Technical Report - **Product specification**

Beach Control-Sistema de gestão e monitorização de praias

Course: IES - Introdução à Engenharia de Software

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Project
abstract: Our product focus on getting data of a public beach, such as : Water temperature, existence of pollutants, wind direction and speed, waves height, tide, temperature, precipitation(mm/h), cloud cover (%), UV index.

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1 Introduction

The **BeachControl**, part of the Integrated Engineering Systems (IES) course, is designed to provide comprehensive management and monitoring of public beaches. This system combines real-time data collection on environmental conditions, such as water temperature and pollution levels, with analytical tools that help interpret this data.

By doing so, the system distinguishes itself from existing solutions by prioritizing user experience and providing useful, data-driven insights. This empowers beachgoers, lifeguards, and environmental researchers to make more informed and effective decisions regarding safety and well-being at the beach.

This report details the product concept, personas, scenarios, and user requirements that shape the development of the BeachControl ensuring it meets the needs of all users while promoting environmental stewardship and public safety.

2 Product concept

Vision statement

Our system will be used for all the people that go to the beach, from the ones who just want to have a nice fun day at the beach to the ones who must work there. By offering a system that provides real-time data on water quality, cloud coverage, weather conditions, pollutants, and beach safety we ensure that the beachgoers and lifeguards are updated with information about the beach, helping decision-making. The platform allows researchers and environmental agencies to collect, analyze, and act on historical data related to pollution trends, and weather conditions. It even can be used to help the administrators set up emergency protocols with real time warnings, reducing response time in case of emergencies. We gather requirements by looking at existing websites that already provide a similar experience as our product, also we talked to some lifeguards and asked about features that they would like to have that would make their job easier, and one was warning all the beachgoers about an event., making it the key feature that differentiate our system from the others.

Personas and Scenarios

Persona: Beachgoer (Sara, 28)

Description: Sara is a young professional who enjoys spending her weekends at the beach with friends and family. She prioritizes safety and comfort, relying on weather and environmental data to plan her visits, ensuring a relaxing and enjoyable day.

Goals: Sara wants to make sure the beach is safe for swimming and comfortable for outdoor activities. She likes to avoid surprises, such as rain or extreme weather, and plans her beach trips based on current conditions.

Needs: She requires up-to-date information on water temperature, wind direction and speed, air temperature, precipitation levels, cloud cover, and the UV index. This helps her decide the best time to visit and how to prepare, ensuring a safe and pleasant experience at the beach.

Persona: Lifeguard (Carlos, 30)

Description: Carlos is a lifeguard with over 5 years of experience, responsible for the safety of beachgoers. He monitors weather and water conditions to ensure a safe environment, staying alert for any potential risks that could affect swimmers and beach visitors.

Goals: Carlos needs to maintain a safe beach environment by keeping track of conditions that might pose risks, such as strong winds, high waves, or dangerous tides. He aims to respond quickly to emergencies and prevent hazardous situations from arising.

Needs: Carlos requires real-time data on wind direction and speed, wave height, tides, water temperature, and UV index. This helps him assess risks, decide when to raise flags, and determine whether swimming is safe. Alerts for sudden changes in weather or water conditions are crucial for his role in ensuring public safety.

Persona: Environmental Researcher (Ana, 40)

Description: Ana is an environmental researcher working for a coastal conservation organization. She studies environmental patterns, focusing on pollution levels and the overall health of coastal areas. Her work involves analyzing long-term data to understand changes in beach ecosystems. b

Goals: Ana's main goal is to track pollutant levels, water quality, and environmental changes over time to ensure the beaches remain safe for both wildlife and human visitors. She aims to identify trends in pollution and other environmental factors to propose measures for coastal preservation.

Needs: Ana requires detailed, historical data on pollutants, water temperature, precipitation, wind direction and speed, and UV index. She uses this information to monitor environmental health, assess risks to wildlife, and study the impact of human activities on the beach ecosystem. Access to long-term data and trends is essential for her research and reporting.

Persona: Administrator (David, 45)

Description: David is an experienced administrator responsible for overseeing the management of the beach data system. He ensures that all data collected is accurate, up-to-date, and accessible to users, including beachgoers, lifeguards, and researchers. With a background in environmental management, David is passionate about promoting public safety and environmental awareness.

Goals: David aims to maintain the integrity and accuracy of the data presented on the platform. He wants to ensure that all user needs are met and managing user access

Needs: David requires efficient tools to manage data entry, updates, and user feedback

Scenarios:

Planning a Safe Beach Day

Sara is planning a beach day with her friends for the weekend. She checks the website early in the morning to see the water temperature, wind speed, and UV index. The UV index is very high, and the wind speed is stronger than usual, so Sara decides to delay the trip until the afternoon when conditions are more favorable.

Ensuring Safety on the Beach

Carlos, on duty as a lifeguard, notices that the conditions at the beach have changed significantly due to increasing wind speeds and rising tides. To ensure the safety of beachgoers, he needs to update the beach safety flag on the official website. Carlos quickly accesses the management system to change the flag color to red, indicating that swimming is prohibited due to dangerous conditions.

Study on the Contamination of Beaches in Lisbon

Description: Ana is conducting a study on the contamination of beaches in Lisbon, specifically focusing on the effects of a recent discharge from a factory into the coastal waters. She uses the app to access data on the presence of certain bacteria in various beaches in the region. Ana analyzes the water samples collected and compares contamination levels across different beaches.

Product requirements (User stories)

Epic: Lifeguard Authentication

User Story 1: Lifeguard Account Activation and Login
Priority: High

As a lifeguard,
I want to activate my account after creation and log in to the system so that I can access essential information and manage safety protocols on the beach.

Acceptance Criteria:
- The lifeguard should receive a confirmation email with a link to activate their account after creation.
- The lifeguard should be able to click the activation link and be redirected to the login page.
- The lifeguard should be able to access the login page and enter their registered email and password.
- The system should validate the credentials and allow access to the dashboard if they are correct.
- If the login fails, the system should display an appropriate error message.
- The system should provide an option that allows the lifeguard to reset their password via email.

Epic: User Interaction

User Story 2: Report data errors

Priority: Low

As a user, I should be able to report some inconsistencies in the data provided so the administrator can check if everything is accurate.

Acceptance Criteria:

- A button labeled "Report Data Error" should be visible
- Clicking the "Report Data Error" button opens a form allowing the user to describe the error.
- Upon successful submission, the user receives a confirmation message.
- The system should send the report error to the administrator

User story 3: Update the flag color

Priority: High

As a lifeguard, I need to be able to update the color of the flag as the day goes by and conditions change, so the people can have real-time updated information.

Acceptance criteria:

- The system allows real-time updates of the flag;
- The update is confirmed with a success message;
- Updates are stored with timestamps.

User story 4: Make/update beach's warnings

Priority: Medium

As a lifeguard, I need to be able to update the various conditions on the beach and the risks that come with them (e.g. sharks close to the shore, tsunami), so that I can ensure that everyone who is and intends to go to the beach is safe.

Acceptance criteria:

- The system allows real-time updates of the warnings;
- The system allows to warn the users about dangers and risks on the beach,
- The update is confirmed with a success message;
- Updates are stored with timestamps.

Epic: Beach's information monitoring

User Story 5: Real-Time beach's information access

Priority: High

As a beachgoer,

I want to access real-time information of the conditions so I can see if the water temperature and cloud cover is favorable for an enjoyable day on the beach.

Acceptance Criteria:

1. The user should be able to select a beach
2. The information about the selected beach should be displayed, reflecting the real-time changes as they occur.

Epic: Beach's data

User Story 6: Download previous beach's data

Priority: Medium

As an environmental researcher, I want to be able to download previous data of a beach so that I can cross data for a research paper that I am working on.

Acceptance criteria:

- The user should be able to select a beach,
- The system should allow the download of a beach data
- The system should show a success message

Epic: Administrative control

User story 7: Real-Time lifeguard and data monitoring

Priority: Medium

As an administrator of the system, I want to see the logs of the warnings made by the lifeguards, the report error, the uptime of the sensors so that I can ensure that all is working as expected

Acceptance criteria:

- The system should have an administration panel for login
- The system should show the uptime of each sensor of a beach
- The system should show the report error sent by the users
- The system should show the warnings with timestamps, beach name, message and the lifeguard's name that made the warning.

Epic: Lifeguard account

User Story 8: Lifeguard account creation.
Priority: Medium
I want to create accounts for lifeguards so that I can ensure only qualified personnel have access to the system.

Acceptance criteria:

- The administrator should be able to access the user management section of the admin dashboard.
- The administrator must fill out a form with the lifeguard's information (name, contact, beach location, etc.).

- The lifeguard should be able to activate their account and log in to the system after setting their password.
- The administrator should be able to view the status of created accounts to ensure they are activated.

3 Architecture notebook

Key requirements and constrains

<Identify issues that will drive the choices for the architecture such as: Will the system be driven by complex deployment concerns, adapting to legacy systems, or performance issues? Does it need to be robust for long-term maintenance?

Identify critical issues that must be addressed by the architecture, such as: Are there hardware dependencies that should be isolated from the rest of the system? Does the system need to function efficiently under unusual conditions? Are there integrations with external systems? Is the system to be offered in different user-interfacing platforms (web, mobile devices, big screens,...)?

 E.g.: (the references cited in [XX] would be hypothetical links to previous specification documents/deliverables)

There are some key requirements and system constraints that have a significant bearing on the architecture. They are:

- The existing legacy Course Catalog System at Wylie College must be accessed to retrieve all course information for the current semester. The C-Registration System must support the data formats and DBMS of the legacy Course Catalog System [E2].
- The existing legacy Billing System at Wylie College must be interfaced with to support billing of students. This interface is defined in the Course Billing Interface Specification [E1].
- All student, professor, and Registrar functionality must be available from both local campus PCs and remote PCs with internet dial up connections.
- The C-Registration System must ensure complete protection of data from unauthorized access. All remote accesses are subject to user identification and password control.
- The C-Registration System will be implemented as a client-server system. The client portion resides on PCs and the server portion must operate on the Wylie College UNIX Server. [E2]
- All performance and loading requirements, as stipulated in the Vision Document [E2] and the Supplementary Specification [15], must be taken into consideration as

the architecture is being developed.>

Architetural view

→ Discuss architecture planned for the software solution.

→ include a diagram

Module interactions

→ explain how the identified modules will interact. Use sequence diagrams to clarify the interactions along time, when needed

→ dicuss more advanced app design issues: integration with Internet-based external services, data synchronization strategy, distributed workflows, push notifications mechanism, distribution of updates to distributed devices, etc.>

4 Information perspetive

<which concepts will be managed in this domain? How are they related?>

<use a logical model (UML classes) to explain the concepts of the domain and their attributes>

5 References and resources