

# Linux Operation System - Project 1

Team 19

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linux\_survey\_TT.c (system call source code)說明

## 1. 取得 pid

```
curr_pid = task_pid_nr(current);
```

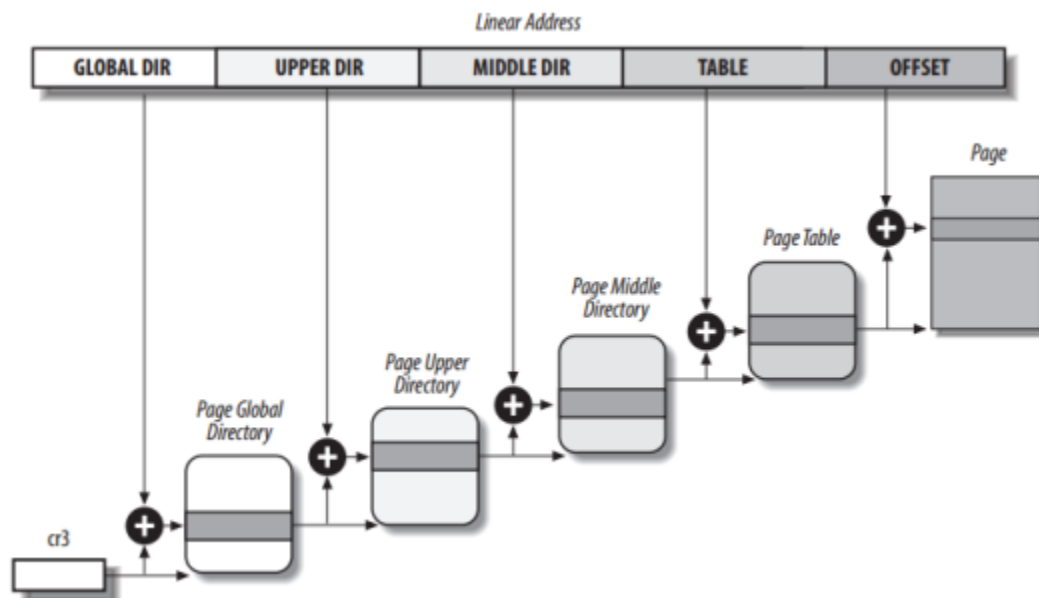
## 2. 根據 pid 拿到 task，再從 task 找到 mm，進一步拿到 mmap

```
task = find_task_by_vpid(curr_pid);  
mm_ = task->mm;  
mmap = mm_>mmap;
```

mmap 包含了 virtual address space interval 的起點與終點

```
vm_start = mmap->vm_start;  
vm_end = mmap->vm_end;
```

## 3. 取得 interval 後，撰寫 virtual address 轉成 physical address 的 function，概念如下圖：



(圖片來源：<https://pokhym.com/category/linux-kernel/>)

以下為 virtual address 轉成 physical address 的 function 的程式碼：

```

unsigned long trans_(unsigned long vaddr) {
    pgd_t *pgd;
    pud_t *pud;
    pmd_t *pmd;
    pte_t *pte;
    unsigned long paddr = 0;
    const struct page *page;
    pgd = pgd_offset(mm_, vaddr);
    if (pgd_none(*pgd)) {
        printk("not mapped in pgd\n");
        return -1;
    }

    pud = pud_offset(pgd, vaddr);
    if (pud_none(*pud)) {
        printk("not mapped in pud\n");
        return -1;
    }

    pmd = pmd_offset(pud, vaddr);
    if (pmd_none(*pmd)) {
        printk("not mapped in pmd\n");
        return -1;
    }

    if(!(pte = pte_offset_map(pmd, vaddr)))
        return 0;
    if(!(page = pte_page(*pte)))
        return 0;
    paddr = page_to_phys(page);
    return paddr;
}

```

4. List the virtual address intervals consisting of the user address space of the **parent** process.

請見 result\_1.txt 中 virt 的部分

5. List the virtual address intervals consisting of the user address space of the **child** process.

請見 result\_2.txt 和 result\_3.txt 的 virt 的部分

6. According to the results of the invocations of system call **void linux\_survey\_TT()** at location 1 of the parent process, and location 2 and location 3 of the child process, list the corresponding physical address intervals used by the above virtual address intervals at the moment that you execute system call **void linux\_survey\_TT()**.

result\_1.txt、result\_2.txt 和 result\_3.txt 的 phys 即為 virtual address interval 對應到的 physical address interval

#### 7. Percentages of the virtual addresses that have physical memory

Valid\_len：virtual address 有對應到 physical address 的 page 總數

Total\_len：physical address page 總數

Percentage XX%即為「有多少比例的 virtual address 有對應到 physical address」

```
000phys address: 0 0valid_len : 345
[ 3243.638701] total_len : 810
[ 3243.638702] Percentage : 42
```

8. According to the results you store in result\_1.txt, result\_2.txt, and result\_3.txt, show the virtual address space intervals of the child process that map to the same physical address space intervals of the parent process at location 2 and location 3 of the child process.

請看 same\_physical\_1&2.txt 和 same\_physical\_1&3.txt 檔案

#### 9. Total amount of main memory

```
free mem:      2197986
total mem:      2652167
buffer mem:      8793
```

程式碼：

```
struct sysinfo sys;
int err = sysinfo(&sys);

printf("\nfree mem:\t%ld\n", sys.freeram);
printf("\ntotal mem:\t%ld\n", sys.totalram);
printf("\nbuffer mem:\t%ld\n", sys.bufferram);
```

#### 10. 驗證

```
123pid: 2356
-----result_2-----
virt : 8048000 - 8049000
phys : 15208000 - 1142c000
```

```
james@james-VirtualBox:~/Desktop$ sudo ./a.out 2356 0x8048000
[sudo] password for james:
0x15208000
```