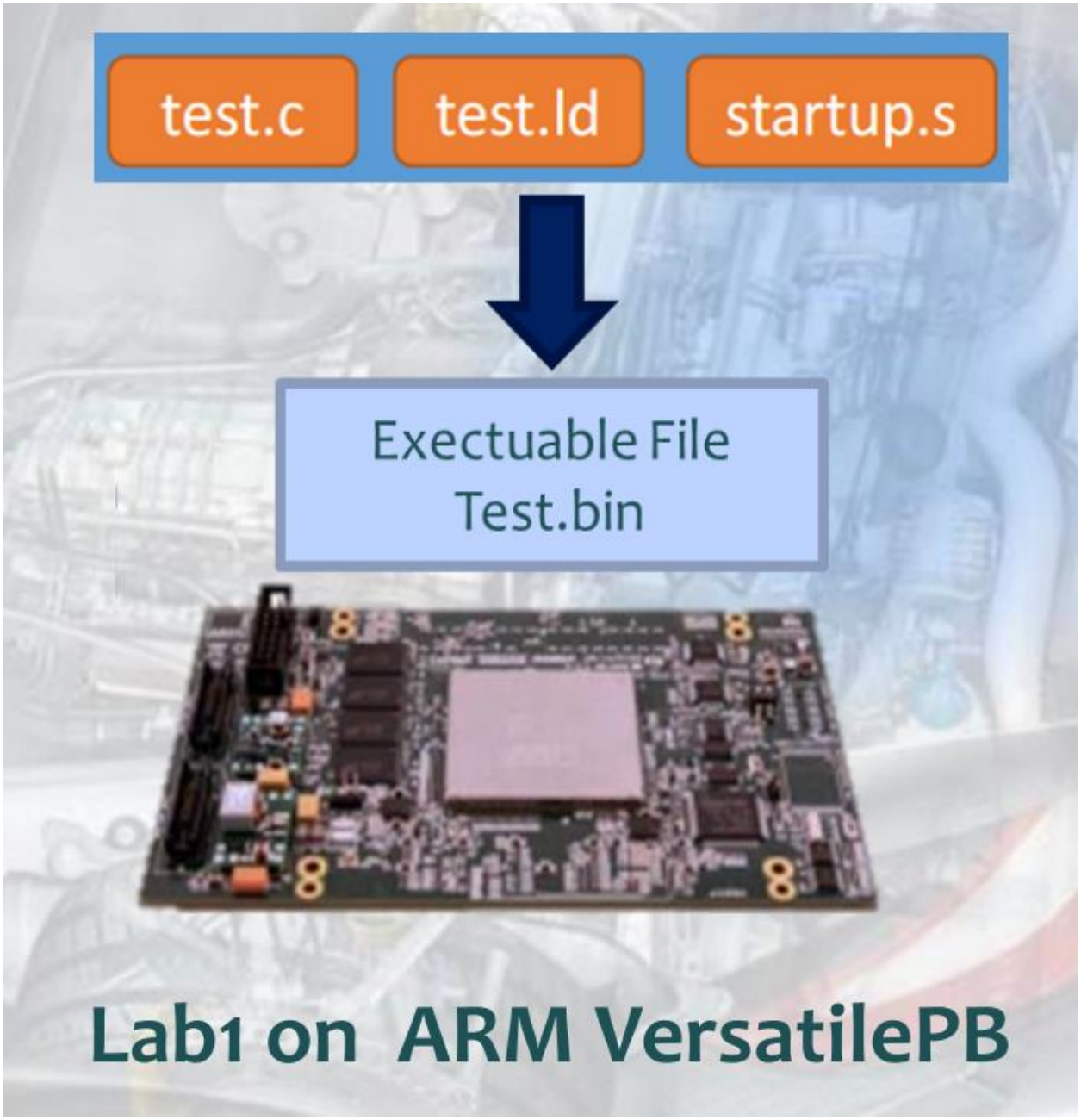
Embedded C Lab 1



Name: Mohammed Hassan

Embedded C Lab 1

1 – The .obj files of (App.o && Uart.o):

a) Debug information included:

App.o

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/app
$ ls *.o
app.o  uart.o

mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/app
$ 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         0000001c  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000064  00000000  00000000  00000050  2**2
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  000000b4  2**0
                  ALLOC
  3 .rodata       00000064  00000000  00000000  000000b4  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, DATA
  4 .debug_info   000008f2  00000000  00000000  00000118  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  5 .debug_abbrev 000001a7  00000000  00000000  00000a0a  2**0
                  CONTENTS, READONLY, DEBUGGING
  6 .debug_aranges 00000020  00000000  00000000  00000bb1  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_line   0000011c  00000000  00000000  00000bd1  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  8 .debug_str    0000051a  00000000  00000000  00000ced  2**0
                  CONTENTS, READONLY, DEBUGGING
  9 .comment      0000007f  00000000  00000000  00001207  2**0
                  CONTENTS, READONLY
 10 .debug_frame  0000002c  00000000  00000000  00001288  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING
 11 .ARM.attributes 00000032  00000000  00000000  000012b4  2**0
                  CONTENTS, READONLY
```

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Uart.o

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/my_lab
$ 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         00000054  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000088  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  00000088  2**0
                  ALLOC
  3 .debug_info   00000057  00000000  00000000  00000088  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  4 .debug_abbrev 00000051  00000000  00000000  000000df  2**0
                  CONTENTS, READONLY, DEBUGGING
  5 .debug_aranges 00000020  00000000  00000000  00000130  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  6 .debug_line   00000039  00000000  00000000  00000150  2**0
                  CONTENTS, RELOC, READONLY, DEBUGGING
  7 .debug_str    000000b6  00000000  00000000  00000189  2**0
                  CONTENTS, READONLY, DEBUGGING
  8 .comment      0000007f  00000000  00000000  0000023f  2**0
                  CONTENTS, READONLY
  9 .debug_frame  00000030  00000000  00000000  000002c0  2**2
                  CONTENTS, RELOC, READONLY, DEBUGGING
 10 .ARM.attributes 00000032  00000000  00000000  000002f0  2**0
                  CONTENTS, READONLY
```

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b) Without Debug information:

App.o

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/app
$ arm-none-eabi-gcc.exe -c -mcpu=arm926ej-s -T . app.c -o app.o

mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/app
$ 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         0000001c  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, RELOC, READONLY, CODE
  1 .data         00000064  00000000  00000000  00000050  2**2
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  000000b4  2**0
                  ALLOC
  3 .rodata       00000064  00000000  00000000  000000b4  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, DATA
  4 .comment      0000007f  00000000  00000000  00000118  2**0
                  CONTENTS, READONLY
  5 .ARM.attributes 00000032  00000000  00000000  00000197  2**0
                  CONTENTS, READONLY
```

Uart.o

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/my_lab
$ 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         00000054  00000000  00000000  00000034  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .data         00000000  00000000  00000000  00000088  2**0
                  CONTENTS, ALLOC, LOAD, DATA
  2 .bss          00000000  00000000  00000000  00000088  2**0
                  ALLOC
  3 .comment      0000007f  00000000  00000000  00000088  2**0
                  CONTENTS, READONLY
  4 .ARM.attributes 00000032  00000000  00000000  00000107  2**0
                  CONTENTS, READONLY
```

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2 –Reading .obj files Symbols:

App.o

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/my_lab
$ arm-none-eabi-nm.exe app.o
00000000 T main
00000000 D String_Buffer
00000000 R String_Buffer2
         U Uart_Send_String
```

Uart.o

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/my_lab
$ arm-none-eabi-nm.exe uart.o
00000000 T Uart_Send_String
```

Startup.o

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Deskto
p/my_lab
$ arm-none-eabi-nm.exe startup.o
         U main
00000000 T reset
         U stack_top
00000008 t stop
```

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Learn-in-depth.elf

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Deskto
p/my_lab
$ arm-none-eabi-nm.exe learn-in-depth.elf
00010010 T main
00010000 T reset
00011148 D stack_top
00010008 t stop
000100e4 D String_Buffer
00010080 T String_Buffer2
0001002c T Uart_Send_String
```

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/my_lab
$ 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      00000010  00010000  00010000  00010000  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  1 .text         000000d4  00010010  00010010  00010010  2**2
                  CONTENTS, ALLOC, LOAD, READONLY, CODE
  2 .data         00000064  000100e4  000100e4  000100e4  2**2
                  CONTENTS, ALLOC, LOAD, DATA
  3 .ARM.attributes 0000002e  00000000  00000000  00010148  2**0
                  CONTENTS, READONLY
  4 .comment      0000007e  00000000  00000000  00010176  2**0
                  CONTENTS, READONLY
```

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Readelf (Learn-in-depth.elf)

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/my_lab
$ arm-none-eabi-readelf.exe -a learn-in-depth.elf
ELF Header:
  Magic:   7f 45 4c 46 01 01 01 00 00 00 00 00 00 00 00 00
  Class:                             ELF32
  Data:                              2's complement, little endian
  Version:                           1 (current)
  OS/ABI:                            UNIX - System V
  ABI Version:                       0
  Type:                              EXEC (Executable file)
  Machine:                           ARM
  Version:                           0x1
  Entry point address:               0x10000
  Start of program headers:          52 (bytes into file)
  Start of section headers:          66596 (bytes into file)
  Flags:                             0x5000200, Version5 EABI, soft-float ABI
  Size of this header:               52 (bytes)
  Size of program headers:           32 (bytes)
  Number of program headers:         1
  Size of section headers:           40 (bytes)
  Number of section headers:         9
  Section header string table index: 8

Section Headers:
  [Nr] Name              Type            Addr     Off    Size   ES Flg Lk Inf Al
  [ 0]                   NULL            00000000 000000 000000 00      0   0  0
  [ 1] .startup          PROGBITS        00010000 010000 000010 00  AX  0   0  4
  [ 2] .text             PROGBITS        00010010 010010 0000d4 00  AX  0   0  4
  [ 3] .data             PROGBITS        000100e4 0100e4 000064 00  WA  0   0  4
  [ 4] .ARM.attributes   ARM_ATTRIBUTES  00000000 010148 00002e 00      0   0  1
  [ 5] .comment          PROGBITS        00000000 010176 00007e 01  MS  0   0  1
  [ 6] .symtab           SYMTAB          00000000 0101f4 000180 10      7  18  4
  [ 7] .strtab           STRTAB          00000000 010374 000066 00      0   0  1
  [ 8] .shstrtab         STRTAB          00000000 0103da 000049 00      0   0  1
Key to Flags:
  W (write), A (alloc), X (execute), M (merge), S (strings), I (info),
  L (link order), O (extra OS processing required), G (group), T (TLS),
  C (compressed), x (unknown), o (OS specific), E (exclude),
  y (purecode), p (processor specific)
```

Output

```
mohas@DESKTOP-VP4AFMT MINGW32 ~/OneDrive/Desktop/my_lab
$ qemu-system-arm -M versatilepb -m 128M -nographic -kernel learn-in-depth.bin
learn-in-depth:Mohammed_Hasan
```