

Field Management Console

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BS in Computer Science



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*The candidates confirm that the work submitted is their own and appropriate credit has been given where reference has been made to work of others

Plagiarism Free Certificate

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Project Report

[Field Management Console]

Change Record

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HEAD OF THE DEPARTMENT

Comments: _____

Date: _____ Signature: _____

Dedication

This work is dedicated to my beloved parents, my teachers and my supervisor

Acknowledgements

I am really thankful to my supervisor Ch. Ahmed Bilal who made this work possible. I wish to express my sincere gratitude to my supervisor, for his enthusiasm, patience, insightful comments, helpful information, and practical advice that have helped us broadly at all times in my research and writing of this proposal.

Executive Summary

Field Management Console is a management tool for construction works with a lean production planning platform to improve work flow and achieve maximum productivity. The job of a project manager is to plan and oversee all aspects of a project, and to meet the project's goals on time and within budget. It will require you to organize people, tasks and resources to bring about a successful conclusion. Field Management Console is an application where project manager can easily add a new project in the system with its location. The teams and worker can see the new location on the map. This solution is also making it easy to check the overall status of all the projects.

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Chapter 1

Introduction

Chapter 1: Introduction

In this chapter we are going to discuss about Field Management Console as its name describes it's a management tool. Its application is wide. But we are focusing only one module here which is construction work. In this modern age it is a modern solution for handling multiple construction sites at once.

We have 3 consoles for management

- Project Manager Console
- Organization Console
- Accountant Console

Currently we are more focused on project manager problems and project management related task.

1.1. Background

Project management general ledgers record business transactions and integrate with other areas of the company like payroll to ensure accounting data is always accurate. Similarly, an accounts payable and receivable feature capable of managing expenditures and customer information is vital to the streamlined operation of your construction project.

Construction management systems allow admin to create budgets and see the status of worker directly in the system, keeping everything centralized and organized. Field management console lets users track the progress of each of these individual chunks in real time as work is completed in the field. This lets project managers react to setbacks.

1.2. Motivations and Challenges

In large scale Construction company. Company have multiple construction sites and multiple teams are working on that site. Some of the teams or a single worker visits different sites in one day. For the project manager it is impossible to check the status of every site and keep track of the work it is a challenge for manager. Keep track of workers and which worker is at which site is also a hassle. Project management always depends on the project supervisor. Accuracy of the reporting is also a very critical. A lot of communication is required for accurate report and status of work.

1.3. Goals and Objectives

The objective of this Field management console is to keep the track of the entire worker in a construction site or in multiple construction sites. Company have multiple construction sites and multiple teams are working on that site. Some of the teams or a single worker visits different sites in one day. So our goal is to making possible for the project manager to check the status of every site and keep track of the work. Project management always depend on the project supervisor. Accuracy of the reporting is also a very good factor. Now the main goal is to making thing reliable and accurate for the project manager.

1.4. Literature Review/Existing Solutions

The Existing system is PROJECT MANAGER. Project Manager is a construction management tool it is the process of managing construction projects. But when you're talking about managing a construction project in comparison to other types of projects, the distinction is mostly that construction is mission-based. That means that the project's organization ends with the end of the project build. As we not study detail about this exiting system basically this process is on working but the main difference between our projects is that map integration. The project manager can see the worker location live and also check the activity of the worker.

1.5. Gap Analysis

Managing projects is hard work. Even harder if you don't use software or have work spread across too many tools. It's easy to lose track of all the working of worker and tough to stay up to date. That's when things fall through the cracks. Use one tool to organize projects, make communication easy, and make tracking of worker easy. You don't have to shuffle between spreadsheets, email, and other tools to keep your projects on course. Track and manage everything from day one to the deadline with Field Management console.

1.6. Proposed Solution

Field Management Console is this solution for the problem defines above. Solution which is built by using maps. With the help of this solution project manager can easily add a new project in the system with its location. The teams and worker can see the new location on the map. By the help of this solution a project manager can check the location of the project what actively is going on the site what is the current status and which team or worker is working on that site, assignment of the project and also with the complete detail of the project. Project manager can easily assign task and check the status of that task. Project manager can also see the location of the worker and monitor their moments between sites or find out the current location of the worker. This solution is also making it easy to check the overall status of all the projects.

Field management console also include the organization and account module for organization level activity management and for the account management.

1.7. Project Plan

Field Management Console as its name describes it's a management tool. Currently we are more focused on project manager problems and project management related task because this is a company-based project and this project is already in working state. The part of our team for FYP is project manager problems and projects management related task. So there for our plan is to get the requirement first and then design the front end for project manager and then start working on back end and further step by step start working on this according to the company requirements.

1.7.1. Work Breakdown Structure

1. Project management

- 1.1. Work breakdown structure
- 1.2. Roles & responsibilities Matrix
- 1.3. Change control system

2. Reports / Documentation

- 2.1. Final documentation introduction
- 2.2. Requirement analysis
- 2.3. System design
- 2.4. Implementation
- 2.5. Testing

3. System

- 3.1. Development environment
 - 3.1.1. Visual studio code(IDE)
 - 3.1.2. Database MongoDB

1.7.2. Roles & Responsibility Matrix

The purpose of roles & responsibility matrix is to identify who will do what.

Table 1: Table of Roles and Responsibilities.

WBS #	WBS Deliverable	Activity #	Activity to Complete the Deliverable	Duration (# of Days)	Responsible Team Member(s) & Role(s)
1	Requirement analysis	1	Done	14	Qasim
2	Requirements Gathering	2	Done	14	Mubashar
3	Feasibility	3	Done	14	Hassan
4	Planning	4	Done	21	All Members
5	Initiation	5	Done	21	All Members
6	Designing	6	Done	14	Hassan
7	Implementation	7	Done	21	Qasim
8	Execution	8	Done	14	All Members
9	Testing	9	Done	21	Mubashar
10	Reviews	10	Done	10	All Members

1.7.3. Gantt chart

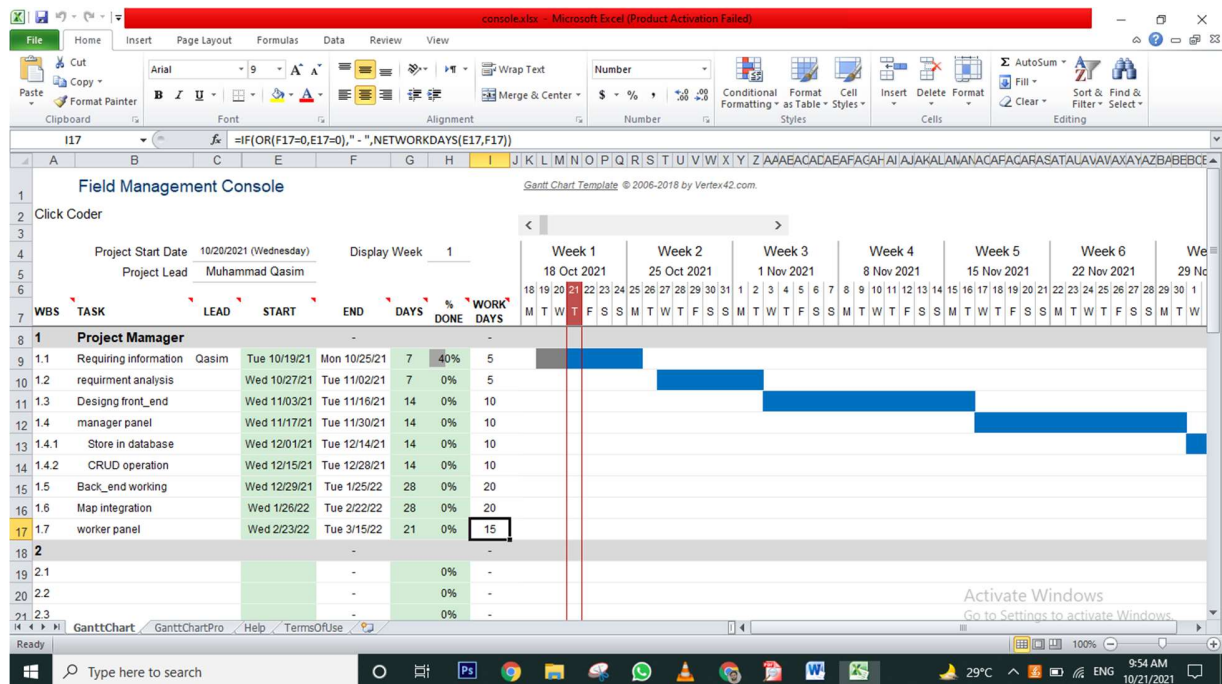


Figure 1: Gantt Chart

Chapter 2

Software Requirement Specifications

Chapter 2: Software Requirement Specifications

2.1. Introduction

2.1.1. Purpose

We are developing a web application Field management console is a management tool for construction works with a lean production planning platform to improve work flow and achieve maximum productivity. The job of a project manager is to plan and oversee all aspects of a project, and to meet the project's goals on time and within budget. It will require you to organize people, tasks and resources to bring about a successful conclusion

2.1.2. Document Conventions

The document is prepared using Microsoft Word 2016 and has used the font type 'Calibri'. The fixed font size has been used to type this document is 12pt for text heading size 14pt and main with 16pt with 1.5 line spacing.

2.1.3. Intended Audience and Reading Suggestions

This project is an application for Field management. It is a management tool to improve work flow and achieve maximum productivity. This document is intended for Developers; to understand the requirements of the app to make it up to the mark, Users; who is going to use the application, marketing staff; who promotes the product and generate revenue for an organization, testers; who verifies that the product meets the functional, performance, design, and implementation requirements identified in the SRS.

2.1.4. Product Scope

Field Management Console includes 3 major modules.

Included Modules

- Project Manager Console

With the help of Project Manager Console the Project manager can easily assigned task and check the status of that task. Project manager can also see the location of the worker and monitor their moments between sites or find out the current location of the worker. This solution is also making it easy to check the overall status of all the projects.

Excluded Modules

- Organization Console

With the help of organization console organizational level activities can be managed easily.

- Accountant Console

With the help of Accountant Console project payments and invoice can be managed easily. It will also help to manage accountant level activities easily.

2.1.5. References

- Channel NewsAsia. 2013. Urgent need for construction industry to raise productivity: Lee Yi Shyan. [online] Available at: <http://www.channelnewsasia.com/news/business/singapore/urgent-need-for-construction-industry-to/677692.html>
- Heiskanen, A. 2013. How to Be Successful with Construction Project Management Software - AEC Business. [online] Available at: <http://aec-business.com/how-to-be-successful-with-construction-project-management-software/>

2.2. Overall Description

2.2.1. Product Perspective

Our Field management console is divided into modules so the main module is project manager console. Field Management Console is an application where project manager can easily add a new project in the system with its location. The teams and worker can see the new location on the map. This solution is also making it easy to check the overall status of all the projects.

2.2.2. Product Functions

1. User End:

The major functionality of user end is given below:

- Registration & Login
- Change password
- User Role
- User Account Management

2. Manager End:

The major functionality of manager end is given below:

- Manager login
- Project data: add/update/view/delete
- Worker List
- Contact list
- Project progress
- Project report

2.2.3. User Classes and Characteristics

Following are the user classes:

Project manager:

Project manager is a person that controls all the construction projects and the worker that work on multiple sites. Project manager assign the worker to a specific project or site the history of all the workers is manage by the project manager.

2.2.4. Operating Environment

Our application is web based application that runs on operating system. It will support windows operating system. Web browser is must require to run this application. Internet access is must to connect the application with real-time database that are store in any server.

2.2.5. Design and Implementation Constraints

The design of the web app is user friendly and attractive. Graphs and maps are used in this application. The *Below mention tools and techniques will help to achieve the goal.*

- **Front End Technology:** ReactJS ,Redux
- **Back End Technology:** Python Flask
- **Database:** MongoDB
- **Other Technology:** Google Map Api
- **Editor:** VS Code

2.2.6. User Documentation

The user documentation will include the following:

- User manual
- Tutorial

2.2.7. Assumptions and Dependencies

The users have sufficient knowledge how to use internet and how to interact with website.

The operation system should be activated Internet connection can also affect the working of application. Users have the basic knowledge of English language.

2.3. External Interface Requirements

2.3.1. User Interfaces

One of the main modules of the web portal needs an effective user interface in order to increase the usability of our software. Therefore, we decided to create a GUI to satisfy that need. In order to create a GUI, we are going to use CSS or react js.

The first interface is the log in screen. This is where the manager has a specific Username and Password so that they can gain access to the database. Then manager can manage his/her profile and the list of users and list of projects.

2.3.2. Hardware Interfaces

To run this application we need a computer system and an internet connection. A computer system must be connected with the internet.

2.3.3. Software Interfaces

Operating system: We have chosen Windows operating system for its best support and user-friendliness.

Browsers: to run this application we must have any browsers software to open the website.

Visual Studio Code: Visual Studio Code is a streamlined code editor with support for development operations like debugging, task running, and version control.

Database: MongoDB use for store data in a database on server.

.

2.3.4. Communications Interfaces

This project supports all types of web browsers to communicate with our website.

Like Google chrome, Firefox, Microsoft Edge

2.4. System Features

There are the following feature that are provide by our application

2.4.1. Registration & Login:

2.4.1.1. Description and Priority

The registration of a user and store it data in database and Login a user and store or keep their data separately

2.4.1.2. Stimulus/Response Sequences

- A user will open the application.
- Application will show the registration page.
- If the user is new, he will fill out the registration form.
- The existing user will switch to The login page the application will authenticate the login details and allow the user to proceed to the home page if the login is successful otherwise it will show unsuccessful login dialog box.

2.4.1.3. Functional Requirements

REQ-SF1-1: The integration of data must be contained

REQ-SF1-2: Application must login or register a manager before showing a page

2.4.2. Project management

2.4.2.1. Description and Priority

The managers simply create a project and assign multiple workers on that project. Some worker assign to a single project

2.4.2.2. Stimulus/Response Sequences

- First manager create a project
- Manager can check the list of ongoing project.
- Check the working of worker
- Keep the track of all the working that works on a specific site or project.

2.4.2.3. Functional Requirements

REQ-SF2-1: Manager can create a project or delete a project

REQ-SF2-2: Manager checks the worker list.

REQ-SF2-3: Manager can check the project list.

2.5. Other Nonfunctional Requirements

2.5.1. Performance Requirements

Speed of the internet connection from the remote computer and speed of connection to the server will affect the performance. Efficiency of the software code will have effect on how quickly commands to the system are given. The internet speed is important for authentication and searching data from firebase database.

2.5.2. Safety Requirements

Terms and conditions should be defined. User should accept that and then use the application to avoid any inconvenience later.

2.5.3. Security Requirements

User authentication offered by the database is used as the safety mechanism for login. So that a user can only access its own data.

2.5.4. Software Quality Attributes

There is the Following software quality attributes:

- Availability
- User friendly
- Reliability
- Maintainability
- Correctness
- Easy to use

2.5.5. Business Rules

Manager authentication is required. Manager can add, delete, view or update a project. Manager only can check the complete list of worker and Assign different worker to a project or site.

Chapter 3

Use Case Analysis

Chapter 3: System Analysis

In this chapter, we will discuss about the use cases regarding the actors which includes customer, manager and Admin separately and also full use case diagram of the system. The visual representation of the use cases is given. Also the fully dressed use case is described as per template with all the attributes which are essential for a fully dressed use case.

3.1. Use Case Model

Use case diagram for Field Management Console.

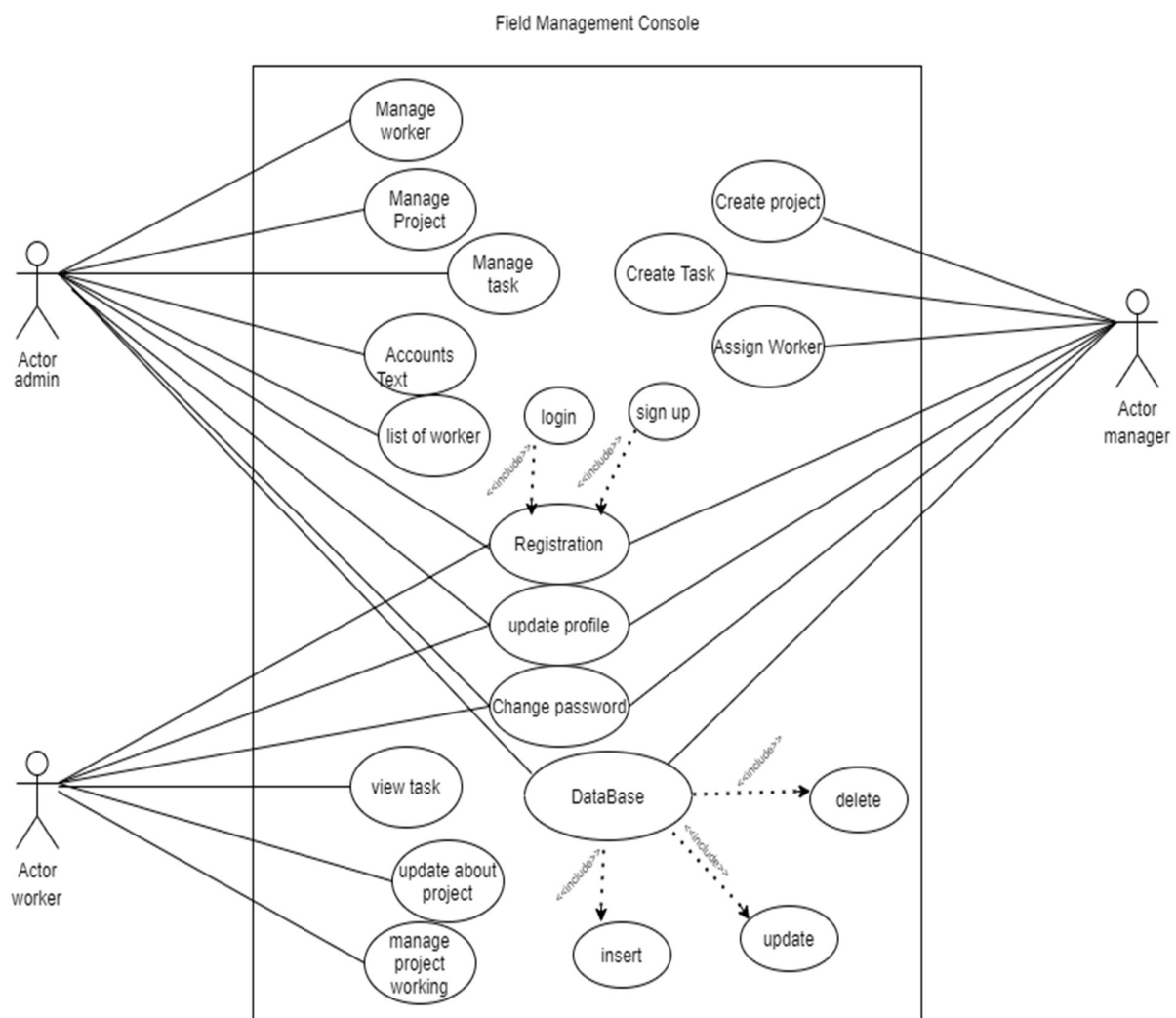


Figure 2: USE Case Model of FMC

3.2. Use Case Descriptions

Registration:

Table 2: Use Case Description of Registration.

Number	1	
Name	Registration	
Summary	User will register before going to home page	
Preconditions	User must have install the application and have internet connection	
Post conditions	Authentic Information	
Primary Actors	User	
Secondary Actors	Owner, Admin	
Trigger	User choose to have an account	
Main Scenario	Step	Action
	1.	System will ask for login or signup
	2.	User will choose an option
	3.	System will show form according to the selection
	4.	User will enter email and password
	5.	System will authenticate the information
	6.	On success, application will further proceed. On Failure, System will ask to re-enter the information.

Database:

Table 3: Use case Description of Database.

Number	2	
Name	Database Management	
Summary	Admin and owner can maintain the database	
Preconditions	Admin must have logged in	
Post conditions	Must have access to database	
Primary Actors	None	
Secondary Actors	Owner, Admin	
Trigger	Admin or owner choose to manage the database	
Main Scenario	Step	Action
	1.	System will ask for login
	2.	User will provide the credentials
	3.	System will authenticate and provide access according to rights.
	4.	Admin or owner can manipulate the data

Chapter 4

System Design

Chapter 4: System Design

In this chapter, we will discuss about the Designing the system of Field Management Console with the Admin, manager, and worker. With the visual representation, System design in different ways like Architecture diagram, domain model, Class diagram, ER diagram and many more which are shown below.

4.1. Architecture Diagram

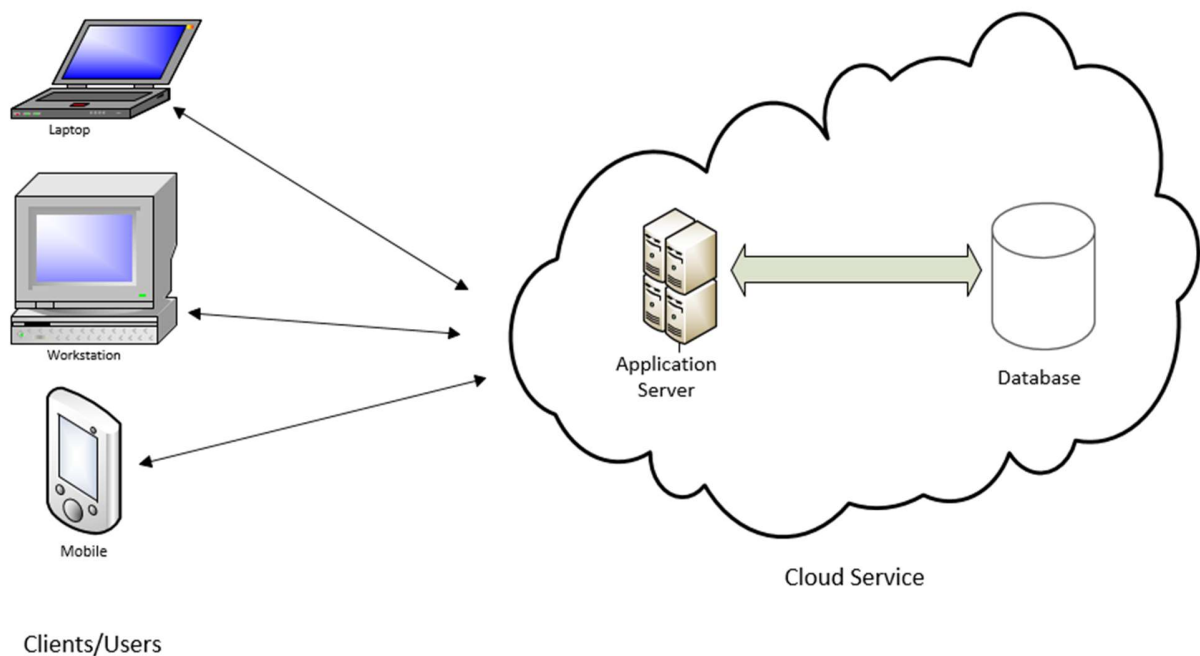


Figure 3: Architecture Diagram of FMC

4.2. Domain Model

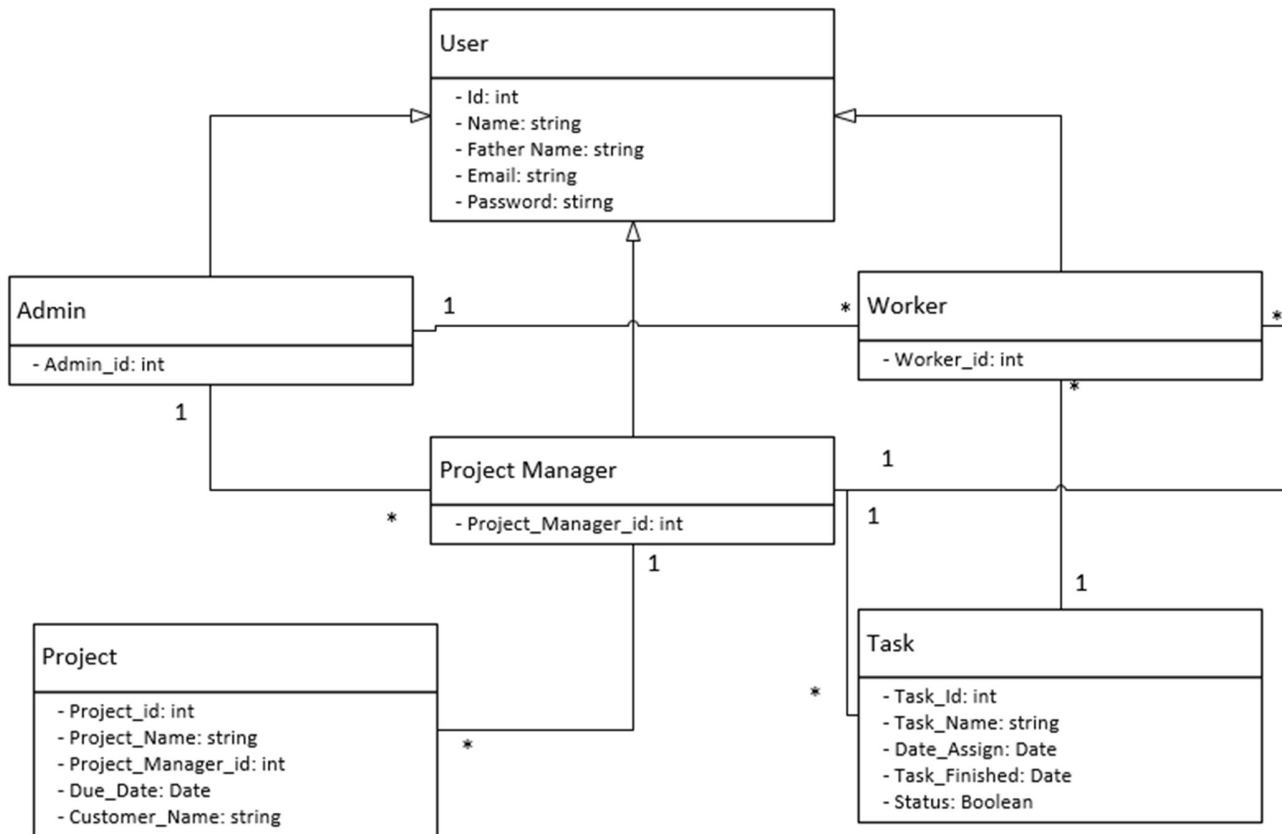


Figure 4: Domain Model of FMC

4.3. Entity Relationship Diagram

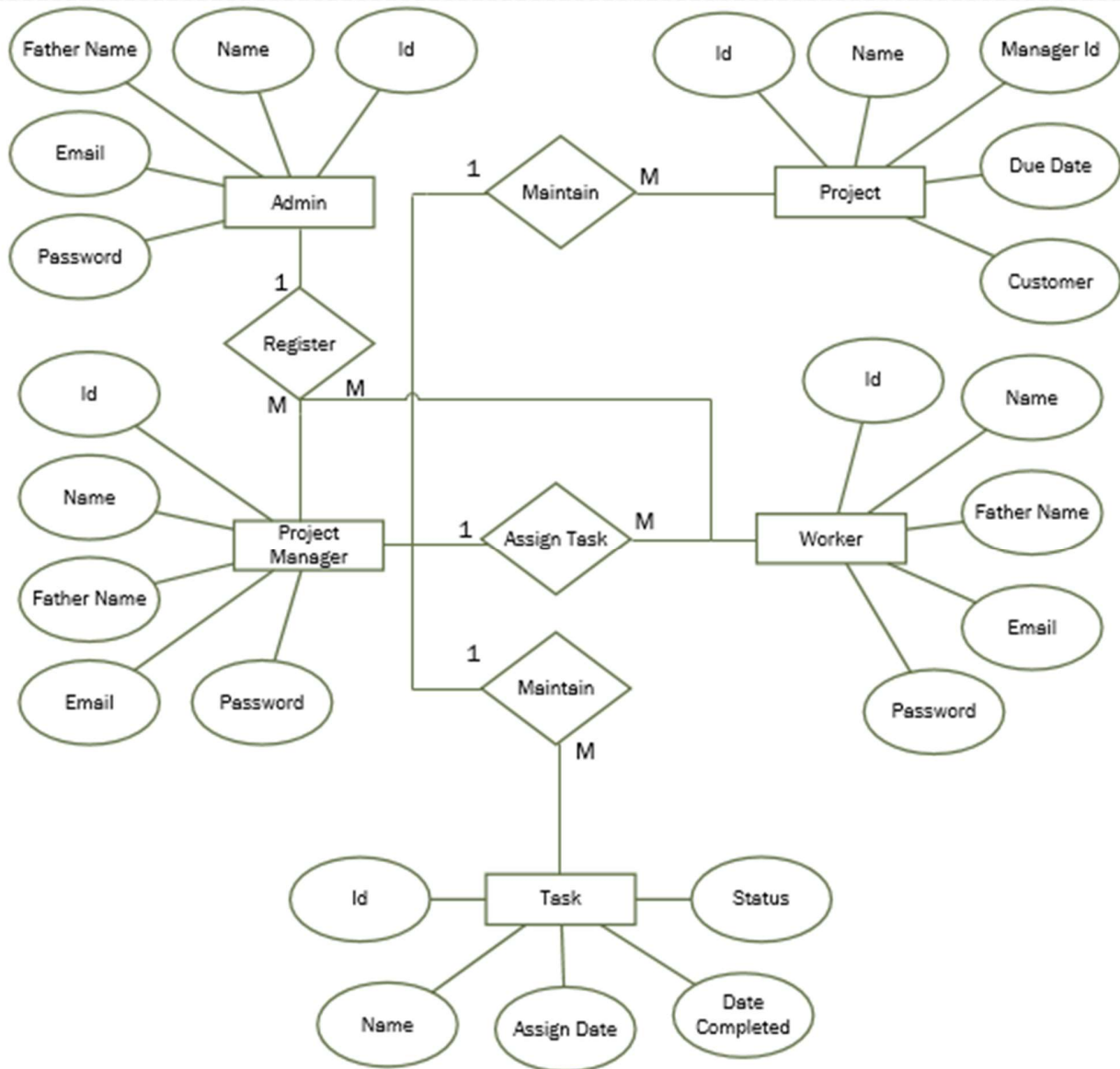


Figure 5: ERD of FMC

4.4. Class Diagram

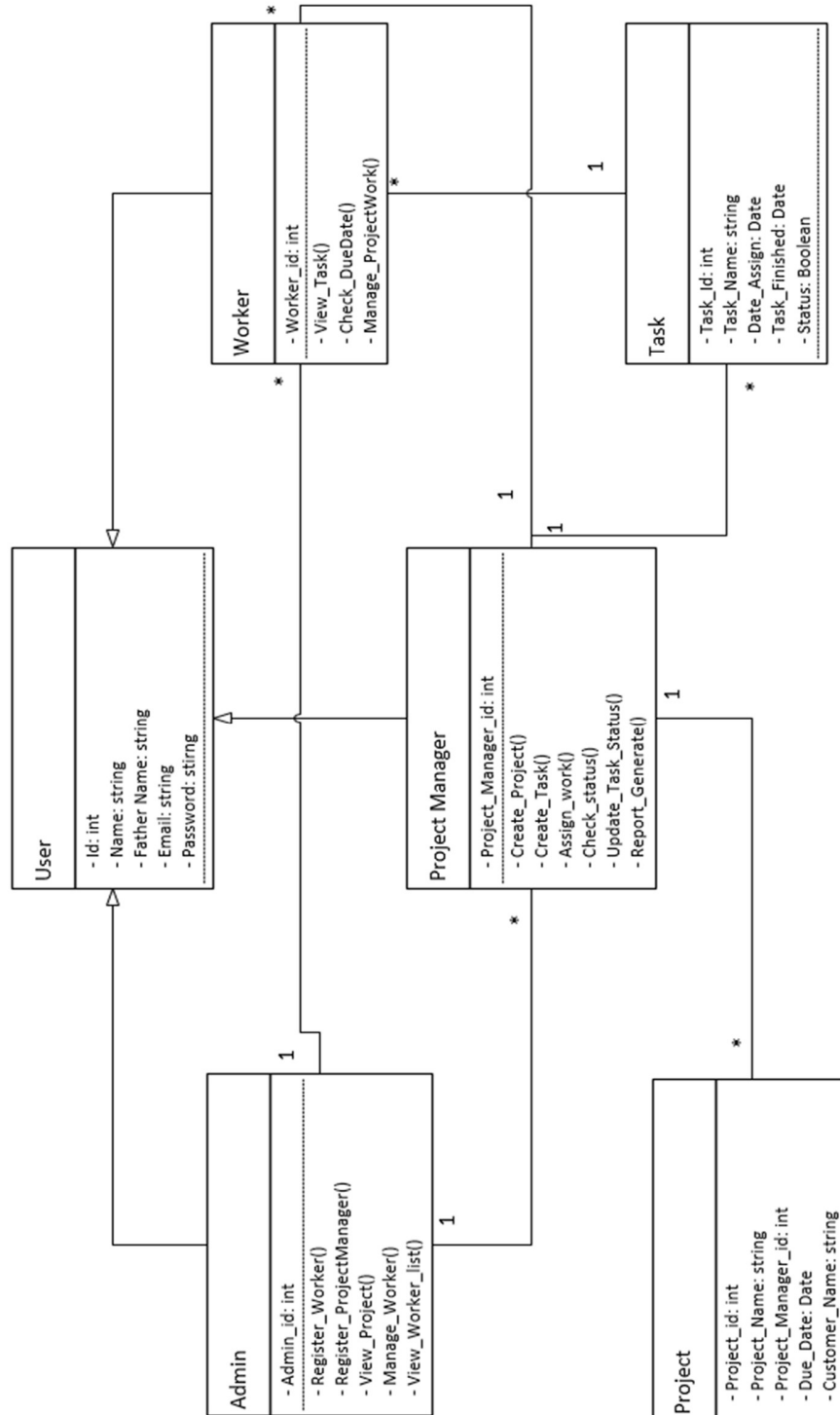


Figure 6: Class Diagram of FMC

4.5. Sequence Diagram

- Admin Sequence Diagram in Filed Management Console.

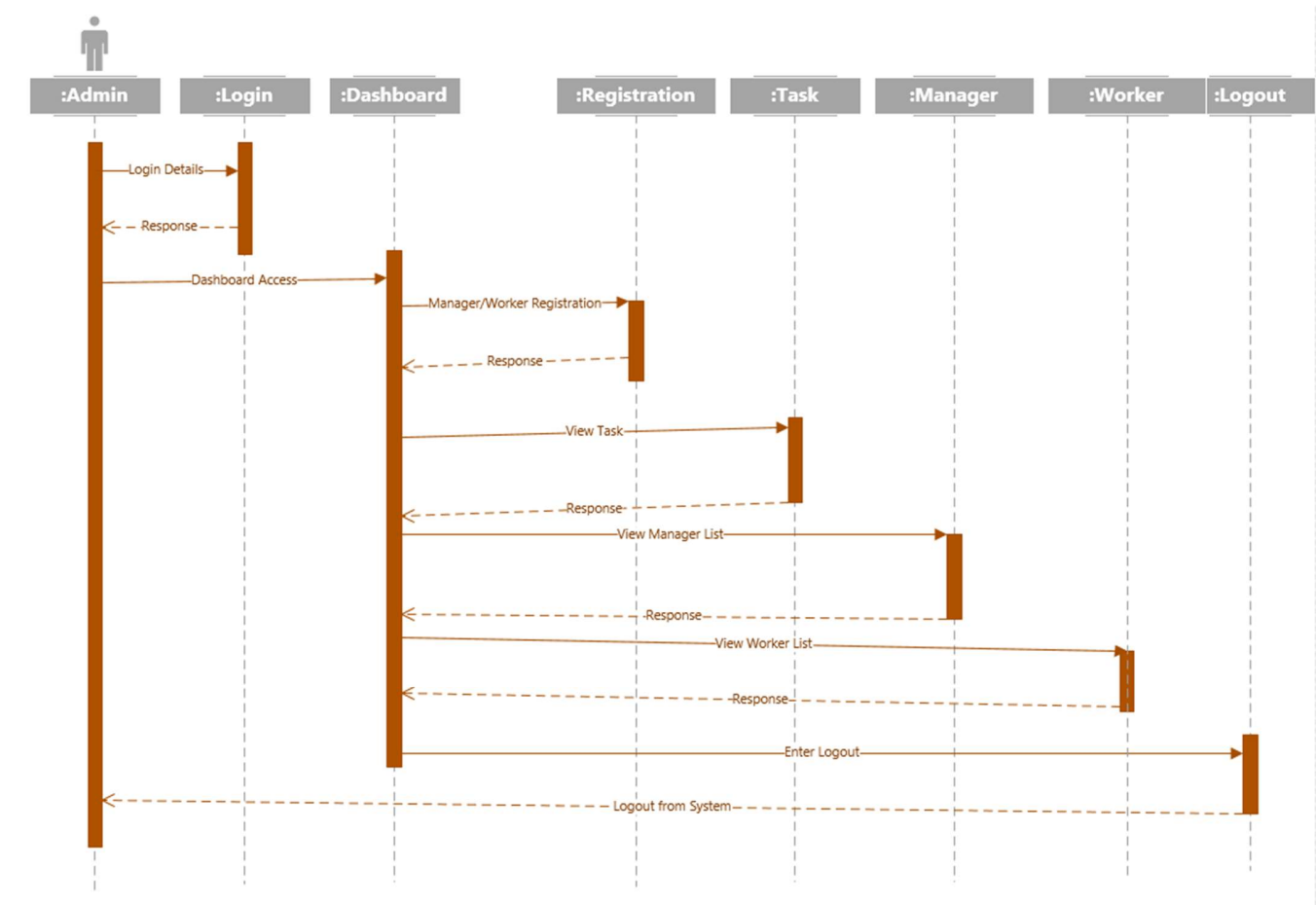


Figure 7: Admin Sequence Diagram of FMC

- Project Manager Sequence Diagram in Filed Management Console.

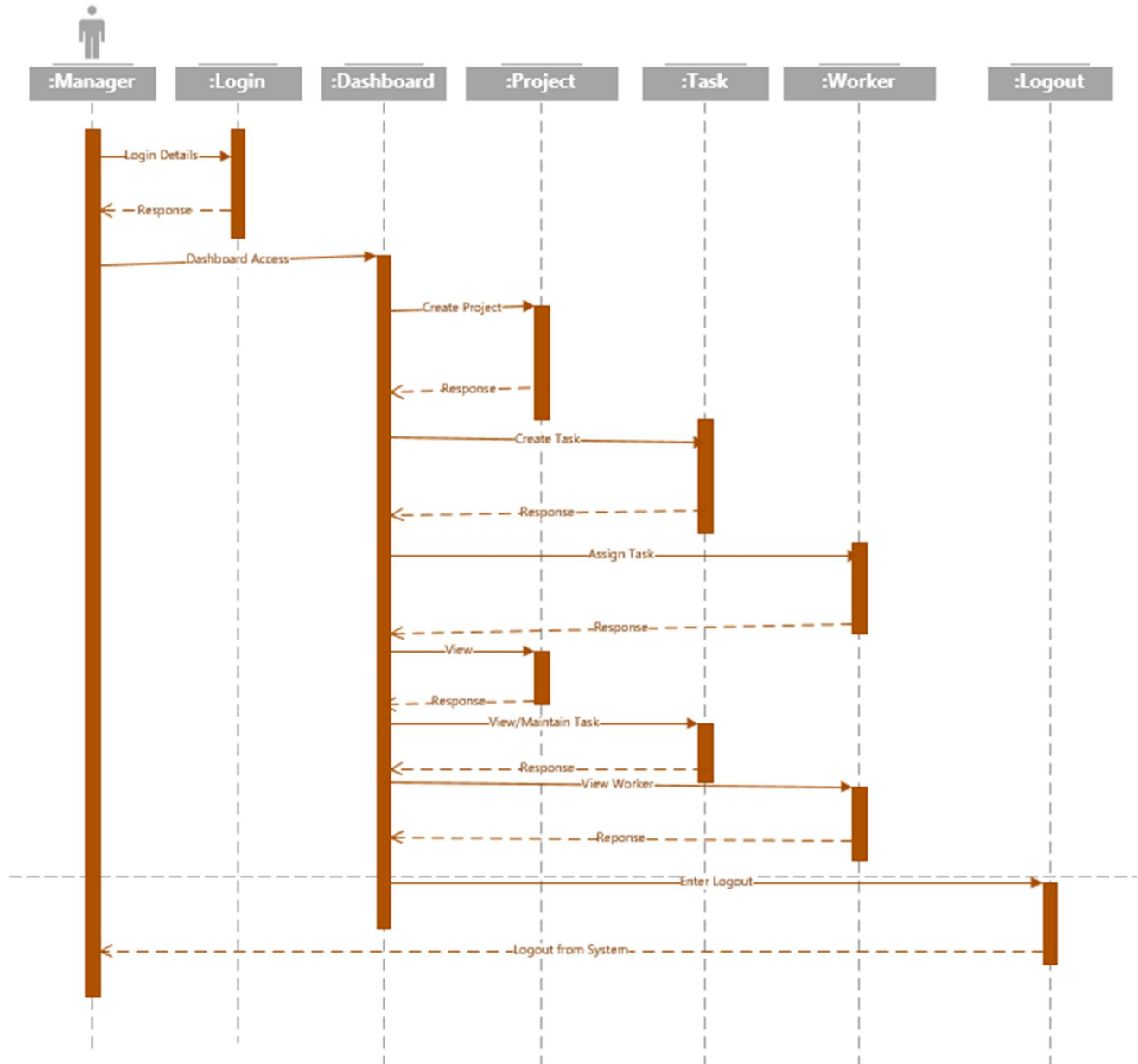


Figure 8: Project Manager Sequence Diagram of FMC

4.6. Activity Diagram

- Admin Activity Diagram in Filed Management Console.

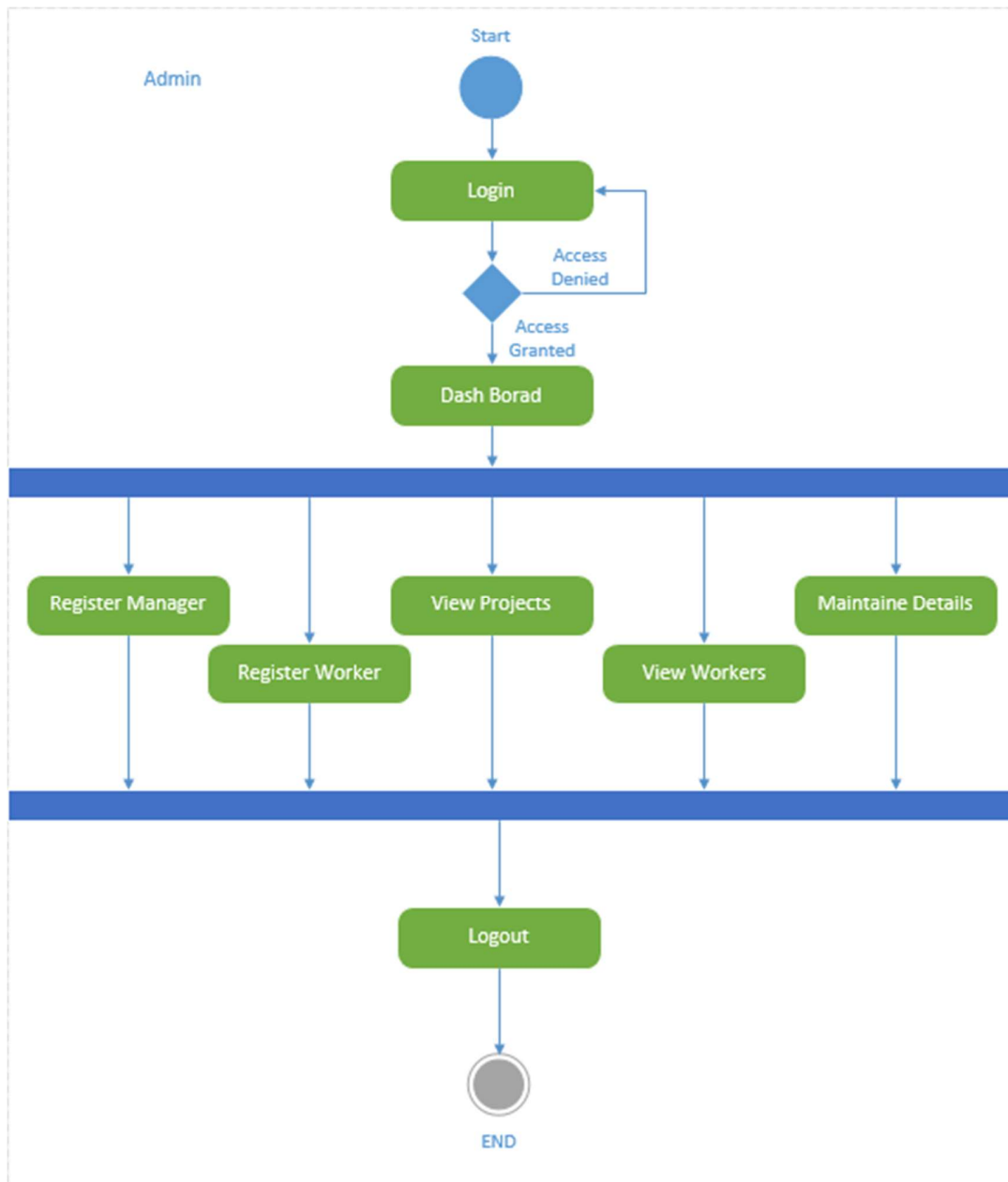


Figure 9: Admin Activity Diagram of FMC

- Project Manager Activity Diagram in Filed Management Console.

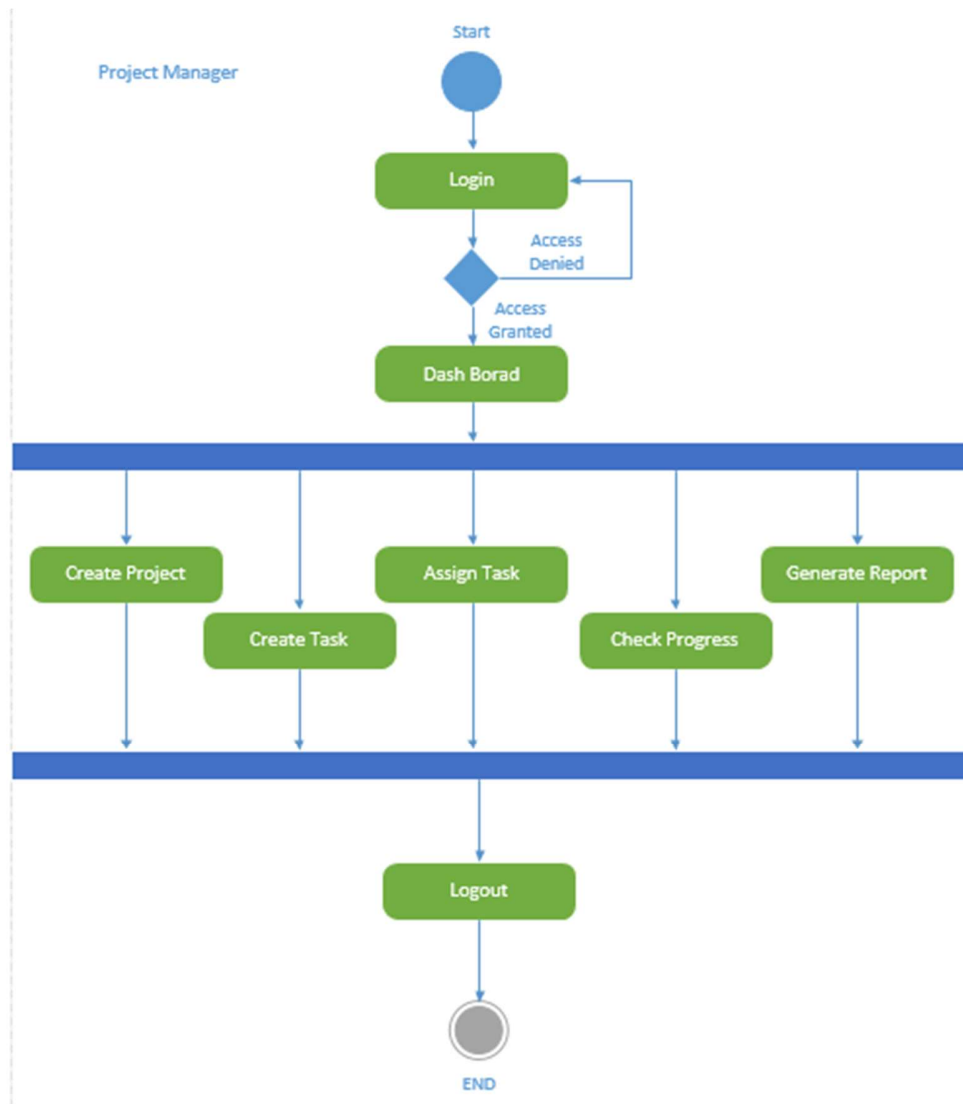


Figure 10: Project Manager Activity Diagram of FMC

- Worker Activity Diagram in Filed Management Console.

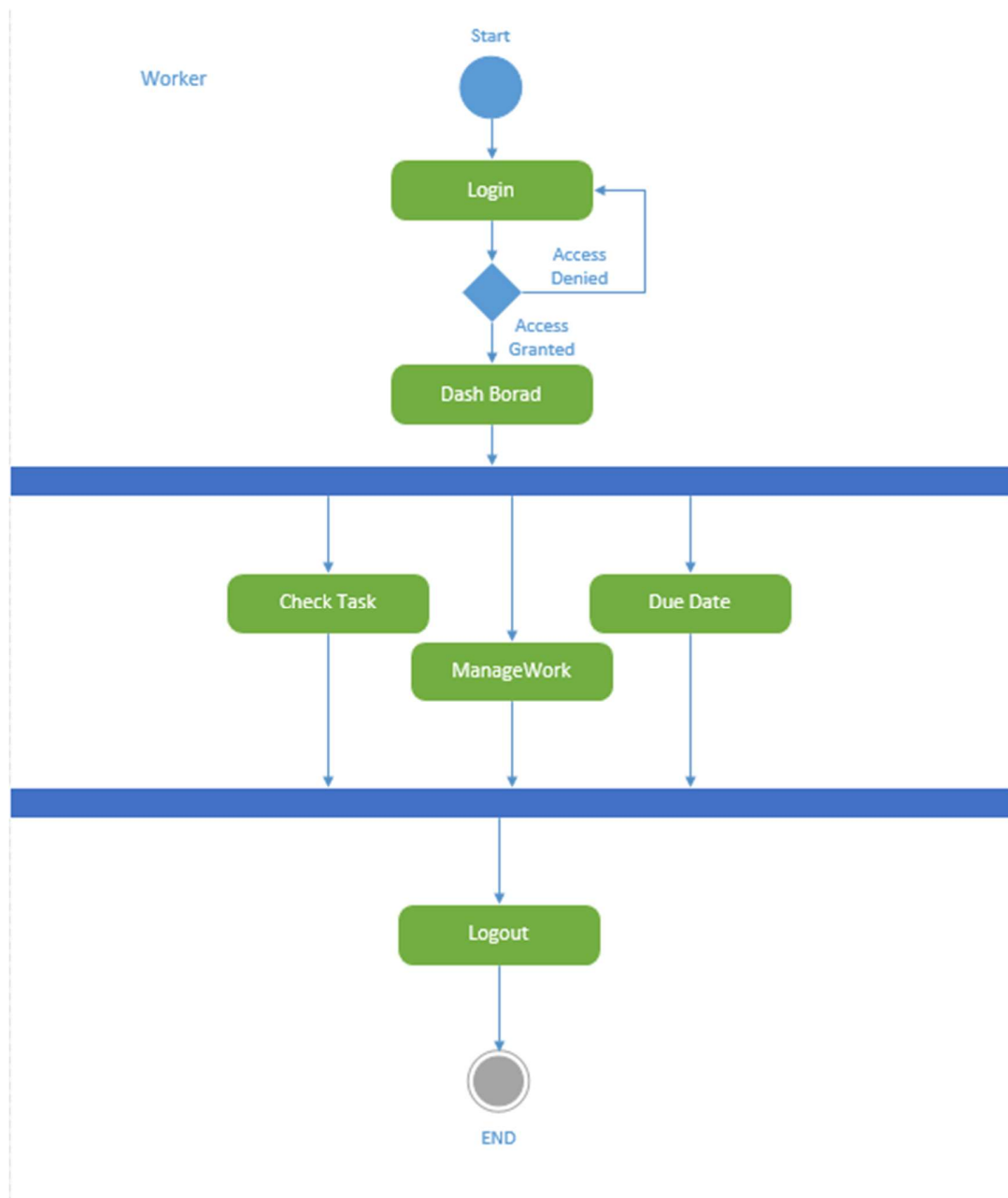


Figure 11: Worker Activity Diagram of FMC

4.7. State Transition Diagram

- Admin State Transition Diagram in Filed Management Console.

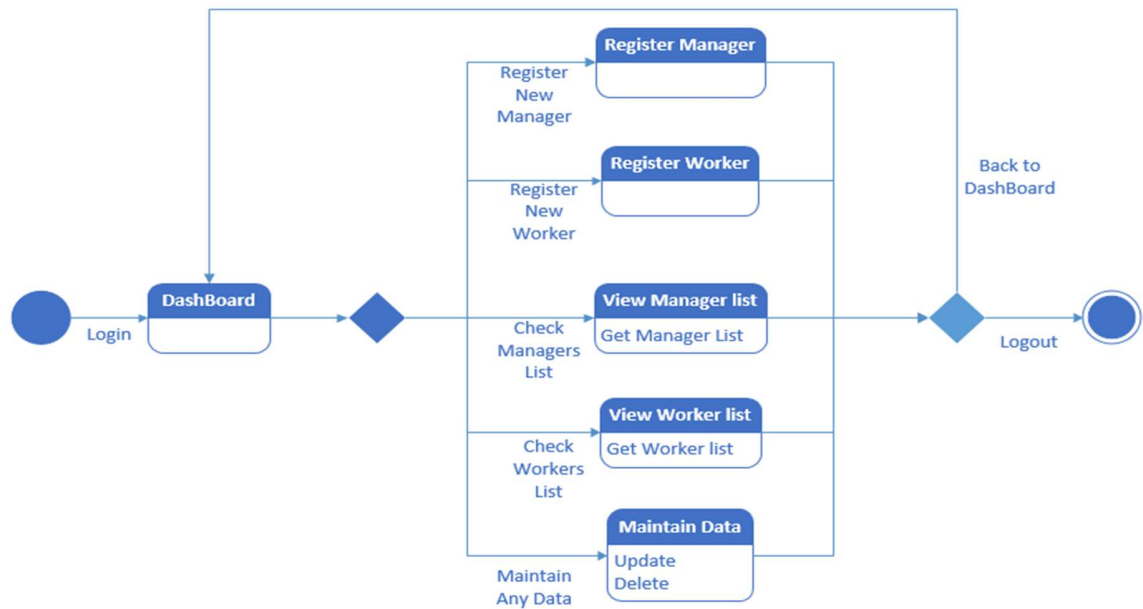


Figure 12: Admin State Transition Diagram of FMC

- Project Manager State Transition Diagram in Filed Management Console.

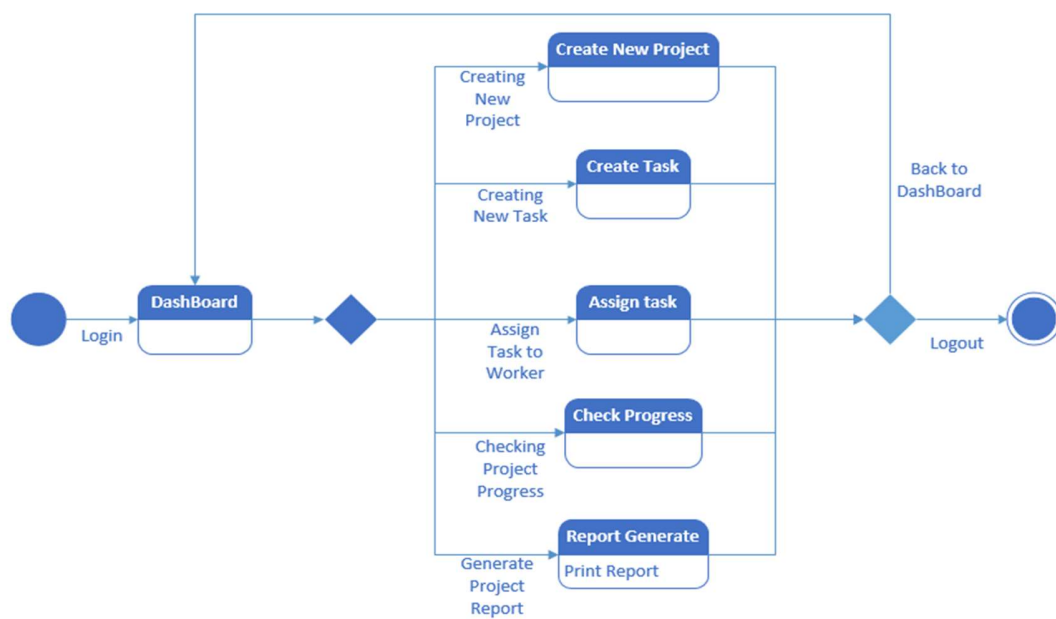


Figure 13: Project Manager State Diagram of FMC

- Worker State Transition Diagram in Filed Management Console.

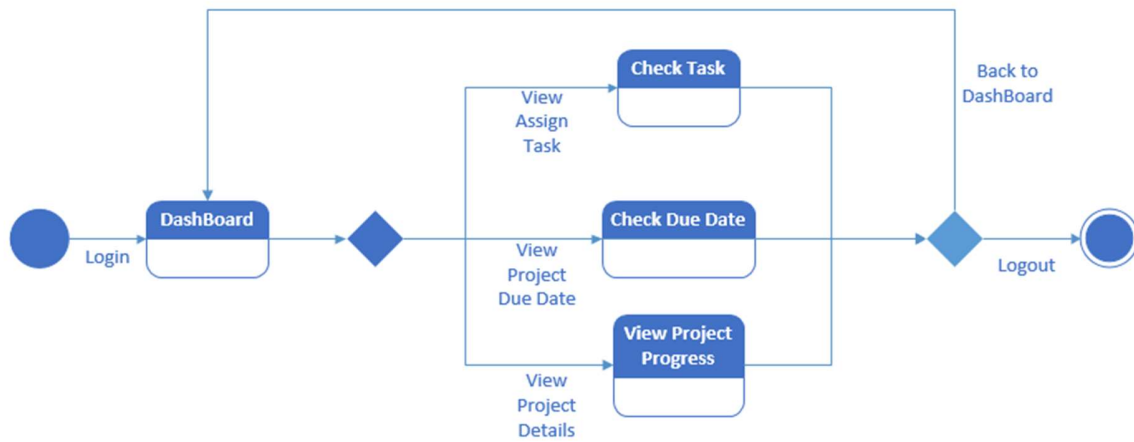


Figure 14: Worker State Transaction Diagram of FMC

4.8. Component Diagram

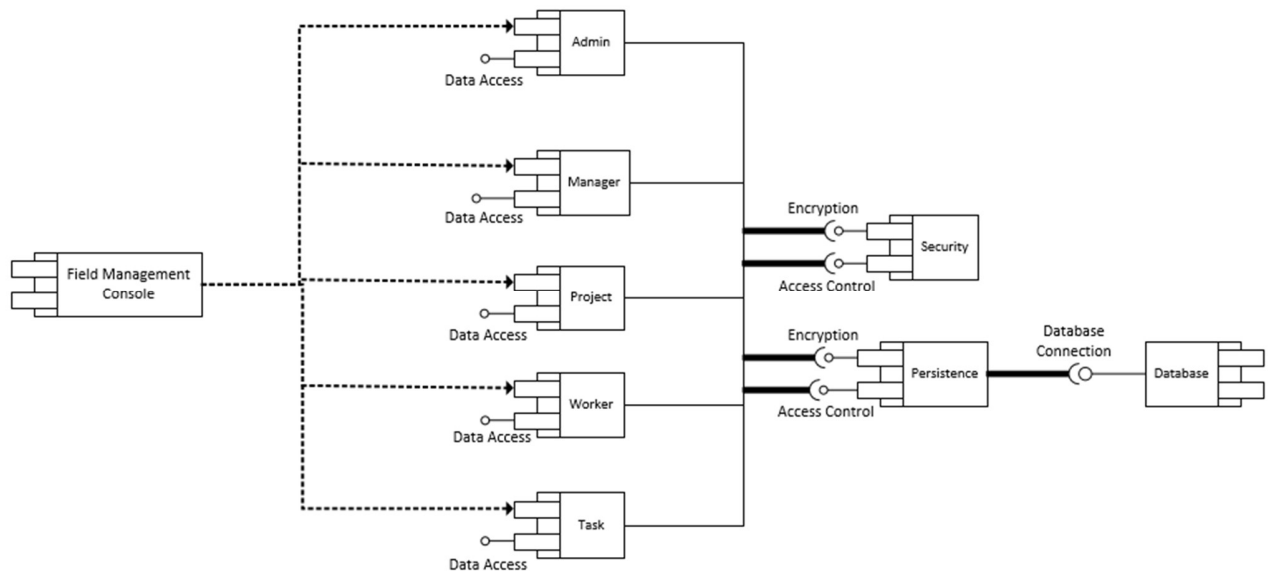


Figure 15: Component Diagram of FMC

4.9. Deployment Diagram

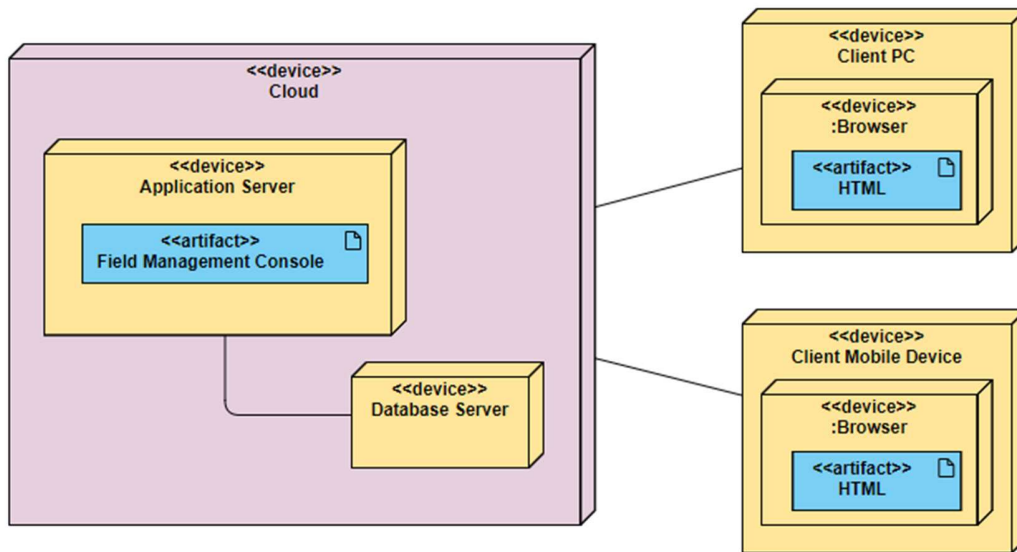


Figure 16: Deployment Diagram of FMC

4.10. Data Flow Diagram

- Level 0 DFD.

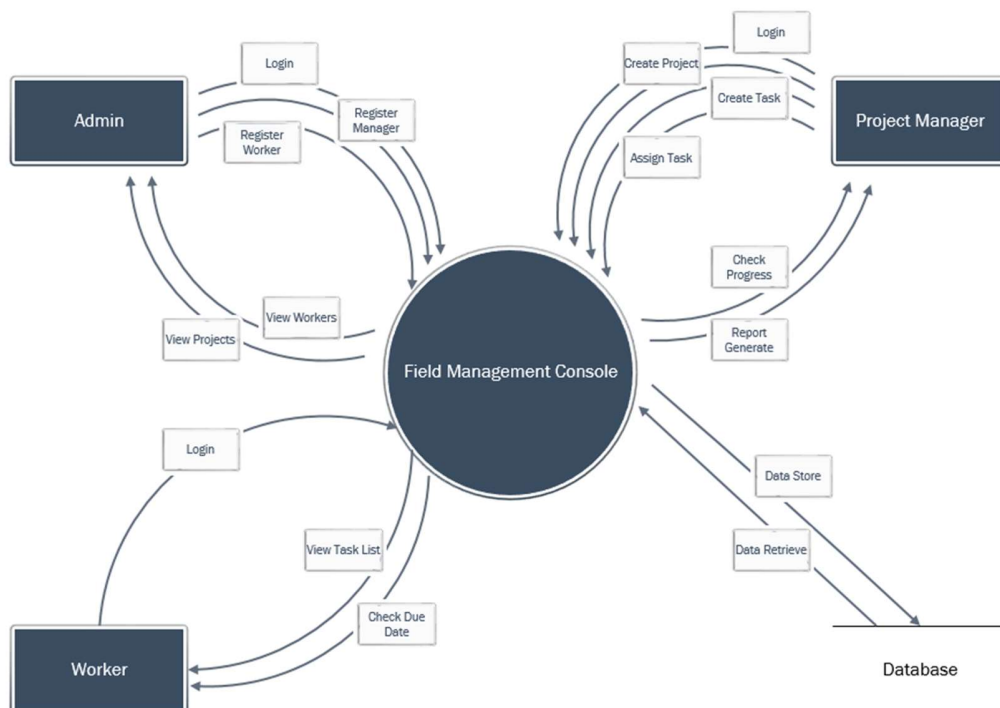


Figure 17: Level 0 DFD of FMC

- Level 1 DFD.

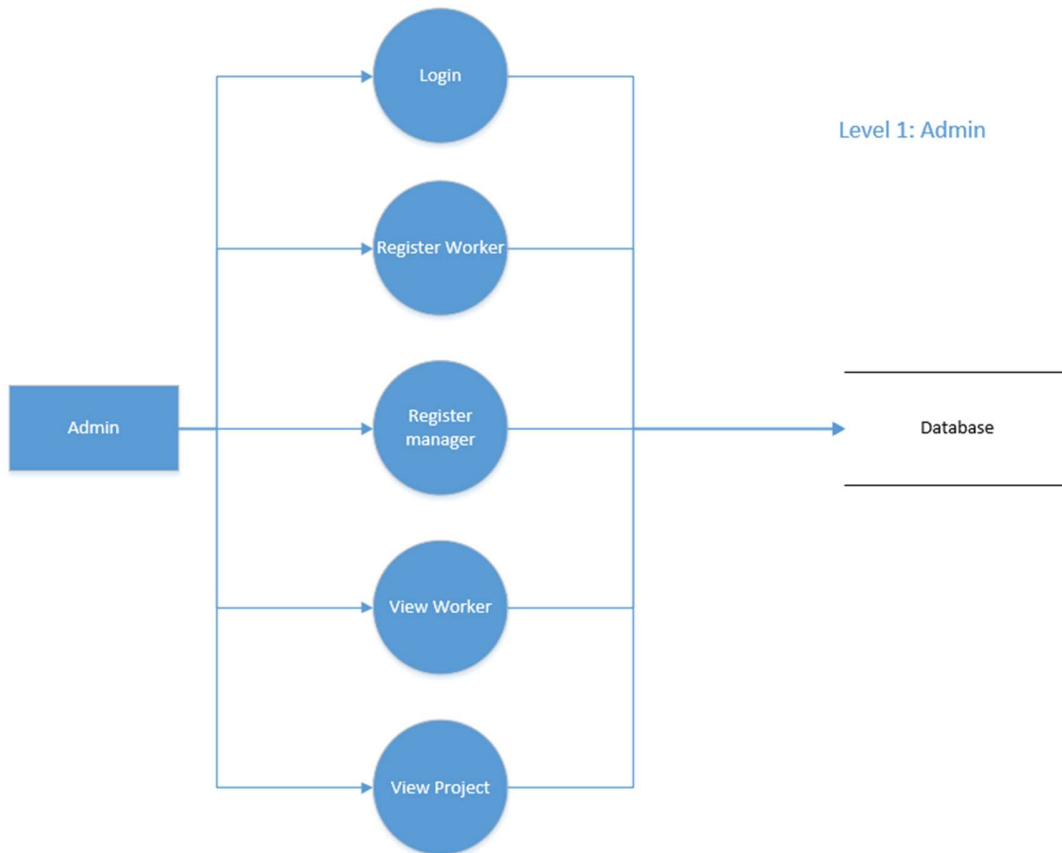


Figure 18: Admin Level 1 DFD of FMC

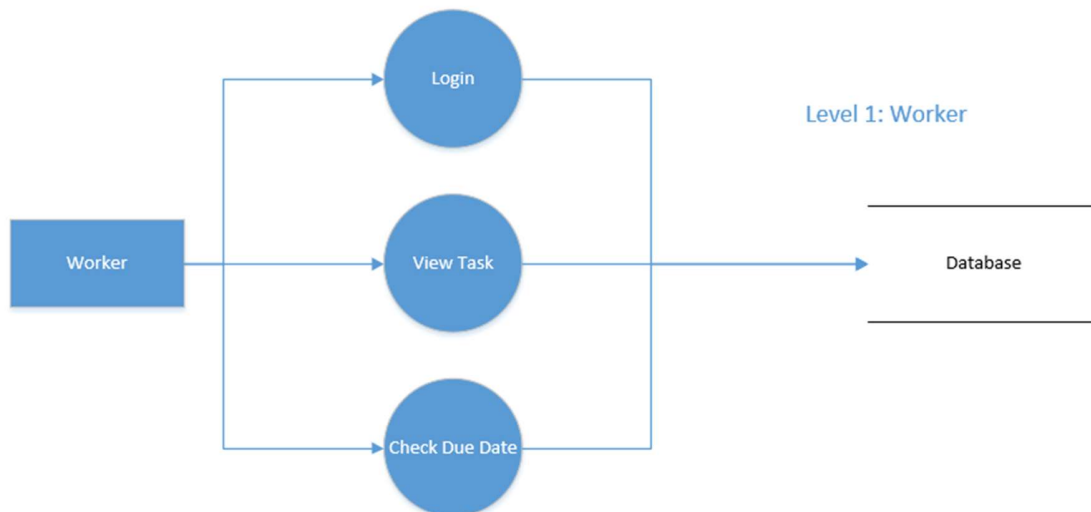


Figure 19: Worker Level 1 DFD of FMC

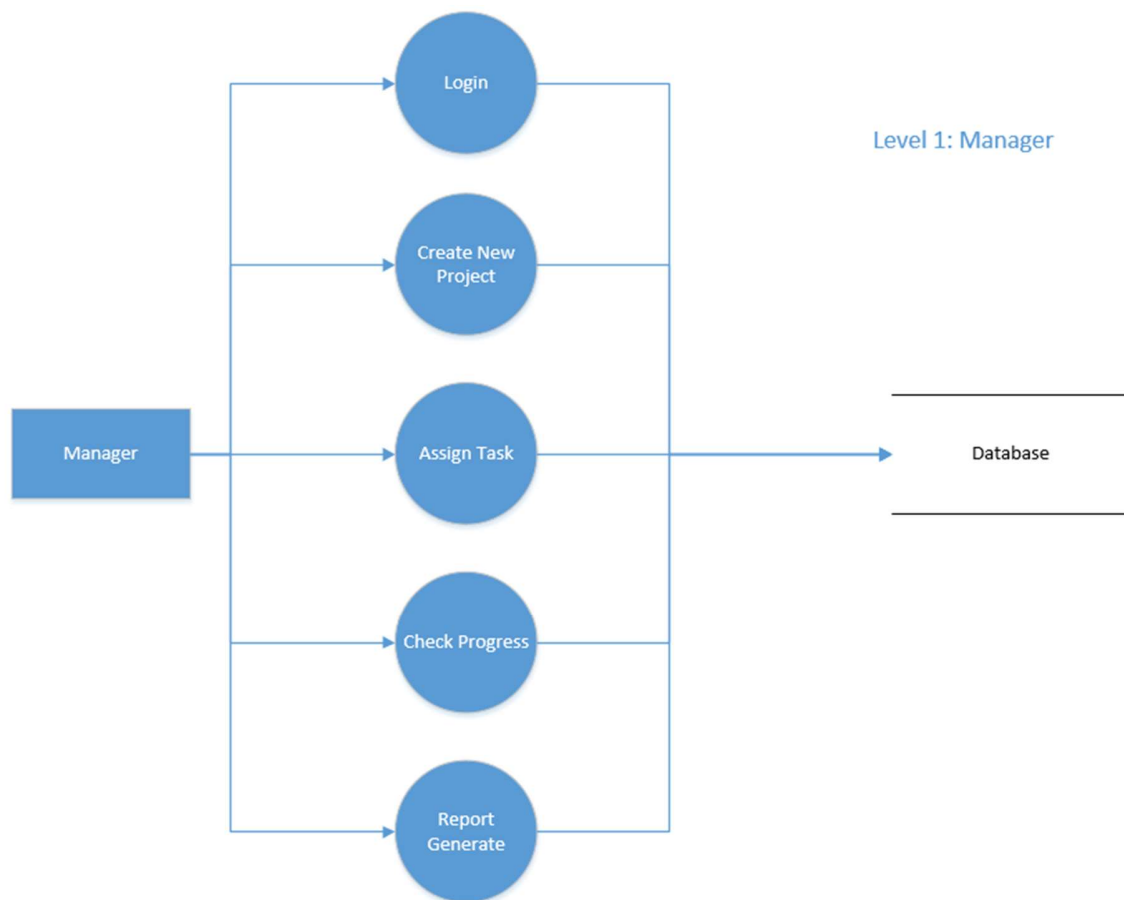


Figure 20: Manager Level 1 DFD of FMC

Chapter 5

Implementation

Chapter 5: Implementation

This chapter describes the project implementation for developing the project Field Management Console. The project implements on python Flask, react.js and the database used is Mongo DB Database. The project will be able to run on any browser because this is a website. The interface for the project will provide a platform where an organization or a company create their projects and check the status of the different projects.

5.1. Important Flow Control/Pseudo codes

There is a simple and important Pseudo code that is the overview of the project.

Step 1: First of all if you are a new user/admin than register you're self.

Step 2: After registration login in to the system. If user/admin forgot their password he can reset their password on clicking the option forgot.

Step 3: You see the three console first one is organization console

Step 4: In organization console admin can add a new user, add new project, assign user to a project, edit the project etc.

Step 5: You can either check the project management console.

Step 6: In project management console there is multiple projects of a specific company you can check the status of the project and the worker staff.

Step 7: And check the working status of the workers.

Step 8: The third option is accounts setting.

Step 9: In account setting you can check the detail of the users add, update or delete the different users.

Step 10: Admin can edit their personal information. Change username or can change the password.

Step 11: Logout from the system.

5.2. Components, Libraries, Web Services and stubs

There are many components is used in the project the main component is Google Maps. We use Google map API to track the status of different projects. We are using Firebase Authentication for User and Admin login which verifies the credentials of the users. We use multiple libraries like firebase-admin, flask-login, flask-wtf, email-validator, and flask-mail etc.

5.3. Deployment Environment

We developed this project in Windows 10 using the Visual Studio Code which is used for website development and other developments. We are providing the solution which is a website and it can access using any browser. The database of the project is deploy on the online server.

5.4. Tools and Techniques

The Below mention tools and techniques will help to achieve the goal.

Front End Technology:

- ReactJS
- Redux

Back End Technology:

- Python Flask

Database:

- MongoDB

Other Technology:

- Google Map Api

Editor:

- VS Code

5.5. Best Practices / Coding Standards

There are following best practices and are the best coding standard that is usually follow by the developers before make a project.

- Defined life cycle and milestone
- Stable requirements and scope
- Defined organization, systems and roles
- Quality Assurance
- Plan Commitments
- Scope and mission

5.6. Version Control

We are currently working on the version 3.0 of the application. The changes will occur and affect the version by the time as the app is making and in working condition but we still in development stage.

Chapter 6

Testing and Evaluation

Chapter 6: Testing and Evaluation

Software Testing is evaluation of the software against requirements gathered from users and system specifications. Testing is conducted at the phase level in software development life cycle or at module level in program code. Software testing comprises of Validation and Verification. This chapter is all about the process by which a system or components are compared against requirements and specifications through testing. We will perform all the testing phase in our project which will increase the performance of the system and improve the design of the system. The project will be stable and supportable after the testing and evaluation.

6.1. Use Case Testing

We test every use case in our project for every possible scenario. Basically use cases are descriptions of a sequence of actions that the system can perform in response to exposure of users or other software systems. Use cases represent functional requirements of the system from a user perspective, not from a technical point of view, so they allow us to accurately place priorities of the functions according to importance of results. We test registration use case to enter all possible value in a field that a common user can enter. We enter some wrong value to check the validation of a form. Use case testing is very helpful.

During testing, use cases allow you to evaluate the accuracy of implementation of user requirements and to perform step-by-step verification of these requirements.

6.2. Equivalence partitioning

Equivalence partitioning is very helpful in testing software. In our development phase we will test the entire module or form with all the validate value if we enter invalid value the software through an error that show user enter a wrong value. It is very helpful to reduce the time of testing. Every test case is cover in equivalence partitioning the valid part or the invalid part also test here. Test cases are designed to cover each partition at least once.

6.3. Boundary value analysis

Boundary value analysis is a software testing technique used to check the error at the boundaries of an input domain. In simple words the input is divided into higher and lower end values. If these values pass the test, it is assumed that all values in between may pass too. For example if we enter password in number the boundary value is including all the positive number. The input domain is all the positive number negative number is not included. We will perform the boundary value analysis in our project.

6.4. Data flow testing

In development process the data flow testing done to ensure the working of all the variables that are used in our project. Data Flow Testing is a type of structural testing. It is a method that is used to find the test paths of a program according to the locations of definitions and uses of variables in the project. Basically we use Data Flow Testing to control flow graph to find the situations that can interrupt the flow of the project.

6.5. Unit testing

During the development process, unit testing will be done to ensure that the entire modules are built correctly. Every smallest module that is the part of the application will be test individually and independently are tested to determine whether they are fit for use.

6.6. Integration testing

Integration testing will be done after we have built the entire component and combined them into the application. We will test the database, the web coding and the user interface and other functionalities here.

6.7. Performance testing

It is a testing technique carried out to determine system performance in terms of sensitivity, reactivity and stability under a particular workload. We will perform this testing technique in our project. We add a different project or we will add many workers in our projects to test the performance of the application. We will check the stability or sensitivity of our project under a particular workload.

6.8. Stress Testing

We will perform stress testing in our project. Stress testing is a type of software testing that verifies the stability and reliability of the system. We will make the project stable or reliable. This test particularly determines the system on its error handling under extremely heavy load conditions. We will add a particular workload in our project to check the reliability. And will verify the stability of our project.

Chapter 7

Summary, Conclusion and Future Enhancements

Chapter 7: Summary, Conclusion & Future Enhancements

7.1. Project Summary

Field Management Console is a management tool for construction works with a lean production planning platform to improve work flow and achieve maximum productivity. The job of a project manager is to plan and oversee all aspects of a project, and to meet the project's goals on time and within budget. It will require you to organize people, tasks and resources to bring about a successful conclusion. Field Management Console is an application where project manager can easily add a new project in the system with its location. The teams and worker can see the new location on the map. This solution is also making it easy to check the overall status of all the projects.

7.2. Achievements and Improvements

When we complete this project we will achieved a perfect platform for a worker to work or for a project manager that can easily add a new project in the system with it location and check all the working of the project using our application. Accuracy of the reporting is also a very good factor. Now the main goal that we will achieve is to making thing reliable and accurate for the project manager. We will add many things in this project later that will improve our project.

7.3. Critical Review

Field Management Console is a management tool for construction works with a lean production planning platform to improve work flow and achieve maximum productivity. The job of a project manager is to plan and oversee all aspects of a project, and to meet the project's goals on time and within budget. After all the discussion our critical review in this project is it will create a very positive impact in our country. If people use this application people will not face any problem of travelling to a construction site. People can check the working of their project from their house. This project is reliable for people it will reduce the human effort.

7.4. Lessons Learnt

Too many lesson learnt during the development of this project. If you create some special thing it needs more energy and more effort. If you work hard you can achieved everything in your life. During the development of this project we learn how to work in a group. How to make different modules that you can test individually. Test the entire module before test the whole program. Understand the flow or working of a lengthy code.

7.5. Future Enhancements/Recommendations

After completing this project we will add to many things in this project. Future enhancements in this project are we will make a biometric login system for the workers to maintain the record of attendances of the workers. We can add the payment method in our project to pay the salaries of the workers.

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Reference and Bibliography

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