

Readers-Writers Problem:

Under this problem statement we look at how processes can use two operations, read and write, on a shared database/file system. When more than one reader accesses some shared database at the same time, no adverse effect is seen, however if more than one writer or a writer and a reader try to access the shared database simultaneously, we encounter a problem.

Proposed Solution:

To solve this problem we have used the concept of spin lock instructions like mutex and wrt. We have made separate functions for each process.

- In the writer's code, wrt is making sure that not more than one writer is able to access the critical section at a time and also no reader is allowed to access the critical section at the time of writing.
- In the reader's code, the spin lock makes sure that while a reader is accessing the critical section, no writer is able to enter that section. More than one reader however can access the critical section at a time.
- The readers code will also be dealing with an integer variable to keep a count of readers entering and exiting the database.

By this we are trying to give the writers exclusive rights to the database, however priority will be given to the readers. The writer won't be able make changes to a database system until all the readers exit and then signal/release the wrt semaphore instruction.

Algorithm Used:

Reader's Process:

```
while (true) {
    wait(mutex);
    read_count++;
    if (read_count == 1)
        wait(rw_mutex);
    signal(mutex);

    . . .
    /* reading is performed */
    . . .
    wait(mutex);
    read_count--;
    if (read_count == 0)
        signal(rw_mutex);
    signal(mutex);
}
```

Writer's Process:

```
while (true) {
    wait(rw_mutex);

    . . .
    /* writing is performed */
    . . .
    signal(rw_mutex);
}
```

Main Idea:

The main idea is to implement a multithreaded solution for the above algorithm using spin locks. We have taken a hard coded number of readers and writers and have made a system call for the main code.

Tools used:

- Linux/Ubuntu operating system for compilation and execution.
- C language is used for the readers-writers code.
- Concept of spin lock and k thread is used.

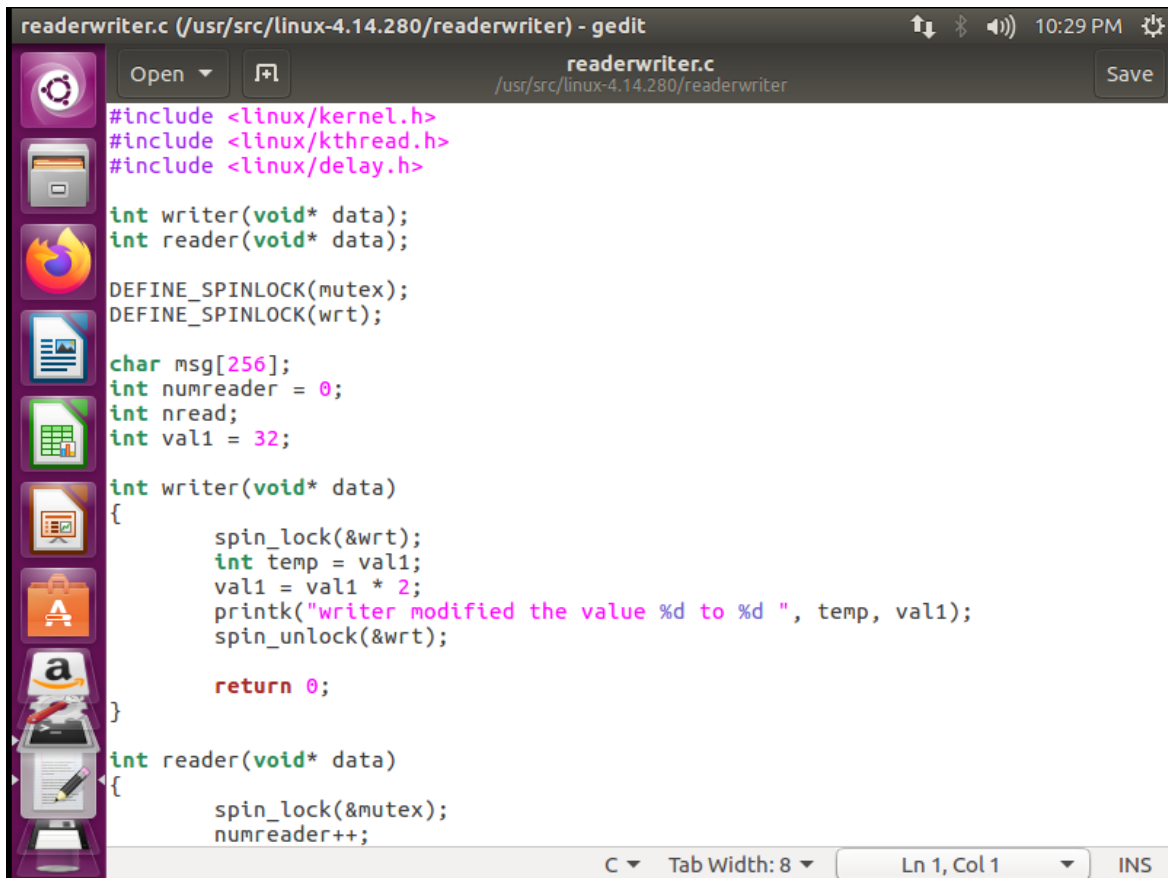
Library Used:

- `#include <linux/kernel.h>`
- `#include <linux/kthread.h>`
- `#include <linux/delay.h>`

Spin Lock:

- `DEFINE_SPINLOCK(mutex);`
- `DEFINE_SPINLOCK(wrt);`

Program code (.c file):



```
readerwriter.c (/usr/src/linux-4.14.280/readerwriter) - gedit
readerwriter.c
/usr/src/linux-4.14.280/readerwriter
Save

#include <linux/kernel.h>
#include <linux/kthread.h>
#include <linux/delay.h>

int writer(void* data);
int reader(void* data);

DEFINE_SPINLOCK(mutex);
DEFINE_SPINLOCK(wrt);

char msg[256];
int numreader = 0;
int nread;
int val1 = 32;

int writer(void* data)
{
    spin_lock(&wrt);
    int temp = val1;
    val1 = val1 * 2;
    printk("writer modified the value %d to %d ", temp, val1);
    spin_unlock(&wrt);

    return 0;
}

int reader(void* data)
{
    spin_lock(&mutex);
    numreader++;
}
```

readerwriter.c (/usr/src/linux-4.14.280/readerwriter) - gedit 10:30 PM

Open readerwriter.c Save
/usr/src/linux-4.14.280/readerwriter

```
if(numreader == 1){
    spin_lock(&wrt);
}
spin_unlock(&mutex);
printk("reader reads value %d ", val1);

spin_lock(&mutex);
numreader--;
if(numreader == 0){
    spin_unlock(&wrt);
}
spin_unlock(&mutex);

return 0;
}

asmlinkage long sys_readerwriter(void)
{
    int i;
    int numberofReaders;
    struct task_struct *myWriter[5];
    numberofReaders = 10;
    struct task_struct *readers[10];

    for(i = 0; i < 5; i++){
        myWriter[i] = kthread_create(writer, NULL, "writer_thread");

        if(myWriter[i]){
            wake_up_process(myWriter[i]);
        }
    }
}
```

C Tab Width: 8 Ln 59, Col 54 INS

```
    }
    else{
        kthread_stop(myWriter[i]);
    }
}

for(i = 0; i < 10; i++){
    readers[i] = kthread_create(reader, NULL, "reader_thread");

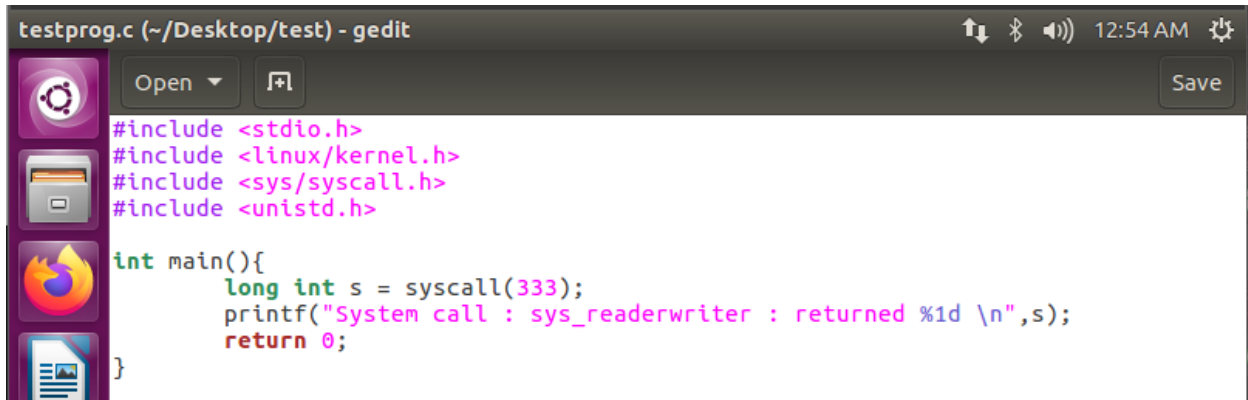
    if(readers[i]){
        wake_up_process(readers[i]);
    }
    else{
        kthread_stop(readers[i]);
    }
}

return 0;
}

C Tab Width: 8 Ln 79, Col 2 INS
```

WORKING:

System Call Code (#333):

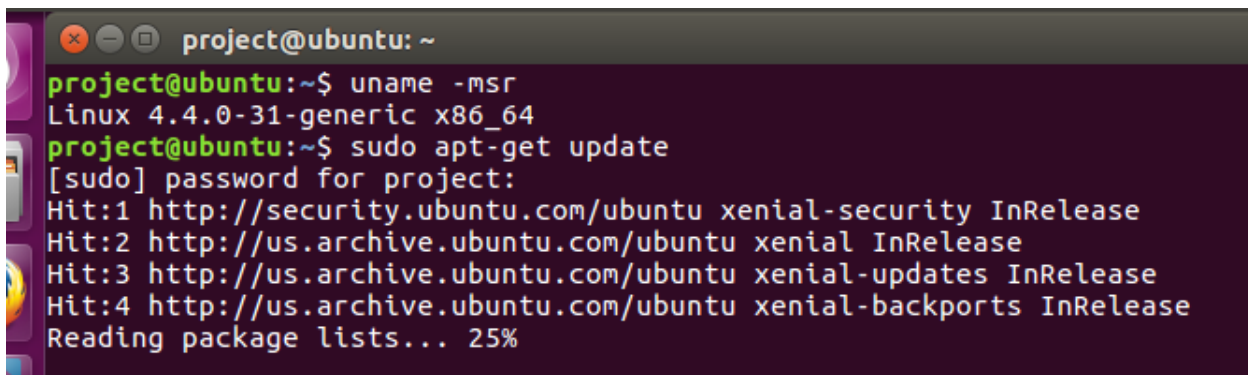


```
testprog.c (~/Desktop/test) - gedit
#include <stdio.h>
#include <linux/kernel.h>
#include <sys/syscall.h>
#include <unistd.h>

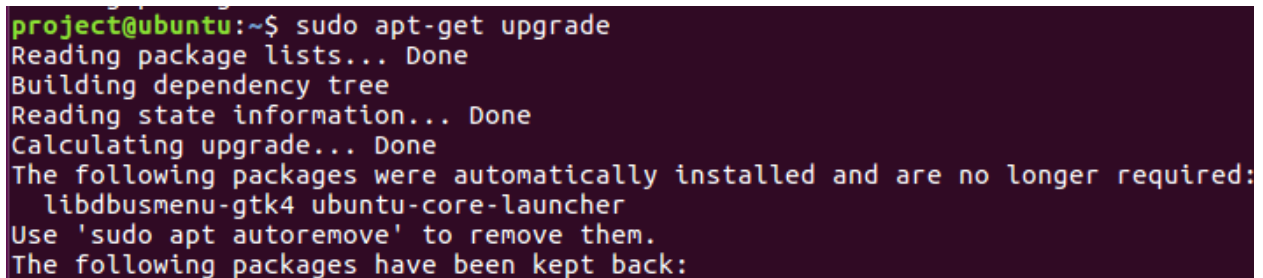
int main(){
    long int s = syscall(333);
    printf("System call : sys_readerwriter : returned %1d \n",s);
    return 0;
}
```

Step by step implementation of system call:

- Updating and Installing all the required files.



```
project@ubuntu: ~
project@ubuntu:~$ uname -msr
Linux 4.4.0-31-generic x86_64
project@ubuntu:~$ sudo apt-get update
[sudo] password for project:
Hit:1 http://security.ubuntu.com/ubuntu xenial-security InRelease
Hit:2 http://us.archive.ubuntu.com/ubuntu xenial InRelease
Hit:3 http://us.archive.ubuntu.com/ubuntu xenial-updates InRelease
Hit:4 http://us.archive.ubuntu.com/ubuntu xenial-backports InRelease
Reading package lists... 25%
```



```
project@ubuntu:~$ sudo apt-get upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages were automatically installed and are no longer required:
  libdbusmenu-gtk4 ubuntu-core-launcher
Use 'sudo apt autoremove' to remove them.
The following packages have been kept back:
```

```

Setting up libedataserver-1.2-21:amd64 (3.18.5-1ubuntu1.3) ...
Setting up libebook-1.2-10:amd64 (3.18.5-1ubuntu1.3) ...
Setting up evolution-data-server-online-accounts (3.18.5-1ubuntu1.3) ...
Setting up libebook-contacts-1.2-2:amd64 (3.18.5-1ubuntu1.3) ...
Setting up libedata-book-1.2-25:amd64 (3.18.5-1ubuntu1.3) ...
Setting up libebook-1.2-16:amd64 (3.18.5-1ubuntu1.3) ...
Setting up libecal-1.2-19:amd64 (3.18.5-1ubuntu1.3) ...
Setting up libedata-cal-1.2-28:amd64 (3.18.5-1ubuntu1.3) ...
Setting up evolution-data-server (3.18.5-1ubuntu1.3) ...
Setting up bluez-obexd (5.37-0ubuntu5.3) ...
Setting up libedataserverui-1.2-1:amd64 (3.18.5-1ubuntu1.3) ...
Setting up gnome-calendar (3.20.4-0ubuntu0.1) ...
Processing triggers for libc-bin (2.23-0ubuntu11.3) ...
Processing triggers for initramfs-tools (0.122ubuntu8.17) ...
update-initramfs: Generating /boot/initrd.img-4.4.0-31-generic
Processing triggers for systemd (229-4ubuntu21.31) ...
Processing triggers for ca-certificates (20210119~16.04.1) ...
Updating certificates in /etc/ssl/certs...
42 added, 86 removed; done.
Running hooks in /etc/ca-certificates/update.d...
done.
Processing triggers for resolvconf (1.78ubuntu7) ...
Processing triggers for ureadahead (0.100.0-19.1) ...
Processing triggers for dictionaries-common (1.26.3) ...
Processing triggers for libgdk-pixbuf2.0-0:amd64 (2.32.2-1ubuntu1.6) ...
project@ubuntu:~$ █

```

```

project@ubuntu:~$ sudo -s
[sudo] password for project:
root@ubuntu:~# apt-get install gcc
Reading package lists... Done
Building dependency tree
Reading state information... Done
gcc is already the newest version (4:5.3.1-1ubuntu1).
gcc set to manually installed.
The following packages were automatically installed and are no longer required:
  libdbusmenu-gtk4 ubuntu-core-launcher
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 57 not upgraded.
root@ubuntu:~# █

```

```

root@ubuntu:~# apt-get install python3-pip python3-dev libffi-dev libssl-dev lib
xml2-dev libxslt1-dev libjpeg8-dev zlib1g-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
python3-dev is already the newest version (3.5.1-3).
python3-dev set to manually installed.
python3-pip is already the newest version (8.1.1-2ubuntu0.6).
The following packages were automatically installed and are no longer required:
  libdbusmenu-gtk4 ubuntu-core-launcher
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  icu-devtools libicu-dev libjpeg-turbo8-dev libssl-doc
Suggested packages:
  icu-doc
The following NEW packages will be installed:
  icu-devtools libffi-dev libicu-dev libjpeg-turbo8-dev libjpeg8-dev
  libssl-dev libssl-doc libxml2-dev libxslt1-dev zlib1g-dev
0 upgraded, 10 newly installed, 0 to remove and 57 not upgraded.
Need to get 12.9 MB of archives.
After this operation, 59.8 MB of additional disk space will be used.
Do you want to continue? [Y/n] █

```

```
Processing triggers for libc-bin (2.27-0ubuntu1) ...  
Setting up icu-devtools (55.1-7ubuntu0.5) ...  
Setting up libicu-dev:amd64 (55.1-7ubuntu0.5) ...  
Setting up libjpeg-turbo8-dev:amd64 (1.4.2-0ubuntu3.4) ...  
Setting up libjpeg8-dev:amd64 (8c-2ubuntu8) ...  
Setting up zlib1g-dev:amd64 (1:1.2.8.dfsg-2ubuntu4.3) ...  
Setting up libssl-dev:amd64 (1.0.2g-1ubuntu4.20) ...  
Setting up libssl-doc (1.0.2g-1ubuntu4.20) ...  
Setting up libxml2-dev:amd64 (2.9.3+dfsg1-1ubuntu0.7) ...  
Setting up libxslt1-dev:amd64 (1.1.28-2.1ubuntu0.3) ...  
Setting up libffi-dev:amd64 (3.2.1-4) ...  
root@ubuntu:~# apt-get install libncursesw5-dev  
Reading package lists... Done
```

```
root@ubuntu:~# apt-get install libncursesw5-dev  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following packages were automatically installed and are no longer required:  
  libdbusmenu-gtk4 ubuntu-core-launcher  
Use 'sudo apt autoremove' to remove them.  
The following additional packages will be installed:  
  libtinfo-dev  
Suggested packages:  
  ncurses-doc  
The following NEW packages will be installed:  
  libncursesw5-dev libtinfo-dev  
0 upgraded, 2 newly installed, 0 to remove and 57 not upgraded.  
Need to get 275 kB of archives.  
After this operation, 1,582 kB of additional disk space will be used.  
Do you want to continue? [Y/n]
```

```
root@ubuntu:~#  
Selecting previously unselected package libtinfo-dev:amd64.  
(Reading database ... 176352 files and directories currently installed.)  
Preparing to unpack .../libtinfo-dev_6.0+20160213-1ubuntu1_amd64.deb ...  
Unpacking libtinfo-dev:amd64 (6.0+20160213-1ubuntu1) ...  
Selecting previously unselected package libncursesw5-dev:amd64.  
Preparing to unpack .../libncursesw5-dev_6.0+20160213-1ubuntu1_amd64.deb ...  
Unpacking libncursesw5-dev:amd64 (6.0+20160213-1ubuntu1) ...  
Processing triggers for man-db (2.7.5-1) ...  
Setting up libtinfo-dev:amd64 (6.0+20160213-1ubuntu1) ...  
Setting up libncursesw5-dev:amd64 (6.0+20160213-1ubuntu1) ...  
root@ubuntu:~#
```



```
Unpacking libncursesw5-dev:amd64 (6.0+20160213-1ubuntu1) ...
Processing triggers for man-db (2.7.5-1) ...
Setting up libtinfo-dev:amd64 (6.0+20160213-1ubuntu1) ...
Setting up libncursesw5-dev:amd64 (6.0+20160213-1ubuntu1) ...
root@ubuntu:~# apt-get install bison
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libdbusmenu-gtk4 ubuntu-core-launcher
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libbison-dev libsigsegv2 m4
Suggested packages:
  bison-doc
The following NEW packages will be installed:
  bison libbison-dev libsigsegv2 m4
0 upgraded, 4 newly installed, 0 to remove and 57 not upgraded.
Need to get 806 kB of archives.
After this operation, 2,204 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

```
Setting up libbison-dev:amd64 (2:3.0.4.dfsg-1) ...
Setting up bison (2:3.0.4.dfsg-1) ...
update-alternatives: using /usr/bin/bison.yacc to provide /usr/bin/yacc (yacc) i
n auto mode
Processing triggers for libc-bin (2.23-0ubuntu11.3) ...
root@ubuntu:~# apt-get install flex
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libdbusmenu-gtk4 ubuntu-core-launcher
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libfl-dev
The following NEW packages will be installed:
  flex libfl-dev
0 upgraded, 2 newly installed, 0 to remove and 57 not upgraded.
Need to get 302 kB of archives.
After this operation, 897 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

```
Setting up libfl-dev:amd64 (2.6.0-11) ...
Setting up flex (2.6.0-11) ...
Processing triggers for libc-bin (2.23-0ubuntu11.3) ...
root@ubuntu:~# apt-get install libelf-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libdbusmenu-gtk4 ubuntu-core-launcher
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  libelf-dev
0 upgraded, 1 newly installed, 0 to remove and 57 not upgraded.
Need to get 54.5 kB of archives.
After this operation, 359 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libelf-dev a
md64 0.165-3ubuntu1.2 [54.5 kB]
Fetched 54.5 kB in 5s (10.8 kB/s)
Selecting previously unselected package libelf-dev:amd64.
(Reading database ... 176612 files and directories currently installed.)
Preparing to unpack .../libelf-dev_0.165-3ubuntu1.2_amd64.deb ...
Unpacking libelf-dev:amd64 (0.165-3ubuntu1.2) ...
Setting up libelf-dev:amd64 (0.165-3ubuntu1.2) ...
root@ubuntu:~#
```



```

root@ubuntu:~# wget https://www.kernel.org/pub/linux/kernel/v4.x/linux-4.14.280.
tar.xz
--2022-05-18 21:48:23-- https://www.kernel.org/pub/linux/kernel/v4.x/linux-4.14
.280.tar.xz
Resolving www.kernel.org (www.kernel.org)... 145.40.73.55, 2604:1380:40e1:4800::
1
Connecting to www.kernel.org (www.kernel.org)|145.40.73.55|:443... connected.
HTTP request sent, awaiting response... 301 Moved Permanently
Location: https://mirrors.edge.kernel.org/pub/linux/kernel/v4.x/linux-4.14.280.t
ar.xz [following]
--2022-05-18 21:48:31-- https://mirrors.edge.kernel.org/pub/linux/kernel/v4.x/l
inux-4.14.280.tar.xz
Resolving mirrors.edge.kernel.org (mirrors.edge.kernel.org)... 147.75.101.1, 260
4:1380:2001:3900::1
Connecting to mirrors.edge.kernel.org (mirrors.edge.kernel.org)|147.75.101.1|:44
3... connected.
HTTP request sent, awaiting response... 200 OK
Length: 104580144 (100M) [application/x-xz]
Saving to: 'linux-4.14.280.tar.xz'

linux-4.14.280.tar.  1%[          ]  1.33M  170KB/s  eta 15m 15s

Length: 104580144 (100M) [application/x-xz]
Saving to: 'linux-4.14.280.tar.xz'

linux-4.14.280.tar. 100%[=====>] 99.74M  773KB/s  in 3m 6s

2022-05-18 21:51:46 (550 KB/s) - 'linux-4.14.280.tar.xz' saved [104580144/104580
144]

root@ubuntu:~# ls
Desktop      Downloads      linux-4.14.280.tar.xz  Pictures  Templates
Documents    examples.desktop  Music                  Public    Videos
root@ubuntu:~# sudo -s
root@ubuntu:~# tar -xvf linux-4.14.280.tar.xz -C /usr/src/

```

- Adding the main code of readers-writers problem:

```

root@ubuntu:/usr/src/linux-4.14.280/readerwriter# gedit readerwriter.c

(gedit:95828): IBUS-WARNING **: The owner of /home/k200310/.config/ibus/bus is n
ot root!

** (gedit:95828): WARNING **: Set document metadata failed: Setting attribute me
tadata::gedit-spell-enabled not supported

** (gedit:95828): WARNING **: Set document metadata failed: Setting attribute me
tadata::gedit-encoding not supported

(gedit:95828): Gtk-WARNING **: Calling Inhibit failed: GDBus.Error:org.freedesk
top.DBus.Error.ServiceUnknown: The name org.gnome.SessionManager was not provided
by any .service files

```

- ```
root@ubuntu:/usr/src/linux-4.14.280/readerwriter# gedit Makefile

(gedit:95904): IBUS-WARNING **: The owner of /home/k200310/.config/ibus/bus is not root!

(gedit:95904): Gtk-WARNING **: Calling Inhibit failed: GDBus.Error:org.freedesktop.DBus.Error.ServiceUnknown: The name org.gnome.SessionManager was not provided by any .service files

** (gedit:95904): WARNING **: Failed to load file icon: /usr/share/glib-2.0/icons/Makefile.png
tadata::gedit

obj-y := readerwriter.o
```

```
export SKIP_STACK_VALIDATION
endif
endif

PHONY += prepare0

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

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.o, $(init-y))
core-y := $(patsubst %/, %/built-in.o, $(core-y))
drivers-y := $(patsubst %/, %/built-in.o, $(drivers-y))
net-y := $(patsubst %/, %/built-in.o, $(net-y))
libs-y1 := $(patsubst %/, %/lib.a, $(libs-y))
libs-y2 := $(filter-out %.a, $(patsubst %/, %/built-in.o, $(libs-y)))
virt-y := $(patsubst %/, %/built-in.o, $(virt-y))

Externally visible symbols (used by link-vmlinux.sh)
export KBUILD_VMLINUX_INIT := $(head-y) $(init-y)
export KBUILD_VMLINUX_MAIN := $(core-y) $(libs-y2) $(drivers-y) $(net-y) $(virt-y)
export KBUILD_VMLINUX_LIBS := $(libs-y1)
export KBUILD_LDS := arch/$(SRCARCH)/kernel/vmlinux.lds
export LDLIBS_vmlinux :=
```

```
*Makefile
/usr/src/linux-4.14.280
Save

export SKIP_STACK_VALIDATION
endif
endif

PHONY += prepare0

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

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.o, $(init-y))
core-y := $(patsubst %/, %/built-in.o, $(core-y))
drivers-y := $(patsubst %/, %/built-in.o, $(drivers-y))
net-y := $(patsubst %/, %/built-in.o, $(net-y))
libs-y1 := $(patsubst %/, %/lib.a, $(libs-y))
libs-y2 := $(filter-out %.a, $(patsubst %/, %/built-in.o, $(libs-y)))
virt-y := $(patsubst %/, %/built-in.o, $(virt-y))

Externally visible symbols (used by link-vmlinux.sh)
export KBUILD_VMLINUX_INIT := $(head-y) $(init-y)
export KBUILD_VMLINUX_MAIN := $(core-y) $(libs-y2) $(drivers-y) $(net-y) $(virt-y)
export KBUILD_VMLINUX_LIBS := $(libs-y1)
export KBUILD_VMLINUX_LIBS += $(patsubst %/, %/lib.a, $(libs-m))

Makefile Tab Width: 8 Ln 977, Col 1 INS
```

```
root@ubuntu:/usr/src/linux-4.14.280# cd include/linux
root@ubuntu:/usr/src/linux-4.14.280/include/linux# ls
8250_pci.h i2c-xiic.h pmbus.h
acct.h i7300_idle.h pm_clock.h
acpi_dma.h i8042.h pm_domain.h
acpi.h i8253.h pm.h
acpi_iort.h icmp.h pm_opp.h
acpi_pmtmr.h icmpv6.h pm_qos.h
adb.h ide.h pm_runtime.h
adfs_fs.h idr.h pm-trace.h
aer.h ieee80211.h pmu.h
```

- Linkage file for the system call:

```
*syscalls.h (/usr/src/linux-4.14.280/include/linux) - gedit
Open [icon] *syscalls.h /usr/src/linux-4.14.280/include/linux Save

asmlinkage long sys_kcmp(pid_t pid1, pid_t pid2, int type,
 unsigned long idx1, unsigned long idx2);
asmlinkage long sys_finit_module(int fd, const char __user *uargs, int flags);
asmlinkage long sys_seccomp(unsigned int op, unsigned int flags,
 const char __user *uargs);
asmlinkage long sys_getrandom(char __user *buf, size_t count,
 unsigned int flags);
asmlinkage long sys_bpf(int cmd, union bpf_attr *attr, unsigned int size);

asmlinkage long sys_execveat(int dfd, const char __user *filename,
 const char __user *const __user *argv,
 const char __user *const __user *envp, int flags);

asmlinkage long sys_membarrier(int cmd, int flags);
asmlinkage long sys_copy_file_range(int fd_in, loff_t __user *off_in,
 int fd_out, loff_t __user *off_out,
 size_t len, unsigned int flags);

asmlinkage long sys_mlock2(unsigned long start, size_t len, int flags);

asmlinkage long sys_pkey_mprotect(unsigned long start, size_t len,
 unsigned long prot, int pkey);
asmlinkage long sys_pkey_alloc(unsigned long flags, unsigned long init_val);
asmlinkage long sys_pkey_free(int pkey);
asmlinkage long sys_statx(int dfd, const char __user *path, unsigned flags,
 unsigned mask, struct statx __user *buffer);

asmlinkage long sys_readerwriter(void);

#endif
C/C++/ObjC Header Tab Width: 8 Ln 946, Col 7 INS
```

```
** (gedit:95936): WARNING **: Set document metadata failed: Setting attribute me
tadata::gedit-position not supported
root@ubuntu:/usr/src/linux-4.14.280/include/linux# cd ../../
root@ubuntu:/usr/src/linux-4.14.280# cd arch/x86/entry/syscalls
root@ubuntu:/usr/src/linux-4.14.280/arch/x86/entry/syscalls# ls
Makefile syscall_32.tbl syscall_64.tbl syscallhdr.sh syscalltbl.sh
root@ubuntu:/usr/src/linux-4.14.280/arch/x86/entry/syscalls# gedit syscall_64.tb
l
(gedit:95961): IBUS-WARNING **: The owner of /home/k200310/.config/ibus/bus is n
ot root!
[icon] [icon] [icon] syscall_64.tbl /usr/src/linux-4.14.280/arch/x86/entry/syscalls Save

#
64-bit system call numbers and entry vectors
#
The format is:
<number> <abi> <name> <entry point>
..
```

Text Editor 10:50 PM

syscall\_64.tbl  
/usr/src/linux-4.14.280/arch/x86/entry/syscalls

Save

|     |        |                   |                       |
|-----|--------|-------------------|-----------------------|
| 306 | common | syncfs            | sys_syncfs            |
| 307 | 64     | sendmmsg          | sys_sendmmsg          |
| 308 | common | setns             | sys_setns             |
| 309 | common | getcpu            | sys_getcpu            |
| 310 | 64     | process_vm_readv  | sys_process_vm_readv  |
| 311 | 64     | process_vm_writev | sys_process_vm_writev |
| 312 | common | kcmp              | sys_kcmp              |
| 313 | common | finit_module      | sys_finit_module      |
| 314 | common | sched_setattr     | sys_sched_setattr     |
| 315 | common | sched_getattr     | sys_sched_getattr     |
| 316 | common | renameat2         | sys_renameat2         |
| 317 | common | seccomp           | sys_seccomp           |
| 318 | common | getrandom         | sys_getrandom         |
| 319 | common | memfd_create      | sys_memfd_create      |
| 320 | common | kexec_file_load   | sys_kexec_file_load   |
| 321 | common | bpf               | sys_bpf               |
| 322 | 64     | execveat          | sys_execveat/ptregs   |
| 323 | common | userfaultfd       | sys_userfaultfd       |
| 324 | common | membarrier        | sys_membarrier        |
| 325 | common | mlock2            | sys_mlock2            |
| 326 | common | copy_file_range   | sys_copy_file_range   |
| 327 | 64     | preadv2           | sys_preadv2           |
| 328 | 64     | pwritev2          | sys_pwritev2          |
| 329 | common | pkey_mprotect     | sys_pkey_mprotect     |
| 330 | common | pkey_alloc        | sys_pkey_alloc        |
| 331 | common | pkey_free         | sys_pkey_free         |
| 332 | common | statx             | sys_statx             |
| 333 | 64     | readerwriter      | sys_readerwriter      |

#

Plain Text Tab Width: 8 Ln 342 Col 57 INS

```
root@ubuntu:/usr/src/linux-4.14.280/arch/x86/entry/syscalls# cd ../../
root@ubuntu:/usr/src/linux-4.14.280/arch/x86# cd ../../
root@ubuntu:/usr/src/linux-4.14.280# make menuconfig
HOSTCC scripts/basic/fixdep
HOSTCC scripts/kconfig/mconf.o
SHIPPED scripts/kconfig/zconf.tab.c
SHIPPED scripts/kconfig/zconf.lex.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
#
```



```
*** End of the configuration.
*** Execute 'make' to start the build or try 'make help'.
```

```
root@ubuntu:/usr/src/linux-4.14.280# make oldconfig
HOSTCC scripts/kconfig/conf.o
HOSTLD scripts/kconfig/conf
scripts/kconfig/conf --oldconfig Kconfig
#
configuration written to .config
#
root@ubuntu:/usr/src/linux-4.14.280# make -j4
```

```
LD [M] sound/soc/intel/haswell/snd-soc-sst-haswell-pcm.ko
LD [M] sound/soc/intel/skylake/snd-soc-skl-ipc.ko
LD [M] sound/soc/intel/skylake/snd-soc-skl.ko
LD [M] sound/soc/snd-soc-core.ko
LD [M] sound/soc/xtensa/snd-soc-xtfpga-i2s.ko
LD [M] sound/soundcore.ko
LD [M] sound/synth/emux/snd-emux-synth.ko
LD [M] sound/synth/snd-util-mem.ko
LD [M] sound/usb/6fire/snd-usb-6fire.ko
LD [M] sound/usb/bcd2000/snd-bcd2000.ko
LD [M] sound/usb/caiaq/snd-usb-caiaq.ko
LD [M] sound/usb/hiface/snd-usb-hiface.ko
LD [M] sound/usb/line6/snd-usb-line6.ko
LD [M] sound/usb/line6/snd-usb-pod.ko
LD [M] sound/usb/line6/snd-usb-podhd.ko
LD [M] sound/usb/line6/snd-usb-toneport.ko
LD [M] sound/usb/line6/snd-usb-variak.ko
LD [M] sound/usb/misc/snd-ua101.ko
LD [M] sound/usb/snd-usb-audio.ko
LD [M] sound/usb/snd-usbmidi-lib.ko
LD [M] sound/usb/usx2y/snd-usb-us122l.ko
LD [M] sound/usb/usx2y/snd-usb-usx2y.ko
LD [M] virt/lib/irqbypass.ko
root@ubuntu:/usr/src/linux-4.14.280# make modules_install install
```

```
mlinux-4.14.280
run-parts: executing /etc/kernel/postinst.d/update-notif
uz-4.14.280
run-parts: executing /etc/kernel/postinst.d/zz-update-gr
z-4.14.280
Generating grub configuration file ...
Warning: Setting GRUB_TIMEOUT to a non-zero value when G
t is no longer supported.
Found linux image: /boot/vmlinuz-4.14.280
Found initrd image: /boot/initrd.img-4.14.280
Found linux image: /boot/vmlinuz-4.4.0-31-generic
Found initrd image: /boot/initrd.img-4.4.0-31-generic
Found memtest86+ image: /boot/memtest86+.elf
Found memtest86+ image: /boot/memtest86+.bin
done
root@ubuntu:/usr/src/linux-4.14.280# shutdown -r
```

```

k200310@ubuntu:~$ uname -r
4.14.280
k200310@ubuntu:~$ ls
Desktop Downloads linux-4.14.280.tar.xz Pictures Templates
Documents examples.desktop Music Public Videos
k200310@ubuntu:~$ cd Desktop
k200310@ubuntu:~/Desktop$ mkdir test
k200310@ubuntu:~/Desktop$ cd test
k200310@ubuntu:~/Desktop/test$ gedit testprog.c

(gedit:2109): Gtk-WARNING **: Attempting to read the recently used resources file at '/home/k200310/.local/share/recently-used.xbel', but the parser failed: Failed to open file '/home/k200310/.local/share/recently-used.xbel': Permission denied.
k200310@ubuntu:~/Desktop/test$ █

```

- Output:

```

k200310@ubuntu:~/Desktop/test
k200310@ubuntu:~/Desktop/test$ gcc testprog.c
testprog.c: In function 'main':
testprog.c:8:9: warning: format '%d' expects argument of type 'int', but argument 2 has type 'long int' [-Wformat=]
 printf("System call : sys_readerwriter : returned %1d \n",s);
 ^
k200310@ubuntu:~/Desktop/test$ ls
a.out testprog.c
k200310@ubuntu:~/Desktop/test$./a.out
System call : sys_readerwriter : returned 0
k200310@ubuntu:~/Desktop/test$ dmesg | grep writer
[6.746286] sr 3:0:0:0: [sr0] scsi3-mmc drive: 1x/1x writer dvd-ram cd/rw xa/form2 cdda tray
[160.266896] writer modified the value 32 to 64
[160.266902] writer modified the value 64 to 128
[160.266944] writer modified the value 128 to 256
[160.266961] writer modified the value 256 to 512
[160.267010] writer modified the value 512 to 1024
k200310@ubuntu:~/Desktop/test$ dmesg | grep reader
[160.267032] reader reads value 1024
[160.267073] reader reads value 1024
[160.267078] reader reads value 1024
[160.267153] reader reads value 1024
[160.267218] reader reads value 1024
[160.267355] reader reads value 1024
[160.267453] reader reads value 1024
[160.267589] reader reads value 1024
[160.267606] reader reads value 1024
k200310@ubuntu:~/Desktop/test$ █

```