

Symposium Presentation Document

Project Title: Real-Time Collaborative Cloud IDE with Project Repositories and Access Control

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Event: [Symposium / Conference Name]

Date: 23/11/2025

1. Problem Statement: Challenges in Modern Coding Collaboration

Software development today demands fast iteration and teamwork. However, collaboration often becomes inefficient due to:

- **Environment Mismatch:** *"It works on my system!"*—local configurations differ across machines.
- **Fragmented Tools:** Switching between IDEs, Git platforms, and messaging services interrupts focus.
- **Complex Access Permissions:** Sharing repositories for quick reviews can compromise security.

▶ **Our Vision:** Enable seamless, secure, and real-time collaboration — as effortless as editing a shared document online.

2. Proposed Solution: A Cloud-Driven Real-Time IDE

We built a browser-based development environment that allows multiple users to collaboratively edit, run, and debug code with **zero setup**.

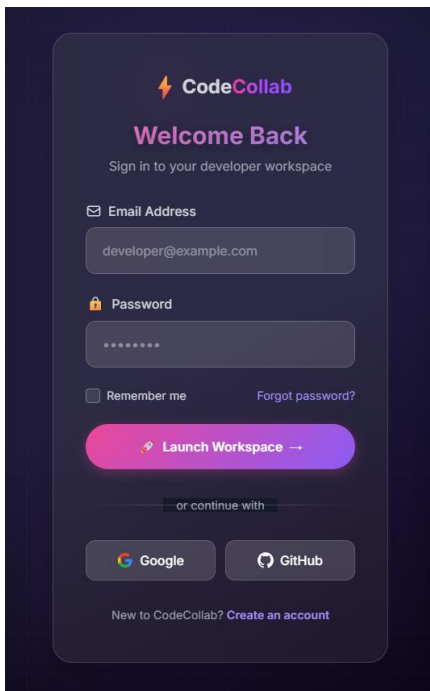
Key Benefits

- **Instant Collaboration:** Join with a single shared link — no cloning required.
 - **Universal Access:** Works directly inside the browser—no installations.
 - **Secure Sharing:** Granular access control for every project.
 - **Professional Experience:** A modern IDE interface with powerful development tools.
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3. Core Functional Features

A. Effortless Onboarding & Project Setup

- Sign in using Google or GitHub.
- Create new projects or import directly from GitHub.



B. Real-Time Collaborative Editing

- Live cursor tracking and instant synchronized code updates.
- Low-latency interaction powered by real-time protocols.

📌 *Insert Image:* Editor view showing two or more users editing simultaneously

C. Secure & Granular Access Permissions

- Collaborators invited via email.
- Role options: **Viewer** / **Editor**

📌 *Insert Image:* Permissions modal with access roles

D. Fully-Featured Web IDE

- **Code Editor:** Monaco-based with autocomplete, syntax highlighting, themes
- **Integrated Terminal:** Execute system commands in-browser
- **Project Explorer:** File/folder management on-cloud


📌 *Insert Image:* Full UI layout — File Explorer + Editor + Terminal

4. Architecture Overview

Our scalable design leverages modern web technologies and real-time infrastructure.

Technology Stack

| Component | Technology |
|------------------|----------------------------|
| UI Framework | Angular |
| Code Editor | Monaco Editor |
| Server | Node.js + Express.js |
| Real-Time Engine | Socket.io |
| Database | MongoDB |
| Authentication | OAuth 2.0 (Google, GitHub) |

 *Insert Image: System Architecture Diagram*
Client ⇄ Socket.io ⇄ Node.js Server ⇄ MongoDB
↓
OAuth Providers (Google / GitHub)

5. Data Integrity & Activity Logging

Every change — from editing a file to modifying access permissions — is fully tracked:

Example Audit Log Entry

```
{  
  "action": "file_updated",  
  "user": "alice@example.com",  
  "timestamp": "2025-10-22T12:00:00Z",  
  "details": "Resolved authentication bug."  
}
```

- ✓ Accountability
 - ✓ Version Transparency
 - ✓ Simplified reversals of unintended changes
-

6. Design Principles: Performance, Security, Reliability

| Principle | Objective | Implementation |
|-------------|----------------------------------|-------------------------------------|
| Speed | Sub-200 ms collaboration latency | Event optimization, local buffering |
| Reliability | Zero-data loss | Auto-save + reconnection recovery |
| Security | Protected code and access | Encrypted tokens, HTTPS, OAuth |

| Principle | Objective | Implementation |
|--------------------|------------------------------|-----------------------------------|
| Scalability | Teams & classrooms supported | Modular microservice-ready design |

7. Conclusion & Future Enhancements

Our platform removes traditional barriers to collaboration in software development. It delivers:


- ✓ Seamless cloud productivity
- ✓ Strong access governance
- ✓ A familiar yet innovative development environment


Roadmap Features

- Support for more programming runtimes (Python, Java, Go)
 - Built-in audio/video for pair-programming
 - One-click deployment workflows
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Thank You!

We appreciate your valuable time and feedback.

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 **Project Link:** [Website / GitHub]