CS Capstone Design Document

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Project BoxSand: Shared Whiteboard

Prepared for

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Abstract

The following document describes the design and structure of the AsyncSync software, the purpose and scope of the document and the intended audience. Furthermore, the document uses diagrams to detail interaction between the users and the software, as well as the AsyncSync software interacting with the Canvas Learning Management Software.

1 OVERVIEW

AsyncSync is a web based application that is real-time collaborative software in the form of an interactive whiteboard. The application will allow multiple users to share an online whiteboard on which they will be able to draw shapes, and objects, write equations, share ideas and communicate. AsyncSync will permit users to simultaneously edit a single workspace (similar to Google Docs), record everything drawn or written on the whiteboard and allow the users to communicate. AsyncSync is intended to replace the current online homework system used by introductory physics students at Oregon State University (OSU). The application will be interacting with the Canvas Learning Management Software (LMS) that is used at OSU. Furthermore, the primary goal of the AsyncSync software is generating data about the user interaction with the software, to aid researchers studying the efficacy of the software, and homework system.

1.1 Purpose

The purpose of this document is to provide a description of the design and structure of the AsyncSync software and how users will interact with the system. Additionally, it details the interaction between the AsyncSync software and Canvas LMS. Diagrams are provided to better illustrate these interactions. Furthermore, this document will be used by the development team as a framework to begin implementing the software and track their progress throughout the development cycle.

1.2 Scope

The scope of this document includes the structure and design of the AsyncSync software and covers the user interactions with the software. Furthermore, the document details how the AsyncSync software will interact with the Canvas LMS, and is illustrated with diagrams. Also within the scope, the use of tracking user's interactions with the software and how data will be gathered to for researchers is discussed. This document does not cover in-depth detail of the technologies being used to implement the software.

1.3 Audience

Primarily, this document is intended for the AsyncSync development team that will be creating the software and the stakeholder, Kenneth Walsh. Additionally, the document is meant for future developers that will continue building upon this software in the years to come to help them understand the original design and implementation of the software.

2 DEFINITIONS

1) AWW: A Web Whiteboard, the whiteboard API
2) BoxSand: A website created by the Physics department at Oregon State University to replace textbooks with free learning material.

3 UML AND ERD DIAGRAM

3.1 UML Diagram

Figure 1. UML Diagram

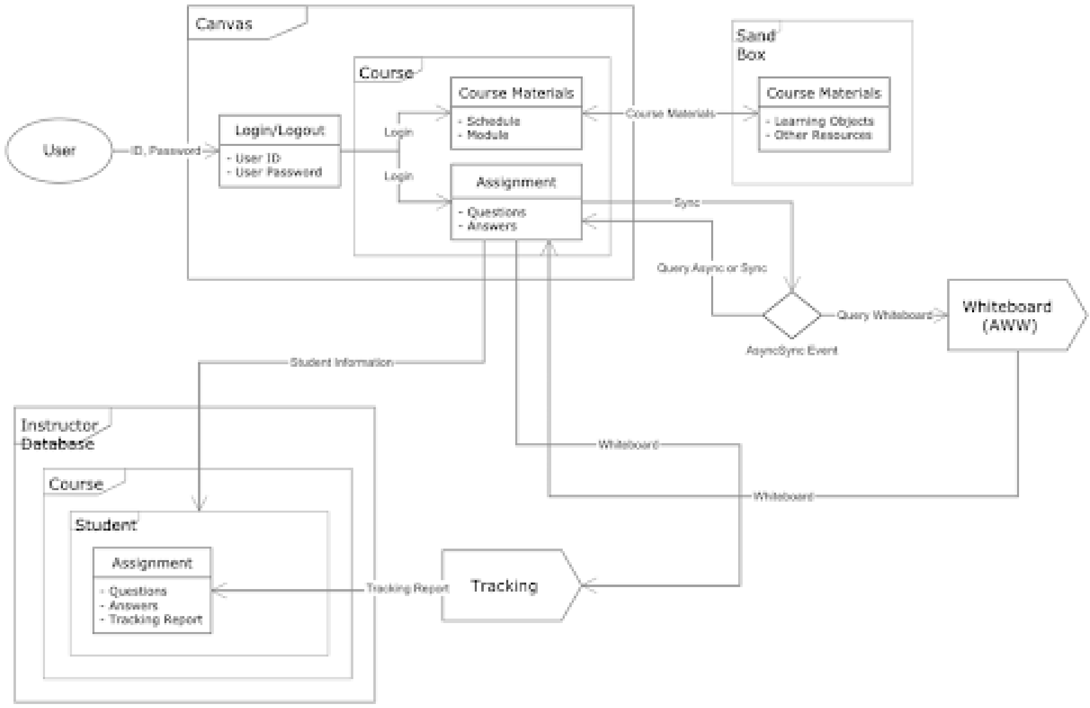


Diagram.png

1) User: Students
2) Canvas: Users can access courses after login into Canvas. They can get course materials, take quizzes and do assignments.
3) BoxSand: A website created by the Physics department at Oregon State University to replace textbooks with free learning material.
4) AsyncSync event: This event asks users to change mode. When they login to Canvas, their mode automatically set up to Async mode. When more than one student works on the same question, it suggests students switch from Async mode to Sync mode.
5) Instructor database: Tracking report is saved into this database. Only instructors can access it, so they can track students' whiteboard.
6) Whiteboard (AWW): It provides a shared whiteboard to students in Sync mode.
7) Tracking: It converts whiteboard information into tracking reports and then sends it to the instructor database.

3.2 ERD Diagram

Figure 2. ERD Diagram

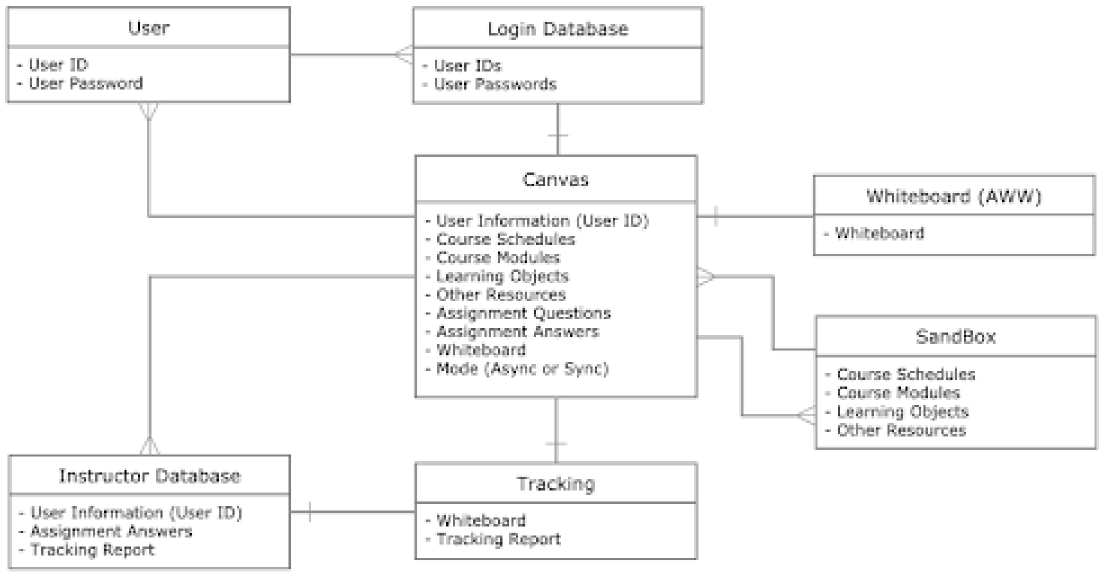


Diagram.png

1) User: A user types user ID and password.
2) Login Database: If user ID and password match, send user ID to the Canvas website, so a user can access to courses.
3) Canvas: Canvas is the hub of the data exchange.
4) Whiteboard (AWW): It provides whiteboards to Canvas.
5) BoxSand: BoxSand send and receive course materials from Canvas
6) Instructor database: It gets user information and tracking reports form Canvas and tracking software. It matches both information and saves.
7) Tracking: It receives whiteboard and then converts to tracking reports.

4 CONCERNS/CONSTRAINTS

Our primary concern is in the ability to gather enough tracking data. The majority of our work will be in connecting students in a shared learning space. The ability to track these interactions relies heavily on seeing which students click what and which tools they use most frequently. This requires all students to remain anonymous in their interactions, which could complicate some of the data gathering. Beyond anonymity, we are restricted to counting API calls in regard to user tracking. Canvas is a proprietary service for security purposes, meaning we cannot see the majority of what happens in the background. However, we are able to run a local Docker instance of Canvas which should make testing much easier.

Due to the security requirements in place by the University, we will not be able to host our web application outside of the Canvas environment. This prevents the open-source and more widely available product we hoped for, but is not a foreseeable issue regarding functionality for the university.

Among other security interests is the need to protect gathered tracking data. With this, there will be no mass database that we have access to for tracking data storage. Instead, the script will output data into a machine readable format to be handled by E-Campus or a future project. This will accommodate for the extensive security analysis required by FERPA regulations.

5 WHITEBOARD INTERFACE AND FUNCTIONALITY

Whiteboard is a tool offered in Sync mode. It is provided when the user accepts the Sync mode query. Canvas should be able to check the number of students working on the same problem. Then, if more than one student works on the same problem, it has to suggest Sync mode to students. If students reject Sync mode, Canvas cannot suggest it anymore. However, students can change from Async mode to Sync mode by clicking on the change mode button. If students accept Sync mode, Canvas requests a whiteboard to AWW. Then, it is offered to students.

Figure 3. Sequence Diagram: Load a Whiteboard

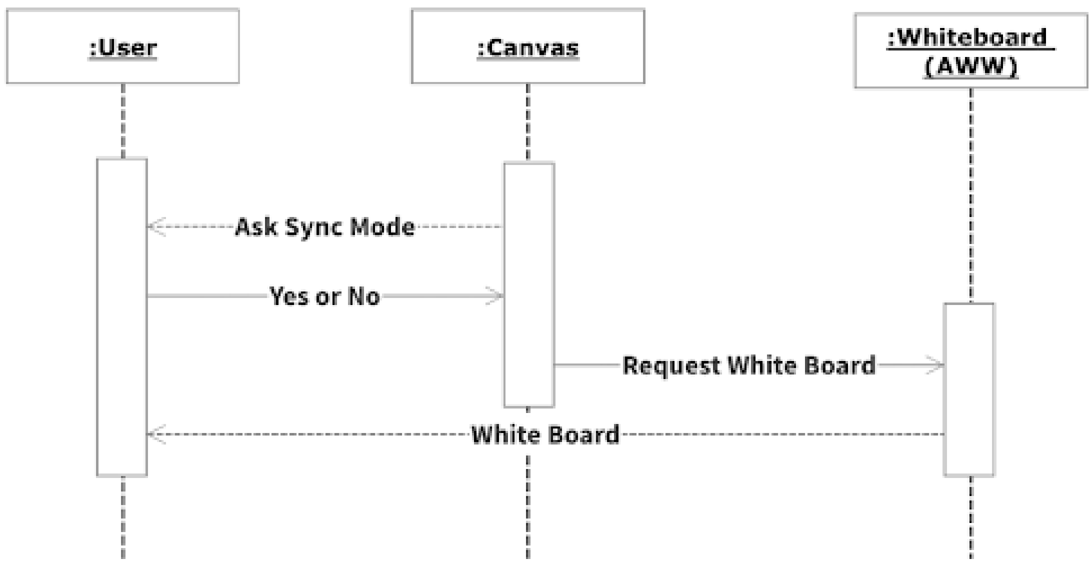
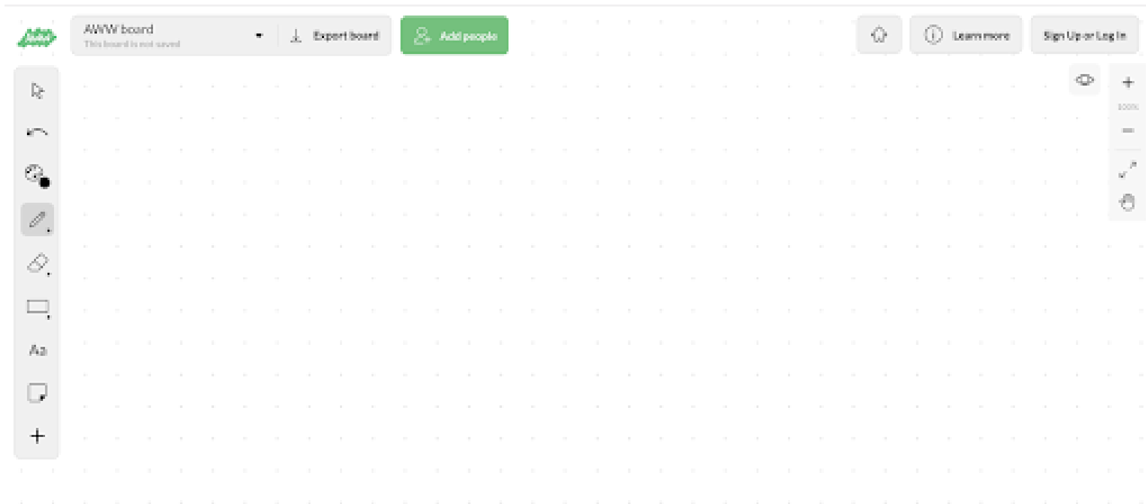


Diagram1.png

Figure 4. AWW Whiteboard



Whiteboard.png

After a whiteboard finish loading into the Canvas website, students are free to draw on it. Canvas read every single change and send it to tracking software.

Figure 5. Sequence Diagram: Read Changed on a Whiteboard

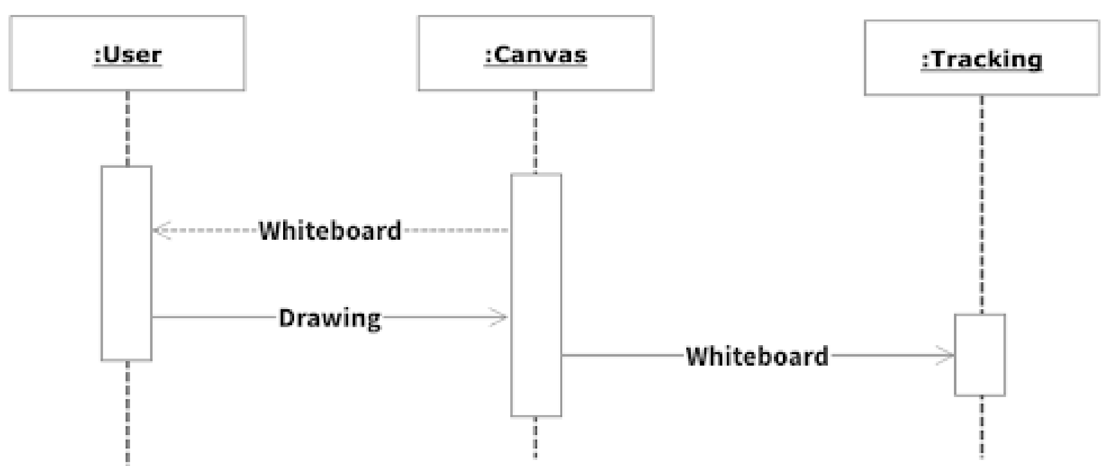
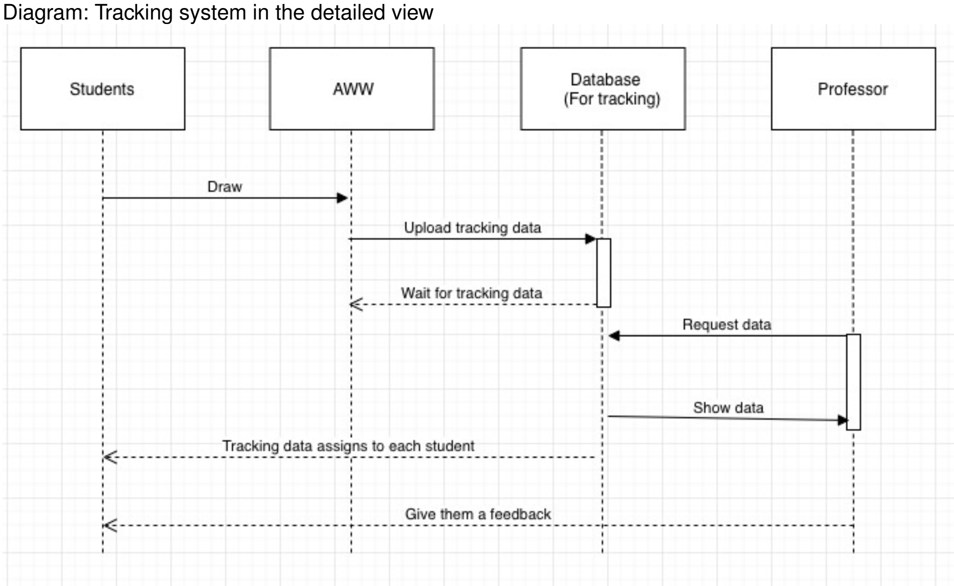


Diagram2.png

6 Tracking System

The administrator, such as professor or other authorized personnel, is the only one to allowed access into the tracking database. In other words, students are never allowed to get into the database. Once student is working on our whiteboard system (AWW), the tracking system will automatically record their work into the database. Since students draw their work on AWW, the database will connect to AWW directly. Students can never control this tracking system. Only the administrator can control the tracking system. For the structure of the database, all tracking data will be mapped to the corresponding students to avoid the conflict. For the professor, he/she can access to the database and see the tracking data by searching student's name. Tracking system doesn't need a immediate response. Since the drawing involves many processes, it is very inefficient for the system to save it as data every time students draw. Therefore, the system will be designed in such a way that the data will be stored every some cycle or the drawing task is completed. After the data is fully accessible and visible by the professor, he/she can give students a feedback.

Figure 6. Sequence Diagram: Tracking system in the detailed view



7 Database

The database is going to be an integral part of the software because collecting data is the main goal of the project and it will need to be stored for later retrieval. Once the data is generated from the tracking the users on the frontend, it will be moved to the backend to be stored in a database. A MySQL database will be implemented to store all the information that is being tracked on the frontend of the application. The data will be stored into the relevant tables that the client will be able to access the data and perform queries to retrieve any relevant data for research purposes. Additionally, users will be able to rewind, or replay the drawings they have previously created and saved to the database.

8 Conclusion

In conclusion, the AsyncSync project is a web software which allows students to collaborate in real-time. It lets students communicate online by offering a whiteboard. Every single change on the whiteboard is saved into the database. AsyncSync project divides into three design parts which are whiteboard and tracking. A whiteboard should be loaded from AWW in whiteboard design. Canvas suggests Sync mode. If students accept, AWW loads a whiteboard into Canvas. Tracking design reports all changes on a whiteboard. Reported changes are saved into the instructor database. AsyncSync is the new style of the education program. It will replace the online physics assignment system. AsyncSync project is expected to improve student learning efficiency.

9 Gantt Charts

Figure 7. Gantt Chart - Term 1

Gantt Chart - Term 1.pdf

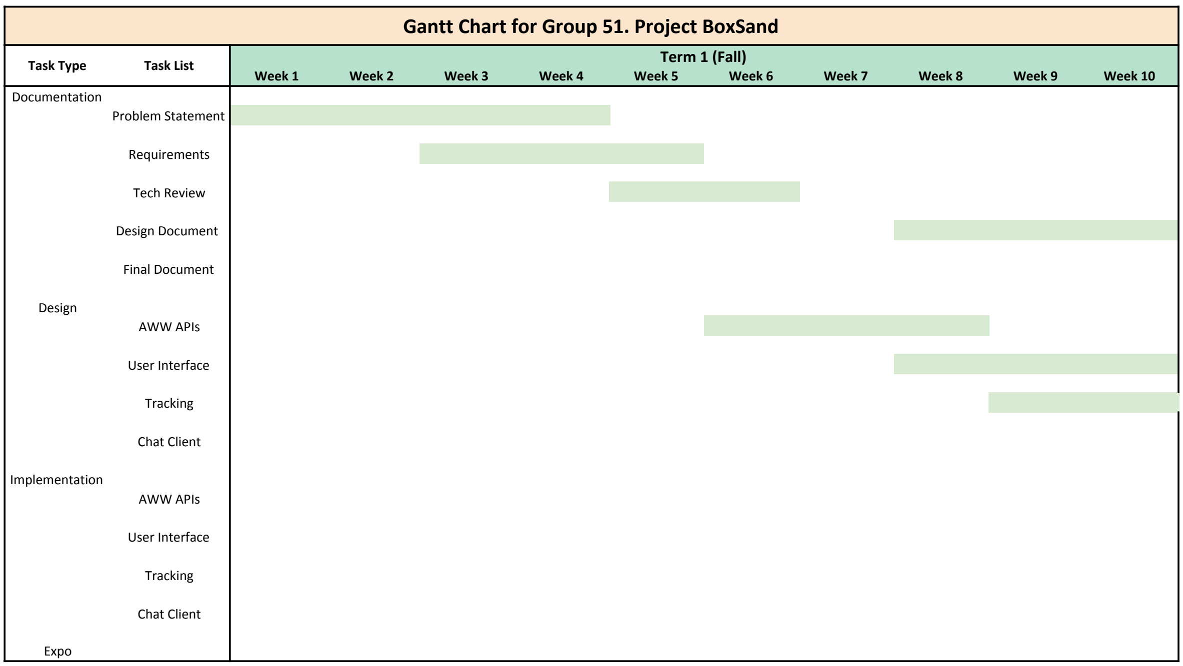


Figure 8. Gantt Chart - Term 2

Gantt Chart - Term 2.pdf

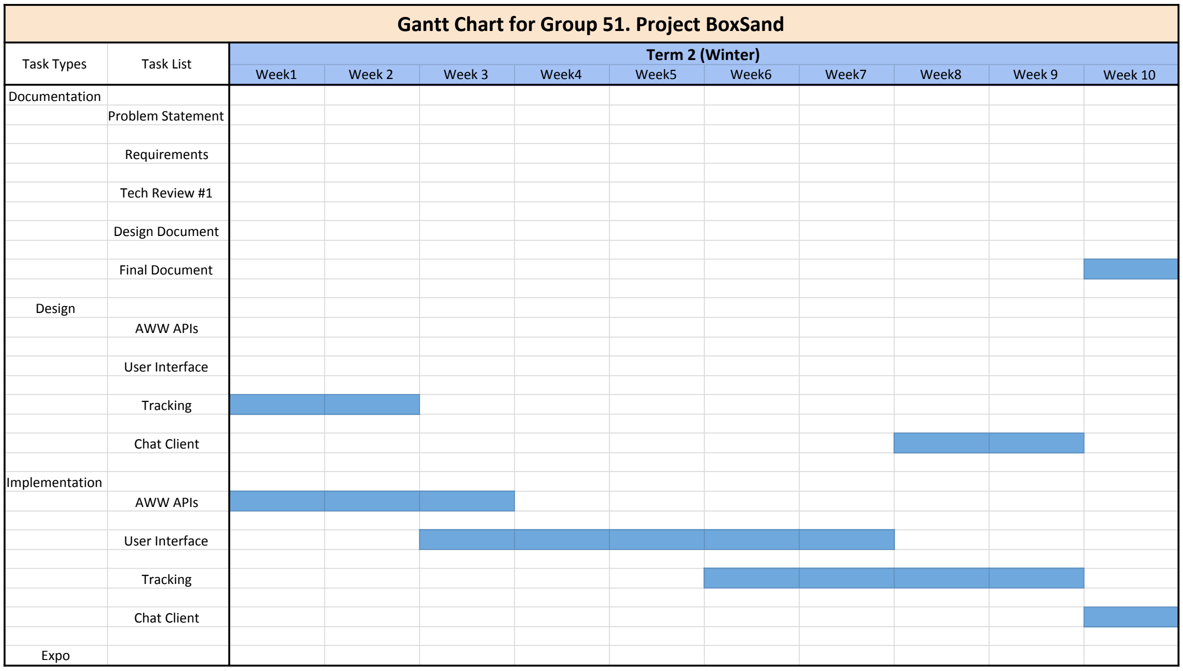


Figure 9. Gantt Chart - Term 3

Gantt Chart - Term 3.pdf