Zach Dubinsky

CSC-270

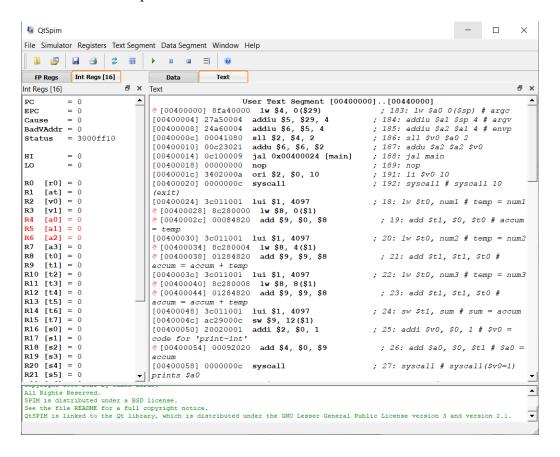
Prof.Rieffel

2/7/22

Lab 5

I affirm that all included work is my own in accordance with the class syllabus and the Union College Honor Code. [Signed: Zachary Dubinsky, 2/7/22]

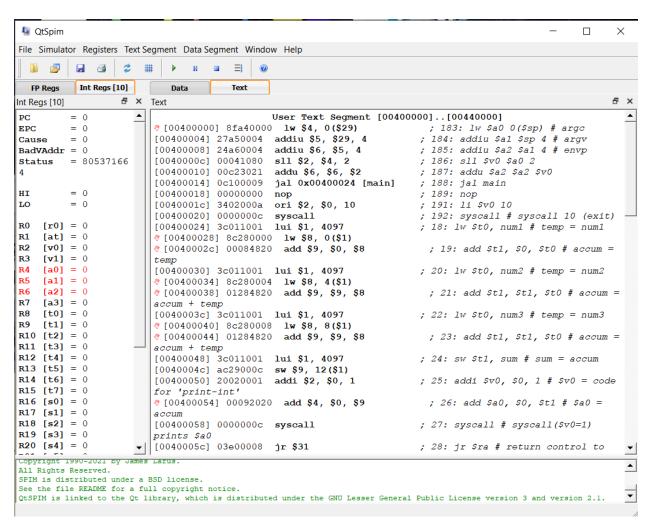
 The first image shows QtSpim with my sum.asm code loaded. All eight breakpoints are marked on this image, and screenshots of the register at each one are included below. The console output was 258.

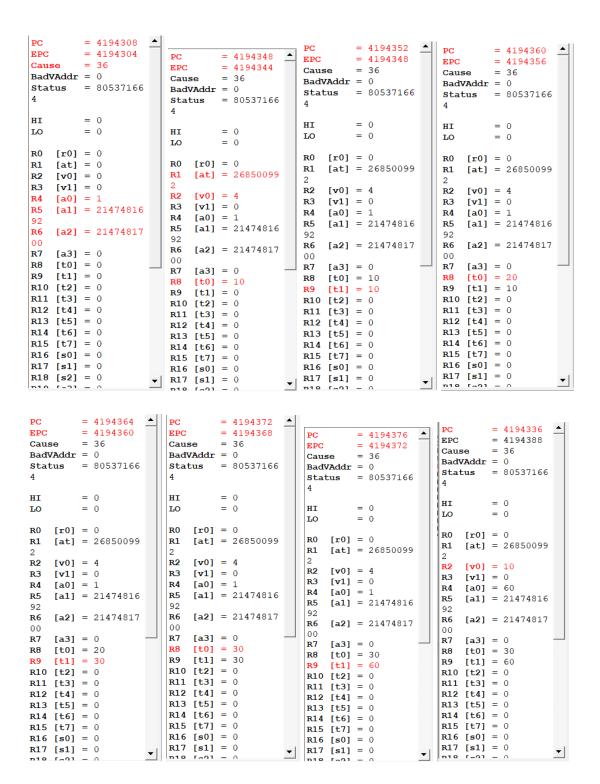


```
PC
                                     = 4194308
                                                         PC
                                                                  = 4194348
PC:
                                     = 4194304
                            EPC
                                                                                      PC
                                                                                               = 4194352
                                                         EPC
                                                                  = 4194344
EPC
         = 0
                            Cause
                                     = 36
                                                                                      EPC
                                                                                              = 4194348
                                                         Cause
                                                                 = 36
        = 0
Cause
                            BadVAddr = 0
                                                                                              = 36
                                                         BadVAddr = 0
                                                                                      Cause
BadVAddr = 0
                            Status = 805371664
                                                                                      BadVAddr = 0
                                                         Status
                                                                 = 805371664
Status = 3000ff10
                                                                                      Status = 805371664
                                     = 0
                                                                  = 0
                                                         ΗI
         = 0
нт
                            LO
                                     = 0
                                                                                      ні
                                                                                              = 0
                                                                  = 0
                                                        T<sub>1</sub>O
LO
         = 0
                                                                                               = 0
                                                                                      LO
                            R0 [r0] = 0
                                                         R0
                                                             [r01 = 0]
R0
    [r0] = 0
                                                                                      R0 [r0] = 0
                            R1 [at] = 0
                                                             [at] = 268500992
                                                         R1
R1
    [at] = 0
                                                                                      R1 [at] = 268500992
                            R2 [v0] = 0
                                                         R2
                                                             [v0] = 4
    [\mathbf{v}0] = 0
                                                                                          [v0] = 4
                            R3
                               [v1] = 0
                                                                                      R2
                                                         R3
                                                             [v1] = 0
R3
    [v1] = 0
                                                                                      R3
                                                                                          [v1] = 0
                               [a0] = 1
                                                         R4
                                                             [a0] = 1
    [a0] = 0
R4
                                                                                          [a01 = 1]
                                                                                     R4
                            R5
                                [a1] = 2147481692
                                                             [a1] = 2147481692
R5
    [a1] = 0
                                                                                      R5
                                                                                          [a11] = 2147481692
                               [a2] = 2147481700
                            R6
                                                         R6
                                                             [a2] = 2147481700
    [a21 = 0]
R6
                                                                                     R6 [a2] = 2147481700
                            R7 [a3] = 0
                                                             [a3] = 0
                                                         R7
    [a31 = 0]
                                                                                     R7 \quad [a3] = 0
R7
                           R8 [t0] = 0
                                                         R8
                                                             [t0] = 17
                                                                                     R8 [t0] = 17
   [t0] = 0
R8
                            R9 [t1] = 0
                                                             [t1] = 0
                                                         R9
                                                                                          [t11] = 17
R9 [t1] = 0
                                                                                      R9
                            R10 [t2] = 0
                                                         R10 [t2] = 0
                                                                                     R10 [t.2] = 0
R10 [t2] = 0
                            R11 [t3] = 0
                                                         R11 [t3] = 0
                                                                                     R11 [t3] = 0
R11 [t3] = 0
                            R12 [t4] = 0
                                                         R12 [t4] = 0
R12 [t4] = 0
                                                                                     R12 [+41 = 0
                            R13 [t5] = 0
                                                         R13 [t5] = 0
                                                                                     R13 [t5] = 0
R13 [t5] = 0
                            R14 [t6] = 0
                                                         R14 [t6] = 0
                                                                                     R14 [t6] = 0
R14 [t6] = 0
                            R15 [t7] = 0
                                                         R15 [t7] = 0
                                                                                     R15 [t7] = 0
R15 [t7] = 0
                            R16 [s0] = 0
                                                         R16 [s0] = 0
                                                                                     R16 [s0] = 0
R16 [s0] = 0
                            R17 [s1] = 0
                                                         R17 [s1] = 0
                                                                                      R17 [s1] = 0
R17 [s1] = 0
                            R18 [s2] = 0
                                                         R18 [s2] = 0
                                                                                      R18 [s2] = 0
R18 [s2] = 0
                            R19 [s3] = 0
                                                         R19 [s3] = 0
                                                                                      R19 [s3] = 0
R19 [s3] = 0
                            R20 [s4] = 0
                                                         R20 [s4] = 0
                                                                                      R20 [s4] = 0
R20 [s4] = 0
                            R21 [s5] = 0
                                                        R21 [s5] = 0
                                                                                     R21 [s5] = 0
R21 [s5] = 0
```

```
▲ PC
                                   = 4194364
                                                                = 4194372
         = 4194360
                                                       PC
PC
                                                                                    PC
                                                                                             = 4194376
                                   = 4194360
                          EPC
                                                        EPC
                                                                = 4194368
EPC
         = 4194356
                                                                                    EPC
                                                                                             = 4194372
                           Cause
                                   = 36
                                                        Cause
                                                                 = 36
Cause
        = 36
                                                                                    Cause
                                                                                             = 36
                           BadVAddr = 0
                                                       BadVAddr = 0
BadVAddr = 0
                                                                                    BadVAddr = 0
                          Status = 805371664
                                                       Status
                                                                 = 805371664
        = 805371664
Status
                                                                                    Status = 805371664
                          ΗI
                                    = 0
                                                                 = 0
         = 0
                                                       HΙ
                                                                                              = 0
                                    = 0
                          LO
                                                       LO
                                                                 = 0
         = 0
LO
                                                                                              = 0
                                                                                    LO
                          R0
                              [r0] = 0
                                                       R0
                                                            [r0] = 0
R0
    [r0] = 0
                                                                                    \mathbf{R0} \quad [\mathbf{r0}] = 0
                          R1
                              [at] = 268500992
                                                            [at] = 268500992
    [at] = 268500992
                                                       R1
                                                                                       [at] = 268500992
R1
                                                                                    R1
                          R2
                               [v01 = 4]
                                                       R2
                                                            [\mathbf{v}0] = 4
    [\mathbf{v}0] = 4
R2
                                                                                    R2
                                                                                       [v0] = 4
                          R3
                               [v1] = 0
    [v1] = 0
                                                       R3
                                                            [v1] = 0
R3
                                                                                    R3 [v1] = 0
                          R4
                               [a0] = 1
R4
    [a0] = 1
                                                       R4
                                                            [a0] = 1
                                                                                    R4 [a0] = 1
                               [a1] = 2147481692
    [a1] = 2147481692
                          R5
                                                       R5
                                                            [a1] = 2147481692
                                                                                    R5 [a1] = 2147481692
R5
                          R6
                               [a2] = 2147481700
                                                       R6
                                                            [a2] = 2147481700
R6
    [a21 = 2147481700]
                                                                                    R6 [a2] = 2147481700
                               [a3] = 0
                          R7
                                                            [a31 = 0]
R7
    [a3] = 0
                                                       R7
                                                                                    R7 [a3] = 0
                               [t0] = -35
                          R8
    [t0] = -35
                                                       R8
                                                            [t0] = 276
                                                                                    R8 [t0] = 276
R8
                          R9
                               [t1] = -18
R9
    [t1] = 17
                                                       R9
                                                            [t1] = -18
                                                                                    R9 [t1] = 258
                          R10 [t2] = 0
                                                       R10 [t2] = 0
                                                                                    R10 [t2] = 0
R10 [t2] = 0
                          R11 [t3] = 0
R11 [t3] = 0
                                                       R11 [t3] = 0
                                                                                    R11 [t3] = 0
                          R12 [t4] = 0
R12 [t4] = 0
                                                       R12 [t4] = 0
                                                                                    R12 [t4] = 0
R13 [t5] = 0
                         - R13 [t5] = 0
                                                       R13 [t5] = 0
                                                                                    R13 [t5] = 0
                          R14 [t6] = 0
R14 [t6] = 0
                                                       R14 [t6] = 0
                                                                                    R14 [t6] = 0
R15 [t7] = 0
                          R15 [t7] = 0
                                                       R15 [t7] = 0
                                                                                    R15 [t7] = 0
R16 [s0] = 0
                          R16 [s0] = 0
                                                                                    R16 [s0] = 0
                                                       R16 [s0] = 0
                          R17 [s1] = 0
R17 [s1] = 0
                                                       R17 [s1] = 0
                                                                                    R17 [s1] = 0
R18 [s2] = 0
                          R18 [s2] = 0
                                                                                    R18 [s2] = 0
                                                       R18 [s2] = 0
R19 [s3] = 0
                          R19 [s3] = 0
                                                                                    R19 [s3] = 0
                                                       R19 [s3] = 0
R20 [s4] = 0
                                                                                    R20 [s4] = 0
                          R20 [s4] = 0
                                                       R20 [s4] = 0
                        - R21 [s5] = 0
R21 [s5] = 0
                                                                                    R21 [s5] = 0
                                                      R21 [s5] = 0
```

2. The first image shows QtSpim with my sum2.asm code loaded. All eight breakpoints are marked on this image, and screenshots of the register at each one are included below. The console output was 60.





3. The first screenshot shows the contents of data memory before execution. The second shows the contents of data memory after execution. The elements of the array are underlined in blue, the elements that were swapped in the second image have been outlined in red.

