**CACIE Tool #27** – **STOMP Surface File Merge Tool**

**ca-merge\_srf.pl**

**Version** **1.0**

**QA**: **QA**

# Description and Purpose

The STOMP Surface File Merge tool merges STOMP Surface File data from two consecutive STOMP simulations (e.g., Surface Files for the 2018 to RTD year simulation and for the RTD year to 12070 simulation). The tool reads a list of STOMP Surface File names to process. Surface File names are assumed to be identical for the two STOMP simulations being merged.

# Functional Requirements

The following are the functional requirements (FR) of the STOMP Surface File Merge tool:

FR-1: Read the file name for the list of Surface Files to process, the name of the directory containing Surface Files for the first (i.e. earlier) of the two time periods being merged, the name of the directory containing Surface Files for the second (i.e., later) of the two time periods being merged, and the name of the directory that will contain the merged output Surface Files.

FR-2: Read the list of Surface Files to process from the file named in command line argument 1. Surface File names are assumed to be identical for the two STOMP simulations being merged.

FR-3: For each Surface File name read in FR-2, copy all lines from the Surface File for the earlier time period being merged to the merged output Surface File.

FR-4: For each Surface File name read in FR-2, identify each line of data (i.e. not a header line) from the Surface File for the later period. Copy the rate values from the later period and adjust each of cumulative values of the later period by summing them with the respective cumulative value of the last time step from the earlier time period; write the adjusted data lines to the merged output Surface File. Header lines from this file are copied unchanged.

FR-5: Generate the merged Surface File.

# Software Requirements Specifications

The Perl programming language was used to develop this script. The Perl v5.18.2 interpreter was used in conjunction with the “Scalar::Util” module.

# Software Design Description

Arguments:

The tool is executed from the command line in a Linux terminal in the following manner:

$ perl ca-merge\_srf.pl surface\_file\_list first\_surface\_file\_directory second\_surface\_file\_directory output\_combined\_surface\_file\_directory

Where:

* “ca-merge\_srf.pl” is the file name of the tool
* “surface\_file\_list” is a file containing a list of Surface Files to be processed (the list of file names represents files located in both directories specified by the next two arguments)
* “first\_surface\_file\_directory” is the name of the directory containing Surface Files for the first (earlier) of the two time periods being merged
* “second\_surface\_file\_directory” is the name of the directory containing Surface Files for the second (later) of the two time periods being merged
* “output\_combined\_surface\_file\_directory” is name of the directory that will contain the merged output Surface Files

Input Files:

* surface\_file\_list – This file contains the list of STOMP output (Surface) files to be processed. It will have one file name per line. Each file listed represents 2 files: one for an earlier time period and the other for the later time period. The tool arguments (“first\_surface\_file\_directory” and “second\_surface\_file\_directory”) determine where these files can be found, as they are not listed in this file.
* STOMP output (Surface) Files. There are 2 groups of these files (both with the same list of names as in surface\_file\_list file) covering 2 time periods. The locations of these files are defined by the following arguments: “first\_surface\_file\_directory” and “second\_surface\_file\_directory”

Output Files:

* output\_combined\_surface\_file\_directory/surface\_file\_list – Merged output Surface Files (each line in the surface\_file\_list file represents one merged Surface File)

Tool Runner:

The following is the shell script configuration that will be passed as an argument to the Tool Runner for qualified runs:

* {directory path to repository}\tools\ca-mergesurf/ca-merge\_srf.pl <$INPUT1> <$INPUT2> <$INPUT3> <$INPUT4>

The shell script variable (indicated by the “$”) will be set in the shell script with the path to the control file (refer to the section of this document describing “Input Files”).

* $INPUT1
  + Path/filename of a file containing a list of files to be processed; file names are the same between the earlier and later time periods
* $INPUT2
  + Directory that contains the earlier time period files
* $INPUT3
  + Directory that contains the later time period files
* $INPUT4
  + Directory to place the output (merged) files

Code Review:

Sara Lindberg performed a code review on May 12, 2020. No impacts to other repository tools or library dependencies were identified for the STOMP Surface File Merge tool.

# Requirements Traceability Matrix

The requirements traceability matrix for the STOMP Surface File Merge tool is presented in Table 1.

| Table  Requirements Traceability Matrix | | |
| --- | --- | --- |
| **Functional Requirement ID** | **Acceptance Test ID** | **Test Case** |
| QA Level | CACIE- STOMP Surface File Merge-IT-1 | Installation Test |
| FR-1, FR-2, FR-5 | CACIE- STOMP Surface File Merge-AT-1 | * Check that output files were created in the “output\_combined\_surface\_file\_directory”. * Check that all the Surface File names listed in “surface\_file\_list” have corresponding output files in the “output\_combined\_surface\_file\_directory”. * Check that the second comment line in each output file indicates that the correct Surface File directories were used for merging. |
| FR-3 | CACIE- STOMP Surface File Merge-AT-1 | Compare Surface Files for the earlier of the two time periods to the merged output Surface Files. Files should be identical down to the end date of the first time period being merged (except for comment lines that begin with “#”). |
| FR-4 | CACIE- STOMP Surface File Merge-AT-1 | Using Excel, compare Surface Files for the later time period to the merged output Surface Files (beginning at the comment line listing the name of the Surface File for the later time period). Rate values should be unchanged. Cumulative values should be equal to the later cumulative values plus the respective cumulative value of the final time step from the Surface File for the earlier time period. Comment lines should be identical. |

# Installation Test Plan and Acceptance Test Plan Cases

The installation test plan for STOMP Surface File Merge is presented in Table 2 and the acceptance test plan case for STOMP Surface File Merge is presented in Table 3.

| Table  **STOMP Surface File Merge Installation Test Plan** | | | |
| --- | --- | --- | --- |
| **STOMP Surface File Merge Installation Testing**  **CACIE-STOMP Surface File Merge – IT-1** | | **Date:** | |
| **Tool Runner Log File Location for this test:** | | **Test Performed By: [FIRST & LAST NAME]** | |
| **Testing Directory:** | | | |
| **Test Step** | **Test Instruction** | **Expected Result** | **Test Result  (Pass/Fail)** |
| Tools Code Repository Directory: | | | |
| Navigate to the testing directory | | | |
| 1 | Invoke Tool runner and test the as follows: Open a Linux terminal and after navigating to the appropriate directory indicated  *./runner\_run\_IT-* *1-surface\_file\_merge .sh* | | |
| 2 | Verify Tool Runner and tool is invoked and executed. | File “[test\_directoryt]\surface\_merge\_IT-1.log” is generated |  |
| 3 | Verify tool is invoked and executed | File “[test\_directory]\IT-1\xprt-1-merged\srf\ modflow\_81-54.srf” is generated |  |

| Table  **STOMP Surface File Merge Acceptance Test Plan Case 1** | | | | |
| --- | --- | --- | --- | --- |
| **STOMP Surface File Merge Acceptance Testing**  **CACIE-STOMP Surface File Merge – AT-1** | | | **Date:** | |
| **Tool Runner Log File Location for this test: OLIVE\\CAVE\CA-CIE-Tools-TestEnv\v4-2\_surface\_merge** | | | **Test Performed By: [FIRST & LAST NAME]** | |
| **Testing Directory: OLIVE\\CAVE\CA-CIE-Tools-TestEnv\v4-2\_surface\_merge** | | | | |
| **Test Step** | **Test Instruction** | | **Expected Result** | **Test Result  (Pass/Fail)** |
| Navigate to the Testing Directory | | | | |
| 1 | Open a Linux terminal and after navigating to the appropriate directory indicated execute the following command: ***runner\_run\_at-1\_surface\_file\_merge.sh***. | | | |
| 2 | Verify tool executed | * Check that output files were created in the “output\_combined\_surface\_file\_directory”. * Check that all the Surface File names listed in “surface\_file\_list” have corresponding output files in the “output\_combined\_surface\_file\_directory”.   Check that the second comment line in each output file indicates that the correct Surface File directories were used for merging. | |  |
| 3 | Verify data from first time period | Compare Surface Files for the first of the two time periods being merged to the merged output Surface Files. Files should be identical down to the end date of the first time period being merged (except for comment lines that begin with “#”). | |  |
| 4 | Using Excel, compare Surface Files for the second of the two time periods being merged to the merged output Surface Files. Perform this as a spot check on three of the merged output files. | | | |
| 5 | Beginning at the comment line listing the name of the Surface File for the second of the two time periods. | Header lines should be identical. | |  |
| 6 | Compare the Rates | Rate values should be unchanged | |  |
| 7 | Compare Cumulatives | Cumulative values should be increased by the cumulative values for the final time step from the Surface File for the first of the two time periods being merged. | |  |

# Acceptance Test Report

To complete the Acceptance Testing use Appendix A. The test case is described as follows:

* Acceptance Test 1 is in Table A-1. It tests the code by comparing the input surface files to the merged output surface file for the 216-U-10 Pond source.

Details of these tests, when they were conducted, by whom, and if they Passed or Failed are in Appendix A.

# User Guide

Execute the tool as follows:

perl [path\_to\_repository]/tools/ca-mergesurf/ca-merge\_srf.pl surface\_file\_list first\_surface\_file\_directory second\_surface\_file\_directory output\_combined\_surface\_file\_directory

see section 4 for an in-depth explanation of each input.

# Tool Versions

This section details changes incorporated into each version of the **STOMP Surface File Merge** tool.

* 1.0 – Tool was developed.

# Appendix

**Completed Acceptance Test Cases**

This appendix documents the completed acceptance test case, AT-1. The tool runner log is provided followed by the completed test plan.

**Tool Runner Log**

###Executing Merge surfaces##

INFO--05/12/2020 02:45:00 PM--Starting CA-CIE Tool Runner. Logging to "./surface\_merge\_AT-1.log"

INFO--05/12/2020 02:45:00 PM--Code Version: 6a972494db2300f4ada263b11ffd42e5490c9bf1 v2.14: /opt/tools/pylib/runner/runner.py<--1bcfd6779e9cbdb82673405873a8e5e81514ae27

INFO--05/12/2020 02:45:00 PM--Code Version: 0b1c633ddbe15a5c6647952b77f58954abe46cea Local repo SHA-1 has does not correspond to a remote repo release version: ../../CA-CIE-Tools-TestRepos/repo\_ca-merge\_srf.pl/tools/ca-mergesurf/ca-merge\_srf.pl<--49c1cddf67e6bbf12aa2f44928d5a84862fef140

INFO--05/12/2020 02:45:00 PM--QA Status: QUALIFIED : /opt/tools/pylib/runner/runner.py

INFO--05/12/2020 02:45:00 PM--QA Status: TEST : ../../CA-CIE-Tools-TestRepos/repo\_ca-merge\_srf.pl/tools/ca-mergesurf/ca-merge\_srf.pl

INFO--05/12/2020 02:45:00 PM--Invoking Command:"perl" with Arguments:"../../CA-CIE-Tools-TestRepos/repo\_ca-merge\_srf.pl/tools/ca-mergesurf/ca-merge\_srf.pl /home/jmcdonald/CAVE/CA-CIE-Tools-TestEnv/v4-2\_surface\_merge/AT-1/surface\_merge\_files /home/jmcdonald/CAVE/CA-CIE-Tools-TestEnv/v4-2\_surface\_merge/AT-1/xprt-1-rtd/srf /home/jmcdonald/CAVE/CA-CIE-Tools-TestEnv/v4-2\_surface\_merge/AT-1/xprt-1-12070/srf /home/jmcdonald/CAVE/CA-CIE-Tools-TestEnv/v4-2\_surface\_merge/AT-1/xprt-1-merged/srf"

INFO--05/12/2020 02:45:00 PM--Username:jmcdonald Computer:olive Platform:Linux 4.4.0-38-generic #57~14.04.1-Ubuntu SMP Tue Sep 6 17:20:43 UTC 2016

###Finished Process###

| Table A-1  **STOMP Surface File Merge Acceptance Test Plan Case 1** | | | | |
| --- | --- | --- | --- | --- |
| **STOMP Surface File Merge Acceptance Testing**  **CACIE-STOMP Surface File Merge – AT-1** | | | **Date: 5/12/2020** | |
| **Tool Runner Log File Location for this test: OLIVE\\CAVE\CA-CIE-Tools-TestEnv\v4-2\_surface\_merge** | | | **Test Performed By: John McDonald** | |
| **Testing Directory: OLIVE\\CAVE\CA-CIE-Tools-TestEnv\v4-2\_surface\_merge** | | | | |
| **Test Step** | **Test Instruction** | | **Expected Result** | **Test Result  (Pass/Fail)** |
| Navigate to the Testing Directory | | | | |
| 1 | Open a Linux terminal and after navigating to the appropriate directory indicated execute the following command: ***runner\_run\_at-1\_surface\_file\_merge.sh***. | | | |
| 2 | Verify tool executed | * Check that output files were created in the “output\_combined\_surface\_file\_directory”. * Check that all the Surface File names listed in “surface\_file\_list” have corresponding output files in the “output\_combined\_surface\_file\_directory”.   Check that the second comment line in each output file indicates that the correct Surface File directories were used for merging. | | Pass |
| 3 | Verify data from first time period | Compare Surface Files for the first of the two time periods being merged to the merged output Surface Files. Files should be identical down to the end date of the first time period being merged (except for comment lines that begin with “#”). | | Pass |
| 4 | Using Excel, compare Surface Files for the second of the two time periods being merged to the merged output Surface Files. Perform this as a spot check on three of the merged output files. | | | |
| 5 | Beginning at the comment line listing the name of the Surface File for the second of the two time periods. | Header lines should be identical. | | Pass |
| 6 | Compare the Rates | Rate values should be unchanged | | Pass |
| 7 | Compare Cumulatives | Cumulative values should be increased by the cumulative values for the final time step from the Surface File for the first of the two time periods being merged. | | Pass |

# Appendix

**Completed Installation Test**

**Tool Runner Log**

###Executing Merge Surfaces ###

###Executing Fingerprint Tool###

###Finished Process###

###Executing Fingerprint Tool###

###Finished Process###

###Executing Fingerprint Tool###

###Finished Process###

###Executing Merge surfaces##

INFO--05/14/2020 04:58:23 PM--Starting CA-CIE Tool Runner. Logging to "./surface\_merge\_IT-1.log"

INFO--05/14/2020 04:58:23 PM--Code Version: 1971d55618c1397c5653f64a1ffad58a5207c666 v2.15: /opt/tools/pylib/runner/runner.py<--1bcfd6779e9cbdb82673405873a8e5e81514ae27

INFO--05/14/2020 04:58:23 PM--Code Version: 1971d55618c1397c5653f64a1ffad58a5207c666 v2.15: /opt/tools/tools/ca-mergesurf/ca-merge\_srf.pl<--3bd22559a13a49989c0479d4be7bbb1f2dfef1db

INFO--05/14/2020 04:58:23 PM--QA Status: QUALIFIED : /opt/tools/pylib/runner/runner.py

INFO--05/14/2020 04:58:23 PM--QA Status: QUALIFIED : /opt/tools/tools/ca-mergesurf/ca-merge\_srf.pl

INFO--05/14/2020 04:58:23 PM--Invoking Command:"perl" with Arguments:"/opt/tools/tools/ca-mergesurf/ca-merge\_srf.pl /home/slindberg/CAVE/CA-CIE-Tools-TestEnv/CA-CIE-Tools\_v2.X\_install\_tests/ca-surface\_merge/IT-1/surface\_merge\_files /home/slindberg/CAVE/CA-CIE-Tools-TestEnv/CA-CIE-Tools\_v2.X\_install\_tests/ca-surface\_merge/IT-1/xprt-1-rtd/srf /home/slindberg/CAVE/CA-CIE-Tools-TestEnv/CA-CIE-Tools\_v2.X\_install\_tests/ca-surface\_merge/IT-1/xprt-1-12070/srf /home/slindberg/CAVE/CA-CIE-Tools-TestEnv/CA-CIE-Tools\_v2.X\_install\_tests/ca-surface\_merge/IT-1/xprt-1-merged/srf"

INFO--05/14/2020 04:58:23 PM--Username:slindberg Computer:olive Platform:Linux 4.4.0-38-generic #57~14.04.1-Ubuntu SMP Tue Sep 6 17:20:43 UTC 2016

###Finished Process###

###Executing Fingerprint Tool###

###Finished Process###

| Table B-1  **STOMP Surface File Merge Installation Test Plan** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **STOMP Surface File Merge Installation Testing**  **CACIE-STOMP Surface File Merge – IT-1** | | | **Date: 05/14/2020** | | |
| **Tool Runner Log File Location for this test:**  **\\olive\backups\CAVE\CA-CIE-Tools-TestEnv\CA-CIE-Tools\_v2.X\_install\_tests\ca-surface\_merge** | | | **Test Performed By: Sara Lindberg** | | |
| **Testing Directory:  \\olive\backups\CAVE\CA-CIE-Tools-TestEnv\CA-CIE-Tools\_v2.X\_install\_tests\ca-surface\_merge** | | | | | |
| **Test Step** | **Test Instruction** | | **Expected Result** | **Test Result  (Pass/Fail)** | |
| Tools Code Repository Directory: | | | | | |
| Navigate to the testing directory | | | | | |
| 1 | Invoke Tool runner and test the as follows: Open a Linux terminal and after navigating to the appropriate directory indicated  *./runner\_run\_IT-* *1-surface\_file\_merge .sh* | | | | |
| 2 | Verify Tool Runner and tool is invoked and executed. | File “[test\_directoryt]\surface\_merge\_IT-1.log” is generated | | | Pass |
| 3 | Verify tool is invoked and executed | File “[test\_directory]\IT-1\xprt-1-merged\srf\ modflow\_81-54.srf” is generated | | | Pass |

**Appendix C**

**QA Checklist**

