# FRANKFURT UNIVERSITY OF APPLIED SCIENCES

**Faculty 2: Computer Science and Engineering**



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### **Topic: Disaster Management Application**

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**Table of Contents**

1. [Introduction 3](#_bookmark0)
2. [Online Communication 3](#_bookmark1)
   1. [Definition of Online Communication 3](#_bookmark2)
   2. [Medium of Online Communication 4](#_bookmark3)
   3. [Effects of Online communication on relationship 4](#_bookmark4)
   4. [Cost of online communication 5](#_bookmark5)
3. [Impact of Online Communication on International Business 5](#_bookmark6)
   1. [Communication Before and After the Internet among business world 5](#_bookmark7)
   2. [Business Communication 6](#_bookmark8)
   3. [How online communication valued International business? 7](#_bookmark9)
4. [Role of Online Communication in Workplace in Different Cultures 8](#_bookmark10)
   1. [Types of Online Communication in Workplace 8](#_bookmark11)
5. [Advantages of Online Communication at Workplace 11](#_bookmark12)
   1. [Control from any equipment 11](#_bookmark13)
   2. [Improves the quality of the communication 11](#_bookmark14)
   3. [Instantaneous and Efficient 12](#_bookmark15)
   4. [Easy Archiving and Retrieval 12](#_bookmark16)
   5. [Employee Monitoring 12](#_bookmark17)
6. [Disadvantages of Online Communication at Workplace 13](#_bookmark18)
   1. [Content based online discussion necessarily excludes some people 13](#_bookmark19)
   2. [The lack of physical presence in online forums may lead to miscommunication 13](#_bookmark20)
   3. [Time consuming 14](#_bookmark21)
   4. [Response delay 14](#_bookmark22)
   5. [Assuming your audience understands the jargon 14](#_bookmark23)
   6. [Thinking that everyone is an excellent communicator 15](#_bookmark24)
   7. [Online forums 15](#_bookmark25)
   8. [Equipment expense 15](#_bookmark26)
   9. [Security issues 16](#_bookmark27)
7. [Case Study 16](#_bookmark28)
   1. [Data Collection 16](#_bookmark29)

[Conclusion 18](#_bookmark30)

[Bibliography 19](#_bookmark31)

[Declaration 21](#_bookmark32)

# Appendix

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**ABSTRACT**

Disasters (Natural and Man-Made) have posed a threat to humanity since the dawn of time. Many countries are vulnerable to disasters as a result of their geographic location, changing climate and human actions. In addition, the countries lack an adequate emergency preparedness mechanism for coping with disasters. In case of a disaster there is a high possibility to existing communication infrastructure getting destroyed or heavily damaged. Therefore, an emergency communication infrastructure is constructed from battery-supplied multi-radio wireless outdoor-routers which are deployed by first responders in the affected region. The outdoor-routers are connecting to each other and are building a wireless mesh network (WMN)- based disaster network, which provides the basis for an IP-based communication. This paper highlights the design and development of a disaster management application which will be provided to the end-user groups of the WMN-based disaster network.

# 1. Introduction

Natural disasters such as Tsunami, Earthquakes, volcanic eruptions etc. and man-made disasters are associated with power failures in industries. These disasters affect the ecosystems and the people living in it. Disasters often cause havoc on existing communication infrastructure. Due to this it is impossible to coordinate the rescuers and volunteers in order to find the victims. As a consequence, it is concluded that a functioning communication infrastructure is essential for the rescue of victims and the management of rescue teams. The disaster network is constructed from battery-supplied wireless outdoor routers, which are deployed in the disaster area and together establish a wireless mesh network (WMN) see Figure 1.

Diagram

Description automatically generated

Figure 1 Network Infrastructure of a WMN based network

The WMN-based disaster network makes use of the NFV (Network Function Virtualization) concept to offer multiple network functionalities and services to end-users. The WMN-based disaster network is intended to be utilized by various end-user groups. The groups include official government groups and also ordinary citizens.

The process of disaster evacuation must be quick, accurate, reliable, efficient, integrated, and accountable and the rescue of victims will be much easier if they are able to communicate through a medium. There comes the disaster management application. This application will be provided to end-user groups of the WMN-based disaster network and it helps in facilitating the communication. The application is built using HTML, CSS and ReactJS programming languages, using IntelliJ software, using NGINX as a web server, and also using PostgreSQL as a database.

This application helps in collecting and sharing disaster information collected by users in real time and ensuring the safety of victims. Furthermore, Disaster Management rescuers can monitor the position and can search for victims faster.

# 2. Architecture Overview

The web application architecture defines the interactions between applications, database and middleware systems on the web. It ensures that many applications can run at the same time. Any standard Web application consists of client-side and server-side.

Diagram

Description automatically generated

Figure 2 General Architecture of the web application

The front-end, often referred to as the client-side, responds to user input and interacts within the browser. The primary objective of the client side is to obtain data from users. The front-end part is generally written in HTML, CSS and JavaScript languages. Coming to the back-end it is also known as the server-side of the app. Any application that can respond to HTTP requests can be run on a server. The server-side is in charge of generating the requested page as well as storing various types of data (text, images, files, etc.), such as user profiles and user feedback. The end-user is never aware of it. Back-end can be done in any of the following languages: Python, Java, Ruby, PHP.

There are at least two sections to the server component: app logic and database (MySQL, SQL, PostgreSQL, Oracle). The former is the web application's main control center, while the latter is where all of the application's permanent data is stored. The architecture implemented in our disaster management application is given in Figure 2.

**2.1 Programming Languages**

The languages implemented in our application are HTML (Hypertext Markup Language), CSS (Cascading Style Sheets), ReactJS and Spring Boot. HTML is a standard markup Language for creating structures and views on webpages. For this application the latest HTML5 version is used. CSS is a language that can describe elements of the HTML language displayed on the screen. CSS provides visual design in HTML language so that web pages can look beautiful CSS is designed to separate presentation and content. The separation results in layout, color and font aspects.CSS is designed to separate presentation and content. The separation results in layout, color and font aspects. This separation can increase the flexibility and control of presentation characteristics and allow HTML pages to access CSS pages separately. In addition, JavaScript is a programming language that can make a website more interactive. ReactJS is a JavaScript library that can be used to build a high-performance UILayer. VSCode is used as the text editor to perform coding for front-end.

Spring Boot is a microservice-based Java web platform that is open source. With its prebuilt code, the Spring Boot system provides a fully production-ready environment that is completely configurable. Developers can create a completely enclosed framework using the microservice architecture, which includes embedded application servers. IntelliJ is a text editor for back-end development.

**2.2** **Middleware Systems**

Tomcat is essentially a servlet container written in Java. Tomcat will accept requests from a client, dynamically compile a container-managed Java class to handle the request as defined in the specific application Context and return the result to the client using its implementation of the Java Servlet and JSP APIs. This method of dynamic content generation allows for extremely fast, threaded, and platform-independent request processing.

The primary function of a web server is to accept and satisfy client requests for static content from a website (HTML pages, files, images, video, and so on). The client is almost always a browser or a mobile device, and the request, like the web server's response, takes the form of a Hypertext Transfer Protocol (HTTP) message. When deployed in front of web and application servers, NGINX is an extremely powerful reverse proxy and load balancer, with translation modules for a variety of application server types.

It's a remarkably robust database management system, with more than two decades of group growth to thank for its high levels of resiliency, honesty, and correctness. Many web, mobile, geospatial, and analytics applications use PostgreSQL as their primary data store or data warehouse.

# 2. Application Design and Implementation

**2.2 Architecture Overview**

**2.3 Rescuer Login**

The client-side of the application shows a login page for rescuer’s and a helpline page for victims. When a rescuer tries to login with the required credentials a request will be sent to the application from the browser. The application forwards the request to the rescuer API to validate the credentials given by the rescuer. Next, the rescuer API approaches the database with a request to authenticate the credentials. Then the database server examines these credentials and if it matches to the one which are in the server it responds with a OK response to the API. The API then generates a token to start the session for the rescuer and this session will be active for few minutes. The sequence flow is represented in the Figure 3.

**2.4 Victim Helpline**

As mentioned, the client-side also contains a helpline page for victims. In this page we setup a helpline page where a victim in need can reach out for help by filling in the details. The details in which the victim can fill are the name, age, current location, number of other victims around and the details of emergency contact. After filling all these details, the browser sends the details to the API as a request to create a ticket. The API processes this request and after storing the details in the database a ticket will be created. The API logs the ticket ID in the allocation service and sends the response to the browser as success. The flow is described in Figure 4.

**2.5 Ticket Allocation**

The status of the tickets is defined as open, In-Progress, close and re-open. As soon as the ticket is created, the status is automatically assigned as open. If the status of the ticket is open for 15 minutes then a rescuer will be automatically assigned to it and the status will be assigned as In-Progress. If a rescuer finishes their task by identifying the victim, he/she can close the ticket manually. By any chance is the same ticket is re-opened it will be automatically assigned to the rescuer who previously closed the ticket. The sequence is shown in Figure 5.

**3.Application Testing**

# Conclusion

In this paper the design of a web application which is useful for victims to communicate with the official government groups during a disaster has been successfully presented. As we know that we can’t predict when a natural disaster will occur and when a man-made event can take place. So, the need for disaster preparedness is extremely important in the global context. Without a

systematic approach it is hard to tackle these kinds of disasters. **In this situation an emergency communication infrastructure can be constructed from battery-supplied multi-radio wireless outdoor-routers which can be deployed by first responders in the affected region. The routers together form a WMN network and a web application can be provided to the end user groups of WMN based disaster network.**

**Can Write a point about technology in conclusion**

# Bibliography

# Declaration

We confirm that the work for the following term paper with the title: "The Role of Online Communication in the Corporate world " was solely undertaken by us and that no help was provided from other sources as those allowed. All sections of the paper that use quotes or describe an argument or concept developed by another author have been referenced, including all secondary literature used, to show that this material has been adopted to support our thesis.

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