

Add System Call

Step 1: Initially login to cloud server(digitalocean.com) through ssh command and download Kernel(linux-4.17.6 version) file using command : `wget https://www.kernel.org/pub/linux/kernel/v4.x/linux-4.17.6.tar.xz`

```
root@subhani: ~
File Edit View Search Terminal Help
root@subhani:~# wget https://www.kernel.org/pub/linux/kernel/v4.x/linux-4.17.6.t
ar.xz
--2018-07-12 10:27:35-- https://www.kernel.org/pub/linux/kernel/v4.x/linux-4.17
.6.tar.xz
Resolving www.kernel.org (www.kernel.org)... 2604:1380:40a0:500::1, 147.75.42.13
9
Connecting to www.kernel.org (www.kernel.org)|2604:1380:40a0:500::1|:443... conn
ected.
HTTP request sent, awaiting response... 301 Moved Permanently
Location: https://mirrors.edge.kernel.org/pub/linux/kernel/v4.x/linux-4.17.6.tar
.xz [following]
--2018-07-12 10:27:36-- https://mirrors.edge.kernel.org/pub/linux/kernel/v4.x/l
inux-4.17.6.tar.xz
Resolving mirrors.edge.kernel.org (mirrors.edge.kernel.org)... 2604:1380:2001:39
90::1, 147.75.101.1
Connecting to mirrors.edge.kernel.org (mirrors.edge.kernel.org)|2604:1380:2001:3
990::1|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 102189404 (97M) [application/x-xz]
Saving to: 'linux-4.17.6.tar.xz'

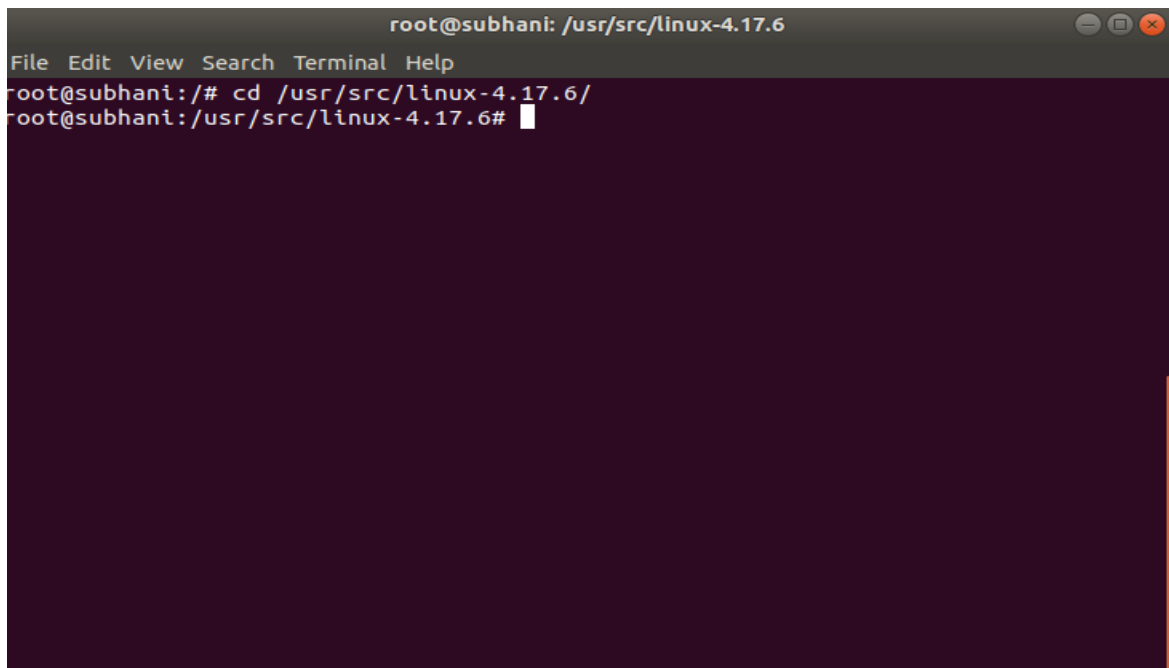
linux-4.17.6.tar.xz 100%[=====>] 97.46M 11.9MB/s in 9.8s

2018-07-12 10:27:47 (9.91 MB/s) - 'linux-4.17.6.tar.xz' saved [102189404/1021894
```

Step 2 : Extract the kernel tar file in `/usr/src/` directory by using command: `sudo tar -xvf linux-4.17.6.tar.xz -C /usr/src/`

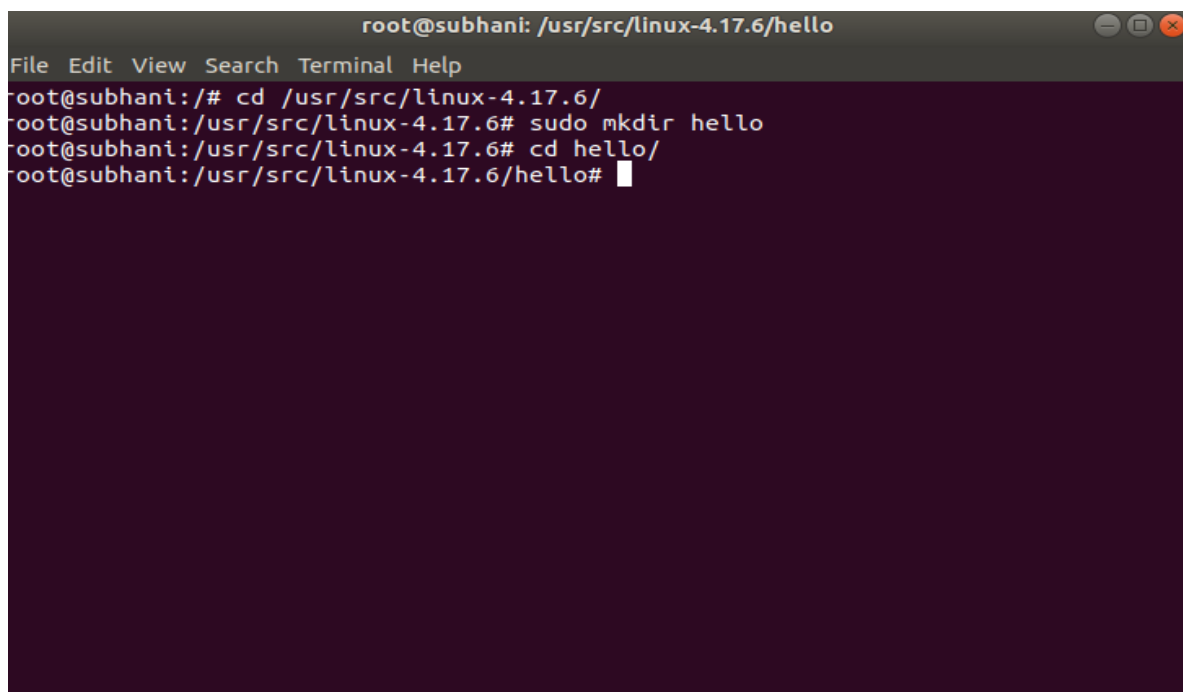
```
root@subhani: ~
File Edit View Search Terminal Help
root@subhani:~# sudo tar -xvf linux-4.17.6.tar.xz -C /usr/src/
linux-4.17.6/
linux-4.17.6/.clang-format
linux-4.17.6/.cocciconfig
linux-4.17.6/.get_maintainer.ignore
linux-4.17.6/.gitattributes
linux-4.17.6/.gitignore
linux-4.17.6/.mailmap
linux-4.17.6/COPYING
linux-4.17.6/CREDITS
linux-4.17.6/Documentation/
linux-4.17.6/Documentation/.gitignore
linux-4.17.6/Documentation/00-INDEX
linux-4.17.6/Documentation/ABI/
linux-4.17.6/Documentation/ABI/README
linux-4.17.6/Documentation/ABI/obsolete/
linux-4.17.6/Documentation/ABI/obsolete/sysfs-bus-usb
linux-4.17.6/Documentation/ABI/obsolete/sysfs-driver-hid-roccat-arvo
linux-4.17.6/Documentation/ABI/obsolete/sysfs-driver-hid-roccat-isku
linux-4.17.6/Documentation/ABI/obsolete/sysfs-driver-hid-roccat-koneplus
linux-4.17.6/Documentation/ABI/obsolete/sysfs-driver-hid-roccat-konepure
linux-4.17.6/Documentation/ABI/obsolete/sysfs-driver-hid-roccat-kovapulus
linux-4.17.6/Documentation/ABI/obsolete/sysfs-driver-hid-roccat-lua
linux-4.17.6/Documentation/ABI/obsolete/sysfs-driver-hid-roccat-pyra
```

Step 3 : change present working directory to extracted directory by using command: `cd /usr/src/linux-4.17.6/`

A terminal window titled 'root@subhani: /usr/src/linux-4.17.6' with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal shows the command 'cd /usr/src/linux-4.17.6/' being executed, and the prompt changes from 'root@subhani:/#' to 'root@subhani:/usr/src/linux-4.17.6#'.

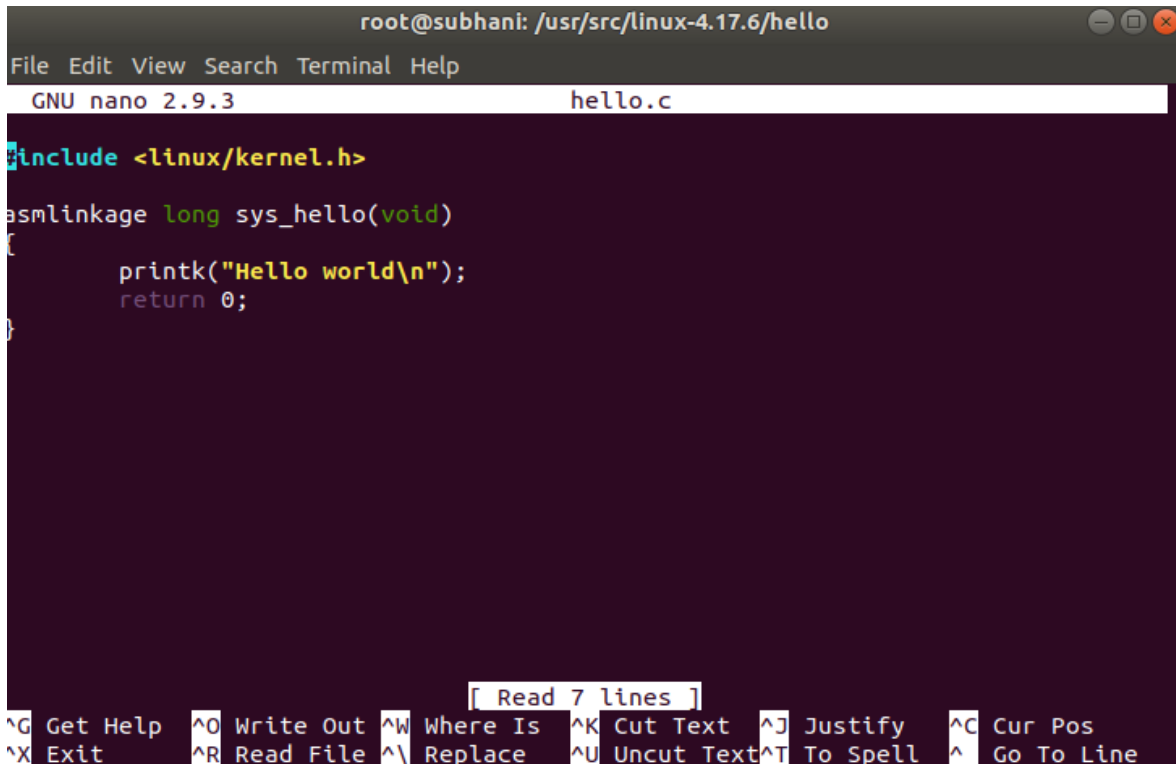
```
root@subhani: /usr/src/linux-4.17.6
File Edit View Search Terminal Help
root@subhani:/# cd /usr/src/linux-4.17.6/
root@subhani:/usr/src/linux-4.17.6#
```

Step 4 : Create a folder 'hello' to create a new system call by using command: `sudo mkdir hello` and change directory to that hello folder by command `cd hello/`

A terminal window titled 'root@subhani: /usr/src/linux-4.17.6/hello' with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal shows three commands being executed: 'cd /usr/src/linux-4.17.6/', 'sudo mkdir hello', and 'cd hello/'. The prompt changes from 'root@subhani:/#' to 'root@subhani:/usr/src/linux-4.17.6/hello#'.

```
root@subhani: /usr/src/linux-4.17.6/hello
File Edit View Search Terminal Help
root@subhani:/# cd /usr/src/linux-4.17.6/
root@subhani:/usr/src/linux-4.17.6# sudo mkdir hello
root@subhani:/usr/src/linux-4.17.6# cd hello/
root@subhani:/usr/src/linux-4.17.6/hello#
```

Step 5 : Create a new system call `sys_hello` by using command:
`sudo nano sys_hello` and write the system call by using nano editor to print “Hello world” and save it.



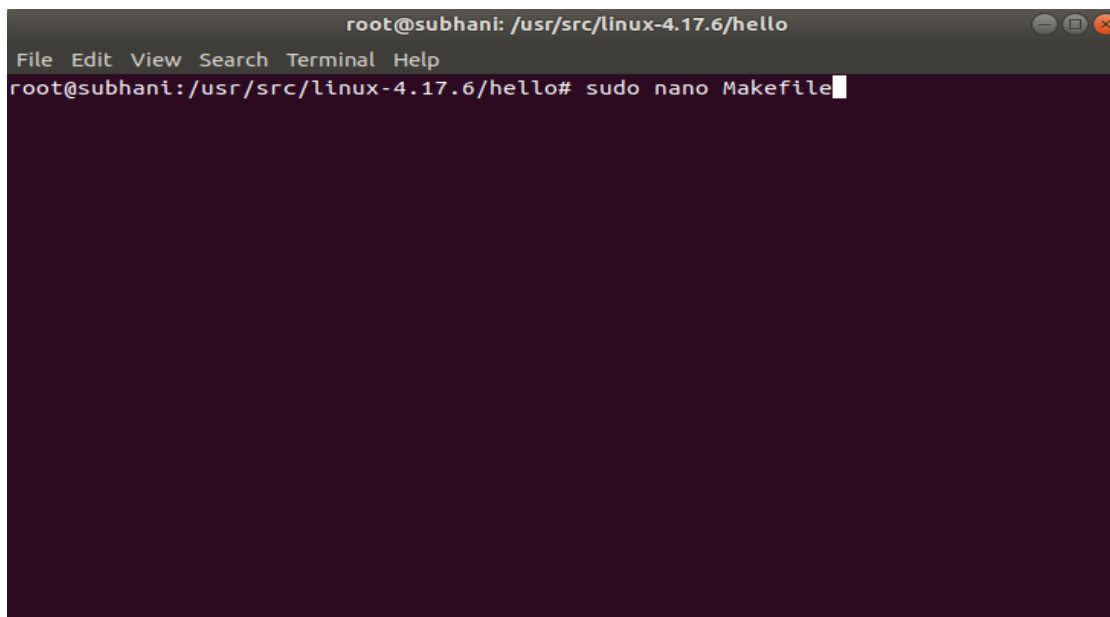
The screenshot shows a terminal window with the nano editor open. The title bar indicates the user is root@subhani in the directory /usr/src/linux-4.17.6/hello. The nano editor's menu bar includes File, Edit, View, Search, Terminal, and Help. The status bar at the top shows 'GNU nano 2.9.3' and the filename 'hello.c'. The editor content shows the following code:

```
#include <linux/kernel.h>

asmmlinkage long sys_hello(void)
{
    printk("Hello world\n");
    return 0;
}
```

The status bar at the bottom displays various keyboard shortcuts: ^G Get Help, ^O Write Out, ^W Where Is, ^K Cut Text, ^J Justify, ^C Cur Pos, ^X Exit, ^R Read File, ^\ Replace, ^U Uncut Text, ^T To Spell, and ^_ Go To Line. A small box in the center of the editor indicates 'Read 7 lines'.

Step 6 : Create a makefile in hello folder to invoke `sys_hello` system call by using nano editor.

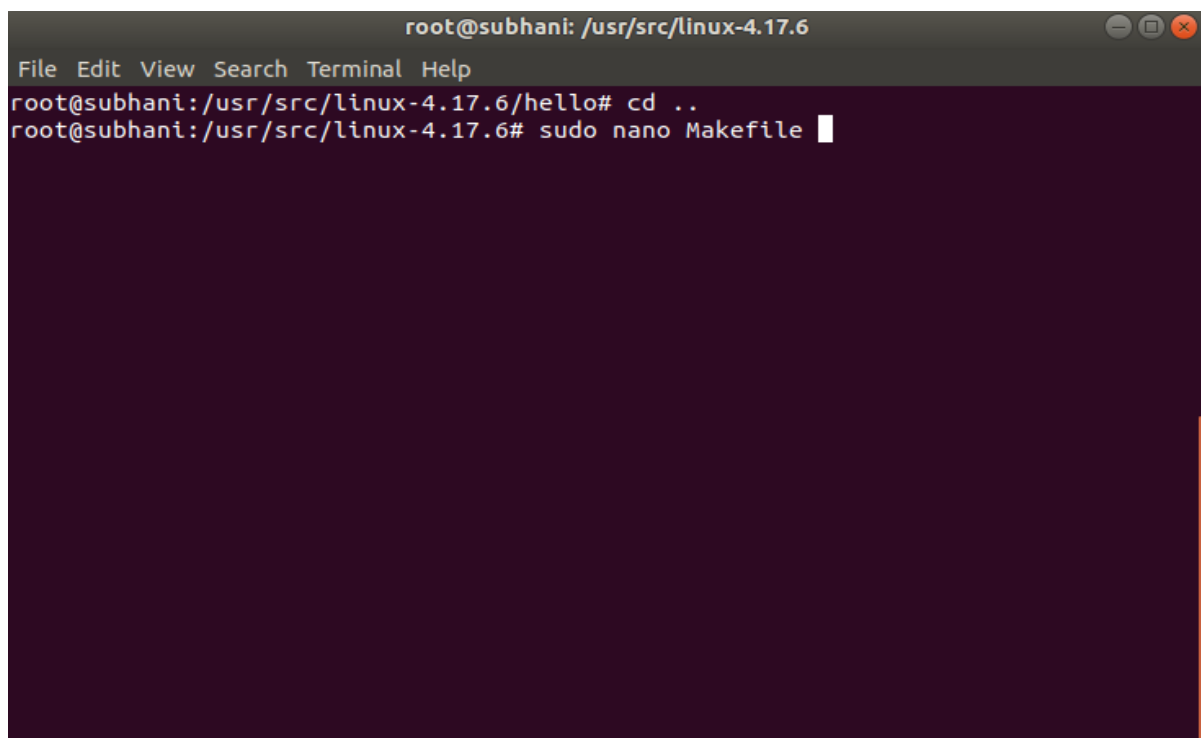


The screenshot shows a terminal window with the nano editor open. The title bar indicates the user is root@subhani in the directory /usr/src/linux-4.17.6/hello. The nano editor's menu bar includes File, Edit, View, Search, Terminal, and Help. The status bar at the top shows 'GNU nano 2.9.3' and the filename 'Makefile'. The editor content is empty, and the cursor is at the end of the first line.



```
root@subhani: /usr/src/linux-4.17.6/hello
File Edit View Search Terminal Help
GNU nano 2.9.3 Makefile Modified
obj-y := hello.o
[ New File ]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```

Step 7 : Now change directory to linux source and change the code `core-y += kernel/ mm/ fs/ ipc/ security/ crypto/ block/` to `core-y += kernel/ mm/ fs/ ipc/ security/ crypto/ block/ hello/`



```
root@subhani: /usr/src/linux-4.17.6
File Edit View Search Terminal Help
root@subhani:/usr/src/linux-4.17.6/hello# cd ..
root@subhani:/usr/src/linux-4.17.6# sudo nano Makefile
```

```
root@subhani: /usr/src/linux-4.17.6
File Edit View Search Terminal Help
GNU nano 2.9.3 Makefile Modified

$(warning "Cannot use CONFIG_STACK_VALIDATION=y, please install libelf-de$
endif
SKIP_STACK_VALIDATION := 1
export SKIP_STACK_VALIDATION
endif
endif

ifeq ($(KBUILD_EXTMOD),)
core-y += kernel/ certs/ mm/ fs/ ipc/ security/ crypto/ block/ hello/

vmlinux-dirs := $(patsubst %/,%,$(filter %/, $(init-y) $(init-m) \
$(core-y) $(core-m) $(drivers-y) $(drivers-m) \
$(net-y) $(net-m) $(libs-y) $(libs-m) $(virt-y)))

vmlinux-alldirs := $(sort $(vmlinux-dirs) $(patsubst %/,%,$(filter %/, \
$(init-) $(core-) $(drivers-) $(net-) $(libs-) $(virt-))))

init-y := $(patsubst %/, %/built-in.a, $(init-y))
File Name to Write: Makefile
^G Get Help      M-D DOS Format   M-A Append      M-B Backup File
^C Cancel        M-M Mac Format   M-P Prepend     ^T To Files
```

Step 8 : Now change the directory to *arch/x86/entry/syscalls* to edit *syscall_64.tbl*

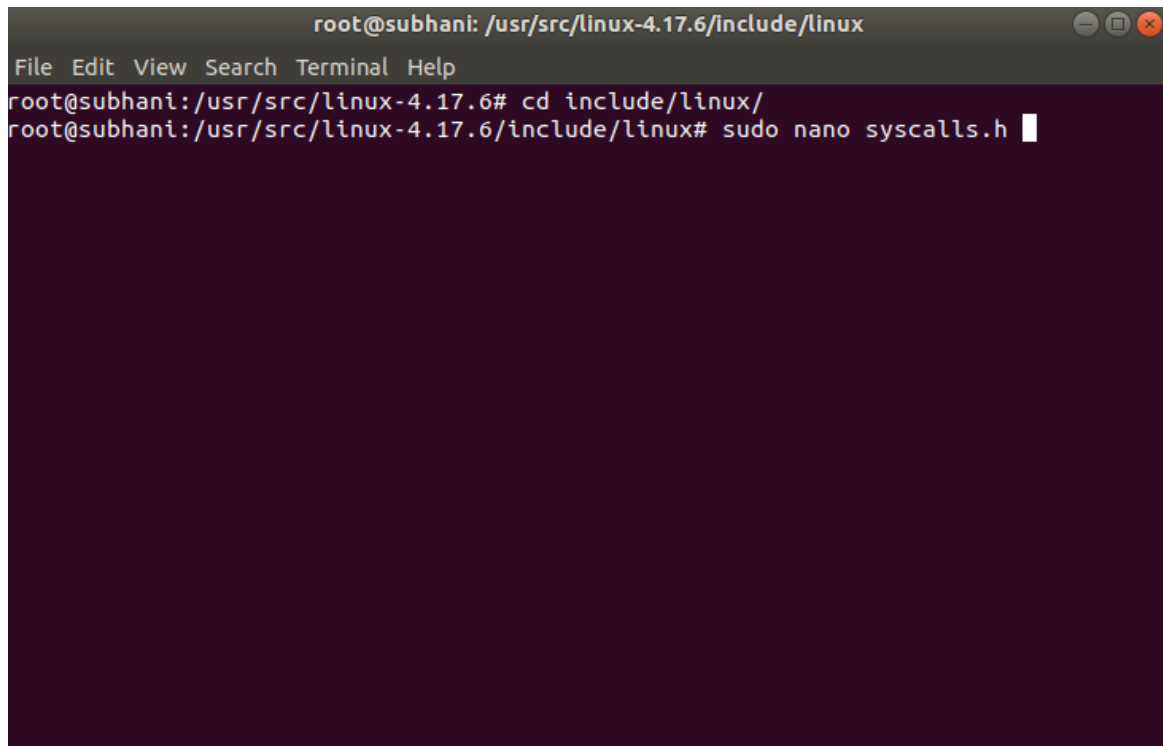
```
root@subhani: /usr/src/linux-4.17.6
File Edit View Search Terminal Help
root@subhani:/usr/src/linux-4.17.6/hello# cd ..
root@subhani:/usr/src/linux-4.17.6# sudo nano Makefile
root@subhani:/usr/src/linux-4.17.6# cd arch/x86/entry/syscalls/
```

```
root@subhani: /usr/src/linux-4.17.6/arch/x86/entry/syscalls
File Edit View Search Terminal Help
root@subhani:/usr/src/linux-4.17.6/arch/x86/entry/syscalls# sudo nano syscall_64.tbl
.tbl
```

add new line – 333 64 hello sys_hello

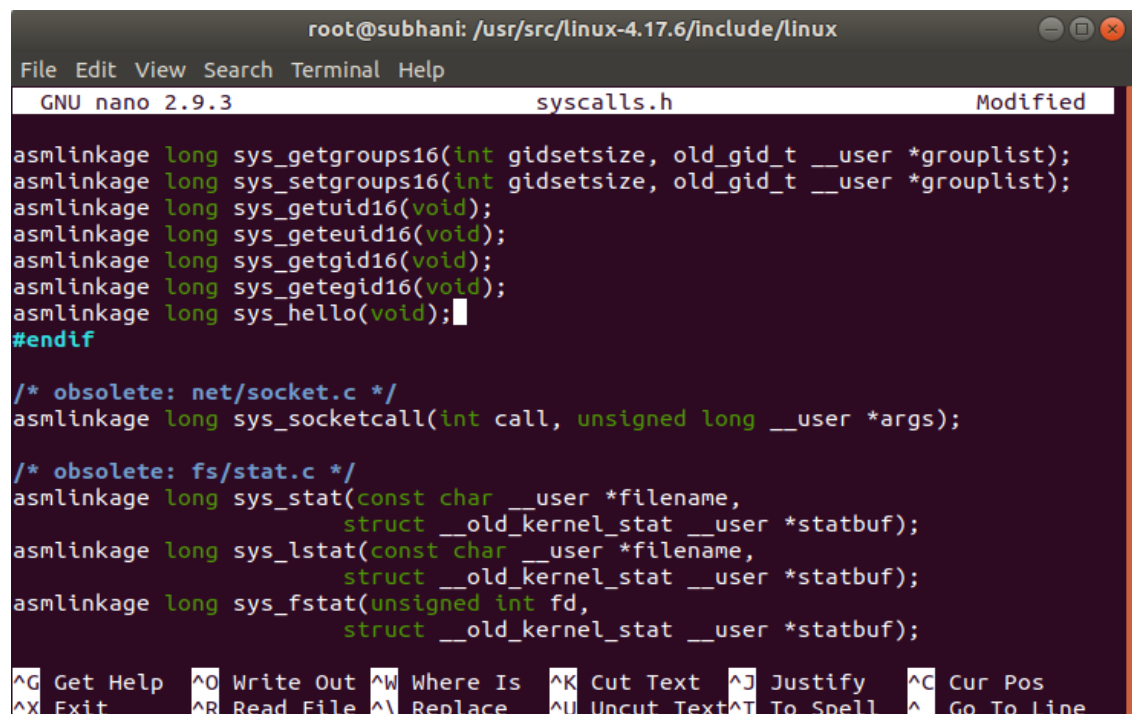
```
root@subhani: /usr/src/linux-4.17.6/arch/x86/entry/syscalls
File Edit View Search Terminal Help
GNU nano 2.9.3          syscall_64.tbl          Modified
327      64      preadv2          __x64_sys_preadv2
328      64      pwritev2         __x64_sys_pwritev2
329      common  pkey_mprotect    __x64_sys_pkey_mprotect
330      common  pkey_alloc       __x64_sys_pkey_alloc
331      common  pkey_free        __x64_sys_pkey_free
332      common  statx            __x64_sys_statx
333      64      hello          sys_hello
#
# x32-specific system call numbers start at 512 to avoid cache impact
# for native 64-bit operation. The __x32_compat_sys stubs are created
# on-the-fly for compat_sys_*() compatibility system calls if X86_X32
# is defined.
#
512      x32      rt_sigaction    __x32_compat_sys_rt_sigaction
513      x32      rt_sigreturn    sys32_x32_rt_sigreturn
514      x32      ioctl          __x32_compat_sys_ioctl
515      x32      readv          __x32_compat_sys_readv
516      x32      writev         __x32_compat_sys_writev
517      x32      recvfrom       __x32_compat_sys_recvfrom
^G Get Help  ^O Write Out ^W Where Is  ^K Cut Text  ^J Justify   ^C Cur Pos
^X Exit      ^R Read File ^\ Replace   ^U Uncut Text ^T To Spell  ^_ Go To Line
```

Step 9: Now change directory to `/include/linux` and edit `syscalls.h`



```
root@subhani: /usr/src/linux-4.17.6/include/linux
File Edit View Search Terminal Help
root@subhani:/usr/src/linux-4.17.6# cd include/linux/
root@subhani:/usr/src/linux-4.17.6/include/linux# sudo nano syscalls.h
```

add our new system call `asmlinkage long sys_hello(void);`



```
root@subhani: /usr/src/linux-4.17.6/include/linux
File Edit View Search Terminal Help
GNU nano 2.9.3 syscalls.h Modified
asmlinkage long sys_getgroups16(int gidsetsize, old_gid_t __user *grouplist);
asmlinkage long sys_setgroups16(int gidsetsize, old_gid_t __user *grouplist);
asmlinkage long sys_getuid16(void);
asmlinkage long sys_geteuid16(void);
asmlinkage long sys_getgid16(void);
asmlinkage long sys_getegid16(void);
asmlinkage long sys_hello(void);
#endif

/* obsolete: net/socket.c */
asmlinkage long sys_socketcall(int call, unsigned long __user *args);

/* obsolete: fs/stat.c */
asmlinkage long sys_stat(const char __user *filename,
                        struct __old_kernel_stat __user *statbuf);
asmlinkage long sys_lstat(const char __user *filename,
                        struct __old_kernel_stat __user *statbuf);
asmlinkage long sys_fstat(unsigned int fd,
                        struct __old_kernel_stat __user *statbuf);

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line
```


Step 10 : Install gcc, libncurses5-dev, bison, flex, libssl-dev, libelf-dev, make and then update and upgrade the system by using commands.

sudo apt-get install gcc libncurses5-dev bison flex libssl-dev libelf-dev make

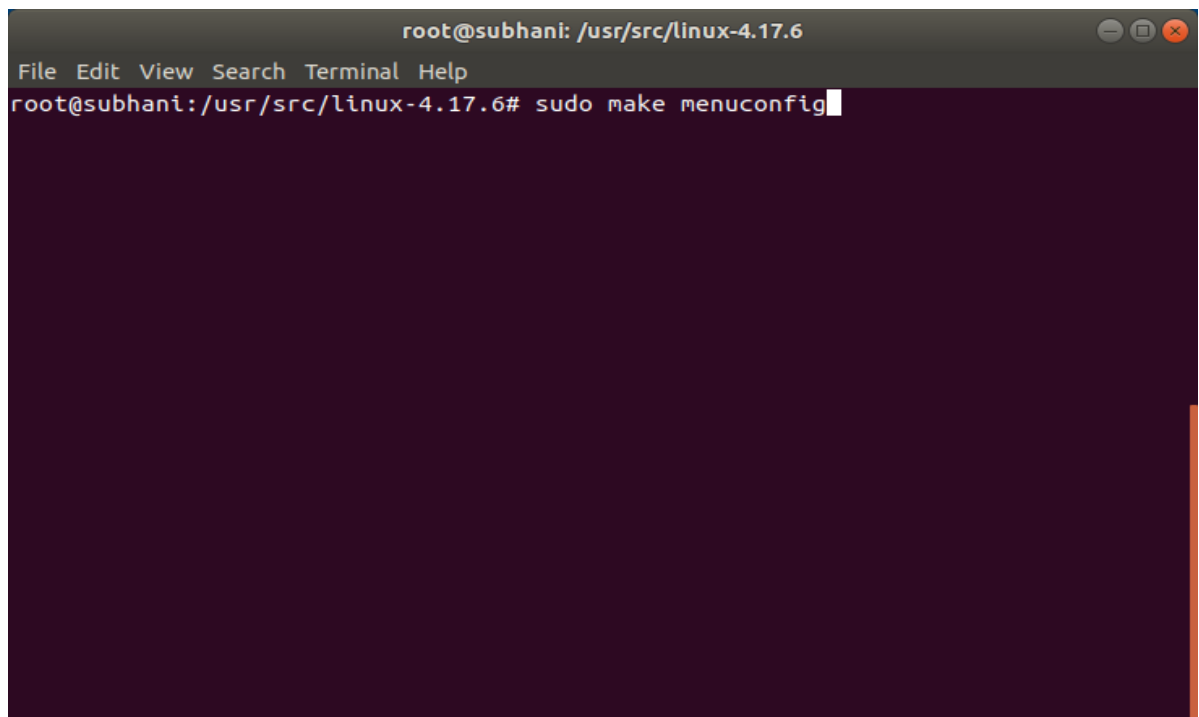
sudo apt-get update

sudo apt-get upgrade

```
root@subhani: /usr/src/linux-4.17.6/include/linux
File Edit View Search Terminal Help
root@subhani:/usr/src/linux-4.17.6/include/linux# sudo apt-get install gcc
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  grub-pc-bin
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu cpp cpp-7 gcc-7
  gcc-7-base libasan4 libatomic1 libbinutils libc-dev-bin libc6-dev libcc1-0
  libcilkrts5 libgcc-7-dev libgomp1 libisl19 libitm1 liblsan0 libmpc3 libmpx2
  libquadmath0 libtsan0 libubsan0 linux-libc-dev manpages-dev
Suggested packages:
  binutils-doc cpp-doc gcc-7-locales gcc-multilib make autoconf automake
  libtool flex bison gdb gcc-doc gcc-7-multilib gcc-7-doc libgcc1-dbg
  libgomp1-dbg libitm1-dbg libatomic1-dbg libasan4-dbg liblsan0-dbg
  libtsan0-dbg libubsan0-dbg libcilkrts5-dbg libmpx2-dbg libquadmath0-dbg
  glibc-doc
The following NEW packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu cpp cpp-7 gcc gcc-7
  gcc-7-base libasan4 libatomic1 libbinutils libc-dev-bin libc6-dev libcc1-0
  libcilkrts5 libgcc-7-dev libgomp1 libisl19 libitm1 liblsan0 libmpc3 libmpx2
  libquadmath0 libtsan0 libubsan0 linux-libc-dev manpages-dev
0 upgraded, 27 newly installed, 0 to remove and 0 not upgraded.
```

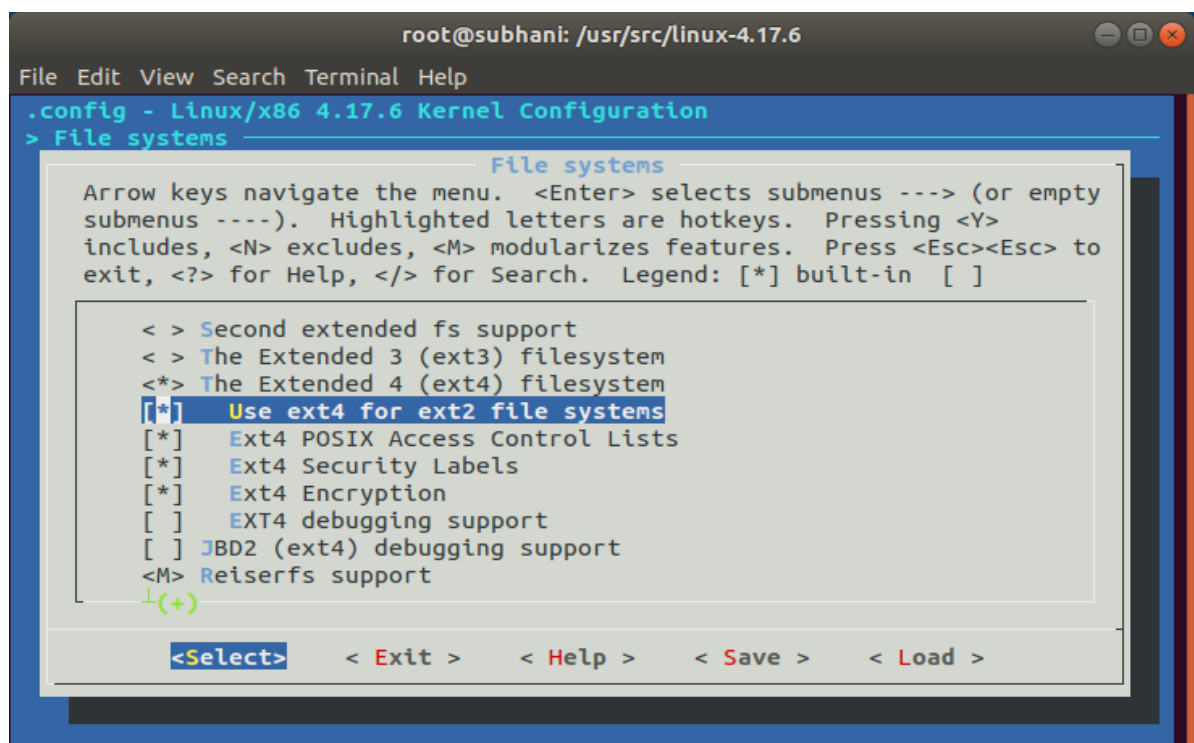
```
root@subhani: /usr/src/linux-4.17.6/include/linux
File Edit View Search Terminal Help
root@subhani:/usr/src/linux-4.17.6/include/linux# sudo apt-get install libncurses5-dev bison flex bc make libssl-dev libelf-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
bc is already the newest version (1.07.1-2).
bison is already the newest version (2:3.0.4.dfsg-1build1).
libssl-dev is already the newest version (1.1.0g-2ubuntu4.1).
The following package was automatically installed and is no longer required:
  grub-pc-bin
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu cpp cpp-7 gcc gcc-7
  gcc-7-base libasan4 libatomic1 libbinutils libc-dev-bin libc6-dev libcc1-0
  libcilkrts5 libfl-dev libfl2 libgcc-7-dev libgomp1 libisl19 libitm1 liblsan0
  libmpc3 libmpx2 libquadmath0 libtinfo-dev libtsan0 libubsan0 linux-libc-dev
  manpages-dev zlib1g-dev
Suggested packages:
  binutils-doc cpp-doc gcc-7-locales build-essential flex-doc gcc-multilib
  autoconf automake libtool gdb gcc-doc gcc-7-multilib gcc-7-doc libgcc1-dbg
  libgomp1-dbg libitm1-dbg libatomic1-dbg libasan4-dbg liblsan0-dbg
  libtsan0-dbg libubsan0-dbg libcilkrts5-dbg libmpx2-dbg libquadmath0-dbg
  glibc-doc ncurses-doc make-doc
The following NEW packages will be installed:
```


Step 11 : Make menuconfig



```
root@subhani: /usr/src/linux-4.17.6
File Edit View Search Terminal Help
root@subhani:/usr/src/linux-4.17.6# sudo make menuconfig
```

it will prompt a window to select different options. Select filesystem as *ext4* and then exit and save the file.

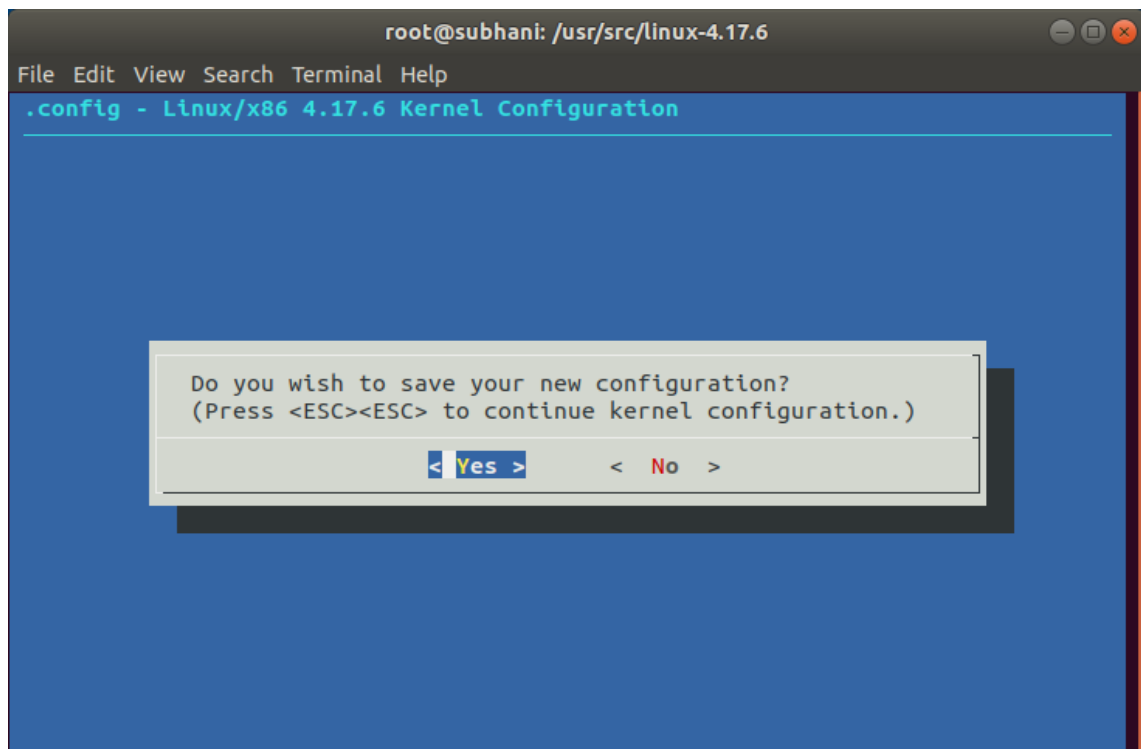


```
root@subhani: /usr/src/linux-4.17.6
File Edit View Search Terminal Help
.config - Linux/x86 4.17.6 Kernel Configuration
> File systems

File systems
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y>
includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to
exit, <?> for Help, </> for Search. Legend: [*] built-in [ ]

< > Second extended fs support
< > The Extended 3 (ext3) filesystem
< * > The Extended 4 (ext4) filesystem
[*] Use ext4 for ext2 file systems
[*] Ext4 POSIX Access Control Lists
[*] Ext4 Security Labels
[*] Ext4 Encryption
[ ] EXT4 debugging support
[ ] JBD2 (ext4) debugging support
< M > Reiserfs support
+ (+)

< Select > < Exit > < Help > < Save > < Load >
```



Step 12 : compile the kernel source code using 6 processes
sudo make -j6 in linux directory.

```
root@subhani: /usr/src/linux-4.17.6
File Edit View Search Terminal Help
root@subhani:/usr/src/linux-4.17.6# sudo make -j6
HOSTCC scripts/kconfig/conf.o
HOSTLD scripts/kconfig/conf
scripts/kconfig/conf --syncconfig Kconfig
CHK include/config/kernel.release
SYSHDR arch/x86/include/generated/asm/syscalls_32.h
HOSTCC scripts/basic/bin2c
SYSHDR arch/x86/include/generated/asm/unistd_32_ia32.h
SYSHDR arch/x86/include/generated/asm/unistd_64_x32.h
WRAP arch/x86/include/generated/uapi/asm/bpf_perf_event.h
WRAP arch/x86/include/generated/uapi/asm/poll.h
SYSHDR arch/x86/include/generated/asm/syscalls_64.h
CHK include/generated/uapi/linux/version.h
UPD include/generated/uapi/linux/version.h
HYPERCALLS arch/x86/include/generated/asm/xen-hypercalls.h
UPD include/config/kernel.release
SYSHDR arch/x86/include/generated/uapi/asm/unistd_32.h
DESCEND objtool
SYSHDR arch/x86/include/generated/uapi/asm/unistd_64.h
SYSHDR arch/x86/include/generated/uapi/asm/unistd_x32.h
HOSTCC /usr/src/linux-4.17.6/tools/objtool/fixdep.o
HOSTLD /usr/src/linux-4.17.6/tools/objtool/fixdep-in.o
LINK /usr/src/linux-4.17.6/tools/objtool/fixdep
GEN /usr/src/linux-4.17.6/tools/objtool/arch/x86/lib/inat-tables.c
```

Step 13 : After make is completed, install the kernel modules by using *sudo make modules_install install*

```
root@subhani: /usr/src/linux-4.17.6
File Edit View Search Terminal Help
LD [M] sound/usb/usbx2y/snd-usb-usbx2y.ko
LD [M] sound/x86/snd-hdmi-lpe-audio.ko
LD [M] virt/lib/irqbypass.ko
root@subhani:/usr/src/linux-4.17.6# sudo make modules_install install
INSTALL arch/x86/crypto/aes-x86_64.ko
INSTALL arch/x86/crypto/aesni-intel.ko
INSTALL arch/x86/crypto/blowfish-x86_64.ko
INSTALL arch/x86/crypto/camellia-aesni-avx-x86_64.ko
INSTALL arch/x86/crypto/camellia-aesni-avx2.ko
INSTALL arch/x86/crypto/camellia-x86_64.ko
INSTALL arch/x86/crypto/cast5-avx-x86_64.ko
INSTALL arch/x86/crypto/cast6-avx-x86_64.ko
INSTALL arch/x86/crypto/chacha20-x86_64.ko
INSTALL arch/x86/crypto/crc32-pclmul.ko
INSTALL arch/x86/crypto/crct10dif-pclmul.ko
INSTALL arch/x86/crypto/des3_edc-x86_64.ko
INSTALL arch/x86/crypto/ghash-clmulni-intel.ko
INSTALL arch/x86/crypto/glue_helper.ko
INSTALL arch/x86/crypto/poly1305-x86_64.ko
INSTALL arch/x86/crypto/salsa20-x86_64.ko
INSTALL arch/x86/crypto/serpent-avx-x86_64.ko
INSTALL arch/x86/crypto/serpent-avx2.ko
INSTALL arch/x86/crypto/serpent-sse2-x86_64.ko
INSTALL arch/x86/crypto/sha1-mb/sha1-mb.ko
INSTALL arch/x86/crypto/sha1-ssse3.ko
```

It will ask for configurations, select according to it

```
root@subhani: /usr/src/linux-4.17.6
File Edit View Search Terminal Help
Package configuration

A new version of /boot/grub/menu.lst is available, but the version installed currently has been locally modified.
What would you like to do about menu.lst?

install the package maintainer's version
keep the local version currently installed
show the differences between the versions
show a side-by-side difference between the versions
show a 3-way difference between available versions
do a 3-way merge between available versions (experimental)
start a new shell to examine the situation

<Ok>
```

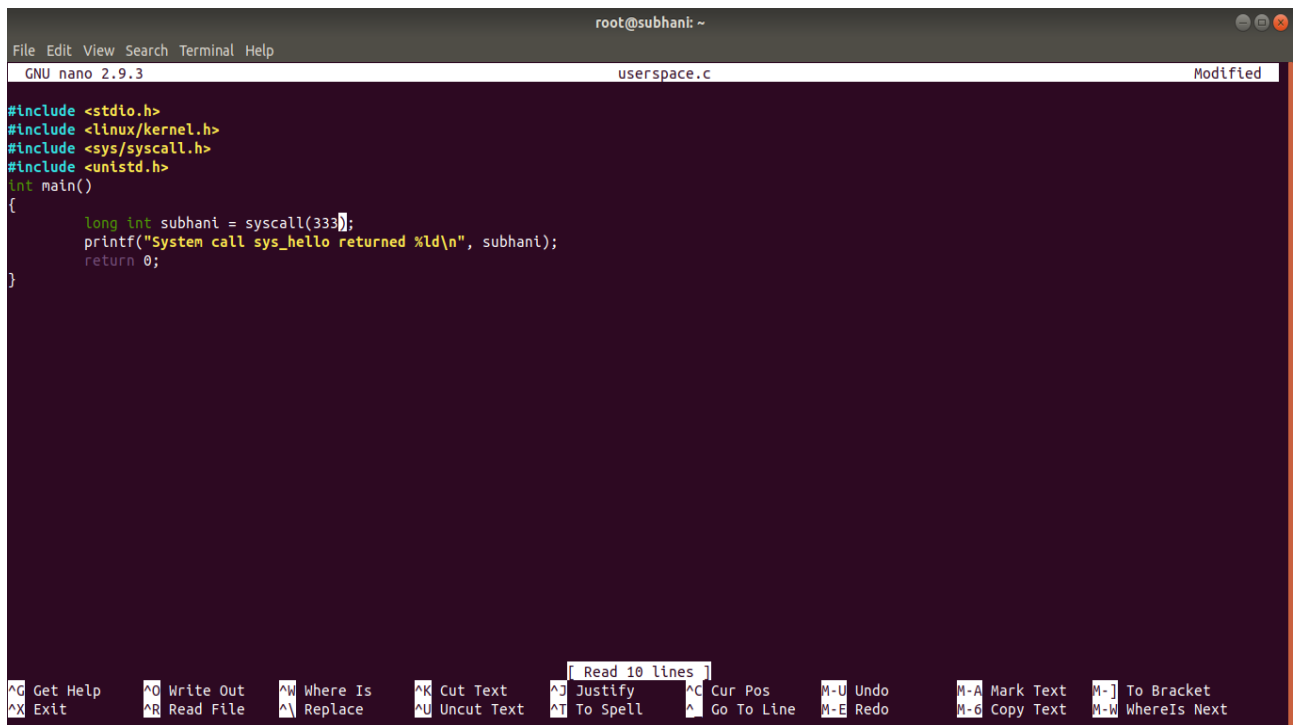
Step 14 : Checking for kernel 4.17.6 module files in boot directory.

```
root@subhani: /boot
File Edit View Search Terminal Help
root@subhani:/usr/src/linux-4.17.6# ls
COPYING      Kconfig      Module.symvers  block  drivers  include  lib      net      sound  vmlinux
CREDITS      LICENSES     README         built-in.a  firmware  init     mm      samples  tools  vmlinux-gdb.py
Documentation MAINTAINERS  System.map     certs   fs       ipc     modules.builtin  scripts  usr    vmlinux.o
Kbuild       Makefile     arch           crypto  hello    kernel   modules.order  security  virt
root@subhani:/usr/src/linux-4.17.6# cd /boot/
root@subhani:/boot# ls
System.map-4.15.0-22-generic  config-4.15.0-22-generic  grub      retpoline-4.15.0-22-generic
System.map-4.17.6            config-4.17.6             initrd.img-4.15.0-22-generic  vmlinuz-4.15.0-22-generic
abi-4.15.0-22-generic        efi                       initrd.img-4.17.6           vmlinuz-4.17.6
root@subhani:/boot# shutdown -r now
```

Step 15 : Checking installed kernel version by using *uname -a* command.

```
root@subhani: ~
File Edit View Search Terminal Help
root@subhani:~# uname -r
4.17.6
root@subhani:~#
```

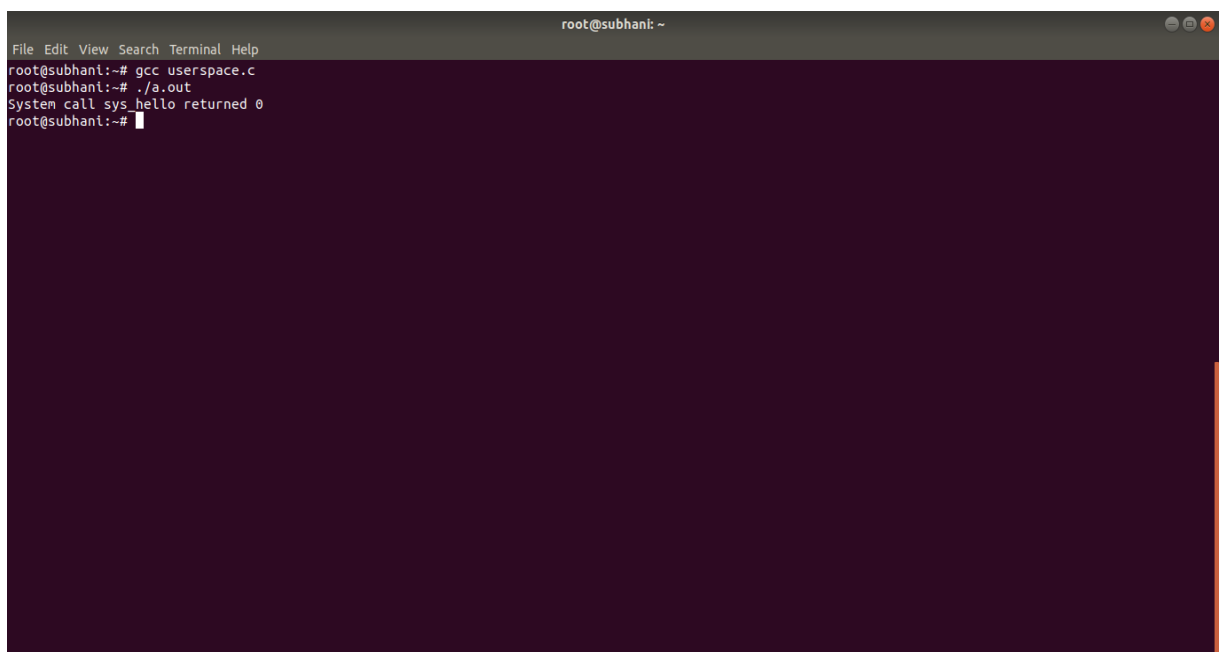
Step 16 : After successful installation of kernel, reboot the system by using command: *shutdown -r now* and create a file *userspace.c* and write the code to invoke our new *system_call*



```
root@subhant: ~  
File Edit View Search Terminal Help  
GNU nano 2.9.3 userspace.c Modified  
#include <stdio.h>  
#include <linux/kernel.h>  
#include <sys/syscall.h>  
#include <unistd.h>  
int main()  
{  
    long int subhant = syscall(333);  
    printf("System call sys_hello returned %ld\n", subhant);  
    return 0;  
}
```

Read 10 lines
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos M-U Undo M-A Mark Text M-J To Bracket
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line M-E Redo M-G Copy Text M-W WhereIs Next

Step 17 : Compile and run the *userspace.c* program



```
root@subhant: ~  
File Edit View Search Terminal Help  
root@subhant:~# gcc userspace.c  
root@subhant:~# ./a.out  
System call sys_hello returned 0  
root@subhant:~#
```

it prints *Hello world* and returns 0 in output i.e., our new system call is invoked.

Now by using commande: *dmesg* we can see the kernel log file which prints Hello world.

```
root@subhank: ~
File Edit View Search Terminal Help
24.323582] systemd[1]: Listening on Journal Socket (/dev/log).
24.436602] Loading iSCSI transport class v2.0-870.
24.474807] EXT4-fs (vda1): re-mounted. Opts: (null)
24.498671] iscsi: registered transport (tcp)
24.567243] systemd-journald[456]: Received request to flush runtime journal from PID 1
24.822229] iscsi: registered transport (iser)
25.252566] EDAC sbridge: Seeking for: PCI ID 8086:6fa0
25.252572] EDAC sbridge: Ver: 1.1.2
25.626575] audit: type=1400 audit(1531396544.916:2): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/bin/lxc-start" pid=715 comm="apparmor_parser"
25.759314] audit: type=1400 audit(1531396545.048:3): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/bin/man" pid=716 comm="apparmor_parser"
25.759595] audit: type=1400 audit(1531396545.048:4): apparmor="STATUS" operation="profile_load" profile="unconfined" name="man_filter" pid=716 comm="apparmor_parser"
25.760002] audit: type=1400 audit(1531396545.048:5): apparmor="STATUS" operation="profile_load" profile="unconfined" name="man_groff" pid=716 comm="apparmor_parser"
25.813434] audit: type=1400 audit(1531396545.104:6): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/sbin/tcpdump" pid=718 comm="apparmor_parser"
25.923558] audit: type=1400 audit(1531396545.204:7): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/sbin/dhclient" pid=714 comm="apparmor_parser"
25.923565] audit: type=1400 audit(1531396545.208:8): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/lib/NetworkManager/nm-dhcp-client.action" pid=714 comm="apparmor_parser"
25.923568] audit: type=1400 audit(1531396545.208:9): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/lib/NetworkManager/nm-dhcp-helper" pid=714 comm="apparmor_parser"
25.923572] audit: type=1400 audit(1531396545.208:10): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/lib/connman/scripts/dhclient-script" pid=714 comm="apparmor_parser"
25.963592] audit: type=1400 audit(1531396545.252:11): apparmor="STATUS" operation="profile_load" profile="unconfined" name="/usr/lib/snapd/snap-confine" pid=711 comm="apparmor_parser"
26.497312] virtio_net virtio1 eth1: renamed from ens4
26.520595] virtio_net virtio0 eth0: renamed from ens3
60.629906] random: crng init done
60.629912] random: 7 urandom warning(s) missed due to ratelimiting
61.092719] new mount options do not match the existing superblock, will be ignored
281.490010] Hello world
root@subhank:~#
```