, could not identify the S/CI program management contacts, was unaware of the requirement to use purple paint to identify S/CI items installed in a system where it is not possible to use S/CI tags, and was not informed of recent non-conforming transceivers found in CD.

Administrative procedure, Controlling Suspect/Counterfeit Items Procedure 1006/1001 paragraph 4 section 2, under Heads of Division/Section Center Responsibilities states "Provide the necessary resources as appropriate to implement this procedure". The S/CI coordinator is on phased retirement and works part time. This does not allow full availability of the S/CI coordinator.

Observations and Recommendations:

1. **Observation:** Some test and inspection activities have no written or scripted procedures.
Recommendation: CD should use checklists, flowcharts or similar aids for multi-step inspection and test procedures.
2. **Observation:** a record of initial test results is not always kept.
Recommendation: CD should keep initial test results, especially for items where performance can degrade over time.
3. **Observation:** standardization of databases and test and inspection interfaces was missing
Recommendation: CD should investigate the benefits of intra-division standardization of test and inspection databases and user interfaces.
4. **Observation:** one incident of lack of implementation of control for non conforming items was observed
Recommendation: CD should ensure their staff is aware of the procedures for controlling S/CI.

Commendable Practices:

Names of Person Interviewed:

Tom Ackenhusen
Chuck Andrews
Jason Allen
Jon Bakken
Gustavo Cancelo
John Chramowicz

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Dave Coder
Glen Cooper
Dave Fagan
Stan Naymola
Scott Nolan
Gene Oleynik
Vince Pavlicek
Alan Prosser
Jim Simone
Amitoj Singh
Adam Walters
Mike Wood

Documents Reviewed:

- ESE Integrated Quality Assurance
- Business Systems Change Management Process
- Sunflower – Fleet Implementation
- Dashboard Front End Evaluation Form
- eBS – Production System Operations
- Acquisition Strategy for the SC Lattice QCD Computing Project Extension
- Fermilab Worker Node Requirements FY10
- Procedure for commissioning new tape technology
- Vendor Submission Checklist
- GCC SL8500 Tape Library Commissioning Report 9/25/2006 1/31/2008
- Procedure for Commissioning LTO5 Technology
- Acceptance Test Procedure For the Ds Cluster
- Fermilab Worker Node Requirements FY10 May 28, 2010
- Exhibit A-Service Subcontracts
- Exhibit BI Insurance
- KOI-2010 Workers-Final
- Networking Inspection and Test Overview
- Single-Mode OTDR Test
- Fermilab US Lattice QCD Cluster Technical Specification, FY2010
- Acceptance Test Procedures for The Ds Cluster
- Acceptance Test results for the Ds Cluster
- Fermilab US Lattice QCD Cluster Requirements and Proposal Evaluation FY2010
- Fermilab Vendor Questionnaire (blank)
- Fermilab Request For Quotation (blank)
- Fermilab Request For Proposal (blank)
- Fermilab Request For Proposal (Sample)
- Vendor Submission Checklist (Sample)
- Amendment of Solicitation (blank)
- Dashboard Front End Evaluation Form
- SCF Quadrant Responses to QA Assessment request
- Procedure for Commissioning New Tape Technology

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- GCC SL8500 Tape Library Commissioning Report 9/25/2006
- GCC SL8500#2 tape Library Commissioning Report SSA Group 1/31/2008
- QA Checklist For LQCD Major Computing hardware System Deployment For Computing Division (CD)-Fy10 Ds Procurement
- US FNAL LQCD RFP 2010 Best Value Award Process May 17,2010
- Fermilab Request for Information – Fermilab Lattice QCD Project
- Benchmarking For FY10 Procurement of the SC Lattice QCD Computing Project Extension (LQCD-ext)
- Sample Service desk ticket for replacing a bad tape Drive
- LTO4 Plots: d0en-55_plot_gone-bade.png, replaced-d0en-66.pmg, LTO4 drive plots from gene Olyenik.docx, plot-read-errors_vs._time_lto_55.png, plot_read_errors_vs.time_lto_66.png, Cat5 Cable tests_fcc375.pdf, Cat6_Cable tests-FCC-1-1346Ode OTDR Test.pdf
- Document # CD-3252 Sequence of Operation for Transfer and Re-Transfer of the Grid Computing Center Source Power Date: July 31, 2009
- T1ProcessorInfo < CMST1 < TWiki
- DiskInfo < CMST1 < TWiki
- Avago Technologies AFBR-703SDZ 10Gb Ethernet, 850 nm, 10GBASE-SR, SFP+ Transceiver Data Sheet
- CAPTAN Inventory
- Finisar Product Specification RoHS-6 Compliant 10Gb/s 10km Single Mode Datacom SFP+ Transceiver FTLX1471D3BCL
- ESE Inspection and Acceptance Test Processes January 14,2011
- ESE Inspection and Acceptance Test Processes Purchase Requisition 214384 January 14, 2011
- Pixel Plane Damaged Pad
- Pixel Plane Over Etched Pads
- Examples of correspondence regarding the rejection of flexible circuits
- Results for SFP+ Component Testing Last updated: Jan, 5, 2011
- CDdoc3568 Guidance on Approval to Build and Test a Change
- Doc Db# 3585 Guidance on Obtaining Approval to Install a Change (Go Live)
- DocDB 3529-v3 Fermilab Change Management Policy
- Change Management Process and Procedure Fermilab Computing Division-CM-V1.0 DocDB #3530
- Guidance on Completing a Change
- Release Management General Checklist
- Release Management Process and Procedure Fermilab Computing Division-RM-1.0 Docdb#3737
- Release Management Policy Fermilab Computing Division-RM-Policy v1.0 Docdb# 3738
- Unix Service Services Change Risk Classification Guidance Unix Server Services
- New Server Request/Support Form
- SCF Quadrant responses to QA Assessment requests23-Dec-2010 Information collected by S. Fuess

(See also “Attachments” section below)

Standards, Regulations, and Other Program Requirements Applied:

The specific criteria applied to this assessment were:
1001 Fermilab Integrated Quality Assurance (IQA)

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Chapter 8 – Inspection and Acceptance Test (IQA)
Chapter 10 – Suspect and Counterfeit Items (IQA)
Other relevant requirements applicable to this assessment:
1006 Suspect/Counterfeit Items Program
1006.1001 Controlling Suspect/Counterfeit

Describe or List Any Other Assessment Methods Used:

None

Corrective Action Plans Issued:

CD-20110307- 01 The requirements of IQA Chapter 10, Suspect and Counterfeit Items, Suspect/Counterfeit Item (S/CI) Program 1001 and Administrative Procedure, Controlling Suspect/Counterfeit Items Procedure 1006/1001 have not been fully and effectively implemented within the CD departments assessed.

Assessors' Names (asterisk indicates team leader):

- Susan Rahimpour* - OQBP
- Don Rohde - AD

Submitted by: Susan Rahimpour **Date:** 03/07/11

Distribution (Distribute to assessed organizations' management, OQBP head, and other interested parties):

| | |
|-------------------|-----------|
| Victoria White | Bob Grant |
| Robert Tschirhart | Ed Vokoun |
| Stephen Wolbers | Jed Heyes |
| Mark Kaletka | |
| William Boroski | |
| Bakul Banerjee | |

Attachments:

- File01 – List_of_test_plans_20110208.pdf
- File02 – TestBank_for_OPSF11i_Upgrade_20110208.pdf
- File03 –Example_Test_Item_3376_20110208.pdf
- File04 – Example_Problem_Report-36 13_20110208.pdf
- File05 – IS_CHange_Mgmt_Process_Flow_20110208.pdf
- File06 – LQCD project procurement strategy
- File07 – Acquisition Strategy for the Lattice QCD Computing Project Extension
- File08 – Fermilab US Lattice QCD Cluster Technical Specification, FY2010
- File09 – Acceptance Test Procedures for The Ds Cluster
- File10 – Acceptance Test Results for the Ds Cluster
- File11 – Fermilab service desk ticket

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- File12 – a snap shot of Twiki reporting system by 8/24/2010
- File13 – Results for SFP+ Component testing.
- File14 – WP_2_TestPlan_2008
- File15 – Pixel Plane Damaged Pad
- File16 – Pixel Plane Over Etched Pads