

Siddharth Iyer

ARM Lab 1 – Fibonacci

Below is my full program for the Fibonacci function

```
fibonacci.s crt0.S
8  .text
9  .global main
10 .extern printf
11
12 main:
13     ldr x0, =prt_str
14     ldr x5, =fib_num
15     ldr x5, [x5]
16     mov x6, #1
17     add x7, xzr, xzr
18     .global fib
19
20 fib:
21     cmp x5, #1
22     B.NE fib_recursive
23     mov x1, x6
24     sub sp, sp, #16
25     str x30, [sp, #0]
26     bl printf
27     ldr x30, [sp, #0]
28     add sp, sp, #16
29     br x30
30
31 fib_recursive:
32     sub sp, sp, #16
33     str x30, [sp, #0]
34     add x8, xzr, x6
35     add x6, x6, x7
36     add x7, x8, xzr
37     sub x5, x5, 1
38     bl fib
39     ldr x30, [sp, #0]
40     add sp, sp, #16
41     br x30
42
43 .data
44 prt_str:
45     .ascii "The requested fib number: %d \n\0"
46 fib_num:
47     .byte 5
48 .end
49
```

.data contains the output string template: "The requested fib number: %d \n\0"

Also contains fibn, the desired output index (in this case, it is 5)

.global main – sends the start of the code to **main**

main:

- Loads the output string .ascii into x0

- the desired Fibonacci index is loaded into x5
- x6 = 1 (this is current)
- x7 = 0 (this is previous)
- the **fib** function is called

fib:

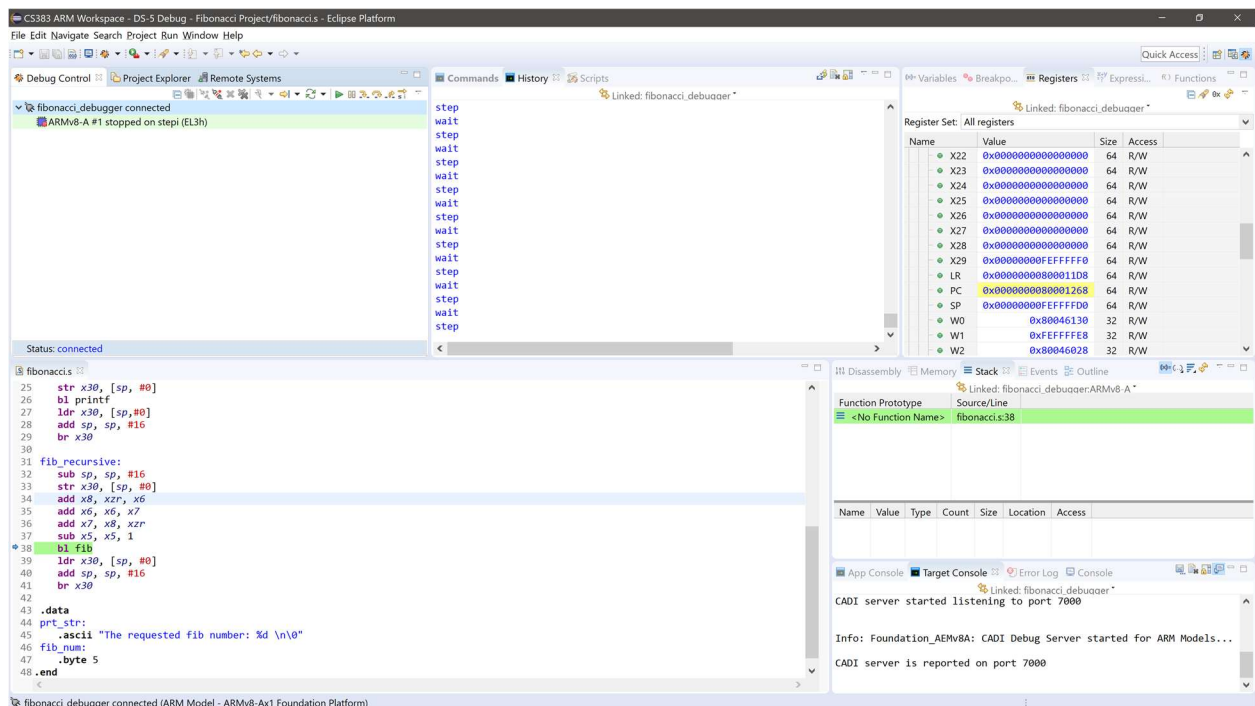
- if x5 == 1, current is moved to x1 as output and the stacks are closed / printf is also called for x0 and x1
- else: **fib_recursive** is called

fib_recursive:

- only need to store link register so only 1 extra position need on stack pointer (sub sp, sp, #16)
- add x8, xzr, x6 (temp = current) // none of this
- add x6, x6, x7 (current = current + previous) // needs to be
- add x7, x8, xzr (previous = old current) // stored on stack
- sub x5, x5, 1 (n = n - 1)
- bl fib (branch to fib to recheck n == 1 – described above in fib section)
- after return, destroy the stack

- printf does not work for me but I understand several people are also having the same issue
- it does not seem to be an issue during compilation

Screenshots of changing link registers:



CS383 ARM Workspace - DS-5 Debug - Fibonacci Project/fibonacci.s - Eclipse Platform

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Debug Control | Project Explorer | Remote Systems | Commands | History | Scripts | Variables | Breakpoints | Registers | Expressions | Functions

fibonacci_debugger connected
ARMv8-A #1 stopped on step (EL3h)

Status: connected

```

14 ldr x5, =fib_num
15 ldr x5, [x5]
16 mov x6, #1
17 add x7, xzr, xzr
18 .global fib
19
20 fib:
21 cmp x5, #1
22 B.NE fib_recursive
23 mov x1, x6
24 sub sp, sp, #16
25 str x30, [sp, #0]
26 bl printf
27 ldr x30, [sp, #0]
28 add sp, sp, #16
29 br x30
30
31 fib_recursive:
32 sub sp, sp, #16
33 str x30, [sp, #0]
34 add x8, xzr, x6
35 add x6, x6, x7
36 add x7, x8, xzr

```

Registers

Name	Value	Size	Access
X22	0x0000000000000000	64	R/W
X23	0x0000000000000000	64	R/W
X24	0x0000000000000000	64	R/W
X25	0x0000000000000000	64	R/W
X26	0x0000000000000000	64	R/W
X27	0x0000000000000000	64	R/W
X28	0x0000000000000000	64	R/W
X29	0x00000000EFFFFFFF	64	R/W
LR	0x000000008000126C	64	R/W
PC	0x000000008000122C	64	R/W
SP	0x00000000EFFFFFFD	64	R/W
W0	0x80046130	32	R/W
W1	0xEFFFFFFE	32	R/W
W2	0x80046028	32	R/W

Disassembly | Memory | Stack | Events | Outline

Function Prototype | Source/Line

<No Function Name> fibonacci.s:21

App Console | Target Console | Error Log | Console

CADI server started listening to port 7000

Info: Foundation_AEMv8A: CADI Debug Server started for ARM Models...

CADI server is reported on port 7000

fibonacci_debugger connected (ARM Model - ARMv8-Ax1 Foundation Platform)

CS383 ARM Workspace - DS-5 Debug - Fibonacci Project/fibonacci.s - Eclipse Platform

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Debug Control | Project Explorer | Remote Systems | Commands | History | Scripts | Variables | Breakpoints | Registers | Expressions | Functions

fibonacci_debugger connected
ARMv8-A #1 stopped on step (EL3h)

Status: connected

```

21 cmp x5, #1
22 B.NE fib_recursive
23 mov x1, x6
24 sub sp, sp, #16
25 str x30, [sp, #0]
26 bl printf
27 ldr x30, [sp, #0]
28 add sp, sp, #16
29 br x30
30
31 fib_recursive:
32 sub sp, sp, #16
33 str x30, [sp, #0]
34 add x8, xzr, x6
35 add x6, x6, x7
36 add x7, x8, xzr
37 sub x5, x5, 1
38 bl fib
39 ldr x30, [sp, #0]
40 add sp, sp, #16
41 br x30
42
43 .data

```

Registers

Name	Value	Size	Access
X22	0x0000000000000000	64	R/W
X23	0x0000000000000000	64	R/W
X24	0x0000000000000000	64	R/W
X25	0x0000000000000000	64	R/W
X26	0x0000000000000000	64	R/W
X27	0x0000000000000000	64	R/W
X28	0x0000000000000000	64	R/W
X29	0x00000000EFFFFFFF	64	R/W
LR	0x000000008000126C	64	R/W
PC	0x000000008000123C	64	R/W
SP	0x00000000EFFFFFF9	64	R/W
W0	0x80046130	32	R/W
W1	0x00000005	32	R/W
W2	0x80046028	32	R/W

Disassembly | Memory | Stack | Events | Outline

Function Prototype | Source/Line

<No Function Name> fibonacci.s:25

App Console | Target Console | Error Log | Console

CADI server started listening to port 7000

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fibonacci_debugger connected (ARM Model - ARMv8-Ax1 Foundation Platform)

CS383 ARM Workspace - DS-5 Debug - Fibonacci Project/fibonacci.s - Eclipse Platform

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Debug Control | Project Explorer | Remote Systems | Commands | History | Scripts | Variables | Breakpoints | Registers | Expressions | Functions

fibonacci_debugger connected
ARMv8-A #1 stopped (EL3h)

step
wait
wait
step
wait
wait
step
wait
wait
step
wait
wait
step
wait
wait
step
wait
wait
step
wait
wait
next

Status: connected

```
21 cmp x5, #1
22 B.NE fib_recursive
23 mov x1, x6
24 sub sp, sp, #16
25 str x30, [sp, #0]
26 bl printf
27 ldr x30, [sp, #0]
28 add sp, sp, #16
29 br x30
30
31 fib_recursive:
32 sub sp, sp, #16
33 str x30, [sp, #0]
34 add x8, xzr, x6
35 add x6, x6, x7
36 add x7, x8, xzr
37 sub x5, x5, 1
38 bl fib
39 ldr x30, [sp, #0]
40 add sp, sp, #16
41 br x30
42
43 .data
44
```

Registers

Name	Value	Size	Access
X22	0x0000000000000000	64	R/W
X23	0x0000000000000000	64	R/W
X24	0x0000000000000000	64	R/W
X25	0x0000000000000000	64	R/W
X26	0x0000000000000000	64	R/W
X27	0x0000000000000000	64	R/W
X28	0x0000000000000000	64	R/W
X29	0x0000000000000000	64	R/W
LR	0x0000000000001244	64	R/W
PC	0x0000000000001244	64	R/W
SP	0x0000000000000000	64	R/W
W0	0x00000000	32	R/W
W1	0x00000000	32	R/W
W2	0x00000000	32	R/W

Disassembly

Function Prototype: <No Function Name> Source/Line: fibonacci.s:27

App Console | Target Console | Error Log | Console

Info: Foundation_AEMv8A: CADI Debug Server started for ARM Models...

CADI server is reported on port 7000

The requested fib number: 5

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Debug Control | Project Explorer | Remote Systems | Commands | History | Scripts | Variables | Breakpoints | Registers | Expressions | Functions

fibonacci_debugger connected
ARMv8-A #1 stopped on step1 (EL3h)

step
wait
wait
step
wait
wait
step
wait
wait
step
wait
wait
step
wait
wait
step
wait
wait
step
wait
wait
next
wait
wait
next

Status: connected

```
21 cmp x5, #1
22 B.NE fib_recursive
23 mov x1, x6
24 sub sp, sp, #16
25 str x30, [sp, #0]
26 bl printf
27 ldr x30, [sp, #0]
28 add sp, sp, #16
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35 add x6, x6, x7
36 add x7, x8, xzr
37 sub x5, x5, 1
38 bl fib
39 ldr x30, [sp, #0]
40 add sp, sp, #16
41 br x30
42
43 .data
44
```

Registers

Name	Value	Size	Access
X22	0x0000000000000000	64	R/W
X23	0x0000000000000000	64	R/W
X24	0x0000000000000000	64	R/W
X25	0x0000000000000000	64	R/W
X26	0x0000000000000000	64	R/W
X27	0x0000000000000000	64	R/W
X28	0x0000000000000000	64	R/W
X29	0x0000000000000000	64	R/W
LR	0x000000000000126C	64	R/W
PC	0x0000000000001248	64	R/W
SP	0x0000000000000000	64	R/W
W0	0x00000000	32	R/W
W1	0x00000000	32	R/W
W2	0x00000000	32	R/W

Disassembly

Function Prototype: <No Function Name> Source/Line: fibonacci.s:28

App Console | Target Console | Error Log | Console

Info: Foundation_AEMv8A: CADI Debug Server started for ARM Models...

CADI server is reported on port 7000

The requested fib number: 5

