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SANDIA NATIONAL LABORATORIES WASTE ISOLATION PILOT PLANT

AP-184 Revision 0

Analysis Plan for Migration of Files from the Oracle/Solaris Cluster to the HPC/Linux Cluster and Qualification of Codes from the Solaris Cluster on the Linux Cluster

Task 4.4.1.3.1

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Table of Contents

1	Introduction and Objectives.....	3
2	Approach.....	3
2.1	File Transfer/Verification from Solaris	3
2.2	Building of Codes on Linux	3
2.3	Testing of Codes on Linux	3
2.4	Code Qualification	4
2.5	Re-run CRA19.....	4
3	Software List	5
4	Tasks	6
5	Special Considerations	7
6	Applicable Procedures	7
7	References.....	7

1 Introduction and Objectives

This analysis plan guides the migration of files used in the WIPP performance assessment (PA) calculations and other files needed for QA documentation from the Oracle/Solaris cluster to the HPC/Linux cluster. This analysis plan also guides the build and testing of the PA codes and other ancillary codes on the HPC/Linux cluster. The primary motivation for the migration is diminishing technical and software support for Solaris. The Linux cluster is a Dell PowerEdge C6420 running CentOS 7.

This analysis plan describes the approach that will be used to: 1) transfer and verify the files from Solaris; 2) build the codes on Linux; 3) test the codes on Linux; 4) qualify the codes on Linux; 5) re-run CRA19; 6) produce an analysis report. Because some of the codes being qualified or archived are used in performance assessment, this is a compliance decision analysis.

The primary objective of this analysis plan is to qualify the codes on Linux and transfer all files from Solaris to Linux. In addition, the run control system will be updated using improved scripting methods. The upgrade will facilitate the preservation of files and capabilities, as well as allow for increased capability.

2 Approach

This section describes the approach used to perform the file transfer/verification and the building, testing, and qualifying of the PA and ancillary codes.

2.1 File Transfer/Verification from Solaris

Files will be transferred from the Solaris cluster to the Linux cluster using remote synchronization since the file structure is identical. Logs of the transfer will be preserved, and any errors reported in the logs or any differences in the number of files transferred will be investigated and corrected. The acceptance criteria are: there will be no errors in the logs and no differences in the number of files transferred.

2.2 Building of Codes on Linux

The codes to be built are shown in Table 1. This list of codes was taken from the SNL WIPP Baseline Software List (Long, 2019) and constitutes the latest versions of all WIPP codes currently qualified on the Solaris cluster. Building of the codes will be performed on the Linux cluster by the Run Control Coordinator. All files needed for the build will be transferred to the Linux Concurrent Versioning System (CVS) as described in Section 2.1. All results from the build will be stored in the Linux CVS by the Run Control Coordinator under each relevant code name.

2.3 Testing of Codes on Linux

The codes to be tested are shown in Table 1. This list of codes was taken from the SNL WIPP Baseline Software List (Long, 2019) and constitutes the latest versions of all WIPP codes currently qualified on the Solaris cluster. Testing of codes will follow NP 19-1 (Long, 2017). The testing

will be conducted on the Linux cluster by the Run Control Coordinator. All files needed for the testing will be transferred to the Linux CVS as described in Section 2.1. All results from the testing will be stored in the Linux CVS by the Run Control Coordinator under each relevant code name.

2.4 Code Qualification

Each code listed in Table 1 will be qualified on the Linux cluster using NP 19-1 (Long, 2017). This list of codes was taken from the SNL WIPP Baseline Software List (Long, 2019) and constitutes the latest versions of all WIPP codes currently qualified on the Solaris cluster. The code sponsor for each code will produce the appropriate software life-cycle documents.

2.5 Re-run CRA19

CRA19 will be re-run on Linux and the mean CCDFs compared to those from the Solaris run to ensure the results are reasonable based on expert technical judgement. There will be a change to how random numbers are sampled within the LHS code on Linux. To facilitate a vector by vector comparison to CRA19, the analysis will first be run using the random number sampling from Solaris. The analysis will then be re-run using the new random number sampling.

3 Software List

Table 1. Codes

Code Name	Current Version	Code Sponsor
ALGEBRACDB	2.36	Michael Feng
BLOTCDB	1.38	Michael Feng
BRAGFLO	7.00	Seth King
CCDFGF	7.04*	Sarah Brunell
CCDFVECTORSTATS	1.01	Sarah Brunell
CUTTINGS_S	6.03	Dwayne Kicker
DRSPALL	1.22	Dwayne Kicker
DTRKMF	1.01	James Bethune
EPAUNI	1.19	Dwayne Kicker
GENMESH	6.10	Michael Feng
GROPECDB	2.13	Michael Feng
ICSET	2.23	Michael Feng
LHS	2.44	Todd Zeitler
MATSET	9.24	Michael Feng
MERGESBALL**	1.02	Dwayne Kicker
MODFLOW2000	1.07	James Bethune
MWT3D	2.51	James Bethune
NONLIN	2.02	Jay Jang
NUTS	2.07	Sungtae Kim
PANEL	5.00	Sungtae Kim
PEST	9.12	James Bethune
POSTBRAG	4.02	Seth King
POSTLHS	4.11	Todd Zeitler
POSTSECOTP2D	1.05	James Bethune
PREBRAG	9.00	Seth King
PRECCDFGF	2.01	Sarah Brunell
PRELHS	2.44	Todd Zeitler
PRESECOTP2D	1.23	James Bethune
RELATE	1.45	Michael Feng
SCREEN_NUTS	1.02	Sungtae Kim
SECOTP2D	1.43	James Bethune
STEPWISE	2.22	Todd Zeitler
SUMMARIZE	3.02	Michael Feng

* - Although CCDFGF Version 7.03 is currently the baseline version of the code, it is anticipated that version 7.04 will be the version of code to be rebuilt on Linux.

** - Although MERGESBALL is not currently on the baseline, it is anticipated that it will be qualified on Solaris and rebuilt on Linux.

4 Tasks

There are six main tasks for this analysis plan.

Task 1: Transfer all files from Solaris to Linux. Verify that the number of files located on the Solaris cluster is identical to the number of files transferred to the Linux cluster. Verify that the log files do not contain any errors. The system administrator will perform this task. The product of this task will be documented in the analysis report. Completion date will be April 1, 2020.

Task 2: Produce all appropriate software life-cycle documentation, starting with the Change Control Form (NP 19-1-9) and ending with the Installation and Checkout Form (NP 19-1-8), for each code in Table 1 per NP 19-1 (Long, 2017). The code sponsor for each code will perform this task. The product of this task will be the appropriate software life-cycle documentation for each code. Completion date will be March 1, 2021.

Task 3: Build new version of each code listed in Table 1 on the Linux cluster. The Run Control Coordinator will perform this task. The product of this task will be documented in the analysis report. Completion date will be March 1, 2021.

Task 4: Test new version of each code listed in Table 1 on the Linux cluster per NP 19-1 (Long, 2017). This task will be performed by the Run Control Coordinator. The product of this task will be the results included in the Validation Documents produced by the code sponsors. Completion date will be March 1, 2021.

Task 5: The CRA19 PA will be re-run on Linux and the mean CCDFs compared to those from the Solaris run to ensure the CCDFs are reasonable based on expert technical judgement. This task will be performed by the Run Control Coordinator. The product of this task will be documented in the analysis report. Completion date will be March 1, 2021.

Task 6: Produce an analysis report to document the completion of these tasks. This task will be performed by the SCM Coordinator/Run Control Coordinator. Completion date will be March 1, 2021.

The estimated start date is March 1, 2020. However, issues related to other work can take precedence over these tasks. The completion date for the migration is estimated to be March 1, 2021.

Table 2. Personnel Expected to be Involved in the Linux Migration Effort

Area of Responsibility	Team Members
SNL Management	Paul Shoemaker
Project Coordinator	Jennifer Long
System Administrator	John Geilow
Run Control Coordinator	Jennifer Long
Code Sponsors/Analysts	Seth King, Sarah Brunell, Dwayne Kicker, Sungtae Kim, Michael Feng, James Bethune, Jay Jang, Todd Zeitler
Code Consultant	Becky McKeown
SCM Coordinator	Jennifer Long
Software QA	Shelly Nielsen, Steve Davis

5 *Special Considerations*

No special considerations are needed.

6 *Applicable Procedures*

The qualification of codes on the Linux cluster will be conducted according to NP 19-1 (Long, 2017).

7 *References*

Long, J. 2017. Nuclear Waste Management Procedure, NP 19-1 “Software Requirements”, Rev. 18. Sandia National Laboratories, ERMS#567724.

Long, J. 2019. Software Baseline List, Rev #81, Sandia National Laboratories, ERMS#571927.

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