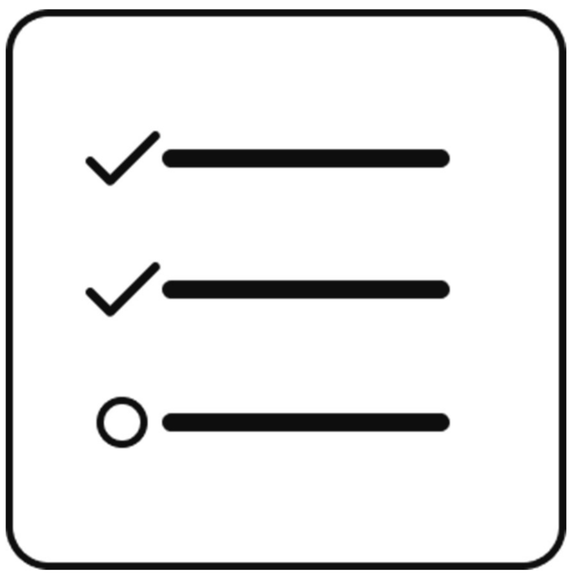
Software Engineering

Capstone Application



Capstone Project Name: Product Backlog

Student Name: Joseph Hurd

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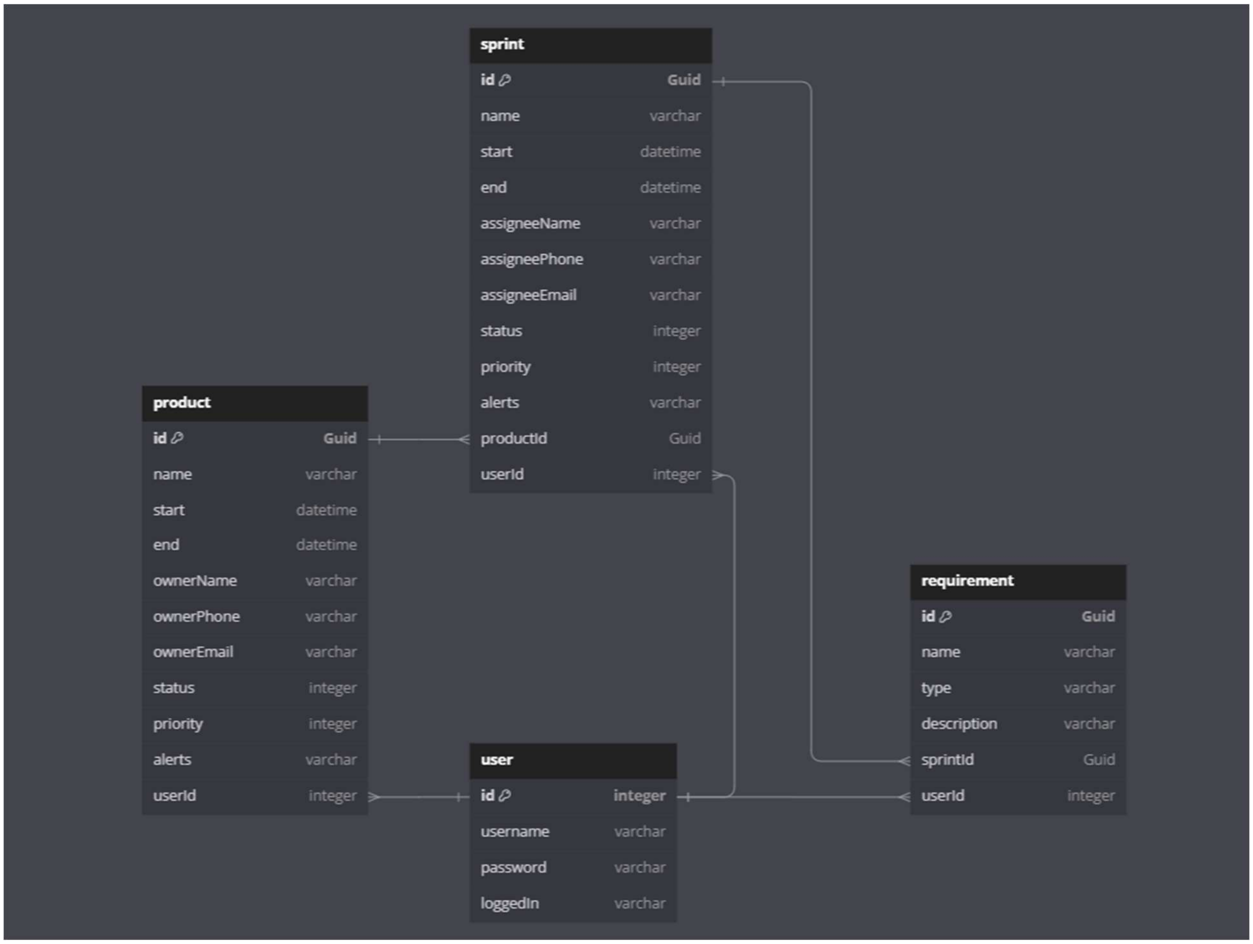
Application Design and Testing

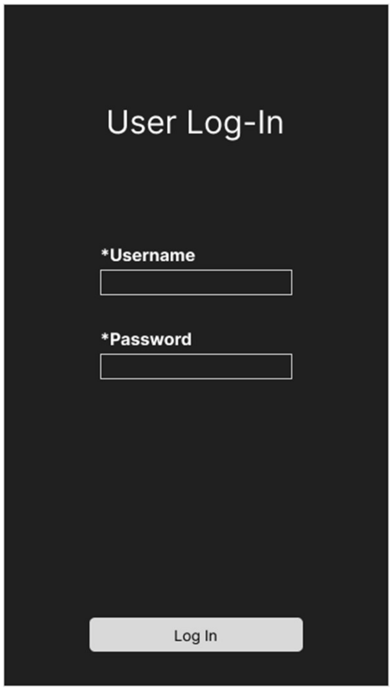
Class Design

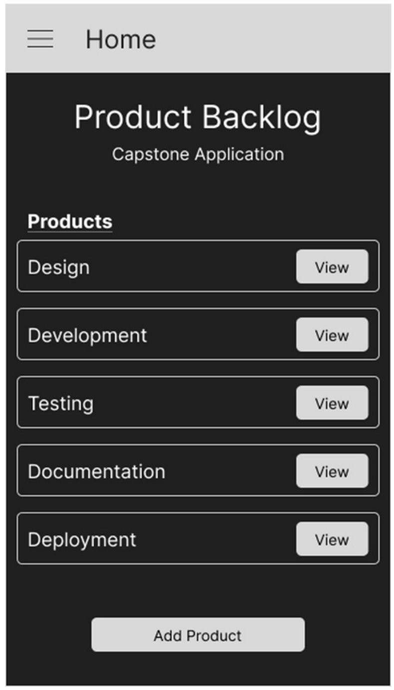
The class diagram below depicts the structure and relationships of the object templates that will enable users to build and manage their product backlogs. A product backlog is used by project managers to track and manage the development of their projects. In this application, every product backlog begins with the user's creation of a single product. However, a complete backlog may contain up to 36 separate products. A product represents a broad overview of the tasks and requirements that need to be completed to satisfy the needs of the client, end-users, and organization. A single product may contain up to 24 tasks. A task can be viewed as an assignment that must be completed to fulfill a specific goal of a product. It is important to note that in this diagram, the object template that represents a task has taken the name of "sprint." This is to eliminate ambiguity between the tasks within a user's product backlog and the .NET framework's System.Threading.Tasks.Task class, which is a critical component for executing asynchronous operations. A single task (sprint) may contain up to 12 requirements. A requirement outlines a condition that must be fulfilled to ensure that a product's deliverable aligns with a specific objective of the organization.

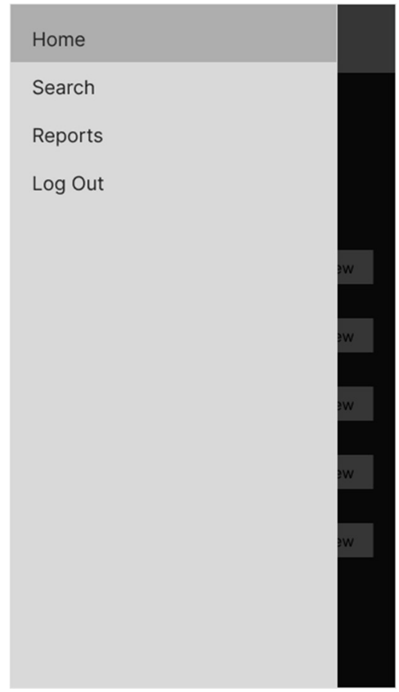


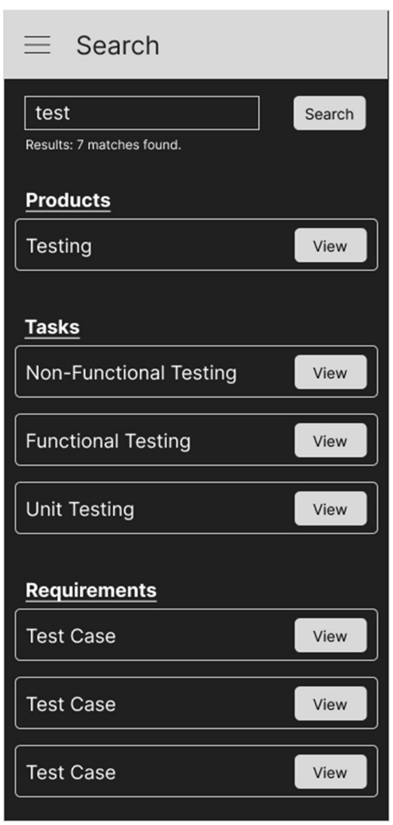
UI Design

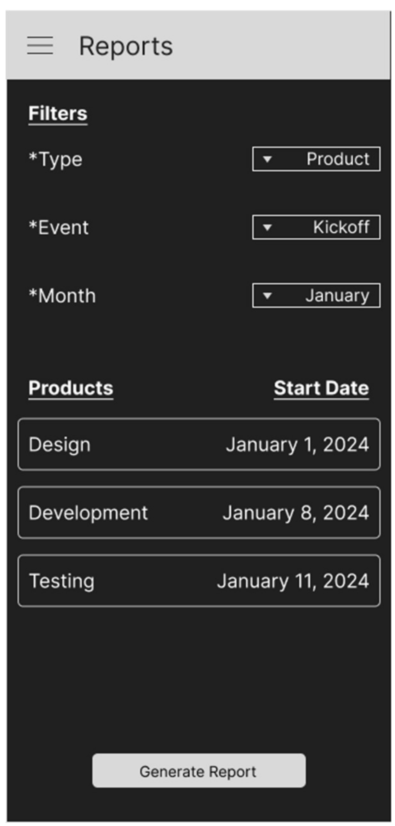
The user interface design aims to provide users with a simple yet intuitive experience. All secondary navigational items are placed within a "hamburger" style menu that offers a familiarity that aligns with conventional mobile application practices. The primary navigation, which users will use to add, edit, and delete products, tasks, and requirements, occurs in a linear fashion. Since products contain tasks and tasks contain requirements, product pages lead to task pages and task pages lead to requirement pages, while a back button with a reversed arrow indicator allows users to navigate to previous pages until they have reached the home page. The user interface is also equipped with dynamic buttons, displays, and alerts that provide visual feedback to ensure the user that their input has been processed and validated.

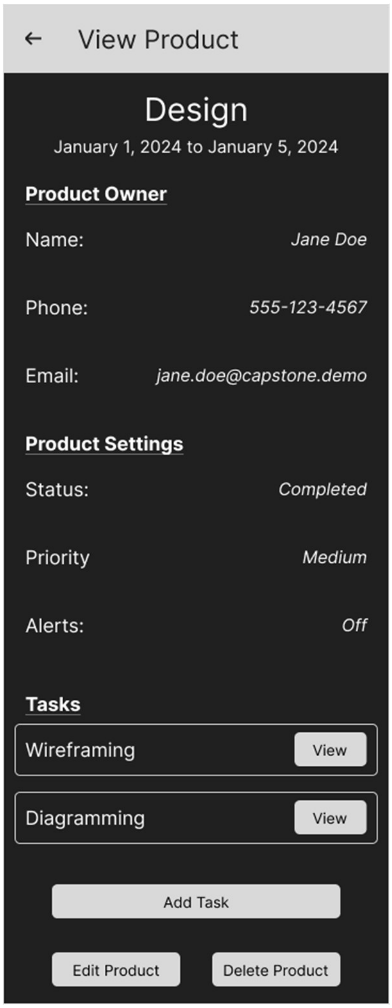


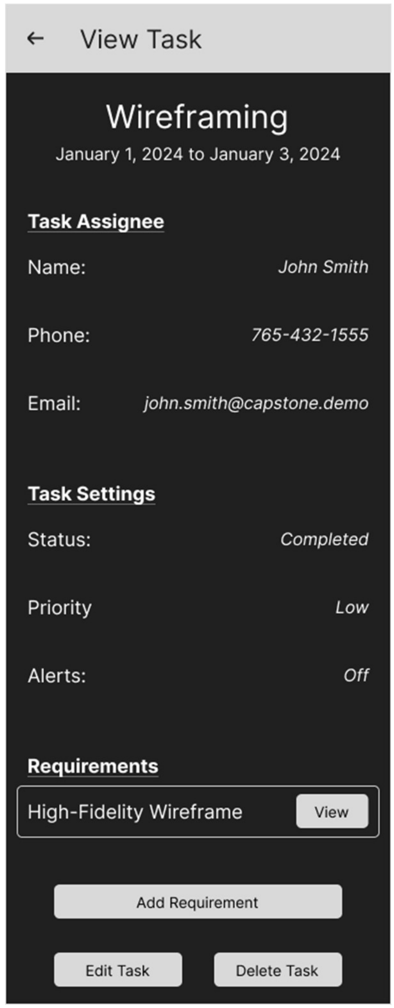









View Product
Design
January 1, 2024 to January 5, 2024
Product Owner
Name: Jane Doe
Phone: 555-123-4567
Email: jane.doe@capstone.demo
Product Settings
Status: Completed
Priority Medium
Alerts: Off
Tasks
Wireframing View
Diagramming View
Add Task
Edit Product
Delete Product


View Task
Wireframing
January 1, 2024 to January 3, 2024
Task Assignee
Name: John Smith
Phone: 765-432-1555
Email: john.smith@capstone.demo
Task Settings
Status: Completed
Priority Low
Alerts: Off
Requirements
High-Fidelity Wireframe View
Add Requirement
Edit Task
Delete Task


View Requirement
High-Fidelity Wireframe
Requirement Details
Type: Design
Description: Design a high-fidelity wireframe that fully illustrates the user interface
Edit Requirement
Delete Requirement

Unit Test Plan

Introduction

Purpose

The purpose of the unit test plan is to ensure that the individual components that make up the application, ranging from front-end user interface elements to back-end CRUD operations, perform as intended.

Overview

Unit testing will be performed to validate the functional and non-functional requirements of the application and to verify the functionality of the individual components. Functional requirements will be tested to ensure that all CRUD operations perform as intended. Non-functional requirements will be tested to ensure that user interface elements and navigation functionalities perform without error. Individual components will be tested to validate important features such as authenticating users, interacting with the user interface, performing searches, generating reports, and adding, viewing, editing, and deleting data.

Test Plan

Items

- Main C# Application Project
- xUnit C# Test Project

Features

- User Authentication: Granting user access to the application based on valid log-in credentials and displaying relevant information to the logged-in user.
- User Interface: Menu navigational elements, dynamic buttons, and accurate displays, alerts, and notifications.
- Performing Searches: Ability to accurately and reliably search products, tasks, and requirements for matching keywords.
- Generating Reports: Ability to accurately and reliably generate reports based on selected criteria filters.
- CRUD Operations: Ability to add, view, edit, and delete products, tasks, and requirements.

Tasks

- Create xUnit test project and add to main application project
- Set xUnit test project referential dependencies to main application project
- Begin unit testing procedures

Needs

Software:

- Visual Studio 2022 Integrated Development Environment
- .NET MAUI Framework v7.0

NuGet Packages:

- CommunityToolkit.Maui v6.1.0
- CommunityToolkit.Maui.Core v6.1.0
- CommunityToolkit.Maui.Markup v3.3.0
- Microsoft.Extensions.Logging.Debug v7.0.0
- Microsoft.Data.SQLite v8.0.0
- SQLite-net-pcl v1.8.116
- Plugin.LocalNotification v10.1.8

Pass/Fail Criteria

- User Authentication:
    - Pass: User is granted access to the application based on valid log-in credentials and is presented only with information that is relevant to their account.
    - Fail: User is granted access to the application based on in-valid log-in credentials and/or is presented with information that is not relevant to their account.
- User Interface:
    - Pass: Menu navigational elements redirect users to the appropriate pages. Dynamic buttons provide visual feedback and perform their intended operations. Displays, alerts, and notifications present accurate information and correspond to the appropriate user settings.

  - Fail: Menu navigational elements do not redirect users to the appropriate pages. Dynamic buttons do not provide visual feedback and/or do not perform their intended operations. Displays, alerts, and notifications present inaccurate information and/or do not correspond to the appropriate user settings.
- Performing Searches:
  - Pass: Search function populates results with relevant products, tasks, and requirements that contain the provided keyword.
  - Fail: Search function does not populate results with relevant products, tasks, and requirements that contain the provided keyword.
- Generating Reports:
  - Pass: Reports are properly generated and ordered based on selected criteria filters.
  - Fail: Reports are not properly generated and/or ordered based on selected criteria filters.
- CRUD Operations:
  - Pass: User can successfully add, view, edit, and delete products, tasks, and requirements.
  - Fail: User cannot successfully add, view, edit, and/or delete products, tasks, and/or requirements.

Procedures

- Write test cases and outline pass/fail criteria
- Run unit tests and analyze results
- Document test results and plan for necessary changes
- Make necessary changes, document changes, and prepare test cases

Results

- User Authentication: Initial tests passed in granting user's access to the application based on valid log-in credentials but failed to display only information that was relevant to the logged-in user. The test passed after modifying the user class to track the log-in status of the active user.
- User Interface: Menu navigational elements, dynamic buttons, and accurate displays and notifications all passed initial tests, however, alerts failed by crashing the application due to being presented before the content page had fully loaded. The test passed after resolving the issue by writing a lambda expression to display the alerts after the content page had fully loaded.
- Performing Searches: Initial tests passed all cases in being able to accurately and reliably search products, tasks, and requirements for matching keywords.
- Generating Reports: Initial tests passed in being able to accurately and reliably generate reports based on selected criteria filters, but failed to organize reports by numerical dates. The test passed after

writing a LINQ query to parse the reports' date strings into datetimes and organize those datetimes by ascending order.

- CRUD Operations: Initial tests passed in being able to add, view, edit, and delete individual products, tasks, and requirements, but failed to delete products with associated tasks and tasks with associated requirements. The test passed after resolving the issue by rewriting the delete functions to check for and delete associated tasks and requirements before deleting products and tasks.

User Guide for Setting Up & Running the Application

Hardware

To setup and run the application, a PC with a minimum of 4 GB of RAM capable of running Windows 10 or higher is required. If debugging on a physical device, an Android mobile device capable of running Android 10 or higher is required.

Software

The Visual Studio 2022 integrated development environment with the .NET MAUI framework are required to successfully setup, run, and maintain the application. If debugging on a virtual device, Android Studio with an emulator capable of running Android 10 or higher is required.

NuGet Packages

The following NuGet packages are required:

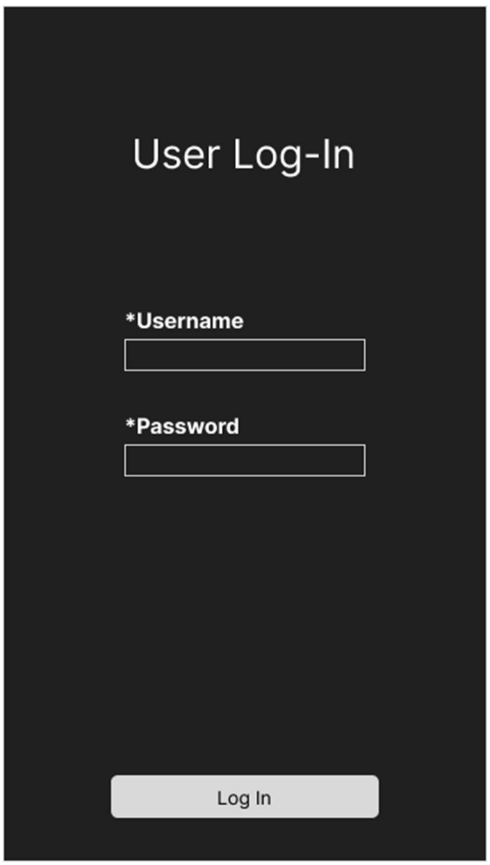
- CommunityToolkit.Maui v6.1.0
- CommunityToolkit.Maui.Core v6.1.0
- CommunityToolkit.Maui.Markup v3.3.0
- Microsoft.Extensions.Logging.Debug v7.0.0
- Microsoft.Data.SQLite v8.0.0
- SQLite-net-pcl v1.8.116
- Plugin.LocalNotification v10.1.8

User Guide for Running the Application from User Perspective

Log-In

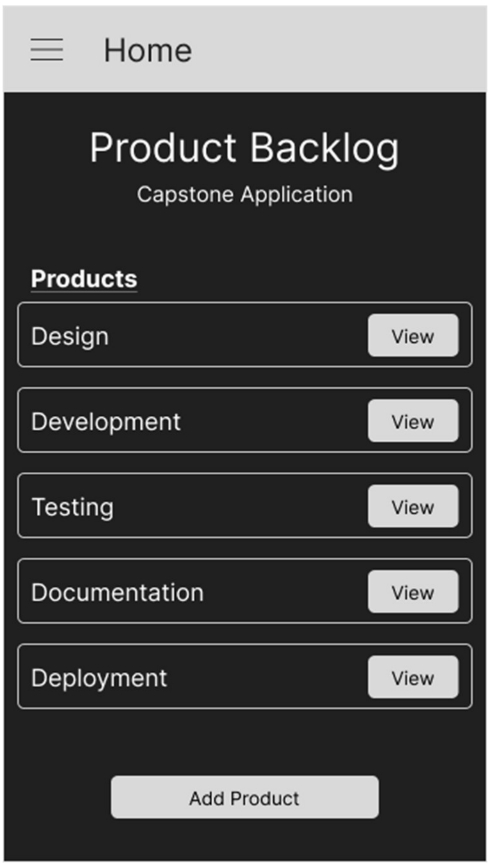
If opening the application for the first time or from a logged-out state, you will be prompted to enter a username and password to access the application's data. The following log-in credentials will grant you full access to the application:

- Username = test
- Password = test



Home

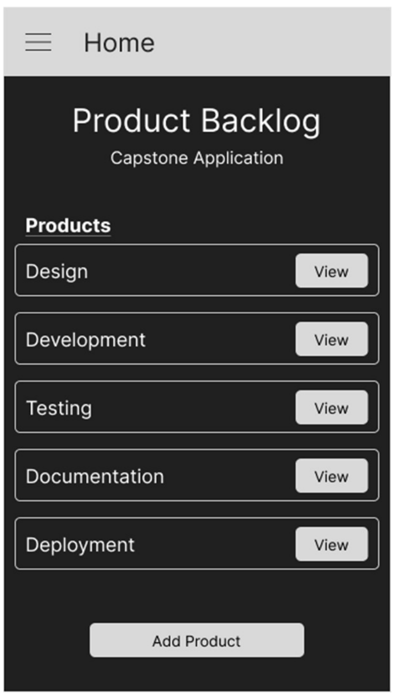
Once logged in, you will be redirected to the home page of the application, which displays a summary list of all the products that are currently within your product backlog. To view a product's details, click on the "View" button to the right of the specific product you would like to view. You may also choose to add a new product to your backlog by clicking the "Add Product" button at the bottom of the page.

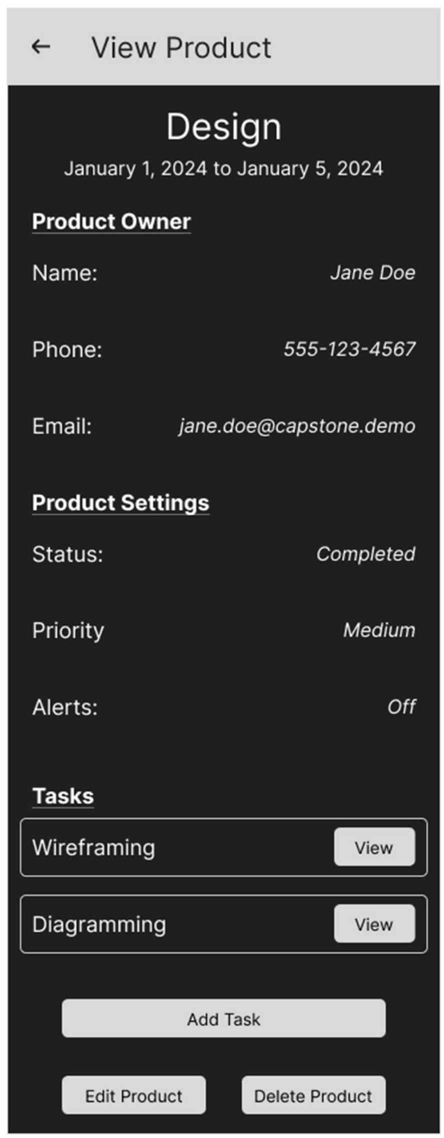


Products

View Product

To view the details of a specific product, click on the "View" button that is associated with the product on the home page. You will then be redirected to the product's view page, where you will be presented with all of the product's information, as well as options to view tasks that are associated with the product, add a new task to the product, edit the product's details, and delete the product from the product backlog.

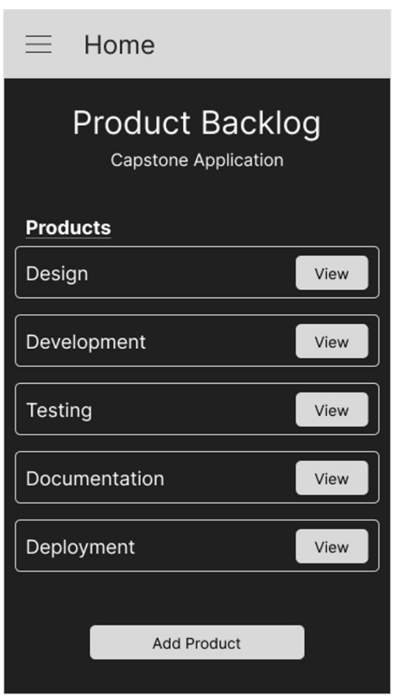


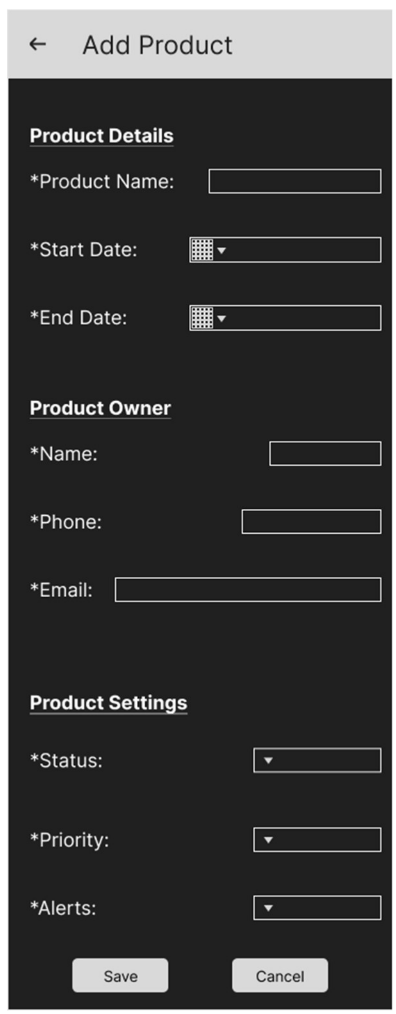


Add Product

To add a new product to your product backlog, click on the "Add Product" button at the bottom of the home page. You will then be redirected to the add product page containing blank fields. Here, you will provide the details of the new product you would like to add to your product backlog. Clicking on the "Save" button at the bottom left of the page will update your product backlog and return you to the home page. Clicking on the "Cancel" button at the bottom right of the page will return you to the home page without saving any changes.

*Note: Fields containing * must be completed to successfully create your product.*

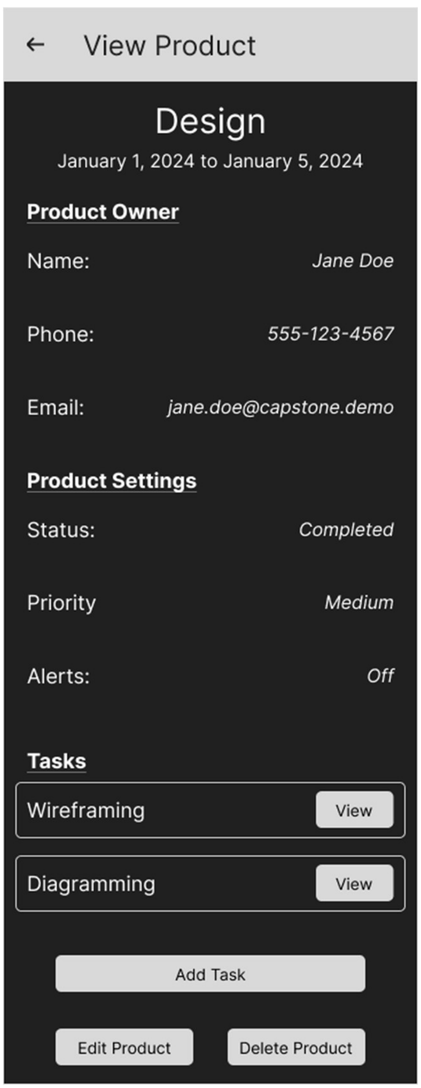


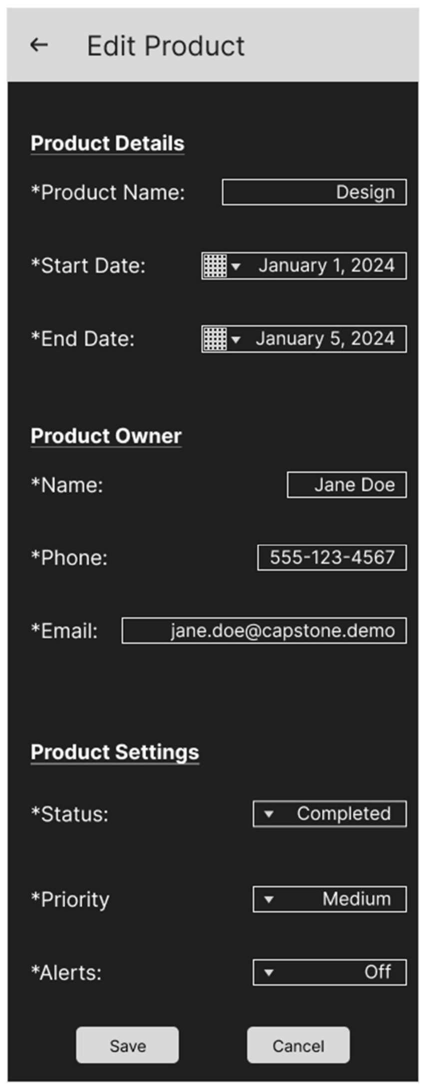


Edit Product

To edit an existing product, click on the “Edit Product” button at the bottom left of the product’s view page. You will then be redirected to the edit product page containing fields that have been populated with the product’s existing details. Here, you may edit the details of the product you have selected. Clicking on the “Save” button at the bottom left of the page will update your product and return you to the product’s view page. Clicking on the “Cancel” button at the bottom right of the page will return you to the product’s view page without saving any changes.

*Note: Fields containing * must be completed to successfully update your product.*

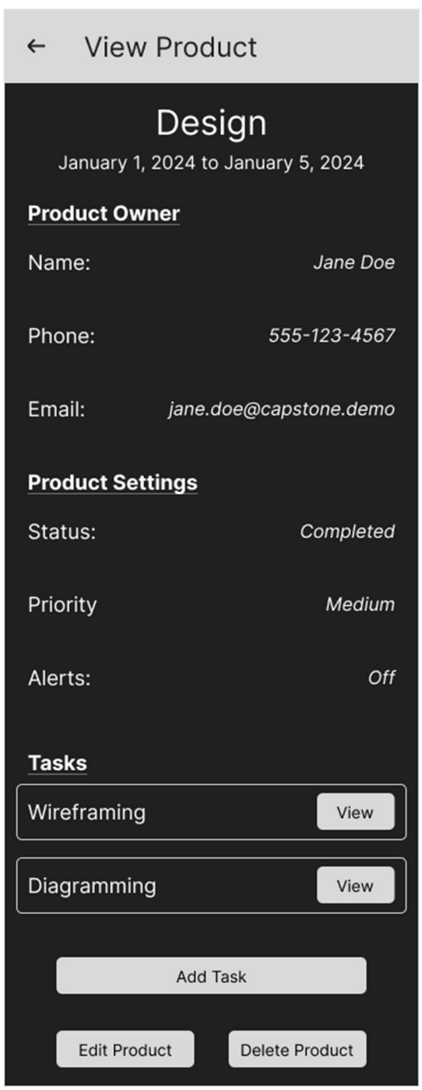


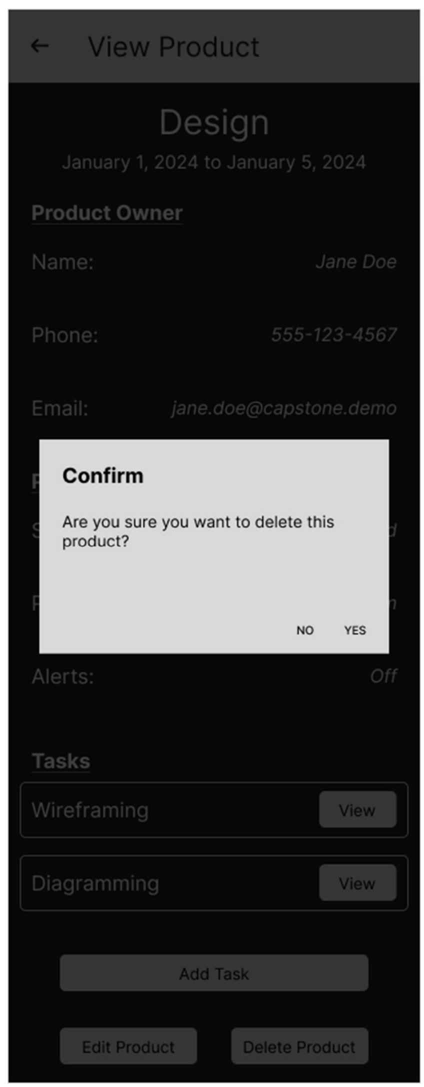


Delete Product

To delete an existing product from your product backlog, click on the "Delete Product" button at the bottom right of the product's view page. You will then be prompted with a pop-up confirmation display. Clicking on the "YES" button at the bottom right of the display will delete your product from the product backlog and return you to the home page. Clicking on the "NO" button at the bottom left of the display will return you to the product's view page without deleting the product.

Note: Deleting a product will also delete the tasks that are associated with it.

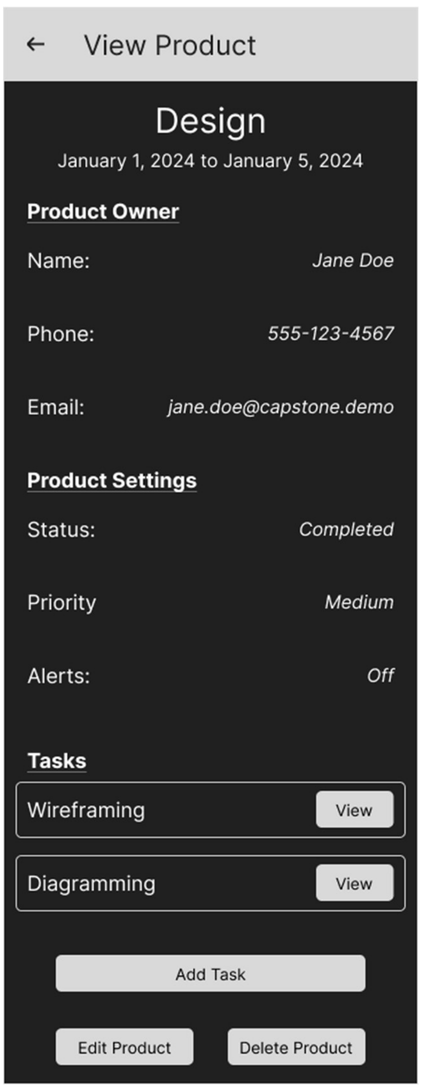


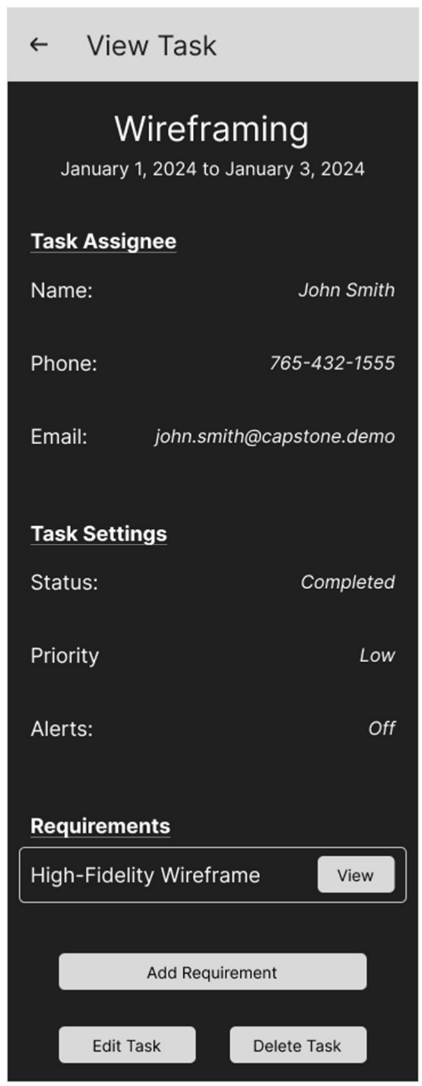


Tasks

View Task

To view the details of a specific task, click on the “View” button that is associated with the task on its product’s view page. You will then be redirected to the task’s view page, where you will be presented with all of the task’s information, as well as options to view requirements that are associated with the task, add a new requirement to the task, edit the task’s details, and delete the task from the product it is associated with.

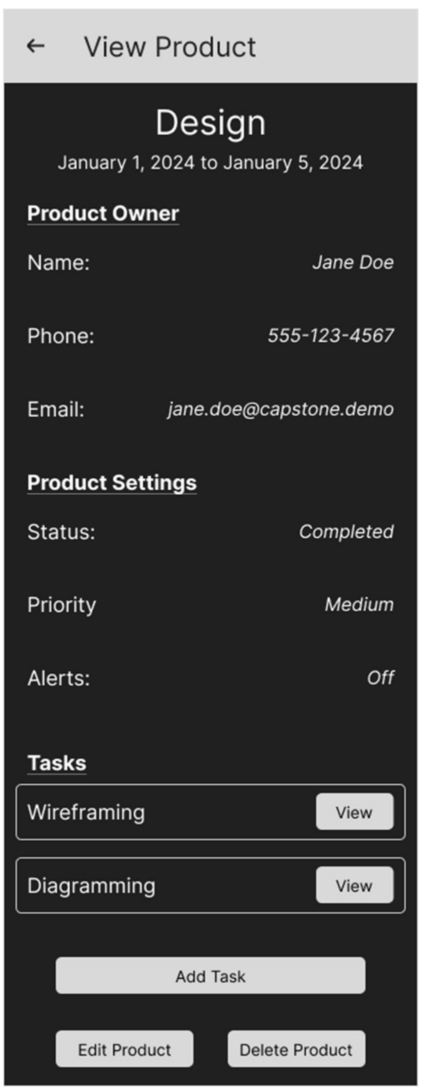


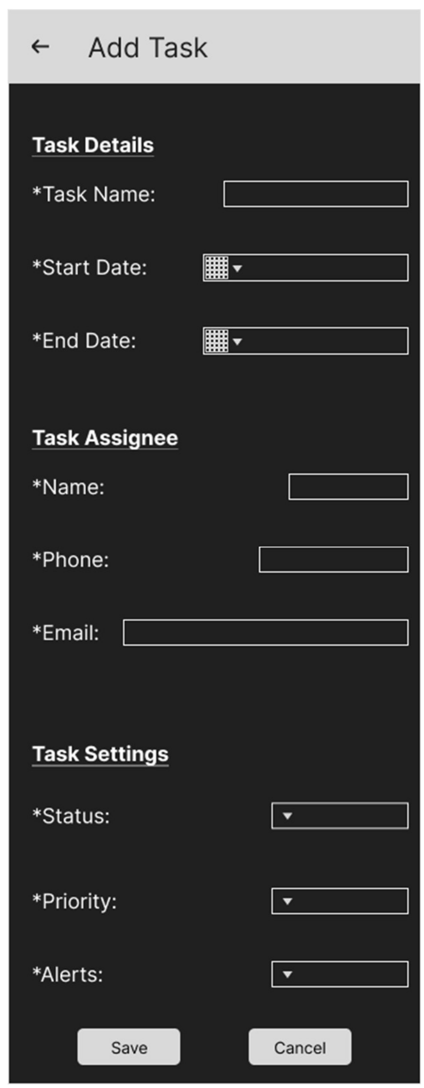


Add Task

To add a new task to a specific product, click on the "Add Task" button at the bottom of the product's view page. You will then be redirected to the add task page containing blank fields. Here, you will provide the details of the new task you would like to add to your selected product. Clicking on the "Save" button at the bottom left of the page will update your product's task list and return you to the product's view page. Clicking on the "Cancel" button at the bottom right of the page will return you to the product's view page without saving any changes.

*Note: Fields containing * must be completed to successfully create your task.*

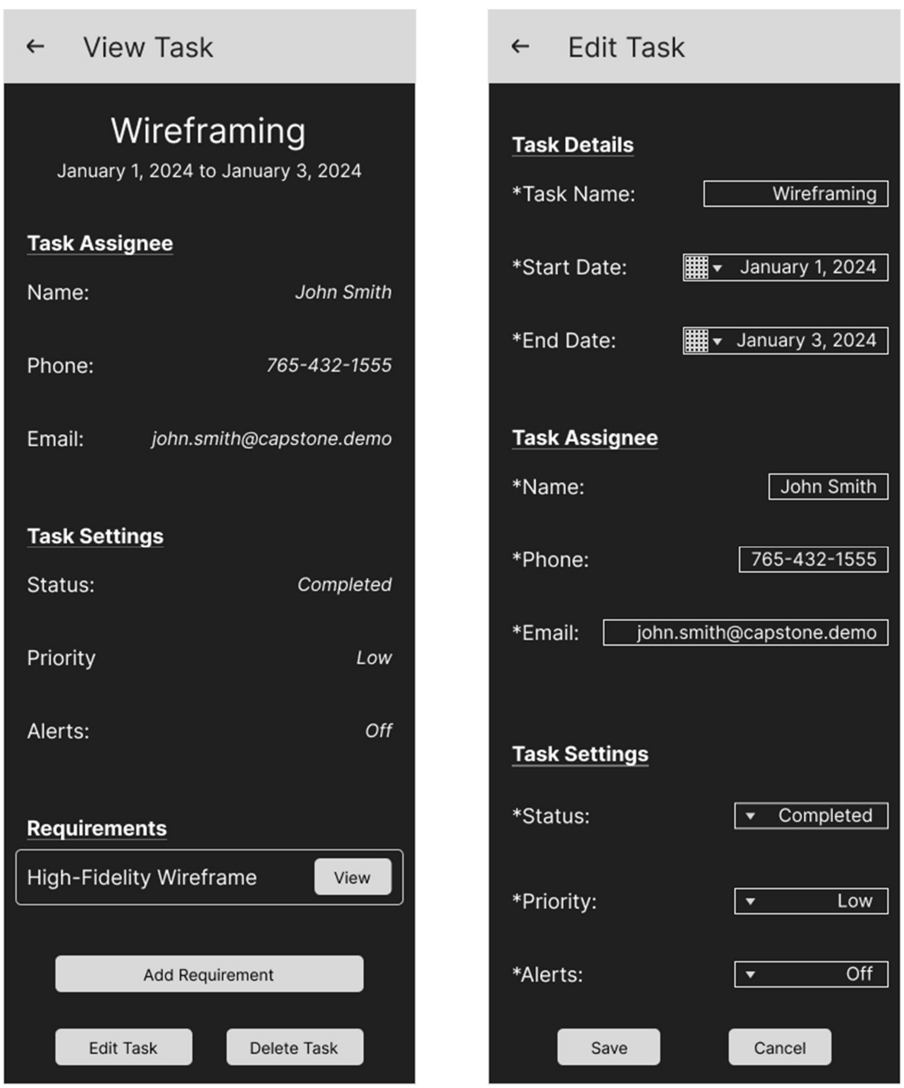




Edit Task

To edit an existing task, click on the "Edit Task" button at the bottom left of the task's view page. You will then be redirected to the edit task page containing fields that have been populated with the task's existing details. Here, you may edit the details of the task you have selected. Clicking on the "Save" button at the bottom left of the page will update your task and return you to the task's view page. Clicking on the "Cancel" button at the bottom right of the page will return you to the task's view page without saving any changes.

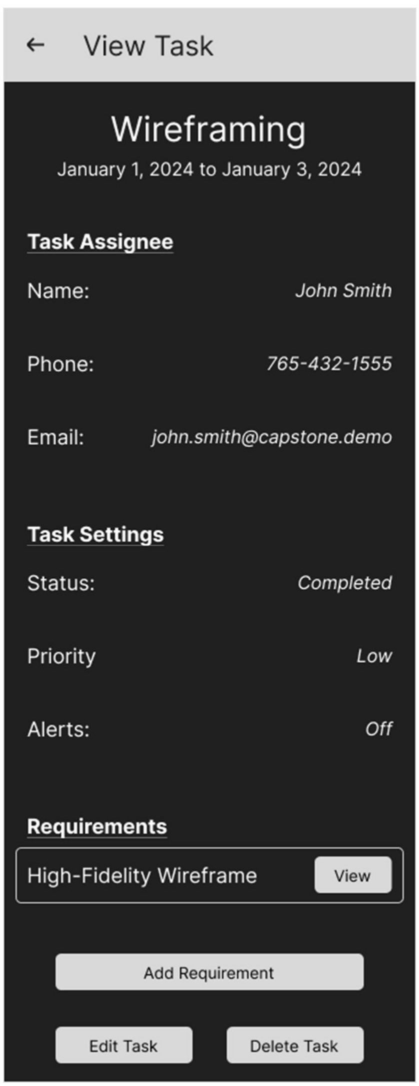
*Note: Fields containing * must be completed to successfully update your task.*

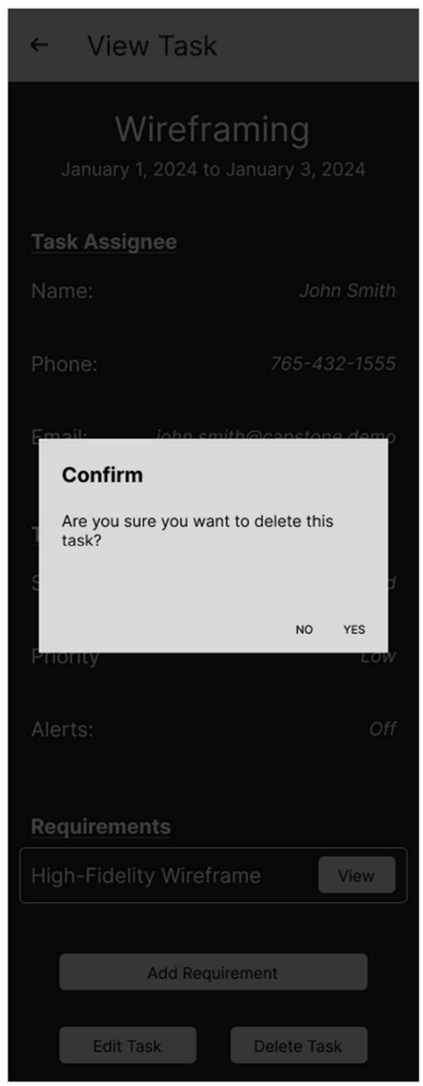


Delete Task

To delete an existing task from a product, click on the "Delete Task" button at the bottom right of the task's view page. You will then be prompted with a pop-up confirmation display. Clicking on the "YES" button at the bottom right of the display will delete your task from the selected product's task list and return you to the product's view page. Clicking on the "NO" button at the bottom left of the display will return you to the task's view page without deleting the task.

Note: Deleting a task will also delete the requirements that are associated with it.

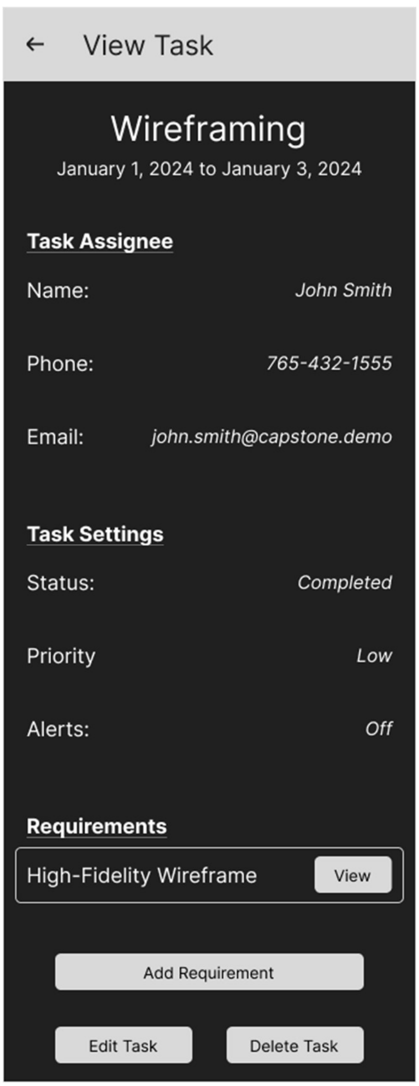




Requirements

View Requirement

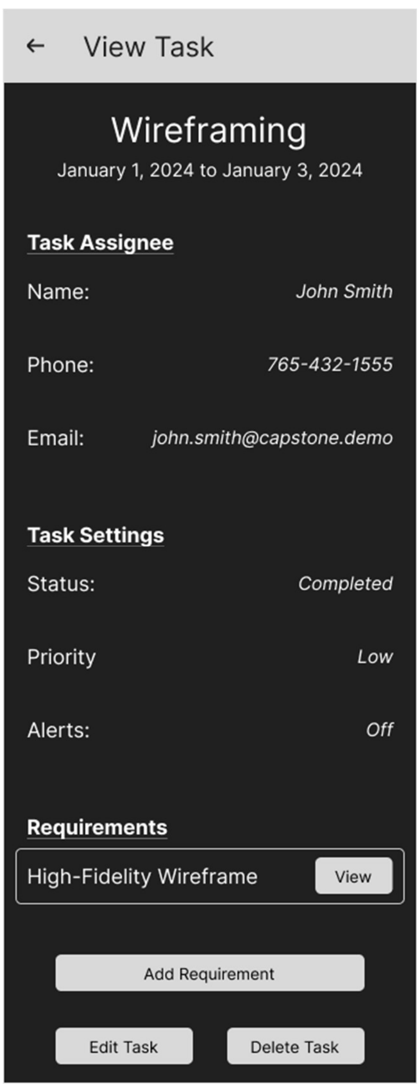
To view the details of a specific requirement, click on the "View" button that is associated with the requirement on its task's view page. You will then be redirected to the requirement's view page, where you will be presented with all of the requirement's information, as well as options to edit the requirement's details and delete the requirement from the task it is associated with.

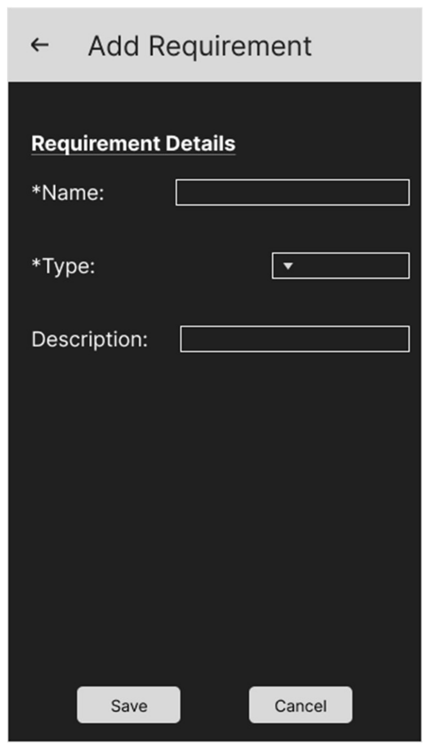


Add Requirement

To add a new requirement to a specific task, click on the "Add Requirement" button at the bottom of the task's view page. You will then be redirected to the add requirement page containing blank fields. Here, you will provide the details of the new requirement you would like to add to your selected task. Clicking on the "Save" button at the bottom left of the page will update your task's requirement list and return you to the task's view page. Clicking on the "Cancel" button at the bottom right of the page will return you to the task's view page without saving any changes.

*Note: Fields containing * must be completed to successfully create your requirement.*





Edit Requirement

To edit an existing requirement, click on the "Edit Requirement" button at the bottom left of the requirement's view page. You will then be redirected to the edit requirement page containing fields that have been populated with the requirement's existing details. Here, you may edit the details of the requirement you have selected. Clicking on the "Save" button at the bottom left of the page will update your requirement and return you to the requirement's view page. Clicking on the "Cancel" button at the bottom right of the page will return you to the requirement's view page without saving any changes.

*Note: Fields containing * must be completed to successfully update your requirement.*

Delete Requirement

To delete an existing requirement from a task, click on the “Delete Requirement” button at the bottom right of the requirement’s view page. You will then be prompted with a pop-up confirmation display. Clicking on the “YES” button at the bottom right of the display will delete your requirement from the selected task’s requirement list and return you to the task’s view page. Clicking on the “NO” button at the bottom left of the display will return you to the requirement’s view page without deleting the requirement.

Settings

Status

The status setting allows you to manage and track the progress of your products and tasks. There are three status options to choose from: “Not started,” “In progress,” and “Completed.” The application will automatically order your product backlog and product task lists based on status (“Not started” to “Completed”), priority (“High” to “Low”), and start and end dates (earliest to latest) so that the most critical items are always displayed first.

Priority

The priority setting allows you to manage and set the precedence of your products and tasks. There are three priority options to choose from: “High,” “Medium,” and “Low.” The application will automatically order your product backlog and product task lists based on status (“Not started” to “Completed”), priority (“High” to “Low”), and start and end dates (earliest to latest) so that the most critical items are always displayed first.

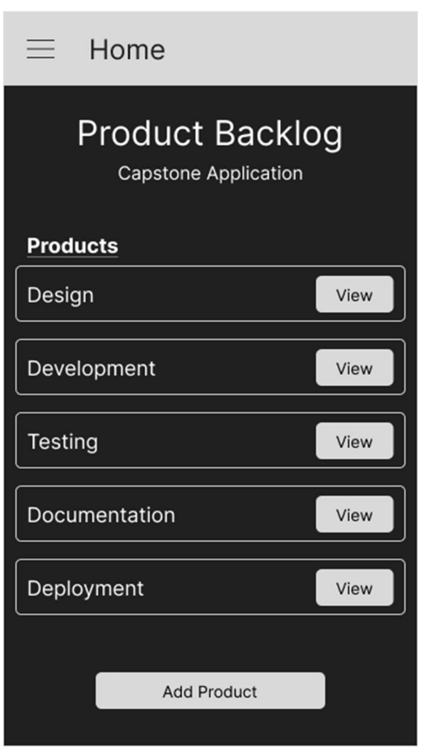
Alerts

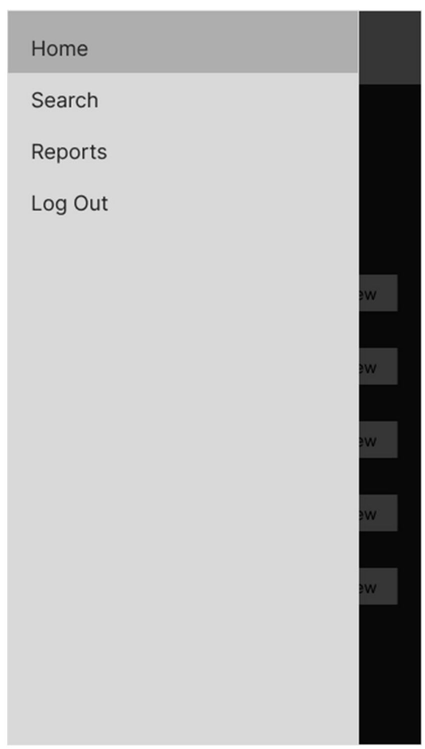
The alerts setting allows you to enable notifications and pop-up displays to notify you of important product and task events. If the alerts setting is configured to “On” for a specific product or task, the application will send you reminders in your mobile device’s notification tray when a kickoff or deadline is occurring that day or upcoming that month. In addition to external notifications, you will also be alerted with pop-up displays within the application when you log in or launch the application from a closed state.

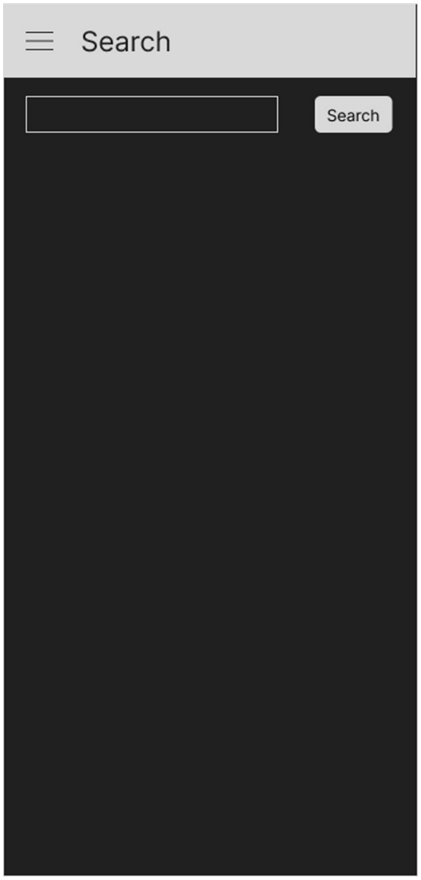
Menu

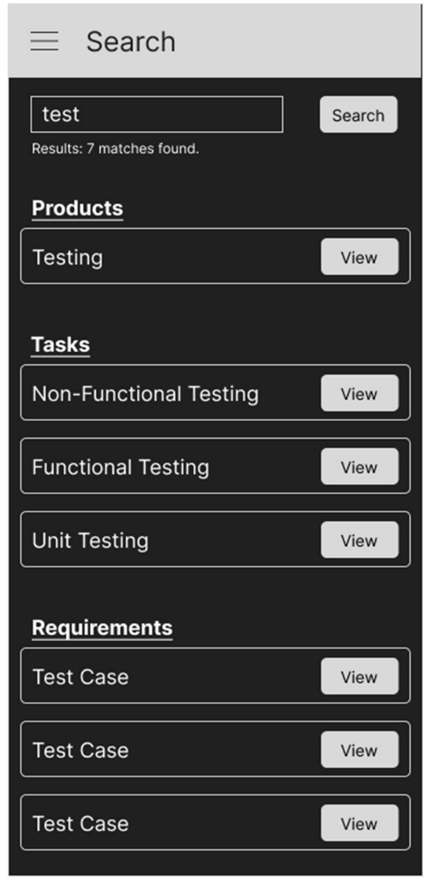
Search

The search page can be used to identify products, tasks, and requirements that contain specific keywords. To navigate to the search page, click on the menu icon (three horizontal lines) at the top left of the home page and select the “Search” item. To perform a search, enter the keyword you would like to search for into the text field at the top left of the page and click on the “Search” button at the top right of the page. Results categorized by products, tasks, and requirements will then be populated with the matching items. Each item will have a “View” button associated with it so that you can navigate to the item’s view page to view, add, edit, or delete data. A results indicator underneath the text field will inform you if any matches have been found.





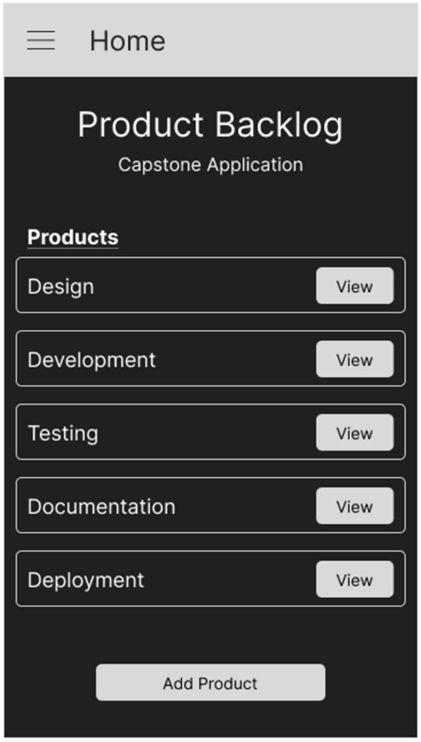


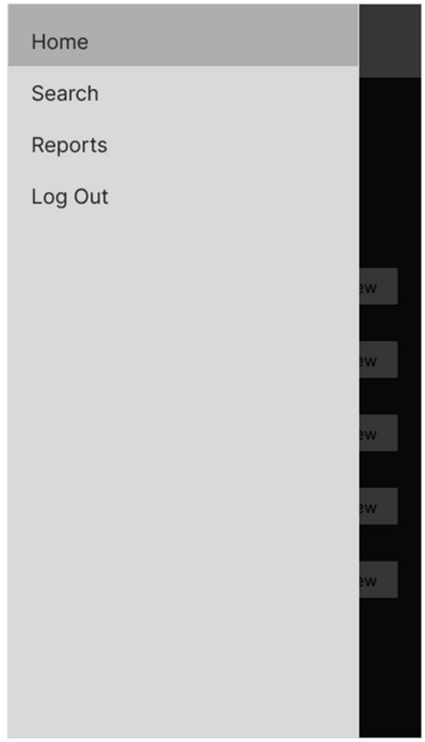


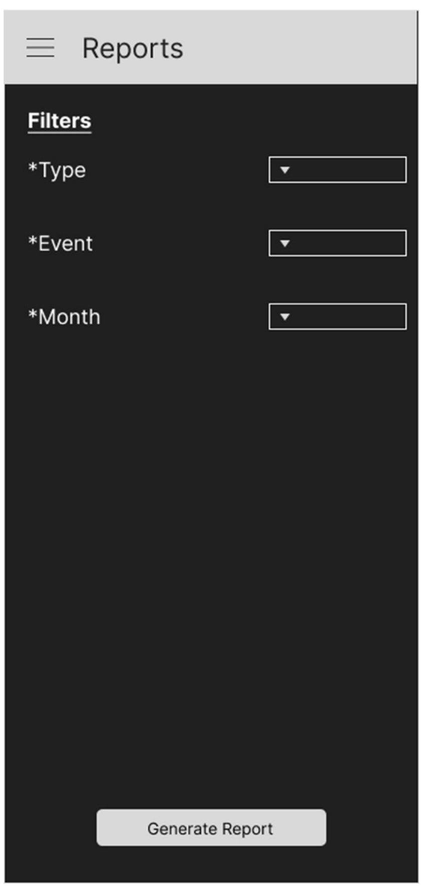
Reports

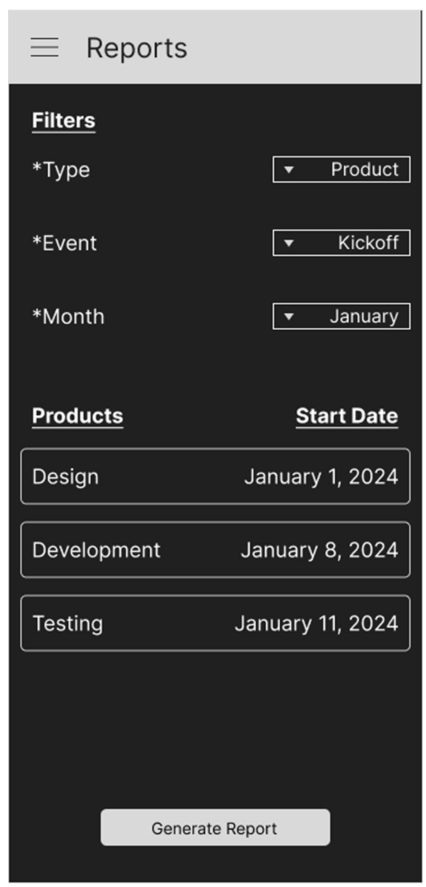
The reports page can be used to generate reports for products and tasks that start or end on specific months. To navigate to the reports page, click on the menu icon (three horizontal lines) at the top left of the home page and select the "Reports" item. To generate a report, select the criteria filters that align with your desired results and click on the "Generate Report" button at the bottom of the page. Your page will then be populated with table records that correspond to the products or tasks that start or end on the month you have selected. A results indicator underneath the criteria filters will inform you if no matches have been found.

*Note: Fields containing * must be completed to successfully generate your report.*


Home
Product Backlog
Capstone Application
Products
Design View
Development View
Testing View
Documentation View
Deployment View
Add Product


Home
Search
Reports
Log Out


Reports
Filters
*Type
*Event
*Month
Generate Report


Reports
Filters
*Type Product
*Event Kickoff
*Month January
Products Start Date
Design January 1, 2024
Development January 8, 2024
Testing January 11, 2024
Generate Report

Log-Out

Logging out is a simple yet effective method to prevent malicious users from accessing your data. To log out of your session, click on the menu icon (three horizontal lines) at the top left of the home page and select the "Log Out" item. This will save your data, end your session, and redirect you to the Log-In page.

Note: If you close the application without logging out, your session will not be ended.