To our customers,

Old Company Name in Catalogs and Other Documents

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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)
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Attached is the description of the detected bug information in Ver. 8 series of the SuperH RISC engine C/C++ Compiler.

The bug will affect this package version.

Attached: P0700CAS8-040518E
SuperH RISC engine C/C++ Compiler Ver. 8  The details of the detected bug information (2)
SuperH RISC engine C/C++ Compiler Ver.8
The details of the detected bug information (2)

The bugs detected in the ver. 8 of the SuperH RISC engine C/C++ Compiler is shown below.

1. Illegal Copy Propagation
[Description]
When a copy instruction existed in a block with multiple branch sources, the copy instruction might be illegally eliminated.

[Example]
```c
int func(int *x) {
    int ret=0;
    while(*x++){
        if(*x==1){
            ret+=2;
        }
    }
    return (ret+2);
}
```

```
_func:
MOV  #0,R5   ; Illegally eliminated the copy instruction and converted R7 to R5
L11:
    MOV.L  @R4,R2
    ADD  #4,R4
   ; *1 Illegally eliminated MOV R7.R5
    TST  R2,R2
    ADD  #2,R5
    BT  L13
    MOV.L  @R4,R0
    CMP/EQ  #1,R0
    BT  L11
    BRA  L11
   ; *2 By *3, BF L11 was converted
    NOP   ; *3 Illegally eliminated MOV R5.R7
L13:
    RTS
    MOV  R5,R0
```

[Conditions]
This problem might occur when all of the following conditions were fulfilled.

(1) The optimize=1 option was specified.
(2) A conditional statement was described.
(3) A copy instruction existed in a block with multiple branch sources (*1 in the above example).
(4) The block of the branch sources in (3) had a path with no definition of the copy source register (R7 in the above example) for the copy instruction (in the example, the path branching from *2 to L11).

[Solution]
This problem can be prevented by the following method.

(1) Specify optimize=0.
2. Illegal Elimination of Unnecessary Expressions

[Description]
If a then or else clause of a conditional statement had an assignment expression and another assignment expression, of which the both sides had the same variable, follows the said expression, the conditional statement might be illegally eliminated.

[Example]
```c
int x;

void f(int y){
    if (y>=256) { /* Illegal elimination */
        x=0; /* *1 */
    }
    x=x; /* *2 Eliminated the assignment expression that had the same variable in both sides */
    x++;
}

void f(int y){
    x=0;
    x++; /* Propagated x=0 */
}

void f(int y){
    x=1;
}
```

[Conditions]
This problem might occur when all of the following conditions were fulfilled.
1. The optimize=1 option was specified.
2. A conditional statement was described.
3. A then or else clause of the conditional statement of (2) had an assignment expression (*1 in the above example).
4. An assignment expression, in which the both sides had the same variable as the variable assigned to in (3), followed the conditional statement of (2) (*2 in the above example).

[Solution]
This problem can be prevented by either of the following methods.
1. Specify optimize=0.
2. Specify opt_range=noblock.
3. Illegal Access with a Parameter Passed via the Stack

[Description]
If a function with the parameter passed via the stack had a function call immediately before the exit, an address for reference to a parameter passed via the stack might be incorrect when the speed option was specified.

[Example]
```c
typedef struct {
  int x;
} ST;
extern void g(ST *x);
void f(int a, ST b) { /* b was a parameter passed via the stack */
  if (a) {
    g(&b);
    /* (A) */
  }
  /* (B) */
}
```

Address where parameter b was stored at the function entry = R15

```
_TST   R4, R4
BT     L12
MOV    R15, R4
MOV.L  L14, R2 ; _g
JMP    @R2 ; (A)
ADD    #4, R4 ; R4 ← R15+4 : Not the address of b
L12:
RTS    ; (B)
NOP
```

[Conditions]
This problem might occur when all of the following conditions were fulfilled.

(1) The optimize=1 option was specified.
(2) The speed option was specified.
(3) The function had a parameter passed via the stack (b in the above example).
(4) The function had multiple exits ((A) and (B) in the above example).
(5) There was a function call immediately before any of the exits in (4) (g(&b); in the above example).
(6) (5) was the only function call in this function.

[Solution]
This problem can be prevented by one of the following methods.

(1) Do not specify the speed option.
(2) Specify optimize=0.
(3) Insert a nop() built-in function after the function call.
(4) Insert a dummy function call in the function and specify the noinline option.
4. Incorrect GBR Relative Logic Operation

[Description]
If a logic operation with a 1-byte array or a bit-field member for which #pragma gbr_base/gbr_base1 was specified was performed, the result of the operation might be written to an incorrect area.

[Example]
```c
#pragma gbr_base a,b
c char a[2],b[2];
void f() {
    a[0] = b[0] & 1;
}

MOV   #_b- (STARTOF $G0),R0
RTS
AND.B #1,8(R0,GBR) ; Wrote the result of the operation to b[0]
```

[Conditions]
This problem might occur when all of the following conditions were fulfilled.
(1) The gbr=user option was specified.
(2) #pragma gbr_base/gbr_base1 was specified for any of the following variables:
   - An (unsigned) char-type array
   - A structure array that has an (unsigned) char-type member
   - A structure that has an (unsigned) char-type array member
   - A structure that has a bit-field member of 8 bits or less
(3) A logic operation of a constant (&, |, ^) with the variable of (2) (b[0] in the above example) was performed.
(4) The variable assigned to by the operation of (3) (a[0] in the above example) fulfilled the condition of (2).
(5) Variables of (3) and (4) were different variables, different elements of the same array, or different members of the same structure.

[Solution]
This problem can be prevented by one of the following methods.
(1) Cancel specification of #pragma gbr_base/gbr_base1.
(2) Specify gbr=auto (outputs a warning and invalidates #pragma gbr_base/gbr_base1).
(3) Assign the result of the operation to a temporary variable for which volatile has been specified.
Example:
```c
void f() {
    volatile char temp;
    temp = b[0] & 1;
    a[0] = temp;
}
```
5. Illegal Elimination of Sign/Zero Extension

[Description]
If the address of a variable/constant or the index of an array was cast to 1 or 2 bytes and this value was used for accessing memory, or the expression which was cast to a char type was assigned to an unsigned short type variable and the result was used for comparison, the cast might be illegally eliminated.

[Example 1]
```c
unsigned short x;
char a[1000];

void f () {
    a[(char)x] = 0;
}
```

```assembly
  MOV.L  L11+2,R2  ; _x
  MOV.L  L11+6,R6  ; _a
  MOV.W  @R2,R5  
  EXTU.B  R5,R0 
  MOV  #0,R5  ; H'00000000
  RTS  
  MOV.B  R5,@(R0,R6) ; When x was not within the range of 0 to 127, an incorrect address might be referred to.
```

[Example 2]
```c
unsigned short sc0;
unsigned int b;

func1() {
    unsigned short us1;
    us1 = (char)b
    return(us0 !=us1);
}
```

```assembly
  MOV.L  L11,R2  ; _b
  MOV.L  L11+4,R5  ; _us0
  MOV.W  @R2,R6  
  EXTS.B  R6,R2  
  MOV.W  @R5,R6  
  EXTU.W  R6,R5  
  CMP/EQ  R2,R5  ; (char)b was not cast to an unsigned short type and was used in comparison.
  MOVT  R0
  RTS
  XOR  #1,R0
```

[Conditions]
This problem might occur when all of the following conditions were fulfilled.
1. The optimize=1 option was specified.
2. One of the following conditions (a)(b) was fulfilled.
   a-1) The address of a variable/constant or the index of an array was explicitly cast to 1 or 2 bytes, or this function had a char/short type temporary parameter and the parameter was used only in the index of an array.
   a-2) The value of (a-1) was used for accessing memory.
   b-1) The expression which was cast to a char type was assigned to an unsigned short type variable.
   b-2) The variable of (b-1) was used for comparison.

[Solution]
This problem can be prevented by one of the following methods.
1. Specify optimize=0.
2. If the condition (2)(b) is fulfilled, declare the unsigned type variable of (b-1) as volatile.