

Selected RELAP5-3D User Problems

***2013 RELAP5 International Users Seminar
September 12-13, 2013
Idaho Falls, ID***

www.inl.gov

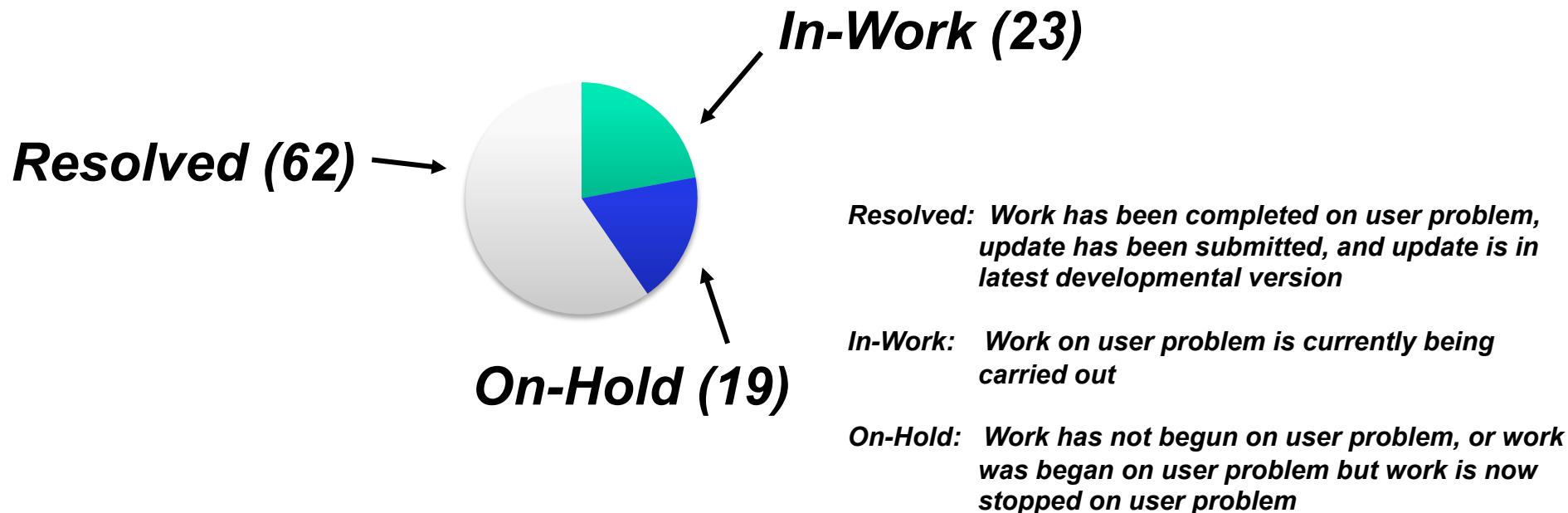


User Problem History

September 2012 – August 2013

104 reported

30 additional older problems were resolved



Selected User Problems

- ***UP# 08035***
- ***UP# 08047***
- ***UP# 12033***
- ***UP# 13006***
- ***UP# 13022***

Problem 08035

- **Symptom:** *The code fails on input if an uncoupled heat structure (i.e. one that does not affect the hydraulics tries to reference another heat structure for its geometry information, presumably because the input geometry (-2) does not equal the geometry of the referenced heat structure (+2).*
- **Root Cause:** *A test on the bit-packing variable 'htopt'*
- **Resolution:** *Resolved. The 24th bit of variable 'htopt' stores the value of the input geometry (i.e. 1, 2, or 3). The 27th bit of variable 'htopt' is set if a heat structure is decoupled from hydrodynamics. The code later tests on the value of variable 'htopt' and because a decoupled structure is set differently, the code sees them as incompatible geometry types. Added a logical variable 'ht_decpl' to be set to true if a heat structure is decoupled. The use of the 27th bit of 'htopt' was then replaced with a test on variable 'ht_decpl'. The value of variable 'htopt' is now the same when they are tested, so the code views them as compatible geometry types and resolves the issue.*

Problem 08047

- **Symptom:** A test problem was developed with the multid component. The downcomer component had 1 ring, 4 sectors, and 6 levels. The geometry was perfectly symmetric except that the flow was provided to only one ring at the top of the downcomer. The outflow connections at the bottom of the downcomer were symmetric. The theta flow at the top level was not symmetric although it should be. When the inlet junction was connected to a theta-face, instead of an r-face, the flow became symmetric.
- **Root Cause:** Incorrect setting of theta velocities.
- **Status:** Resolved. Modified the deck so that there was only 1 axial level – still not symmetric. Found that the upwind velocity for the 4th ring was not set correctly. Corrected the upwind velocity and the flow became symmetric. Connected the inlet flow to the second theta volume – no longer symmetric. Found that due to the structure of subroutine FLUX3D, the 1st theta volume doesn't know about the upwind velocity in theta volume 2. Added an internal subroutine that allowed volume 1 to know about the flow in volume 2. The flow is now symmetric and equivalent regardless of which theta face the flow is attached to.

Problem 12033

- **Symptom:** *A restart problem fails when the capability to control a time-dependent junction with a control variable is added on restart. The traceback points to subroutine IREQUEST.*
- **Root Cause:** *Incorrect handling of the volume orientation.*
- **Status:** *Resolved. The input decks with the failure were unavailable, so tried various configurations to try to get a problem to fail. Was not successful with a time-dependent junction. Tried adding a control variable to control a pump on restart. Altered the cstest1.i and cstest2.i decks and was able to get the failure to occur. Found that some control variable variables were being used before they were allocated on a restart. Modified the coding in internal subroutine REQCNV in IREQUEST so that non-allocated coding could not be accessed. This corrected the issue.*

Problem 13006

- **Symptom:** A continuation of the problem addressed in UP# 08047. The deck used to correct UP# 08047 which was a 4 theta volume problem with 1 level, and 1 ring was modified to have 2 rings. The flow diverged from symmetry after ~25 s.
- **Root Cause:** Round-off error in calculations.
- **Status:** Resolved. Differences were found in the calculation of variables in subroutine PRESEJ. The variables calculated for symmetric volumes are slightly different because of the order of operations. Corrected this issue by storing the calculations in variables sized to real*16, then transferring the values back to real*8 variables at the end of subroutine PRESEJ. This eliminated the observed differences in PRESEJ. Repeated this process for the BPLU solver and subroutine EQFINL. After making these changes, the results are now symmetric for the entire transient problem. This also fixed the differences in various non-symmetric 3D problems. There is some considerable affect on computation time with these changes, so these changes are not made part of the default code. These changes can be accessed using card 1 option 63.

Problem 13022

- ***Symptom: The verification file reveals differences between Vf and Vg from base case to its restart on the first time step after restart. The difference in the hexadecimal digits occurs in the 20th and 21st digits respectively.***
- ***Root Cause: Differences in calculation of variable 'timehy'.***
- ***Status: In-Work. The observed differences are due to small differences in the calculation of variable 'timehy'. A fix has been worked up, but it causes failures with PVM problems, so it hasn't been implemented. This same issue was observed in 13 other user problems.***