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### **Milestone Four Narrative: Enhancement Three – Databases**

#### **Artifact Description**

The artifact I selected for this enhancement is the Grazioso Salvare Animal Dashboard, originally created in CS-340: Client/Server Development. The dashboard integrates Python, Dash, and MongoDB to visualize animal shelter data. It was first developed in Fall 2025 as part of coursework focused on client/server interactions and database integration. The artifact includes a CRUD module (`crud.py`) for database operations and a Jupyter Notebook/Dash interface for filtering and visualizing rescue animals.

#### **Justification for Inclusion**

I chose this artifact for my ePortfolio because it demonstrates my ability to design and implement database solutions that support real-world applications. The database layer is central to the dashboard's functionality, enabling efficient storage, retrieval, and manipulation of animal rescue data. By enhancing the database code, I showcase skills in query optimization, indexing, input validation, and secure credential handling. These improvements make the dashboard more professional, reliable, and user-friendly, aligning with industry standards for database management.

#### **Course Outcomes Alignment**

In Module One, I planned to meet the outcome of demonstrating innovative techniques and tools in computing practices for implementing database solutions. With this enhancement, I achieved that goal by:

- Adding **indexes** to improve query performance.
- Implementing **query sanitization** to strengthen input validation and security.
- Improving **error handling** to ensure graceful failure instead of crashes.
- Supporting **projections and limits** in queries for efficiency and usability.
- Introducing **secure credential handling** through environment variables.

These changes directly support the Computer Science program outcome related to software engineering and databases. My outcome-coverage plan remains consistent, and this milestone confirms my progress toward competency in database practices.

#### **Reflection on Process**

Enhancing the database taught me how small changes can have significant impacts on

performance and usability. For example, adding indexes reduced query response times, making the dashboard more responsive when filtering large datasets. Query sanitization improved reliability by preventing errors from malformed inputs and protecting against potential misuse. One challenge I faced was authentication: my local MongoDB instance initially rejected credentials, which required me to adjust the connection logic to support both authenticated and unauthenticated environments. This reinforced the importance of designing flexible, secure systems that adapt to different deployment contexts.

Through this process, I strengthened my ability to balance efficiency, usability, and security in database design. These skills are directly transferable to professional environments where robust data solutions are critical. The enhanced artifact now demonstrates not only functional CRUD operations but also professional-quality practices in database management.

**Before vs. After Comparison**

Aspect	Original Artifact	Enhanced Artifact
Credentials	Hard-coded username/password	Secure environment variable handling
Indexing	None	Indexes on animal_type, breed, location, age_upon_outcome
Query validation	Broad queries allowed	Sanitization restricts to expected fields
Error Handling	Minimal try/except	Robust error handling with clear messages
Read Method	Returned all fields, no limits	Supports projections and result limits
Return Values	Boolean success/failure	Informative counts and inserted IDs