Software Requirements Specification

Debuggers Anonymous

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Introduction

The purpose of this project is to develop a user-friendly platform that enables homeowners to assess the potential benefits of solar power for their properties. The platform aims to provide users, regardless of their knowledge about solar power installations, with the ability to estimate the amount of energy they could generate from a solar installation on their own homes. By offering rough estimates and valuable insights, the platform will empower homeowners to make informed decisions about adopting solar energy solutions.

The motivation behind this project stems from the current energy challenges faced by South Africa, particularly the implementation of load shedding due to strains on the power grid. As a result, many South Africans are seeking alternative energy solutions for their households. The increasing interest in solar installations is evident from the significant investment in imported solar panels for residential use. However, the high cost of these installations and the uncertainty surrounding their potential benefits create barriers for homeowners.

To address these challenges, this project proposes the development of a comprehensive system that simplifies the assessment process for prospective buyers. The system will provide users with the ability to request calculations on their household's energy generation potential over a specified period. By leveraging a trained AI model and considering factors such as location, weather conditions, and geographical features, the system will estimate the amount of sunlight the user's property is likely to receive. The results will be presented in a user-friendly manner, catering to individuals with varying levels of knowledge about solar power.

By providing users with comprehensive reports on kilowatt-hours produced by the solar array over different time periods and showcasing the estimated power consumption of appliances, the platform aims to educate and empower homeowners to make informed decisions about adopting solar energy solutions.

Overall, this project seeks to address the growing interest in solar installations, alleviate the uncertainty surrounding their potential benefits, and empower homeowners with the knowledge to make informed choices regarding renewable energy solutions.

Users

1. Homeowners: The primary users of the software system are homeowners who are interested in assessing the potential benefits of solar power installations for their properties. These users may have varying levels of knowledge and understanding about solar power and may be looking for a user-friendly and accessible tool to help them make informed decisions about their energy needs.

2. Solar Service Providers: The software system is designed to cater to solar service providers who offer installation and maintenance services for solar power systems. These businesses can leverage the system's capabilities by accessing the API, which they can integrate into their own websites and software solutions. By utilizing the provided API functionalities, solar service providers can enhance their offerings, providing their customers with accurate estimates and valuable insights regarding the potential benefits of solar power installations.

3. Admin users: Admin users oversee and manage the software system. They have access to an administrative dashboard providing valuable insights and statistics on user activities and API usage. The dashboard shows user engagement, including homeowner access, frequency, and interaction patterns. Admin users can also track API utilization by solar service providers, identifying businesses integrating the system's functionalities. This centralized platform enables efficient management, monitoring, and data-driven decision-making, ensuring system stability and optimal performance. Admin users play a vital role in facilitating seamless operations for homeowners and solar service providers.

User Stories

1. As a homeowner, I want to be able to input basic information about my property (such as location) so that the software system can provide me with an estimate of the potential energy output of a solar power system.
2. As a homeowner, I want to have access to a user-friendly interface that clearly presents the estimated return on investment (ROI) and payback period for installing a solar power system, enabling me to evaluate the financial viability of the investment.
3. As a homeowner, I want the software system to provide personalized recommendations and suggestions for optimizing the design and configuration of a solar power system based on my specific property characteristics, energy usage patterns, and goals.
4. As a homeowner, I want the ability to save and revisit my calculations and assessment results within the software system, allowing me to compare different scenarios and make well-informed decisions at my convenience.
5. As a homeowner, I want the ability to generate a comprehensive report. This report will help me visualize and understand the potential benefits of installing solar panels, allowing me to share the information with stakeholders, such as family members or financial advisors, and make an informed decision about adopting solar energy.
6. As a solar service provider, I want access to comprehensive and accurate solar energy generation calculations through the system's API, enabling me to integrate this data into my

own software or website and provide customized quotes and recommendations to homeowners.

7. As an admin user, I want to view and analyse statistical data on user engagement, such as the number of homeowners using the software, frequency of usage, and popular features, to assess the system's performance and identify areas for improvement.
8. As an admin user, I want to monitor API usage and track which solar service providers are utilizing the system's functionalities, allowing me to evaluate the system's adoption and potential business collaborations.
9. As an admin user, I want to be able to add, remove, and edit the suggested solar products available to users.

Requirements

Homeowners

- Homeowners should have the ability to input their location to initiate the solar score calculation process.
- Homeowners should receive a solar score calculation that provides an estimate of the potential energy output achievable with a solar power system.
- Logged-in homeowners should have access to an advanced calculation tool.
  - Homeowners should be able to add their desired appliances to the calculation tool to determine the solar system's capacity to power them.
  - Homeowners should have access to information on different solar products available and their respective benefits.
  - Homeowners should be able to save their calculations for future reference.
  - Homeowners should be able to generate detailed reports that include additional data and factors considered during the calculation process

Solar service provider

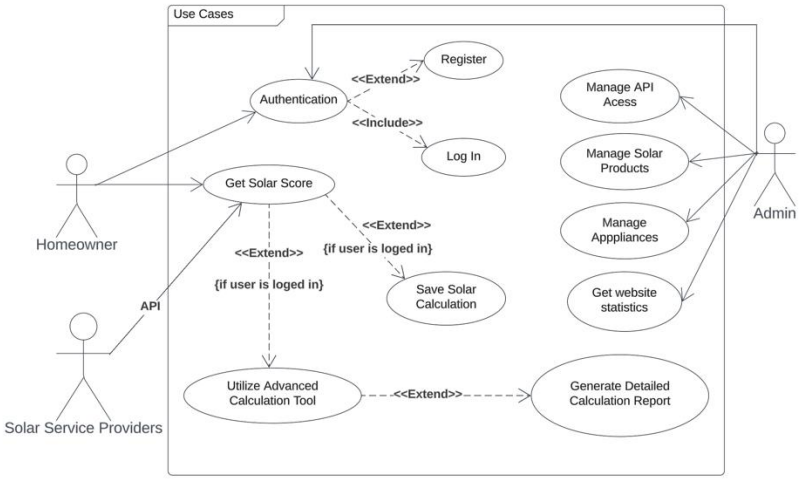
- Solar service providers should have access to the system's API to retrieve comprehensive solar energy generation calculations for their own software or websites.

Admin Users

- Admin users should have access to a dashboard displaying statistics and insights on user activities, including homeowner engagement and API usage.
- Admin users should have the capability to track and manage API usage, identifying solar service providers utilizing the system's functionalities and monitoring their activity.
- Admin users should be able to manage the suggested solar products available to users. This includes the capability to add, remove, and edit the products that users can view and interact with.

Use Cases

1. Authentication
2. Log In
3. Registration
4. Get Solar Score
5. Utilize Advanced Calculation Tool
6. Generate Detailed Calculation Report
7. Save Solar Calculation
8. Manage API Access
9. Manage Solar Products
10. Manage Appliances
11. Get website statistics



Subsystems

Solar Calculator Subsystem

- Enable users to input their location for the solar score calculation.
- Offer a more advanced calculation tool for logged-in users.
  - Allow users to add appliances to their advanced calculation.
  - Allow users to see the benefits of different solar products.
  - Provide users with an in depth report about their solar potential

Database Subsystem

- Enable logged-in users to save their calculations and access them later.

AI Model Subsystem

- Provide users with the generated solar score calculation.

Authentication and Authorisation Subsystem

- Implement user authentication functionalities, including sign-up, log-in, and log-out.
- Enforce authorization rules to ensure appropriate access to system features based on user roles.

Administrative Dashboard Subsystem

- Allow admin users to manage the suggested solar products available to users.
- Enable admin users to access and view statistics regarding website and API usage.
- Allow admin users to manage the API

API Subsystem

- Provide solar service providers with access to the system's API to obtain comprehensive solar energy generation calculations for integration into their own software or websites.

Service Contract

Minimum Requirements- Debuggers Anonymous & EPI USE

Service Contract

Debuggers Anonymous – EPI USE

Project Overview

The goal of this project is to create a solar power calculation tool.

Users will be able to securely register and login, enter their address, and receive an evaluation of the solar potential of their property.

The evaluation will incorporate a trained AI model to detect the average sunlight in the area and estimate the amount of energy that could be generated based on different types of solar installations.

Interface / Web Application:

- Design a user-friendly interface that encompasses interactive tools, comprehensive calculation rundowns, and detailed information about how the user can benefit from solar.
- Develop an account management system where users can save their calculations
- Ensure the interface is mobile-friendly
- Optional: Enable users to download a report of their property.

Calculations with AI Model:

- Generate the solar potential of a location
- Account for factors such as weather, obstructions, and potential shading during the calculation
- Optional: Fine-tune the AI model to provide more accurate measurements for a user's house, rather than a general area.

Database:

- Develop a database to store user credentials and previous calculations
- Ensure compliance with the Protection of Personal Information Act (POPI)
- Ensure the data is stored securely.

REST/SOAP API:

- Create a REST/SOAP API to deliver data from the database to the front-end
- Ensure data security
- Compress data to optimise performance.

By signing below, you acknowledge and agree that the aforementioned requirements accurately represent the agreed-upon project specifications.

Name: Ruan Rossouw
Signature:

Name: Tristan Constable
Signature:

Front-End & Back-End

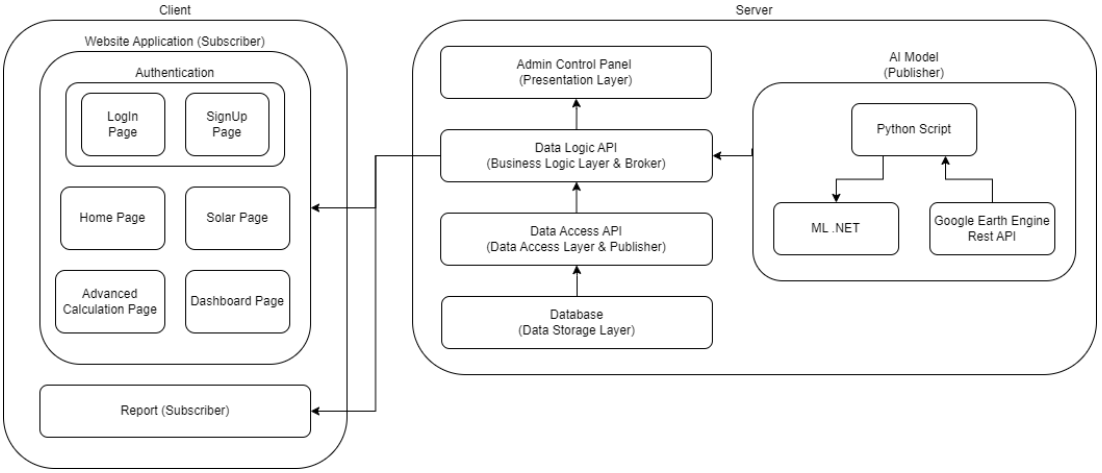
Instead of adding these files to a Word document, we provide a link to the original documents because they are subject to change and consist of multiple pages: https://github.com/COS301-SE-2023/Blue-Skies/blob/main/docs/other/Service%20Contract%20-%20FrontEnd%20%26%20BackEnd.pdf

AI & Back-End

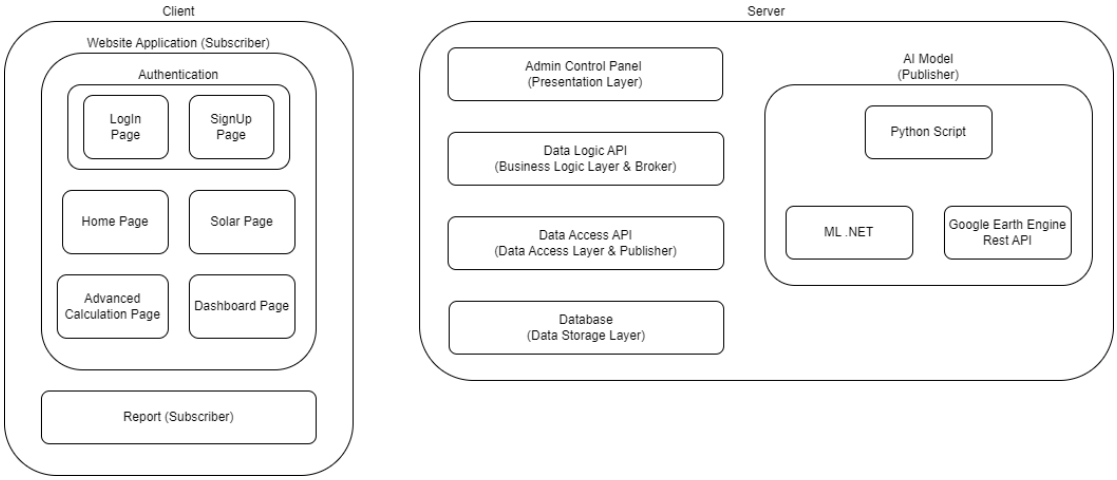
Instead of adding these files to a Word document, we provide a link to the original documents because they are subject to change and consist of multiple pages: https://github.com/COS301-SE-2023/Blue-Skies/blob/main/docs/other/Service%20Contract%20-%20AI%20%26%20Backend.pdf

Architectural Structure

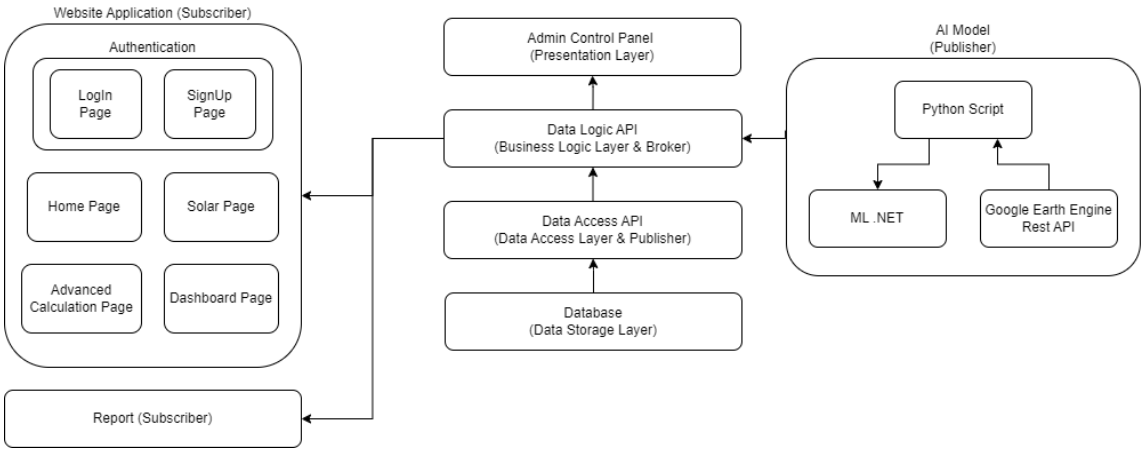
Overview



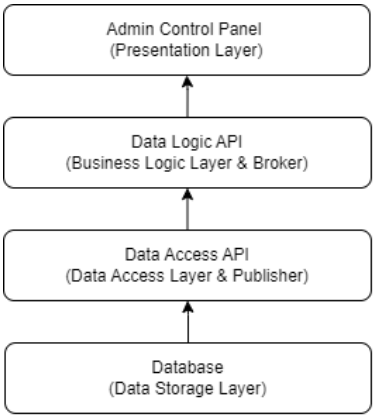
Client-Server pattern



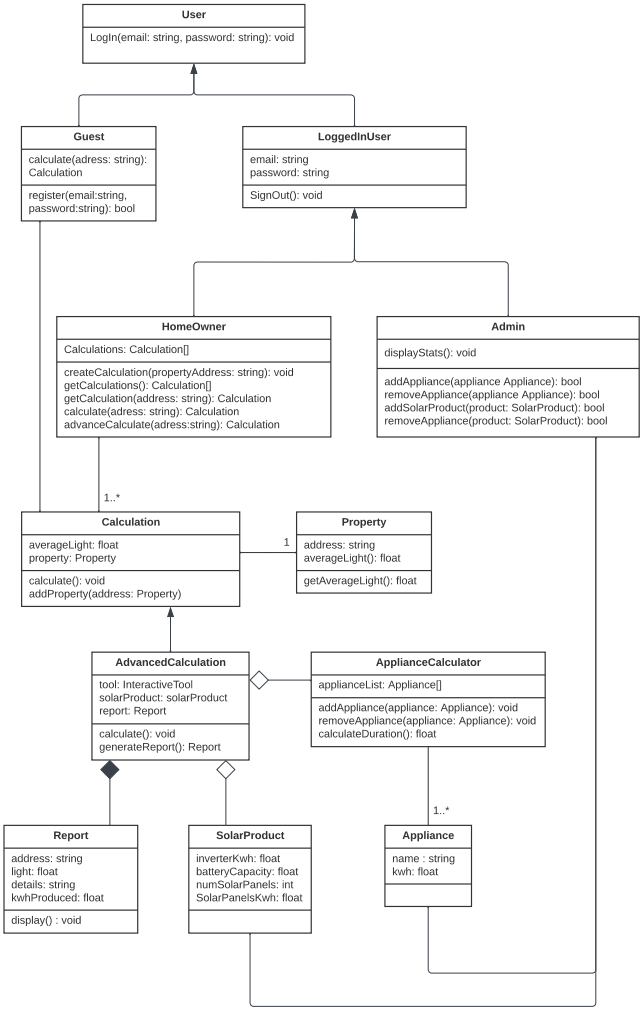
Broker pattern



Layered pattern



Class diagram



Quality requirements

1. Performance: The system should be able to handle a high volume of user traffic and data processing without experiencing slowdowns or crashes. The system should deliver results in real-time.
2. Reliability: The system should be reliable and free of errors, with consistent performance across different devices and operating systems. The system should ensure that user data is accurate, complete, and consistent throughout the system, without any data loss or corruption.
3. Maintainability: The system should be easy to maintain and update, with clear documentation and coding practices that allow for efficient troubleshooting and bug fixing. The system should be built using modular and reusable code, allowing for efficient maintenance and updates to be made to specific parts of the system without affecting the rest of the system.
4. Usability: The system should be easy to use, with a clear and intuitive interface that allows homeowners and/or business owners to easily navigate the features and tools provided. The application interface should be user friendly and accessible to users with different levels of knowledge of solar systems.
5. Security: The system should protect user data and prevent unauthorized access or data breaches. All user data should be securely stored in a database. Any sensitive information will need to be encrypted.
6. Scalability: The system should be designed to scale as the user base grows, with the ability to handle increasing amounts of data and traffic.
7. Compatibility: The system should be compatible with a wide range of web browsers and devices, including desktop and mobile devices.
8. Accuracy: The system should provide rough estimates of the potential energy generation and cost savings that homeowners could achieve through solar power installations.

Trace-ability matrix

Requirements	Solar Calculator	Database	Authentication and Authorisation	Administrative Dashboard	API
Homeowners should have the ability to input their location to initiate the solar score calculation process.	X				
Homeowners should receive a solar score calculation that provides an estimate of the potential energy output achievable with a solar power system.	X				X
Logged-in homeowners should have access to an advanced calculation tool.	X		X		
Homeowners should be able to add their desired appliances to the calculation tool to determine the solar system's capacity to power them.	X		X		
Homeowners should have access to information on different solar products available and their respective benefits.	X		X		
Homeowners should be able to save their calculations for future reference.		X	X		
Homeowners should be able to generate detailed reports that include additional data and factors considered during the calculation process.	X				
Solar service providers should have access to the system's API to retrieve comprehensive solar energy generation calculations for their own software or websites.					X
Admin users should have access to a dashboard displaying statistics and insights on user activities, including homeowner engagement and API usage.			X	X	
Admin users should have the capability to track and manage API usage, identifying solar service providers utilizing the system's functionalities and monitoring their activity.			X	X	
Admin users should be able to manage the suggested solar products available to users. This includes the capability to add, remove, and edit the products that users can view and interact with.			X	X	
The system should be able to handle a high volume of user traffic and data processing without experiencing slowdowns or crashes. The system should deliver results in real-time.	X	X			X
The system should be reliable and free of errors, with consistent performance across different devices and operating systems. The system should ensure that user data is accurate, complete, and consistent throughout the system, without any data loss or corruption.	X		X	X	
The system should be easy to maintain and update, with clear documentation and coding practices that allow for efficient troubleshooting and bug fixing. The system should be built using modular and reusable code, allowing for efficient maintenance and updates to be made to specific parts of the system without affecting the rest of the system.	X	X	X	X	X
The system should be easy to use, with a clear and intuitive interface that allows homeowners and/or business owners to easily navigate the features and tools provided. The application interface should be user friendly and accessible to users with different levels of knowledge of solar systems.	X		X	X	
The system should protect user data and prevent unauthorized access or data breaches. All user data should be securely stored in a database. Any sensitive information will need to be encrypted.	X	X	X		X
The system should be designed to scale as the user base grows, with the ability to handle increasing amounts of data and traffic.	X	X			X
The system should be compatible with a wide range of web browsers and devices, including desktop and mobile devices.	X		X		
The system should provide rough estimates of the potential energy generation and cost savings that homeowners could achieve through solar power installations.	X				X