Technical Specifications: Eden Fresh

Provided by Team Web Crawlers

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Submission Date: December 15, 2021

1. Product Development Technologies

1.1. Development Hardware

Development computers should be using the 64-bit builds of Windows 10 Home/Pro with feature update 2004+ or Windows 11 with feature update 21H2+, and at least 4 GB of RAM and 128 GB of storage installed, in order to install and run the following development environment software and product development technologies.

1.2. Development Environment

1.2.1. Integrated Development Environment

Visual Studio 2022 Community 17.0.1+ will be used to write code for the product and upload the code to our online source code repository. Uploading to the source code repository upload is reliant on having Git installed and being signed in to a GitHub account, but does not require an additional plugin. Depending on the implementation technologies used, it may be necessary to obtain plugins for those languages or libraries.

1.2.2. Database Client

SQL Server Management Studio will be used for SQL Server database building, administration, and remote monitoring. It creates a remote connection to a SQL Server database, allowing users to send queries and view database contents.

1.2.3. File Transfer Protocol Client

FileZilla Client 3.55.1+ will be used for uploading web application files to the back-end server via file transfer protocol during deployment.

1.2.4. Package Manager

NuGet 5.11.0+ is a package manager included with .Net Core 5. It will be used to acquire software packages for use in development.

1.2.5. Supported Browser

Google Chrome for Windows 10 89 and later versions released before May 2022 must be installed to test our product compatibility with the web browser.

1.2.6. Git

Git 2.33.0+ will be used to facilitate product source code version control on GitHub through integration with Visual Studio Code. Git is distributed version control software that allows for local, offline testing and version branching, but requires additional setup compared to other version control software.

1.2.7. GitHub

GitHub will be used to maintain and control versions of the product source code as well as all project development artifacts. GitHub is an easily accessible online Git repository that requires an account. The repository will be made public to allow the client access to all documents.

1.2.8. Github Desktop

GitHub Desktop 2.9.4+ for Windows will be used for managing a local copy of the GitHub repository. This will allow offline access to up-to-date versions of the GitHub repository contents.

1.3. Product Development Languages

1.3.1. Front-End Logic

Typescript 4.4 will be used to handle logic required for the front-end. Typescript is a superset of Javascript/ECMAscript, that allows for static typing of variables. Typescript supports use of Javascript libraries, but doing so requires additional libraries to define classes for those Javascript libraries, which introduces an additional point of failure if those class libraries are unsupported or outdated. Typescript code is transpiled into Javascript code, meaning that any code using Typescript will take time to transpile before use. Applications include general system

behaviors like input validation and error handling, as well as certain features that will be implemented on the front-end such as the street directions feature.

1.3.2. Back-End Logic

C# 9.0 will be used to develop software for the back-end layers. C# is a general-purpose programming language that supports multiple programming paradigms. Unlike PHP, web development with C# will need the use of libraries like .NET. Applications include general system behaviors (input validation, security, access control), the business logic used for our app's unique features, and for database information processing. C# web development is supported by ASP.NET, and has been pre-approved.

1.4. Software Frameworks and Libraries

1.4.1. Front-End User Interface Framework (pending approval)

Possible Choices: Angular 12.2.8, Vue.js 3.2.19, Vue.js 2.6.14, React 17.0.2

A front-end framework will be used to assist Single Page Application front-end development. It will provide JavaScript/TypeScript libraries for development of the user interface to make it compatible with the SPA architecture. Using a single page application framework will assist in creating the view and viewmodel aspects of our web app architecture, but may also add new points of failure in loss of support or introduction of vulnerabilities in code.

1.4.2. Back-End Framework

.NET 6.0 provides a framework for web app development in the form of ASP.NET. It provides libraries for building web pages, microservices, and other architecture components. While development with C# is heavily supported by libraries like .NET 6 and other third-party packages via NuGet, this also means that our code will gain more points of failure if these libraries lose support in the future or include breaking updates. Use of .NET limits our IDE choice to Visual Studio, JetBrains Rider, and a few more.

1.4.3. Hashing Algorithm Package (pending approval)

Possible Choices: Konscious.Security.Cryptography.Argon2 1.2.1, BCrypt-Official 0.1.109, SimpleCrypto 0.3.30.26

A hashing algorithm package will provide a hashing algorithm to be used for security applications such as user password hashing. The libraries chosen use hash algorithms with a definable work factor, allowing for increased security by deciding how much work each hash requires to perform. However, we must be careful in choosing this work factor to avoid overusing the CPU for only password hashing and starving other processes.

1.5. Database Technology

1.5.1. Database Management System

SQL Server 2019 Express 15.0.2000.5 and later versions released until May 2022 will be used to store and manage back-end access to user data necessary for our app's features. SQL Server 2019 Express is licensed for use in production environments, but database files are limited to 10 GB at most. Furthermore, if we plan to use the SQL Server Language extensions with SQL Server, our back-end language choice will be limited to Java, C#, Python, or R.

1.5.2. Data Access (pending approval)

SQL will be used for database management. It will be used to build the back-end database to store user data and for data queries by business logic software. SQL as a language is only compatible with relational SQL database software - if we plan to use a non-relational database such as NoSQL, then a different language will be used.

1.6. Internet Protocol Libraries

1.6.1. WebSockets Protocol Library (pending approval)

Possible Choices: SignalR, WebSocket-Sharp 1.0.3-rc11, WebSocket.Client 4.3.38

A WebSockets protocol library will be used to enable WebSockets communication between our web server and clients. This will allow us to implement the live chat feature. It should be noted that these libraries were selected for their compatibility with C# and ASP.NET

Core. If we select a different back-end language for our web app, we will have to select a library other than these possible choices.

1.7. Third-Party Services

1.7.1. Street Map and Directions Service

Google Maps will provide information about street addresses, as well as geographical distance and street directions between two given locations. It will be used for input validation, the area search feature, and the street directions feature. Google Maps provides a limited number of free transactions (where a transaction is considered any use of their services, even with an invalid input), meaning that we must be careful with how often our code uses these services during deployment and testing.

2. Project Testing Technologies

2.1. Testing Environment

2.1.1. Testing Platform

The developer's computer will also be used to host the staging environment for testing our web app. While this is not ideal because developers' computer hardware and operating systems will likely differ from the production environment, we cannot afford to acquire a second instance of the same web host. As a result, we must take care to watch the tested components' resource usage and operating system interactions during testing to ensure compatibility with the deployment environment.

2.1.2. Testing Automation Software (pending approval)

Possible Choices: Katalon Studio, Selenium, Watir, Cucumber, TestProject

A testing automation framework will be used to design automated tests of our web app components' functions, in order to speed up testing and deployment. Use of testing automation software may require use of another programming language, such as Ruby to use Watir.

3. Production/Deployment Technologies

3.1. Back-end Web Server Technology

3.1.1. Web Host

Microsoft Azure will be used as the provider for our web host server. A web server host is necessary to host and execute the back-end and web server software, and perform the communication between the front-end and back-end. Azure offers a free tier for virtual machine usage, but will charge for further usage of any other resources (such as private endpoints for communication between the web server and a SQL server, and egress network traffic), meaning we must be careful regarding which resources we use and how much of it we use during development and deployment to control the charges we incur.

3.1.2. Web Server Operating System (pending approval)

Possible Options: Windows Server 2019/2016, CentOS 7

The operating system of the web server we will use depends on which web host option is chosen. The host server's operating system will affect our choices in web server software and potentially other pieces of software needed for deployment. In particular, using a distribution of Linux will prevent us from using Internet Information Services as our web server software, though ASP.NET is compatible with other web server software. As the more often used OS, Windows suffers a larger amount of hacking attempts than Linux distros, meaning that its use entails a stronger focus on security during development. However, using Linux may entail a more complicated security setup. Important to note is that Windows is more familiar to the team than any Linux distro, meaning that use of a Linux distro may require more learning/research to properly use.

3.1.3. Web Server Software

Internet Information Services (IIS) 10.0 will be used to develop software for the back-end layers. It will enable service of web page documents from the host server to end users, as well as additional information necessary to facilitate a single-page app. IIS is limited to the Windows operating system family. Therefore, if the approved web host provides a Linux-based server, possible alternatives for approval include *Apache 2.4*, *nginx 1.21.3, and lighttpd 1.4.60*. ASP.NET also provides a cross-platform web server in Kestrel, which may also be considered.

4. Project Development Tools and Equipment

4.3. Artifact Drafting

4.3.1. Google Docs

Google Docs will be used for team collaboration on artifact drafting. Google Docs allows for live collaboration on text documents and storage on the cloud, but requires an internet connection for live collaboration and to save any changes made to the document.

4.3.2. Diagrams.net

Diagrams.net will be used for developing diagrams to be used in artifact drafting. It provides many types of diagram elements such as UML diagram elements, flowchart and sequence diagram elements, and basic shapes and arrows.

4.4. Agile Planning and Communication Tools

4.4.1 Trello

Trello will be used for Product Backlog publication and to hold other information necessary for team organization such as deadlines, class information, and meeting information. Trello is an online, flexible, card-based management board that supports Agile development

practices. However, using the service requires an internet connection, and it does not record team performance metrics.

4.4.2. Google Sheets

Google Sheets will be used for detailed Sprint and Product Backlog publication and Sprint planning. Google Sheets is an online spreadsheet drafting application that allows for live collaboration and online sharing of spreadsheets. Using Google sheets requires an internet connection.

4.4.3. Discord

Discord (Windows 10 client 10.0.19041+) will be used for live team collaboration and discussion through text. Discord is a live chat service that allows for group messaging and file uploads.

4.4.4. Zoom

Zoom 5.7.7+ will be used for live team collaboration, daily standups, and communication with clients for feedback and demonstrations.