KETTERING UNIVERSITY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

CE-426-01

Keil uVision and ARM Assembly

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Table of Contents

1. Memory address table

Line	Bytes	R0	R1	R2	R3	R4	R14	R15	N	Z	C	V
	-	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0xFFFFFFFF	0x080000EC	0	0	0	0
133	2	0x08000111	0x00000000	0x00000000	0x00000000	0x00000000	0xFFFFFFFF	0x080000EE	0	0	0	0
134	2	0x08000111	0x00000000	0x00000000	0x00000000	0x00000000	0x080000F1	0x08000110	0	0	0	0
37	2	0x08000111	0x00000000	0x00000000	0x00000000	0x00000000	0x080000F1	0x080000F0	0	0	0	0
135	2	0x08000113	0x00000000	0x00000000	0x00000000	0x00000000	0x080000F1	0x080000F2	0	0	0	0
41	2	0x08000113	0x00000000	0x00000000	0x00000000	0x00000000	0x080000F1	0x08000112	0	0	0	0
42	2	0x0800014C	0x00000000	0x00000000	0x00000000	0x00000000	0x080000F1	0x08000114	0	0	0	0
43	2	0x0800014C	0x08000158	0x00000000	0x00000000	0x00000000	0x080000F1	0x08000116	0	0	0	0
45	2	0x0800014C	0x08000158	0x20000000	0x00000000	0x00000000	0x080000F1	0x08000118	0	0	0	0
46	2	0x08000150	0x08000158	0x20000000	0x87654321	0x00000000	0x080000F1	0x0800011C	0	0	0	0
47	2	0x08000150	0x0800015C	0x20000000	0x87654321	0xAABBCCDD	0x080000F1	0x08000120	0	0	0	0
48	2	0x08000150	0x0800015C	0x20000000	0x87654321	0x32210FFE	0x080000F1	0x08000122	0	0	1	1
50	2	0x08000150	0x0800015C	0x20000004	0x87654321	0x32210FFE	0x080000F1	0x08000126	0	0	1	1
51	2	0x08000154	0x0800015C	0x20000004	0x23456789	0x32210FFE	0x080000F1	0x0800012A	0	0	1	1
52	2	0x08000154	0x08000160	0x20000004	0x23456789	0x08000160	0x080000F1	0x0800012E	0	0	1	1
53	2	0x08000154	0x08000160	0x20000004	0x23456789	0xA3124577	0x080000F1	0x08000130	1	0	0	1
55	2	0x08000154	0x08000160	0x20000008	0x23456789	0xA3124577	0x080000F1	0x08000134	1	0	0	1
56	2	0x08000154	0x08000160	0x20000008	0x3456789A	0xA3124577	0x080000F1	0x08000136	1	0	0	1
57	2	0x08000154	0x08000160	0x20000008	0x3456789A	0xCCDDEEFF	0x080000F1	0x08000138	1	0	0	1
58	2	0x08000154	0x08000160	0x20000008	0x3456789A	0x01346799	0x080000F1	0x0800013A	0	0	1	0
60	2	0x08000154	0x08000160	0x20000008	0x3456789A	0x01346799	0x080000F1	0x0800013C	0	0	1	0

2. Objectives

- Create a new assembly project using uVision
- Learn the standard initialization steps of embedded software
- Perform basic ARM assembly programming

3. Program Source Code

3.1 Lab.s:

```
        AREA MyData, CODE

array1
   DCD 0x87654321, 0x23456789, 0x3456789A
array2
   DCD 0xAABBCCDD, 0x7FCCDDEE, 0xCCDDEEFF

   AREA MyAnswers, DATA
array3
   SPACE 12


   AREA MyCode, CODE, READONLY
   EXPORT    SystemInit
   EXPORT    __main

SystemInit
   BX    LR

__main
   ENTRY
   LDR R0, =array1
   LDR R1, =array2
   LDR R2, =array3

   LDR R3, [R0], #4
   LDR R4, [R1], #4
   ADDS R4, R3, R4
   STR R4, [R2], #4

   LDR R3, [R0], #4
   LDR R4, [R1], #4
   ADDS R4, R3, R4
   STR R4, [R2], #4

   LDR R3, [R0]
```

```
LDR R4, [R1]
ADDS R4, R3, R4
STR R4, [R2]

B    .
END
```

4. Questions

4.1 Question 1

What values are in memory locations 0x20000000 through 0x2000000B when the program finishes?

0x20000000: FE 0F 21 32 77 45 12 A3 99 67 34 01

4.2 Question 2

Compare the branch destination in R0 before the "BX R0" is executed in the Reset_Handler to the value in the PC immediately after the branch is executed. Explain the discrepancy between the values.

This discrepancy can be seen due to a change in memory location. Here the code goes from the System_Init to the main code; this is important because the compiler jumps from one code to another.

4.3 Question 3

How long does the program take to execute? Count only the time in "__main", without including the execution of the infinite loop instruction (B .) at the end of the program source file

0.00000500 = 5.00us