W I D E

Web Integrated Development Environment

Group 17
Adviser - Dr. Goce Trajcevski

Michael Davis - Database Management and Meeting Facilitator
Lily Krohn - Front End Developer and Meeting Scribe
Chris Lopez - Backend Developer and Record Manager
Kyle Marek - Front End Developer and Testing Engineer
Zachary Mohling - Full Stack Engineer and Project Manager
Griffin Stout - Front End Developer and Web Manager

Team Email: sddec20-17@iastate.edu
Team Website: https://sddec20-17.sd.ece.iastate.edu

Executive Summary

Development Standards & Practices Used

- Agile Development
- Continuous Integration / Continuous Delivery (CI / CD)
- Test Driven Development (TDD)
- Potentially Use Pair Programming
- Source Control (Gitlab)
- Task Management Software(Trello or Kanban)
- Backend Documentation (API Docs/Method Stubs)
- Organized file structure
- High level design
- Web design standards

Summary of Requirements

- Application is accessible via Web Browser
- Multiple users are able to collaborate on the same file simultaneously
- Application supports the compilation of C documents.
- Application supports an online text editor
    - Syntax Highlighting
    - Error Detection
    - Auto-completion
- Integrated version control via Git
- Server will store user files
- Backend will support direct peer to peer interaction via websockets
- Automatic file saving
- Support file version control
- Support live edits for files
- User will login to use the application via database verification
- We will need to utilize features of Google Cloud Platform
- Will also be utilizing open source softwares and libraries

Applicable Courses from Iowa State University Curriculum

- COM S 309
- COM S 327
- CPRE 288
- SE 339
- SE 329
- SE 185/ EE 285
- COM S 311
- COM S 363
- SE 319

New Skills/Knowledge acquired that was not taught in courses

- React.js
- Typescript
- Monaco Text Editor
- Kubernetes
- Google Cloud Platform
- Docker
- PostgreSQL

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1. Introduction

1.1 Acknowledgement

Special thanks to Dr. Goce Trajcevski for his help with project planning and development.

1.2 Problem and Project Statement

In a world that is becoming more dependent on cloud storage and cloud computing, there is more of a focus on making software development less dependent on the personal machine. However, almost all software is developed on a local machine by one collaborator at a time. Developing on a machine requires additional steps to share files and download files from the internet. On top of these additional steps, there is maintenance to ensure that the project will be able to run on additional machines. All of these tedious steps and maintenance just simply to run the project can be very time consuming and reduces the efficiency of software development.

The solution we propose to solve these issues is WIDE, a web integrated development environment. WIDE is a web application, meaning it will be accessible through a browser by going to the URL. Through WIDE, users are able to save files, develop software, and run projects all on the cloud. Users will no longer need to download files or upload files from their machine to the cloud. Neither will they have to be concerned with the project running on their machine, because all code can be compiled and executed on the remote server. To top it all off, WIDE will enable the ability for users to collaborate on files together with real time updates. WIDE is the path to a more efficient, and less dependant future for software development.

1.3 Operational Environment

The operating environment of WIDE will be from a device's web browser and served from various public cloud services. The targeted frontend environment will be web browsers of consumer desktop and laptop operating systems.

1.4 Requirements

Functional Requirements

- Collaborative editing of source files
- Built-in Git UI for version control
- Authentication of users for joining and logging into projects
- Autosaving and source history
- Create/Import project
- Execution output and interaction
- Compile and execute artifacts

Non-Functional Requirements

- Fast response time
- Must support an adequate amount of users
- Sufficient storage space available

1.5 Intended Users and Uses

Our intended user is a company with software development teams that doesn't want to spend lots of money or time setting up and installing software on everyone's seperate computer. The intended use is for when teams want to work on the same code at one time without having to install software or have multiple people work together on the same computer.

1.6 Assumptions and Limitations

Assumptions

- Basic security will be implemented (such as database protection)
- Terminal interface is the only way to run a program (No GUI will be shown to the user if they create one in their program)
- Our application will only include text in English

Limitations

- Remote terminal security will not be included at first because it is not necessary for proof of concept of the project and is quite complex to implement
- C will be the only available language at first due to the fact that C is well defined and small, making it a good first language to incorporate
- Advanced security implementations will be lower priority compared to our main features
- Autosave functionality will start as a timed event, given enough time we will implement an autosave on difference within the files
- We will need to utilize features of Google Cloud Platform - budget around $500

1.7 Expected End Product and Deliverables

- Service-oriented Backend System
    - A microservice-based system which supports the functional requirements. Each service will be containerized and orchestrated to simplify deployment and provide resilience.
- IDE Web Application / Editor
    - Our front end will feature a web based-text editor where users can simultaneously edit, debug, and execute code. Our delivery date for this product will be December 2020, at the end of the semester.
- Documentation of Configuration Files

- With the delivery of our application we will also provide documentation of the configuration files which will be used to define the build processes in order to run our app.

2. Specifications and Analysis

2.1 Proposed Approach

We have implemented a basic text editor that we will use to expand on for the rest of our project. We have done this by following our functional and non-functional requirements as listed in section 1.4. The rest of our approach method will be improving our basic text editor and implementing the functional requirements of collaborative editing of source files, a built-in Git UI, the authentication of users when joining and logging into projects, autosaving and source history, and many more. We will also have the non-functional requirements of fast response time, allowing for support of adequate amount of users, and having sufficient storage space available.

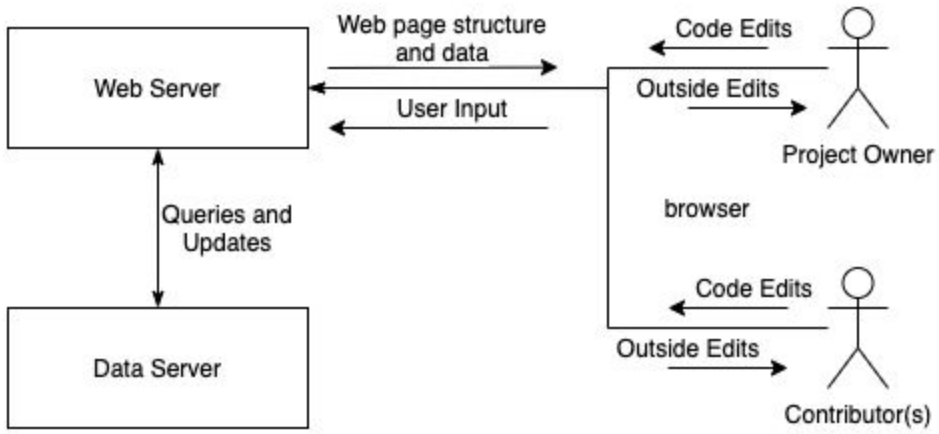
2.2 Design Analysis

So far we have set up our gitlab repository, done research on the technologies we will need to implement in our project, and created a basic implementation of the text editor that our project will be based upon. We have made several conceptual diagrams to organize the layout of all of the components that will make up our project. Through meetings with our faculty mentor, we have identified assumptions and loose ends present in our project and have developed several use cases and scenarios to support our project ideas. So far we have made good progress and we will continue by solidifying our use cases and progressing on development based on this.

2.3 Development Process

We will be following an Agile Development Process featuring 2 week sprints. This will allow us to continuously develop and produce code and will allow for easy code refinement. We will also be executing a Test Driven Development process in order to prioritize testing throughout the creation of our project.

2.4 Conceptual Sketch



Multiple contributors will be able to make live concurrent edits in the same file through a web browser. The web browser interfaces with the web server to provide the content and data to the user and the data server. The projects will be hosted on the data server for all purposes. When the user opens a file, the data will be pulled from the data server and continually updated. If another user makes an edit, the changes will be sent to the data server and updated on all other user displays.

3. Statement of Work

3.1 Previous Work and Literature

3.2 Technology Considerations

3.3 Task Decomposition

3.4 Possible Risks and Risk Management

3.5 Project Proposed Milestones and Evaluation Criteria

3.6 Project Tracking Procedures

We will be using GitLab's built in Scrum infrastructure to track our progress during this project.

3.7 Expected Results and Validation

4. Project Timeline, Estimated Resources, and Challenges

4.1 Project Timeline

The project will be completed by December 2020.

4.2 Feasibility Assessment

Some foreseen challenges of our project are that we have lots of functionality that we hope to implement - however, due to the sake of time we will most likely have to cut back on some deliverables. We will aim to implement our main functionality first to our best ability and then expand from there.

4.3 Personnel Effort Requirements

4.4 Other Resource Requirements

4.5 Financial Requirements

Our estimated budget for this project is $500.

5. Testing and Implementation

5.1 Interface Specifications

5.2 Hardware and Software

5.3 Functional Testing

5.4 Non-Functional Testing

5.5 Process

5.6 Results

6. Closing Material

6.1 Conclusion

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6.3 Appendices