Curriculator

CEN4940 - Spring 2025

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Software to simplify course and program browsing

Project Specification

- Develop a standalone IT Program Curriculum Viewer application that allows users to query course data, identify inconsistencies, and generate reports. The application must be designed for standalone use with an embedded database or JSON for optimized data operations.

Description	Start Date	End Date	Duration
Project Start	01/19/25	04/13/25	84 Days
System Design Phase 1	1/19/25	2/2/25	14 Days
System Design Phase 2	2/2/25	2/16/25	14 Days
System Implementation Phase 1	2/16/25	3/2/25	14 Days
System Implementation Phase 2	3/2/25	3/16/25	14 Days
Integration Testing	3/16/25	4/6/25	21 Days
User Acceptance Testing	4/6/25	4/13/25	7 Days

What is Curriculator?

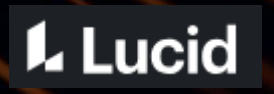
- A software that can accept a CSV or excel file with a specified format and displays the information to the user in a friendly navigation window. This allows easy access to:
- Courses
  - Course name / code
  - Prerequisites / Corequisites
  - The programs the course is offered in
- Programs
  - Program name / code
  - Required courses
  - Alternate courses
  - Elective courses

Technologies Used

- The project was built with several Java libraries and technology stacks
- Frontend:
  - GluonFX / JavaFX
  - CSS
  - Java
- Backend:
  - Java
  - Junit5 (testing)
  - Mockito (testing)
- Collaboration:
  - LucidChart / LucidSpark
  - Figma
  - Git / GitHub
  - Slack

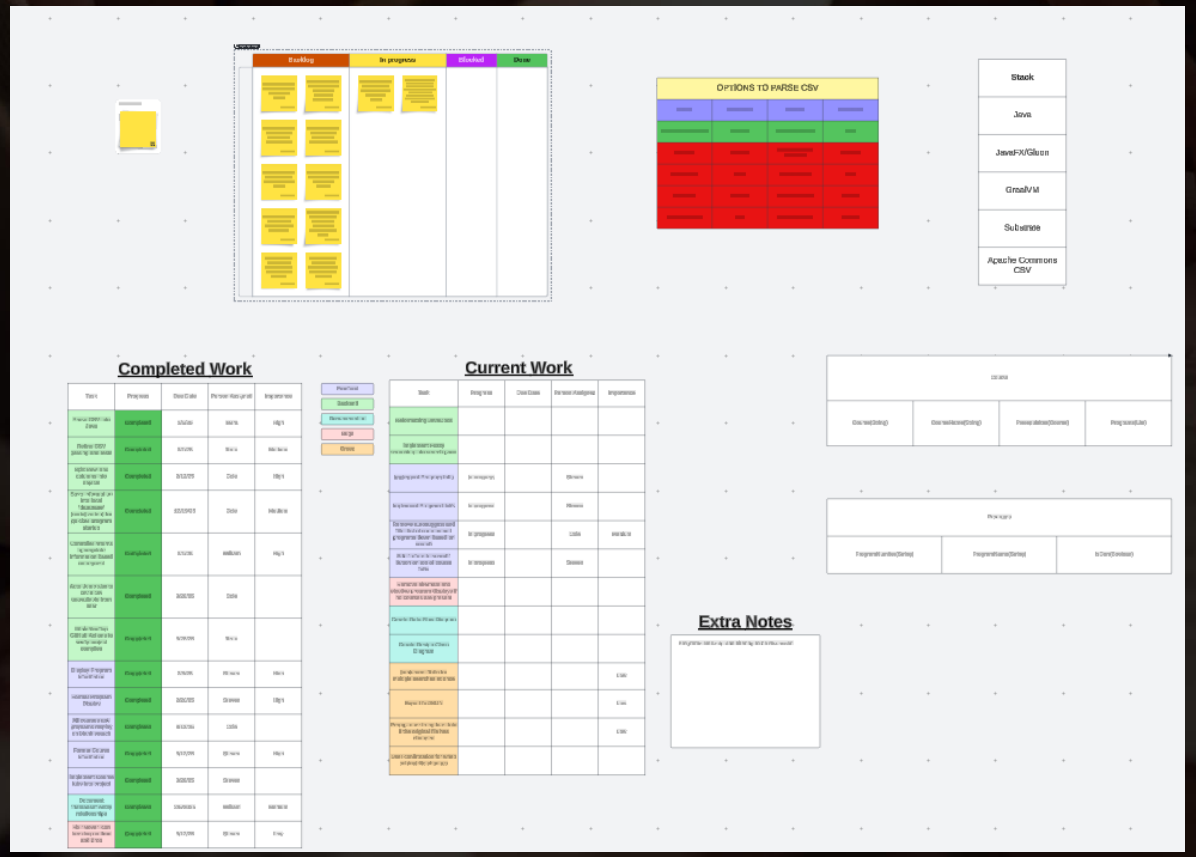






Planning and Organization

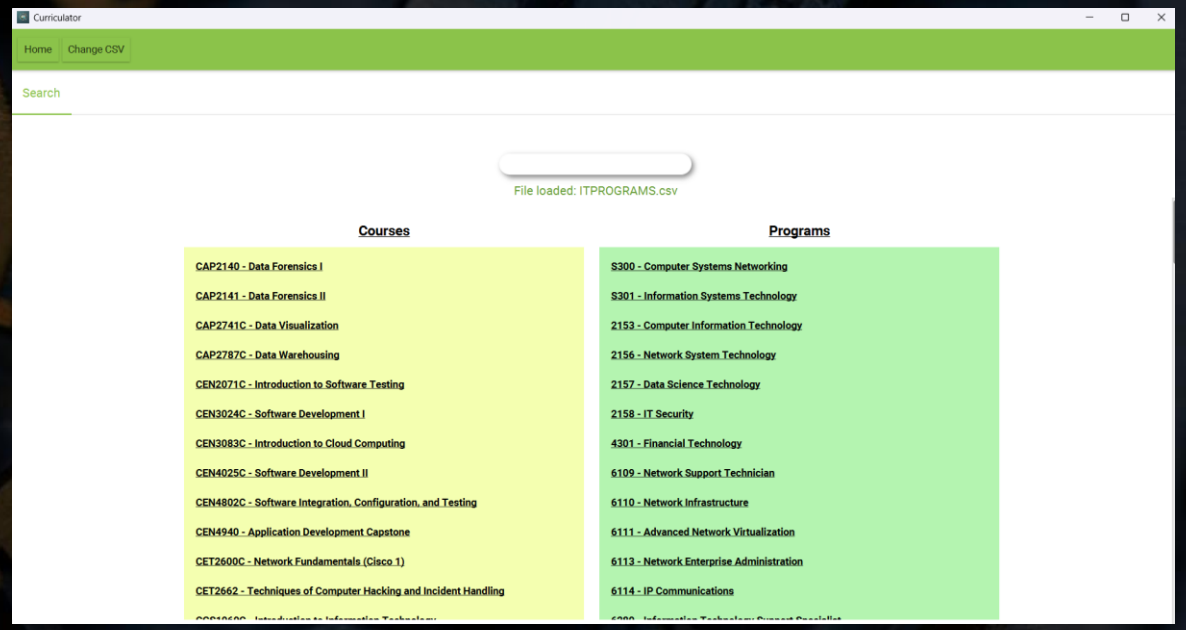
- We planned out the software with user stories, class diagrams, and UI wireframing prototypes



Program Operation

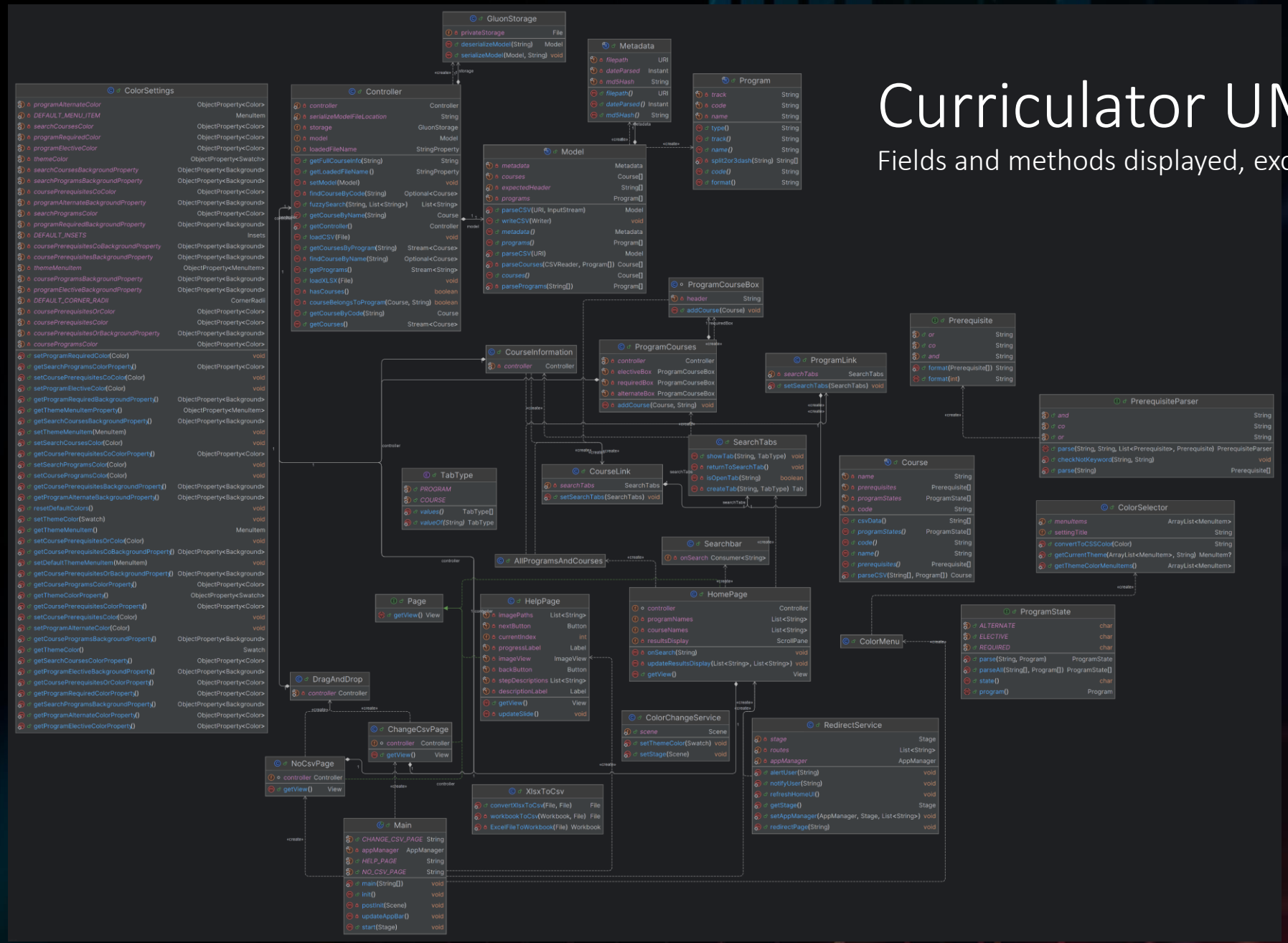
- Turning excel sheets that make your head spin into easily readable data!

	A	B	C	D	E	F
1	COURSE	COURSE NAME	PREREQUISITES	S00-Computer Systems Networ	S301-Information Systems Technology-Application Developme	S301-Information Systems Technology-Fin
2	CAP2140	Data Forensics I	CTS1131C and CTS1133C and CTS1120C			
3	CAP2141	Data Forensics II	CAP2140			
4	CAP2741C	Data Visualization	COP2822C and COP2034C and CGS2512C			
5	CAP2787C	Data Warehousing	CTS2437C			
6	CEN2071C	Introduction to Software Testing	COP2551C or COP2334C or COP2360C or COP2837C or COP2220C or COP2800C or COP2		R	R
7	CEN3024C	Software Development I	COP3330C		R	
8	CEN3083C	Introduction to Cloud Computing	CNT2001C or CET2600C		R	
9	CEN4025C	Software Development II	CEN3024C co CEN4802C		R	
10	CEN4802C	Software Integration, Configuration, and Testing	CEN3024C and CEN2071C co CEN4025C		R	
11	CEN4940	Application Development Capstone	CEN4025C and COP4655C and CEN4802C and COP4847C		R	
12	CET2600C	Network Fundamentals (Cisco 1)	CTS1131C and CTS1133C	R	A	A
13	CET2662	Techniques of Computer Hacking and Incident Handling	CTS1131C and CTS1133C and CTS1120C			
14	CGS1060C	Introduction to Information Technology				
15	CGS1100C	Microcomputer Applications for Business and Economics			R	R
16	CGS2512C	Spreadsheet Concepts and Practices				
17	CGS2542	Database Concepts for Microcomputers	CGS1060C or CGS1100C			
18	CGS2820	Web Site Design and Development	COP2822C			
19	CGS2821	Advanced Web Site Design and Development	CGS2820			
20	CIS1942	Computer Information Technology Internship				
21	CIS2321	Information Systems	CGS1100C		R	R
22	CIS2349C	Introduction to Big Data using Hadoop	COP2034C and COP2800C and CTS2437C and CNT1015C			
23	CIS2930	Computer Information Technology Special Topics				
24	CIS3534C	Scripting for Network Professionals	CTS1133C and CET2600C and CTS2655C	R		
25	CNT1015	Operating Systems Foundations		R		
26	CNT2001C	Computer Networks and Telecommunications	CGS1060C or CGS1100C		R	R
27	CNT2102C	Enterprise Networking, Security, and Automation (Cisco 3)	CTS2655C	R		
28	CNT2404	Intrusion Detection Systems and Auditing	CET2662			
29	CNT2942	rk System Technology & IT Security Cooperative Education (Internship)				
30	CNT3014C	Enterprise Systems Integration	CTS2655C	R		
31	CNT3105C	Software Defined Networking	CTS1334C and CNT2102C and CIS3534C	R		
32	CNT3403C	Firewall Configuration and Design	CNT2102C and CNT4708C and CNT3105C	R		
33	CNT4503C	Advanced Convergent Technologies	CNT2102C	R		
34	CNT4708C	Advanced Network Traffic Analysis	CTS2655C	R		
35	CNT4931C	Computer Networking Capstone	CNT3014C and CNT4503C	R		
36	CNT4940	omputer Systems Networking Cooperative Education (Internshi	ISM3013 and ISM3014	R		
37	COP1000C	Introduction to Computer Programing			R	R
38	COP2034C	Programming in Python	COP1000C			
39	COP2073C	Introduction to Statistical Programming with R	COP1000C			
40	COP2220C	C Programming	COP1000C			
41	COP2334C	Object-Oriented Programming with C++	COP1000C			
42	COP2360C	Introduction to C#	COP1000C		A	A
43	COP2551C	Introduction to Object Oriented Programming with Java	COP1000C		R	R
44	COP2800C	Java 1	COP1000C		A	A
45	COP2805C	Advanced Java Programming	COP2551C or COP2800C			
46	COP2806C	Developing Enterprise Applications Using Java EE	COP2805C			
47	COP2822C	Web Technologies	COP1000C			
48	COP2823C	ASP.NET Programming	COP2837C or COP2360C			
49	COP2837C	Introduction to Programming with Visual Basic.NET	COP1000C			
50	COP2842C	Internet Programming	COP2822C		A	A
51	COP3330C	Object-Oriented Programming	COP2551C or COP2800C or COP2360C		R	
52	COP3813C	Web Application Development			R	
53	COP4655C	Application Development for Mobile Devices	CTS2437C and COP3330C and CEN2071C and ISM3113C		R	
54	COP4847C	Advanced Web Application Development	COP3330C and COP3813C		R	
55	CTS1120C	Fundamentals of Information Security	CTS 1131C and CTS 1133C or CGS1060C and CNT1015C and CNT2001C	R	R	R
56	CTS1131C	Software Configuration		R	R	R
57	CTS1133C	Hardware Configuration		R	R	R
58	CTS1136	A+ Certification Review				
59	CTS1154	Technical Support		R		
60	CTS1334C	Server Configuration	CTS1131C and CTS1133C	R		



Curriculator UML Diagram

Fields and methods displayed, excluding test packages

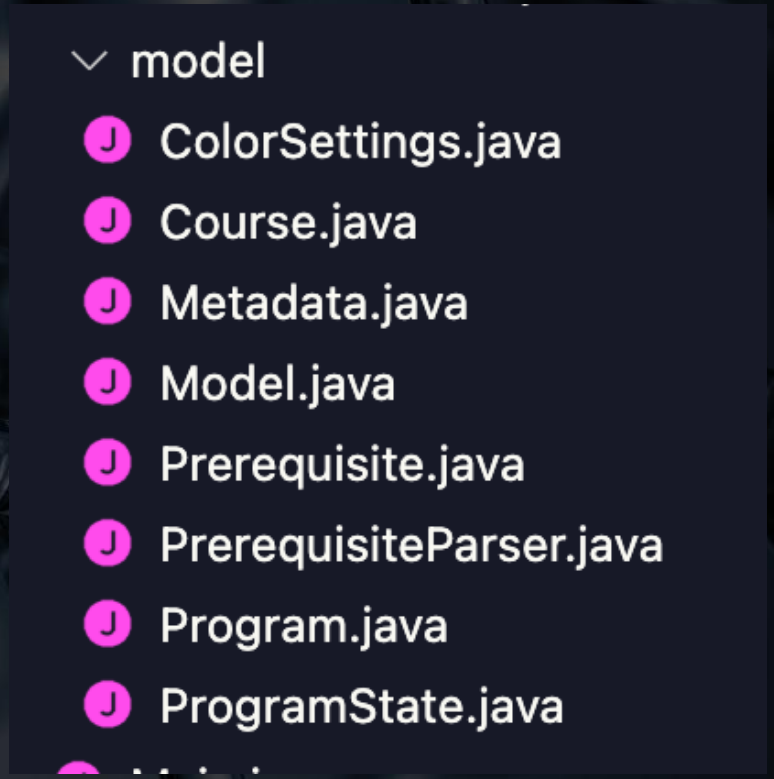


Code Structure

- Used MVC pattern for our code structure:
- Model – Manages the data
- View – The user interface built with JavaFX
- Controller – Connects the view and model, handles business logic

The Model

- Defines core data structures such as Courses, Programs, and Metadata.
- Provides methods for the Controller to parse a CSV file.
- Uses Java records and sealed interfaces for clear, type-safe parsing.
- Thoroughly unit tested, 100% code coverage!



Model - ProgramState

- Represents an association between a Program and Course.
- Each Course may be Required, Alternate, or Elective in each Program.
- Uses the Program parsed from the CSV header, encapsulating it in a sealed interface for type-safe handling later.

```java
/**
 * Returns the program associated with this state. Will be automatically
 * implemented by the record classes, which contain Program program().
 *
 * @return the program associated with this state
 */
Program program();

/**
 * Represents a required program state.
 *
 * @param program the program associated with this state
 */
public static record Required(Program program) implements ProgramState {

/**
 * Represents an alternate program state.
 *
 * @param program the program associated with this state
 */
public static record Alternate(Program program) implements ProgramState {

/**
 * Represents an elective program state.
 *
 * @param program the program associated with this state
 */
public static record Elective(Program program) implements ProgramState {
```

Model - PrerequisiteParser

- Parses Prerequisite Course codes using a state machine.
- Prerequisites separated by “and” must all be satisfied.
- A group of Prerequisites separated by “or” are alternates, separate from other Prerequisites listed.
- A Corequisite is indicated by “co” and a Course code.

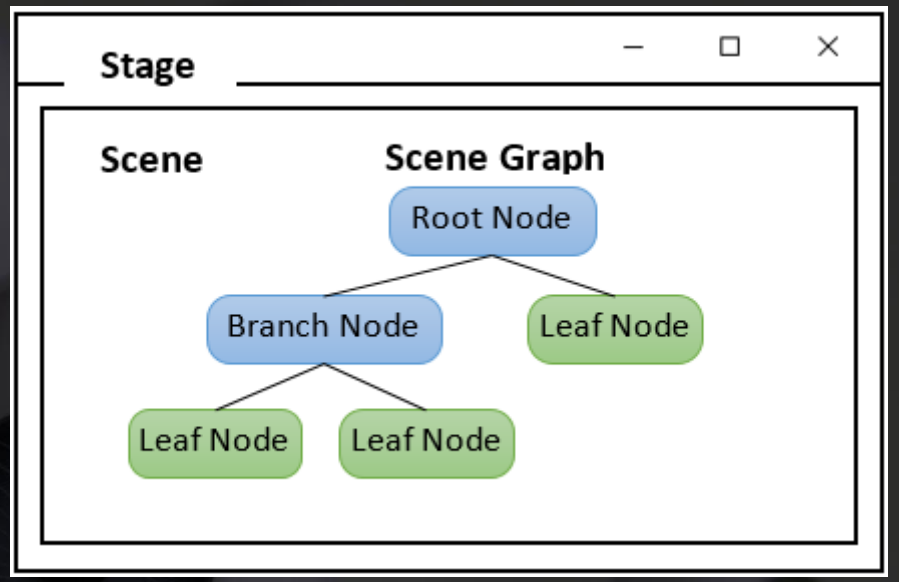
“COP1000 and COP2000 or COP3000 co COP4000” →

Prerequisites: COP1000, (COP2000 or COP3000)
Corequisites: COP4000

```
/**
* Parse method, which each state implements differently.
*/
Cody
PrerequisiteParser parse(String prerequisites, String token,
        List<Prerequisite> results, Prerequisite last) throws ParseException;

Cody
static record And() implements PrerequisiteParser {…

Cody
static record Or() implements PrerequisiteParser {…

Cody
static record Corequisite() implements PrerequisiteParser {…

Cody
static record Keyword() implements PrerequisiteParser {…
```

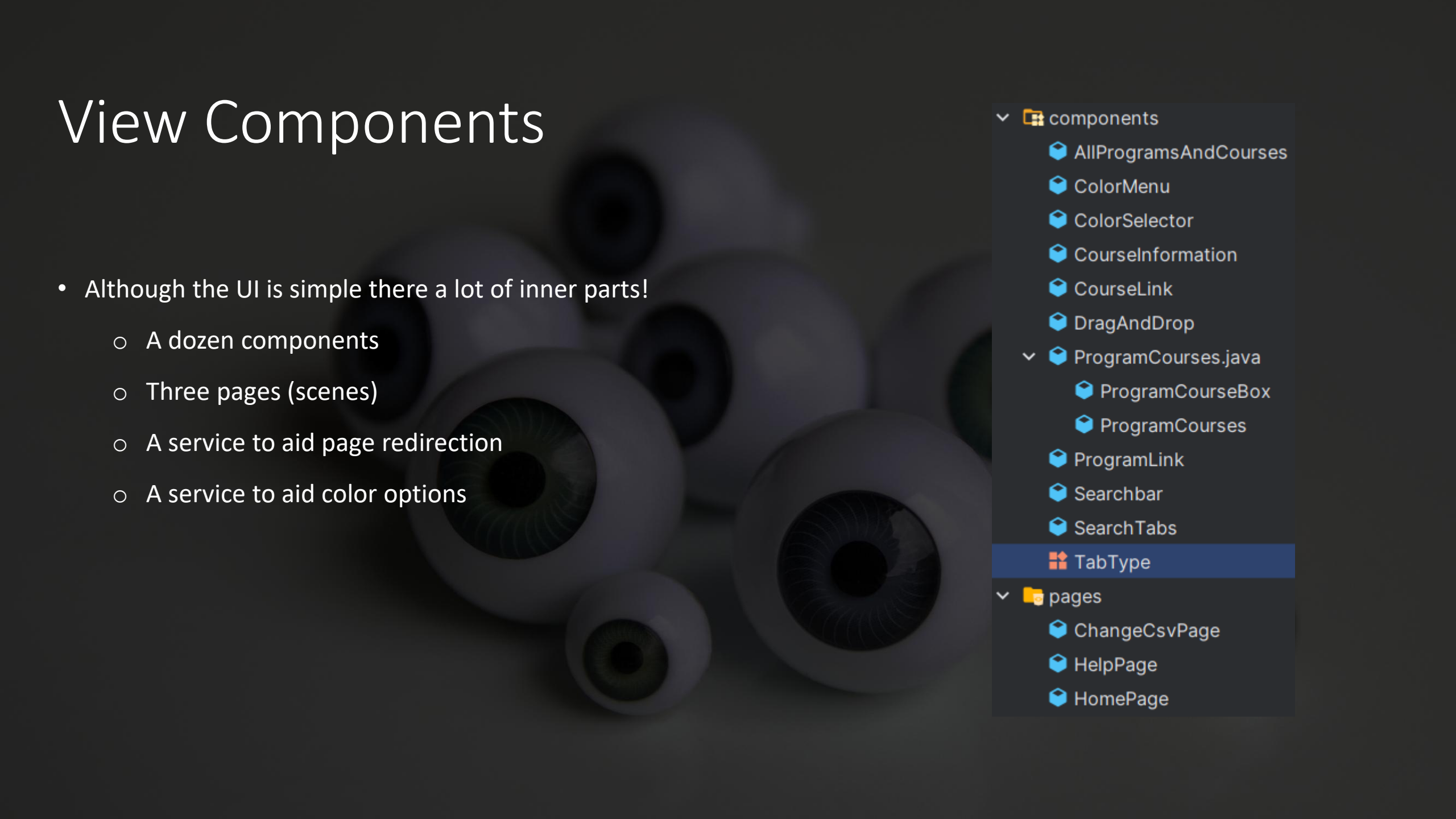
The View

- Built using JavaFX
- Responsible for what the user sees and interacts with
- Uses a Stage (main application window)
- Displays content through Scenes
- Contains UI components like buttons, text fields
- Sends user actions (like clicks or input) to the Controller



View Components

- Although the UI is simple there a lot of inner parts!
  - A dozen components
  - Three pages (scenes)
  - A service to aid page redirection
  - A service to aid color options



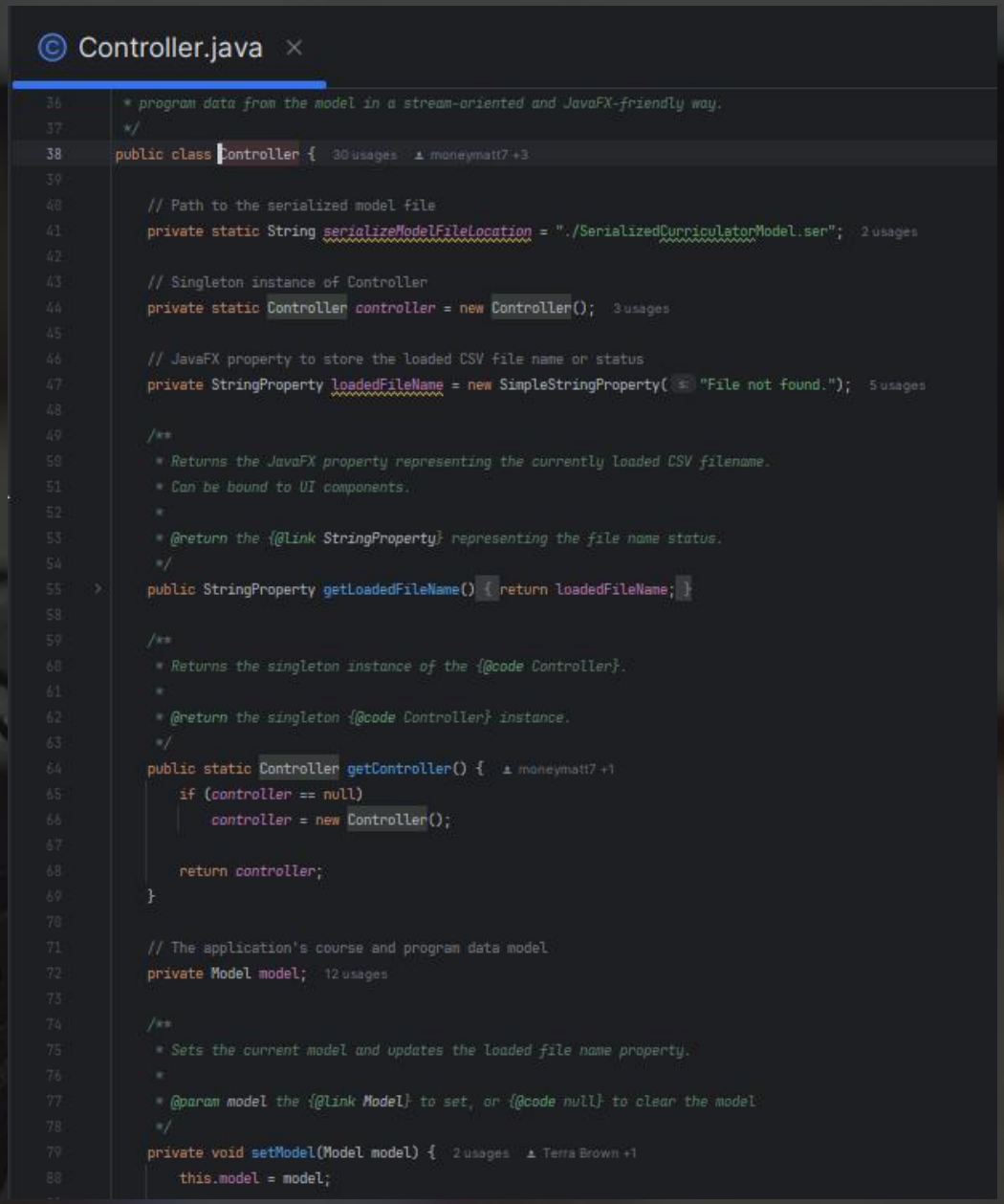
View Tab System

- With collaboration and planning we designed a tab system
  - Allows user to “drill down” into programs and course prerequisites
  - When the tabs overflow a simple dropdown list allows easy navigation

The Controller

A bridge between the model and the view

- Utilizes the Singleton Pattern to ensure consistent access to data across the views
- Loads, parses, and serializes the model
- Feeds the view, supplying lists of courses and programs for display in the UI
- Handles the data flow, when a user uploads or searches data, the view talks to the controller, and the controller talks to the model.



Controller - Storing Application Data

- Users upload CSV or XLSX files into the application
- The application converts these files into Java objects
- Java objects run in memory and are lost when the app closes
- To retain data, Java objects are serialized into a .ser file
- The serialized file is saved for future retrieval and use

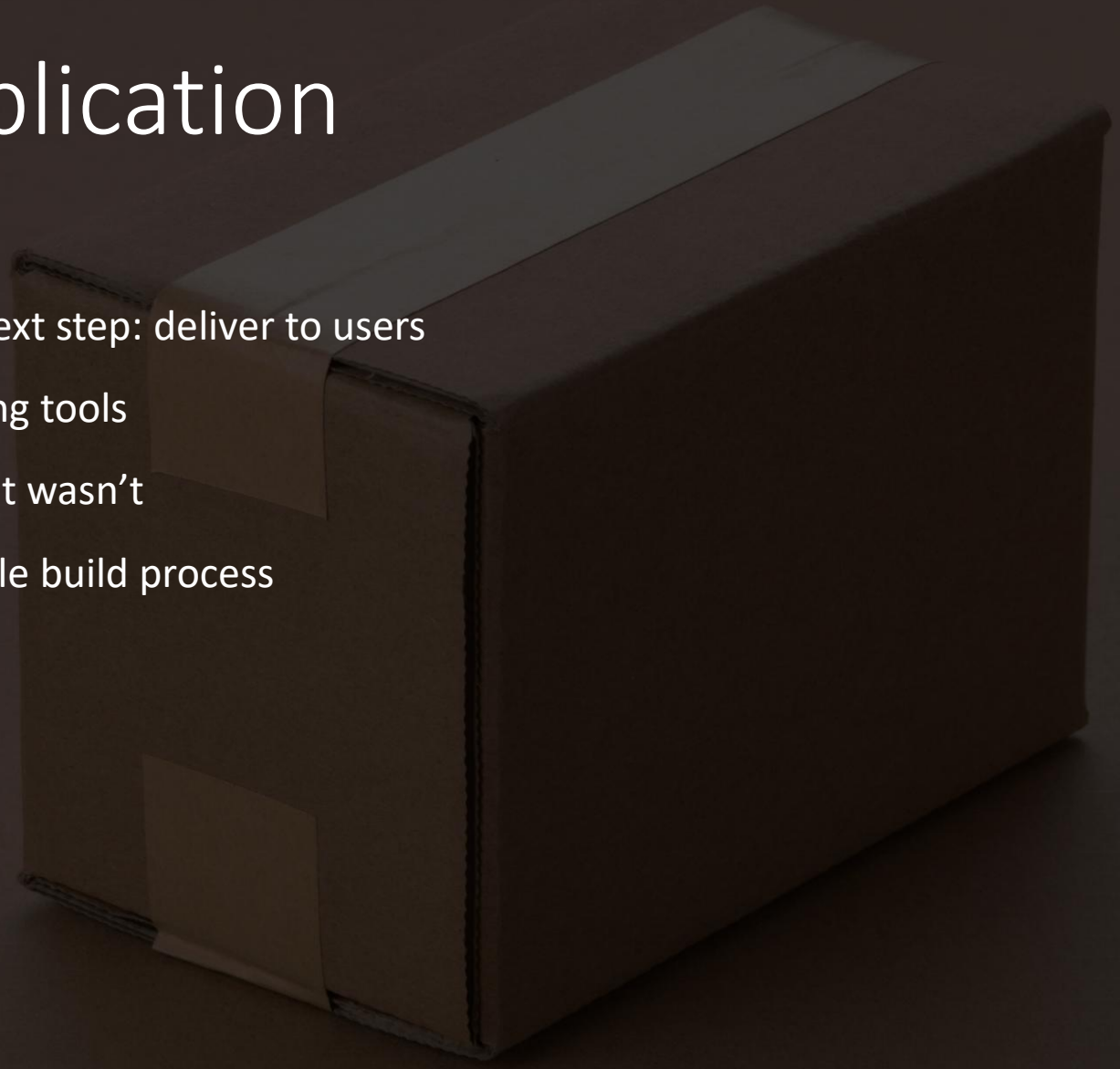
Controller - Gluon Storage

- The application uses the Gluon framework, which provides a built-in storage service
- Gluon Storage offers several benefits over standard file storage:
  - Stores files in a private location accessible only to the app
  - Ensures cross-platform compatibility by finding the recommended storage location per platform
  - Automatically deletes files when the application is uninstalled
  - Offers a secure, platform-agnostic method for storing application data

Application Logging

- Use Log4j2 for flexible and high-performance logging
- Configure logger settings using an XML file
- Define log output file in the configuration
- Instantiate logger in each class
- Use logger to add log statements across the application

Packaging Application



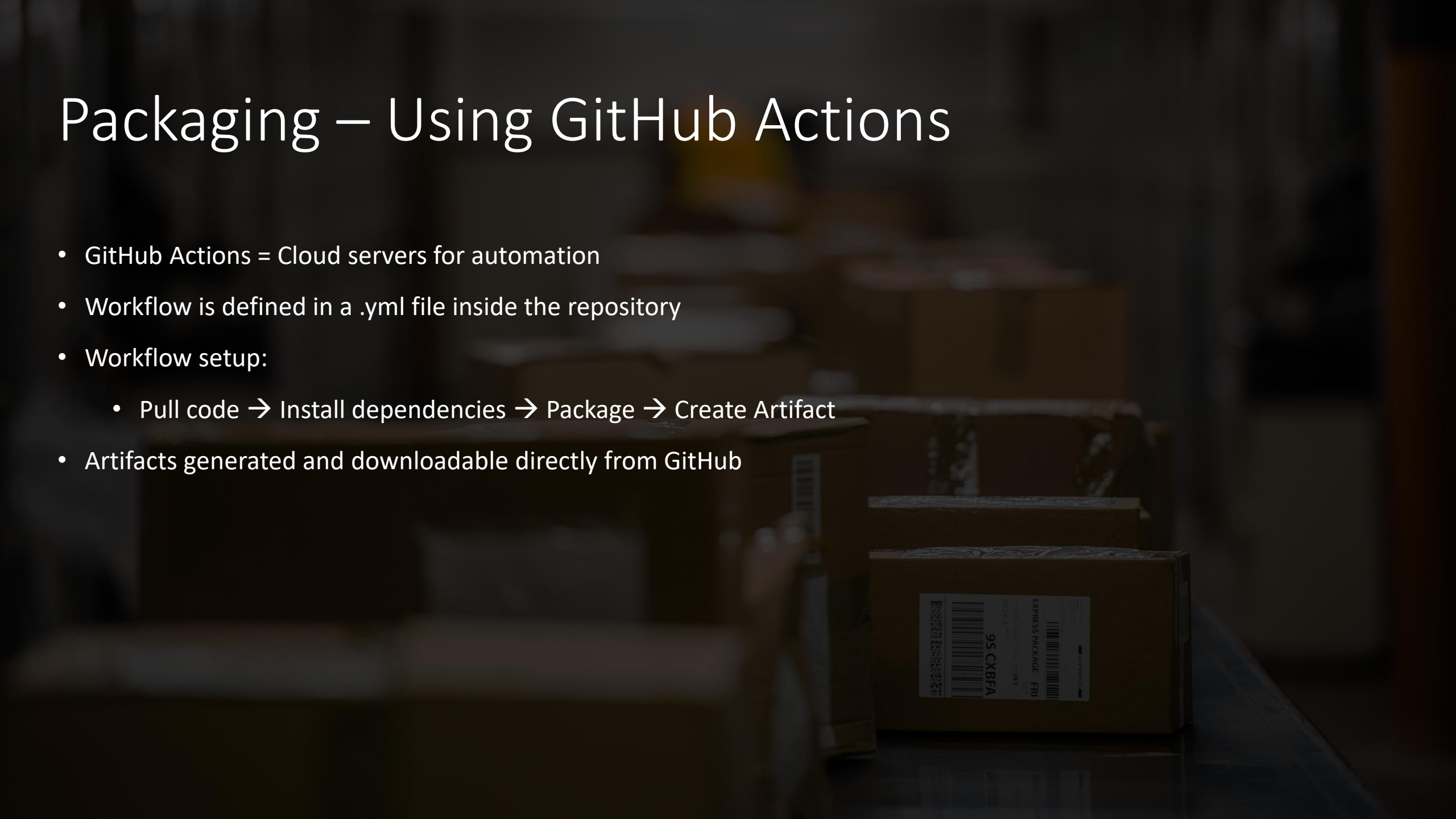
- App worked in development next step: deliver to users
- Gluon provides native packaging tools
- Expected it to be simple… but it wasn’t
- Needed a consistent, repeatable build process

Packaging – Local Issues

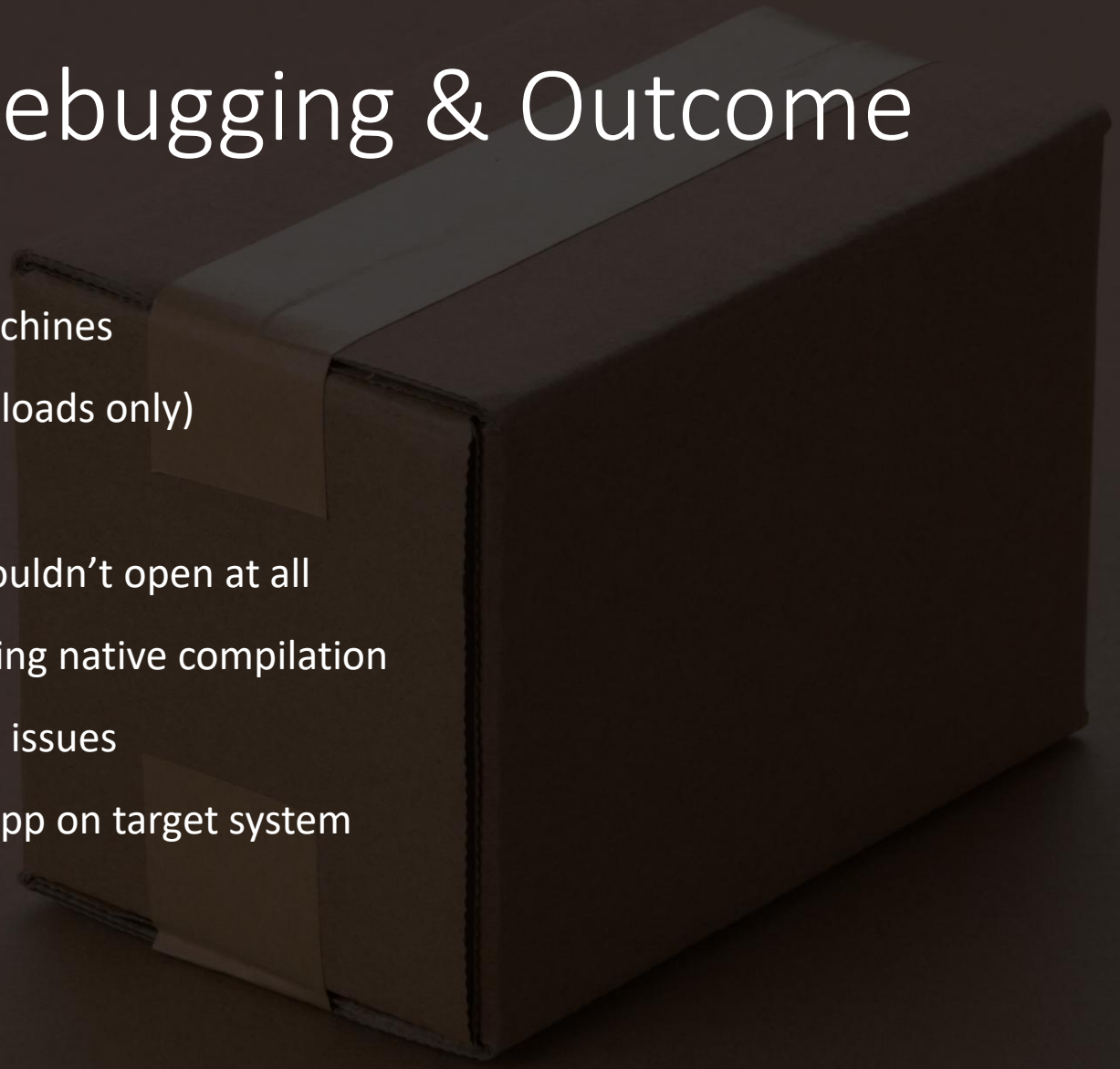
- Ran into dependency problems
- Required many tools to be manually installed
- Local setup was fragile and time-consuming
- Decided to switch to a clean, isolated build environment

Packaging – Using GitHub Actions

- GitHub Actions = Cloud servers for automation
- Workflow is defined in a .yml file inside the repository
- Workflow setup:
  - Pull code → Install dependencies → Package → Create Artifact
- Artifacts generated and downloadable directly from GitHub

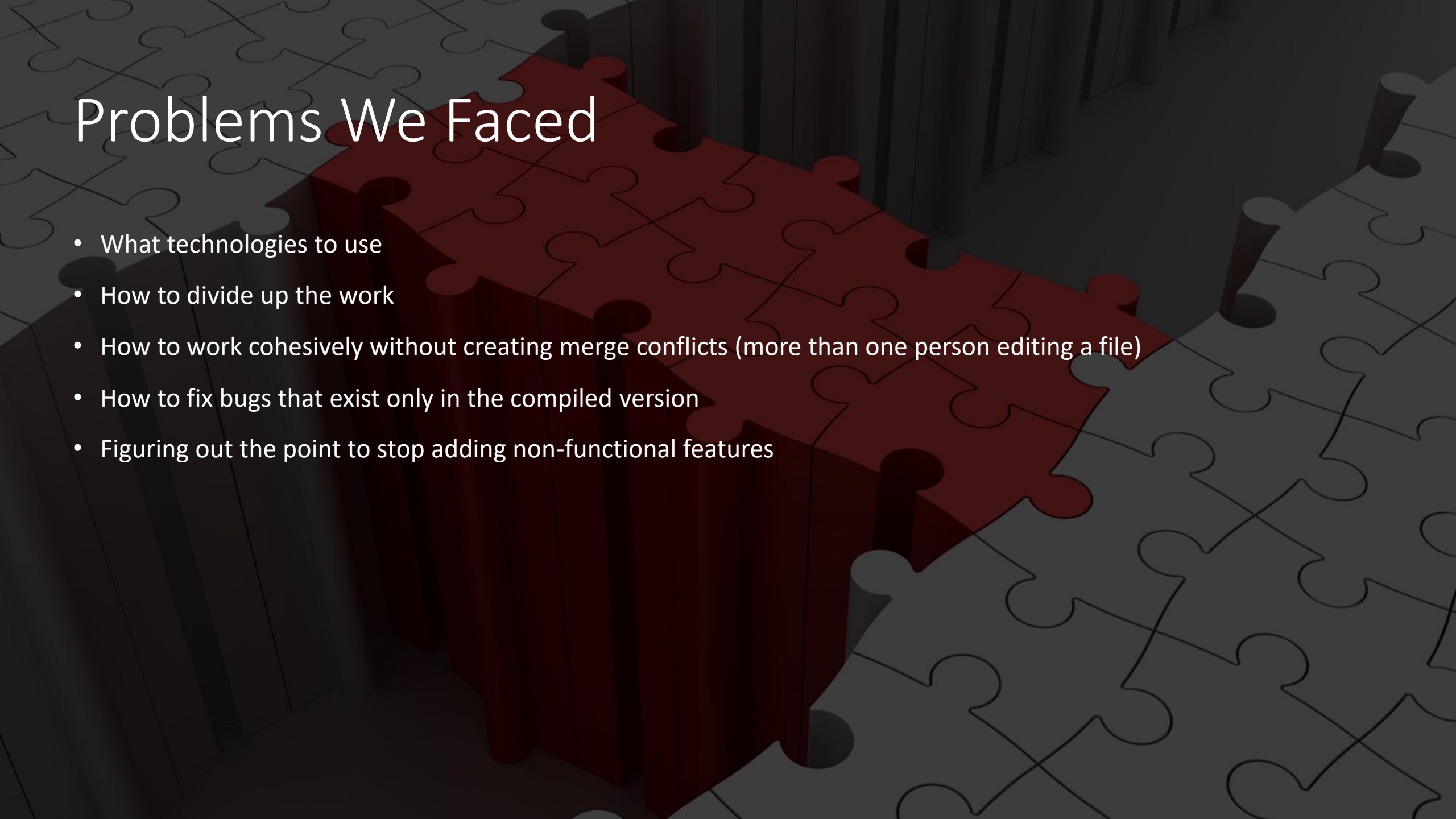


Packaging – Debugging & Outcome



- .exe behavior varied across machines
- Worked on Horizon PC (CSV uploads only)
- Failed on some other PCs
- Added SLF4J logging → app wouldn’t open at all
- Likely dependency conflict during native compilation
- Tried JVM packaging, got same issues
- Final result: partially working app on target system

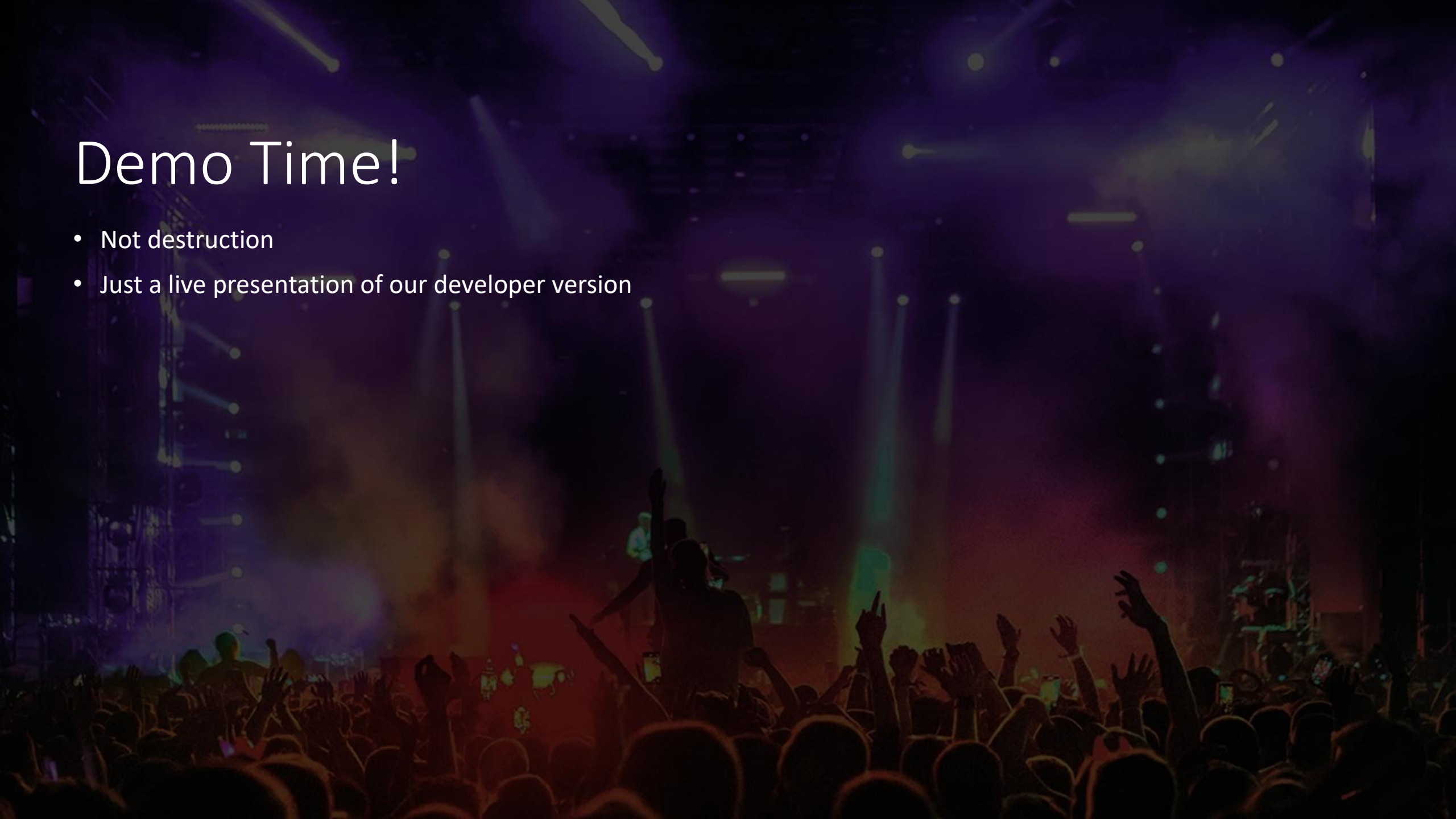
Problems We Faced



- What technologies to use
- How to divide up the work
- How to work cohesively without creating merge conflicts (more than one person editing a file)
- How to fix bugs that exist only in the compiled version
- Figuring out the point to stop adding non-functional features

The Backlog

- Exporting to a formatted file
  - Request of JSON format
- CeL Master sheet implementation
  - Status
  - Updated dates
- Compiled Bugs
  - Drag and Drop functionality
  - Serialization / Deserialization
- Dynamic Loading
  - Load data on original file change



Demo Time!

- Not destruction
- Just a live presentation of our developer version

Conclusion

- This course has been the pinnacle of all that we have learned here at FSCJ
- It was so much fun to collaborate and work our way through developing functional software from scratch!
- We will take what we have learned here to make the software of the future

- Thanks for coming!