OS Assignment 2 - Q2

Kernel Memory Copy

Following lines refer to a version of the kernel without the newly-defined system call as “stock kernel” and a version of the kernel with this defined system call as “custom kernel.”

A system call - `twodmemcpy()` - is defined in the custom kernel that copies one 2-D floating point matrix into another. The system call is defined in a separate directory, twodmemcpy, within the kernel root directory.

The syscall is defined in twodmemcpy.c file which makes use of the `SYSCALL_DEFINEX` macro to define the syscall. The syscall makes use of the `__copy_from_user()` call to copy data from the user-space-defined input 2-D floating point matrix into a buffer defined in the kernel space. This data is then copied into another 2-D floating point matrix within the user space using the `__copy_to_user()` call.

The `syscall_64.tbl` file within the custom kernel is modified to add the `twodmemcpy()` syscall (as common-type) at serial number 451. The kernel Makefile is also modified to include the new directory to compile in order to generate executables for the new syscall. The Makefile for twodmemcpy.c specifies that the kernel is supposed to produce an object file for the twodmemcpy system call which the kernel further compiles to produce the executables.

Once the custom kernel has been compiled, a new C file is used in the user space to test the working of the `twodmemcpy()` syscall. This script first defines the source and the destination matrices. It then invokes the `twodmemcpy()` syscall to copy the source matrix into the destination matrix. If the syscall is not invoked successfully, the file returns `EFAULT`. It tests for the successful working of the custom syscall by comparing the two matrices and prints a response message for the same i.e. “Copying successful” if the two matrices are equivalent and “Copying unsuccessful” if the two matrices are not identical.

A copy of the stock kernel was made and `diff` was called between the custom kernel and the copy of the stock kernel; the output was stored in a patch file (`patch.txt`). The patch file shows the difference between the `syscall_64.tbl` files in the two kernels, the `Makefile` of the two kernels, the twodmemcpy directories defined within the two kernels (this directory is empty for the stock kernel and is created to show the existence of the twodmemcpy.c in the custom kernel).