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HW2: OS_6233_HW1_Linux_Kernel

1. What are kernel APIs? What is the difference between kernel APIs and system calls?

Kernel APIs are interfaces for user-space applications. It can invoke user-space applications and manipulate the output.

System call can permit user-space application to invoke methods in the kernel.

2. What are roles of files in /boot/ (vmlinuz-*, initrd.img-*, grub, config*)?

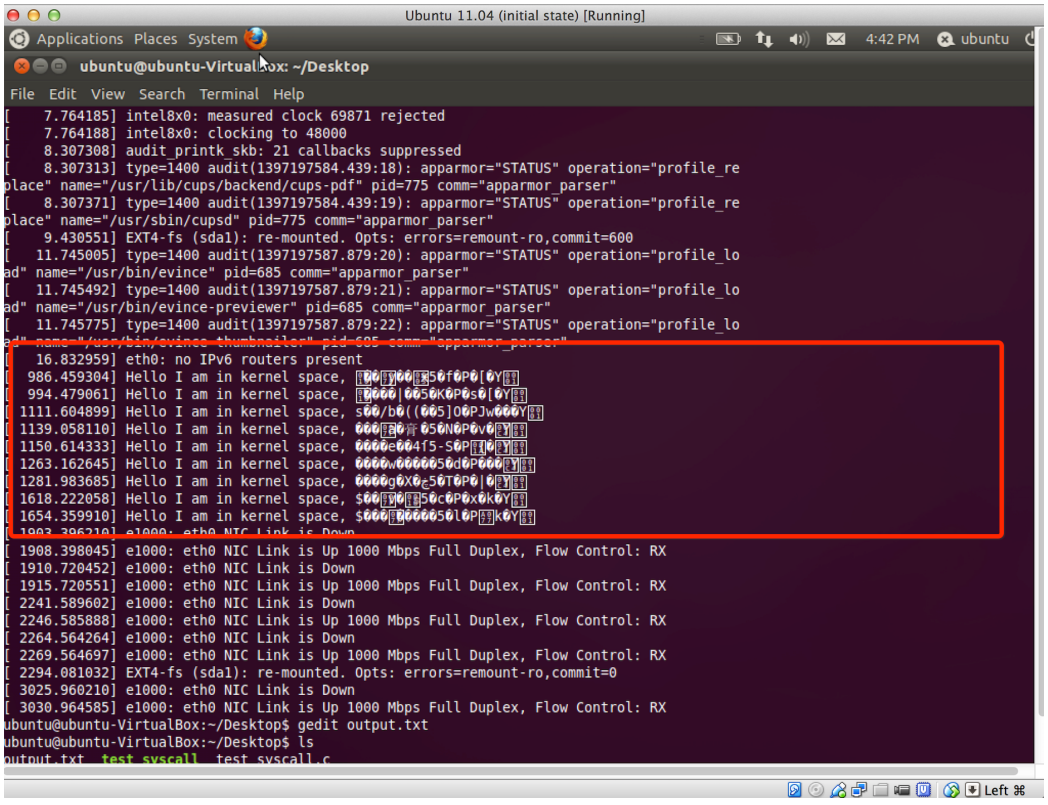
vmlinuz-*: is a compressed Linux kernel. It is the first thing that is loaded into memory.

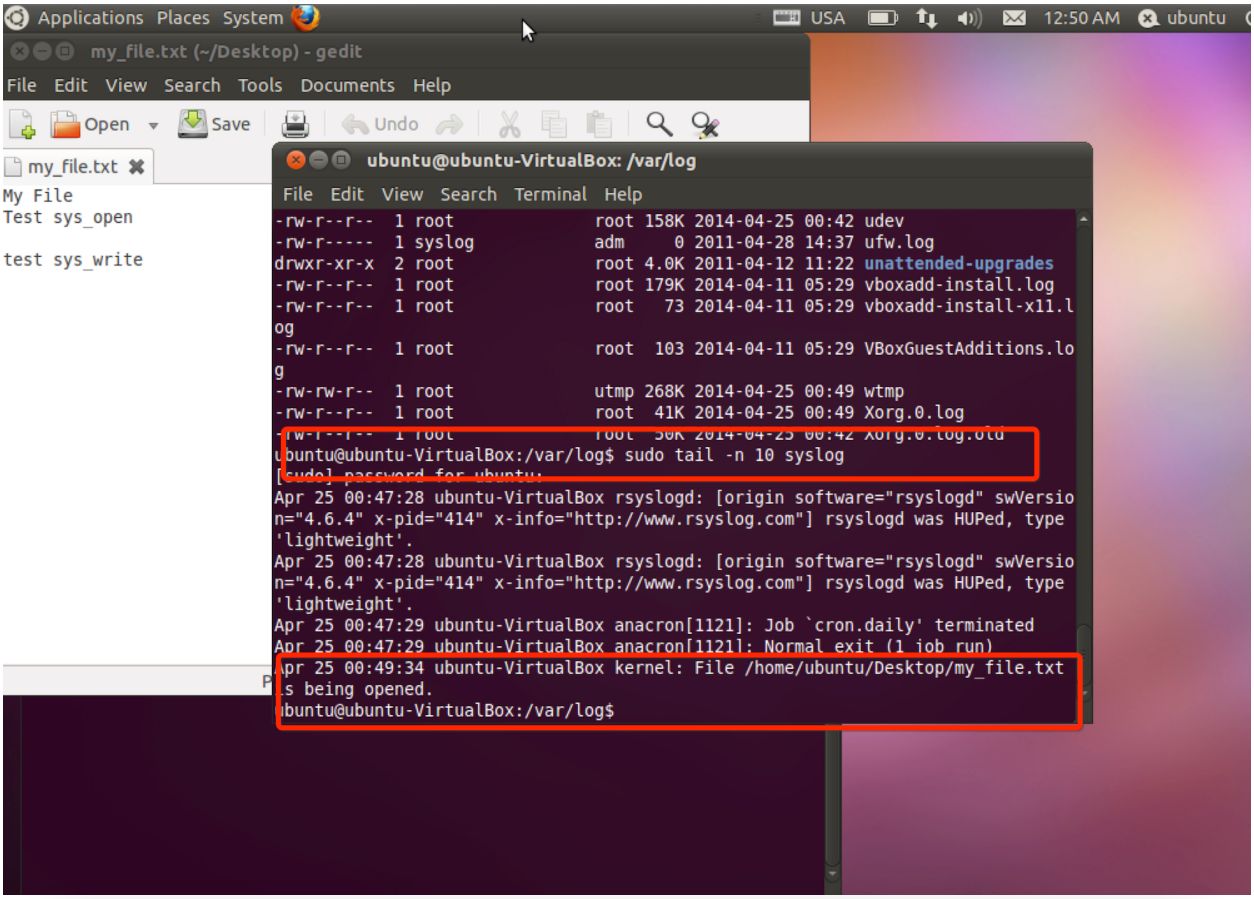
initrd.img-*: is a temporary root file system. It is mounted during system boot to support the two-state boot process. It also contains various executables and drivers which permit the root file system to be mounted successfully.

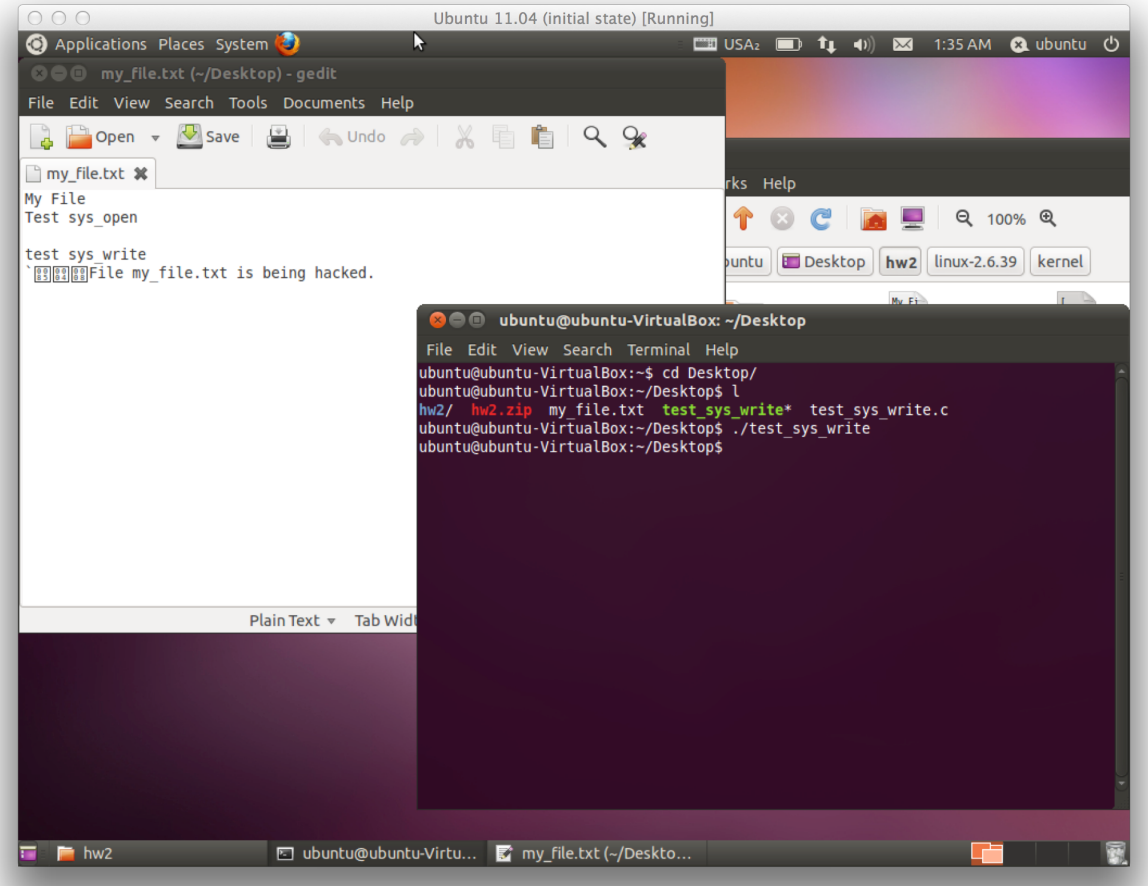
grub: is one of the boot loaders. It is used to fire up the kernel when start the system.

config*: is the configuration file of the kernel. In this file, we have the option to choose which functionality, module or driver to add into the kernel. So that we can get a minimum size and useful linux system. In the homework step 6, we streamline_config.pl to generate a minimum .config file to make the compilation process faster.

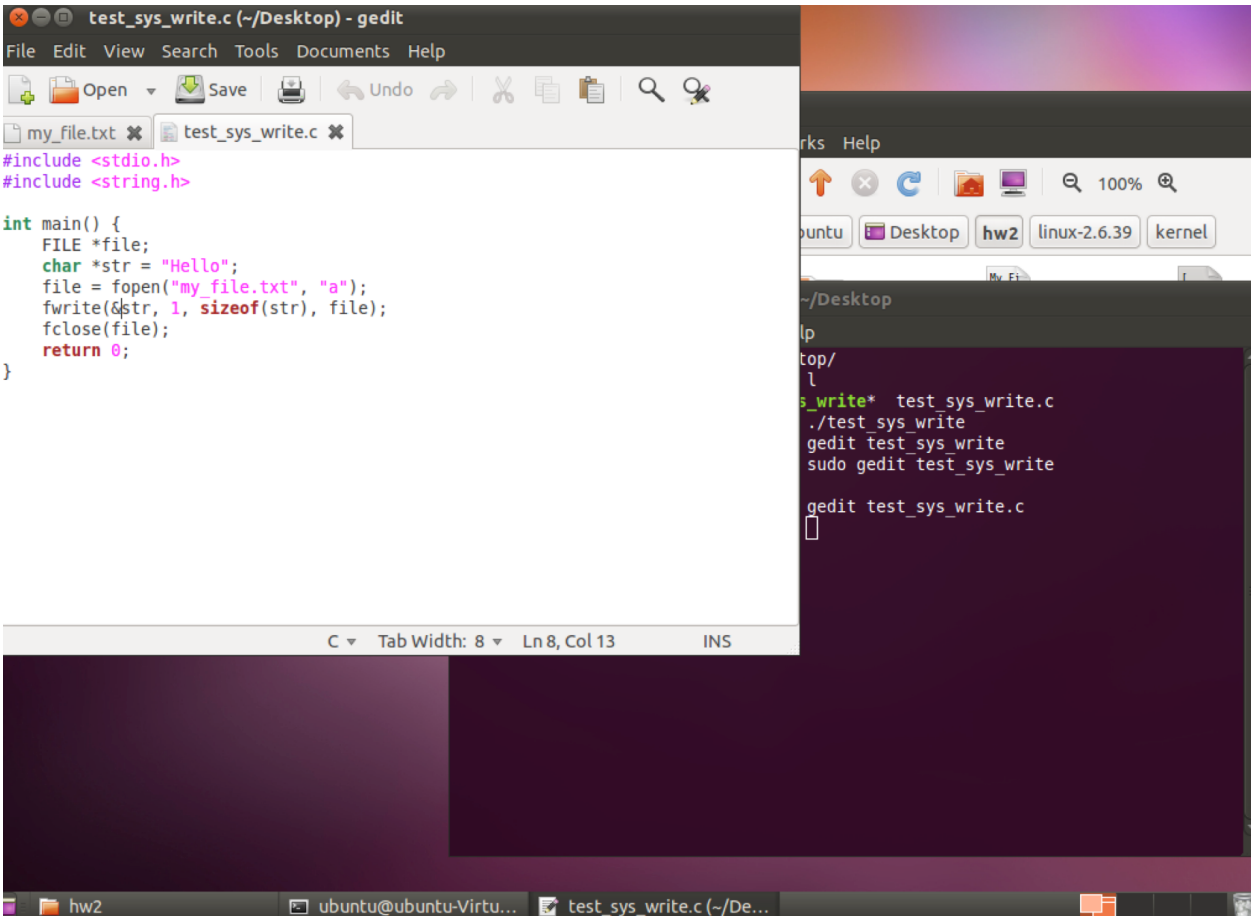
3. Include the screenshots AND all modified files from tasks 1, 2 and 3 below.



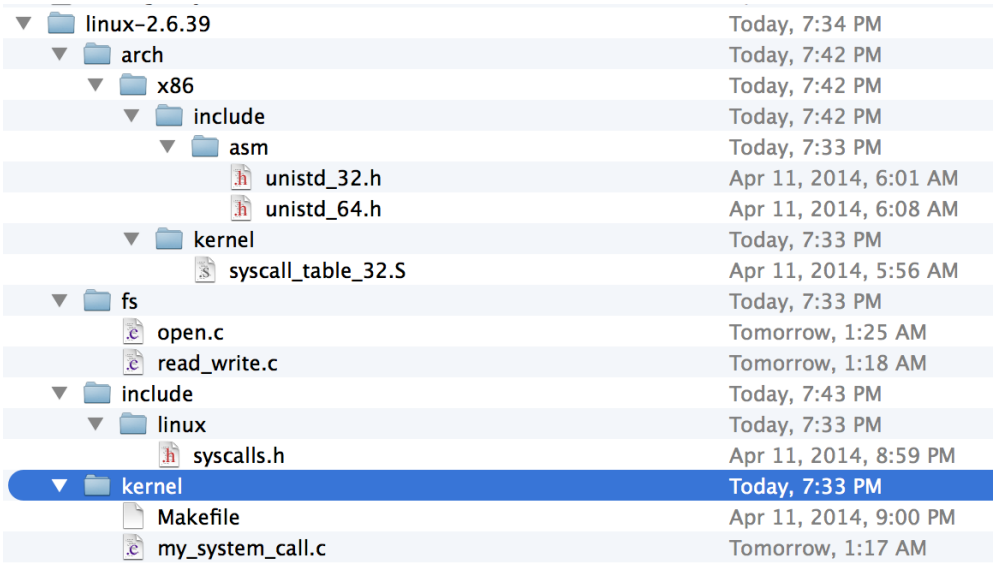

Applications Places System
USA
12:50 AM
ubuntu
my_file.txt (~/Desktop) - gedit
File Edit View Search Tools Documents Help
Open
Save
Undo
my_file.txt
My File
Test sys_open
test sys_write
ubuntu@ubuntu-VirtualBox: /var/log
File Edit View Search Terminal Help
-rw-r--r-- 1 root root 158K 2014-04-25 00:42 udev
-rw-r----- 1 syslog adm 0 2011-04-28 14:37 ufw.log
drwxr-xr-x 2 root root 4.0K 2011-04-12 11:22 unattended-upgrades
-rw-r--r-- 1 root root 179K 2014-04-11 05:29 vboxadd-install.log
-rw-r--r-- 1 root root 73 2014-04-11 05:29 vboxadd-install-x11.log
-rw-r--r-- 1 root root 103 2014-04-11 05:29 VBoxGuestAdditions.log
-rw-rw-r-- 1 root utmp 268K 2014-04-25 00:49 wtmp
-rw-r--r-- 1 root root 41K 2014-04-25 00:49 Xorg.0.log
ubuntu@ubuntu-VirtualBox:/var/log$ sudo tail -n 10 syslog
[sudo] password for ubuntu:
Apr 25 00:47:28 ubuntu-VirtualBox rsyslogd: [origin software="rsyslogd" swVersion="4.6.4" x-pid="414" x-info="http://www.rsyslog.com"] rsyslogd was HUPed, type 'lightweight'.
Apr 25 00:47:28 ubuntu-VirtualBox rsyslogd: [origin software="rsyslogd" swVersion="4.6.4" x-pid="414" x-info="http://www.rsyslog.com"] rsyslogd was HUPed, type 'lightweight'.
Apr 25 00:47:29 ubuntu-VirtualBox anacron[1121]: Job `cron.daily' terminated
Apr 25 00:47:29 ubuntu-VirtualBox anacron[1121]: Normal exit (1 job run)
Apr 25 00:49:34 ubuntu-VirtualBox kernel: File /home/ubuntu/Desktop/my_file.txt is being opened.
ubuntu@ubuntu-VirtualBox:/var/log$


Ubuntu 11.04 (initial state) [Running]
Applications Places System
USA2
1:35 AM
ubuntu
my_file.txt (~/Desktop) - gedit
File Edit View Search Tools Documents Help
Open
Save
Undo
my_file.txt
My File
Test sys_open
test sys_write
`[][][]File my_file.txt is being hacked.
Plain Text
Tab Widt
100%
Desktop
hw2
linux-2.6.39
kernel
ubuntu@ubuntu-VirtualBox: ~/Desktop
File Edit View Search Terminal Help
ubuntu@ubuntu-VirtualBox:~$ cd Desktop/
ubuntu@ubuntu-VirtualBox:~/Desktop$ l
hw2/ hw2.zip my_file.txt test_sys_write* test_sys_write.c
ubuntu@ubuntu-VirtualBox:~/Desktop$ ./test_sys_write
ubuntu@ubuntu-VirtualBox:~/Desktop$
hw2
ubuntu@ubuntu-Virtu...
my_file.txt (~/Deskto...

(screenshot for test_sys_write.c. You can also find the source file in the hw2 folder.)

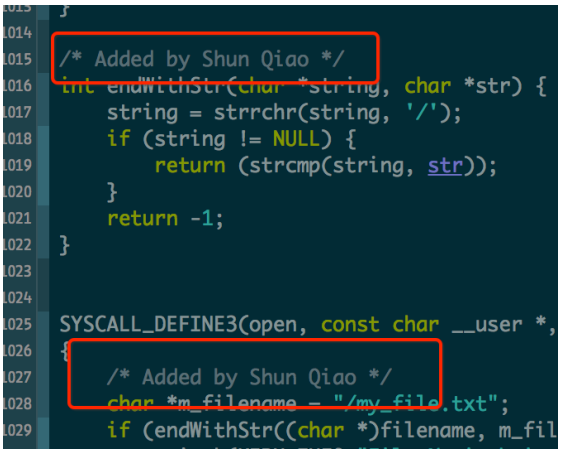


All the modified & added files in linux-2.6.39:



All the modified codes are marked by “/* Added by Shun Qiao */”. Search for them to find the location.

For example:



References:

Kernel APIs, Part 1: Invoking user-space applications from the kernel
http://www.ibm.com/developerworks/linux/library/l-user-space-apps/index.html?ca=drs

vmlinuz Definition
http://www.linfo.org/vmlinuz.html

Linux initial RAM disk (initrd) overview
https://www.ibm.com/developerworks/library/l-initrd/

Configuring the Bootloader
http://www.gentoo.org/doc/en/handbook/handbook-x86.xml?part=1&chap=10

Linux From Scratch
http://www.linuxfromscratch.org/lfs/view/development/chapter08/kernel.html

Github:

https://github.com/qiaoshun8888/OS_6233_HW1_Linux_Kernel