Synchronous

Team 10 Project Backlog

Kevin Wu, Ryan Borzello, Saksham Jain, Shreyas Iyengar

Problem Statement

Collaborating with teammates on small projects is commonplace in college and the workforce, yet setting up a workspace for the team with existing tools is cumbersome. Existing services such as Google Drive have the overhead of having to share the documents with each team member, and quick collaborative notepad services don't have other useful features such as chat, file sharing, or whiteboards. Synchronous puts all these features in one place allowing teams to start working together as quickly as possible. With Synchronous, users can set up a workspace with a custom URL, and other members can easily join by going to the URL. With Synchronous you get real-time collaboration, without the need for creating an account or sending out invitations.

Background Information

Problem

Online work has been surging in popularity during the COVID-19 pandemic due to work from home mandates and off-campus online instruction. Collaborative workspaces are essential tools for connecting users, allowing them to work together in real time. The target audience would include students and workers needing to work together over the Internet. For example, a student might want to quickly create a workspace to explain a concept to a friend through both diagrams and text. Existing solutions for workspaces are more suited for long-term projects by forcing users to save documents to their account's online storage. On the other hand, quicker options dedicated to collaborative text editing lack features crucial to working together on anything other than text documents.

Similar Systems

Online workspaces can be created using existing file storage and sharing services such as Google Drive. These services allow a user to create a folder within their existing storage and share it with other users so everybody can edit documents created in the folder simultaneously. Individual files can be created and shared as well. Registration is required to create and share documents and folders. For anonymous collaborative editing, services such as Etherpad and collabedit exist for sharing of text-only documents.

Notion is another existing product that is dedicated to making easy to share workspaces for teams and projects. It allows for real time collaboration and communication between team members, as well as project tracking, team wiki, and file sharing. It does not offer built in options for drawing and users must log in to edit pages.

Limitations

File storage services are inconvenient because users must register to create files. This problem also exists for Notion and other team workspace solutions. Synchronous will be accountless, allowing users to create shared workspaces and edit files in existing workspaces without signing up.

Anonymous text sharing services solve this issue but do not allow collaborative editing of documents that are not text. To share whiteboards or files, one must find a different site offering those specific features. Synchronous will gather many useful features such as text editing, whiteboards, chat, and file sharing into one place while making the workspace customizable so users won't have unwanted features cluttering screen space.

To share a folder or document with existing file storage services, users must go through many clicks to create the document and change its sharing settings. It is also easy to incorrectly select a permission setting while sharing a document, causing pain down the road when others can only view the document but not edit it. Synchronous aims to allow for creating a workspace in one click. Existing workspaces can be accessed by visiting its URL in the browser or entering its unique ID. This eliminates the trouble of sharing a document and others complaining that it was not shared correctly.

Requirements

Functional

1. As a team leader, I would like to be able to create a workspace.
2. As a team leader, I would like to set a workspace's unique ID.
3. As a team leader, I would like to be able to password protect my workspace during creation so that unauthorized users cannot access it.
4. As a team leader, I would like to optionally let others view my workspace without a password but have editing privileges be password-protected so I can share something for others to see but not edit.
5. As a team leader, I would like to have my workspace automatically delete itself after 24 hours.
6. As a team member, I would like to be able to access a workspace through its URL.
7. As a team member, I would like to be able to access a workspace by entering its unique ID.

8. As a team member, I would like to be able to send an email out to invite people
9. As a user, I would like to be able to change my nickname in my workspace so that other users can see who is making changes.
10. As a user, I would like to be able to see who else is online in my workspace.
11. As a user, I would like to view a list of previous workspaces that I have opened.
12. As a user, I would like to be able to add a text document app to my workspace that synchronizes the text with all other users and shows what text I am selecting to them.
13. As a user, I would like to be able to view and revert to a point in the history of a text document (if time allows).
14. As a user, I would like to be able to create rich text content in a text document app.
15. As a user, I would like to add suggestions to sections of text in a text document app.
16. As a user, I would like to create a text document app by uploading a PDF document, an Office Open XML document (.docx), or a plain text file and be able to edit the document's contents (if time allows).
17. As a user, I would like to be able to download the contents of a text document app as a PDF document, an Office Open XML document (.docx), and a plain text file.
18. As a user, I would like to be able to add a whiteboard app to my workspace that synchronizes all changes on the whiteboard.
19. As a user, I would like to draw on the whiteboard with multiple colors.
20. As a user, I would like to use different marker sizes for drawing on the whiteboard.
21. As a user, I would like to be able to erase strokes on the whiteboard.
22. As a user, I would like to see other people's pointers in a whiteboard app.
23. As a user, I would like to be able to upload an image to the whiteboard app so that I can draw on top of it.
24. As a user, I would like to be able to download the contents of a whiteboard app as a PDF document, a JPG file, or a PNG file.
25. As a user, I would like to be able to add a chat app to my workspace so that I can communicate with other users connected to the workspace.
26. As a user, I would like to be able to add a file sharing app to my workspace so that other users connected to the workspace can download the file I am sharing.
27. As a user, I would like to be able to share any type of file in the workspace.
28. As a user, I would like to be able to minimize, rearrange, and resize an app without affecting what other users connected to the workspace see so that I can customize my workspace layout.
29. As a user, I would like to be able to view what apps are minimized in the workspace in a sidebar so I can reopen them.
30. As a user, I would like to be able to delete an app so that I can discard its contents.
31. As a user, I would like to download the contents of all apps at once (if time allows).
32. As a user, I would like to upload the contents of all apps to recreate a past workspace (if time allows).
33. As a user, I would like to be able to access the workspace from any device browser.

34. As a user, I would like to split the workspace into multiple workspaces within the same session.
35. As a user, I would like to be able to submit bug fixes and user issues to the developer.
36. As a new user, I would like to have a tutorial explaining all the features when using the app for the first time.
37. As a user, I would like to be able to edit data in apps if my connection is lost and have my changes be synced when I rejoin the connection.

Non-functional:

Hosting
Synchronous will use Firebase Realtime Database with JS to sync changes without using SQL. We believe that it will allow us to edit data offline as well as re-sync when finding a stable connection. The Python-based backend that assigns rooms and serves static content will be hosted on a Vultr virtual private server. A new workspace should be able to be created within 200 ms.

Security
Synchronous will provide a platform for teams to create and work on projects. It is imperative that the workspaces they create will not be tampered with. We will implement JWT to prevent collisions between workspace assignments. In addition, we will utilize JSX with React to enhance security and prevent XSS. Firebase will also ensure proper database security on the host server, as well as real-time updates and tracking to ensure proper database management.

Usability
The interface needs to be easy to learn to use and understand. Since the goal of Synchronous is to speed up team interaction it has to be quick to set up. Users can create new apps in the workspace easily and start work right away with ease. To improve ease of use, we will allow users to set their own workspace IDs so they can be easily remembered and shared. This will allow users to skip the step of sharing a link with teammates.

Performance
Synchronous needs to quickly update and display new changes to the other users. There needs to be low latency, so users can be more efficient and keep their train of thought. We also need to be able to manage the multiple applications within a workspace, so each part can be worked on simultaneously. Using Firebase Realtime Database, we can use data synchronization to quickly update and achieve the desired performance. New updates should be shared within 500 ms.

Resilience

During periods of heavy usage, the website needs to still be able to perform at peak performance. Firebase can handle up to 200,000 connections at once, which should be enough for all operations. This can be improved by expanding the database storage through sharding if demand requires.