

Module Five Milestone Four Narrative

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## **Artifact Narrative: Scene and Camera Save/Load Enhancement for OpenGL 3D Scene Manager**

### **Brief Description of the Artifact**

The artifact is an enhanced C++ OpenGL 3D scene manager application, developed as part of my CS-499 Capstone project in 2025. The enhancement focused on adding robust save/load functionality for both scene objects and the camera state using JSON serialization. This allows users to persist and restore the entire scene including object positions and camera view, across sessions, greatly improving usability and flexibility.

### **Justification for Inclusion in the ePortfolio**

I selected this artifact for my ePortfolio because it demonstrates my ability to design, implement, and integrate advanced features into an existing software system. The artifact showcases several key software development skills:

- **Modular Design:** I refactored the codebase to use dedicated manager classes for textures and materials and introduced a new JSON Database utility for serialization.
- **Data Persistence:** I implemented JSON-based save/load for both scene objects and camera state, using the `nlohmann::json` library and custom serialization functions.
- **Code Maintainability:** The enhancements are well documented, with clear in-line comments and separation of concerns, making the codebase easier to maintain and extend.

The most significant improvement is the ability to save and restore not just the positions of objects, but also the camera's position and orientation. This required careful coordination between the scene manager, camera, and the new JSON database utility.

## Course Outcomes and Outcome-Coverage Updates

My planned outcome for this enhancement was to demonstrate proficiency in software engineering practices, including modularity, data persistence, and user focused feature development.

I met this outcome by:

- Designing and implementing a modular save/load system.
- Integrating third-party libraries (nlohmann::json) for serialization.
- Ensuring the solution is robust, extensible, and user-friendly.

## Reflection on the Enhancement Process

Enhancing and modifying the artifact was a valuable learning experience.

I learned how to:

- **Integrate new features into a legacy codebase:** I had to carefully analyze existing dependencies and refactor code to support modular managers and serialization.
- **Debug complex build and include path issues:** I encountered challenges with file organization and include paths, which required a deep understanding of Visual Studio project structure and C++ include mechanics.
- **Implement robust serialization:** Writing custom to\_json/from\_json functions for both scene objects and camera state taught me about the importance of precise data mapping and error handling.
- **Test and validate enhancements:** I developed a workflow for testing save/load functionality, including editing JSON files manually and verifying scene restoration.

The biggest challenge was resolving issues caused by duplicate files and incorrect include paths, which led to confusing compiler errors. Through systematic troubleshooting and careful project organization, I was able to resolve these issues and ensure the enhancements worked as intended.

## **Conclusion**

This artifact is included in my ePortfolio because it demonstrates my ability to enhance a complex software system with meaningful, user focused features. The process deepened my understanding of modular design, data persistence, and debugging in C++, and I am proud of the resulting improvements to both functionality and code quality.