TASK COMPLETION REPORT FOR UPDATE FXTPTM

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by

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FOR UPDATE FXTPTM

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ABSTRACT

Update FXTPTM corrects a trip pointer error in subroutine TIMCHK that prevented the trip-initiated, problem-termination feature from functioning in TRAC-P.

1.0. INTRODUCTION

Knolls Atomic Power Laboratory reported that the trip-initiated, problem-termination feature was not functioning in TRAC-P, Version 5.4.15. A listing of the modified input data for the DRAIN standard test problem and the TRCMSG file output was provided that demonstrated that the TRAC-P calculation did not terminate when the problem-termination designated trip's set status was set to ONforward. The assigned task was to investigate and correct this nonfunctioning feature in TRAC-P, Version 5.4.28.

2.0. UPDATE FXTPTM

The cause of the trip-initiated, problem-termination feature not functioning was traced to a misdefined pointer variable in subroutine TIMCHK. When update UNITS programmed TRAC-PF1/MOD2, Version 5.4, to provide SI/English units input/output, all A-array pointer variables for the trip data needed to be shifted to provide additional storage space in the control-parameter data section for control-block and trip-signal, user-defined, units-name labels. The trip pointer variable in subroutine TIMCHK did not have this shift modification done to it by update UNITS, and none of the UNITS test problems exercised this trip-initiated, problem-termination feature. Appendix A shows a listing of update FXTPTM (FiX TriP TerMination) that corrects the definition of this pointer variable in subroutine TIMCHK.

3.0. TESTING

The DRAIN, MARVIK, and ZIONPWR standard test problems were modified to test the trip-initiated, problem-termination feature correction of update FXTPTM. Appendix B shows a listing of portions of their TRACIN files that were modified, and the end portion of their terminal-output listings where the controlling trip, after its set status was set to ONforward, terminated the calculation at the start of the
next timestep. The DRAIN test problem was modified in the same manner as the KAPL test problem. The MARVIK test problem defined two trips where the first trip, when set to ON\textsubscript{forward} at 10 s, only generated a restart data dump; the second trip, when set to ON\textsubscript{forward} at 15 s, generated a restart data dump and terminated the calculation. The ZIONPWR test problem used an existing pump-controlling trip to terminate the calculation when the pump trip's set status was set to ON\textsubscript{forward}. All three of these test problems show that the trip-initiated, restart-dump and problem-termination feature in TRAC-P is now functioning correctly.

4.0. CONCLUSIONS

The trip-initiated, problem-termination feature in TRAC-P, Version 5.4.28 has been fixed by update FXTPTM. The feature was not functioning because update UNITS in TRAC-PF1/MOD2, Version 5.4 did not shift a trip pointer variable in subroutine TIMCHK.

ACKNOWLEDGMENT

The author wishes to thank Richard J. Smith for valuable discussions during the development and testing of this TRAC-P update.
APPENDIX A
Listing of Update FXTPTM

*ident fxtptm
/* ----------------------------------------Update Header Rev. 02-01-96------*/
/*
* File & Update Ident name (must be the same): fxtpt.m
*
* TSHOOTER identifier:
*
* Code developer: Bob Steink Date developed: 6/2/97
* Acknowledgements: KAPL reported this error
* Update reviewer: Date reviewed: 6/xx/97
*
* Update to be applied to MOD2 _X_ or other :
*
* CFS file path: /073417
*
* Purpose of update: Update fxtptm (Fxt Trip Termination) corrects
well a pointer error in subroutine TIMCHK that
prevented a trip when set ON from terminating
a TRAC-P calculation.
*
* Basis for update: A designated trip for terminating a TRAC-P
calculation did not terminate the calculation
when its set status changed from OFF to ON.
*
* Dependencies on other updates: none
*
* Justification of non-ANSI coding: N.A.
*
* Is this a NULL update? YES ___ NO X_
*
* Does this update generate new unit labels? YES ___ NO X_
* If yes, path and /name of LABNEW file: N.A.
*
* Does the TRAC I/O change because of this update? YES ___ NO X_
* TRAC I/O includes input, dump, output, and graphics files. If
* yes, then submit the necessary manual changes.
*
* Does this change require that any of the TRAC support codes, e.g.
* EXTRACT, GOCNVRT, or EXCON, be changed? YES ___ NO X_
* If yes, then include a description of the necessary changes.
* This description will be passed onto the custodian of the TRAC
* support codes.
*
change because of this update? YES ___ NO X_
* If yes, then submit the necessary manual changes.
*
* NAME OF
* SUBROUTINE
* OR COMDECK
* CHANGED DESCRIPTION OF CHANGE
*
* TIMCHK A pointer variable definition is corrected.
*-----------------------------------------------------------
*
*/ subroutine timchk changes
*delete ifrd.628
l = 1cnt1 + 10 + 6 * ia(1cntl+5) + 7 * ia(1cntl+1) + 17 * ia(1cntl+2) + ia(1cntl+3) 
   + 6 * ia(1cntl+2) + ia(1cntl+4) + 5 * ia(1cntl+5) - 80

*compile timchk
*/
APPENDIX B

Portions of the TRACIN File and Terminal Listings
From the DRAIN, MARVIK, and ZIONPWR Test Problems

DRAIN test problem - changed ntrp=0 to 1 on line 74
and added lines 90 to 112 in file DRAININ

71 *  oitmax  sitmax  isolut  ncontr  nccfl
72  10  10  0  0  0
73 *  ntsv  ntcb  ntcf  ntrp  ntcp
74  1  0  0  1  1
75 *
76  ********************************************
77 * component-number data *
78  ********************************************
79 *
80 * iorder*  700  701  702e
81 *
82  ********************************************
83 * control-parameter data *
84  ********************************************
85 *
86 * signal variables
87 *  idsv  isvn  ilcn  icnl  icn2
88  1  0  0  0  0
89 *
90 * trips
91 *
92 *  ntse  ntct  ntsf  ntdp  ntsd
93  0  0  0  1  0
94 *
95 *  idtp  isrt  iset  itst  idsg
96  220  2  0  1  1
97 *  setp(1)  setp(2)
98  -1.0000e+00  1.2000e+02
99 *  dtsp(1)  dtsp(2)
100  0.0000e+00  0.0000e+00
101 *  ifsp(1)  ifsp(2)
102  0  0
103 *
104 *  ndmp  trip id 220 should cause trac-p to terminate
105  1
106 *  idmp
107  -220
108 *
109 * This input is -abs(220) = - the absolute value of the trip id. If
110 * the absolute value is made negative, the trip initiates a problem
111 * termination (which we want) after generating a restart dump.
112 *
113  ********************************************
114 * component data *
115  ********************************************

End of terminal output from test problem DRAININ

1897  90.268514  0.100000  2
1900  90.568514  0.100000  2  0.1340  0.0000  1  700  6
at 120.000000 s, the trip 220 signal crossed setpoint s2 = 1.200000E+02 *
at 120.068514 s, the trip 220 signal is 1.200685E+02 *
at 120.068514 s, trip 220 is reset from 0 to 1 with a set status of on-forward
restart dump generated at problem time 120.168514 s after 2196 time steps

computative timing statistics

cpu time is s

Note: IEEE floating-point exception traps enabled:
overflow; division by zero; invalid operation;
See the Numerical Computation Guide, ieee_handler(3M)
MARVIK test problem - changed ntsv=0 to 1 and ntrp=0 to 2 on line 91 and added lines 99 to 137 in file MARVIKIN

88 * oitmax sitmax isolut ncontr nccfl
89 30 80 0 0 0
90 * ntsv ntcb ntcf ntrp ntcp
91 1 0 0 2 0
92 *
93 ********************************************
94 * component-number data *
95 ********************************************
96 *
97 * iorder* 1 2 3 4e
98 *
99 ********************************************
100 * signal variable *
101 ********************************************
102 *
103 * ids v isvn ilcn icn12 icn2
104 1 0 0 0 0
105 *
106 ********
107 * trips *
108 ********
109 *
110 * ntse ntct ntsf ntdp ntsd
111 0 0 0 2 0
112 *
113 * idtp isrt iset itst ids g
114 1 2 0 1 1
115 * setp(1) setp(2)
116 0.0000e+00 1.0000e+01
117 * dtsp(1) dtsp(2)
118 0.0000e+00 0.0000e+00
119 * ifsp(1) ifsp(2)
120 0 0
121 *
122 * idtp isrt iset itst ids g
123 2 2 0 1 1
124 * setp(1) setp(2)
125 0.0000e+00 1.5000e+01
126 * dtsp(1) dtsp(2)
127 0.0000e+00 0.0000e+00
128 * ifsp(1) ifsp(2)
129 0 0
130 *
131 * two trips - trip id 1 is set on at 10 s to generate a restart data dump and trip id 2 is set on at 15 s to generate a restart data dump and terminate the calc.
132 *
133 * ndmp
134 2
135 * idmp(1) idmp(2)
136 1 -2
137 *
138 ********************************************
139 * component data *
140 ********************************************
End of terminal output from test problem MARVIKIN

input data is being processed

h2o properties are used

restart dump generated at problem time \(0.000000\) s after \(0\) time steps

minimum maximum time long graphics dump short
step (s) step (s) end (s) step (s) step (s) step (s) step (s)
\(1.000E-03\) \(1.000E+00\) \(1.000E-01\) \(1.000E-01\) \(1.000E-01\) \(1.000E-01\) \(1.000E-01\)
convective energy-error controller is \(1.0000E+20\) w

<table>
<thead>
<tr>
<th>time-step</th>
<th>problem</th>
<th>time-step</th>
<th>outer-it.</th>
<th>cpu</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>time (s)</td>
<td>size (s)</td>
<td>number</td>
<td>time (s)</td>
</tr>
<tr>
<td>1</td>
<td>0.001000</td>
<td>0.001000</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.002050</td>
<td>0.001050</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.003153</td>
<td>0.001103</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.004310</td>
<td>0.001158</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.005526</td>
<td>0.001216</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

restart dump generated at problem time \(0.101200\) s after \(38\) time steps

minimum maximum time long graphics dump short
step (s) step (s) end (s) step (s) step (s) step (s) step (s)
\(1.000E-03\) \(1.000E+00\) \(5.600E+01\) \(5.000E+00\) \(5.000E-01\) \(1.000E+01\) \(1.000E+00\)
convective energy-error controller is \(1.0000E+20\) w

<table>
<thead>
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<th>outer-it.</th>
<th>cpu</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>time (s)</td>
<td>size (s)</td>
<td>number</td>
<td>time (s)</td>
</tr>
<tr>
<td>13</td>
<td>1.122178</td>
<td>0.053215</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>2.217262</td>
<td>0.105362</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>3.273677</td>
<td>0.155667</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>4.385453</td>
<td>0.208609</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>5.329539</td>
<td>0.253565</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>124</td>
<td>6.477082</td>
<td>0.308210</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>128</td>
<td>7.790086</td>
<td>0.340010</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>131</td>
<td>8.935421</td>
<td>0.400549</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>134</td>
<td>10.261289</td>
<td>0.463686</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

restart dump generated at problem time \(10.261289\) s after \(134\) time steps

at \(10.000000\) s, the trip \(1\) signal crossed setpoint \(s2 = 1.000000E+01\)*
at \(10.261289\) s, the trip \(1\) signal is \(1.026129E+01\)*
at \(10.261289\) s, trip \(1\) is reset from \(0\) to \(1\) with a set status of on-forward

<table>
<thead>
<tr>
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<th>problem</th>
<th>time-step</th>
<th>outer-it.</th>
<th>cpu</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>time (s)</td>
<td>size (s)</td>
<td>number</td>
<td>time (s)</td>
</tr>
<tr>
<td>135</td>
<td>10.748160</td>
<td>0.486870</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

restart dump generated at problem time \(10.748160\) s after \(135\) time steps
at 15.000000 s, the trip 2 signal crossed setpoint $s_2 = 1.500000E+01$

at 15.521944 s, the trip 2 signal is $1.552194E+01$

at 15.521944 s, trip 2 is reset from 0 to 1 with a set status of on-forward

restart dump generated at problem time 16.068849 s after 145 time steps
end of problem

cpu time is

Note: IEEE floating-point exception traps enabled:
  - overflow; division by zero; invalid operation;
  See the Numerical Computation Guide, ieee_handler(3M)

castor:/export/castor1/rgs/trac> mv trcout marvikout

**ZIONPWR test problem** - changed ntdp=0 to 1 on line 1444
  and added lines 1467 to 1471 in file ZIONPWRIN
1467 * ndmp terminate the calculation when trip id 1 is set on
1468 1
1469 * idmp
1470 -1
1471 *
1472 ******************
1473 * component data *
1474 ******************

End of terminal output from test problem ZIONPWRIN

time-step problem time-step outer-it. cpu courant numbers sets location
number time (s) size (s) number time (s) 1-d 3-d flag cmp cell
5 0.005000 0.001000 2

minimum maximum time long graphics dump short
time domain data to be used
domain edit edit edit edit
step (s) step (s) end (s) step (s) step (s) step (s) step (s)
1.000E-03 2.500E-01 2.000E+01 2.100E+01 5.000E-01 2.100E+01 2.100E+01

convective energy-error controller is 1.0000E+20 w

at 3.894929 s, the trip 1 signal crossed setpoint sl = 5.505000E+02 k
at 4.071032 s, the trip 1 signal is 5.504990E+02 k

at 4.071032 s, trip 1 is reset from 0 to 1 with a set status of on-forward

restart dump generated at problem time 4.275034 s after 121 time steps

time-step problem time-step outer-it. cpu courant numbers sets location
number time (s) size (s) number time (s) 1-d 3-d flag cmp cell
121 4.275034 0.204002 1

end of problem

cpu time is s

Note: IEEE floating-point exception traps enabled:
  overflow; division by zero; invalid operation;

B-6
See the Numerical Computation Guide, ieee_handler(3M)
castor:/export/castor1/rgs/trac> mv trcout zionpwroit