

User Problems Solved in the First Quarter of 2014

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Many User Problems are submitted every year and are solved as time permits. The problems solved in the first quarter are listed and five are summarized.

Background

Eleven new UP (User Problems) have been turned in during the January to March quarter. In that time, nine UP have been solved. UP fall into several categories:

- Input processing failure
- Code execution failure
- Unphysical result
- Requested new feature.

All of the categories are represented in this collection of problems solved, see Table 1. One of the reported problems, UP 14001, does not fit into any of the categories.

Table 1. User Problems solved in the first quarter of 2014

UP	Title / Description	Date Fixed	Author
13049	Restarts with MA18 and PGMRES do not run	1/21	Mesina
14001	Memory Leaks occur in PHISICS/RELAP5-3D coupled run at input	1/21	Mesina
14002	Bulletproofing for Verification File input	1/29	Mesina
14006	Issues with the “all” Option for Strip Files	3/09	Mesina
14007	Machine Binary Plot files strip to all zeroes in ASCII	3/09	Mesina
13097	Unphysical Change in Total Mass	3/14	Anderson
14005	Issue with moving problem input	3/27	Anderson
14011	A machine binary strip fails	3/28	Anderson

In Table 1, the UP number is given in column 1, a description of the problem occurs in column 2, and the date the solution was submitted is in column 3. All of these improvements have gone into internal version 4.2.0 and will be available in the next general code release this summer.

Some Solved User Problems

In this section, a summary of the UP is provided for several of the UP listed above. They are listed by category of UP.

UP 14005 Input Processing Failure

Description: A client is having a code failure when using the moving model. This problem was confirmed to fail on a Linux platform. It will run if you comment out the 2090N00X cards. When you look at the output file, the I-level output for the transient data has garbage values, not those that were input.

Input: The client supplied an input deck, RotationTestError.inp.

Solution: Tracing revealed that an array went out of bounds in subroutine SEARCH.F. Code updates were submitted that prevent the array from exceeding its bounds in the routine. This problem now runs to completion.

UP 13097 Unphysical Result

Description: In running the bubbling steam through liquid problem, mixbub.i, an unphysical step change in the total mass is observed in version 4.1.3. This change was not observed versions previous to 4.1.3. The reason for the change is unknown.

Input: An INL input deck, mixbub.i, reveals the issue.

Solution: Detailed tracing revealed that subtraction of two nearly identical values resulted in a value that was slightly larger than 0.0 ($\sim 1e-17$). This difference caused the code to enter an if-test incorrectly. Adding a line of code to zero out the subtraction if the difference was less than $1e-9$ solves the problem.

UP 13049 Code Execution Failure

A client reported that restarts that use the MA18 and PGMRES solvers fail with a core dump in subroutine TSETSL.

Critical quantities for use in constructing the matrices were not being initialized in TSETSL for these two solvers, therefore. Rewiring the coding initialized these critical quantities. Testing with numerous variations of semi- and nearly-implicit and single and multiple hydro systems and with multiple input cases revealed no other problems. All standard and verification test cases run fine with the update.

UP 14002 New Feature Request

Description: Customer requested several small improvements to the verification programming included input bulletproofing, change of call to enforce final timestep, and changing name of Dump to Kernel.

Input: None supplied, none needed.

Solution: The coding for the changes was written, tested, and submitted.

UP 14001 Memory Leaks

This is an issue on clusters and multi-processor platforms. Memory is lost as the problem runs, chewing up resources. Some memory leaks cause code failure while others do not.

Description: Andrea Alfonsi in INL discovered memory leaks when running RELAP5-3D in conjunction with PHISICS. These occur in RRKINO and RRADHT. For a "large" problem they amount to 1MB to 6MB. No input file was provided, but a line number were supplied.

Input: No input provided for the coupled calculation, just a trace

Solution: In two cases, an allocatable derived type array was tested for allocation and, if it did not exist, was allocated. The lines of code that followed unconditionally allocated components of the derived type. This is an issue when the derived type pre-existed the statements, as may happen on the second case of an input deck, because the component arrays already exist. It is exacerbated in parallel when more than one process may attempt to allocate the derived type components separately as is done when running with PHISICS.