



LAB 1

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Using versatilepb processor and qemu simulator

App.c :

```
#include "uart.h"

unsigned char string_buffer[100] = "Learn-in-depth:<Matarawy>";
unsigned char const string_buffer2[100] = "Learn-in-depth:<Matarawy>";
void main(void)
{
    Uart_Send_String (string_buffer);
}
```

Uart.c :

```
#include "uart.h"

#define UARTODR    *((volatile unsigned int *) ((unsigned int *) 0x101f1000))

void Uart_Send_String (unsigned char* P_tx_string)
{
    while(*P_tx_string != '\0')
    {
        UARTODR = (unsigned int) (*P_tx_string);
        P_tx_string ++;
    }
}
```

Uart.h :

```
#ifndef _UART_H_
#define _UART_H_

void Uart_Send_String (unsigned char* P_tx_string);

#endif
```

StartUp.s :

```
.global reset
reset:
    ldr sp, =stack_top
    bl main
stop:
    b stop
```

LinkerScript.ld :

```
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_Dumb for App.o Without debugging:

```
$ 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 .rodata        00000064  00000000  00000000  000000b0  2**2
    CONTENTS, ALLOC, LOAD, READONLY, DATA
  4 .comment       00000012  00000000  00000000  00000114  2**0
    CONTENTS, READONLY
  5 .ARM.attributes 00000032  00000000  00000000  00000126  2**0
    CONTENTS, READONLY
```

Obj_Dumb for App.o With debugging:

```
$ 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      0000009b  00000000  00000000  000001f7  2**0
    CONTENTS, READONLY, DEBUGGING
  9 .comment       00000012  00000000  00000000  00000292  2**0
    CONTENTS, READONLY
10 .ARM.attributes 00000032  00000000  00000000  000002a4  2**0
    CONTENTS, READONLY
11 .debug_frame    0000002c  00000000  00000000  000002d8  2**2
    CONTENTS, RELOC, READONLY, DEBUGGING
```

Finding symbol for App.o, startup.o & LearnInDepth.elf files:

```
abdel@LAPTOP-JGVNE8G0:~/Downloads/Mastering_embedded_system/github_repo/Unit3_Embedded_C/Unit3/Lesson_2 (main)
$ arm-none-eabi-nm.exe App.o
00000000 T main
00000000 D string_buffer
00000000 R string_buffer2
00000000 U Uart_Send_String

abdel@LAPTOP-JGVNE8G0:~/Downloads/Mastering_embedded_system/github_repo/Unit3_Embedded_C/Unit3/Lesson_2 (main)
$ arm-none-eabi-nm.exe startup.o
00000000 U main
00000000 T reset
00000000 U stack_top

abdel@LAPTOP-JGVNE8G0:~/Downloads/Mastering_embedded_system/github_repo/Unit3_Embedded_C/Unit3/Lesson_2 (main)
$ arm-none-eabi-nm.exe learn-in-depth.elf
0001005c T main
00010000 T reset
0001114d B stack_top
000100d8 D string_buffer
00010074 T string_buffer2
0001000c T Uart_Send_String
```

After Compile and linking Project:

```
abdel@LAPTOP-JGVNE8G0:~/Downloads/Mastering_embedded_system/github_repo/Unit3_Embedded_C/Unit3/Lesson_2 (main)
$ qemu-system-arm -M versatilepb -m 128M -nographic -kernel learn-in-depth.bin
Learn-in-depth:<Matarawy>
```