**4-2 Milestone Three: Enhancement Two - Narrative**

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The artifact selected for this enhancement is the CS-360 Mobile Programming Inventory Manager Android application, originally developed between April and June 2024. The initial implementation of the low stock notifications relied on a linear search algorithm with O(n) complexity, which required scanning the entire dataset sequentially. As the dataset grew, this approach became increasingly inefficient. To improve system performance and scalability I integrated an AVL Tree, a self-balancing binary search tree that ensures more efficient lookup, insertion, and deletion operations by reducing time complexity to O(log n). Unlike a standard BST, which can become unbalanced and degrade to O(n) search time in the worst case the AVL Tree maintains balance through rotations, ensuring consistently optimal performance. This enhancement allows the system to remain responsive and scalable, regardless of inventory size.

I selected this artifact because it effectively demonstrates my ability to analyze and implement data structures and algorithms to optimize application performance. When evaluating options for an appropriate algorithm, I chose the AVL Tree specifically for its self-balancing properties, which prevents the inefficiencies of an unbalanced BST. This enhancement showcases my ability to evaluate trade-offs in algorithm selection, implement complex data structures, and optimize search operations for real-world applications. Through this process, I successfully met Outcome 3, as I designed a computing solution using algorithmic principles while managing performance trade-offs. Additionally, by documenting the enhancement process, refining the code structure, and ensuring clarity in my implementation details, I am actively demonstrating Outcome 2. Finally, through iterative improvements, code review, publishing to my ePortfolio, and incorporating instructor feedback, I continue to work toward fulfilling Outcome 1. To further demonstrate the benefits of the AVL Tree algorithm, I implemented a linear search with console outputs for each task, with the AVL tree consistently performing A screenshot of a computer program

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