

### 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. It is the API that allows programs in user space to access system resources and services of the Linux kernel. It is composed out of the System Call Interface of the Linux kernel and the subroutines in the GNU C Library (glibc)

System call can permit user-space application to invoke methods in the kernel, for example, a C function called `fopen()` can use system call that is `sys_open()`. The difference is that APIs work in the higher layer.

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

`vmlinuz-*`: the name of the Linux kernel executable, It is the first thing that is loaded into memory.

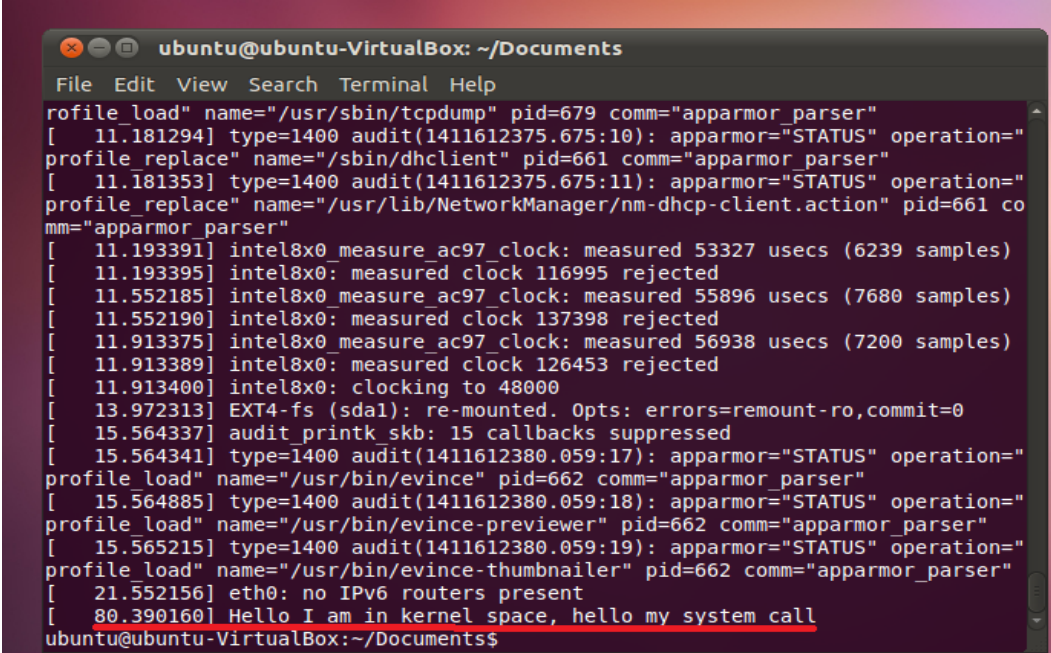
`initrd.img-*`: a scheme for loading a temporary root file system into memory in the boot process of the Linux kernel. `initrd` and `initramfs` refer to two different methods of achieving this. Both are commonly used to make preparations before the real root file system can be mounted.

`grub`: a boot loader package from the GNU Project. It provides a user the choice to boot one of multiple operating systems installed on a computer or select a specific kernel configuration available on a particular operating system's partitions.

`config*`: the configuration file of the kernel. This file contains configuration files, or the initial settings for some computer programs. We have the option to choose which functionality, module or driver to add into the kernel.

### 3. Include the screenshots from tasks 1, 2 and 3 below.

Task1:



```
ubuntu@ubuntu-VirtualBox: ~/Documents
File Edit View Search Terminal Help
[ 11.181294] type=1400 audit(1411612375.675:10): apparmor="STATUS" operation="
profile_replace" name="/sbin/dhclient" pid=661 comm="apparmor_parser"
[ 11.181353] type=1400 audit(1411612375.675:11): apparmor="STATUS" operation="
profile_replace" name="/usr/lib/NetworkManager/nm-dhcp-client.action" pid=661 co
mm="apparmor_parser"
[ 11.193391] intel8x0_measure_ac97_clock: measured 53327 usecs (6239 samples)
[ 11.193395] intel8x0: measured clock 116995 rejected
[ 11.552185] intel8x0_measure_ac97_clock: measured 55896 usecs (7680 samples)
[ 11.552190] intel8x0: measured clock 137398 rejected
[ 11.913375] intel8x0_measure_ac97_clock: measured 56938 usecs (7200 samples)
[ 11.913389] intel8x0: measured clock 126453 rejected
[ 11.913400] intel8x0: clocking to 48000
[ 13.972313] EXT4-fs (sda1): re-mounted. Opts: errors=remount-ro,commit=0
[ 15.564337] audit_printk_skb: 15 callbacks suppressed
[ 15.564341] type=1400 audit(1411612380.059:17): apparmor="STATUS" operation="
profile_load" name="/usr/bin/evince" pid=662 comm="apparmor_parser"
[ 15.564885] type=1400 audit(1411612380.059:18): apparmor="STATUS" operation="
profile_load" name="/usr/bin/evince-previewer" pid=662 comm="apparmor_parser"
[ 15.565215] type=1400 audit(1411612380.059:19): apparmor="STATUS" operation="
profile_load" name="/usr/bin/evince-thumbnailer" pid=662 comm="apparmor_parser"
[ 21.552156] eth0: no IPv6 routers present
[ 80.390160] Hello I am in kernel space, hello my system call
ubuntu@ubuntu-VirtualBox:~/Documents$
```

## Task2:

```
ubuntu@ubuntu-VirtualBox: ~/Documents
File Edit View Search Terminal Help
ed
[ 76.406910] /sys/devices/system/cpu/cpu3/cache/index1/shared_cpu_map is being
opened
[ 76.406933] /sys/devices/system/cpu/cpu3/cache/index2/shared_cpu_map is being
opened
[ 76.406970] /proc/net/dev is being opened
[ 76.407015] /proc/irq/22/smp_affinity is being opened
[ 76.407047] /proc/irq/12/smp_affinity is being opened
[ 76.407079] /proc/irq/15/smp_affinity is being opened
[ 77.006594] /dev/sr0 is being opened
[ 77.787715] /etc/localtime is being opened
[ 77.788513] /usr/share/zoneinfo/UTC is being opened
[ 77.789110] /home/ubuntu/.cache/dconf/user is being opened
[ 77.789196] /home/ubuntu/.config/dconf/user is being opened
[ 77.791836] /usr/share/zoneinfo/Europe/Rome is being opened
[ 77.795171] /usr/share/zoneinfo is being opened
[ 77.853619] /etc/ld.so.cache is being opened
[ 77.853674] /lib/i386-linux-gnu/libc.so.6 is being opened
[ 77.854163] myfile.txt is being opened
[ 79.005686] /dev/sr0 is being opened
[ 80.697591] /etc/ld.so.cache is being opened
[ 80.697659] /lib/i386-linux-gnu/libc.so.6 is being opened
[ 80.698282] /usr/lib/locale/locale-archive is being opened
ubuntu@ubuntu-VirtualBox:~/Documents$
```

## Task3:

```
Applications Places System
root@ubuntu-VirtualBox: ~/Documents
File Edit View Search Terminal Help
ubuntu@ubuntu-VirtualBox:~$ sudo -s
[sudo] password for ubuntu:
root@ubuntu-VirtualBox:~# cd Documents/
root@ubuntu-VirtualBox:~/Documents# ls
a.out  myfile.txt  openfile  testsyscall  writefile
b.txt  my_system  call.c  openfile.c  testsyscall.c  write
root@ubuntu-VirtualBox:~/Documents# gcc writefile.c -o write
root@ubuntu-VirtualBox:~/Documents# ./writefile
root@ubuntu-VirtualBox:~/Documents#

myfile.txt (~/.Documents) - gedit
File Edit View Search Tools Document
myfile.txt x
test
myfile.txt is being hacked.

ubuntu@ubuntu-VirtualBox: ~/Documents
File Edit View Search Terminal Help
ed.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135510] kern.log is being hacke
d.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135520] vteUZVFNX is being hack
ed.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135529] vteN9VFNX is being hack
ed.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135533] syslog is being hacked.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135544] kern.log is being hacke
d.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135552] vteUZVFNX is being hack
ed.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135561] vteN9VFNX is being hack
ed.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135565] syslog is being hacked.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135576] kern.log is being hacke
d.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135580] vteUZVFNX is being hack
ed.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135588] vteN9VFNX is being hack
ed.
Oct 7 02:17:29 ubuntu-VirtualBox kernel: [ 160.135614] vteUZVFNX is being hack
ed.^C
ubuntu@ubuntu-VirtualBox:~/Documents$
```