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190905522 CSE D Roll 62

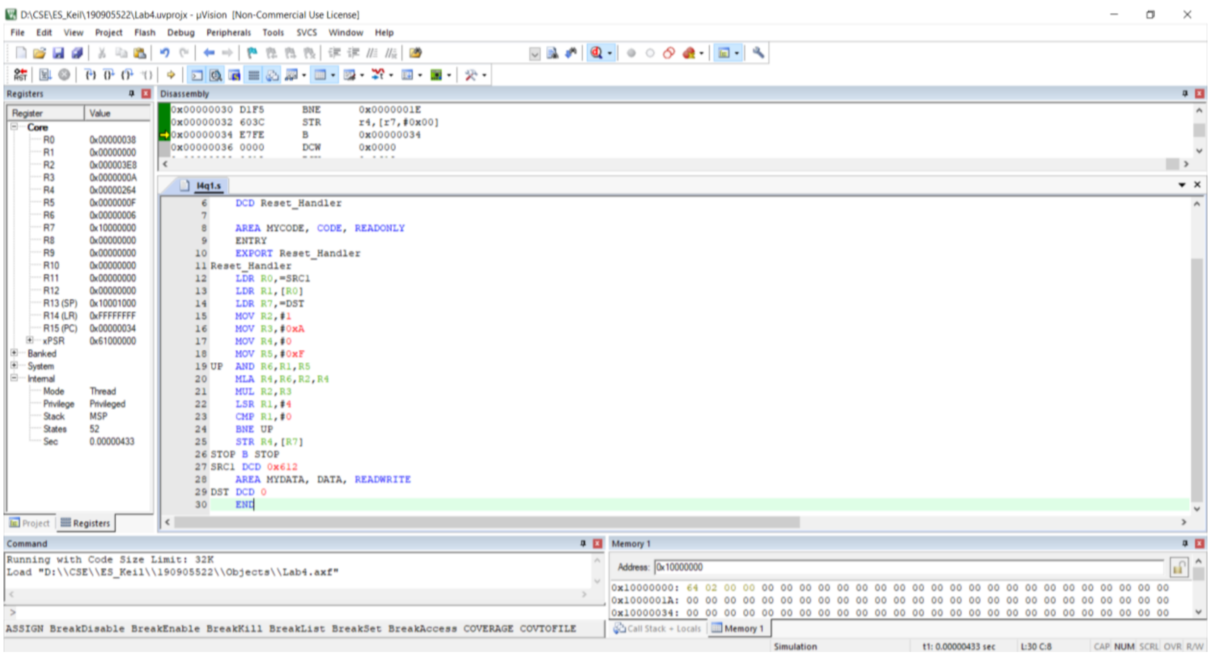
ES Lab 4 (Week 4) – Branching and Looping

Q1) Convert a 32-bit packed BCD number into its equivalent hexadecimal number.

CODE:

```
        AREA RESET, DATA, READONLY
        EXPORT __Vectors

__Vectors
        DCD 0X10001000
        DCD Reset_Handler

        AREA MYCODE, CODE, READONLY
        ENTRY
        EXPORT Reset_Handler
Reset_Handler
        LDR R0,=SRC1
        LDR R1,[R0]
        LDR R7,=DST
        MOV R2,#1
        MOV R3,#0xA
        MOV R4,#0
        MOV R5,#0xF
UP      AND R6,R1,R5
        MLA R4,R6,R2,R4
        MUL R2,R3
        LSR R1,#4
        CMP R1,#0
        BNE UP
        STR R4,[R7]
STOP B STOP
SRC1 DCD 0x612
        AREA MYDATA, DATA, READWRITE
DST DCD 0
        END
```

OUTPUT:


D:\CSE\ES_Keil\190905522\Lab4.uvprojx - µVision [Non-Commercial Use License]

```
Register      Value
Core
  R0          0x00000038
  R1          0x00000000
  R2          0x000003E8
  R3          0x0000000A
  R4          0x00000264
  R5          0x0000000F
  R6          0x00000006
  R7          0x10000000
  R8          0x00000000
  R9          0x00000000
  R10         0x00000000
  R11         0x00000000
  R12         0x00000000
  R13 (SP)    0x10001000
  R14 (LR)    0xFFFFFFFF
  R15 (PC)    0x00000034
  xPSR        0x61000000
Banked
System
Internal
  Mode        Thread
  Privilege   Privileged
  Stack       MSP
  States      52
  Sec         0.00000433
```

```
0x00000030 D1F5       BNE      0x0000001E
0x00000032 603C       STR      r4,[r7,#0x00]
0x00000034 E7FE       B        0x00000034
0x00000036 0000       DCW      0x0000
```

```
        DCD Reset_Handler

        AREA MYCODE, CODE, READONLY
        ENTRY
        EXPORT Reset_Handler
Reset_Handler
        LDR R0,=SRC1
        LDR R1,[R0]
        LDR R7,=DST
        MOV R2,#1
        MOV R3,#0xA
        MOV R4,#0
        MOV R5,#0xF
UP      AND R6,R1,R5
        MLA R4,R6,R2,R4
        MUL R2,R3
        LSR R1,#4
        CMP R1,#0
        BNE UP
        STR R4,[R7]
STOP B STOP
SRC1 DCD 0x612
        AREA MYDATA, DATA, READWRITE
DST DCD 0
        END
```

```
Running with Code Size Limit: 32K
Load "D:\\CSE\\ES_Keil\\190905522\\Objects\\Lab4.axf"
>
ASSIGN BreakDisable BreakEnable BreakKill BreakList BreakSet BreakAccess COVERAGE COVTOFILE
```

```
Address: 0x10000000
0x10000000: 64 02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1000001A: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x10000034: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

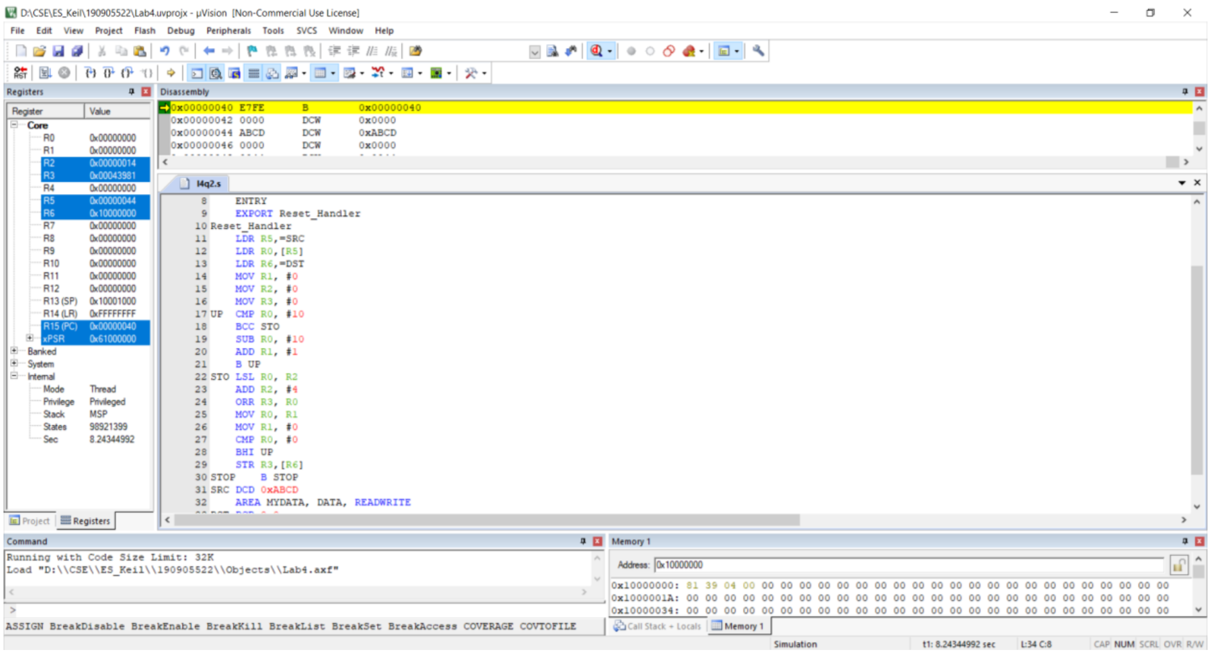
```
Simulation    t1: 0.00000433 sec    L:30 C:8    CAP NUM SCRL OVR R/W
```

Q2) Convert a 16-bit hex number into its equivalent packed BCD.

CODE:

```
        AREA RESET, CODE, READONLY
                EXPORT __Vectors
__Vectors
        DCD 0x10001000
        DCD Reset_Handler
        AREA myCode, CODE, READONLY
        ENTRY
        EXPORT Reset_Handler
Reset_Handler
        LDR R5,=SRC
        LDR R0,[R5]
        LDR R6,=DST
        MOV R1, #0
        MOV R2, #0
        MOV R3, #0
UP      CMP R0, #10
        BCC STO
        SUB R0, #10
        ADD R1, #1
        B UP
STO     LSL R0, R2
        ADD R2, #4
        ORR R3, R0
        MOV R0, R1
        MOV R1, #0
        CMP R0, #0
        BHI UP
        STR R3,[R6]
STOP    B STOP
SRC DCD 0xABCD
        AREA MYDATA, DATA, READWRITE
DST DCD 0x0
        END
```

OUTPUT:



D:\CSE\ES_Keil\190905522\Lab4.uvprojx - µVision [Non-Commercial Use License]

Register	Value
R0	0x00000000
R1	0x00000000
R2	0x00000014
R3	0x00043981
R4	0x00000000
R5	0x00000044
R6	0x10000000
R7	0x00000000
R8	0x00000000
R9	0x00000000
R10	0x00000000
R11	0x00000000
R12	0x00000000
R13 (SP)	0x10001000
R14 (LR)	0xFFFFFFFF
R15 (PC)	0x00000040
xPSR	0x61000000
Mode	Thread
Privilege	Privileged
Stack	MSP
States	98921399
Sec	8.24344992

```
0x00000040 E7FE      B         0x00000040
0x00000042 0000      DCW       0x0000
0x00000044 ABCD      DCW       0xABCD
0x00000046 0000      DCW       0x0000
```

```
     ENTRY
     EXPORT Reset_Handler
Reset_Handler
     LDR R5,=SRC
     LDR R0,[R5]
     LDR R6,=DST
     MOV R1, #0
     MOV R2, #0
     MOV R3, #0
UP   CMP R0, #10
     BCC STO
     SUB R0, #10
     ADD R1, #1
     B UP
STO  LSL R0, R2
     ADD R2, #4
     ORR R3, R0
     MOV R0, R1
     MOV R1, #0
     CMP R0, #0
     BHI UP
     STR R3,[R6]
STOP     B STOP
SRC  DCD 0xABCD
     AREA MYDATA, DATA, READWRITE
```

```
Running with Code Size Limit: 32K
Load "D:\\CSE\\ES_Keil\\190905522\\Objects\\Lab4.axf"
```

```
Address: 0x10000000
0x10000000: 81 39 04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1000001A: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x10000034: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Registers
Disassembly
l4q2.s
Project
Registers
Command
Memory 1
ASSIGN BreakDisable BreakEnable BreakKill BreakList BreakSet BreakAccess COVERAGE COVTOFILE
Call Stack + Locals
Simulation
t1: 8.24344992 sec
L:34 C:8
CAP NUM SCRL OVR R/W

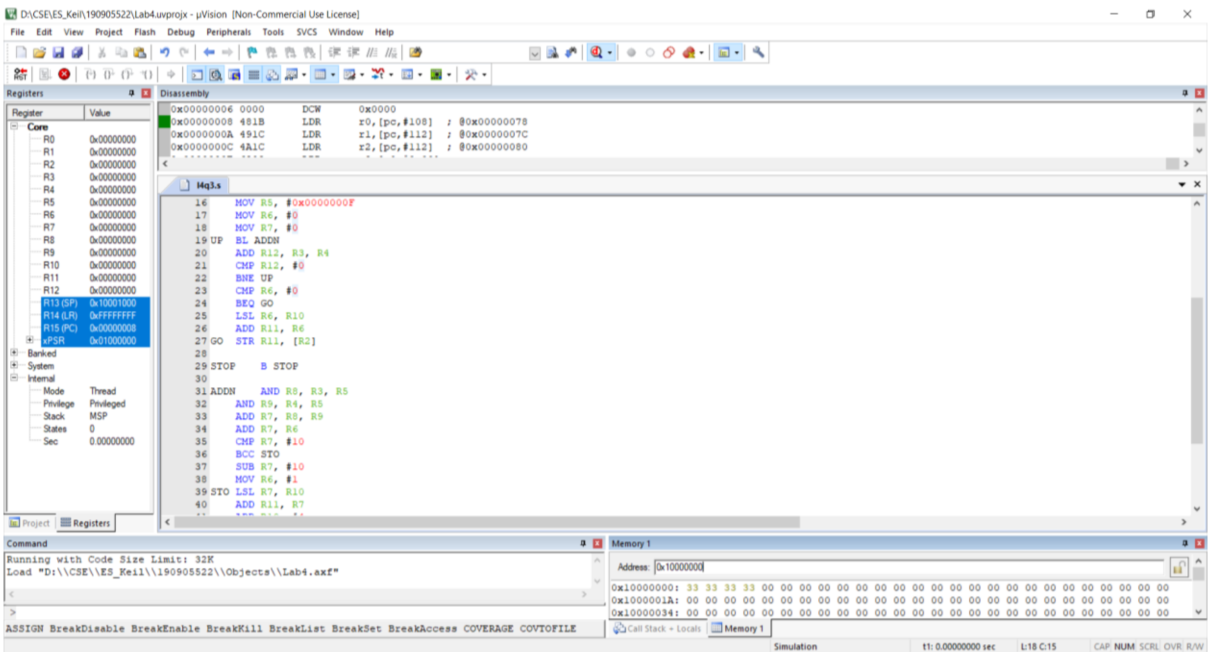
Q3) Add two 32-bit packed BCD numbers and store the result in packed BCD form.

CODE:

```
        AREA RESET, CODE, READONLY
                EXPORT __Vectors
__Vectors
        DCD 0x10001000
        DCD Reset_Handler


        AREA myCode, CODE, READONLY
        ENTRY
        EXPORT Reset_Handler
Reset_Handler
        LDR R0, =SRC1
        LDR R1, =SRC2
        LDR R2, =DST
        LDR R3, [R0]
        LDR R4, [R1]
        MOV R5, #0x0000000F
        MOV R6, #0
        MOV R7, #0
UP      BL ADDN
        ADD R12, R3, R4
        CMP R12, #0
        BNE UP
        CMP R6, #0
        BEQ GO
        LSL R6, R10
        ADD R11, R6
GO      STR R11, [R2]

STOP    B STOP

ADDN    AND R8, R3, R5
        AND R9, R4, R5
        ADD R7, R8, R9
        ADD R7, R6
        CMP R7, #10
        BCC STO
        SUB R7, #10
        MOV R6, #1
STO     LSL R7, R10
        ADD R11, R7
        ADD R10, #4
        MOV R7, #0
        LSR R3, #4
        LSR R4, #4
        BX LR
SRC1    DCD 0x11111111
SRC2    DCD 0x22222222
```

```
        AREA MYDATA, DATA, READWRITE
DST DCD 0x0
        END
```

OUTPUT:



```
D:\CSE\ES_Keil\190905522\Lab4.uvprojx - µVision  [Non-Commercial Use License]
```

```
Register    Value
Core
  R0        0x00000000
  R1        0x00000000
  R2        0x00000000
  R3        0x00000000
  R4        0x00000000
  R5        0x00000000
  R6        0x00000000
  R7        0x00000000
  R8        0x00000000
  R9        0x00000000
  R10       0x00000000
  R11       0x00000000
  R12       0x00000000
  R13 (SP)  0x10001000
  R14 (LR)  0xFFFFFFFF
  R15 (PC)  0x00000008
  xPSR      0x01000000
Banked
System
Internal
  Mode      Thread
  Privilege Privileged
  Stack     MSP
  States    0
  Sec       0.00000000
```

```
0x00000006 0000      DCW      0x0000
0x00000008 481B      LDR      r0,[pc,#108]  ; @0x00000078
0x0000000A 491C      LDR      r1,[pc,#112]  ; @0x0000007C
0x0000000C 4A1C      LDR      r2,[pc,#112]  ; @0x00000080
```

```
     MOV R5, #0x0000000F
     MOV R6, #0
     MOV R7, #0
UP   BL ADDN
     ADD R12, R3, R4
     CMP R12, #0
     BNE UP
     CMP R6, #0
     BEQ GO
     LSL R6, R10
     ADD R11, R6
GO   STR R11, [R2]

STOP     B STOP

ADDN     AND R8, R3, R5
     AND R9, R4, R5
     ADD R7, R8, R9
     ADD R7, R6
     CMP R7, #10
     BCC STO
     SUB R7, #10
     MOV R6, #1
STO  LSL R7, R10
     ADD R11, R7
```

```
Running with Code Size Limit: 32K
Load "D:\\CSE\\ES_Keil\\190905522\\Objects\\Lab4.axf"
```

```
ASSIGN BreakDisable BreakEnable BreakKill BreakList BreakSet BreakAccess COVERAGE COVTOFILE
```

```
Address: 0x10000000
0x10000000: 33 33 33 33 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1000001A: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x10000034: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

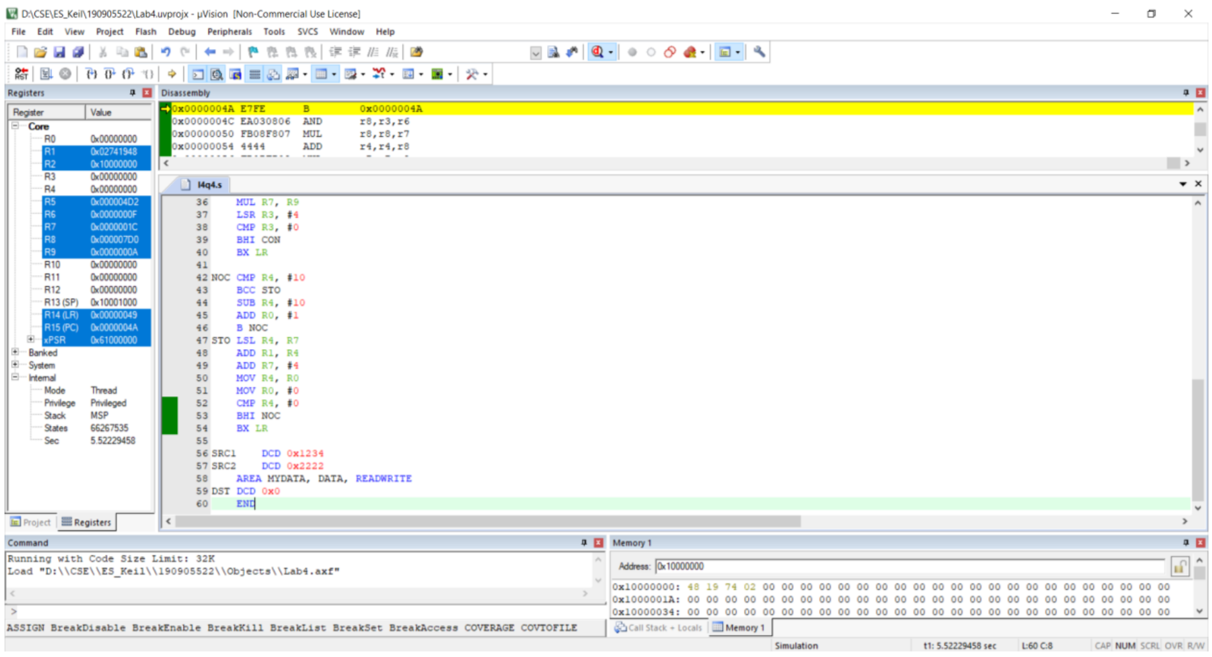
```
Simulation    t1: 0.00000000 sec    L:18 C:15
```

Q4) Multiply two 16-bit packed BCD and store the result in packed BCD form.

CODE:

```
        AREA RESET, CODE, READONLY
                EXPORT __Vectors
__Vectors
        DCD 0x10001000
        DCD Reset_Handler

        AREA myCode, CODE, READONLY
        ENTRY
        EXPORT Reset_Handler
Reset_Handler
        LDR R0, =SRC1
        LDR R1, =SRC2
        LDR R2, =DST
        LDR R3, [R0]
        MOV R6, #0xF
        MOV R7, #1
        MOV R9, #10
        BL CON
        MOV R5, R4
        LDR R3, [R1]
        MOV R7, #1
        MOV R4, #0
        MOV R8, #0
        BL CON
        MUL R4, R4, R5
        MOV R0, #0
        MOV R1, #0
        MOV R7, #0
        BL NOC
        STR R1, [R2]

STOP    B STOP
CON     AND R8, R3, R6
        MUL R8, R7
        ADD R4, R8
        MUL R7, R9
        LSR R3, #4
        CMP R3, #0
        BHI CON
        BX LR

NOC CMP R4, #10
        BCC STO
        SUB R4, #10
        ADD R0, #1
        B NOC
STO     LSL R4, R7
        ADD R1, R4
        ADD R7, #4
        MOV R4, R0
        MOV R0, #0
        CMP R4, #0
        BHI NOC
        BX LR

SRC1    DCD 0x1234
SRC2    DCD 0x2222
        AREA MYDATA, DATA, READWRITE
DST DCD 0x0
        END
```

OUTPUT:


D:\CSE\ES_Keil\190905522\Lab4.uvprojx - µVision [Non-Commercial Use License]
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
Registers
Disassembly
l4q4.s
Project
Registers
Command
Memory 1
Call Stack + Locals
Memory 1
Simulation
t1: 5.52229458 sec
L:60 C:8
CAP NUM SCRL OVR R/W

Register	Value
Core	
R0	0x00000000
R1	0x02741948
R2	0x10000000
R3	0x00000000
R4	0x00000000
R5	0x000004D2
R6	0x0000000F
R7	0x0000001C
R8	0x000007D0
R9	0x0000000A
R10	0x00000000
R11	0x00000000
R12	0x00000000
R13 (SP)	0x10001000
R14 (LR)	0x00000049
R15 (PC)	0x0000004A
xPSR	0x61000000
Banked	
System	
Internal	
Mode	Thread
Privilege	Privileged
Stack	MSP
States	66267535
Sec	5.52229458

```
0x0000004A E7FE      B        0x0000004A
0x0000004C EA030806  AND      r8,r3,r6
0x00000050 FB08F807  MUL      r8,r8,r7
0x00000054 4444      ADD      r4,r4,r8
```

```
        MUL R7, R9
        LSR R3, #4
        CMP R3, #0
        BHI CON
        BX LR

NOC     CMP R4, #10
        BCC STO
        SUB R4, #10
        ADD R0, #1
        B NOC
STO     LSL R4, R7
        ADD R1, R4
        ADD R7, #4
        MOV R4, R0
        MOV R0, #0
        CMP R4, #0
        BHI NOC
        BX LR

SRC1    DCD 0x1234
SRC2    DCD 0x2222
        AREA MYDATA, DATA, READWRITE
DST DCD 0x0
        END
```

```
Running with Code Size Limit: 32K
Load "D:\\CSE\\ES_Keil\\190905522\\Objects\\Lab4.axf"

>
ASSIGN BreakDisable BreakEnable BreakKill BreakList BreakSet BreakAccess COVERAGE COVTOFILE
```

```
Address: 0x10000000
0x10000000: 48 19 74 02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1000001A: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x10000034: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

THE END