

Report lec.2 unit 3

App.c

```
#include "uart.h"

const int x=100;

unsigned char string_buffer[100]="learn in depth 2024 : mark";

int main(){

    uart_send_string(string_buffer);

    return 0;

}
```

Uart.c

```
#include "uart.h"

#define UART0DR *((volatile unsigned int *const)((unsigned int*)0x101f1000))

void uart_send_string(unsigned char *P_tx_string){

    while(*P_tx_string != '\0'){

        UART0DR =(unsigned char) (*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

This PC > DATA (C:) > ARM_TOOLCHAIN > bin > Assignment 2

Name	Date modified	Type	Size
adding rodata to app-o sections	9/9/2024 9:53 PM	PNG File	69 KB
app	9/9/2024 11:38 PM	C Source File	1 KB
app.o	9/9/2024 11:39 PM	O File	2 KB
app	9/9/2024 11:54 PM	S File	2 KB
app-o sections	9/9/2024 9:45 PM	PNG File	80 KB
app-s	9/9/2024 11:57 PM	PNG File	85 KB
startup.o	9/10/2024 12:31 AM	O File	1 KB
startup	9/10/2024 12:26 AM	S File	1 KB
uart	9/9/2024 9:31 PM	C Source File	1 KB
uart	9/9/2024 9:32 PM	C Header Source F...	1 KB
uart.o	9/9/2024 9:33 PM	O File	3 KB

```

startup - Notepad
File Edit Format View Help
.globl reset
reset:
    ldr sp, =0x00011000
    bl main
stop: b stop

```

```

mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ arm-none-eabi-as.exe -mcpu=arm926ej-s startup.s -o startup.o
startup.s: Assembler messages:
startup.s: Warning: end of file not at end of a line; newline inserted

mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ 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          0000000c  00000000  00000000  00000034  2**2
CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
 1 .data          00000000  00000000  00000000  00000040  2**0
CONTENTS, ALLOC, LOAD, DATA
 2 .bss           00000000  00000000  00000000  00000040  2**0
ALLOC
 3 .ARM.attributes 00000022  00000000  00000000  00000040  2**0
CONTENTS, READONLY

```

Linker script

This PC > DATA (C:) > ARM_TOOLCHAIN > bin > Assignment 2

Name	Date modified	Type	Size
adding rodata to app-o sections	9/9/2024 9:53 PM	PNG File	69 KB
app	9/9/2024 11:38 PM	C Source File	1 KB
app.o	9/9/2024 11:39 PM	O File	2 KB
app	9/9/2024 11:54 PM	S File	2 KB
app-o sections	9/9/2024 9:45 PM	PNG File	80 KB
app-s	9/9/2024 11:57 PM	PNG File	85 KB
learn_in_depth.elf	9/11/2024 12:46 AM	ELF File	35 KB
linker_script	9/11/2024 12:46 AM	LD File	1 KB
Map_file	9/11/2024 12:46 AM	Text Document	4 KB
start_up	9/10/2024 12:35 AM	PNG File	68 KB
startup.o	9/10/2024 12:31 AM	O File	1 KB
startup	9/11/2024 12:27 AM	S File	1 KB
uart	9/9/2024 9:31 PM	C Source File	1 KB
uart	9/9/2024 9:32 PM	C Header Source F...	1 KB
uart.o	9/9/2024 9:33 PM	O File	3 KB

```

linker_script - Notepad
File Edit Format View Help

ENTRY(reset)
MEMORY
{
    Mem (rwx) : ORIGIN = 0x00000000, LENGTH = 64M
}

SECTIONS
{
    . = 0x10000 ; /*specify entry point*/
    .startup : :
    {
        startup.o(.text)
    }>Mem
    .text :
    {
        *(.text) *(.rodata)
    }>Mem
    .data :
    {
        *(.data)
    }>Mem
    .bss :
    {
        *(.bss) *(COMMON)
    }>Mem
    . = . + 0x1000 ; /* stack size */
    stack_top = . ;
}

```

Sections of object files

App.o

```
app 9/9/2024 9:51 PM C Source File 1 KB
app.c 9/9/2024 9:51 PM C File 2 KB
File Edit Selection View Go Run Terminal Help app.c - Visual Studio Code
Restricted Mode is intended for safe code browsing. Trust this window to enable all features. Manage Learn
C uart.c C app.c X C uarth
C: > ARM_TOOLCHAIN > bin > Assignment 2 > C app.c
1 #include "uart.h"
2 const int x=100;
3 unsigned char string_buffer[100]="learn in depth 2024 : mark";
4 int main(){
5     uart_send_string(string_buffer);
6     return 0;
7 }

MINGW32/c/ARM_TOOLCHAIN/bin/Assignment 2
CONTENTS, READONLY
mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ arm-none-eabi-gcc.exe -c -I -mcpu=arm926ej-s app.c -o app.o
mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ 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          00000028 00000000 00000000 00000034 2**2
CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
 1 .data          00000064 00000000 00000000 0000005c 2**2
CONTENTS, ALLOC, LOAD, DATA
 2 .bss           00000000 00000000 00000000 000000c0 2**0
ALLOC
 3 .rodata         00000004 00000000 00000000 000000c0 2**2
CONTENTS, ALLOC, LOAD, READONLY, DATA
 4 .comment        00000012 00000000 00000000 000000c4 2**0
CONTENTS, READONLY
 5 .ARM.attributes 00000030 00000000 00000000 000000d6 2**0
CONTENTS, READONLY
mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ |
```

Uart.o

```
mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ 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, RELOC, 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      00000060 00000000 00000000 000001ba 2**0
CONTENTS, READONLY, DEBUGGING
 9 .comment        00000012 00000000 00000000 0000021a 2**0
CONTENTS, READONLY
10 .ARM.attributes 00000030 00000000 00000000 0000022c 2**0
CONTENTS, READONLY
11 .debug_frame    00000028 00000000 00000000 0000025c 2**2
CONTENTS, RELOC, READONLY, DEBUGGING
mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ |
```

Startup.o

```
mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ arm-none-eabi-as.exe -mcpu=arm926ej-s startup.s -o startup.o
startup.s: Assembler messages:
startup.s: Warning: end of file not at end of a line; newline inserted

mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ 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          0000000c  00000000  00000000  00000034  2**2
    CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data          00000000  00000000  00000000  00000040  2**0
    CONTENTS, ALLOC, LOAD, DATA
  2 .bss           00000000  00000000  00000000  00000040  2**0
    ALLOC
  3 .ARM.attributes 00000022  00000000  00000000  00000040  2**0
    CONTENTS, READONLY

mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$
```

Learn_in_depth.elf

This PC > DATA (C:) > ARM_TOOLCHAIN > bin > Assignment 2

Name	Date modified	Type	Size
adding rodata to app-o sections	9/9/2024 9:53 PM	PNG File	69 KB
app	9/9/2024 11:38 PM	C Source File	1 KB
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app-o sections	9/9/2024 9:45 PM	PNG File	80 KB
app-s	9/9/2024 11:57 PM	PNG File	85 KB
learn_in_depth.elf	9/11/2024 12:46 AM	ELF File	35 KB
linker - ld	9/11/2024 12:47 AM	PNG File	62 KB
linker_script	9/11/2024 12:46 AM	LD File	1 KB
Map_file	9/11/2024 12:46 AM	Text Document	4 KB
start_up	9/10/2024 12:35 AM	PNG File	68 KB
startup.o	9/10/2024 12:31 AM	O File	1 KB
startup	9/11/2024 12:27 AM	S File	1 KB
uart	9/9/2024 9:31 PM	C Source File	1 KB
uart	9/9/2024 9:32 PM	C Header Source F...	1 KB
uart.o	9/9/2024 9:33 PM	O File	3 KB

```
mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ arm-none-eabi-nm.exe learn_in_depth.elf
0001000c T main
00010000 T reset
000110ec D stack_top
00010008 t stop
00010088 D string_buffer
00010034 T uart_send_string
00010084 T x

mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ arm-none-eabi-objdump.exe -h learn_in_depth.elf

learn_in_depth.elf:      file format elf32-littlearm

Sections:
Idx Name          Size      VMA           LMA           File off  Algn
  0 .startup       0000000c  00010000  00010000  00008000  2**2
    CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .text          0000007c  0001000c  0001000c  0000800c  2**2
    CONTENTS, ALLOC, LOAD, READONLY, CODE
  2 .data          00000064  00010088  00010088  00008088  2**2
    CONTENTS, ALLOC, LOAD, DATA
  3 .ARM.attributes 0000002e  00000000  00000000  000080ec  2**0
    CONTENTS, READONLY
  4 .comment       00000011  00000000  00000000  0000811a  2**0
    CONTENTS, READONLY
  5 .debug_info    0000005c  00000000  00000000  0000812b  2**0
    CONTENTS, READONLY, DEBUGGING
  6 .debug_abbrev  00000051  00000000  00000000  00008187  2**0
    CONTENTS, READONLY, DEBUGGING
  7 .debug_loc     0000002c  00000000  00000000  000081d8  2**0
    CONTENTS, READONLY, DEBUGGING
  8 .debug_aranges 00000020  00000000  00000000  00008204  2**0
    CONTENTS, READONLY, DEBUGGING
  9 .debug_line    0000003d  00000000  00000000  00008224  2**0
    CONTENTS, READONLY, DEBUGGING
 10 .debug_str     00000060  00000000  00000000  00008261  2**0
    CONTENTS, READONLY, DEBUGGING
 11 .debug_frame   00000028  00000000  00000000  000082c4  2**2
    CONTENTS, READONLY, DEBUGGING

mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$
```

Symbol table

```
MINGW32:/c/ARM_TOOLCHAIN/bin/Assignment 2

mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ arm-none-eabi-nm.exe learn_in_depth.elf
0001000c T main
00010000 T reset
000110ec D stack_top
00010008 t stop
00010088 D string_buffer
00010034 T uart_send_string
00010084 T x

mark@DESKTOP-KJ5VTUS MINGW32 /c/ARM_TOOLCHAIN/bin/Assignment 2
$ .....
```

Output

hppa-firmware	4/30/2018 4:48 PM	Disc Image File	211 KB	MINGW32:/c/Program Files (x86)/qemu
iconv.dll	11/18/2013 2:40 AM	Application extens...	27 KB	mark@DESKTOP-KJ5VTUS MINGW32 /c/Program Files (x86)/qemu
kvmvapic.bin	4/30/2018 4:48 PM	BIN File	9 KB	\$./qemu-system-arm -M versatilepb -m 128M -nographic -kernel learn_in_depth.bin
learn_in_depth.bin	9/11/2024 12:57 AM	BIN File	1 KB	dsound: Could not initialize DirectSoundCapture
libatk-1.0-0.dll	2/20/2018 6:15 AM	Application extens...	110 KB	dsound: Reason: No sound driver is available for use, or the given GUID is not a valid D
libbz2-1.dll	11/27/2013 12:42 ...	Application extens...	65 KB	ound device ID
libcairo-2.dll	2/20/2018 6:32 AM	Application extens...	857 KB	learn in depth 2024 : mark
libcairo-gobject-2.dll	2/20/2018 6:32 AM	Application extens...	27 KB	
libcurl-4.dll	3/15/2018 5:31 PM	Application extens...	497 KB	
libeay32.dll	12/7/2017 7:35 PM	Application extens...	1,785 KB	