**CS-499 Computer Science Capstone**

**4-2 Milestone Three: Enhancement Two: Algorithms and Data Structure**

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**Artifact : Android Inventory Tracking App**

The artifact I chose, as I mentioned last week, is the inventory tracking app I developed in the CS-360 Mobile Architecture and Design course. Throughout this course, the goal will be to adapt this application, which works with an offline database, to work both offline and online. The reason I chose this application is that, as I mentioned in my previous assignment, "it allows me to demonstrate my skills in all areas required within the course, such as Software Design and Engineering, Algorithms and Data Structures, and Databases, within a single project" (Arslan, 3-2 milestone p.1). Moreover, since the project is now going to be available online, I had the opportunity to showcase my skills in secure coding and creating secure architectures (DevSecOps). Additionally, demonstrating my approach to such projects, which are highly likely to be encountered in our professional life, will provide an advantage in my career. In summary, the project, in its current state:

Regarding data structures and algorithms, this project provides a wide range of opportunities to showcase my abilities, as it involves the use and creation of arrays, lists, hashtables, primitive data types, and resource data types. Additionally, it includes the use of comprehensive data types like tinyint (boolean) and datetime within the database. In terms of algorithms, the complex structure of hybrid working requires many studies, such as the creation of complex algorithms, identifying errors in these algorithms, and updating the algorithms, which makes the project unique in this aspect.

**Progress to Date:**

Here’s what has been done since last week:

* Changes were made in the databases: There were some misspellings and extra fields in the web service database. Extra fields were removed, and misspellings were corrected. The login date column in the session table was adjusted to be NOT NULL and default to NOW(), shifting this process from the code to the database. On the local database side, an additional table was needed:a settings table was created to hold the working mode (offline, online) of the program and the web service proxy settings.
* Security improvements were made on the web service: External access to pages was blocked, and each code page was adjusted to be called only through the index, preventing them from being called individually from outside the index page. A global security function was added to filter user input, and this function was integrated within the classes to filter incoming data.
* functions such as listInventory and listItem, which were in the "task remaining" section from the previous week, were completed, and the lock mechanism was established.
* A test program to test the web service was initiated, as manual testing was time-consuming. Once completed, this program will allow for quick testing to identify and fix deficiencies and errors.
* Since the REST API does not provide a template like WDSL, it was reorganized to provide a template and usage guide for those who will use this service.

**Tasks Remaining:**

1. Web service: Functions for notifications (add, delete, edit, send notifications, etc.).
2. Performing test operations and fixing errors in the web service.
3. Development of data synchronization architecture.
4. Creating the settings section in the Android application (including web service settings, synchronization settings, or working mode settings).
5. Rewriting the existing backend code in the Android application according to the new architecture.
6. Implementing the synchronization architecture.
7. Final check (security, errors, etc.).

**Course Outcomes:**

I believe the project can meet all 5 outcomes, as I mentioned last week, and I think it currently meets the majority of the first three. Additionally, the security work I did this week allowed me to start addressing the 5th outcome: "Develop a security mindset that anticipates adversarial exploits in software architecture and designs to expose potential vulnerabilities, mitigate design flaws, and ensure privacy and enhanced security of data and resources." Once the security work is complete, I believe it will largely satisfy this outcome.

**Challenges Encountered During the Project:**

Aside from last week’s challenges, this week I encountered difficulties with the lock mechanism setup. This structure, which is crucial for the project, slightly deviated from my initial architectural design. Instead of performing each operation within a single function, breaking it down into parts seemed more suitable, making the structure usable for all operations. Therefore, I had to spend some time on this part. The initial tests gave positive results, but I cannot currently predict whether there will be errors or deficiencies found in detailed tests after the test script is completed and how much more the structure will need to change.