

CSE 661 - Advanced Computer Architecture

Group #2 Question 1

1. Source Code

```
1 .data
2 array: .word 30, -12, -50, 48, 7, 19, -1030, 400, -32, 76
3 array_size: .word 10
4 print_min: .asciiz "minimum value: "
5 print_max: .asciiz "\nmaximum value: "
6 .globl main
7 .text
8
9
10 main:
11     la $a0, array                # load the address of array into $a0
12     lw $a1, array_size           # $a1 is initially set to array size (10) and used as a counter
13     lw $t2, ($a0)                # $t2 is the max value variable
14     lw $t3, ($a0)                # $t3 is the min value variable
15
16 loop:
17     beq $a1, $zero, printResults # if the counter is now 0, entire array has been evaluated so jump to printResults
18     lw $t0, ($a0)                # $t0 initially points to array[0]
19     bge $t0, $t3, checkIfMin     # if $t0 >= $t3, check if $t0 is minimum value
20     move $t3, $t0
21
22     checkIfMin:
23     ble $t0, $t2, checkIfMax     # if $t0 <= $t2, check if $t0 is max value
24     move $t2, $t0
25
26     checkIfMax:
27     subi $a1, $a1, 1            # decrease the array counter
28     addi $a0, $a0, 4            # jump to the beginning of the loop
29     j loop
30
31 printResults:
32     li $v0, 4
33     la $a0, print_min           # print "minimum value" string
34     syscall
35
36     li $v0, 1
37     move $a0, $t3               # print minimum value
38     syscall
39
40     li $v0, 4
41     la $a0, print_max           # print "maximum value" string
42     syscall
43
44     li $v0, 1
45     move $a0, $t2               # print maximum value
46     syscall
47
48     li $v0, 10                  # exit program
49     syscall
```

2. Assembly Output

C:\Users\jasmine\Desktop\hw2_mips.asm - MARS 4.5

File Edit Run Settings Tools Help

Run speed at max (no interaction)

Registers Coproc 1 Coproc 0

Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	10
\$v1	3	0
\$a0	4	400
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	76
\$t1	9	0
\$t2	10	400
\$t3	11	-1030
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	0
\$s2	18	0
\$s3	19	0
\$s4	20	0
\$s5	21	0
\$s6	22	0
\$s7	23	0
\$s8	24	0
\$s9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194440

Text Segment

Bkpt	Address	Code	Basic	Source
	0x00400000	0x3c011001	lui \$1,4097	11: la \$a0, array # load the ad...
	0x00400004	0x34240000	ori \$4,\$1,0	
	0x00400008	0x3c011001	lui \$1,4097	12: lw \$a1, array_size # \$a1 is init...
	0x0040000c	0x8c250028	lw \$5,40(\$1)	
	0x00400010	0x8c8a0000	lw \$t2,(\$a0)	13: lw \$t2, (\$a0) # \$t2 is the ...
	0x00400014	0x8c8b0000	lw \$t3,(\$a0)	14: lw \$t3, (\$a0) # \$t3 is the ...
	0x00400018	0x10a0000b	beq \$5,\$0,11	17: beq \$a1, \$zero, printResults # if the coun...
	0x0040001c	0x8c880000	lw \$8,0(\$4)	18: lw \$t0, (\$a0) # \$t0 initial...
	0x00400020	0x010b082a	slt \$1,\$8,\$11	19: bge \$t0, \$t3, checkIfMin # if \$t0 >= ...

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	30	-12	-50	48	7	19	-1030	400
0x10010020	-32	76	10	1768843629	544044397	1970037110	2112101	2019e5082e
0x10010040	183e4122e5	181832e560	540e97973	0	0	0	0	0
0x10010060	0	0	0	0	0	0	0	0
0x10010080	0	0	0	0	0	0	0	0
0x100100a0	0	0	0	0	0	0	0	0
0x100100c0	0	0	0	0	0	0	0	0

Mars Messages Run IO

minimum value: -1030
maximum value: 400
-- program is finished running --