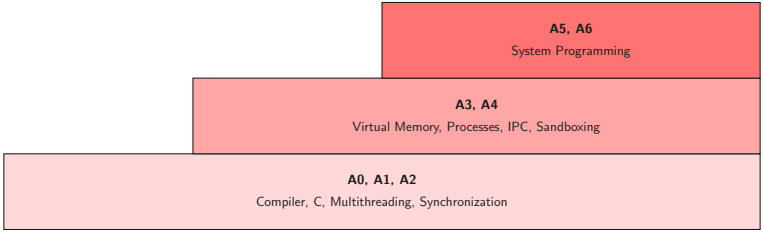
System Level Programming

Daniel Gruss

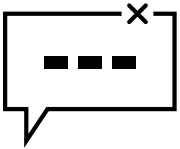
2021-03-15

Course Overview



A3 - Virtual Memory

Segmentation fault



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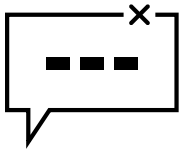

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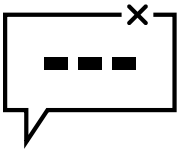
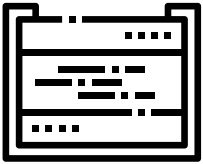
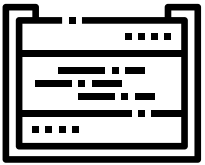


- We've all been there: access to "invalid" memory location
- But aren't pointers indices of this large array called RAM / physical memory?
- How can addresses in physical memory be "invalid"?

- **Pointers are not addresses/indices in a large array called RAM / physical memory**





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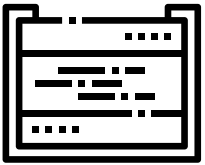

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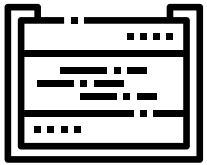

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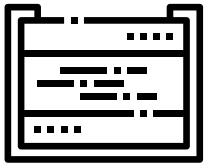

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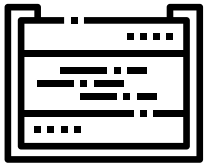

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→ different processes can use the same pointer / virtual address, but "see" different things there

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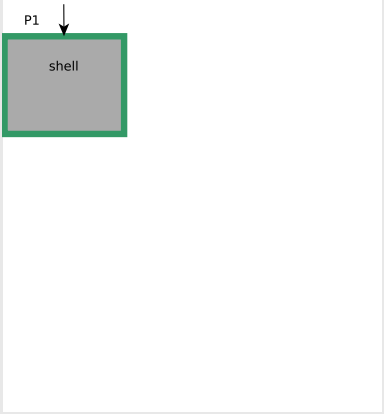
- We want a full explanation for the answer and **what I have to do to observe the behavior you describe**
- Don't collaborate with others - we cross check who did what when, answered which question when, etc.

A4 - Interprocess Communication

Code

```
//shell stuff
```

Image



Code

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pid_t pid = fork();
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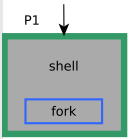

Code

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    pid_t pid = fork();
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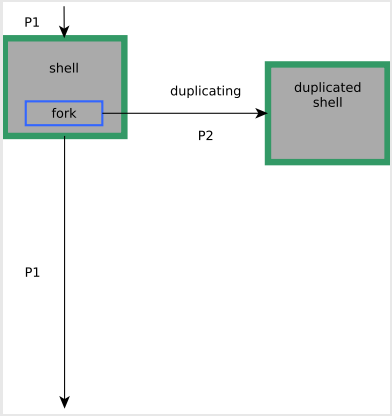
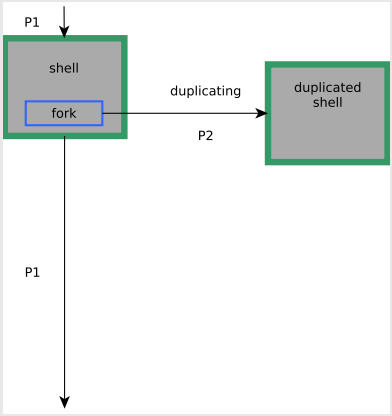


Code

```
//shell stuff

    pid_t pid = fork();
    if(pid == 0)
    {
            const char* args[] = {"~/
                "};
    }
    else
    {
            //do further shell stuff
    }
```

Image

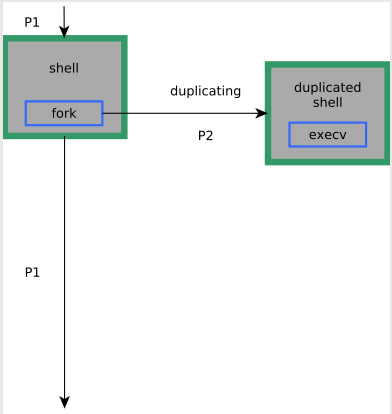


Code

```
//shell stuff

pid_t pid = fork();
if(pid == 0)
{
  const char* args[] = {"~/"};
  execv("/bin/ls", args);
}
else
{
  //do further shell stuff
}
```

Image



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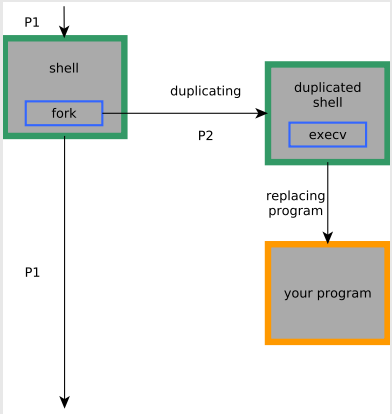

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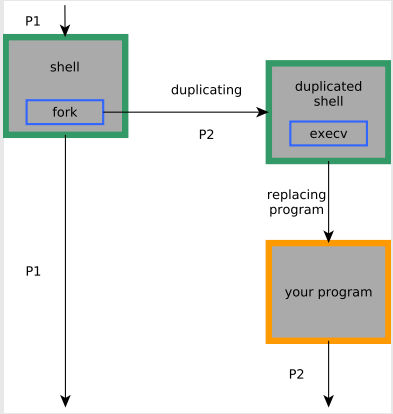
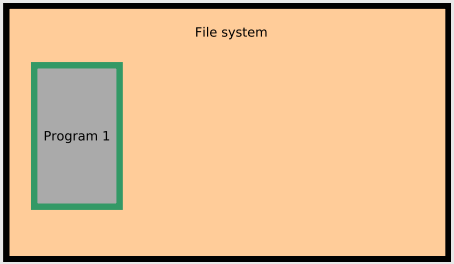

P1
shell
fork
duplicating
P2
duplicated
shell
execv
replacing
program
your program
P1
P2

Code

```
/* just the start of the main */
```

Image



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int fd = shm_open("obj",O_RDWR,0644);
```

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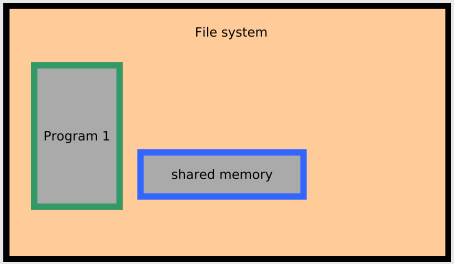

Code

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/* found in (/dev/shm/obj)  */
int fd = shm_open("obj",O_RDWR,0644);

/* enlarge the shared memory object */
ftruncate(fd, 1000);
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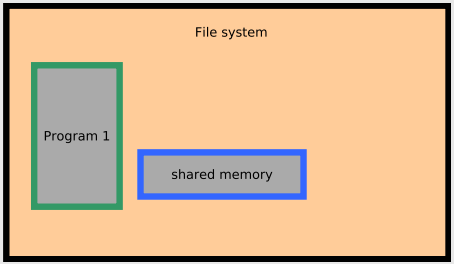

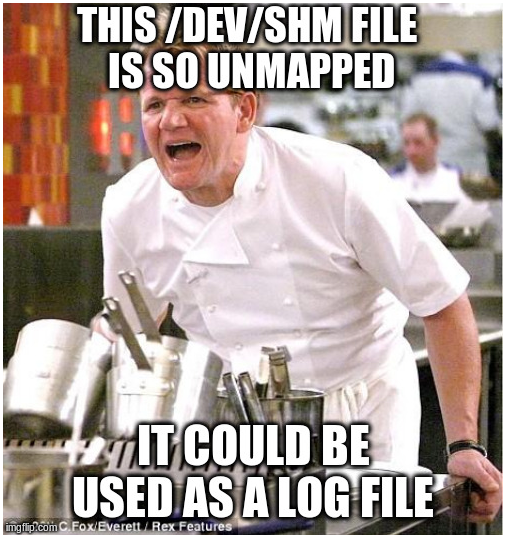
THIS /DEV/SHM FILE
IS SO UNMAPPED
IT COULD BE
USED AS A LOG FILE
imgflip.com © Fox/Everett / Rex Features


WHY DON'T WE
TAKE THE SHM FILE
AND MAP IT INTO
THE VIRTUAL MEMORY

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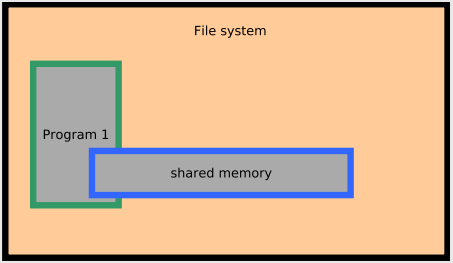

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