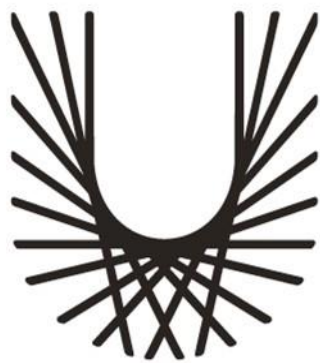# Functional Specification

Elderly Care Management System(ECMS)

SE TU — Ollscoil Teicneolaíochta an Oirdheiscirt

South East Technological University

(Student: C00270632) Qadeer Hussain
Supervisor: Paul Barry
SOFTWARE DEVELOPMENT PROJECT YEAR 4

Table of Contents

Introduction

The purpose of this document is to outline the functionality of the Elderly Care Management System (ECMS). The aim of this project is to create a secure application by implementing cryptography to safe guard and manage the patient data used by Care Centres. This system will be designed to cater for two primary users the administrator and carers. Administrators will be handling patients details, registrations, as well as creating and managing care plans and rosters. The Carer is tasked with managing daily care activities, administering medication, and reporting any incidents. The secure application ensures both users can perform there roles efficiently while maintaining confidentiality and integrity of there data.

These are a few key features that will be implemented in this project:

- Security: Implementing data encryption and decryption to ensure the security of patients sensitive information and to comply with the Health Level 7 standard.
- Patient Profile: Maintaining the patients personal and medical information.
- Care Planner: To create and manage a custom care plan for individual elderly patients.
- Medical Dashboard: Keeping track of patients medical histories, current medications, and the dosages of medicine to be administered.
- Roster: Schedule daily carer to patients.
- Incident Reporting: Report any incidents that occurred during the carer's visit to the patient.
- Alerts: To keep up to date on any incidents that have been reported by the carer among other notifications.

This document will highlight the target audience for the application and will also discuss the systems architecture and existing systems in the Appendix. It will outline a context diagram, use case diagram that will show interactions between different users and will also explain FURPS+ metrics (Functionality, Usability, Reliability, Performance, Supportability+).

Project Overview

The Elderly Care Management System (ECMS) aim is to enhance management of the patients information in care centres. Ensuring all patient data adheres to the Health Level 7 standards of security by implementing encryption and decryption using Shared key or Public key. The data is easily accessible and easily updatable. There are two main users in this application: The Administrator and the Carer.

Core Functionality

The core functionalities of this project are:

Security: The aim is to implement cryptography for data encryption/decryption to keep the patients data secured. There are two sorts of encryption and decryption Shared Key and Public Key. Ensuring all data patient data adheres to the Health Level 7 standards.

Patient Profile: The ECMS keeps a secure record of the patient personal and medical information. They profile every patient according to their needs and goals they want to achieve.

Care Planner: To create and manage a custom care plan for individual patients who have been registered into the care system. The administrator creates tasks which will be completed by the carers for the patient. For example tasks such as cleaning the patient rooms, giving them their medication on time, assisting them with their activities. Multiple visit for the patients will be organised for Morning, Lunch, Afternoon, Evening and Bedtime.

Medical Dashboard: This is a crucial component of a care system. It contains the patients medical history, current medication and there dosages. This gives real time updates when the carer administers the medicine to the patients. The patients medical information will be encrypted and securely stored.

Roster: This will be used by the administrator to schedule patients a carer for the day. The administrator can make changes to the roster depending on the schedule and the teams availability ensuring only authorized personnel such as carer can view it.

Non Core Functionality

Login: To allow users to login securely to the system.

Register: To allow administrators register new carer's into the system.

Incident Reporting: This will be used by the carer to report incidents that occurred during their visits. For example: If the patient had a fall and injured themselves, the carer will create a report and upload

it. They will be able to explain in detail how the incident occurred and what was done. This will send an alert to the administrator.

Alerts: The administrator will receive alerts on patients that are created by the carer. An example of this would be if an incident occurred during a carers visit to a patient, the administrator will be able to access that through the alert notification and will be able to sign off the incident.

Target Audience/Platform

There are two users for the Elderly Care Management System:

- Administrator
- Carer

The Administrator will be handling all the patients personal details such as their Name, Date of birth, Phone number, Home address, Email Address, Medical history, Dietary requirements, Medication, there GP and the Next of Kin name, Next of Kin Number and Next of Kin email. The administrator will also be handling Carer details and securely saving all this data by having it encrypted.

The Carer will be assigned to patients for their shifts depending on their roster. The carer assigned to the patient will tend to tasks such as looking after the personal care needs of patients like giving them a shower or bath, assisting with feeding, and toileting. The carer will give the patients medication on time and will document everything. They will also follow the patients interests and support them and assist them in their daily activities. If an incident occurs during the day, the carer must report the incident to the administrator.

This will be a web application that will be accessible on both mobile devices and desktop. Users will be able to access this easily. The user interface will be designed so it is simple to navigate. Administrators and Carers will be able to easily access the application.
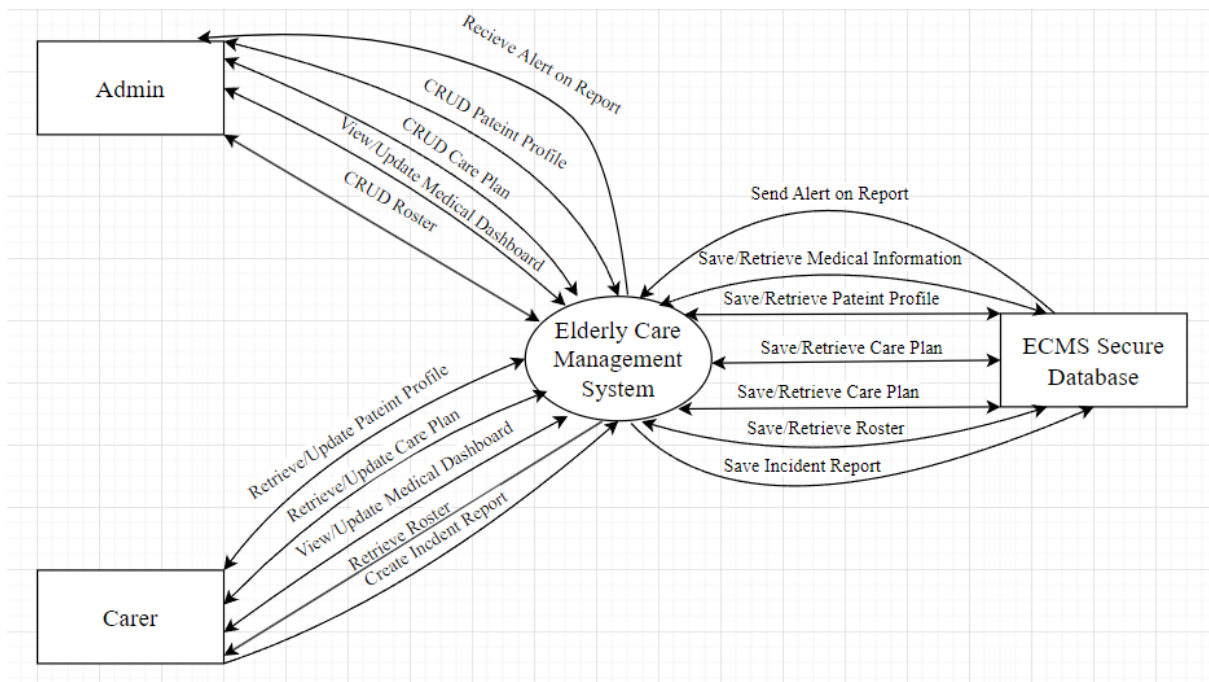
Context Diagrams

Figure 1: Context Diagram

Use Case Diagram

Figure 2: Use case Diagram

Brief Use Case

Use Case Name: Login
Actors: Admin, Carer, ECMS Secure Database
Description: This use case begins when the Admin or Carer log into the application. The user enter there credentials once this is confirmed against there credentials stored in the database. The use case ends when they successfully log in.

Use Case Name: Register
Actors: Admin, ECMS Secure Database
Description: This use case beings when the Admin registers a new user on the system. The admin enters there details to create an account under the new user name. The use case ends when the new user has been added successfully and stored securely in the database.

Use Case Name: Patient Profile
Actors: Admin, Carer, ECMS Secure Database
Description: This use case begins when the Admin creates a new patient profile which includes there personal and medical information or when both users view and update patient information. This information is saved in the database. The use case ends after creation, viewing or modifying and successfully stores any changes to the database.

Use Case Name: Care Planner
Actors: Admin, Carer, ECMS Secure Database
Description: This use case begins when the Admin creates or updates care plans for the patient and the Carer use this to view there tasks assigned to them. The use case ends when the creation of a care plan is complete or when the tasks are completed and then is stored securely in the database.

Use Case Name: Medical Dashboard
Actors: Admin, Carer, ECMS Secure Database
Description: The use case begins when either users access the medical dashboard which contains information on each patients medical history, current medication, when, where and who administered the medication. The use case ends when Carer signs off any medication administered, Admin is finished viewing patients medical data and all data is stored securely into the database.

Use Case Name: Roster
Actors: Admin, Carer, ECMS Secure Database
Description: This use case begins when the Admin makes any changes to the depending on carer availability and assigning carer's to patients. The carer can then view there roster for the day. The use case ends when the Admin successfully makes any changes or when the carer is finished viewing them. Any changes are stored into the database.

Use Case Name: Incident Reporting
Actors: Admin, Carer, ECMS Secure Database
Description: This use case begins when the Carer wants to report an incident during there visit to the patient, this includes what happened during the incident what actions were taken by the Carer. The use case ends when the Carer submits the report and the system triggers an alert to the Admin. The report is securely saved to the database.

Use Case Name: Alerts (extends Incident Reporting)
Actors: Admin, ECMS Secure Database
Description: This use case begins when the Admin receives an alert on a patient that require there attention. The Admin reviews the alert and respond appropriately. The use case ends when the Admin signs off the alert.

Detailed Use Case

Use Case Name: Login
Actors: Admin, Carer, ECMS Secure Database
Pre-Conditions: The user must be registered with the ECMS system.
Main Success Scenario: 1. The user navigates to the log in page. 2. The user enters there username and password. 3. They successfully log into the application.
Post-Conditions: The user have logged into there accounts.
Alternative Scenario: The login information is incorrect, the user is prompted to re-enter there details.

Use Case Name: Register
Actors: Admin, ECMS Secure Database
Pre-Conditions: The Admin is logged into the system and is able top register new staff.
Main Success Scenario: 1. The Admin navigate to the register page. 2. The Admin enters the new Carer personal information such as name and contact details. 3. The system stores the new user into the database. 4. Confirmation is displayed of successful registration.
Post-Conditions: The new Carer details are successfully saved into the database.
Alternative Scenario: The Admin inputs the invalid details into the input boxes and an error is displayed.

Use Case Name: Patient Profile
Actors: Admin, Carer, ECMS Secure Database
Pre-Conditions: When the user is logged and there is an existing patient profile or the admin is going to create one.
Main Success Scenario: 1. The users navigate to the patient profile page. 2. The Admin creates a new patient profile if required. 3. Admin and Carer can view or modify patient information. 4. This is securely saved in the database.
Post-Conditions: CRUD patient profile is stored securely in the database.
Alternative Scenario: The Carer attempts to create a new patient profile, the system denies them as they do not have proper permissions.

Use Case Name: Care Planner
Actors: Admin, Carer, ECMS Secure Database
Pre-Conditions: The Users are logged in and here is an existing care plan or the admin is going to create a care plan.
Main Success Scenario: 1. The users navigate to the care plan page. 2. Admin creates a new care plan for a patient if required. 3. Admin and Carer can view or update any tasks scheduled to them. 4. Any changes are stored in the database
Post-Conditions: Care plans are successfully updated by the users
Alternative Scenario: The carer attempts to create a new care plan for a patient, the system denies them as they do not have proper permissions.

Use Case Name: Medical Dashboard
Actors: Admin, Carer, ECMS Secure Database.
Pre-Conditions: The users are logged in and accessing the medical dashboard to complete there tasks.
Main Success Scenario: 1. The users navigate to the medical dashboard. 2. The Carer is displayed medical history, current medication, and dosages for there assigned patients. 3. The Carer updates the dashboard as they complete task such as administering medication. 4. The Admin is able to view completed medical tasks for all patients via the dashboard.
Post-Conditions: Medical records are up-to-date and where, when and who administered the medication is securely saved in the database.
Alternative Scenario: The system fails to update in real time.

Use Case Name:	Roster
Actors: Admin, Carer, ECMS Secure Database	
Pre-Conditions: The Admin is logged in Carers and patients are registered in the system.	
Main Success Scenario: 1. The Admin navigates to the roster. 2. The Admin assigns or reassigns carer's to patients based on needs and carer availability. 3. Any changes are saved into the database. 4. The Carer is able to view there roster for the day.	
Post-Conditions: Roster is updated successfully , Carer have there most up-to-date roster.	
Alternative Scenario: The Admin inputs conflicting schedules, the system alerts the Admin on the conflict.	

Use Case Name:	Incident Reporting
Actors: Admin, Carer, ECMS Secure Database	
Pre-Conditions: An Incident Occurs during the Carer's visit.	
Main Success Scenario: 1. The Carer navigates to the incident reporting page. 2. The Career documents what occurred at the incident. 3. The report is securely saved into the database.	
Post-Conditions: The incident has been reported, saved, and is now accessible for the Admin, who has also received an alert.	
Alternative Scenario: The report was not saved successfully, system alert the Carer.	

Use Case Name:	Alerts (extends Incident Reporting)
Actors: Admin, ECMS Secure Database	
Pre-Conditions: The Admin receives an alert on a patient that requires there attention	
Main Success Scenario: 1. The admin navigate to the Alerts page. 2. The Alert displays a report was created by a Carer 3. The Admin reviews the alert and takes any further actions required.	
Post-Conditions: The Admin was alerted of an incident that occurred allowing them to respond timely matter.	
Alternative Scenario: The Admin receives a late alert on the incident.	

FURPS+ Metrics

Functionality

- The Management of the patient and carer data, scheduling tasks, incident reporting and security of this application.
- Incorporating real time updates for the patients medication administered.
- Implementing cryptography to protect the data and to comply with the Health level 7 standard.
- The app must allow administrator to make changes to patient and carer data

Usability

- The text will have high contrast to the background to ensure readability and visibility for all users.
- The application must be easy to navigate and use.
- Configure the application to ensure users see only data relevant to their responsibilities.
- The application must save any changes made by administrator or carer within 10-20 seconds.

Reliability

- The application must have a 99% uptime.
- The only downtime should be for maintenance
- Implementing error handling to maintain the application.

Performance

- Ensure quick loading and processing on the application.
- Conduct load testing on the application using different scenarios.

Supportability

- Provide clear user manual and system documentation to assist users to easily navigate the application.
- Ensure the application is scalable for a large amount of users.
- The application should work with any web browser.
- The application should be flexible enough to incorporate additional features in the future.

Security(+)

- Implementing encryption and decryption using either shared key or public key to safely store the patient and staff data.
- All logins must be securely saved in the database.
- Ensuring the system meets security demands as a Care System application.

Appendix

Similar Applications

These are some of the Applications I came across during my research for this document.

Pass App created by Every Life

This applications features include:

- Care Planning which allows for the creation of custom care plans for the patient, this feature facilitates care tasks to be completed by the carer.
- This app includes a roster for managers to plan visits in detail and allocate the most suitable carer.
- It includes an incident reporting tool to create reports of incidents that have occurred during the carer visits.
- GP connect allows for seamless viewing of patients medical history, access to up-to-date patient information enables care providers to administer medication safely and ensures that all actions are recorded in real time.
- An EMAR system to minimise medication errors by ensuring accurate tracking and administration of medication and to view when, where, and who administered the medication.
- Open Pass which allows family members to stay up to date with there loved ones well being.
- Finance system for automated billing and invoicing for more streamlined workflows. Creating and customizing employee profile.
- Document builder to create templates for care docs.

Log my care

This has two separate apps: Care Office and Carer App.

Care Office:

- This application allows the office workers to manage and view activities
- It gives a simple overview of tasks, incidents and documents on its dashboard.
- The app can create, assign and track tasks for the carer with details such as signature requirements for when a task has been completed.
- App creates reports to see the overall pattern such as indent reports in the month.
- Create and organise documents such as care plans, risk assessments and goals to reach.
- Manage all carers and residents within the work force.
- Fly through Inspections.

Carer App:

- A to do list for the carer for there patient.
- Carer can add photos and videos and a speech to text
- Using eMAR that notifies the carer to administer the medicine and sign it off
- Carer can view all information on there patient includes different care plans and GP information.

Nourish

The application features include:

- Personalized Care Plans according to patients needs
- Emergency admission pack for when a patient is being transferred to a different care centre or hospital.
- Seamless handover: The whole team will be able to see the latest changes to the patients they support.
- Speech to text: to make notes efficiently.
- Quick close tag which signify a task has been completed.
- Record activities of the patient through out there day
- Offline access even without connection: the carer's are able to access all they key information they require.
- Upload pictures document information with pictures.
- Direct messaging a secure communication between the team.
- Incident care management.
- Care reports
- Control and security on all patient data and follows including ISO 27001 and Cyber Essentials Plus.
- Invoicing and payroll

References

Augusto Vega, P. B. A. B., 2017. *Rugged Embedded Systems*. s.l.:Morgan Kaufmann.

Health Level Seven International, 2024. *Introduction to HL7 Standards.* [Online]
Available at: https://www.hl7.org/implement/standards/index.cfm?ref=nav
[Accessed October 2024].

Log my Care, 2024. *Log my Care*. [Online]
Available at: https://www.logmycare.co.uk/
[Accessed October 2024].

Nourish, 2024. *Nourish*. [Online]
Available at: https://nourishcare.com/
[Accessed October 2024].

Oracle, 2010. *Shared Key and Public Key Encryption*. [Online]
Available at: https://docs.oracle.com/cd/E19047-01/sunscreen151/806-5397/howskipworks-4/index.html
[Accessed 01 October 2024].

Pass by Everylife, 2024. *Pass*. [Online]
Available at: https://www.everylifetechnologies.com/
[Accessed October 2024].

ScienceDirect, 2017. *Embedded security*. [Online]
Available at: https://www.sciencedirect.com/topics/computer-science/shared-key-encryption
[Accessed October 2024].