

Cadence

A Web-Based Virtual Group Study and Co-Working Platform Using Real-Time Collaboration Tools

Project Proposal

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Abstract—Cadence is a web-based virtual co-working platform intended to support focused study and work through shared presence and synchronized activity rather than continuous direct interaction. The system plans to allow multiple users to join virtual rooms, participate in shared focus sessions using a synchronized Pomodoro-timer, and communicate through lightweight, room-based interaction mechanisms. Users will be represented by static 2D characters whose appearance changes based on their current working state, creating a sense of togetherness while minimizing cognitive and visual distractions.

The platform will be implemented using Django as the backend framework and will incorporate real-time communication techniques to synchronize user presence, session state, and activity status across participants. Instead of focusing on content sharing or social network features, the system focuses on coordinated time management, shared state consistency, and minimal but meaningful interaction. The key concepts of the project are multi-user web application design, real-time systems, and backend-driven coordination, while remaining extensible for future interaction modalities.

Index Terms—Virtual co-working, group study, real-time collaboration, WebSockets, Django, online learning

I. INTRODUCTION

Remote and independent study environments often lack the sense of shared presence that helps individuals maintain focus and accountability. While many collaborative tools prioritize continuous interaction or rich media communication, such approaches can introduce unnecessary distractions when the primary objective is

consistent individual work. Conversely, traditional productivity tools are often solitary, offering limited motivation through social context or shared structure.

Virtual co-working systems attempt to bridge this gap by enabling individuals to work alongside others in a shared digital space. However, existing solutions frequently rely on complex interfaces, heavy client-side processing, or distracting models that are not always aligned with focused productivity. This project proposes a simplified, web-based approach that emphasizes coordinated activity and presence awareness rather than constant interaction.

Cadence aims to be designed as a real-time multi-user web application where participants join virtual rooms and engage in synchronized focus sessions governed by a shared timer. User presence is represented visually through simple 2D characters that reflect working states such as focusing, taking a break, or being idle. Real-time updates are intended to ensure that room membership, session progress, and user status remain consistent across all connected clients. Interaction within the system will be intentionally minimal and context-aware, to support coordination while enhancing focus.

From a software engineering perspective, the project plans to emphasize a backend-centric design and real-time system coordination rather than frontend-heavy frameworks. This will be done to maintain state consistency and synchronize shared timing across all users. It includes concepts such as user authentication, database modeling, shared state management, and real-time communication via WebSockets. Rather than functioning as

a traditional social media platform centered on content feeds or social graphs, the system prioritizes time-based collaboration and presence-driven interaction. The goal of the project is to produce a practical productivity tool and a meaningful space that is scalable and has real-time multi-user web systems.

II. PROBLEM STATEMENT

Many modern social media platforms are primarily designed to maximize user engagement through continuous content consumption, which often leads to distraction, doom-scrolling, and reduced productivity. While students, remote workers, and hobbyists increasingly rely on online tools for focused work and creative activities. For example, existing social platforms such as Facebook, Instagram, and TikTok have algorithms that prioritize engagement and continuous content consumption, encouraging behaviors like endless scrolling and constant notifications that reduce productivity, leading to increased cognitive load, overstimulation, and shorter attention spans. There is a need for a virtual co-working environment that supports structured, distraction-free productivity while still providing a sense of working together, independent of a user's profession or purpose.

This project aims to address the problem by designing a platform for shared accountability and coordinated activity that provides real-time synchronization of shared workspaces. Unlike traditional social media platforms, the system will be designed to support focus rather than engagement for its own sake, helping users feel "together" while working independently.

III. PROJECT OBJECTIVES

The objective of the Cadence project is to design and develop a web-based virtual co-working platform that enables users to participate in synchronized focus sessions while maintaining real-time awareness of other participants. The system is intended to provide a structured and distraction-minimized environment that supports collaborative work for students, remote workers, and hobbyists.

Cadence enables multiple users to join shared virtual co-working rooms and engage in focus sessions governed by a common Pomodoro-based timer. By synchronizing session timing and user activity states across all participants, the system aims to replicate key motivational and accountability aspects of physical co-working environments. The project further demonstrates the feasibility of real-time state synchronization, centralized session

management, and presence awareness through the development of a functional multi-user web application prototype.

IV. PROJECT FEATURES

The Cadence system is designed to provide core functionalities that support synchronized focus sessions, real-time presence awareness, and minimal user interaction within virtual co-working environments. The key project features are summarized as follows:

- User authentication and basic profile management for secure access.
- Virtual co-working rooms with support for both public and private access.
- Real-time updates of user presence and activity status.
- Room-based text communication for brief coordination.
- Static two-dimensional avatar representations reflecting user working states.
- Centralized storage of session data and basic productivity history.
- A clean, responsive, and minimal user interface to encourage focused work

V. METHODOLOGY

The development of Cadence is planned to follow a modular and iterative methodology focused on backend-driven design and real-time coordination. The system is proposed as a web-based application using a client-server architecture, where the backend will be responsible for authentication, session management, shared state synchronization, and data persistence.

Next, in the development process, the team will begin with the analysis and identify core functionalities such as user authentication, room management, synchronized timers, and real-time presence updates. Based on these requirements, the system will be divided into logical modules, including user management, room and session handling, real-time communication, and data storage.

Django will be used as the main backend framework to manage application logic, URL routing, database interactions, and authentication. WebSockets will be used to handle Real-time communication and enable continuous bidirectional communication between the server and connected clients. This will allow synchronized Pomodoro timers, live presence updates, and room-based messaging to function consistently across multiple users.

The frontend will be implemented using standard web technologies, including HTML and CSS, with minimal

JavaScript for handling WebSocket events and dynamic UI updates. This approach will try to reduce frontend complexity while maintaining responsiveness and usability. User interactions such as joining rooms, starting focus sessions, and viewing activity states are handled through server-rendered templates and real-time updates.

Finally, the system needs to be tested iteratively to ensure consistency of the shared state, correct synchronization of timers, and proper handling of user connections and disconnections.

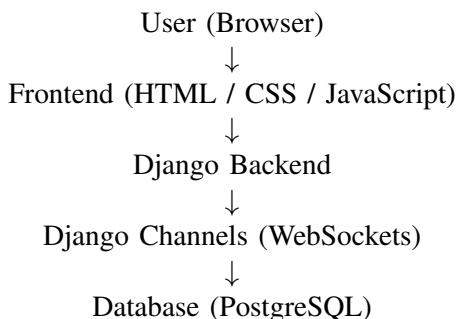


Fig 1. Proposed Web-Application Workflow

VI. USE CASES

Cadence is expected to support sustained focus and consistency during remote study, work, and creative activities by combining structured time management with shared presence and real time coordination.

Use Case A: Group Based Focus Sessions A group of users such as students preparing for exams, remote workers completing tasks, or hobbyists working on creative projects may join a shared virtual room. Once the session begins, all participants are expected to follow a synchronized Pomodoro based time cycle while observing each other's activity states. This shared timing and presence help create a sense of working together, even though each user is engaged in independent tasks.

Use Case B: Individual Co Working with Presence Awareness An individual user joins a virtual room to work alongside others without engaging in continuous communication, but will have the option to interact with others. By seeing the real time presence and activity status of other participants, the user remains aware of a shared working environment. By following this plan, the system can promote accountability and reduce distraction, resulting in more organized and productive work sessions.

VII. TECHNOLOGIES USED

Component	Technology
Backend	Django
Real-Time Engine	Django Channels, WebSockets
Frontend	HTML, CSS, JavaScript
Database	SQLite / PostgreSQL
Collaboration	Chatrooms and Shared Timer

TABLE I

TOOLS AND TECHNOLOGIES USED

VIII. EXPECTED RESULTS

The system is expected to improve student focus, reduce procrastination, and enhance engagement through real-time collaboration. By providing a shared study environment, students will feel motivated and accountable, leading to better learning outcomes.

IX. CONCLUSION

Cadence presents a focused and purposeful alternative to traditional social and collaborative platforms by prioritizing productivity, shared presence, and synchronized activity over continuous interaction and content consumption. By planning to combine real-time coordination with an interactive design, the system will support users in maintaining concentration while benefiting from the motivational effects of working alongside others.

Overall, The project hopes to demonstrate practical applications of backend-centric web development, real-time multi-user systems, and shared state management using modern web technologies. Its modular and scalable architecture allows for future extensions such as enhanced analytics, additional interaction modes, or integration with external productivity tools.

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