2011 SAPHIRE 8 Software Quality Assurance Status Report

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Current activities and progress related to the SAPHIRE 8 Quality Assurance Program

By Kurt G. Vedros

Revision 0

Chapter 1 Introduction

Background

The Software Quality Assurance engineer position was created in fiscal year 2011 to better maintain and improve the quality of the SAPHIRE 8 development program. This year's Software Quality Assurance tasks concentrated on developing the framework of the SQA program. This report reviews the accomplishments and recommendations for each of the subtasks set forth for JCN V6059:

- Reviews, Tests, and Code Walkthroughs
- Data Dictionary
- Metrics
- Requirements Traceability Matrix
- Provide Oversight on SAPHIRE QA Activities
- Support NRC Presentations and Meetings

Chapter 2 Discussion

Subtask 1.1 Reviews, Tests, and Code Walkthroughs

Form 189 Description

The activities of the SQA member in this subtask include, but are not limited to:

- Perform or assist in peer reviews or code walkthroughs
- Review test results and perform tests
    - Tests performed may be static, functional, or acceptance testing as determined by the SQA member.
- The SQA member shall determine if commercial software is available to assist in performing these tests, and if so shall request that the NRC Project Manager (PM) approve its purchase.

Accomplishments

The major accomplishment in this subtask was to research, purchase and set up the test management software SpiraTest which assigns tests to requirements and tracks progress. SpiraTest also has the capability of bug and features request tracking. An effort was started to integrate the web-based bug reporting system into SpiraTest for a bug tracking and trending function as part of the software metrics. This is nearing completion as of this letter.

The SQA member created a formal Preliminary Design Review and Critical Design Review process which was folded into the quality assurance plans and documentation. The final documents are being released at the same time as this letter.

The SQA member spot reviewed modules for standards compliance. There were no formal reports created for these reviews. The SQA performed speed tests on calculations with multi-thread solving capabilities.

Recommendations

Finish the bug tracking integration of the SpiraTest software and expand the integration of SpiraTest into the documentation of the automated tests performed. This will completely move the test verification to an electronic format.

The SQA should be present for design reviews. The SQA should also review the documentation of the PDRs and CDRs when each phase of the design feature moves on to the next phase: PDR to final design, CDR to implementation.

When to do peer reviews and code walkthroughs needs to be determined, whether this is time based or based on the release of new revisions of the code.

Subtask 1.2 Data Dictionary

Form 189 Description

This subtask supports the development of a data dictionary for SAPHIRE 8. A data dictionary is a useful document for assisting software programmers. SAPHIRE does not currently have a well-developed data dictionary; however. SAPHIRE documentation exists such as the Programmers Workbench and the Database Schema from earlier SAPHIRE versions. The SQA member shall become proficient in the knowledge needed to be the primary writer, and to assume ownership of the document. The data dictionary, as it is being developed, shall be provided to the NRC PM for review and comment.

Accomplishments

The lead designer wrote a utility to create a data dictionary, which defines the functions found in the various code modules for follow on development efforts. This data dictionary is produced in an .html format. The SQA understands how to use this utility and manages a current copy readily available in the RCS repository. A data dictionary will be sent to the NRC PM and TM at the end of September 2011.

Recommendations

Continue to maintain a current copy of the data dictionary in the RCS, available upon demand.

Subtask 1.3 Metrics

Form 189 Description

Software metrics help to improve quality of the code, and their use is recommended by applicable SAPHIRE SQA guidance. The SQA member shall research and recommend SAPHIRE metric(s) that will be useful in SAPHIRE development and maintenance. A letter report shall be delivered to the NRC PM during the first fiscal year of this activity on the research, results, and recommendations. At the direction of the NRC PM, the SQA member will begin implementing SAPHIRE metric(s).

Accomplishments

A metrics review was performed by the SQA member and a letter report recommending metrics going forward along with their periodicity and relevance was delivered to the NRC Project Manager and Technical Manager in August 2011. Implementation of this new metrics program was included in the quality assurance documentation updates which will be delivered at the end of September 2011.

Recommendations

Metrics that involve quality assurance software programs should be run prior to release of a new revision of SAPHIRE 8 (CodeHealer, Coverage Validator, Performance Validator, Memory Validator, and Thread Validator). Metrics tracking bugs and features requests should be reported on periodically, such as every 6 months.

Subtask 1.4 Requirements Traceability Matrix

Form 189 Description

To improve the current RTM for SAPHIRE, the SQA member shall update the RTM as needed. The SQA member shall determine if commercial software suitable for updating the RTM is available, and if so shall request that the NRC PM approve its purchase. It is desirable that commercial software for updating the RTM be purchased in FY 2011 and be implemented for future SAPHIRE work at the direction of the NRC PM.

Accomplishments

A search was made to identify a product that would produce a RTM without having to purchase a full-blown software development package such as provided by the Microsoft Visual Studio environment, which includes a RCS, editors, and other functions that would duplicate our capabilities at a large cost. A solution was found with the test management software from Inflectra called SpiraTest. The RTM was produced as required and requested and was facilitated by the purchase of the SpiraTest test management software mentioned above. An updated RTM is kept in the RCS repository.

Recommendations

Continue to utilize SpiraTest's capabilities and maintain a RTM in the RCS repository.

Subtask 1.5 Provide Oversight on SAPHIRE 8 QA Activities

Form 189 Description

The SQA member shall provide oversight on SQA activities, including but not limited to the following:

- Ensuring the revision control system (RCS) is up to dated and contains all important documentation and files

- Write a document on what the RCS is and list its contents

- Reviewing and updating SAPHIRE QA documentation, accounting for relations between documentation. Include the following documentation(as well as others as applicable):

    - Acceptance Test Plan

    - Configuration Management Plan

    - QA Plan

    - Project Plan

    - RTM

    - RTM software package reports

    - System Test Plan

    - SDP Interface training manual

    - SAPHIRE 8, "New Features and Capabilities Overview"

- For the Software Verification and Validation (SV&V) Plan, review and provide comments to the development team. Specifically ensure that remaining IV&V comments from N6423 are addressed.

- As part of this subtask, a report of the oversight provided on SAPHIRE SQA activities will be provided. This report, which can consist of several documents submitted via one cover letter, shall include the following items:

    1. Action taken to ensure that the RCS is up-to-date and contains all important documentation and other files

    2. Documentation stating what the RCS is and listing its contents

    3. Action taken to review and update SAPHIRE QA documentation accounting for relations between documentation. Include the following documentation (as well as others as applicable):

        - Acceptance Test Plan

        - Configuration Management Plan

        - QA Plan

        - Project Plan

        - RTM

        - RTM software package reports

- System Test Plan
- SDP Interface training manual
- SAPHIRE 8, "New Features and Capabilities Overview"

At the direction of the NRC PM, implement SQA improvements.

Accomplishments

A major focus was placed on the revision control system (RCS). Efforts were made to include all the applicable quality assurance documentation in the RCS by gathering it from developers and project managers, former IV&V members, and the SQA's hard-drive. Most of the documentation was already in the RCS; however this gathering effort consolidated all of the QA documentation into the RCS. A report was sent to the NRC defining the RCS, its contents and where it fits in the QA program.

This also encompasses the work performed by the SQA member to keep the quality assurance documentation up to date. Major revisions of nearly all documents were delivered in February which updated the status of SAPHIRE 8 from a software product in a development stage to one that is in its operational life cycle. Two new releases of SAPHIRE 8 were made over the year that required the addition of new automated tests to the testing program. New design documents were added to the RCS and their overviews added to the SVVP volume 2. The SQA reviewed the results of these tests and added their descriptions to the quality assurance documents. There were also additions to the documents made to incorporate the PDR, CDR, and the use of metrics. These new revisions will be transmitted as a package at the end of September 2011.

Recommendations

Organize the RCS into more descriptive folders, making the documentation easier to find. For instance, there has been a change in the document transmittal procedures at INL where some documents such as the SVVP were not sent through Scientific and Technical Information Management System (STIMS) are now required to do so. We have a folder in the RCS for external documents that have gone through STIMS; another for IV&V, and another for QA documents, these can be organized better.

The SQA needs to continue to monitor and maintain the RCS and the documents that comprise it. The SQA also needs to continue to monitor the code files in the RCS for meeting standards and RCS usage.

Subtask 1.6 Support NRC Presentations and Meetings

Form 189 Description

At the request of the NRC PM, the SQA member shall provide support for NRC presentations and meetings.

Accomplishments

Two reviews of the SAPHIRE program were presented during NRC visits to INL over the year.

In addition, a NRC IG audit was performed on the SAPHIRE 8 program this year. The INL SQA and INL PM provided support in the form of requested documentation, meetings and interviews.

Recommendations

Continue to maintain the information in an accurate and readily available format and also maintain the competent INL PM, development team and SQA such that that information can be transmitted when required.