BUG REPORT

December 14, 2016

On the bug of the Fortran/C/C++ compiler

The execution result malfunction was detected by executable created by
Technical Computing Suite Fortran/C/C++ Compiler for FX100.

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[PH11970]

1. Phenomena and Occurrence conditions
   Abnormal termination at execution time or unexpected execution result may
   be caused at the following conditions.

  1) All the following compiler options are valid. Or the equivalent
     optimization control specifier mfunc(2) or mfunc(3) to 1-2) is valid.
     1-1) -O2 or higher (*1)
     1-2) -Kmfunc=2 or -Kmfunc=3 (*2)
     1-3) -Ksimd(*3)
  2) The source program includes nested loops.
  3) The initial or terminate value of loop control variable of the innermost
     loop and its outer loop included in nested loops in 2) is not constant.
  4) The innermost loop of 3) includes exponentiation or the following
     intrinsic functions converted to multi-operation functions. (*4)
        asin, acos, atan, atan2, erf, erfc, exp, exp10, log, log10, sin, cos
  5) Either of the following conditions are met.
     5-1) The actual arguments of multi-operation function of 4) meet either of
          the following conditions.
        5-1a) The actual arguments are scalar expressions including the control
              variable of the innermost loop.
        5-1b) The actual arguments are updated before calling the multi-operation
              function in the same loop.
     5-2) An array, which is assigned the result of calling multi-operation
          function, meets either of the following conditions.
        5-2a) The array is not accessed sequentially.
        5-2b) The array is referred after calling the multi-operation function
              in the same loop.
  6) SIMD conversion is applied to the loop of 4). (*5)

  *1: Compiler option -Kfast induces -O3.
  *2: If the level of -Kmfunc is omitted, -Kmfunc=1 is induced.
  *3: Compiler option -O2 or higher induces -Ksimd.
  *4: Compiler message jwd8300o-i shows the conversion to multi-operation
     function is applied.
  *5: Compiler messages jwd6001s-i, jwd6002s-i, jwd6004s-i and jwd6007s-i show
     that SIMD conversion is applied.

  <Example codes>
    [5-1a]
      do j=1,nj
        do i=1,ni
          ... = sin(float(i))
        end do
      end do

```
[5-1b]
  do j=1,nj
    do i=1,ni
      b(i,j) = ...
      ...    = sin(b(i,j))
    end do
  end do

[5-2a]
  do i=1,ni
    do j=1,nj
      a(i,j) = sin(....)
    end do
  end do

[5-2b]
  do j=1,nj
    do i=1,ni
      a(i,j) = sin(....)
      ....   = a(i,j)+1.0
    end do
  end do
```

2. Language
  Fortran/C/C++

3. Cause
  Optimization of SIMD mode(*) set instruction was incorrect.
  This bug occurred because of the influence of bug fix number PH09923 of
  Technical Computing Suite V2.0L20(T01776-01).
  By the influence of this bug, SIMD extension instructions in the
 multi-operation functions that had to be executed by 2-wide SIMD was
 executed by 4-wide SIMD, and abnormal termination at execution time or
 unexpected execution result might occur.

  *: 2-wide SIMD or 4-wide SIMD.

4. Possible preventive measures
  This bug can be avoided by either of the following ways.
    a) Specify the compiler option -Knomfunc or -Kmfunc=1.
    b) Specify the compiler option -Kocl. And,
       specify the optimization control specifier nomfunc or mfunc(1)
      to the loops.

5. Classification of detections
  This bug was detected in the field (JAXA).

6. Scope of influence
  This is the bug of the Fortran/C/C++ compilers included in the following
  product.
    - Technical computing Suite V2.0L20 T01776-01 (FX100)
      * Other products (except FX100) do not meet.

7. Correction delivery schedules
  The emergency fix for Technical Computing Suite V2.0L20 (for FX100)
  will be provided on around the middle of January 2017.

8. Check tool
  Check tool delivery is scheduled on December 21, 2016.
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