Report on the Assignment: Create OS

Purpose of the Operating System

This operating system (XV6-RISCV) is a simplified re-implementation of Dennis Ritchie and Ken Thompson's Unix Version 6 (V6). It is implemented for the RISC-V architecture and designed to run on QEMU. The operating system serves as a minimal, yet complete operating system that demonstrates fundamental OS concepts. By studying it, we have gained more hands-on insights into the core components and principles of operating system design and functionality.

Key Functions

cat: Reads the content of one or more files or standard input and outputs it to standard output. It is commonly used for displaying file contents. (**Usage: cat README)**

echo: Prints the provided arguments to the standard output, separated by spaces, and followed by a newline (**Usage: echo "Hello Word"**). Besides, write text to a file (**Usage: echo "Hello Word" > test.txt**).

grep: Searches for lines in a file or standard input that match a specified regular expression pattern and prints those lines(**Usage: grep qemu README).** Supports simple regex operators like ^ (start of line) (**Usage: grep ^This README**), . (any character) (**Usage: grep y.u README**), * (zero or more repetitions) (**Usage: grep yu* README)**, and $ (end of line) (**Usage: grep t$ README)**.

ls: Lists the contents of directories or details about a file. Displays information such as file/directory name, type, inode number, and size. (**Usage: ls)**

mkdir: Creates new directories with the specified names. If the creation fails, an error message is displayed. (**Usage: mkdir sample_folder)**

rm: Removes files with the specified names. Reports errors for non-existent or inaccessible files and ensures safe deletion. (**Usage: rm sample_folder)**

wc: Counts the number of lines, words, and characters in files or standard input. (**Usage: wc README)**

forktest: Tests the system's ability to handle multiple forks up to a maximum limit (N times). Validates process creation and cleanup through fork and wait system calls. (**Usage: forktest)**

Number of Code Lines

The modified XV6 codebase consists of approximately 4,572 lines for the kernel, 1,256 lines for user programs, and 373 lines for build scripts and tools, totaling around 6,201 lines of code.