**3-2 Milestone Two: Enhancement One: Software Design and Engineering**

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**Brief Description of the Artifact**

The artifact I selected for enhancement is a data-driven application initially developed for my CS 210 course. The project involved creating a list management system that reads items from a text file and displays them to the user. For my CS 499 Capstone project, I enhanced this application by integrating a database to store list items and user accounts, implementing user authentication, and providing a system for users to log out. These enhancements were made to demonstrate my skills in software design and engineering.

**Justification for Inclusion in ePortfolio**

I chose this artifact because it showcases my ability to design and implement a software system that involves both front-end and back-end development. The specific components of the artifact that highlight my skills include:

**Database Integration:** I integrated SQLite to store and manage list items and user accounts, which illustrates my ability to work with databases and perform CRUD operations.

**User Authentication:** I implemented a user authentication system, which showcases my understanding of security practices and my ability to develop secure login mechanisms.

**Session Management:** I added functionality for users to log out or close the application safely, demonstrating my skills in session management and user experience design.

These enhancements align with the course objectives I planned to meet in Module One, particularly in the category of software design and engineering.

**Meeting Course Objectives**

In Module One, I set out to enhance the CS 210 project by implementing user login and authentication, modifying the application to save list items from a text file to a database, and adding a system for logging out or closing the application. I successfully met these objectives by creating a User class to manage user information and authentication status, developing a Database class to handle database operations including adding users, authenticating users, and managing list items, and ensuring that the application properly handles user sessions and securely logs out users. Through these enhancements, I demonstrated my ability to use well-founded and innovative techniques, skills, and tools in computing practices to implement solutions that deliver value and achieve industry-specific goals. Additionally, I developed a security mindset by anticipating potential vulnerabilities, mitigating design flaws, and ensuring the privacy and security of data. In future milestones, I plan to implement a more efficient data structure for managing the list of items, add more database interaction options, and further improve the application's security.

**Reflection on the Enhancement Process**

The process of enhancing and modifying this artifact was a valuable learning experience. I learned several key lessons:

**Database Management:** Integrating SQLite and performing CRUD operations helped me understand the complexity of database management and how to efficiently interact with a database from a C++ application.

**Security Practices:** Implementing user authentication highlighted the importance of security in software development. I learned how to securely handle user credentials and protect against common vulnerabilities such as SQL injection.

**Session Management:** Adding functionality for user sessions and logout processes helped me to understand the need for a smooth and secure user experience. It taught me how to manage user states and ensure data consistency.

**Challenges Faced**

During the enhancement process, I faced several challenges. One significant challenge was ensuring that the database interactions were efficient and did not introduce performance bottlenecks. I addressed this by optimizing my SQL queries and carefully managing database connections. Another challenge was implementing secure authentication mechanisms. I overcame this by researching best practices for secure coding.

Overall, this enhancement process has strengthened my skills in software design and engineering. It has also given me a better appreciation for the importance of security and user experience in software development. This project milestone now serves as a strong demonstration of my abilities I category one and is a valuable addition to my ePortfolio.