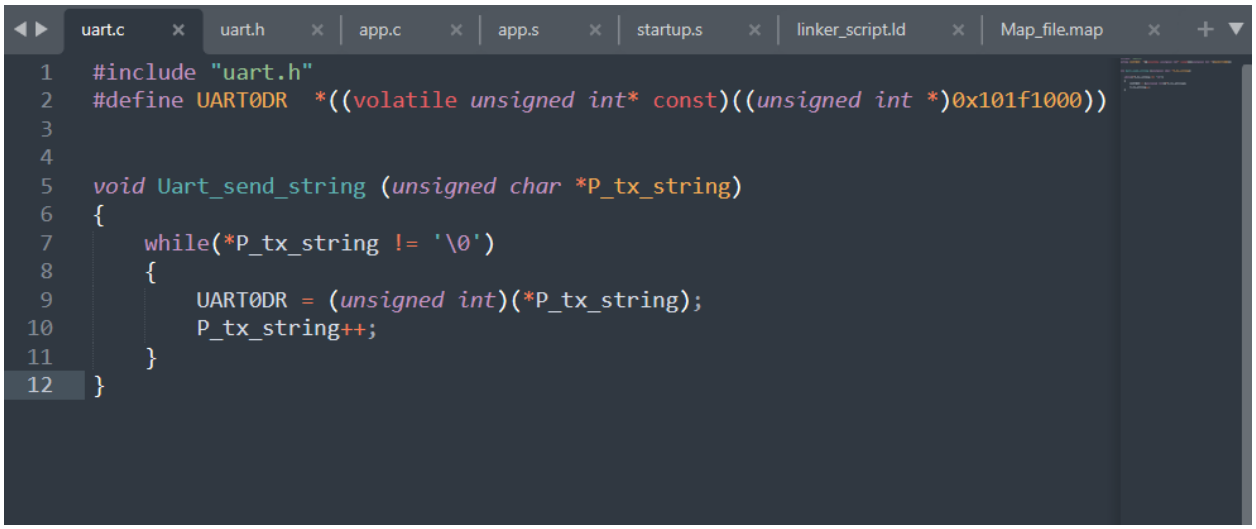
Assignment-2

- The codes :

1. uart.c



2. app.c

3. uart.h

uart.c | uart.h | app.c | app.s | startup.s | linker_script.ld | Map_file.map

```
1  #ifndef _UART_H_
2  #define _UART_H_
3
4  void Uart_send_string (unsigned char *P_tx_string);
5
6  #endif
```

4. startup.s

uart.c | uart.h | app.c | app.s | startup.s | linker_script.ld | Map_file.map

```
1  .globl reset
2  reset:
3       ldr sp,= stack_top
4       bl main
5  stop: b stop
```

5. linker_script.ld

uart.c | uart.h | app.c | app.s | startup.s | linker_script.ld | Map_file.map

```
ENTRY(reset)
MEMORY
{
    Mem (rwx) : ORIGIN = 0x00000000, LENGTH = 64M
}
SECTIONS
{
    . = 0x10000;
    .startup . :
    {
      startup.o(.text)
    }>Mem
    .text :
    {
      *(.text) *(.rodata)
    }>Mem
    .data :
    {
      *(.data)
    }>Mem
    .bss :
    {
      *(.bss) *(COMMON)
    }>Mem
    . = . + 0x1000;
    stack_top = . ;
}
```

- obj files:

1. app.o

```
ziade@LAPTOP-SO076FNK MINGW64 /d/Embedded system diploma/github_repo/Unit_3_Embe
dded_C/Lesson2_Assignment (main)
$ arm-none-eabi-objdump.exe -h app.o

app.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000018  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000064  00000000  00000000  0000004c  2**2
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  000000b0  2**0
                  ALLOC
  3 .debug_info   0000006c  00000000  00000000  000000b0  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev 0000005a  00000000  00000000  0000011c  2**0
                  CONTENTS, READONLY, DEBUGGING
  5 .debug_loc    0000002c  00000000  00000000  00000176  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges 00000020  00000000  00000000  000001a2  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line   00000035  00000000  00000000  000001c2  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str    00000088  00000000  00000000  000001f7  2**0
                  CONTENTS, READONLY, DEBUGGING
  9 .comment      00000012  00000000  00000000  0000027f  2**0
                  CONTENTS, READONLY
 10 .ARM.attributes 00000032  00000000  00000000  00000291  2**0
                  CONTENTS, READONLY
 11 .debug_frame  0000002c  00000000  00000000  000002c4  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING
```

2. uart.o

```
ziade@LAPTOP-SO076FNK MINGW64 /d/Embedded system diploma/github_repo/Unit_3_Embe
dded_C/Lesson2_Assignment (main)
$ arm-none-eabi-objdump.exe -h uart.o

uart.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000050  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000084  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  00000084  2**0
                  ALLOC
  3 .debug_info   0000005c  00000000  00000000  00000084  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev 00000051  00000000  00000000  000000e0  2**0
                  CONTENTS, READONLY, DEBUGGING
  5 .debug_loc    0000002c  00000000  00000000  00000131  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges 00000020  00000000  00000000  0000015d  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line   0000003d  00000000  00000000  0000017d  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str    0000008a  00000000  00000000  000001ba  2**0
                  CONTENTS, READONLY, DEBUGGING
  9 .comment      00000012  00000000  00000000  00000244  2**0
                  CONTENTS, READONLY
 10 .ARM.attributes 00000032  00000000  00000000  00000256  2**0
                  CONTENTS, READONLY
 11 .debug_frame  00000028  00000000  00000000  00000288  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING
```

3. startup.o

```
ziade@LAPTOP-SO076FNK MINGW64 /d/Embedded system diploma/github_repo/Unit_3_Embe
dded_C/Lesson2_Assignment (main)
$  arm-none-eabi-objdump.exe -h startup.o

startup.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000010  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000044  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  00000044  2**0
                  ALLOC
  3 .ARM.attributes 00000022  00000000  00000000  00000044  2**0
                  CONTENTS, READONLY
```

- To show sections for learn-in-depth.elf

```
ziade@LAPTOP-SO076FNK MINGW64 /d/Embedded system diploma/github_repo/Unit_3_Embe
dded_C/Lesson2_Assignment (main)
$  arm-none-eabi-objdump.exe -h startup.o

startup.o:     file format elf32-littlearm

Sections:
Idx Name          Size      VMA       LMA       File off  Algn
  0 .text         00000010  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000044  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  00000044  2**0
                  ALLOC
  3 .ARM.attributes 00000022  00000000  00000000  00000044  2**0
                  CONTENTS, READONLY
```

- To show symbol table for learn-in-depth.elf

```
ziade@LAPTOP-SO076FNK MINGW64 /d/Embedded system diploma/github_repo/Unit_3_Embe
dded_C/Lesson2_Assignment (main)
$  arm-none-eabi-nm.exe learn-in-depth.elf
00010010 T main
00010000 T reset
000110dc D stack_top
00010008 t stop
00010078 D string_buffer
00010028 T Uart_send_string
```

- burn binary file on board using qemu

```
ziade@LAPTOP-SO076FNK MINGW64 /d/Embedded system diploma/github_repo/Unit_3_Embe
dded_C/Lesson2_Assignment (main)
$ qemu-system-arm -M versatilepb -m 128M -nographic -kernel learn-in-depth.bin
learn-in-depth:<Ziad>
```