Operating System Design & Implementation

Lab1: Establish Lab Environment

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Objective:

In this lab you can learn

- Understand version control system and makefile project
- Understand use QEMU and GDB to debug linux 0.11 kernel
- Learn how to use the diff to produce the modified kernel patch and commit to SVN system

1. Lab 1-1 Linux 0.11 Development Environment Setup

Open VMware and login fedora use below account.

Username: osdi

Password: osdi2014

Note: If you want do the labs at home you can download the VM image from here http://140.113.166.123/OSDI_VM.zip

1.1. Check out your lab files for SVN system

```
$mkdir osdi

$cd osdi

$svn co http://140.113.166.123/OSDI_SVN/u9955853
```

Note: SVN account

User name is u{your student id}

Password is osdi{your student id}

For example, if your id is 9955853, username=u9955853 password=osdi9955853, SVN path= http://140.113.166.123/OSDI_SVN/u9955853

When SVN check out, download the linux root file system from http://140.113.166.123/OSDI2015/lab1/osdi.img

Then you will see the the linux0.11 source code ***"linux-0.11"*** and linux root file system disk ***"osdi.img"*** in your OSDI folder.

Note: There are some helpful SVN client tools that will let use version control system more easier.

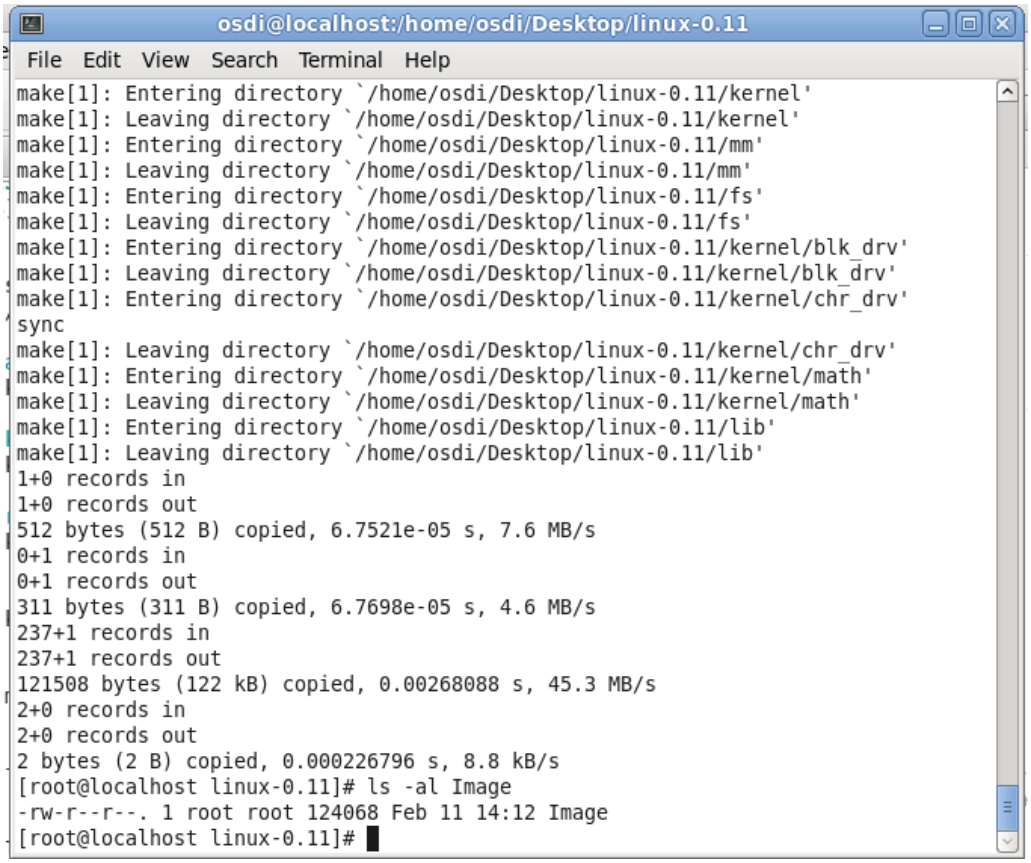
Windows environment: http://tortoisesvn.tigris.org/

Linux environment: http://www.wandisco.com/smartsvn/home

1.2. Build the linux 0.11

```
$cd lab1
$cd linux-0.11
$make
```

After make, you will see a bootable file ***"Image"*** in the linux-0.11 folder, it contains system bootloader and linux0.11 kernel.



Note: if you have modified any file, please ‘make clean’ before next make.

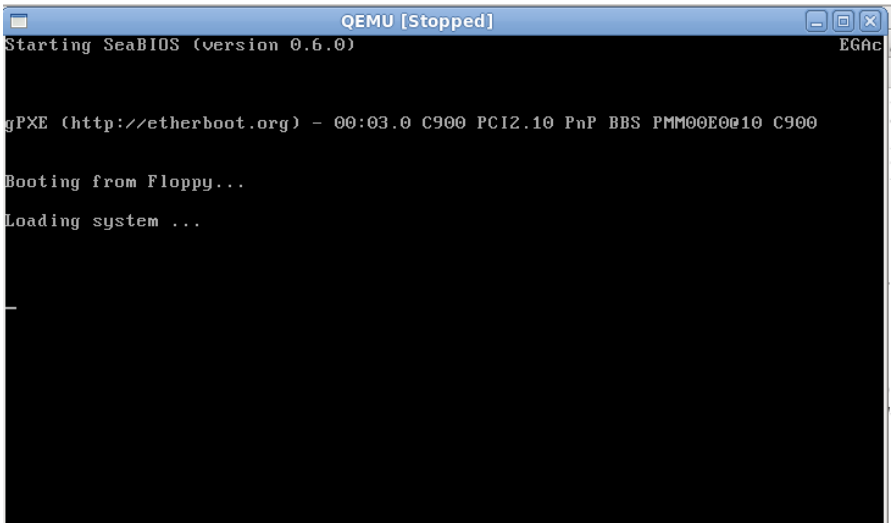
1.3. Find the makefile bugs

Our linux 0.11 makefile have some syntax errors. Please find that and fix them.

1.4. Run the linux 0.11

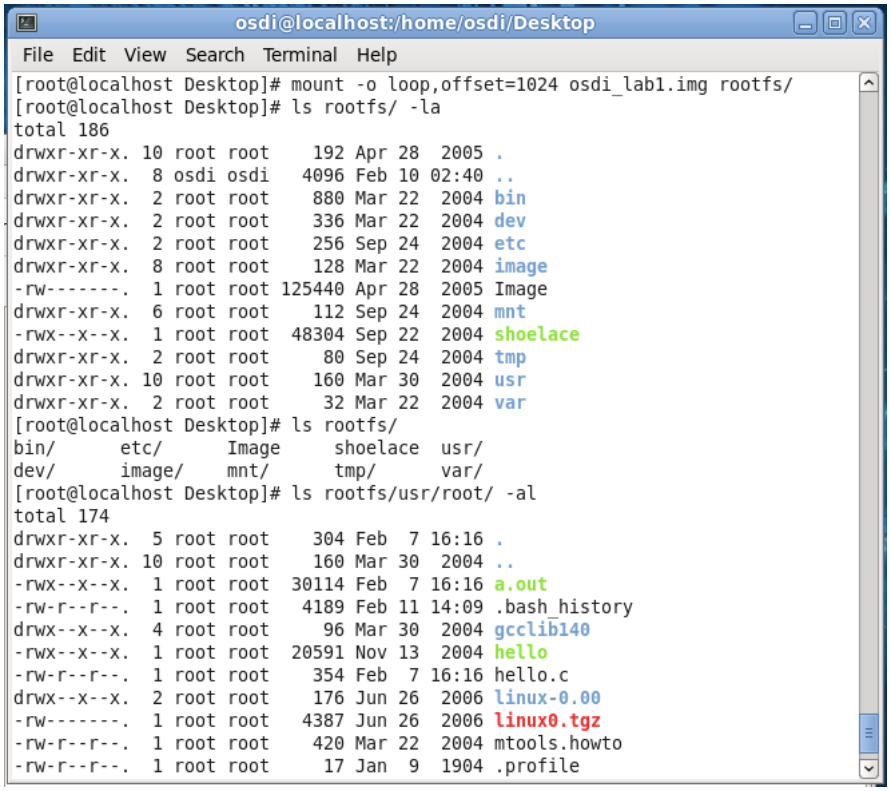
After linux 0.11 make, system will produce a bootable floppy disk image called ***“Image”*** in your linux 0.11 root folder, then you can just use QEMU emulator to load this image and run linux 0.11.

```
$qemu -m 16M -boot a -fda Image -hda ../osdi.img
```



Note: osdi_lab1.img is a MINIX root file system it contain the some executable files, such as shell system, gcc, etc. Uou can mount the root file system to modify or add the files.

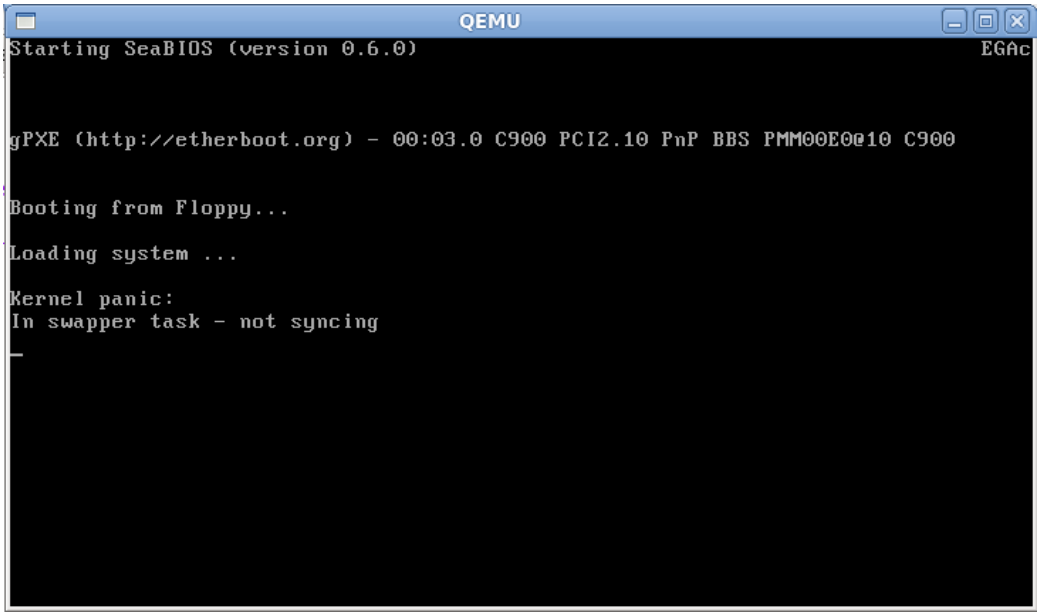
```
$mkdir rootfs
$mount -o loop,offset=1024 osdi.img rootfs/
```



2. Lab 1-2 Debug kernel

2.1. Find the kernel bugs

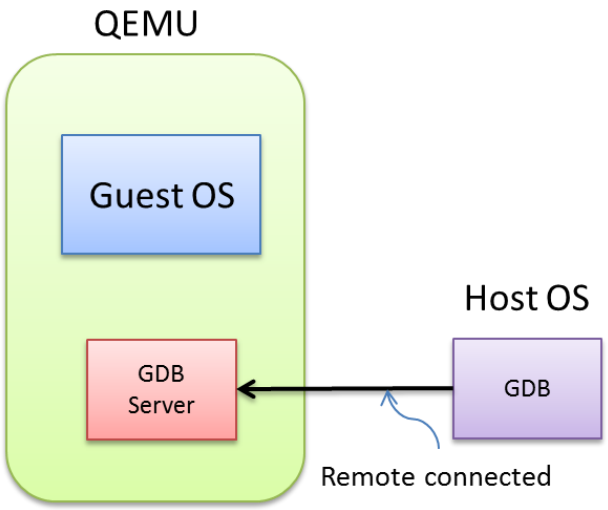
In this lab you need use the GDB to find out the bugs and fix them.



Hint: Use backtrace command to find the kernel bugs, there are 2 bugs in lab1 linux kernel.

2.2. Debug the linux 0.11 on QEMU

In QEMU environment your can debug the linux kernel via gdbserver and gdb. Use this to find the kernel and open gdb with linux 0.11 kernel symbol file.



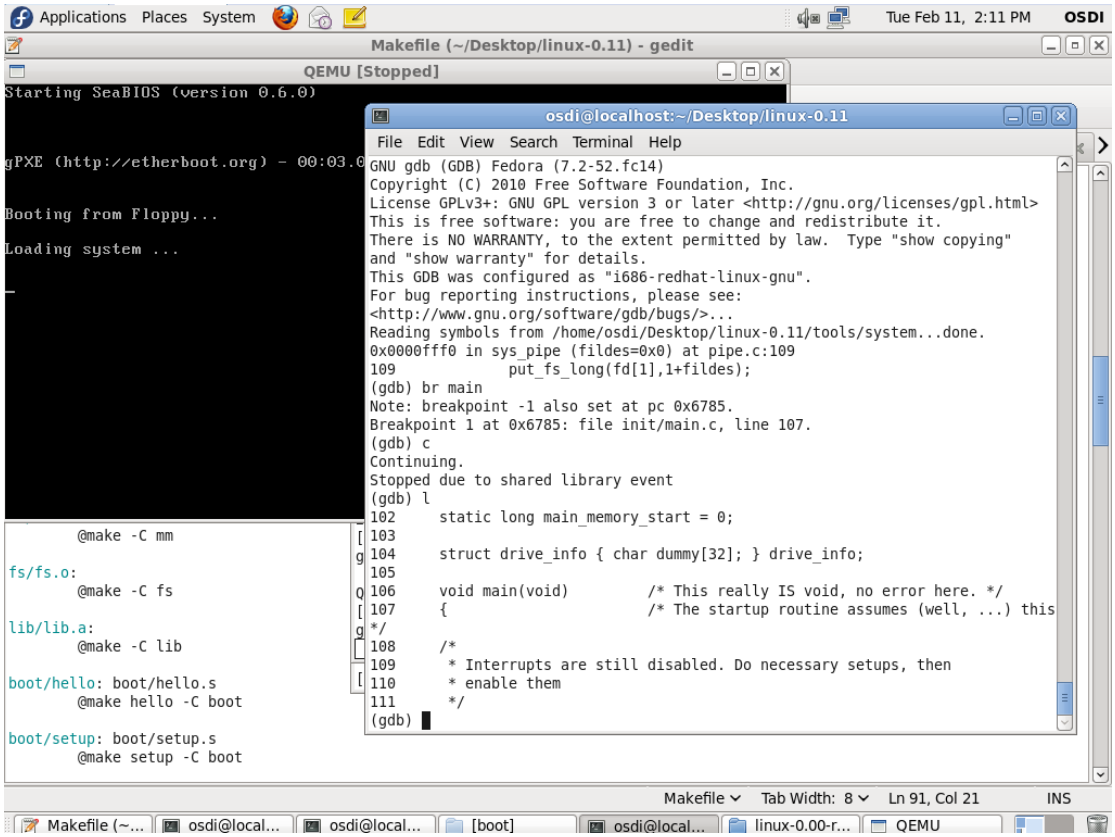
```
$qemu -m 16M -boot a -fda Image -hda ../osdi.img -s -S -serial stdio

Open another console

$cd linux-0.11

$gdb tools/system

(gdb) target remote localhost:1234
```



Note: Useful GDB commands

‘b’- set break point

‘c’- continue program

‘list’- list code

‘backtrace’- show call stack

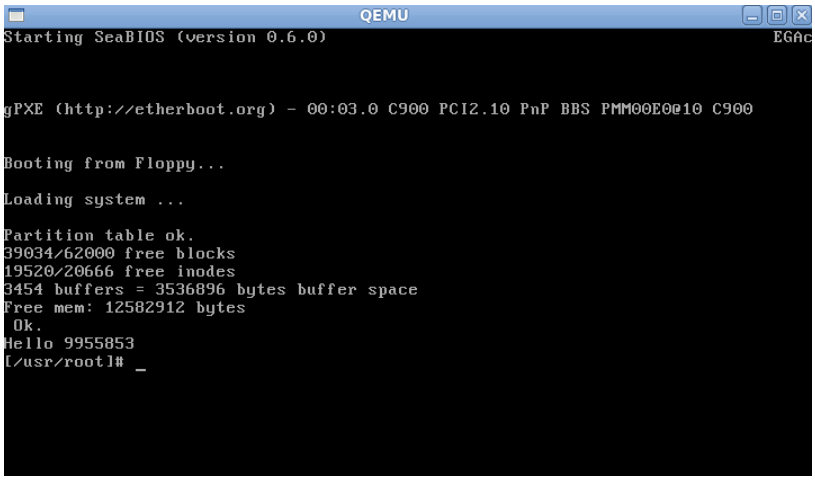
‘info r’-show current registers value

Ctrl+c – stop program

GDB command reference: http://www.cmlab.csie.ntu.edu.tw/~daniel/linux/gdb.html

2.3. Print your student id

Modify the linux 0.11 source code and print your student id before shell startup.



3. Lab 1-3 Update your lab1 data for DEMO

3.1. Create the kernel path file

Create your kernel path file as name "{student id}.patch", its need include your lab1.1 and lab1.2 all modifications.

You can use "svn diff > xxx.patch" to generate the patch file between SVN repository and your local svn folder. Or you can just use the diff command to produce the patch file.

Note: Before diff, please ***"make clean"*** your project first.

Reference: http://blog.longwin.com.tw/2013/08/linux-diff-patch-learn-note-2013/

3.2. Commit your source code and image

```
$cd lab1

$svn add {student id}.patch

$svn commit -m  "Lab1 demo"
```

Note: SVN command reference:
http://www.linuxfromscratch.org/blfs/edguide/chapter03.html