

# Lab 3

Brief: Toggle led on GPIO PORTF PIN 3 on Tiva-c Board TM4C123 and debug with keil-uvision.

1. **Code:** In the same file in which this file attached
2. **Sections:** sections for object and .elf files.

## 2.1. main.o

```
MINGW64/d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3
Mina@Bello MINGW64 /d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3 (main)
$ arm-none-eabi-objdump -h main.o

main.o:      file format elf32-littlearm

Sections:
Idx Name          Size      VMA           LMA           File off  Algn
  0 .text          000000cc  00000000  00000000  00000034  2**2
    CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .data          00000000  00000000  00000000  00000100  2**0
    CONTENTS, ALLOC, LOAD, DATA
  2 .bss           00000000  00000000  00000000  00000100  2**0
    ALLOC
  3 .debug_info     00000065  00000000  00000000  00000100  2**0
    CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev   0000005a  00000000  00000000  00000165  2**0
    CONTENTS, READONLY, DEBUGGING
  5 .debug_loc      00000038  00000000  00000000  000001bf  2**0
    CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges  00000020  00000000  00000000  000001f7  2**0
    CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line     00000063  00000000  00000000  00000217  2**0
    CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str      0000009b  00000000  00000000  0000027a  2**0
    CONTENTS, READONLY, DEBUGGING
  9 .comment        00000012  00000000  00000000  00000315  2**0
    CONTENTS, READONLY
10 .ARM.attributes 00000033  00000000  00000000  00000327  2**0
    CONTENTS, READONLY
11 .debug_frame     0000002c  00000000  00000000  0000035c  2**2
    CONTENTS, RELOC, READONLY, DEBUGGING
```

## 2.2. startup.o

```
MINGW64:/d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3
Mina@Bello MINGW64 /d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3 (main)
$ arm-none-eabi-objdump -h startup.o

startup.o:          file format elf32-littlearm

Sections:
Idx Name              Size      VMA           LMA           File off  Algn
  0 .text              000000fc  00000000  00000000  00000034  2**2
    CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data              00000000  00000000  00000000  00000130  2**0
    CONTENTS, ALLOC, LOAD, DATA
  2 .bss               00000400  00000000  00000000  00000130  2**2
    ALLOC
  3 .vectors           00000010  00000000  00000000  00000130  2**2
    CONTENTS, ALLOC, LOAD, RELOC, DATA
  4 .debug_info         00000150  00000000  00000000  00000140  2**0
    CONTENTS, RELOC, READONLY, DEBUGGING
  5 .debug_abbrev       000000b6  00000000  00000000  00000290  2**0
    CONTENTS, READONLY, DEBUGGING
  6 .debug_loc          00000064  00000000  00000000  00000346  2**0
    CONTENTS, READONLY, DEBUGGING
  7 .debug_aranges      00000020  00000000  00000000  000003aa  2**0
    CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_line         00000067  00000000  00000000  000003ca  2**0
    CONTENTS, RELOC, READONLY, DEBUGGING
  9 .debug_str          00000131  00000000  00000000  00000431  2**0
    CONTENTS, READONLY, DEBUGGING
10 .comment             00000012  00000000  00000000  00000562  2**0
    CONTENTS, READONLY
11 .ARM.attributes     00000033  00000000  00000000  00000574  2**0
    CONTENTS, READONLY
12 .debug_frame        0000004c  00000000  00000000  000005a8  2**2
    CONTENTS, RELOC, READONLY, DEBUGGING
```

## 2.3. lab\_3.elf

```
MINGW64/d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3
Mina@Bello MINGW64 /d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3 (main)
$ arm-none-eabi-objdump -h lab_3.elf

lab_3.elf:      file format elf32-littlearm

Sections:
Idx Name          Size      VMA           LMA           File off  Algn
  0 .text          000001d8  00000000  00000000  00008000  2**2
    CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .bss           00000404  20000000  000001d8  00010000  2**2
    ALLOC
  2 .debug_info    000001b5  00000000  00000000  000081d8  2**0
    CONTENTS, READONLY, DEBUGGING
  3 .debug_abbrev  00000110  00000000  00000000  0000838d  2**0
    CONTENTS, READONLY, DEBUGGING
  4 .debug_loc     0000009c  00000000  00000000  0000849d  2**0
    CONTENTS, READONLY, DEBUGGING
  5 .debug_aranges 00000040  00000000  00000000  00008539  2**0
    CONTENTS, READONLY, DEBUGGING
  6 .debug_line    000000ca  00000000  00000000  00008579  2**0
    CONTENTS, READONLY, DEBUGGING
  7 .debug_str     00000136  00000000  00000000  00008643  2**0
    CONTENTS, READONLY, DEBUGGING
  8 .comment       00000011  00000000  00000000  00008779  2**0
    CONTENTS, READONLY
  9 .ARM.attributes 00000033  00000000  00000000  0000878a  2**0
    CONTENTS, READONLY
10 .debug_frame   00000078  00000000  00000000  000087c0  2**2
    CONTENTS, READONLY, DEBUGGING
```

## 3. Symbols: symbols for each object file and .elf file

### 3.1. main.o

```
MINGW64/d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3
Mina@Bello MINGW64 /d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3 (main)
$ arm-none-eabi-nm main.o
00000000 T main
```

### 3.2. startup.o

```
MINGW64:/d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3
Mina@Bello MINGW64 /d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3 (main)
$ arm-none-eabi-nm startup.o
                 U _E_bss
                 U _E_data
                 U _E_text
                 U _S_bss
                 U _S_data
00000000 T Default_Handler
00000000 D gP_fun_vectors
00000000 W H_Fault_Handler
00000004 C i
                 U main
00000000 W NMI_Handler
0000000c T Reset_Handler
00000000 b Stack_Top
```

### 3.3. lab\_3.elf and lab\_3.axf are the same .

```
MINGW64:/d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3
Mina@Bello MINGW64 /d/Mastering_embedded_systems/GitHub_Repo/Embedded_Systems_Online_Diploma/Unit3-Embedded_C/Lecture_4/Lab_3 (main)
$ arm-none-eabi-nm lab_3.elf
20000400 B _E_bss
20000000 T _E_data
000001d8 T _E_text
20000000 B _S_bss
20000000 T _S_data
000000dc T Default_Handler
00000000 T gP_fun_vectors
000000dc W H_Fault_Handler
20000400 B i
00000010 T main
000000dc W NMI_Handler
000000e8 T Reset_Handler
20000000 b Stack_Top
```

#### 4. Map\_file.map

```
D:\Mastering_embedded_systems\Github_Repo\Embedded_Systems_Online_Diploma\Unit3-Embedded_C\Lecture_4\Lab_3\Map...
File Edit Selection Find View Goto Tools Project Preferences Help

Map_file.map x

1
2 Allocating common symbols
3 Common symbol      size      file
4
5 i                  0x4      startup.o
6
7 Memory Configuration
8
9 Name      Origin      Length      Attributes
10 flash     0x00000000    0x20000000    xr
11 sram      0x20000000    0x20000000    xrw
12 *default* 0x00000000    0xffffffff
13
14 Linker script and memory map
15
16
17 .text      0x00000000    0x1d8
18 *(.vectors*)
19 .vectors   0x00000000    0x10 startup.o
20           0x00000000    gp_fun_vectors
21 *(.text*)
22 .text      0x00000010    0xcc main.o
23           0x00000010    main
24 .text      0x000000dc    0xfc startup.o
25           0x000000dc    H_Fault_Handler
26           0x000000dc    Default_Handler
27           0x000000dc    NMI_Handler
28           0x000000e8    Reset_Handler
29 *(.rodata)
30           0x000001d8    _E_text = .
31
32 .glue_7     0x000001d8    0x0
33 .glue_7     0x00000000    0x0 linker stubs
34
35 .glue_7t    0x000001d8    0x0
36 .glue_7t    0x00000000    0x0 linker stubs
37
38 .vfp11_veneer 0x000001d8    0x0
39 .vfp11_veneer 0x00000000    0x0 linker stubs
40
41 .v4_bx      0x000001d8    0x0
42 .v4_bx      0x00000000    0x0 linker stubs
43
44 .iplt       0x000001d8    0x0
45 .iplt       0x00000000    0x0 main.o
46
47 .rel.dyn    0x000001d8    0x0
48 .rel.iplt   0x00000000    0x0 main.o
49
50 .data       0x20000000    0x0 load address 0x000001d8
51           0x20000000    _S_data = .
52 *(.data)
53 .data       0x20000000    0x0 main.o
54 .data       0x20000000    0x0 startup.o
55           0x20000000    _E_data = .
56
57 .igot.plt   0x20000000    0x0 load address 0x000001d8
58 .igot.plt   0x00000000    0x0 main.o
59
60 .bss        0x20000000    0x404 load address 0x000001d8
61           0x20000000    _S_bss = .
62
63 /* hcc */
```

Line 1, Column 1 main (25) Spaces: 4 Plain Text

```

60 .bss          0x20000000      0x404 load address 0x000001d8
61             0x20000000      _S_bss = .
62 *(.bss)
63 .bss          0x20000000      0x0 main.o
64 .bss          0x20000000      0x400 startup.o
65 *(.stack)
66             0x20000400      . = ALIGN (0x4)
67             0x20000400      _E_bss = .
68 COMMON       0x20000400      0x4 startup.o
69             0x20000400      i
70 LOAD main.o
71 LOAD startup.o
72 OUTPUT(lab_3.elf elf32-littlearm)
73
74 .debug_info   0x00000000      0x1b5
75 .debug_info   0x00000000      0x65 main.o
76 .debug_info   0x00000065      0x150 startup.o
77
78 .debug_abbrev  0x00000000      0x110
79 .debug_abbrev  0x00000000      0x5a main.o
80 .debug_abbrev  0x0000005a      0xb6 startup.o
81
82 .debug_loc     0x00000000      0x9c
83 .debug_loc     0x00000000      0x38 main.o
84 .debug_loc     0x00000038      0x64 startup.o
85
86 .debug_aranges 0x00000000      0x40
87 .debug_aranges
88             0x00000000      0x20 main.o
89 .debug_aranges
90             0x00000020      0x20 startup.o
91
92 .debug_line     0x00000000      0xca
93 .debug_line     0x00000000      0x63 main.o
94 .debug_line     0x00000063      0x67 startup.o
95
96 .debug_str       0x00000000      0x136
97 .debug_str       0x00000000      0x9b main.o
98 .debug_str       0x0000009b      0x9b startup.o
99             0x131 (size before relaxing)
100
101 .comment         0x00000000      0x11
102 .comment         0x00000000      0x11 main.o
103             0x12 (size before relaxing)
104 .comment         0x00000000      0x12 startup.o
105
106 .ARM.attributes  0x00000000      0x33
107 .ARM.attributes
108             0x00000000      0x33 main.o
109 .ARM.attributes
110             0x00000033      0x33 startup.o
111
112
113 .debug_frame     0x00000000      0x78
114 .debug_frame     0x00000000      0x2c main.o
115 .debug_frame     0x0000002c      0x4c startup.o
116

```