Programming Problems
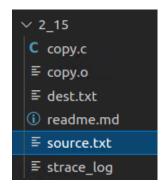
For the instruction to execute each file, please refer to *readme.md* in each problem's directory.

Q2.15

execution snapshot

```
ubuntu@ubuntu2004:~/Desktop/hw1/2_15$ ./copy.o
Please enter the name of source file: source.txt
Please enter the name of destination file: dest.txt

Successfully copy source.txt's content to dest.txt !
```

```
≡ source.txt ×                 □ ···    ≡ dest.txt    ×
2_15 > ≡ source.txt                      2_15 > ≡ dest.txt
  1   Hellow world!                        1   Hellow world!
  2   I am here                            2   I am here
```

```
∨ 2_15
  C copy.c
  ≡ copy.o
  ≡ dest.txt
  ⓘ readme.md
  ≡ source.txt
  ≡ strace_log
```

strace code snapshot

```
ubuntu@ubuntu2004:~/Desktop/hw1/2_15$ gcc copy.c -o copy.o
ubuntu@ubuntu2004:~/Desktop/hw1/2_15$ strace ./copy.o
execve("./copy.o", ["./copy.o"], 0x7ffd76a00950 /* 57 vars */) = 0
brk(NULL)                               = 0x55691e6b9000
arch_prctl(0x3001 /* ARCH_??? */, 0x7ffe71426c80) = -1 EINVAL (Invalid argument)
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=68562, ...}) = 0
mmap(NULL, 68562, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7fb570222000
close(3)                                = 0
openat(AT_FDCWD, "/lib/x86_64-linux-gnu/libc.so.6", O_RDONLY|O_CLOEXEC) = 3
read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0\360A\2\0\0\0\0\0"..., 832) = 832
pread64(3, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784
pread64(3, "\4\0\0\0\20\0\0\0\5\0\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0\0"..., 32, 848) = 32
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\237\333t\347\262\27\320l\223\27*\202C\370T\177"..., 68, 880) = 68
fstat(3, {st_mode=S_IFREG|0755, st_size=2029560, ...}) = 0
mmap(NULL, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_ANONYMOUS, -1, 0) = 0x7fb570220000
pread64(3, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784
pread64(3, "\4\0\0\0\20\0\0\0\5\0\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0\0"..., 32, 848) = 32
pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0\237\333t\347\262\27\320l\223\27*\202C\370T\177"..., 68, 880) = 68
mmap(NULL, 2037344, PROT_READ, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0x7fb57002e000
mmap(0x7fb570050000, 1540096, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x22000) = 0x7fb570050000
mmap(0x7fb5701c8000, 319488, PROT_READ, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x19a000) = 0x7fb5701c8000
mmap(0x7fb570216000, 24576, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRITE, 3, 0x1e7000) = 0x7fb570216000
mmap(0x7fb57021c000, 13920, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOUS, -1, 0) = 0x7fb57021c000
close(3)                                = 0
```

```
arch_prctl(ARCH_SET_FS, 0x7fb570221540) = 0
mprotect(0x7fb570216000, 16384, PROT_READ) = 0
mprotect(0x55691d4bc000, 4096, PROT_READ) = 0
mprotect(0x7fb570260000, 4096, PROT_READ) = 0
munmap(0x7fb570222000, 68562)           = 0
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0x1), ...}) = 0
brk(NULL)                               = 0x55691e6b9000
brk(0x55691e6da000)                     = 0x55691e6da000
fstat(0, {st_mode=S_IFCHR|0620, st_rdev=makedev(0x88, 0x1), ...}) = 0
write(1, "Please enter the name of source "..., 38Please enter the name of source file: ) = 38
read(0, source.txt
"source.txt\n", 1024)            = 11
openat(AT_FDCWD, "source.txt", O_RDONLY) = 3
write(1, "Please enter the name of destina"..., 43Please enter the name of destination file: ) = 43
read(0, d.txt
"d.txt\n", 1024)                 = 6
openat(AT_FDCWD, "d.txt", O_RDONLY)     = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "source.txt", O_RDONLY) = 4
openat(AT_FDCWD, "d.txt", O_WRONLY|O_CREAT|O_TRUNC, 0666) = 5
fstat(4, {st_mode=S_IFREG|0664, st_size=23, ...}) = 0
read(4, "Hellow world!\nI am here", 4096) = 23
fstat(5, {st_mode=S_IFREG|0664, st_size=0, ...}) = 0
read(4, "", 4096)                       = 0
write(1, "\n", 1
)                       = 1
write(1, "Successfully copy source.txt's c"..., 50Successfully copy source.txt's content to d.txt !
) = 50
close(4)                                = 0
write(5, "Hellow world!\nI am here", 23) = 23
close(5)                                = 0
lseek(0, -1, SEEK_CUR)                  = -1 ESPIPE (Illegal seek)
exit_group(0)                           = ?
+++ exited with 0 +++
```

Q3.14

execution snapshot

```
ubuntu@ubuntu2004:~/Desktop/hw1/3_14$ gcc main.c
ubuntu@ubuntu2004:~/Desktop/hw1/3_14$ ./a.out
Please enter a number > 0 : 8
Parents is waiting on child process...
Child is working...
8 4 2 1
Child process is done.
Parent process is done.
ubuntu@ubuntu2004:~/Desktop/hw1/3_14$
```

Q3.15

execution snapshot

```
ubuntu@ubuntu2004:~/Desktop/hw1/3_15$ gcc main.c -o main -lrt
ubuntu@ubuntu2004:~/Desktop/hw1/3_15$ ./main 8
Child: write data to shared memory done.
Parent: start read from shared memory.
8,4,2,1
ubuntu@ubuntu2004:~/Desktop/hw1/3_15$
```

Q3.20

execution snapshot

```
ubuntu@ubuntu2004:~/Desktop/hw1/3_20$ gcc copyfile.c
ubuntu@ubuntu2004:~/Desktop/hw1/3_20$ ./a.out input.txt copy.txt
```

```
C copyfile.c        ≡ input.txt  X  ...      ≡ copy.txt  X

3_20 > ≡ input.txt                    3_20 > ≡ copy.txt
   1    hello world                      1    hello world
   2    NTUT 108820001                   2    NTUT 108820001
```