Vinh Khoa Ton October 25, 2014

A Cube: Perform A³

Calculate A³ where A is an 8-bit unsigned variable. The result is placed into 24-bit variable C. The 24-bit result is saved using little endian byte ordering.

 $C2:C1:C0 = A^3$

Simulation of the multiplication problem 50³. The answer should equal 125,000 (0x2625A0).

```
Name
                                                                                 Value
                                                                                             Type
                                                                                                               Location
A_Cubed:
                                                                                 50 '2'
                                                                      Α
                                                                                             SRAM Location
                                                                                                               0x0100
    1ds
          r26,A
                    : load
                                                                                 0x00 ''
    mul
                                                                      C
                                                                                             SRAM Location
                                                                                                               0x0101
         r26,r26
    movw r25:r24, r1:r0
    rcall muls16x8_24
                                                                   Memory
          C,r2
                    ; least significant byte (little end)
          C+1,r3
                    ; most significant byte (big end)
                                                                                       8/16 abc.
          C+2, r4
                                                                   000100 32 00 00 00 00 00 00 00 00 00
                                                                   00010A 00 00 00 00 00 00 00 00 00
    rjmp A_Cubed
                                                                   00011F 00 00 00 00 00 00 00 00 00
```

Figure 1: Start of program with A initialized to 0x32 (50_{10}) by double click on variable A on the Watch and enter "50"

```
.CSEG
                                                                    Watch
                                                                    Name
                                                                                  Value
                                                                                              Type
                                                                                                                Location
A_Cubed:
                                                                                  50 '2'
                                                                                              SRAM Location
                                                                                                                 0x0100
                    ; load
    lds
         r26,A
                                                                                  0x48 'H'
                                                                                              SRAM Location
         r26,r26
    m11 1
    movw r25:r24, r1:r0
    rcall muls16x8_24
                                                                    Memory
                    ; least significant byte (little end)
         C,r2
    sts
         C+1,r3
                                                                                        8/16 abc.
                                                                                                     Address: 0x100
    sts
                    ; most significant byte (big end)
                                                                    Data
    sts C+2, r4
                                                                   000100 32 48 00 00 00 00 00 00 00 00
                                                                   00010A 00 00 00 00 00 00 00 00 00 00
    rjmp A_Cubed
                                                                   000114 00 00 00 00 00 00 00 00 00 00
```

Figure 2: After performing calculation of A 3 (by performing A 2 with command "mul r26, r26" and A 2 *A with subroutine muls16x8_24), result of C0 is 0x48

```
.CSEG
                                                                    Watch
                                                                     Name
                                                                                  Value
                                                                                               Type
                                                                                                                 Location
A_Cubed:
                                                                                  50 '2'
                                                                                              SRAM Location
                                                                                                                 0x0100
    lds
          r26,A
                                                                                  0x48 'H'
                                                                                              SRAM Location
                                                                                                                 0x0101
    mul r26,r26
    movw r25:r24, r1:r0
    rcall muls16x8_24
                                                                    Memory
          C,r2
                    ; least significant byte (little end)
          C+1,r3
    sts
                     ; most significant byte (big end)
                                                                    Data
                                                                                     ▼ 
                                                                                        8/16 abc.
                                                                                                     Address: 0x100
    sts
          C+2, r4
                                                                    000100 32 48 E8 00 00 00 00 00 00 00
                                                                    00010A 00 00 00 00 00 00 00 00 00
    rjmp A_Cubed
                                                                    000114 00 00 00 00 00 00 00 00 00 00
```

Figure 3: Result of C1 is 0xE8

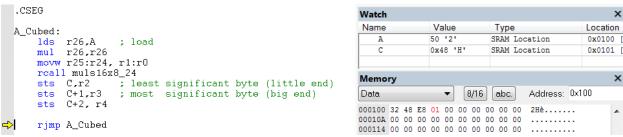


Figure 4: Result of C2 is 0x01. End of program with the result is $0x01E848(125,000_{10})$ containing in C2:C1:C0.