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Formal Verification of Data Modifications in Cloud Block Storage Based on Separation Logic

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Abstract: *This project encompasses multiple integrated modules, each contributing to a secure and organized data management system involving three key stakeholders: the Administrator, Data Owner, and Data User. The admin module facilitates secure login using a user ID and password. Administrators can parse data content, manage user requests, and monitor user activities. All operations and activities are logged for security and auditing purposes. The Data Owner module enables users to register with their complete details and log in securely. Once authenticated, Data Owners can upload data files specifically in text format which are stored in a secured database. They can also generate and share encryption keys with authorized users and retain access to view their uploaded content. In the Data User module, users register and log in using an email ID and password. Data Users can search for available data uploaded by Data Owners. Upon receiving the correct decryption key, users can verify the key and proceed to decrypt and download the data. Security within this system is enhanced using the Advanced Encryption Standard (AES), a symmetric-key block cipher known for its robustness in encrypting and decrypting sensitive data. This encryption standard is widely adopted across applications such as secure transactions and cloud storage. To ensure data integrity and secure password storage, the system also incorporates hash algorithms, specifically SHA-256, which generates a 256-bit message digest, ensuring the integrity and authenticity of data. In managing and displaying data efficiently, the project implements sorting algorithms. These algorithms are essential for organizing data in a logical, accessible format either alphabetically or numerically. The choice of a suitable sorting algorithm depends on various criteria, including time complexity, space complexity, and algorithm stability, which are critical for optimizing performance in data analysis and database management systems. Together, these components establish a secure, efficient, and user-friendly data sharing and access system grounded in cryptographic principles and computational efficiency.*

Keywords: *Data Owner*

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