NARA Non-record Material Database

Supervisor: Lindsay Oakley

By: Muhammad Putra

Context:

Description:

This project involves developing a database for NARA's Heritage Science Research and Testing Lab. The primary goal is to organize and manage the lab's collection of non-record materials, which includes deaccessioned and naturally aged items, treatment materials, and other relevant samples. By creating a centralized and searchable database, the project aims to streamline access to these materials, facilitating better analysis, research, and decision-making in the preservation and conservation of archival holdings. This database will serve as a valuable resource for the lab's team, visiting scholars, and the broader heritage science community.

Vocabulary:

1. **Database:** A system where information (data) is stored in an organized way, making it easy to find and manage.
2. **Server-side:** The part of a website that works behind the scenes, handling information and making sure everything runs smoothly. It connects to the database to manage data and sends the right information to the client-side. This is often called the "back-end."
3. **Client-side:** The part of a website that you see and interact with, like buttons, forms, and text. It works with the server-side to show you the information you need. This is often called the "front-end."

My Contributions:

Plan Database:

I began by interviewing Lindsay Oakley to gain a clear understanding of her expectations for the database and the overall project. During our discussion, I took detailed notes, including her preference for an SQL database. Following this, I created an initial entity relationship diagram (ERD) to prototype the database structure. Over the next few weeks, I held feedback sessions with various team members from different research labs at NARA to refine and iterate on the diagram. After approximately four weeks of collaboration and revisions, I finalized the ERD, laying a solid foundation for the database design.

Create Database:

After finalizing my database diagram, I began the process of implementing it on the lab's desktop computer. At Lindsay's request, I used MySQL to host the database. I started by writing the necessary SQL `CREATE` statements to initialize six tables. To ensure everything was structured correctly, I first designed mock data in Google Sheets, allowing me to visualize how the tables would look and interact with each other. Once I had a clear understanding, I used SQL `INSERT` statements to populate the MySQL database with data. I then created relationship tables to define dependencies, ensuring that changes to one table would appropriately impact others when data was updated or deleted. Finally, I developed and tested SQL queries to search, update, and remove data from the tables. This phase of the project took approximately two weeks to complete.

Plan Website:

Having officially completed my intern project for NARA, I discussed with my supervisor, Lindsay Oakley, the idea of developing a web application to make the database easily accessible to a wide range of users, particularly those with limited technical experience in SQL. I began by selecting the technical tools and languages (the tech stack) required for the website development. This process involved submitting several IT tickets to get approval for these tools, which took several weeks to finalize. While awaiting approval, I started working on a basic prototype of the website features using Figma. Although Figma is typically used to design an entire website, including navigation between pages, I focused on designing the key features due to time constraints.

Create Website:

With limited time remaining in my internship, I began coding the web application, focusing primarily on the server-side. During these final two weeks, I developed and implemented multiple endpoints, thoroughly testing each URL to ensure they functioned correctly. As my internship draws to a close, I am now focused on creating comprehensive documentation to guide future users in navigating and maintaining the database project.

Future Steps:

Complete Website:

This involves finalizing the server-side application, developing the client-side interface, and periodically updating the database to ensure functionality and relevance.

Post-MVP Enhancements:

This stage focuses on integrating additional features requested by Lindsay, such as an export-to-zip file functionality.

Website Hosting:

Currently, the website is hosted locally on a NARA lab desktop. To enhance accessibility across various devices, it is crucial to find a reliable platform for external hosting.

Cloud Migration:

Migrating the database to the cloud is the next critical step to improve security, accessibility, and scalability.

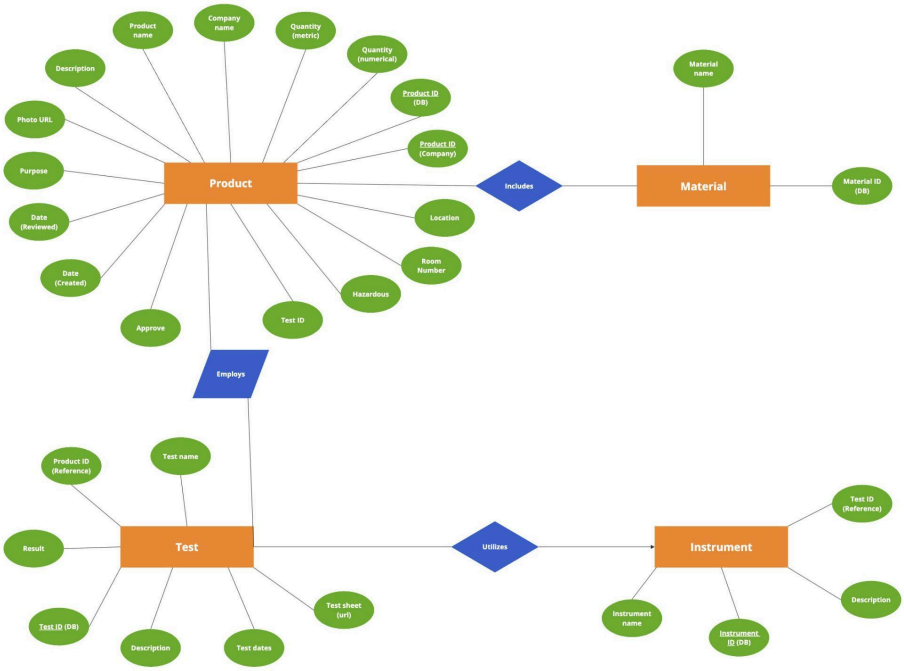
Multi-User Support and Efficiency:

The website is currently designed for single-user access. The next phase involves enabling multi-user support, with key considerations including transaction management, concurrency control, and parallel processing.

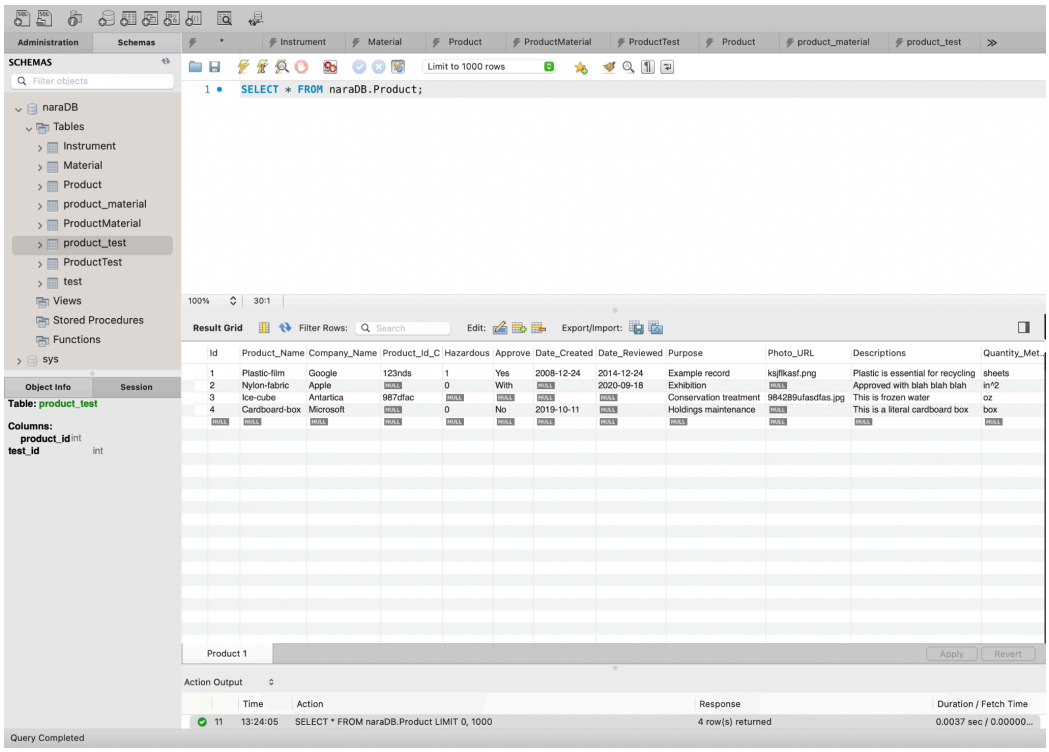
1. **Transactions**: A transaction is like a promise that a group of actions will either all happen successfully or none at all. This helps keep data accurate and reliable, especially when something goes wrong.
2. **Concurrency**: Concurrency means that a system can do multiple things at the same time. For example, a website can handle many users browsing different pages all at once without slowing down.
3. **Parallelism**: Parallelism is when a big task is split into smaller parts, and each part is worked on at the same time by different processors. This makes the work get done faster, similar to how having more people work on a job together can get it finished quicker.

Photos:

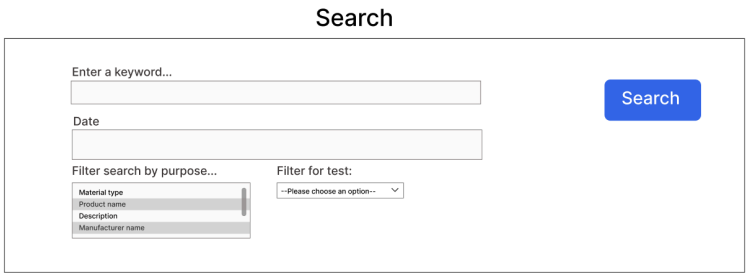
Entity Relationship Diagram for Database:



Tables and mock data in MySQL:



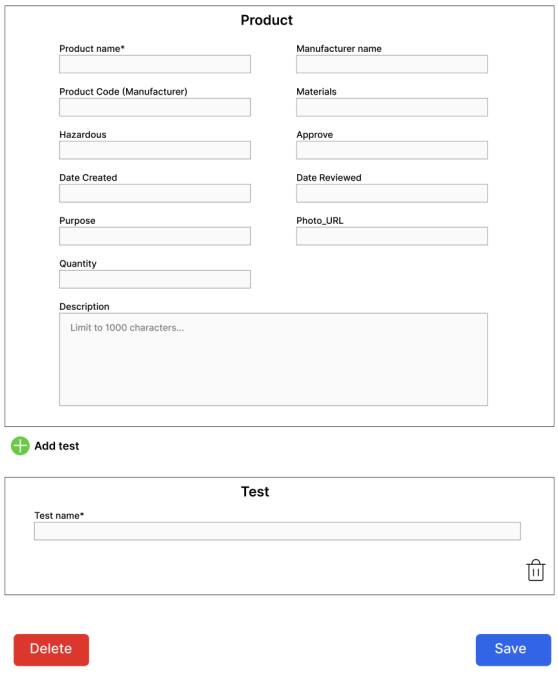
Prototype of search bar on Figma:



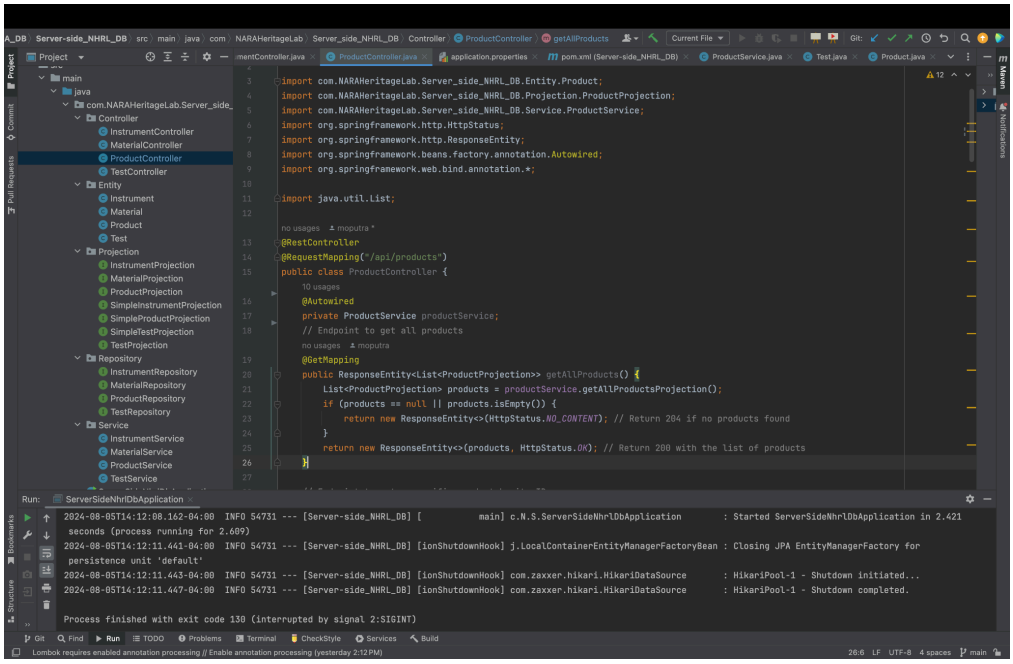
3 Results

Name	Description	Manufacturer	Date(s)	
Plastic film	blah blah blah	Targét	1950, 2001	
Cardboard box	blah blah blah	Trader Mo's	1780	
Wheat bun	blah blah blah	Whole snack	null	

Prototype of adding, updating, and/or deleting a product on Figma:



Snippet of code from server-side development of website:

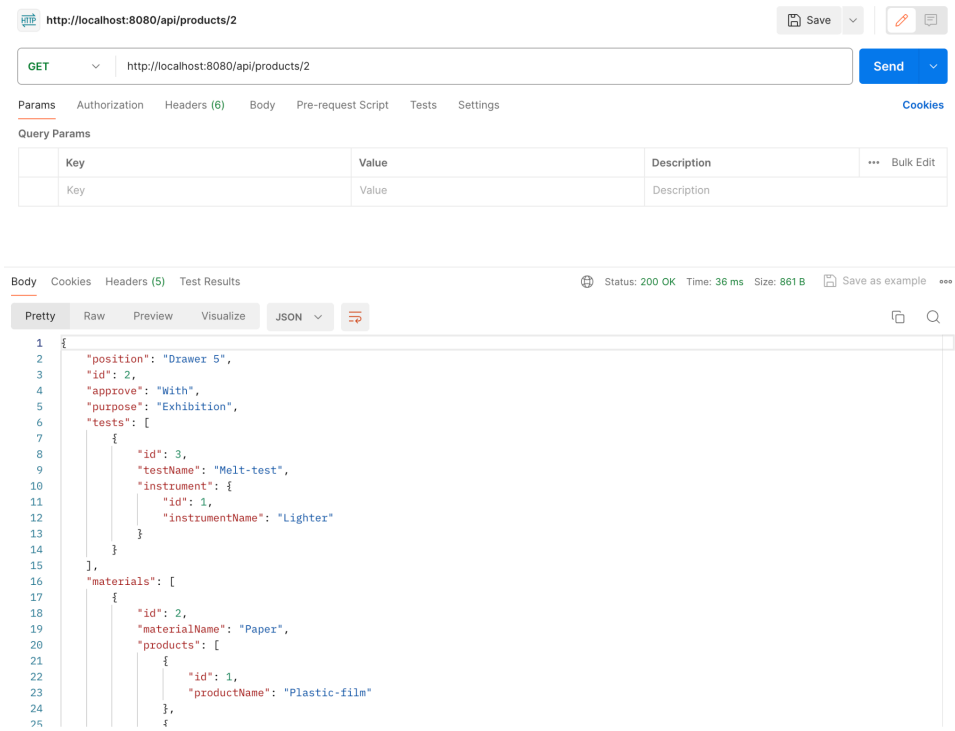


```
import com.NARAHeritageLab.Server_side_NHRL_DB.Entity.Product;
import com.NARAHeritageLab.Server_side_NHRL_DB.Projection.ProductProjection;
import com.NARAHeritageLab.Server_side_NHRL_DB.Service.ProductService;
import org.springframework.http.HttpStatus;
import org.springframework.http.ResponseEntity;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController
@RequestMapping("/api/products")
public class ProductController {
    @Autowired
    private ProductService productService;
    // Endpoint to get all products
    @GetMapping
    public ResponseEntity<List<ProductProjection>> getAllProducts() {
        List<ProductProjection> products = productService.getAllProductsProjection();
        if (products == null || products.isEmpty()) {
            return new ResponseEntity<>(HttpStatus.NO_CONTENT); // Return 204 if no products found
        }
        return new ResponseEntity<>(products, HttpStatus.OK); // Return 200 with the list of products
    }
```

Testing URL endpoints on Postman:



http://localhost:8080/api/products/2

Save

GET http://localhost:8080/api/products/2 Send

Params Authorization Headers (6) Body Pre-request Script Tests Settings Cookies

Query Params

Key	Value	Description	Bulk Edit
Key	Value	Description	

Body Cookies Headers (5) Test Results Status: 200 OK Time: 36 ms Size: 861 B Save as example

Pretty Raw Preview Visualize JSON


```
{
    "position": "Drawer 5",
    "id": 2,
    "approve": "With",
    "purpose": "Exhibition",
    "tests": [
        {
            "id": 3,
            "testName": "Melt-test",
            "instrument": {
                "id": 1,
                "instrumentName": "Lighter"
            }
        }
    ],
    "materials": [
        {
            "id": 2,
            "materialName": "Paper",
            "products": [
                {
                    "id": 1,
                    "productName": "Plastic-film"
                },
```