International School

Capstone Project 2

CMU-SE 451

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Rapid Rescue Response System

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PROJECT INFORMATION			
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Contents

1. Executive Summary

In natural disaster-prone areas like Central Vietnam, the annual occurrence of strong storms leads to floods and landslides, often leaving residents stranded without an exact address. This complicates rescue efforts as victims have difficulty transmitting their location to responders. Furthermore, remote areas lacking infrastructure pose additional challenges, lengthening the time needed to locate those in danger. Recognizing the urgency of this situation, our project aims to develop a real-time emergency response system. By providing timely location data, the system aims to support faster and more effective rescues, ultimately improving the chances of survival for those in danger.

Through the integration of personal information and real-time location tracking, our proposed solution will enable individuals to transmit their exact location to designated rescue teams, including rescue services. emergency services and police. This is an initiative that addresses an urgent need in disaster management, consistent with industry trends on the importance of rapid response and leveraging technology to enhance emergency services. By optimizing communication between victims and rescuers, our project aims to minimize response times and maximize life-saving outcomes.

2. Project Background

The Central Coast region of Vietnam faces recurring challenges due to natural disasters, particularly severe storms that trigger floods and landslides. These calamities often render traditional means of communication ineffective, leaving individuals stranded without precise addresses, impeding rescue efforts, and exacerbating the risk to human life. Moreover, remote and inaccessible areas present additional hurdles, as locating victims in such terrain requires considerable time and resources.

The motivation behind initiating this project stems from the critical need to address these challenges and improve emergency response capabilities in disaster-prone regions. Recent industry trends emphasize the integration of technology into disaster management strategies, highlighting the potential for innovative solutions to enhance the effectiveness and efficiency of rescue operations.

By leveraging advancements in location tracking technology and communication systems, our project aims to develop a comprehensive solution that enables individuals in distress to quickly and accurately transmit their whereabouts to designated rescue teams. This initiative aligns with the growing demand for proactive measures to mitigate the impact of natural disasters and underscores the importance of leveraging technology to save lives and minimize the loss of property in vulnerable communities.

3. Project Objectives

In disaster-prone regions like Vietnam's Central Coast, challenges abound in effectively responding to emergencies triggered by severe storms, floods, and landslides. These events often result in individuals being stranded without precise addresses, hindering rescue efforts and endangering lives. Moreover, remote and rugged terrain complicates the task of locating victims, further delaying critical assistance.

Motivated by the urgent need to address these challenges, our project aims to develop an integrated emergency response system tailored to the specific needs of vulnerable communities. This system has the following key objectives:

Enhance Timely Communication and Accessibility: Develop a user-friendly platform enabling individuals affected by natural disasters to transmit their precise locations to rescue teams in real-time, even in remote areas, facilitating swift response and assistance.

Optimize Resource Allocation and Coordination: Streamline the deployment of rescue teams and resources by providing accurate location data, fostering seamless collaboration between various stakeholders involved in disaster response, and ensuring an efficient and coordinated effort to address emergencies.

Promote Community Resilience: Empower communities to actively participate in disaster preparedness and response efforts by providing them with the tools and resources necessary to communicate their needs effectively and coordinate with rescue teams.

By achieving these objectives, our project seeks to significantly improve the effectiveness and efficiency of emergency response efforts in disaster-prone regions, ultimately saving lives and reducing the impact of natural disasters on vulnerable communities. This initiative aligns with industry trends emphasizing the integration of technology into disaster management strategies, underscoring the importance of leveraging innovation.

4. Scope and Requirements

4.1 Scope

The Rapid Rescue Response System (RRRS) is designed to assist individuals in broadcasting distress signals when facing emergencies in Da Nang City. This system is accessible to all residents, ensuring quick and easy utilization in any situation. Offering various functions and features, users can specify the type of emergency they are experiencing from a categorized list and then activate the

distress signal by clicking a button, prompting the system to locate the nearest rescue station. A noteworthy aspect is the system's capability to update the status of victims to their family members. Once a distress signal is received, the rescue station confirms and initiates a plan to assist the victims. Furthermore, all interactions between the system and users, including distress signal transmissions and victim status updates, are displayed and continuously updated in real-time on a map. Despite these advantages, limitations persist, such as the system's current coverage limited to Da Nang City and its unverified performance in real-life scenarios.

4.2 Requirements.

Listed below are the functional, non-functional, and technical requirements of the software solution. It is imperative that these requirements are clearly defined, measurable, and in alignment with the project objectives.

Functional requirements:

- The system mandates users to input a password and username during login to authenticate their identity.
- The system presents victims with a list of problems from which they can select.
- The system enables users to dispatch distress signals along with their information (such as longitude and latitude) to the rescue station.
- The system facilitates users in capturing and sending pictures to the rescue station.
- The system supports the real-time transmission of notifications regarding the status of victims to both their family members and the rescue station.
- The system must possess the capability to locate the closest rescue station to the victim.

Non-functional requirements:

- The system must exhibit prompt responsiveness to user requests.
- The system should be user-friendly and accessible to users of all kinds.
- The map display should function effectively on both mobile and web platforms.
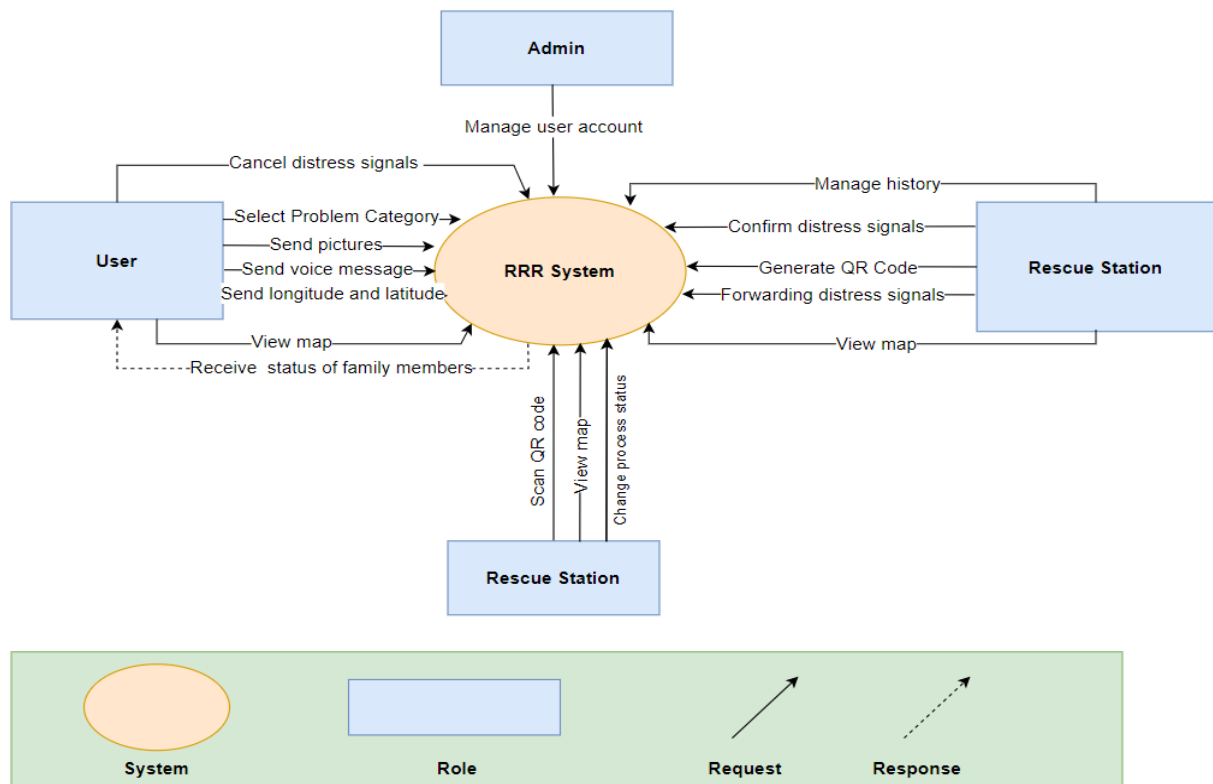- The system must operate seamlessly on both mobile and web platforms.

4.3 System context

Image 1: *System Context.*

5. Methodology and Approach

Project Management Approach:

The project will adhere to the Agile project management approach, specifically Scrum, to ensure flexibility, adaptability, and continuous improvement. This methodology involves breaking down the project into smaller, manageable iterations called sprints, typically lasting 2-4 weeks each. The project team will conduct regular sprint planning, daily stand-up meetings, sprint reviews, and sprint retrospective sessions to monitor progress, address any issues, and adjust plans as necessary.

Development Methodology:

For development, the project will utilize Docker to package and deploy the product on a Ubuntu server.

Technical Stack:

The selection of the technical stack for the project will depend on the specific requirements and constraints. However, a typical modern tech stack may include:

- **Programming Languages:** Java, JavaScript.
- **Frameworks:** Vue.js, Spring Boot, React Native.

- **Databases:** MySQL.
- **Tools and Platforms:** Docker, Git/GitHub, Intellij, VS Code, MySql Workbench, Figma.
- **Server:** Ubuntu.

The system will leverage Map APIs to retrieve victims' locations and subsequently employ the "*Haversine algorithm*" to calculate the shortest distance between a rescue station and the victim's position.

Communication and Collaboration:

Effective communication and collaboration are essential for project success. The project team will utilize various communication channels such as regular meetings, emails, instant messaging, and collaborative tools like Drive,Trello, Zoom, Zalo or Google Meet to stay in touch with each other.

6. Project Timeline.

Table 1: *Project Timeline*

No	Task Name	Duration (Day(s))	Start	Finish
1	Initial	10	11/02/2024	19/02/2024
1.1	Project's Kick-off Meeting	1	11/02/2024	11/02/2024
1.2	Discuss about project idea	2	11/02/2024	12/02/2024
1.3	Create Proposal Document	4	13/02/2024	16/02/2024
1.4	Create Documents Plan	2	17/03/2024	18/02/2024
2	Developments	84	19/02/2024	17/05/2024
2.1	Sprint 1	21	19/02/2024	11/03/2024
2.2	Sprint 2	21	12/03/2024	02/04/2024
2.3	Sprint 3	21	03/04/2024	24/04/2024
2.4	Sprint 4	21	25/04/2024	16/05/2024
3	Project Meeting	1	17/05/2024	17/05/2024
4	Final Release	1	20/05/2024	20/05/2024
	Duration	96	11/02/2024	20/05/2024

7. Resource Allocation.

Table 2: Resource Allocation

Constraint	Constraints Description	Guidelines for Acceptance
Economic	In terms of cost, the main issue lies in the cost of researching, implementing a backend to handle, and analyze data, and front end with a user-friendly interface. There is also the cost of renting a server and deploying a server.	Design cost: 100-200$ Production cost: 4500-5000$ Maintenance cost: 100-500$
Ethical	Ensure that the system protects user data and privacy. The system should be reliable and accurate in sending SOS signals and communicating with rescue stations. False alarms should be minimized	Verifying user identity is crucial to minimize the risk of signal forgery
Social and Global	The software is for everyone. The application is essential for sending emergency signals in dangerous situations.	The product needs to be developed in an optimal and user-friendly way to reach a wide range of users
Sustainability	Needs to maintain the continuous operation of the system, so as not to affect the visualization and analysis of people	Refers to the sustainability of resources, including material, energy, supplies, manufacturing techniques, personnel, operation, and the need for additional infrastructure, as well as the sustainability of the design including reliability, lifetime, durability, reusability, and maintainability.

8. Budget and Cost Estimate.

Table 3: *Cost Description.*

Description	Amount	Unit
Number of members	4	Person
Number of working-hours per day	5	Hour
Number of working-day per week	6	Days
Number of working hours per week	30	Hour
The cost per member per hour	2	USD
The cost per member per week	60	USD
The duration of the project	13,7	Week
The number of working days	96	Day

Table 4: *Total Cost.*

No.	Criteria	Price (USD)	Amount(Hours)	Total (USD)
1	Working hour	2	1,644	3288
2	Management cost	20%		657.6
Total				3945.6

Explain:

Amount of working hours = 4 members * 30 hours * 13,7 weeks.

Management cost = total * 20%

9. Risk Management

Table 5: *Priority symbol.*

RATING FOR LIKELIHOOD AND SERIOUSNESS FOR EACH RISK			
L	Rated as Low	E	Rated as Extreme (Used for Seriousness only)
M	Rated as Medium	NA	Not Assessed
H	Rated as High		

Table 6: *Project Risk.*

Risk	Definition	Level	Likelihood	Mitigation Strategy
Estimates of project planning	The plan may be delayed for the initial estimate of the project.	L	L	Analysis and assessment of the scale. Reduce requirements.
Requirements	Internal contradictions that may exist in the request. Important requirements may be missing from the formal requirements specification.	H	H	Uniform requirements prior to analysis.
Estimated project schedule	Time sort of work.	E	E	Time project was created to be updated and evaluated regularly.
Programming experience	Programming Languages and technology	M	L	Experience sharing used to reduce the research time.

Technical processes	The standard procedure cannot meet the requirements of specific solutions. The new process may be required. The process can be improved and more efficient.	L	M	Analysis of requirements and processes to ensure appropriate levels. If the new process is needed, we need to evaluate this response has improved over the old process.
Network	Block by Limited Bandwidth	H	H	Upgrade transmission line network. Use some technologies such as load balance, message queue
Time	Project implementation period is too short and some team members are working a job, so our team cannot complete this project on a short time. During project implementation, our team to learn and have more work to do, our team cannot focus all their time to carry out this project.	H	M	Reduce time and increase individual personal time working in their stay on the 7th day and Sunday.
Project Management	Project management system may not be sufficient to support the requirements of the project.	L	H	Discuss with the group to offer solutions and consistent accuracy.

10. Stakeholder Engagement

Table 7: *Roles.*

Role	Responsibility	Name/Title
Product Owner	- Understand the user and customers with their needs. - Collaborate with the development team. - Manage the stakeholders. - Describe the user experience and product features. - Provides detail user stories.	Duy Tan University
Scrum Master	- Communicate the value of Scrum. - Teach the organization on Scrum to maximize business value. - Attend all Scrum meetings. - Preserve the integrity and spirit of the Scrum framework. - Maintain the focus of the Team. - Make the Team aware of impediments and facilitate efforts to resolve them. - Serve as a coach and mentor to members of the Team. - Respectfully hold the Team, Product Owner, and Stakeholders accountable for their commitments.	Ly Thanh Long

	• Continually work with the Team and business to find and implement improvements.	
Secretary	• Record the content of group meetings and activities of the member.	Nguyen Phan Minh Thinh
Reviewer	• Review documents.	All Member
Developer	• Analysis of the functions and requirements of the product. • Code and test. • Fix error.	All Member
Analyzer	• Gather user stories. • Analysis user story to do specify Document.	Nguyen Anh Minh
Tester	• Create Test Plan and prepare Test Case • Creation of test designs, test processes, test cases and test data. • Carry out testing as per the defined procedures. • Graph the results and make sure people know when test results decline. • Prepare all reports related to software testing carried out. • Analysis and evaluate the Test result. • Ensure that all tested related work is carried out as per the defined standards and procedures.	Pham Xuan Vinh, Nguyen Anh Minh, Nguyen Phan Minh Thinh

Mentor	- Guide on the process. - Monitoring all activities of the Team. - Help with anything.	Tran Thi Thuy Trinh