

实验四 实验报告

一、实验进度

完成了所有必做任务。

二、实验结果

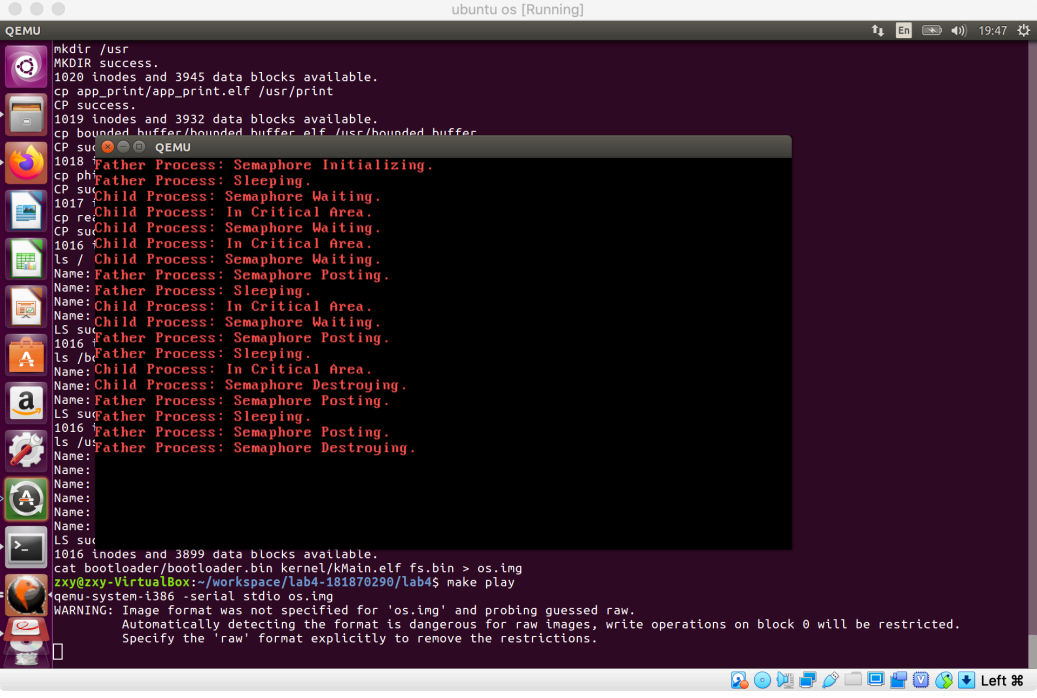
2.1 实现格式化输入函数

```
QEMU
Input: " test %c test %6s %d %x"
Ret: 4: a, oslab, 2020, adc.
Input: " test %c test %6s %d %x"
-
essed raw.
pages, write oper
tions.
$ make play
essed raw.
pages, write oper
tions.
essed raw.
pages, write oper
tions.
$
zxy@zxy-VirtualBox:~/workspace/lab4-181870290/lab4$ make play
qemu-system-i386 -serial stdio os.img
WARNING: Image format was not specified for 'os.img' and probing guessed raw.
Automatically detecting the format is dangerous for raw images, write oper
Specify the 'raw' format explicitly to remove the restrictions.
test a test oslab 2020 0xadc
```

2.2 实现进程通信

```
1016 inode: QEMU
ls /
Name: .., I
Name: .., I
Name: boot, I
Name: usr, I
LS success
1016 inode:
ls /boot
Name: .., I
Name: .., I
Name: init
LS success
1016 inode:
ls /usr
Name: .., I
Name: .., I
Name: prin
Name: bound
Name: phil
Name: read
LS success.
1016 inodes and 3899 data blocks available.
cat bootloader/bootloader.bin kernel/kMain.elf fs.bin > os.img
zxy@zxy-VirtualBox:~/workspace/lab4-181870290/lab4$ make play
qemu-system-i386 -serial stdio os.img
WARNING: Image format was not specified for 'os.img' and probing guessed raw.
Automatically detecting the format is dangerous for raw images, write oper
Specify the 'raw' format explicitly to remove the restrictions.
```

2.3 实现信号量相关系统调用



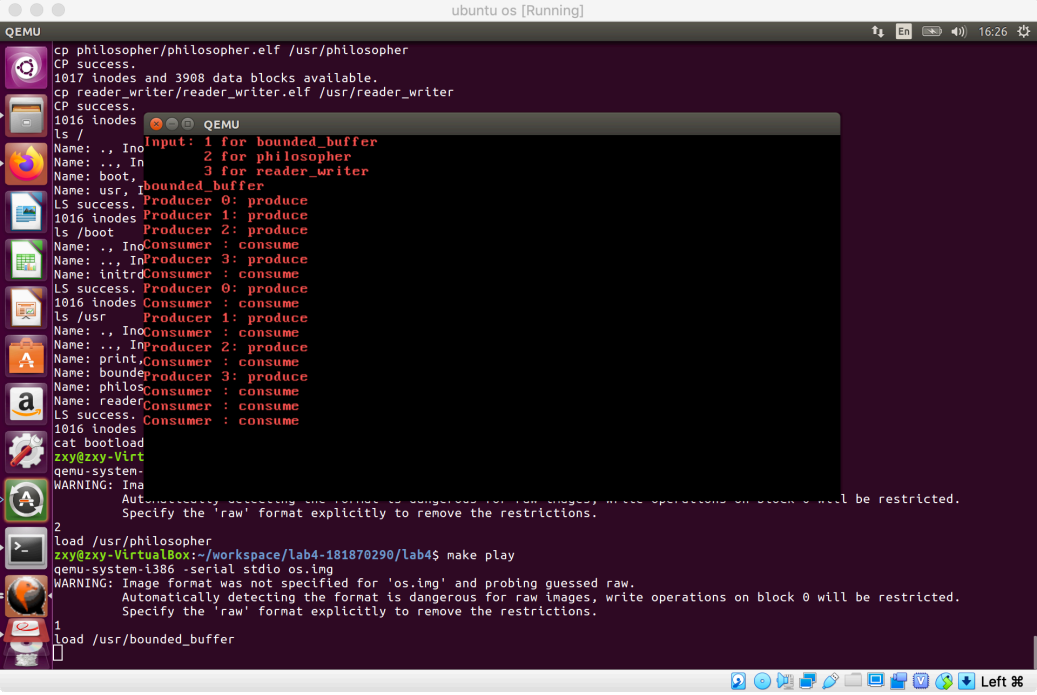
```

QEMU
ubuntu os [Running]
mkdir /usr
MKDIR success.
1020 inodes and 3945 data blocks available.
cp app_print/app_print.elf /usr/print
CP success.
1019 inodes and 3932 data blocks available.
cp bounded_buffer/bounded_buffer.elf /usr/bounded_buffer
CP suc
1018
Father Process: Semaphore Initializing.
Name:
CP phy
Father Process: Sleeping.
CP su
1017
Child Process: Semaphore Waiting.
CP re
Child Process: In Critical Area.
CP su
Child Process: Semaphore Waiting.
1016
Child Process: In Critical Area.
ls /
Child Process: Semaphore Waiting.
Name:
Father Process: Semaphore Posting.
Name:
Child Process: Sleeping.
Name:
Child Process: In Critical Area.
Name:
Child Process: Semaphore Waiting.
LS su
Father Process: Semaphore Posting.
1016
Father Process: Sleeping.
ls /b
Child Process: In Critical Area.
Name:
Child Process: Semaphore Destroying.
Name:
Father Process: Semaphore Posting.
LS su
Father Process: Sleeping.
1016
Father Process: Semaphore Posting.
ls /u
Father Process: Semaphore Destroying.
Name:
Name:
Name:
Name:
Name:
LS suc
1016 inodes and 3899 data blocks available.
cat bootloader/bootloader.bin kernel/kMain.elf fs.bin > os.img
zxy@zxy-VirtualBox:~/workspace/lab4-181870290/lab4$ make play
qemu-system-i386 -serial stdio os.img
WARNING: Image format was not specified for 'os.img' and probing guessed raw.
Automatically detecting the format is dangerous for raw images, write operations on block 0 will be restricted.
Specify the 'raw' format explicitly to remove the restrictions.

```

2.4 基于信号量解决进程同步问题

生产者-消费者问题:



```

QEMU
ubuntu os [Running]
cp philosopher/philosopher.elf /usr/philosopher
CP success.
1017 inodes and 3908 data blocks available.
cp reader_writer/reader_writer.elf /usr/reader_writer
CP success.
1016 inodes
ls /
Input: 1 for bounded_buffer
Name: .., Ino 2 for philosopher
Name: .., In 3 for reader_writer
Name: usr, bounded_buffer
LS success. Producer 0: produce
1016 inodes Producer 1: produce
ls /boot Producer 2: produce
Name: .., InoConsumer : consume
Name: .., InProducer 3: produce
Name: initrdConsumer : consume
LS success. Producer 0: produce
1016 inodes Consumer : consume
ls /usr Producer 1: produce
Name: .., InoConsumer : consume
Name: .., InProducer 2: produce
Name: print,Consumer : consume
Name: bounded,producer 3: produce
Name: philos,Consumer : consume
Name: reader,Consumer : consume
LS success. Consumer : consume
1016 inodes
cat bootloader
zxy@zxy-Virt
qemu-system-
WARNING: Ima
Automatically detecting the format is dangerous for raw images, write operations on block 0 will be restricted.
Specify the 'raw' format explicitly to remove the restrictions.
2
load /usr/philosopher
zxy@zxy-VirtualBox:~/workspace/lab4-181870290/lab4$ make play
qemu-system-i386 -serial stdio os.img
WARNING: Image format was not specified for 'os.img' and probing guessed raw.
Automatically detecting the format is dangerous for raw images, write operations on block 0 will be restricted.
Specify the 'raw' format explicitly to remove the restrictions.
1
load /usr/bounded_buffer

```

哲学家就餐问题:

```

ubuntu os [Running]
zxy@zxy-VirtualBox:~/workspace/lab4-181870290/lab4$ make play
qemu-system-i386 -serial stdio os.img
WARNING: Image format was not specified for 'os.img' and probing guessed raw.
will be restricted.

philosopher
Philosopher 0: think
Philosopher 1: think
Philosopher 2: think
Philosopher 3: think
Philosopher 4: think
Philosopher 0: eat
Philosopher 3: eat
Philosopher 0: think
Philosopher 1: eat
Philosopher 3: think
Philosopher 4: eat
Philosopher 1: think
Philosopher 2: eat
Philosopher 4: think
Philosopher 0: eat
Philosopher 2: think
Philosopher 3: eat
Philosopher 0: think
Philosopher 1: eat
Philosopher 3: think
Philosopher 0: eat
Philosopher 1: think
Philosopher 2: eat
will be restricted.
will be restricted.
will be restricted.
will be restricted.

zxy@zxy-VirtualBox:~/workspace/lab4-181870290/lab4$ make play
qemu-system-i386 -serial stdio os.img
WARNING: Image format was not specified for 'os.img' and probing guessed raw.
Automatically detecting the format is dangerous for raw images, write operations on block 0 will be restricted.
Specify the 'raw' format explicitly to remove the restrictions.
2
load /usr/philosopher

```

读者-写者问题:

```

ubuntu os [Running]
1020 inodes and 3945 data blocks available.
cp app/print/ano-print-elf /usr/print
CP succ
1019 in
Input: 1 for bounded_buffer
CP succ
2 for philosopher
1018 in
3 for reader_writer
cp phil_reader_writer
CP succ
Writer 0: write
1017 in
Writer 1: write
CP read
Writer 2: write
CP succ
1016 in
Reader 0: read, total 1 reader
ls / Reader 1: read, total 2 reader
Name: .Reader 2: read, total 3 reader
Name: .Writer 0: write
Name: uWriter 1: write
LS succ
Writer 2: write
1016 in
Reader 0: read, total 1 reader
ls /boo Reader 1: read, total 2 reader
Name: .Reader 2: read, total 3 reader
Name: iWriter 0: write
LS succ
Writer 1: write
1016 in
ls /usr Writer 2: write
Name: .Reader 0: read, total 1 reader
Name: .Reader 1: read, total 2 reader
Name: pReader 2: read, total 3 reader
Name: b
Name: p
Name: r
LS succ
1016 inodes and 3890 data blocks available.
cat bootloader/bootloader.bin kernel/kMain.elf fs.bin > os.img
zxy@zxy-VirtualBox:~/workspace/lab4-181870290/lab4$ make play
qemu-system-i386 -serial stdio os.img
WARNING: Image format was not specified for 'os.img' and probing guessed raw.
Automatically detecting the format is dangerous for raw images, write operations on block 0 will be restricted.
Specify the 'raw' format explicitly to remove the restrictions.
3
load /usr/reader_writer

```

三、实验代码

3.1 实现格式化输入函数

代码修改: kernel/kernel/irqHandle.c

实现函数:

keyboardHandle 将键盘输入存入缓冲区。在接收到合法的键码后将keyCode放入keyBuffer, 并在设备STD_IN上被阻塞的进程中取出一个进程pt唤醒。代码结构类似于V操作。

syscallReadStdIn 从缓存区中读取数据。当设备STD_IN未被阻塞时, syscallReadStdIn将阻塞当前进程。在进程被唤醒时读keyBuffer中所有数据。代码结构类似于P操作。

3.2 实现进程通信

代码修改: kernel/kernel/irqHandle.c

实现函数:

syscallWriteShMem / syscallReadShMem 例程处理。根据syscall.c中封装函数read/write于syscall的参数接口获取读写内容的buffer起始、size与index。参考irqHandle.c中的读写对共享内存进行读写。

3.3 实现信号量相关系统调用

代码修改: kernel/kernel/irqHandle.c

实现函数:

syscallSemInit 子例程。根据syscall.c中封装函数, 选择一个未使用的信号量初始化并返回该信号量的编号。

syscallSemWait 子例程。如果value<0则阻塞进程。

syscallSemPost 子例程。当value<=0时, 唤醒一个被阻塞的进程。

syscallSemDestroy 子例程。将给定编号的信号量状态设为未使用。

3.4 解决进程同步问题

生产者-消费者问题

代码修改: bounded_buffer/main.c

选择参数: 缓冲区最大限制buffer = 3, 轮次 value = 2

哲学家就餐问题

代码修改: philosopher/main.c

选择参数: 哲学家用餐人数 = 5, 轮次无限

读者-写者问题

代码修改: reader_writer/main.c

选择参数: 读者人数 = 写者人数 = 3, 轮次无限

四、实验中遇到的问题以及解决方法

1. 在实现格式化输入函数时, 无法正确显示完全字符或是显示空字符。问题在于在判断keycode是否合法时只把keycode == 0 判断为非法, 使得一些非法keycode在getChar之后转化为'\0'使得读取buffer时的字符串不正确。

2. 在解决读者-写者问题时, 在第一个reader后卡住了。发现问题时Rcount没有存储在共享内存空间中, 导致多个读者申请占用时Rcount均为0, 使得信息量CountMutex被占用而无法释放WriteMutex造成死锁。参考实现进程通讯部分解决问题。

六、实验心得

通过对代码结构的理解, 读懂每一个程序的含义及其起到的作用是顺利完成实验的关键。实验中需要对实验指南进行研读, 并能积极的对一些功能进行实践, 保持良好学习心态, 这是健康的学习成长经历。