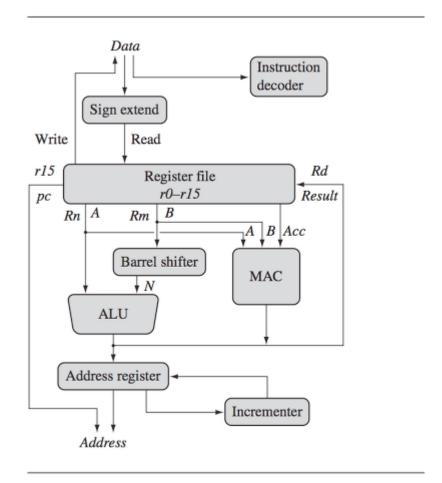
TI DSP, MCU 및 Xilinx Zynq FPGA 프로그래밍 전문가 과정

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- (1) add
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- (3) orr
- (4) rsble
- (5) bic
- (6) cmp
- (7) eor
- (8) tst
- (9) mvn

1. ARM ARCHITECTURE 1



ARM core dataflow model.

ARM

옵션 - MAC이 있으면 DSP

MAC

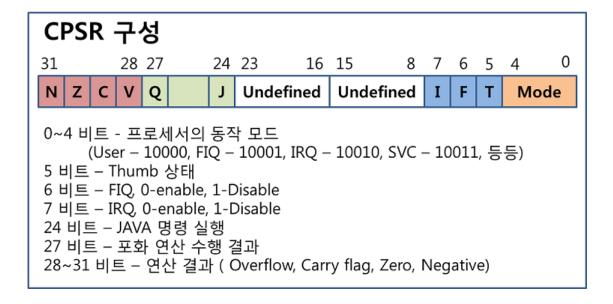
--> 곱셈연산으로 덧셈 클록 수를 줄이기 위함.

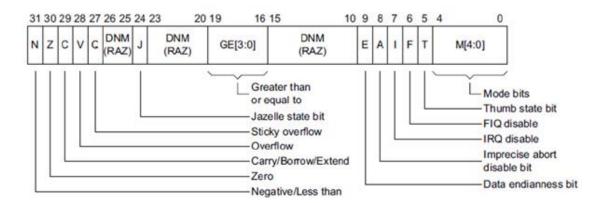
--> 곱셈 덧셈 처리를 1클록에 함.

cpsr -> intel eflags register랑 같음

satuartion --> core 연산

1. ARM ARCHITECTURE 2





arm 4byte 단위씩 명령어 구성.

Shift를 이용해서 모자란 bit수를 활용함.

It: less than

gt: greater than

eq: equal to

ne: not equal to

le : less than or equal to

ge: greater than or equal to

2. ARM ASM - ADD

```
1 #include<stdio.h>
                                                                                                            and track explicitly loaded dynamic code.
                                                                                                            0xf67ceb00 in ?? ()
 3 int main(void){
                                                                                                            (qdb) b main
                                                                                                            Breakpoint 1 at 0x10440: file add.c, line 9.
        register unsigned int r0 asm("r0");
                                                                                                            (gdb) c
        register unsigned int r1 asm("r1");
                                                                                                            Continuing.
        register unsigned int r2 asm("r2");
                                                                                                            warning: Could not load shared library symbols for
                                                                                                            Use the "info sharedlibrary" command to see the
        \Gamma 1 = 77;
                                                                                                            Do you need "set solib-search-path" or "set sysre
10
       \Gamma 2 = 37;
                                                                                                            Breakpoint 1, main () at add.c:9
12
       asm volatile("add r0, r1, r2");
                                                                                                                             \Gamma 1 = 77:
13
                                                                                                            (gdb) n
14
        printf("r0 = %d\n", r0);
                                                                                                            10
                                                                                                                             \Gamma 2 = 37;
        return 0;
                                                                                                            (gdb) n
16 }
                                                                                                            12
                                                                                                                             asm volatile("add r0, r1, r2");
                                                                                                            (gdb) info regi
                                                                                                                            0x1
                                                                                                                            0x4d
                                                                                                                                     77
                                                                                                            г2
                                                                                                                            0x25
                                                                                                                                     37
                                                                                                            г3
                                                                                                                            0x10438 66616
                                                                                                                            0x1046c 66668
                                                                                                           г5
                                                                                                                            0x0
                                                                                                                                     0
                                                                                                            гб
                                                                                                                            0x10310 66320
                                                                                                                            0x0
                                                                                                                                     0
                                                                                                                            0x0
                                                                                                            r8
r9
r10
r11
r12
sp
lr
pc
1:1 [모두]
                                                                                        ~/arm_asm/add.c\
                                                                                                                            0x0
                                                                                                                                     0
                                                                                                                            0xf67fe000
                                                                                                                                              -159391744
                                                                                                                            0xf6ffeed4
                                                                                                                                              -150999340
                                                                                                                            0xf6ffef50
                                                                                                                                              -150999216
 🕲 🖨 📵 hyunwoopark@hyunwoopark-P65-P67SG: ~/arm_asm
                                                                                                                            0xf6ffeed0
                                                                                                                                              0xf6ffeed0
hyunwoopark@hyunwoopark-P65-P67SG:~$ cd arm_asm/
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ ls
                                                                                                                            0xf6686d14
                                                                                                                                              -160928492
                                                                                                                            0x10448 0x10448 <main+16>
a.out add.c and.c bic.c cmp.c eor.c mvn.c orr.c rsble.c sub.c tst.c
                                                                                                           cpsr
(gdb) n
14
                                                                                                                            0x60000010
                                                                                                                                              1610612752
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ qemu-arm-static -g 1234 -L /usr/arm-linux-qnueabi ./a.o
                                                                                                                             printf("r0 = %d\n", r0);
r0 = 114
                                                                                                            (gdb) n
15
                                                                                                                             return 0;
                                                                                                            (gdb) info regi
                                                                                                                                     9
                                                                                                            Г0
                                                                                                                            0x9
                                                                                                            Г1
                                                                                                                            0x0
                                                                                                                                     0
                                                                                                            г2
                                                                                                                            0xf67b06b8
                                                                                                                                              -159709512
                                                                                                            г3
                                                                                                                            0x9
                                                                                                            Г4
                                                                                                                            0x1046c 66668
                                                                                                            r5
                                                                                                                                     0
                                                                                                                            0x0
                                                                                                            гб
                                                                                                                            0x10310 66320
                                                                                                            г7
                                                                                                                            0x0
                                                                                                                                     0
                                                                                                           г8
                                                                                                                            0x0
                                                                                                            Г9
                                                                                                                            0x0
                                                                                                            г10
                                                                                                                            0xf67fe000
                                                                                                                                              -159391744
                                                                                                            г11
                                                                                                                            0xf6ffeed4
                                                                                                                                              -150999340
                                                                                                            г12
                                                                                                                            0x0
                                                                                                            sp
lr
                                                                                                                            0xf6ffeed0
                                                                                                                                              0xf6ffeed0
                                                                                                                            0x1045c 66652
                                                                                                            pc
                                                                                                                            0x1045c 0x1045c <main+36>
                                                                                                            CPST
                                                                                                                            0x60000010
                                                                                                                                              1610612752
```

2. ARM ASM - SUB

```
arning: could not toad shared tibrary symbols for 2 tibraries, e.g. /tib/tibc.so.o.
 1 #include<stdio.h>
                                                                                                        Use the "info sharedlibrary" command to see the complete listing.
                                                                                                        Do you need "set solib-search-path" or "set sysroot"?
 3 int main(void){
                                                                                                        Breakpoint 1, main () at sub.c:10
       register unsigned int ro asm("ro");
                                                                                                                        r1 = 77;
       register unsigned int r1 asm("r1");
                                                                                                        (qdb) n
       register unsigned int r2 asm("r2");
                                                                                                                        \Gamma 2 = 37;
                                                                                                        11
       register unsigned int r3 asm("r3");
                                                                                                        (gdb)
                                                                                                        12
                                                                                                                        \Gamma 3 = 34;
       \Gamma 1 = 77:
                                                                                                        (gdb) info regi
11
       \Gamma 2 = 37;
                                                                                                                       0x1
       \Gamma 3 = 34:
                                                                                                                       0x4d
                                                                                                        Γ1
13
                                                                                                        Г2
                                                                                                                       0x25
                                                                                                                                37
       if(r1 > r2){
                                                                                                                       0x10438 66616
           asm volatile("subgt r3, r3, #1"); // sub greater than -->subgt
                                                                                                                       0x10474 66676
16
                                                                                                                       0x0
                                                                                                                                0
17
                                                                                                        Г6
                                                                                                                       0x10310 66320
       printf("r3 = %d\n", r3);
                                                                                                                       0x0
       return 0;
                                                                                                        F8
                                                                                                                       0x0
                                                                                                                                0
20 }
                                                                                                        r9
                                                                                                        г10
                                                                                                                       0xf67fe000
                                                                                                                                        -159391744
                                                                                                        г11
                                                                                                                       0xf6ffeed4
                                                                                                                                        -150999340
                                                                                                        Г12
                                                                                                                       0xf6ffef50
                                                                                                                                        -150999216
                                                                                                                       0xf6ffeed0
                                                                                                                                        0xf6ffeed0
                                                                                                        SP
                                                                                                                       0xf6686d14
                                                                                                                                        -160928492
                                                                                                                       0x10448 0x10448 <main+16>
1:1 [모두]
                                                                                   ~/arm_asm/sub.c\
                                                                                                                       0x60000010
                                                                                                                                        1610612752
                                                                                                        cpsr
"sub.c" 20L, 338C
                                                                                                         (gdb) n
                                                                                                                        if(r1 > r2){
 (a) (b) hyunwoopark(a) hyunwoopark-P65-P67SG: ~/arm asm
                                                                                                         (gdb)
                                                                                                                                asm volatile("subgt r3, r3, #1"); // sub greater than -->subgt
hyunwoopark@hyunwoopark-P65-P67SG:~$ cd arm_asm/
                                                                                                         (gdb) info regi
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ ls
                                                                                                                       0x1
a.out add.c and.c bic.c cmp.c eor.c mvn.c orr.c rsble.c sub.c tst.c
                                                                                                                       0x4d
                                                                                                                                77
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ qemu-arm-static -g 1234 -L /usr/arm-linux-qnueabi ./a.o
                                                                                                        Γ2
Γ3
                                                                                                                       0x25
                                                                                                                                37
ut
                                                                                                                       0x22
                                                                                                                                34
0 = 114
                                                                                                        г4
                                                                                                                       0x10474 66676
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ arm-linux-gnueabi-gcc -g sub.c
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ qemu-arm-static -q 1234 -L /usr/arm-linux-qnueabi ./a.o
                                                                                                        г5
                                                                                                                       0x0
                                                                                                                       0x10310 66320
                                                                                                        Г6
\Gamma 3 = 33
                                                                                                                       0x0
                                                                                                                                0
                                                                                                        r8
                                                                                                                       0x0
                                                                                                                                0
                                                                                                        Г9
                                                                                                                       0x0
                                                                                                        r10
                                                                                                                       0xf67fe000
                                                                                                                                        -159391744
                                                                                                                       0xf6ffeed4
                                                                                                        г11
                                                                                                                                        -150999340
                                                                                                        г12
                                                                                                                       0xf6ffef50
                                                                                                                                        -150999216
                                                                                                                       0xf6ffeed0
                                                                                                                                        0xf6ffeed0
                                                                                                        sp
                                                                                                        lr
                                                                                                                       0xf6686d14
                                                                                                                                        -160928492
                                                                                                                       0x10454 0x10454 <main+28>
                                                                                                                       0x20000010
                                                                                                                                        536870928
```

2. ARM ASM - rsble

```
🕽 🖨 🗊 hyunwoopark@hyunwoopark-P65-P67SG: ~/arm_asm
 🕽 🖨 📵 hyunwoopark@hyunwoopark-P65-P67SG: ~/arm_asm
                                                                                                         (gdb) n
 1 #include<stdio.h>
                                                                                                         17
                                                                                                                         if( r2 <= r1)
                                                                                                         (gdb) info regi
 3 int main(void){
                                                                                                         гО
                                                                                                                        0x1
                                                                                                                                 77
                                                                                                         г1
                                                                                                                        0x4d
       register unsigned int r0 asm("r0");
                                                                                                         г2
                                                                                                                        0x25
                                                                                                                                 37
       register unsigned int r1 asm("r1");
                                                                                                                        0x22
                                                                                                                                 34
                                                                                                         г3
       register unsigned int r2 asm("r2");
                                                                                                                        0x10480 66688
       register unsigned int r3 asm("r3");
                                                                                                                        0x3
       register unsigned int r4 asm("r4");
                                                                                                                        0x10310 66320
                                                                                                         гб
       register unsigned int r5 asm("r5");
                                                                                                                        0x0
11
                                                                                                                        0x0
12
13
14
15
       r1 = 77;
                                                                                                                        0x0
       \Gamma 2 = 37;
                                                                                                                        0xf67fe000
                                                                                                                                          -159391744
       r3 = 34;
                                                                                                         г11
                                                                                                                        0xf6ffeed4
                                                                                                                                          -150999340
       r5 = 3;
                                                                                                         г12
                                                                                                                        0xf6ffef50
                                                                                                                                          -150999216
16
17
                                                                                                         sp
                                                                                                                        0xf6ffeec8
                                                                                                                                         0xf6ffeec8
                                                                                                                        0xf6686d14
                                                                                                                                          -160928492
18
           asm volatile("rsble r4, r5, #5"); // reverse sub less equal 5 - r5(3)
19
20
21
22 }
                                                                                                                        0x10450 0x10450 <main+24>
                                                                                                         pc
                                                                                                                        0x60000010
                                                                                                                                         1610612752
                                                                                                         CPST
       printf("r4 = %d\n", r4);
                                                                                                         (gdb)
       return 0;
                                                                                                         18
                                                                                                                                 asm volatile("rsble r4, r5, #5"); // reverse sub less equal r5 -r4
                                                                                                         (gdb) info regi
                                                                                                                        0x1
                                                                                                         F0
                                                                                                         г1
                                                                                                                        0x4d
                                                                                                                        0x25
                                                                                                                                 37
                                                                                                         г2
                                                                                                                        0x4d
                                                                                                         г3
22:1 [모두]
                                                                                  ~/arm_asm/rsble.c\
                                                                                                                        0x10480 66688
"rsble.c" 22L, 426C 저장 했습니다
                                                                                                         г5
                                                                                                                        0x3
                                                                                                         Г6
                                                                                                                        0x10310 66320
 @ @ hyunwoopark@hyunwoopark-P65-P67SG: ~/arm asm
                                                                                                         г7
                                                                                                                        0x0
                                                                                                                                 0
                                                                                                                        0x0
hyunwoopark@hyunwoopark-P65-P67SG:~/arm asm$ arm-linux-qnueabi-qcc -q rsble.c
                                                                                                                        0x0
                                                                                                                                 0
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ qemu-arm-static -g 1234 -L /usr/arm-linux-gnueabi ./a.o
                                                                                                         г10
                                                                                                                        0xf67fe000
                                                                                                                                          -159391744
ut
r4 = 2
                                                                                                         г11
                                                                                                                        0xf6ffeed4
                                                                                                                                          -150999340
                                                                                                         г12
                                                                                                                        0xf6ffef50
                                                                                                                                          -150999216
                                                                                                                        0xf6ffeec8
                                                                                                                                         0xf6ffeec8
                                                                                                                        0xf6686d14
                                                                                                                                          -160928492
                                                                                                                        0x1045c 0x1045c <main+36>
                                                                                                                        0x80000010
                                                                                                                                         -2147483632
                                                                                                         (qdb) n
                                                                                                                         printf("r4 = %d\n", r4);
                                                                                                         20//
                                                                                                         (gdb) info regi
                                                                                                         Г0
                                                                                                                        0x1
                                                                                                                                 77
                                                                                                         г1
                                                                                                                        0x4d
                                                                                                                                 37
                                                                                                                        0x25
                                                                                                         г3
                                                                                                                        0x4d
                                                                                                         г4
                                                                                                                        0x2
                                                                                                         г5
                                                                                                                        0x3
                                                                                                         гб
                                                                                                                        0x10310 66320
                                                                                                         г7
                                                                                                                        0x0
                                                                                                         Г8
                                                                                                                        0x0
                                                                                                                        0x0
                                                                                                         Г9
                                                                                                         г10
                                                                                                                        0xf67fe000
                                                                                                                                          -159391744
                                                                                                         г11
                                                                                                                        0xf6ffeed4
                                                                                                                                          -150999340
                                                                                                                        0xf6ffef50
                                                                                                                                          -150999216
                                                                                                         Г12
                                                                                                                        0xf6ffeec8
                                                                                                                                         0xf6ffeec8
```

2. ARM ASM – bic

```
Г0
                                                                                                                         0x7
       for(i = 31; i>= 0;){
                                                                                                         Г1
                                                                                                                         0x7
           printf("%d", (reg >> i--) & 1);
                                                                                                          Г2
                                                                                                                         0xf6fff02c
                                                                                                                                           -150998996
                                                                                                                         0x104cc 66764
                                                                                                          г3
       printf("\n");
                                                                                                                         0x10508 66824
                                                                                                         Г4
                                                                                                                         0x0
                                                                                                         г5
                                                                                                                                  0
                                                                                                         Г6
                                                                                                                         0x10340 66368
12 int main(void){
                                                                                                          г7
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                         г8
                                                                                                                         0x0
                                                                                                                                  0
       register unsigned int r0 asm("r0");
                                                                                                          г9
                                                                                                                         0x0
                                                                                                                                  0
       register unsigned int r1 asm("r1");
                                                                                                          г10
                                                                                                                         0xf67fe000
                                                                                                                                           -159391744
       register unsigned int r2 asm("r2");
                                                                                                         г11
                                                                                                                         0xf6ffeed4
                                                                                                                                           -150999340
17
       register unsigned int r3 asm("r3");
                                                                                                          г12
                                                                                                                         0xf6ffef50
                                                                                                                                           -150999216
       register unsigned int r4 asm("r4");
18
                                                                                                                         0xf6ffeed0
                                                                                                                                           0xf6ffeed0
                                                                                                          Sp
lr
19
       register unsigned int r5 asm("r5");
                                                                                                                         0xf6686d14
                                                                                                                                           -160928492
20
                                                                                                                         0x104dc 0x104dc <main+16>
21
22
23
24
25
26
27
       r0 = 7;
                                                                                                                         0x60000010
                                                                                                          CDST
                                                                                                                                          1610612752
       \Gamma 1 = 7;
                                                                                                          (gdb)
                                                                                                          25
                                                                                                                                  \Gamma 3 = 42;
       if( r0 == r1){
                                                                                                          (gdb) info regi
           \Gamma 3 = 42;
                                                                                                          гО
                                                                                                                         0x7
           asm volatile("biceg r2, r3, #7"); // 42 & ~7 1111 1000
                                                                                                          Г1
                                                                                                                         0x7
                                                                                                                         0xf6fff02c
                                                                                                          Γ2
                                                                                                                                           -150998996
28
29
30
                                                                                                          г3
                                                                                                                         0x7
       show_reg(r2);
                                                                                                                         0x10508 66824
                                                                                                          г4
       return 0;
                                                                                                          г5
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                          Гб
                                                                                                                         0x10340 66368
10:1 [바닥]
                                                                                     ~/arm_asm/bic.c\
                                                                                                          г7
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                          r8
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                          r9
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                          Г10
                                                                                                                         0xf67fe000
                                                                                                                                           -159391744
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$_arm-linux-qnueabi-qcc_-q_bic.c
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ qemu-arm-static -q 1234 -L /usr/arm-linux-gnueabi ./a.o
                                                                                                         || 111
                                                                                                                         0xf6ffeed4
                                                                                                                                           -150999340
                                                                                                          г12
                                                                                                                         0xf6ffef50
                                                                                                                                           -150999216
                                                                                                          sp
lr
pc
                                                                                                                         0xf6ffeed0
                                                                                                                                           0xf6ffeed0
0000000000000000000000000000101000
                                                                                                                         0xf6686d14
                                                                                                                                           -160928492
                                                                                                                         0x104e8 0x104e8 <main+28>
                                                                                                                         0x60000010
                                                                                                                                          1610612752
                                                                                                          CPST
                                                                                                          (qdb) n
                                                                                                                                  asm volatile("biceq r2, r3, #7"); // 42 & ~7 1111 1000
                                                                                                          26
                                                                                                          (gdb)
                                                                                                          29/
                                                                                                                          show_reg(r2);
                                                                                                          (gdb) info regi
                                                                                                          Г0
                                                                                                                         0x7
                                                                                                          Г1
                                                                                                                         0x7
                                                                                                          Г2
                                                                                                                         0x28
                                                                                                                                  40
                                                                                                         г3
                                                                                                                         0x2a
                                                                                                         г4
                                                                                                                         0x10508 66824
                                                                                                         г5
                                                                                                                         0x0
                                                                                                         Г6
                                                                                                                         0x10340 66368
                                                                                                         г7
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                         F8
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                         Г9
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                         г10
                                                                                                                         0xf67fe000
                                                                                                                                           -159391744
                                                                                                         г11
                                                                                                                         0xf6ffeed4
                                                                                                                                           -150999340
                                                                                                          г12
                                                                                                                         0xf6ffef50
                                                                                                                                           -150999216
                                                                                                                         0xf6ffeed0
                                                                                                                                          0xf6ffeed0
```

2. ARM ASM - cmp

```
1 #include<stdio.h>
                                                                                                         г4
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                         r5
                                                                                                                         0x0
 3 int main(void){
                                                                                                         Г6
                                                                                                                         0x102d8 66264
                                                                                                                         0x0
                                                                                                                                  0
       register unsigned int r0 asm("r0") = 0;
                                                                                                         г8
                                                                                                                         0x0
                                                                                                                                  0
       register unsigned int r1 asm("r1") = 0;
                                                                                                         Г9
                                                                                                                         0x0
       register unsigned int r2 asm("r2") = 0;
                                                                                                         r10
                                                                                                                         0xf67fe000
                                                                                                                                          -159391744
      register unsigned int r3 asm("r3") = 0;
                                                                                                         г11
                                                                                                                         0xf6ffeed4
                                                                                                                                          -150999340
       register unsigned int r4 asm("r4") = 0;
                                                                                                                         0xf6ffef50
                                                                                                                                          -150999216
                                                                                                         г12
       register unsigned int r5 asm("r5") = 0;
                                                                                                                         0xf6ffeecc
                                                                                                                                          0xf6ffeecc
                                                                                                         sp
11
                                                                                                         lr
                                                                                                                         0xf6686d14
                                                                                                                                          -160928492
      asm volatile("cmp r0, r1"); // r0 - r1 == 0 --> 0110
asm volatile("mov r2, #5"); // mov -> r2 = 5
12
                                                                                                         pc
                                                                                                                         0x10420 0x10420 <main+32>
                                                                                                          cpsr
                                                                                                                         0x60000010
                                                                                                                                          1610612752
      asm volatile("cmp r0, r2"); // r0 - r1 != 0 --> 1000
14
                                                                                                          (gdb) n
                                                                                                          13
                                                                                                                          asm volatile("mov r2, #5");
       return 0;
                                                                                                         (gdb) info regi
17 }
                                                                                                         гО
                                                                                                                         0x0
                                                                                                         Г1
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                         г4
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                         г5
                                                                                                                         0x0
                                                                                                         r6
                                                                                                                         0x102d8 66264
                                                                                                         г7
                                                                                                                         0x0
                                                                                                         г8
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                          г9
                                                                                                                         0x0
                                                                                                         r10
                                                                                                                         0xf67fe000
                                                                                                                                          -159391744
14:57 [모두]
                                                                                     ~/arm_asm/cmp.c\
                                                                                                          г11
                                                                                                                         0xf6ffeed4
                                                                                                                                          -150999340
"cmp.c" 17L, 458C 저장 했습니다
                                                                                                                                          -150999216
                                                                                                         r12
                                                                                                                         0xf6ffef50
                                                                                                         sp
                                                                                                                         0xf6ffeecc
                                                                                                                                          0xf6ffeecc
                                                                                                         lr
                                                                                                                         0xf6686d14
                                                                                                                                          -160928492
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ arm-linux-gnueabi-gcc -g cmp.c
                                                                                                                         0x10424 0x10424 <main+36>
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ qemu-arm-static -g 1234 -L /usr/arm-linux-gnueabi ./a.o
                                                                                                         //pc
                                                                                                         CPST
                                                                                                                         0x60000010
                                                                                                                                          1610612752
                                                                                                         (gdb) n
                                                                                                                          asm volatile("cmp r0, r2");
                                                                                                          (gdb) n
                                                                                                                          return 0;
                                                                                                          (gdb) info regi
                                                                                                         гО
                                                                                                                                  0
                                                                                                         г1
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                         г2
                                                                                                                         0x5
                                                                                                         г3
                                                                                                                         0x0
                                                                                                          г4
                                                                                                                         0x0
                                                                                                          r5
                                                                                                                         0x0
                                                                                                                         0x102d8 66264
                                                                                                         гб
                                                                                                         г7
                                                                                                                         0x0
                                                                                                                                  0
                                                                                                         г8
                                                                                                                         0x0
                                                                                                         Г9
                                                                                                                         0x0
                                                                                                         г10
                                                                                                                         0xf67fe000
                                                                                                                                          -159391744
                                                                                                         г11
                                                                                                                         0xf6ffeed4
                                                                                                                                          -150999340
                                                                                                                                          -150999216
                                                                                                         г12
                                                                                                                         0xf6ffef50
                                                                                                         sp
lr
                                                                                                                         0xf6ffeecc
                                                                                                                                          0xf6ffeecc
                                                                                                                         0xf6686d14
                                                                                                                                          -160928492
                                                                                                         pc
                                                                                                                         0x1042c 0x1042c <main+44>
                                                                                                                         0x80000010
                                                                                                                                          -2147483632
                                                                                                         cpsr
```

2. ARM ASM - eor

```
г2
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                           г3
                                                                                                                          0x0
                                                                                                                                   0
       for(i = 31; i>= 0;){
                                                                                                           Г4
                                                                                                                          0x0
                                                                                                                                   0
           printf("%d", (reg >> i--) & 1);
                                                                                                           r5
                                                                                                                          0x0
                                                                                                           гб
                                                                                                                          0x10340 66368
9 10 }
       printf("\n");
                                                                                                           г7
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                           г8
                                                                                                                                   0
                                                                                                           Г9
                                                                                                                          0x0
12 int main(void)[
                                                                                                          г10
                                                                                                                          0xf67fe000
                                                                                                                                            -159391744
                                                                                                                          0xf6ffeed4
                                                                                                                                            -150999340
                                                                                                           г11
       register unsigned int r0 asm("r0") = 0;
                                                                                                           г12
                                                                                                                          0xf6ffef50
                                                                                                                                            -150999216
       register unsigned int r1 asm("r1") = 0;
15
                                                                                                                          0xf6ffeec8
                                                                                                                                           0xf6ffeec8
                                                                                                           Sp
lr
       register unsigned int r2 asm("r2") = 0;
                                                                                                                          0xf6686d14
                                                                                                                                            -160928492
       register unsigned int r3 asm("r3") = 0;
                                                                                                                          0x104ec 0x104ec <main+32>
       register unsigned int r4 asm("r4") = 0;
                                                                                                                          0x60000010
                                                                                                                                            1610612752
       register unsigned int r5 asm("r5") = 0;
                                                                                                           (gdb)
20
                                                                                                           22
                                                                                                                                   r0 = 10;
21
22
23
24
25
26
27
28
29
       if( r0 == r1){
                                                                                                           (gdb)
           r0 = 10;
                                                                                                           23
                                                                                                                                   r3 = 5;
           r3 = 5;
                                                                                                           (gdb)
           asm volatile("eors r1, r3, r0"); // r3 ^ r0
                                                                                                                                   asm volatile("eors r1, r3, r0"); // r3 ^ r0
                                                                                                           (gdb)
                                                                                                                           show_reg(r1);
       show_reg(r1);
return 0;
                                                                                                           (gdb) info regi
                                                                                                                          0xa
                                                                                                                                   10
                                                                                                                                   15
                                                                                                                          0xf
                                                                                                                          0x0
                                                                                                                                   0
30:1 [바닥]
                                                                                      ~/arm_asm/eor.c\
                                                                                                                          0x5
"eor.c" 30L, 520C 저장 했습니다
                                                                                                                                   0
                                                                                                                          0x0
                                                                                                           г5
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                           гб
                                                                                                                          0x10340 66368
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ arm-linux-gnueabi-gcc -g eor.c
                                                                                                                          0x0
hyunwoopark@hyunwoopark-P65-P675G:~/arm_asm$ qemu-arm-static -g 1234 -L /usr/arm-linux-gnueabi ./a.o
                                                                                                                                   0
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                                          0x0
                                                                                                                                   0
000000000000000000000000000001111
                                                                                                                          0xf67fe000
                                                                                                                                            -159391744
                                                                                                           г11
                                                                                                                          0xf6ffeed4
                                                                                                                                            -150999340
                                                                                                           г12
                                                                                                                          0xf6ffef50
                                                                                                                                            -150999216
                                                                                                                          0xf6ffeec8
                                                                                                                                            0xf6ffeec8
                                                                                                           sp
                                                                                                                          0xf6686d14
                                                                                                                                            -160928492
                                                                                                                          0x10508 0x10508 <main+60>
                                                                                                           pc
                                                                                                                          0x20000010
                                                                                                                                            536870928
                                                                                                           CDST
                                                                                                           (gdb)
                                                                                                                                   10
                                                                                                           r0
                                                                                                                          0xa
                                                                                                           Г1
                                                                                                                          0xf
                                                                                                                                   15
                                                                                                           г2
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                           г3
                                                                                                                          0x5
                                                                                                                                   5
                                                                                                           Г4
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                                          0x0
                                                                                                           г5
                                                                                                           гб
                                                                                                                          0x10340 66368
                                                                                                           г7
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                           г8
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                           F9
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                           r10
                                                                                                                          0xf67fe000
                                                                                                                                            -159391744
                                                                                                           г11
                                                                                                                          0xf6ffeed4
                                                                                                                                            -150999340
                                                                                                           г12
                                                                                                                                            -150999216
                                                                                                                          0xf6ffef50
                                                                                                                                           0xf6ffeec8
                                                                                                                          0xf6ffeec8
```

2. ARM ASM - eor

```
1 #include<stdio.h>
                                                                                                       Г9
                                                                                                                      0x0
                                                                                                       г10
                                                                                                                      0xf67fe000
                                                                                                                                       -159391744
 3 int main(void){
                                                                                                       г11
                                                                                                                      0xf6ffeed4
                                                                                                                                       -150999340
                                                                                                       г12
                                                                                                                      0xf6ffef50
                                                                                                                                       -150999216
       register unsigned int r0 asm("r0") = 0;
                                                                                                                      0xf6ffeecc
                                                                                                                                       0xf6ffeecc
                                                                                                       sp
       register unsigned int r1 asm("r1") = 0;
                                                                                                       lr
                                                                                                                      0xf6686d14
                                                                                                                                       -160928492
       register unsigned int r2 asm("r2") = 0;
                                                                                                       pc
                                                                                                                      0x10428 0x10428 <main+40>
       register unsigned int r3 asm("r3") = 0;
                                                                                                                      0x60000010
                                                                                                                                       1610612752
                                                                                                        CDST
       register unsigned int r4 asm("r4") = 0;
                                                                                                      (gdb)
       register unsigned int r5 asm("r5") = 0;
                                                                                                        17
                                                                                                                       return 0:
                                                                                                        (gdb) info regi
12
                                                                                                       гО
13
       asm volatile("cmp r0, r1"); // r0 - r1 == 0 // 0110
                                                                                                       Г1
                                                                                                                      0x0
                                                                                                                               0
14
15
       asm volatile("mov r2, #3"); // mov -> r2 = 3
                                                                                                                      0x3
       asm volatile("tsteq r2, #5"); // if (equal r0, r1) --> r2 & 5
                                                                                                                      0x0
16
                                                                                                       г4
                                                                                                                      0x0
17
18
       printf("%d\n", r2);
                                                                                                       г5
                                                                                                                      0x0
       return 0;
                                                                                                                      0x102d8 66264
19
20 }
                                                                                                                      0x0
                                                                                                       г8
                                                                                                                      0x0
                                                                                                       Г9
                                                                                                                      0x0
                                                                                                       г10
                                                                                                                      0xf67fe000
                                                                                                                                       -159391744
                                                                                                       r11
                                                                                                                                       -150999340
                                                                                                                      0xf6ffeed4
                                                                                                       г12
                                                                                                                      0xf6ffef50
                                                                                                                                       -150999216
                                                                                                                      0xf6ffeecc
                                                                                                                                       0xf6ffeecc
                                                                                                                                       -160928492
                                                                                                                      0xf6686d14
                                                                                                                      0x1042c 0x1042c <main+44>
15:69 [모두]
                                                                                [+] ~/arm_asm/tst.c\
                                                                                                        срѕг
                                                                                                                      0x20000010
                                                                                                                                      536870928
-- 끼워넣기 --
                                                                                                        (gdb) n
                                                                                                        (dbp)
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ qemu-arm-static -L /usr/arm-linux-gnueabi ./a.out
                                                                                                       0xf6686d14 in ?? ()
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$
                                                                                                        Cannot find bounds of current function
                                                                                                        (gdb) info regi
                                                                                                                      0x0
                                                                                                        г1
                                                                                                                      0x0
                                                                                                                               0
                                                                                                       г2
                                                                                                                      0x3
                                                                                                       Г3
                                                                                                                      0x0
                                                                                                       г4
                                                                                                                      0x10440 66624
                                                                                                       r5/
                                                                                                                      0x0
                                                                                                       гб
                                                                                                                      0x102d8 66264
                                                                                                                      0x0
                                                                                                       r8
                                                                                                                      0x0
                                                                                                       r9
                                                                                                                      0x0
                                                                                                       г10
                                                                                                                      0xf67fe000
                                                                                                                                       -159391744
                                                                                                       Г11
                                                                                                                      0x0
                                                                                                       г12
                                                                                                                      0xf6ffef50
                                                                                                                                       -150999216
                                                                                                       sp
lr
                                                                                                                      0xf6ffeed8
                                                                                                                                       0xf6ffeed8
                                                                                                                      0xf6686d14
                                                                                                                                       -160928492
                                                                                                       pc
                                                                                                                      0xf6686d14
                                                                                                                                       0xf6686d14
                                                                                                                      0x20000010
                                                                                                                                       536870928
                                                                                                       cpsr
                                                                                                        (gdb) c
                                                                                                        Continuing.
                                                                                                        [Inferior 1 (Remote target) exited normally]
```

2. ARM ASM - eor

```
0x0
 1 #include<stdio.h>
                                                                                                           г4
                                                                                                                          0x0
                                                                                                                                    0
                                                                                                                          0x0
                                                                                                           r5
                                                                                                                                    0
 3 int main(void){
                                                                                                           F6
                                                                                                                          0x10310 66320
                                                                                                                          0x0
                                                                                                                                   0
       register unsigned int r0 asm("r0") = 0;
                                                                                                           F8
                                                                                                                          0x0
                                                                                                                                   0
       register unsigned int r1 asm("r1") = 0;
register unsigned int r2 asm("r2") = 0;
                                                                                                                          0x0
                                                                                                           Г9
                                                                                                          r10
                                                                                                                          0xf67fe000
                                                                                                                                            -159391744
       register unsigned int r3 asm("r3") = 0;
                                                                                                           г11
                                                                                                                          0xf6ffeed4
                                                                                                                                            -150999340
       register unsigned int r4 asm("r4") = 0;
                                                                                                                          0xf6ffef50
                                                                                                                                            -150999216
                                                                                                          Г12
       register unsigned int r5 asm("r5") = 0;
                                                                                                                          0xf6ffeec8
                                                                                                                                            0xf6ffeec8
                                                                                                           sp
                                                                                                           lin
                                                                                                                          0xf6686d14
                                                                                                                                            -160928492
12
                                                                                                           рс
                                                                                                                          0x10458 0x10458 <main+32>
13
       asm volatile("cmp r0, r1");
                                                                                                           cpsr
                                                                                                                          0x60000010
                                                                                                                                            1610612752
14
       asm volatile("mvneq r1, #0"); // mvn r1 ^ 0
                                                                                                           (gdb) n
15
                                                                                                                           asm volatile("mvneq r1, #0"); // mvn r1 ^ 0
                                                                                                           14
16
       printf("r1 = 0x%x\n", r1);
                                                                                                           (gdb) info regi
17
       return 0;
                                                                                                          г0
                                                                                                                          0x0
                                                                                                                                   0
18
                                                                                                           Г1
                                                                                                                          0x0
                                                                                                                                   0
19 }
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                                          0x0
                                                                                                                                    0
                                                                                                          г4
                                                                                                                          0x0
                                                                                                                                    0
                                                                                                           г5
                                                                                                                          0x0
                                                                                                           Г6
                                                                                                                          0x10310 66320
                                                                                                           г7
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                           г8
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                           г9
                                                                                                                          0xf67fe000
                                                                                                                                            -159391744
                                                                                                           r10
1:1 [모두]
                                                                                      ~/arm_asm/mvn.c\
                                                                                                           г11
                                                                                                                          0xf6ffeed4
                                                                                                                                            -150999340
"mvn.c" 19L, 407C
                                                                                                           г12
                                                                                                                          0xf6ffef50
                                                                                                                                            -150999216

    hyunwoopark@hyunwoopark-P65-P67SG: ~/arm asm

                                                                                                          sp
lr
                                                                                                                          0xf6ffeec8
                                                                                                                                            0xf6ffeec8
                                                                                                                          0xf6686d14
                                                                                                                                            -160928492
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ arm-linux-gnueabi-gcc -g tst.c
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ arm-linux-gnueabi-gcc -g mvn.c
                                                                                                                          0x1045c 0x1045c <main+36>
                                                                                                                          0x60000010
                                                                                                                                            1610612752
hyunwoopark@hyunwoopark-P65-P67SG:~/arm_asm$ qemu-arm-static -g 1234 -L /usr/arm-linux-gnueabi ./a.o
                                                                                                           (gdb) n
                                                                                                                           printf("r1 = 0x%x\n", r1);
\underline{r}1 = 0xffffffff
                                                                                                           (gdb) info regi
                                                                                                                          0x0
                                                                                                           Γ0
                                                                                                                          0xffffffff
                                                                                                           Г1
                                                                                                           г2
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                           Г3
                                                                                                                          0x0
                                                                                                                                    0
                                                                                                           г4
                                                                                                                          0x0
                                                                                                                                    0
                                                                                                                          0x0
                                                                                                           r5
                                                                                                           Г6
                                                                                                                          0x10310 66320
                                                                                                           г7
                                                                                                                          0x0
                                                                                                           г8
                                                                                                                          0x0
                                                                                                                                   0
                                                                                                                          0x0
                                                                                                           Г9
                                                                                                          г10
                                                                                                                          0xf67fe000
                                                                                                                                            -159391744
                                                                                                          г11
                                                                                                                          0xf6ffeed4
                                                                                                                                            -150999340
                                                                                                          г12
                                                                                                                          0xf6ffef50
                                                                                                                                            -150999216
                                                                                                                          0xf6ffeec8
                                                                                                                                            0xf6ffeec8
                                                                                                           sp
lr
                                                                                                                          0xf6686d14
                                                                                                                                            -160928492
                                                                                                           pc -
                                                                                                                          0x10460 0x10460 <main+40>
                                                                                                           срѕг
                                                                                                                          0x60000010
                                                                                                                                            1610612752
                                                                                                           (gdb) n
                                                                                                           17 -
                                                                                                                           return 0;
```