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ASSIGNMENT NO. 8

TITLE: Inter-process Communication using Shared Memory using System V.

//hello.c

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

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

//Makefile

```
obj-y := hello.o
```

//test.c

```
#include <stdio.h>

#include <linux/kernel.h>

#include <sys/syscall.h>

#include <unistd.h>

int main()
{
    long int r = syscall(545);
```

```
printf("System call sys_hello returned %ld\n", r);  
return 0;  
}
```

```
cd linux-3.18.29
cd kernel
mkdir hello
cd hello
gedithello.c
geditMakefile
cd Makefile
cd arch/x86/syscalls
gedit syscall_64.tbl
cd
cd include/linux/
geditsyscalls.h
sudo make menuconfig
sudo make
gccuserspace.c
./a.out
dmesg | tail -1
```

```
vishal@ubuntu: ~/Desktop/linux-3.18.29
vishal@ubuntu:~$ cd Desktop
vishal@ubuntu:~/Desktop$ cd linux-3.18.29
vishal@ubuntu:~/Desktop/linux-3.18.29$ cd kernel
vishal@ubuntu:~/Desktop/linux-3.18.29/kernel$ mkdir hello
vishal@ubuntu:~/Desktop/linux-3.18.29/kernel$ cd hello
vishal@ubuntu:~/Desktop/linux-3.18.29/kernel/hello$ gedit hello.c
vishal@ubuntu:~/Desktop/linux-3.18.29/kernel/hello$ gedit Makefile
vishal@ubuntu:~/Desktop/linux-3.18.29/kernel/hello$ cd
vishal@ubuntu:~$ gedit Makefile
vishal@ubuntu:~$ cd Desktop
vishal@ubuntu:~/Desktop$ cd linux-3.18.29
vishal@ubuntu:~/Desktop/linux-3.18.29$ gedit Makefile
vishal@ubuntu:~/Desktop/linux-3.18.29$
```

```
Makefile (~/Desktop/linux-3.18.29) - gedit
Open Save Undo
Makefile x
$(MODSECKEY) $(MODPUBKEY)
873 else
874 mod_sign_cmd = true
875 endif
876 export mod_sign_cmd
877
878
879 ifeq ($(KBUILD_EXTMOD),)
880 core-y += kernel/ mm/ fs/ ipc/ security/ crypto/ block/ hello/
881
882 vmlinux-dirs := $(patsubst %/,%, $(filter %/, $(init-y) $(init-m) \
883 $(core-y) $(core-m) $(drivers-y) $(drivers-m) \
884 $(net-y) $(net-m) $(libs-y) $(libs-m)))
885
886 vmlinux-alldirs := $(sort $(vmlinux-dirs) $(patsubst %/,%, $(filter %/, \
887 $(init-) $(core-) $(drivers-) $(net-) $(libs-))))
888
889 init-y := $(patsubst %/, %/built-in.o, $(init-y))
890 core-y := $(patsubst %/, %/built-in.o, $(core-y))
891 drivers-y := $(patsubst %/, %/built-in.o, $(drivers-y))
892 net-y := $(patsubst %/, %/built-in.o, $(net-y))
Makefile Tab Width: 8 Ln 881, Col 1 INS
```

```
vishal@ubuntu: ~/Desktop/linux-3.18.29/arch/x86/syscalls
vishal@ubuntu:~/Desktop/linux-3.18.29/arch/x86/syscalls$ cd arch/x86/syscalls
vishal@ubuntu:~/Desktop/linux-3.18.29/arch/x86/syscalls$ gedit syscall_64.tbl
vishal@ubuntu:~/Desktop/linux-3.18.29/arch/x86/syscalls$
```

```
syscall_64.tbl (~/Desktop/linux-3.18.29/arch/x86/syscalls) - gedit
Open Save Undo
syscall_64.tbl x
349 525 x32 sigaltstack compat_sys_sigaltstack
350 526 x32 timer_create compat_sys_timer_create
351 527 x32 mq_notify compat_sys_mq_notify
352 528 x32 kexec_load compat_sys_kexec_load
353 529 x32 waitid compat_sys_waitid
354 530 x32 set_robust_list compat_sys_set_robust_list
355 531 x32 get_robust_list compat_sys_get_robust_list
356 532 x32 vmsplice compat_sys_vmsplice
357 533 x32 move_pages compat_sys_move_pages
358 534 x32 preadv compat_sys_preadv64
359 535 x32 pwritev compat_sys_pwritev64
360 536 x32 rt_tgsigqueueinfo compat_sys_rt_tgsigqueueinfo
361 537 x32 recvmmsg compat_sys_recvmmsg
362 538 x32 sendmmsg compat_sys_sendmmsg
363 539 x32 process_vm_readv compat_sys_process_vm_readv
364 540 x32 process_vm_writev compat_sys_process_vm_writev
365 541 x32 setsockopt compat_sys_setsockopt
366 542 x32 getsockopt compat_sys_getsockopt
367 543 x32 io_setup compat_sys_io_setup
368 544 x32 io_submit compat_sys_io_submit
369 545 64 hello sys_hello
Plain Text Tab Width: 8 Ln 369, Col 50 INS
```

```
vishal@ubuntu: ~/Desktop/linux-3.18.29/include/linux
vishal@ubuntu:~/Desktop/linux-3.18.29$ cd include/linux/
vishal@ubuntu:~/Desktop/linux-3.18.29/include/linux$ gedit syscalls.h

(gedit:44357): Gtk-WARNING **: GtkScrolledWindow 0xc5e880 is mapped but visible
child GtkScrollbar 0xc68b50 is not mapped

(gedit:44357): Gtk-WARNING **: GtkScrolledWindow 0xc5e880 is mapped but visible
child GtkScrollbar 0xc68d50 is not mapped

(gedit:44357): Gtk-WARNING **: GtkScrolledWindow 0xc5e880 is mapped but visible
child GtkScrollbar 0xc68b50 is not mapped

(gedit:44357): Gtk-WARNING **: GtkScrolledWindow 0xc5e880 is mapped but visible
child GtkScrollbar 0xc68d50 is not mapped
```

```
syscalls.h (~/Desktop/linux-3.18.29/include/linux) - gedit
Open Save Undo
syscalls.h x
861 unsigned long liovcnt,
862 const struct iovec __user *rvec,
863 unsigned long riovcnt,
864 unsigned long flags);
865 asmlinkage long sys_process_vm_writev(pid_t pid,
866 const struct iovec __user *lvec,
867 unsigned long liovcnt,
868 const struct iovec __user *rvec,
869 unsigned long riovcnt,
870 unsigned long flags);
871
872 asmlinkage long sys_kcmp(pid_t pid1, pid_t pid2, int type,
873 unsigned long idx1, unsigned long idx2);
874 asmlinkage long sys_finit_module(int fd, const char __user *uargs, int flags);
875 asmlinkage long sys_seccomp(unsigned int op, unsigned int flags,
876 const char __user *uargs);
877 asmlinkage long sys_getrandom(char __user *buf, size_t count,
878 unsigned int flags);
879 asmlinkage long sys_bpf(int cmd, union bpf_attr *attr, unsigned int size);
880 asmlinkage long sys_hello(void);
881 #endif
C/C++/ObjC Header Tab Width: 8 Ln 880, Col 33 INS
```

```
vishal@ubuntu: ~/Desktop/linux-3.18.29
vishal@ubuntu:~/Desktop/linux-3.18.29$ sudo make menuconfig
[sudo] password for vishal:
HOSTCC scripts/basic/fixdep
HOSTCC scripts/kconfig/mconf.o
SHIPPED scripts/kconfig/zconf.tab.c
SHIPPED scripts/kconfig/zconf.lex.c
SHIPPED scripts/kconfig/zconf.hash.c
HOSTCC scripts/kconfig/zconf.tab.o
HOSTCC scripts/kconfig/lxdialog/checklist.o
HOSTCC scripts/kconfig/lxdialog/util.o
HOSTCC scripts/kconfig/lxdialog/inputbox.o
HOSTCC scripts/kconfig/lxdialog/textbox.o
HOSTCC scripts/kconfig/lxdialog/yesno.o
HOSTCC scripts/kconfig/lxdialog/menubox.o
HOSTLD scripts/kconfig/mconf
scripts/kconfig/mconf Kconfig
#
# using defaults found in /boot/config-4.2.0-27-generic
#
/boot/config-4.2.0-27-generic:1411:warning: symbol value 'm' invalid for OPENVSW
ITCH_GRE
/boot/config-4.2.0-27-generic:1412:warning: symbol value 'm' invalid for OPENVSW
ITCH_VXLAN
/boot/config-4.2.0-27-generic:1413:warning: symbol value 'm' invalid for OPENVSW
```



```
vishal@ubuntu: ~/Desktop/linux-3.18.29
.config - Linux/x86 3.18.29 Kernel Configuration

Linux/x86 3.18.29 Kernel Configuration
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 [ ]

^(-)
  Processor type and features --->
  Power management and ACPI options --->
  Bus options (PCI etc.) --->
  Executable file formats / Emulations --->
  [*] Networking support --->
  Device Drivers --->
  Firmware Drivers --->
  File systems --->
  Kernel hacking --->
  Security options --->
  L(+)

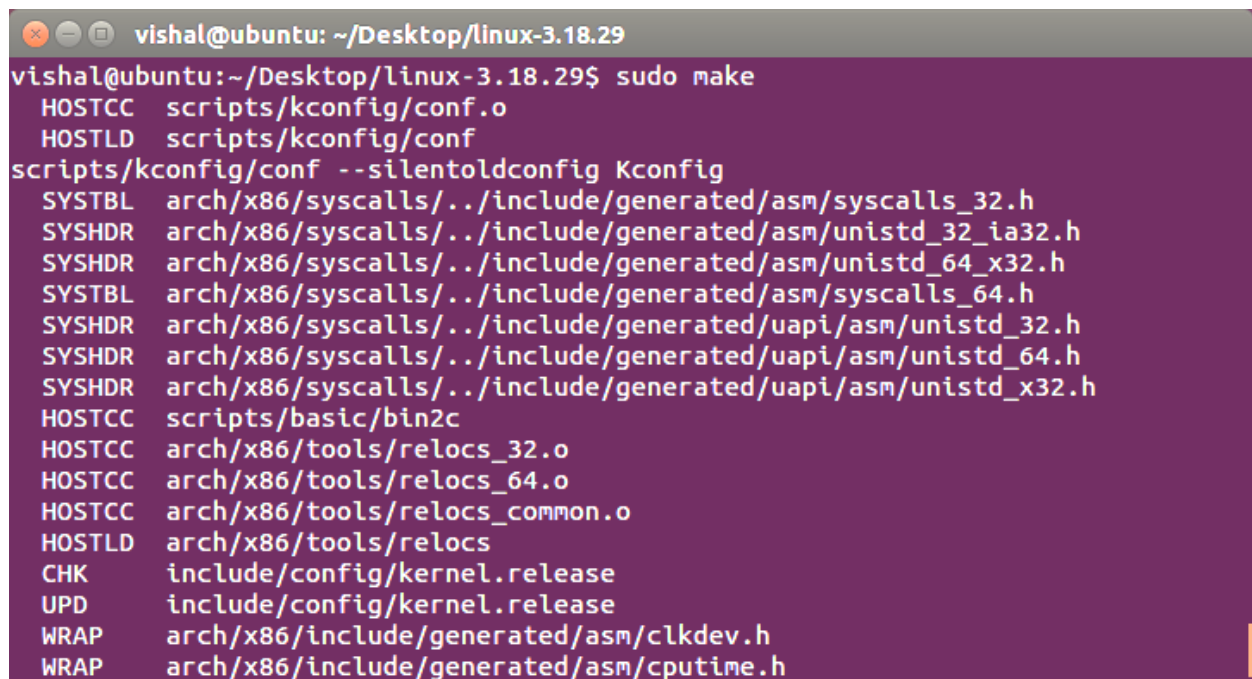
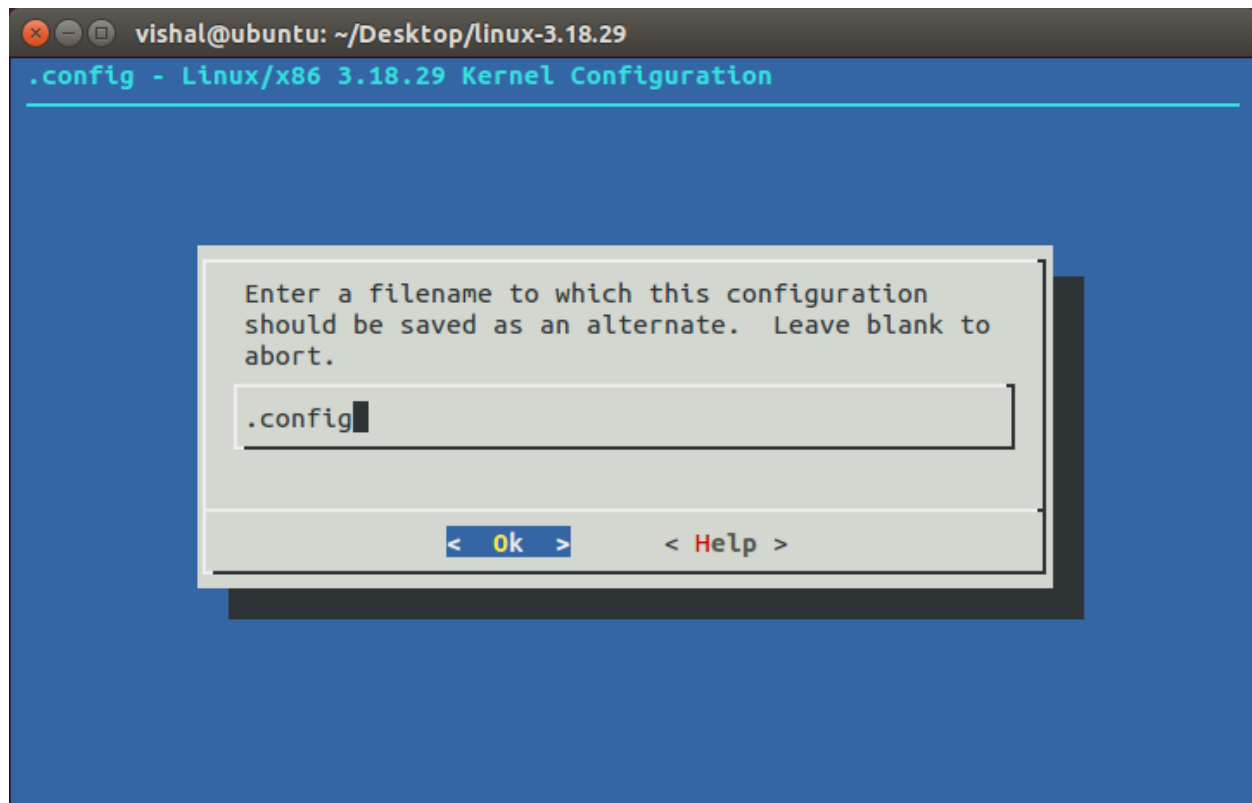
<Select>  < Exit >  < Help >  < Save >  < Load >
```

```
vishal@ubuntu: ~/Desktop/linux-3.18.29
.config - Linux/x86 3.18.29 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
< > Ext3 journalling file system support
< * > The Extended 4 (ext4) filesystem
  [*] Use ext4 for ext2/ext3 file systems
  [*] Ext4 POSIX Access Control Lists
  [*] Ext4 Security Labels
  [ ] EXT4 debugging support
  [*] JBD2 (ext4) debugging support
  < M > Reiserfs support
  [ ] Enable reiserfs debug mode
  L(+)

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




```
vishal@vishal-virtual-machine: ~/Desktop/linux-3.18.29
vishal@vishal-virtual-machine:~/Desktop/linux-3.18.29$ sudo make modules_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/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/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/sha-mb/sha1-mb.ko
INSTALL arch/x86/crypto/sha1-ssse3.ko
INSTALL arch/x86/crypto/sha256-ssse3.ko
INSTALL arch/x86/crypto/sha512-ssse3.ko
INSTALL arch/x86/crypto/twofish-avx-x86_64.ko
```

```
vishal@ubuntu: ~/Desktop
vishal@ubuntu:~$ cd Desktop
vishal@ubuntu:~/Desktop$ gcc userspace.c
vishal@ubuntu:~/Desktop$ ./a.out
System call returned 0
vishal@ubuntu:~/Desktop$ dmesg | tail -1
[19477.360457] hello world
vishal@ubuntu:~/Desktop$
```