DESIGN AND DEVELOPMENT OF AN INTELLIGENT EMERGENCY STATE REPORTING SYSTEM FOR PUERTO RICO

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Administrative Portal for Emergency Management

ABSTRACT & INTRODUCTION

Emergency response in Puerto Rico requires timely and coordinated access to operational information across multiple responding agencies. However, information may be distributed across different systems, reports, and communication channels, making it difficult to maintain a unified operational view. This research presents the design and development of a secure Administrative Portal for Emergency Management. Research in cybersecurity, emergency dashboard design, system architecture, and triage guided the development of an integrated architecture and functional prototype focused on controlled access, centralized visualization, and structured data management.

RESEARCH QUESTION

How can a secure and centralized administrative portal integrate cybersecurity, emergency visualization, and structured triage to support decision-making and interagency coordination in Puerto Rico?

OBJECTIVES

The main objective of this research was to design and develop a secure, centralized administrative portal to support emergency coordination and decision-making in Puerto Rico.

Specific Objectives:

- Identifying system, coordination, and cybersecurity gaps in emergency information management.
- Designing a secure architecture for controlled access and data management.
- Developing a centralized dashboard for emergency monitoring and visualization.
- Structuring emergency data to support coordinated interagency operations
- Exploring AI-assisted triage for emergency prioritization with human oversight.

SYSTEM DESIGN & METHODOLOGY

1. Development Process

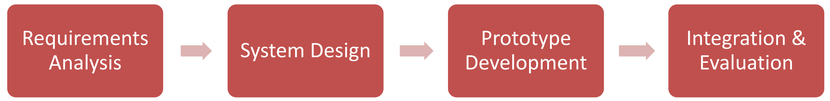


Fig. 1. Development Process.
Research requirements guided the system design, prototype development, integration, and evaluation..

2. System Architecture

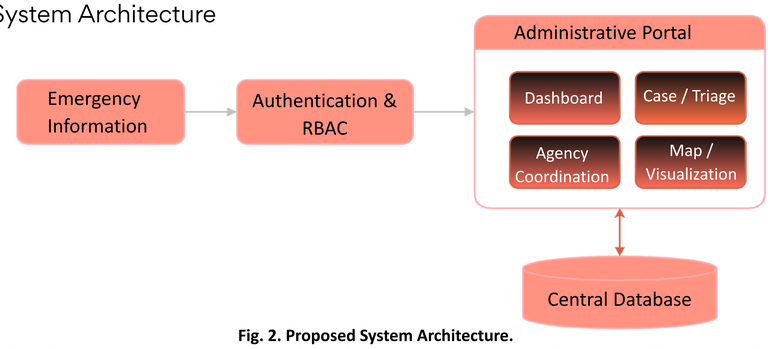


Fig. 2. Proposed System Architecture.
The architecture integrates emergency information, secure authentication, administrative functions, and centralized data management.

3. Technology Stack

Frontend	Backend	Database	Security
HTML/CSS/JavaScript + Thymeleaf	Java + Spring Boot	MySQL	RBAC + MFA Designs

PROTOTYPE & KEY RESULTS

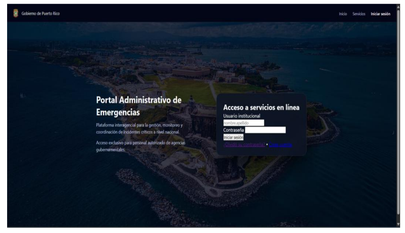


Fig. 3. Secure Administrative Login
Authentication interface providing controlled access for authorized institutional users.

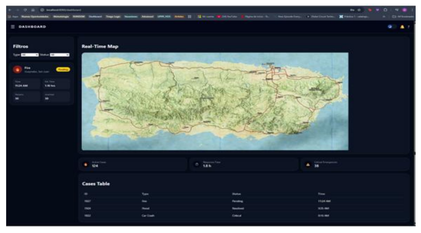


Fig. 4. Centralized Emergency Management Dashboard
Centralized interface for incident monitoring, mapping, and case management.



SYSTEM IMPLEMENTATION & SECURITY

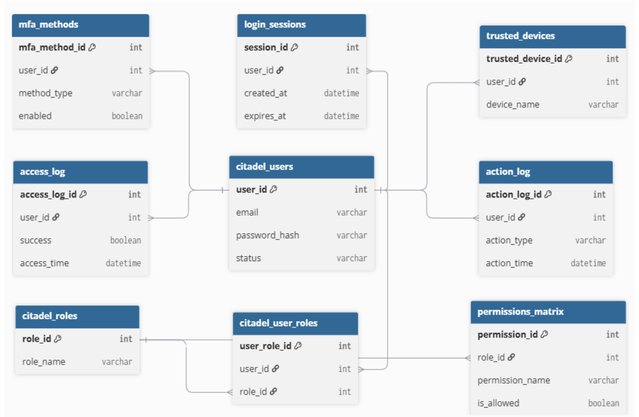


Fig. 5. Security and Access Control Data Model.
Simplified ERD illustrating RBAC, MFA, session management, trusted devices, permission control, and security auditing.

The relational database provides a centralized and structured environment for managing user, role, permission, session, and security information. Its design supports data consistency, controlled access, traceability, and secure information management across the administrative portal.

ANALYSIS & FINDINGS

The prototype demonstrated the successful integration of Java, Spring Boot, Thymeleaf, and MySQL within the proposed architecture. Web components, backend logic, and structured data operated within a unified environment, while the system design incorporated security structures for RBAC, MFA, session management, permissions, and auditing. These findings demonstrate the technical feasibility of integrating security, structured data management, and emergency-response functionality within a unified administrative environment, establishing a foundation for future system development.

CONCLUSION & FUTURE WORK

The developed prototype demonstrates the potential of a centralized administrative portal to improve emergency information management in Puerto Rico. By integrating geographic visualization, case management, institutional workflows, and centralized data, the system establishes a foundation for improved situational awareness and interagency coordination. Future work will focus on real-world agency and emergency-data integration, security and usability testing, implementation and validation of the proposed security mechanisms, and AI-assisted triage with human oversight.

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