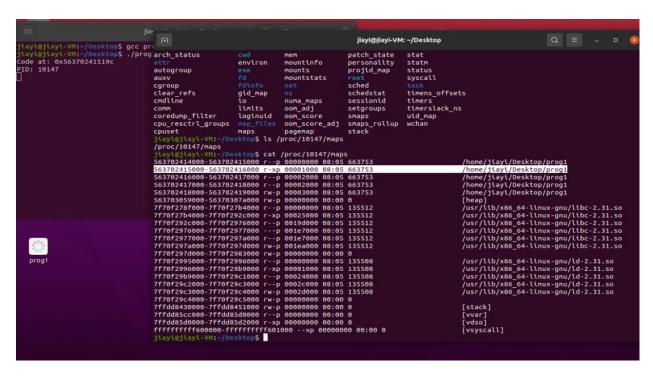# Name: Jiayi Xu

Date: 01/16/2021

Class: CS360—Operating System

Module 2

A-

Can you locate the code memory region of the process?

0x56370241519c

Does the value of location1 fall in this region?

Yes, the memory region is between the second line of the process address space.

What is the protection/permission of the region?

r-xp: write is disabled.

B-


```
jiayi@jiayi-VM:~/Desktop$ gcc prog2.c -o prog2 -Wall
jiayi@jiayi-VM:~/Desktop$ ./prog2
Process id: 10509
global string: 0x5655529b3010
read_only_integer: 0x5655529b1004
the code:: 0x5655529b01ec

/proc/10509/maps

5655529af000-5655529b0000 r--p 00000000 08:05 663763                    /home/jiayi/Desktop/prog2
5655529b0000-5655529b1000 r-xp 00001000 08:05 663763                    /home/jiayi/Desktop/prog2
5655529b1000-5655529b2000 r--p 00002000 08:05 663763                    /home/jiayi/Desktop/prog2
5655529b2000-5655529b3000 r--p 00002000 08:05 663763                    /home/jiayi/Desktop/prog2
5655529b3000-5655529b4000 rw-p 00003000 08:05 663763                    /home/jiayi/Desktop/prog2
565553b6f000-565553b90000 rw-p 00000000 00:00 0                         [heap]
7f3b5a0af000-7f3b5a0d4000 r--p 00000000 08:05 135512                    /usr/lib/x86_64-linux-gnu/libc-2.31.so
7f3b5a0d4000-7f3b5a24c000 r-xp 00025000 08:05 135512                    /usr/lib/x86_64-linux-gnu/libc-2.31.so
7f3b5a24c000-7f3b5a296000 r--p 0019d000 08:05 135512                    /usr/lib/x86_64-linux-gnu/libc-2.31.so
7f3b5a296000-7f3b5a297000 ---p 001e7000 08:05 135512                    /usr/lib/x86_64-linux-gnu/libc-2.31.so
7f3b5a297000-7f3b5a29a000 r--p 001e7000 08:05 135512                    /usr/lib/x86_64-linux-gnu/libc-2.31.so
7f3b5a29a000-7f3b5a29d000 rw-p 001ea000 08:05 135512                    /usr/lib/x86_64-linux-gnu/libc-2.31.so
7f3b5a29d000-7f3b5a2a3000 rw-p 00000000 00:00 0
7f3b5a2b5000-7f3b5a2b6000 r--p 00000000 08:05 135508                    /usr/lib/x86_64-linux-gnu/ld-2.31.so
7f3b5a2b6000-7f3b5a2d9000 r-xp 00001000 08:05 135508                    /usr/lib/x86_64-linux-gnu/ld-2.31.so
7f3b5a2d9000-7f3b5a2e1000 r--p 00024000 08:05 135508                    /usr/lib/x86_64-linux-gnu/ld-2.31.so
7f3b5a2e2000-7f3b5a2e3000 r--p 0002c000 08:05 135508                    /usr/lib/x86_64-linux-gnu/ld-2.31.so
7f3b5a2e3000-7f3b5a2e4000 rw-p 0002d000 08:05 135508                    /usr/lib/x86_64-linux-gnu/ld-2.31.so
7f3b5a2e4000-7f3b5a2e5000 rw-p 00000000 00:00 0
7ffd58851000-7ffd58872000 rw-p 00000000 00:00 0                         [stack]
7ffd588db000-7ffd588df000 r--p 00000000 00:00 0                         [vvar]
7ffd588df000-7ffd588e1000 r-xp 00000000 00:00 0                         [vdso]
ffffffffff600000-ffffffffff601000 --xp 00000000 00:00 0                 [vsyscall]
jiayi@jiayi-VM:~/Desktop$
```

Locate the memory regions where the global string and read_only_integer fall into.

What are the regions protection flags?

Global string: rw-p

Read_only_integer: r--p

Does it make sense? Include the output and circle where they are and explain in one sentence why these 2 variables fall in regions with different protection flags.

Yes, the global string is a static variable, it can be write, read, and shared, but the read_only_integer as its name, it is only can be read and shared, cannot write or execute.

C-

Create a program and declare a few local variables in main (e.g., an int, a double). Then print their addresses. Do they appear in the place you expected? Show your output and highlight the memory region where they are located.

Yes, it appears in the expected place, and the integer and double are local variables, so it should be in stack.

D-

 Create a program and declare a few variables using malloc. Then print where they point to. Do they point to an area of memory that you expected? Show your output and highlight the memory region where they point to.

Yes, it pointing the expected area which is heap area.

```
jiayi@jiayi-VM:~/Desktop$ vim prog4.c
jiayi@jiayi-VM:~/Desktop$ gcc prog4.c -o prog4 -Wall
jiayi@jiayi-VM:~/Desktop$ ./prog4
Process id: 11121
a pointing to: 0x5609ec7592a0
b pointing to: 0x5609ec7592c0
c pointing to: 0x5609ec7592e0


/proc/11121/maps

5609ec70b000-5609ec70c000 r--p 00000000 08:05 663767                     /home/jiayi/Desktop/prog4
5609ec70c000-5609ec70d000 r-xp 00001000 08:05 663767                     /home/jiayi/Desktop/prog4
5609ec70d000-5609ec70e000 r--p 00002000 08:05 663767                     /home/jiayi/Desktop/prog4
5609ec70e000-5609ec70f000 r--p 00002000 08:05 663767                     /home/jiayi/Desktop/prog4
5609ec70f000-5609ec710000 rw-p 00003000 08:05 663767                     /home/jiayi/Desktop/prog4
5609ec759000-5609ec77a000 rw-p 00000000 00:00 0                          [heap]
7fb07e4d0000-7fb07e4f5000 r--p 00000000 08:05 135512                     /usr/lib/x86_64-linux-gnu/libc-2.31.so
7fb07e4f5000-7fb07e66d000 r-xp 00025000 08:05 135512                     /usr/lib/x86_64-linux-gnu/libc-2.31.so
7fb07e66d000-7fb07e6b7000 r--p 0019d000 08:05 135512                     /usr/lib/x86_64-linux-gnu/libc-2.31.so
7fb07e6b7000-7fb07e6b8000 ---p 001e7000 08:05 135512                     /usr/lib/x86_64-linux-gnu/libc-2.31.so
7fb07e6b8000-7fb07e6bb000 r--p 001e7000 08:05 135512                     /usr/lib/x86_64-linux-gnu/libc-2.31.so
7fb07e6bb000-7fb07e6be000 rw-p 001ea000 08:05 135512                     /usr/lib/x86_64-linux-gnu/libc-2.31.so
7fb07e6be000-7fb07e6c4000 rw-p 00000000 00:00 0
7fb07e6d6000-7fb07e6d7000 r--p 00000000 08:05 135508                     /usr/lib/x86_64-linux-gnu/ld-2.31.so
7fb07e6d7000-7fb07e6fa000 r-xp 00001000 08:05 135508                     /usr/lib/x86_64-linux-gnu/ld-2.31.so
7fb07e6fa000-7fb07e702000 r--p 00024000 08:05 135508                     /usr/lib/x86_64-linux-gnu/ld-2.31.so
7fb07e703000-7fb07e704000 r--p 0002c000 08:05 135508                     /usr/lib/x86_64-linux-gnu/ld-2.31.so
7fb07e704000-7fb07e705000 rw-p 0002d000 08:05 135508                     /usr/lib/x86_64-linux-gnu/ld-2.31.so
7fb07e705000-7fb07e706000 rw-p 00000000 00:00 0
7ffcceb31000-7ffcceb52000 rw-p 00000000 00:00 0                          [stack]
7ffcceb96000-7ffcceb9a000 r--p 00000000 00:00 0                          [vvar]
7ffcceb9a000-7ffcceb9c000 r-xp 00000000 00:00 0                          [vdso]
ffffffffff600000-ffffffffff601000 --xp 00000000 00:00 0                  [vsyscall]
jiayi@jiayi-VM:~/Desktop$
```