NetApp Capstone Project Spring 2022

FUSE Kernel Extension

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Project Overview

The purpose of this FUSE kernel extension product is to apply a disk space quota enforcement feature on users or customers to the existing open-source FUSE filesystem source code for admins and storage space owners who are knowledgeable with using a deployed FUSE based memory storage system.

This project utilizes the FUSE filesystem to implement a kernel extension which intercepts system calls, and implement the syscalls to enforce a maximum user quota feature, implementing the calls to check if the user has exceeded the maximum user quota. For example, each user gets 5GB of free storage space before needing to pay for additional storage.

Project Details

The main product features includes the function of intercepting file related syscalls and operations, a quota based system for user storage with a certain amount of maximum storage space, and a SQLite database for managing the quotas and documenting operation logs.

To enforce quota management and determine user disk space usage, several FUSE operations that could impact user quota have been modified for the purpose of the project. These operations include write, unlink, mkdir, rmdir, truncate, chown, and link. The source code of these operations has been modified and implemented to log and manage quota for multiple users or entities.

The project also consists of complicated tests and operations boolean checks to ensure the logging system and quota enforcement works properly as intended. This helps to ensure the proper execution of the FUSE filesystem framework in case of the use of different machines among the individual users.

For this project specifically, the additional storage feature is not an implemented feature of the filesystem. However, if the individual user's maximum free storage amount has been reached, the system automatically prevents users from further exceeding it. Additionally, an in-memory database is implemented which stores user data usage. The database log entries are then used to determine whether or not the aforementioned maximum quota has been reached.