V9-Ucore

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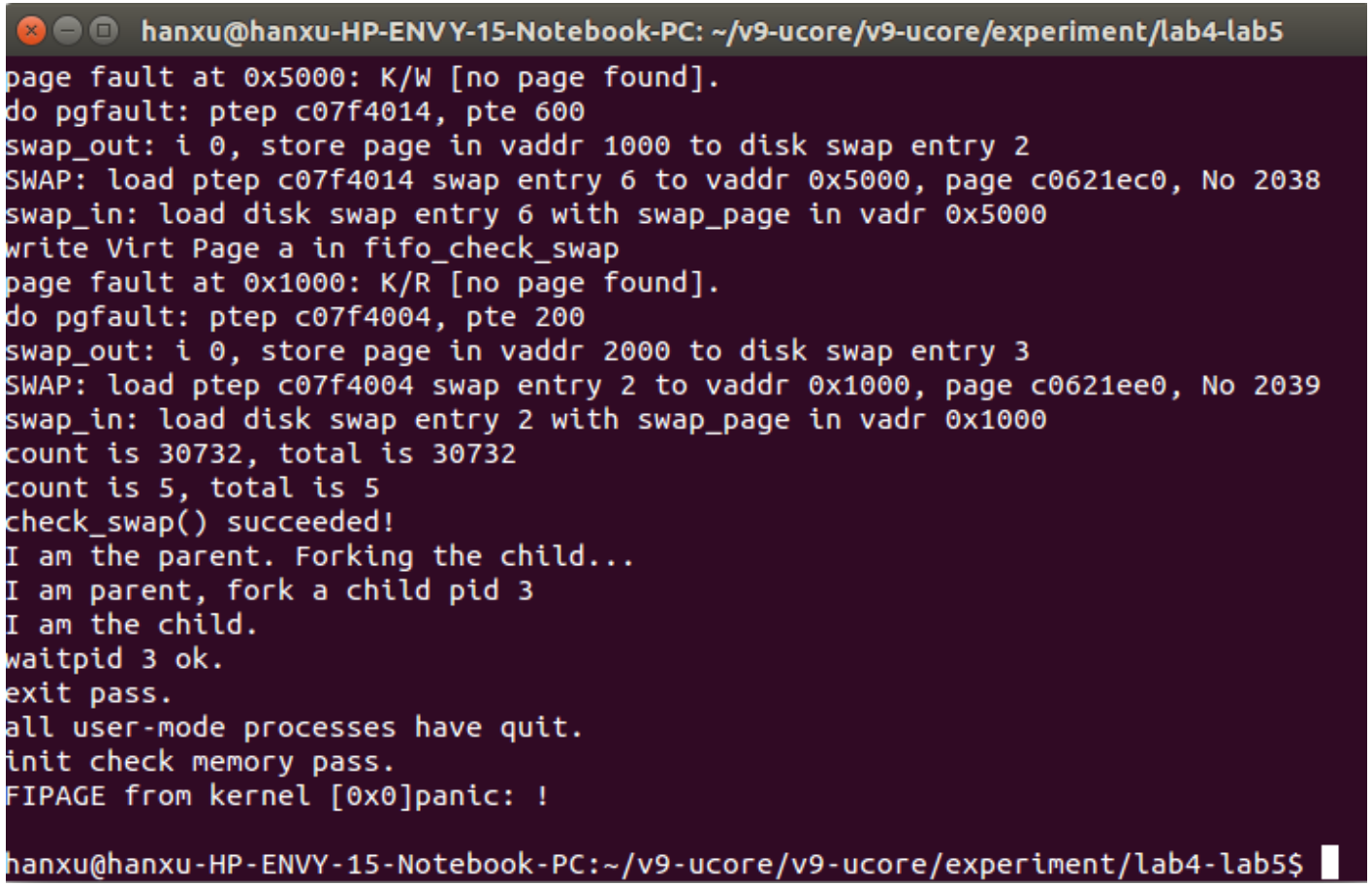
中断，内存

- 不再赘述

进程

- 修改程序能够载入二进制编译完成的用户程序（原本程序是嵌入系统内部，现在将程序放入磁盘中更接近实际）
- 进程调度的底层的修改(堆栈设置，load_icode，权限)
- 文件编译头的修改（没有文件系统时二进制头无法获取text，data段大小）
- 修改页表初始项使得支持模拟硬盘（v9模拟硬盘会映射到内存上4MB，调用要建立映射）


hanxu@hanxu-HP-ENVY-15-Notebook-PC: ~/v9-ucore/v9-ucore/experiment/lab4-lab5
page fault at 0x5000: K/W [no page found].
do pgfault: ptep c07f4014, pte 600
swap_out: i 0, store page in vaddr 1000 to disk swap entry 2
SWAP: load ptep c07f4014 swap entry 6 to vaddr 0x5000, page c0621ec0, No 2038
swap_in: load disk swap entry 6 with swap_page in vadr 0x5000
write Virt Page a in fifo_check_swap
page fault at 0x1000: K/R [no page found].
do pgfault: ptep c07f4004, pte 200
swap_out: i 0, store page in vaddr 2000 to disk swap entry 3
SWAP: load ptep c07f4004 swap entry 2 to vaddr 0x1000, page c0621ee0, No 2039
swap_in: load disk swap entry 2 with swap_page in vadr 0x1000
count is 30732, total is 30732
count is 5, total is 5
check_swap() succeeded!
I am the parent. Forking the child...
I am parent, fork a child pid 3
I am the child.
waitpid 3 ok.
exit pass.
all user-mode processes have quit.
init check memory pass.
FIPAGE from kernel [0x0]panic: !
hanxu@hanxu-HP-ENVY-15-Notebook-PC:~/v9-ucore/v9-ucore/experiment/lab4-lab5$

文件系统

- 将xv6的文件系统融入v9-ucore之前的体系中（配合模拟器mkfs使用，简化模拟硬盘操作）
- 取消了xv6在系统调用中编译的方式，直接载入二进制文件
- 扩展了ucore的系统调用以支持文件系统

用户程序

- 修改stdio，stdlib（主要是文件名的问题）
- 修改ulib.c
- 修改syscall.c，系统调用方式上的差别（0x80中断和v9的TRAP）
- 增加umain.h，增加一层用户程序的外包来取代链接汇编

```c
#include <io.h>
#include <ulib.h>
#include <umain.h>


int magic = -0x10384;

int
main(void) {
    int pid, code, ret;

    cprintf("I am the parent. Forking the child...\n");
    pid = fork();

    if (pid == 0) {
        cprintf("I am the child.\n");
        yield();
        yield();
        yield();
        yield();
        yield();
        yield();
        yield();
        yield();
        exit(magic);
    }
    else {
        cprintf("I am parent, fork a child pid %d\n",pid);
    }

    assert(pid > 0);
    ret = waitpid(pid, &code);
    assert( ret== 0 && code == magic);
    assert(waitpid(pid, &code) != 0 && wait() != 0);

    cprintf("waitpid %d ok.\n", pid);

    cprintf("exit pass.\n");
    return 0;
}
```

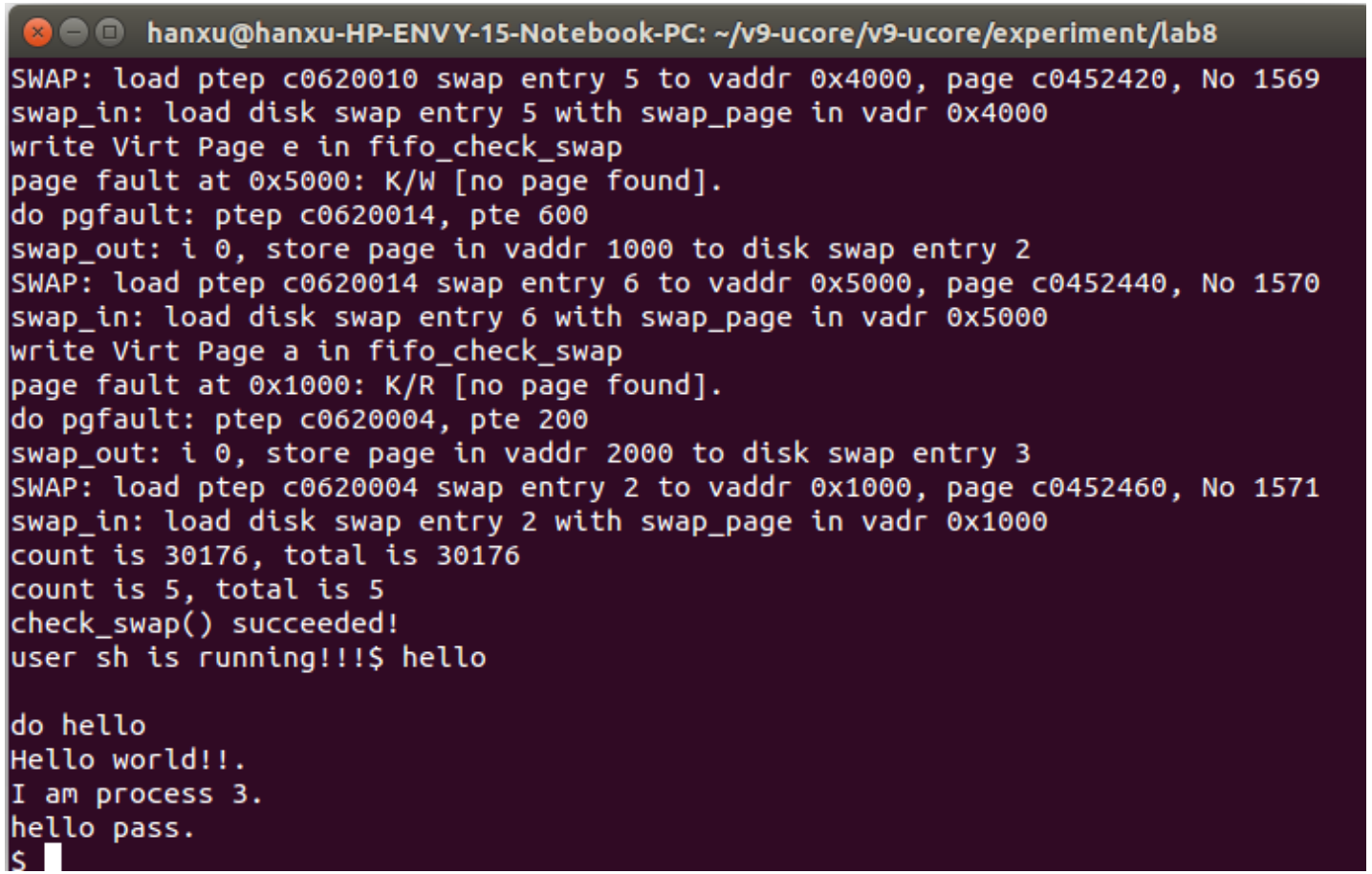
```c
#ifndef __USER_LIBS_UMAIN_H__
#define __USER_LIBS_UMAIN_H__
#include <ulib.h>

int umain(void);

int main(void) {
    int ret = umain();
    exit(ret);
}

#define main umain

#endif /* !__USER_LIBS_UMAIN_H__ */
```


hanxu@hanxu-HP-ENVY-15-Notebook-PC: ~/v9-ucore/v9-ucore/experiment/lab8
SWAP: load ptep c0620010 swap entry 5 to vaddr 0x4000, page c0452420, No 1569
swap_in: load disk swap entry 5 with swap_page in vadr 0x4000
write Virt Page e in fifo_check_swap
page fault at 0x5000: K/W [no page found].
do pgfault: ptep c0620014, pte 600
swap_out: i 0, store page in vaddr 1000 to disk swap entry 2
SWAP: load ptep c0620014 swap entry 6 to vaddr 0x5000, page c0452440, No 1570
swap_in: load disk swap entry 6 with swap_page in vadr 0x5000
write Virt Page a in fifo_check_swap
page fault at 0x1000: K/R [no page found].
do pgfault: ptep c0620004, pte 200
swap_out: i 0, store page in vaddr 2000 to disk swap entry 3
SWAP: load ptep c0620004 swap entry 2 to vaddr 0x1000, page c0452460, No 1571
swap_in: load disk swap entry 2 with swap_page in vadr 0x1000
count is 30176, total is 30176
count is 5, total is 5
check_swap() succeeded!
user sh is running!!!$ hello
do hello
Hello world!!.
I am process 3.
hello pass.
$

将来可以完善的方向

- 修改模拟器和文件系统
- 新指令集支持

收获与感想

- 代码阅读量和编写量大，调试水平直线上升……
- 对操作系统的理解更加深入，对整个流程机理有了直观把握
- 工程性很强，在合作开发上有经验教训的收获
- 代码注释很重要！！！

谢谢