




学号：202200130223		姓名：李洋永	班级：4 班
实验题目：实验 7 存储管理			
实验学时：2		实验日期：2024.11.20	
实验目的：通过获取进程空间，理解 Linux 中进程的存储管理方式与进程地址空间的组成。			
实验环境：Ubuntu			
源程序清单：			
<div><div>Makefile</div><div>pmap</div><div>pmap.c</div></div>			
编译及运行结果：			
<pre>q@q-virtual-machine:~/Desktop/ny7\$ gmake cc pmap.c -o pmap q@q-virtual-machine:~/Desktop/ny7\$./pmap 3653 -x Address: 56a915c1f000-56a915c20000, Perms: r--p, Offset: 0, Path: /home/q/Desktop/train/dp Address: 56a915c20000-56a915c22000, Perms: r-xp, Offset: 1000, Path: /home/q/Desktop/train/dp Address: 56a915c22000-56a915c23000, Perms: r--p, Offset: 3000, Path: /home/q/Desktop/train/dp Address: 56a915c23000-56a915c24000, Perms: r--p, Offset: 3000, Path: /home/q/Desktop/train/dp Address: 56a915c24000-56a915c25000, Perms: rw-p, Offset: 4000, Path: /home/q/Desktop/train/dp Address: 56a915c25000-56a915c27000, Perms: rw-p, Offset: 0, Path: [anonymous] Address: 56a916c0a000-56a916c2b000, Perms: rw-p, Offset: 0, Path: [heap] Address: 75cd6b600000-75cd6b628000, Perms: r--p, Offset: 0, Path: /usr/lib/x86_64-linux-gnu/libc.so.6 Address: 75cd6b628000-75cd6b7bd000, Perms: r-xp, Offset: 28000, Path: /usr/lib/x86_64-linux-gnu/libc.so.6 Address: 75cd6b7bd000-75cd6b815000, Perms: r--p, Offset: 1bd000, Path: /usr/lib/x86_64-linux-gnu/libc.so.6 Address: 75cd6b815000-75cd6b816000, Perms: ---p, Offset: 215000, Path: /usr/lib/x86_64-linux-gnu/libc.so.6 Address: 75cd6b816000-75cd6b81a000, Perms: r--p, Offset: 215000, Path: /usr/lib/x86_64-linux-gnu/libc.so.6 Address: 75cd6b81a000-75cd6b81c000, Perms: rw-p, Offset: 219000, Path: /usr/lib/x86_64-linux-gnu/libc.so.6 Address: 75cd6b81c000-75cd6b829000, Perms: rw-p, Offset: 0, Path: [anonymous] Address: 75cd6b919000-75cd6b927000, Perms: r--p, Offset: 0, Path: /usr/lib/x86_64-linux-gnu/libm.so.6 Address: 75cd6b927000-75cd6b9a3000, Perms: r-xp, Offset: e000, Path: /usr/lib/x86_64-linux-gnu/libm.so.6 Address: 75cd6b9a3000-75cd6b9fe000, Perms: r--p, Offset: 8a000, Path: /usr/lib/x86_64-linux-gnu/libm.so.6 Address: 75cd6b9fe000-75cd6b9ff000, Perms: r--p, Offset: e4000, Path: /usr/lib/x86_64-linux-gnu/libm.so.6 Address: 75cd6b9ff000-75cd6ba00000, Perms: rw-p, Offset: e5000, Path: /usr/lib/x86_64-linux-gnu/libm.so.6 Address: 75cd6ba00000-75cd6ba9a000, Perms: r--p, Offset: 0, Path: /usr/lib/x86_64-linux-gnu/libstdc++.so.6.0.30 Address: 75cd6ba9a000-75cd6bbab000, Perms: r-xp, Offset: 9a000, Path: /usr/lib/x86_64-linux-gnu/libstdc++.so.6.0.30 Address: 75cd6bbab000-75cd6bcb1a000, Perms: r--p, Offset: 1ab000, Path: /usr/lib/x86_64-linux-gnu/libstdc++.so.6.0.30 Address: 75cd6bcb1a000-75cd6bc1b000, Perms: ---p, Offset: 21a000, Path: /usr/lib/x86_64-linux-gnu/libstdc++.so.6.0.30 Address: 75cd6bc1b000-75cd6bc26000, Perms: r--p, Offset: 21a000, Path: /usr/lib/x86_64-linux-gnu/libstdc++.so.6.0.30 Address: 75cd6bc26000-75cd6bc29000, Perms: rw-p, Offset: 225000, Path: /usr/lib/x86_64-linux-gnu/libstdc++.so.6.0.30 Address: 75cd6bc29000-75cd6bc2c000, Perms: rw-p, Offset: 0, Path: [anonymous] Address: 75cd6bd06000-75cd6bd0a000, Perms: rw-p, Offset: 0, Path: [anonymous] Address: 75cd6bd0a000-75cd6bd0d000, Perms: r--p, Offset: 0, Path: /usr/lib/x86_64-linux-gnu/libgcc_s.so.1 Address: 75cd6bd0d000-75cd6bd24000, Perms: r-xp, Offset: 3000, Path: /usr/lib/x86_64-linux-gnu/libgcc_s.so.1 Address: 75cd6bd24000-75cd6bd28000, Perms: r--p, Offset: 1a000, Path: /usr/lib/x86_64-linux-gnu/libgcc_s.so.1 Address: 75cd6bd28000-75cd6bd29000, Perms: r--p, Offset: 1d000, Path: /usr/lib/x86_64-linux-gnu/libgcc_s.so.1 Address: 75cd6bd29000-75cd6bd2a000, Perms: rw-p, Offset: 1e000, Path: /usr/lib/x86_64-linux-gnu/libgcc_s.so.1 Address: 75cd6bd3b000-75cd6bd3c000, Perms: rw-s, Offset: 0, Path: /SYSV000000dd Address: 75cd6bd3c000-75cd6bd3d000, Perms: rw-s, Offset: 0, Path: /SYSV000000dd Address: 75cd6bd3d000-75cd6bd3e000, Perms: rw-s, Offset: 0, Path: /SYSV000000dc Address: 75cd6bd3e000-75cd6bd3f000, Perms: rw-s, Offset: 0, Path: /SYSV000000dc Address: 75cd6bd3f000-75cd6bd40000, Perms: rw-s, Offset: 0, Path: /SYSV00000079 Address: 75cd6bd40000-75cd6bd41000, Perms: rw-s, Offset: 0, Path: /SYSV00000079 Address: 75cd6bd41000-75cd6bd42000, Perms: rw-s, Offset: 0, Path: /SYSV00000078 Address: 75cd6bd42000-75cd6bd44000, Perms: rw-p, Offset: 0, Path: [anonymous] Address: 75cd6bd44000-75cd6bd46000, Perms: r--p, Offset: 0, Path: /usr/lib/x86_64-linux-gnu/ld-linux-x86-64.so.2 Address: 75cd6bd46000-75cd6bd70000, Perms: r-xp, Offset: 2000, Path: /usr/lib/x86_64-linux-gnu/ld-linux-x86-64.so.2 Address: 75cd6bd70000-75cd6bd7b000, Perms: r--p, Offset: 2c000, Path: /usr/lib/x86_64-linux-gnu/ld-linux-x86-64.so.2</pre>			

```
q@q-virtual-machine:~/Desktop/my7$ ./pmap 3653 -X
```

```
Address: 56a915c1f000-56a915c20000, Perms: r--p, Offset: 0, Path: /home/q/Desktop/train/dp
```

```
Size: 4 kB
```

```
Rss: 4 kB
```

```
Shared_Clean: 4 kB
```

```
Size: 8 kB
```

```
Rss: 8 kB
```

```
Shared_Clean: 8 kB
```

```
Size: 4 kB
```

```
Rss: 4 kB
```

```
Shared_Clean: 4 kB
```

```
Size: 4 kB
```

```
Rss: 4 kB
```

```
Shared_Clean: 0 kB
```

```
Size: 4 kB
```

```
Rss: 4 kB
```

```
Shared_Clean: 0 kB
```

```
Size: 8 kB
```

```
Rss: 4 kB
```

```
Shared_Clean: 0 kB
```

```
Size: 132 kB
```

```
Shared_Clean: 0 kB
```

```
Size: 4 kB
```

```
Rss: 0 kB
```

```
Shared_Clean: 0 kB
```

```
Address: 56a915c20000-56a915c22000, Perms: r-xp, Offset: 1000, Path: /home/q/Desktop/train/dp
```

```
Address: 56a915c22000-56a915c23000, Perms: r--p, Offset: 3000, Path: /home/q/Desktop/train/dp
```

```
Address: 56a915c23000-56a915c24000, Perms: r--p, Offset: 3000, Path: /home/q/Desktop/train/dp
```

```
Address: 56a915c24000-56a915c25000, Perms: rw-p, Offset: 4000, Path: /home/q/Desktop/train/dp
```

```
Address: 56a915c25000-56a915c27000, Perms: rw-p, Offset: 0, Path: [anonymous]
```

```
Address: 56a916c0a000-56a916c2b000, Perms: rw-p, Offset: 0, Path: [heap]
```

```
Address: 75cd6b600000-75cd6b628000, Perms: r--p, Offset: 0, Path: /usr/lib/x86_64-linux-gnu/libc.so.6
```

```
Address: 75cd6b628000-75cd6b7bd000, Perms: r-xp, Offset: 28000, Path: /usr/lib/x86_64-linux-gnu/libc.so.6
```

```
Address: 75cd6b7bd000-75cd6b815000, Perms: r--p, Offset: 1bd000, Path: /usr/lib/x86_64-linux-gnu/libc.so.6
```

```
Address: 75cd6b815000-75cd6b816000, Perms: ---p, Offset: 215000, Path: /usr/lib/x86_64-linux-gnu/libc.so.6
```

```
Address: 75cd6b816000-75cd6b81a000, Perms: r--p, Offset: 215000, Path: /usr/lib/x86_64-linux-gnu/libc.so.6
```

```
Address: 75cd6b81a000-75cd6b81c000, Perms: rw-p, Offset: 219000, Path: /usr/lib/x86_64-linux-gnu/libc.so.6
```

```
Address: 75cd6b81c000-75cd6b829000, Perms: rw-p, Offset: 0, Path: [anonymous]
```

```
Address: 75cd6b919000-75cd6b927000, Perms: r--p, Offset: 0, Path: /usr/lib/x86_64-linux-gnu/libm.so.6
```

```
Address: 75cd6b927000-75cd6b9a3000, Perms: r-xp, Offset: e000, Path: /usr/lib/x86_64-linux-gnu/libm.so.6
```

```
Address: 75cd6b9a3000-75cd6b9fe000, Perms: r--p, Offset: 8a000, Path: /usr/lib/x86_64-linux-gnu/libm.so.6
```

```
Address: 75cd6b9fe000-75cd6b9ff000, Perms: r--p, Offset: e4000, Path: /usr/lib/x86_64-linux-gnu/libm.so.6
```

```
Address: 75cd6b9ff000-75cd6ba00000, Perms: rw-p, Offset: e5000, Path: /usr/lib/x86_64-linux-gnu/libm.so.6
```

```
Address: 75cd6ba00000-75cd6ba9a000, Perms: r--p, Offset: 0, Path: /usr/lib/x86_64-linux-gnu/libstdc++.so.6.0.30
```

```
Address: 75cd6ba9a000-75cd6bbab000, Perms: r-xp, Offset: 9a000, Path: /usr/lib/x86_64-linux-gnu/libstdc++.so.6.0.30
```

```
Address: 75cd6bbab000-75cd6bc1a000, Perms: r--p, Offset: 1ab000, Path: /usr/lib/x86_64-linux-gnu/libstdc++.so.6.0.30
```

```

snprintf(maps_path, sizeof(maps_path), "/proc/%s/maps", pid); //构建路径
snprintf(smmaps_path, sizeof(smmaps_path), "/proc/%s/smmaps", pid); //

maps_file = fopen(maps_path, "r"); //打开对应文件
if (!maps_file) {
    perror("Failed to open maps file");
    return;
}

if (extended) { //将详细文件打开
    smmaps_file = fopen(smmaps_path, "r");
    if (!smmaps_file) {
        perror("Failed to open smmaps file");
        fclose(maps_file);
        return;
    }
}

char line[512];
while (fgets(line, sizeof(line), maps_file)) { //从文件中读取
    char address[64], perms[8], path[256] = "[anonymous]";
    unsigned long offset, inode, dev_major, dev_minor;
    sscanf(line, "%63s %7s %lx %lx:%lx %lu %255s",
           address, perms, &offset, &dev_major, &dev_minor, &inode, path);

    printf("Address: %s, Perms: %s, Offset: %lx, Path: %s\n",
           address, perms, offset, path);

    if (extended) { //详细信息
        char smmaps_line[512];
        while (fgets(smmaps_line, sizeof(smmaps_line), smmaps_file)) {
            if (strncmp(smmaps_line, "Size:", 5) == 0 ||
                strncmp(smmaps_line, "Rss:", 4) == 0 ||
                strncmp(smmaps_line, "Shared_Clean:", 13) == 0) {
                printf(" %s", smmaps_line);
            }
            if (smmaps_line[0] == '\n') break;
        }
    }
}

```

根据 pid 构建路径后从对应文件中读取信息

问题及收获：

Linux 中进程的信息储存在文件中，pmap 功能实现需要通过 pid 获取文件路径，根据路径读取文件。