Overview of Implementation:

The goal of this project was to implement the ls command for the stacsos operating system, allowing users to list the contents of directories. The implementation involved the creation of a user space application and modifications to the TAR filesystem driver and the system call infrastructure to support directory listings.

Assumptions:

1. The TAR filesystem contains a nested hierarchy of directories and files.
2. The maximum filename length and the structure of directory nodes are based on the VFS layer specifications.

Implementation Details:

User Space Program: Created a new directory ls under user/ and added the program to the Makefile. The program reads the command-line arguments to determine the directory path and whether to present a long listing (-l flag).

System Call Modification: Introduced a new system call /usr/ls to retrieve directory listings. This was necessary to handle the transmission of structured directory data from the kernel to user space.

TAR Filesystem: Modified the tarfs_node class to support reading directory contents. Implemented a method to gather directory entries and their attributes (size).

Data Transmission: Used buffer allocation strategies to safely copy data between kernel space and user space, ensuring boundary checks and data integrity.

Challenges Encountered:

While working on the practical, I one of the challenges that became apparent was decided how to transfer the directory data between the user’s console and program. Originally, I attempted to transfer the data in the syscall_result output. But this provided problematic as I could not encode the information in u64 without errors. I realized that I could pass a char buffer to the syscall program for storing the data. This enabled for easy access and retrieval and solved my issues.

Testing:

I tested the implementation using the /tree directory structure, verifying that both standard and long listings correctly display the directory contents. Also, cross-verified file sizes with the actual sizes in the sysroot directory to ensure accuracy. In my testing I have found my results reliable and accurate.