

# 유닉스기초 (CB3500575-061) - 최성기 교수님 - GDB 과제

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1. vi Homework.c 명령어를 입력하여, 주어진 예제 코드를 작성한다.

```
nozerose — nozerose@ubuntu: ~/test/ch12 — ssh nozerose@192.168.64....
1  include <stdio.h>
2  #define S_TO_M 60
3
4  void main(void)
5  {
6      int sec, min, left;
7
8      printf("Enter the number of seconds\n");
9      printf("Enter 0 to end the program\n");
10     while(sec > 0) {
11         scanf("%d", sec);
12         min = sec / S_TO_M;
13         left = sec % S_TO_M;
14         printf("%d sec is %d min, %d sec\n", sec, min, left);
15         printf("Next input?\n");
16     }
17 }
"Homework.c" 17L, 332B                                1,1                                All
```

2. gcc -g Homework.c -o Homework 명령어를 입력하여, Homework 실행파일을 생성한다.

> Homework 실행파일을 실행하면, **Segmentation fault (core dumped)** 오류가 뜬다.

```
[nozerose@ubuntu:~/test/ch12$ gcc -g Homework.c -o Homework ]
Homework.c: In function 'main':
Homework.c:11:25: warning: format '%d' expects argument of type 'int *', but arg
ument 2 has type 'int' [-Wformat=]
   11 |         scanf("%d", sec);
      |                   ~^   ~~~
      |                   |   |
      |                   |   int
      |                   int *

[nozerose@ubuntu:~/test/ch12$ Homework ]
Enter the number of seconds
Enter 0 to end the program
4
Segmentation fault (core dumped)
```

3. gdb Homework 명령어를 입력하고, run 명령어를 입력하여 error를 확인한다.

> run 명령어를 입력할 때 프로그램이 정상적으로 작동하는 것처럼 보이지만, 임의의 정수를 입력하면 "Segmentation fault"가 발생하여 오류가 있다는 것을 알 수 있다.

```
[nozerose@ubuntu:~/test/ch12$ gdb Homework
GNU gdb (Ubuntu 12.1-0ubuntu1~22.04) 12.1
Copyright (C) 2022 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
Type "show copying" and "show warranty" for details.
This GDB was configured as "aarch64-linux-gnu".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<https://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
<http://www.gnu.org/software/gdb/documentation/>.

For help, type "help".
Type "apropos word" to search for commands related to "word"...
Reading symbols from Homework...
(gdb) run
Starting program: /home/nozerose/test/ch12/Homework
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/aarch64-linux-gnu/libthread_db.so.1".
Enter the number of seconds
Enter 0 to end the program
20

Program received signal SIGSEGV, Segmentation fault.
0x0000ffff7e55eb4 in __vfprintf_internal (s=<optimized out>, format=<optimized out>, argptr=<error reading variable: Cannot access memory at address 0x14>, mode_flags=mode_flags@entry=2) at ./stdio-common/vfprintf-internal.c:1896
1896 ./stdio-common/vfprintf-internal.c: No such file or directory.
```

4. bt 명령어를 사용하여, 어느 위치에서 오류가 발생했는지 파악할 수 있다.

> Homework.c 의 11 번째 줄의 "scanf"에서 오류가 발생했음을 알 수 있다.

```
Reading symbols from Homework...
(gdb) run
Starting program: /home/nozerose/test/ch12/Homework
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/aarch64-linux-gnu/libthread_db.so.1".
Enter the number of seconds
Enter 0 to end the program
72

Program received signal SIGSEGV, Segmentation fault.
0x0000ffff7e55eb4 in __vfprintf_internal (s=<optimized out>, format=<optimized out>, argptr=<error reading variable: Cannot access memory at address 0x48>, mode_flags=mode_flags@entry=2) at ./stdio-common/vfprintf-internal.c:1896
1896 ./stdio-common/vfprintf-internal.c: No such file or directory.
(gdb) bt
#0  0x0000ffff7e55eb4 in __vfprintf_internal (s=<optimized out>, format=<optimized out>, argptr=<error reading variable: Cannot access memory at address 0x48>, mode_flags=mode_flags@entry=2) at ./stdio-common/vfprintf-internal.c:1896
#1  0x0000ffff7e51f74 in __isoc99_scanf (format=<optimized out>) at ./stdio-common/isoc99_scanf.c:30
#2  0x0000aaaaaaa0848 in main () at Homework.c:11
(gdb) list
1891 in ./stdio-common/vfprintf-internal.c
```

5. 선언된 세 int 변수 sec, min, left를 초기화하지 않아 garbage값이 음수가 될 수 있다.  
만약, sec가 음수가 된다면 while문에 진입하지 못해 코드가 제대로 동작하지 못할 수 있다.

```
Reading symbols from Homework...
((gdb) b main
Breakpoint 1 at 0x8dc: file Homework.c, line 5.
((gdb) run
Starting program: /home/nozerose/test/ch12/Homework
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib/aarch64-linux-gnu/libthread_db.so.1".

Breakpoint 1, main () at Homework.c:5
5      {
((gdb) n
8          printf("Enter the number of seconds\n");
((gdb) list
3
4      void main(void)
5      {
6          int sec, min, left;
7
8          printf("Enter the number of seconds\n");
9          printf("Enter 0 to end the program\n");
10         while(sec > 0) {
11             scanf("%d", &sec);
12             min = sec / S_TO_M;
((gdb) p sec
$1 = 65535
((gdb) p min
$2 = -2936
((gdb) p left
$3 = 65535
```

6. 11번째 줄에서 scanf("%d", &sec); 로 수정해야하고, sec 변수를 1로 초기화하면 정상적으로 프로그램이 실행된다.

```
1  #include <stdio.h>
2  #define S_TO_M 60
3
4  void main(void)
5  {
6      int sec = 1, min, left;
7
8      printf("Enter the number of seconds\n");
9      printf("Enter 0 to end the program\n");
10     while(sec > 0) {
11         scanf("%d", &sec);
12         min = sec / S_TO_M;
13         left = sec % S_TO_M;
14         printf("%d sec is %d min, %d sec\n", sec, min, left);
15         printf("Next input?\n");
16     }
17 }
"Homework.c" 17L, 337B                                     1,1                                     All
```

7. 다시 Homework.c 파일을 컴파일한 후, 실행하면 아래처럼 실행된다.

```
[nozerose@ubuntu:~/test/ch12$ Homework
Enter the number of seconds
Enter 0 to end the program
72
72 sec is 1 min, 12 sec
Next input?
37
37 sec is 0 min, 37 sec
Next input?
0
0 sec is 0 min, 0 sec
Next input?
```