



Exercise 8

Compile your project code so it prints out the heap pointer and the stack pointer. Print out a global variable address. If you can find it, modify your linker file to swap your uninitialized variables and initialized variables. Verify it is as expected in the memory map. See how that changes your code output.

Turn in your notes on what you found to Discord #assignment-submission by 9am on Jan 29th.

Note: there will be more detailed hints on how to do this as the week goes on. If you get stuck, look in the Discord #homework-help for a Hints thread.

1. prints out the heap pointer: heap addr: 0x20001418

```
Termite 3.4 (by CompuPhase)
COM9 230400 bps, 8N1, no handshake
stack addr: 0x20007e04
global addr: 0x200006e8
heap addr: 0x20001418
```

Debugger:

```
uint32_t * dynamic_mem = malloc(sizeof *dynamic_mem);
Delay_MS(15);
```

Expression	Type	Value
dynamic_mem	uint32_t*	0x20001418
(x)= *dynamic_mem	uint32_t	3715147223

map file address:

```
9003 .user_heap_stack
9004 0x0000000020001410 0xc00 load address 0x000000000800f148
9005 0x0000000020001410 . = ALIGN (0x8)
9006 [!provide] PROVIDE (end = .)
9007 0x0000000020001410 PROVIDE (_end = .)
9008 0x0000000020001810 . = (. + _Min_Heap_Size)
9009 *fill* 0x0000000020001410 0x400
9010 0x0000000020002010 . = (. + _Min_Stack_Size)
9011 *fill* 0x0000000020001810 0x800
9012 0x0000000020002010 . = ALIGN (0x8)
```

2. prints out the stack pointer: stack pointer address: 0x20007e04

```
Termite 3.4 (by CompuPhase)
COM9 230400 bps, 8N1, no handshake
stack addr: 0x20007e04
global addr: 0x200006e8
heap addr: 0x20001418
```

Debugger:

```
118 }
119 }
120
121
122 void print_stack_pointer()
123 {
124     void* p = NULL;
125     printf("stack addr: 0x%x\n", (int)(void*)&p);
126 }
127
```

Register	Value
r10	0
r11	0
r12	0
sp	0x20007e00
lr	0x800d7fd <user_main+36>
pc	0x800d8a6 <print_stack_point...

Name : sp
Hex: 0x20007e00
Decimal: 536903168

3. Print out a global variable address: global address 0x200006e8

```
Termite 3.4 (by CompuPhase)
COM9 230400 bps, 8N1, no handshake
stack addr: 0x20007e04
global addr: 0x200006e8
heap addr: 0x20001418
```

Map file:

```
8943 .bss.global_var
8944 0x00000000200006e8 0x4 ./Src/user_main.o
8945 0x00000000200006e8 global_var
8946 .bss.__malloc_free_list
```

Debugger:

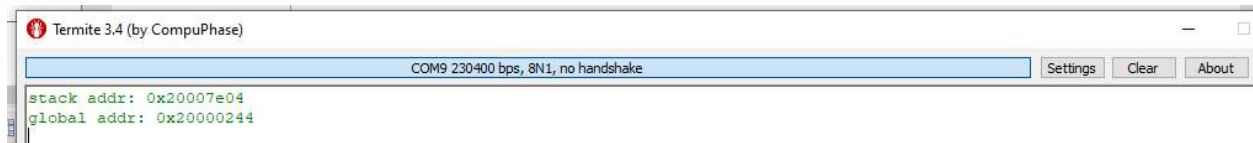
```
uint32_t * address = &global_var;
uint32_t * dynamic_mem = malloc(sizeof *dynamic_mem);
Delay_MS(15000);

print_stack_pointer();
printf("global addr: 0x%x\n", (int)address);
printf("heap addr: 0x%x\n", (int)dyn
/*
```

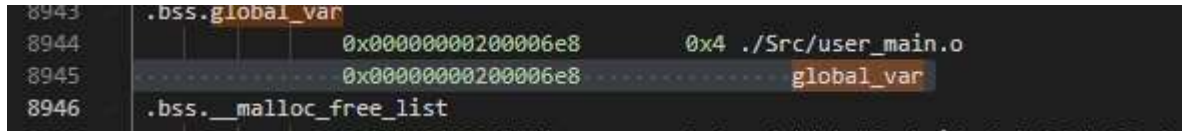
Expression	Type	Value
address	uint32_t*	0x200006e8 (Hex)
(*)= *address	uint32_t	0

```
VL53L0X_Dev_t VL53L0XDev;
VL53L0XDev.Id=0;
VL53L0XDev.DevLetter ='1';
```

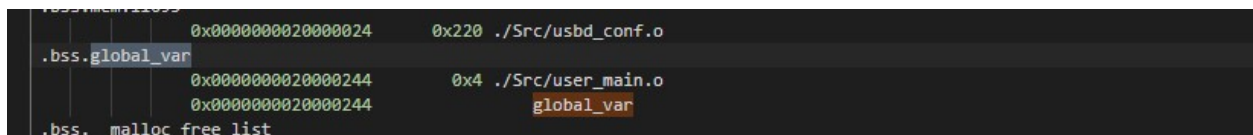
4. If you can find it, modify your linker file to swap your uninitialized variables and initialized variables.



Before:



After modification:



Debugger:

