**COMSATS University Islamabad,   
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SOFTWARE REQUIREMENTS SPECIFICATION   
(SRS DOCUMENT)

for

**DARTS**

Detection And Recognition with Tracking of Suspects  
Version 1.0

***By***

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Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Date** | **Reason for changes** | **Version** |
|  |  |  |  |
|  |  |  |  |

**Application Evaluation History**

|  |  |
| --- | --- |
| **Comments (by committee)**  **\*include the ones given at scope time both in doc and presentation** | **Action Taken** |
|  |  |
|  |  |

Supervised by

Mr. Tahir Mustafa Madni

Signature\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Introduction

This is a **Software Requirement Specification (SRS)** document for our application called **DARTS (Detection And Recognition with Tracking of Suspects)**, which is an application to recognize and track suspects. This document includes the various ways the user can interact with the system, how the system responds and the operating environment to the reader. It includes UML diagrams that explain the flow of the system and the use cases show the various ways through which the user can interact with the system. It also includes the system’s functional requirements and constraints so we can better design a beta version of our system successfully and efficiently.

## Purpose

The purpose of the Software Requirements Specification is to highlight the requirements for **DARTS.** This document will specify use cases of each module along with their functional requirements. It also contains the non-functional requirements and as well as our elicitation technique. The main purpose of this document is to explore and collect all ideas that will help us in defining our product. We shall also predict how our product will work in order to reach the main objective of our project, we will explain the ideas in our document that are being considered but also keeping in view the concepts that might be elaborated or discarded later on as the product develops.

The document also describes the project’s authorized users who will use our product for tracking of suspects.

## Scope

This project presents a web and mobile application for the use of Law Enforcement Agencies, and other security related organizations, through which they will be able to monitor the movements of a suspect. Suspicious behavior will be monitored and suspect will be detected and recognized through facial recognition algorithms that will be running on the available surveillance camera’s feeds in real time. As soon as a suspect is recognized (through available pictures in the database however old) or a suspicious behavior is seen, the tier 1 servers will send the relevant data to the main server where it will begin mapping the suspect’s movements and predicting its next location based on machine learning algorithms. Based on the severity of the threat, the system will notify the Quick response units, that are registered through QR code, through a mobile application and provide them with an interface to communicate with other units, formulate a plan and be provided with a backup. On the other hand, the system will provide a monitoring system for the authorized person so they can strategically capture the suspect.

Our system’s main features include:

* Facial recognition algorithms
* Machine learning algorithms
* Face recreation algorithms
* Abandoned object detection
* Path mapping of suspect
* Severity of threat calculation
* Mobile and Web application
* Preprocessing and enhancement of images
* Communication system
* Database management

# Overall description

## Product perspective

Our application is an entirely new product that is being made for the law enforcement agencies to use. It is a highly innovative surveillance system that is best suited to be developed at this current time terrorism is at the low and tourism is at the high so, Pakistan needs the best possible intelligent surveillance system. It uses computer vision technology to detecting abandoned objects, recognize and track suspects even if their faces are occluded by mapping their location hence aiding the quick response units in catching the suspects timely and providing safety to the citizens.

## Operating environment

Our system shall operate correctly if following requirements are fulfilled:

* **Supported Operating System:**

Embedded 8 Standard, Windows 8, Windows 8.1 or higher

* **Recommended Hardware Configuration:**
* 64-bit (x64) processor
* 16 GB Memory (or more)
* Physical i7 3.1 GHz or faster processor
* DX11 capable graphics adapter
* Android 5.0 or higher
* **Software Requirements:**

.NET Framework 4.5

Python 3.7 or higher

## Design and implementation constraints

* The mobile application that Quick response units will use will run only on android phones.
* The surveillance cameras have to be registered to the system
* If a suspect is hiding their face, the facial recognition algorithm will not work

# Requirement identifying technique

Following were the requirement identifying techniques

* Brainstorming
* Group Discussion
* Observation
* Document Analysis
* Research Papers
* Discussion with Supervisor

## Use case diagram

## Use case description

## Module 1: Cameras Manager

1. Add a new camera

|  |  |
| --- | --- |
| **Use Case ID:** | UC:1.1 |
| **Use Case Name:** | Add a new camera |
| **Actors:** | Admin |
| **Description:** | Admin will be able to add a new camera to the system. |
| **Trigger:** | Admin presses ‘Add a new Camera’ button. |
| **Preconditions:** | 1. Admin is logged in and authorized to add a new camera. 2. camera is up and running |
| **Post conditions:** | A new camera will be registered into the system. |
| **Normal Flow:** | 1. Admin opens the application 2. Admin logs in the application with their login credentials. 3. Admin clicks on ‘Add a new Camera’ button. 4. Admin enters required details about the camera. 5. Admin presses the ‘Add Camera’ button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Admin is not authorized to add a new camera. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Remove a camera

|  |  |
| --- | --- |
| **Use Case ID:** | UC:1.2 |
| **Use Case Name:** | Remove a camera |
| **Actors:** | Admin |
| **Description:** | Admin will be able to remove camera from the system. |
| **Trigger:** | Admin presses ‘Remove a Camera’ button. |
| **Preconditions:** | 1. Admin is logged in and authorized to remove the camera. 2. camera exists and is connected to the system. |
| **Post conditions:** | A camera will be unregistered from the system. |
| **Normal Flow:** | 1. Admin opens the application 2. Admin logs in the application with their login credentials. 3. Admin clicks on ‘Remove a Camera’ button. 4. Admin enters required details about the camera to be removed. 5. Admin selects the camera from the list of cameras that match the details. 6. Admin presses the ‘Remove Camera’ button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Admin is not authorized to add a new camera. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Search for cameras

|  |  |
| --- | --- |
| **Use Case ID:** | UC:1.3 |
| **Use Case Name:** | Search for cameras |
| **Actors:** | Admin |
| **Description:** | Admin will be able to search cameras registered in the system. |
| **Trigger:** | Admin presses ‘Search’ button. |
| **Preconditions:** | 1. Admin is logged in and authorized to view the camera feeds. 2. cameras are up and running |
| **Post conditions:** | A list of real-time camera feeds will be shown to the admin. |
| **Normal Flow:** | 1. Admin opens the application 2. Admin logs in the application with their login credentials. 3. Admin clicks on ‘Surveillance Feeds’ button. 4. Admin enters required details about the camera in the search bar. 5. Admin presses the ‘Search’ button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Admin is not authorized to view the camera feeds. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Edit Camera Details

|  |  |
| --- | --- |
| **Use Case ID:** | UC:1.4 |
| **Use Case Name:** | Edit Camera Details |
| **Actors:** | Admin |
| **Description:** | Admin will be able to edit camera details saved in the system. |
| **Trigger:** | Admin presses ‘Save Changes’ button. |
| **Preconditions:** | 1. Admin is logged in and authorized to add a new camera. 2. camera is up and running |
| **Post conditions:** | A list of real-time camera feeds will be shown to the admin. |
| **Normal Flow:** | 1. Admin opens the application 2. Admin logs in the application with their login credentials. 3. Admin clicks on ‘Surveillance Feeds’ button. 4. Admin enters required details about the camera in the search bar. 5. Admin presses the ‘Search’ button. 6. Admin selects the camera. 7. Admin clicks on ‘Edit Camera Details’ 8. Admin makes updates to camera’s details. 9. Admin clicks on ‘Save Changes’ button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Admin is not authorized to edit camera’s details. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. View camera’s live footage

|  |  |
| --- | --- |
| **Use Case ID:** | UC:1.5 |
| **Use Case Name:** | View camera’s live footage |
| **Actors:** | Admin |
| **Description:** | Admin will be able to view the live footage from a camera. |
| **Trigger:** | Admin clicks on the camera footage admin wants to view. |
| **Preconditions:** | 1. Admin is logged in and authorized to add a new camera. 2. camera is up and running |
| **Post conditions:** | Admin is shown camera feed with detection and recognition functionalities working live. |
| **Normal Flow:** | 1. Admin opens the application 2. Admin logs in the application with their login credentials. 3. Admin clicks on ‘Surveillance Feeds’ button. 4. Admin enters required details about the camera in the search bar. 5. Admin presses the ‘Search’ button. 6. Admin selects the camera. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Admin is not authorized to view camera footage. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

## Module 2: Tier 1 Servers handling system

1. Automated assignment of cameras

|  |  |
| --- | --- |
| **Use Case ID:** | UC:2.1 |
| **Use Case Name:** | Automated assignment of cameras |
| **Actors:** | Admin |
| **Description:** | Admin will be able to let the application assign cameras to tier 1 servers. |
| **Trigger:** | Admin presses ‘Automated assignment of cameras’ button. |
| **Preconditions:** | 1. Admin is logged in and authorized to make changes to system’s network. |
| **Post conditions:** | Cameras are uniformly distributed between the tier 1 servers to reduce bottleneck and increase performance. |
| **Normal Flow:** | 1. Admin opens the application 2. Admin logs in the application with their login credentials. 3. Admin clicks on ‘Automated assignment of cameras’ button. 4. Admin confirms the action by providing their login credentials again. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Admin is not authorized to make changes to system’s network. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Add a server

|  |  |
| --- | --- |
| **Use Case ID:** | UC:2.2 |
| **Use Case Name:** | Add a server |
| **Actors:** | Admin |
| **Description:** | Admin will be able to add a new tier 1 server. |
| **Trigger:** | Admin presses ‘Add Server’ button. |
| **Preconditions:** | 1. Admin is logged in and authorized to make changes to system’s network. |
| **Post conditions:** | A new tier 1 server will be added to increase performance. |
| **Normal Flow:** | 1. Admin opens the application 2. Admin logs in the application with their login credentials. 3. Admin clicks on ‘Add a new Tier 1 Server’ button. 4. Admin enters the details for the new tier 1 server. 5. Admin clicks on ‘Add Server’ button. 6. Admin confirms the action by providing their login credentials again. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Admin is not authorized to make changes to system’s network. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Remove a server

|  |  |
| --- | --- |
| **Use Case ID:** | UC:2.3 |
| **Use Case Name:** | Remove a server |
| **Actors:** | Admin |
| **Description:** | Admin will be able to remove a tier 1 server. |
| **Trigger:** | Admin presses ‘Remove Server’ button. |
| **Preconditions:** | 1. Admin is logged in and authorized to make changes to system’s network. |
| **Post conditions:** | A new tier 1 server will be removed from the system. |
| **Normal Flow:** | 1. Admin opens the application 2. Admin logs in the application with their login credentials. 3. Admin clicks on ‘Tier 1 Servers’ button. 4. Admin searches for the server by entering keywords into the search area. 5. Admin is displayed a list of tier 1 servers. 6. Admin selects a tier 1 server. 7. Admin clicks on ‘Remove Server’ button. 8. Admin confirms the action by providing their login credentials again. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Admin is not authorized to make changes to system’s network. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. View list of connected cameras to server

|  |  |
| --- | --- |
| **Use Case ID:** | UC:2.4 |
| **Use Case Name:** | View list of connected cameras to server |
| **Actors:** | Admin |
| **Description:** | Admin will be able to view a list of cameras connected to tier 1 server. |
| **Trigger:** | Admin presses ‘List Connected Cameras’ button. |
| **Preconditions:** | 1. Admin is logged in and authorized to view system’s network. |
| **Post conditions:** | A list of cameras assigned to selected server will be shown. |
| **Normal Flow:** | 1. Admin opens the application 2. Admin logs in the application with their login credentials. 3. Admin clicks on ‘Tier 1 Servers’ button. 4. Admin searches for the server by entering keywords into the search area. 5. Admin is displayed a list of tier 1 servers. 6. Admin selects a tier 1 server. 7. Admin clicks on ‘List connected cameras’ button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Admin is not authorized to view system’s network. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Manually assign camera to tier 1 server

|  |  |
| --- | --- |
| **Use Case ID:** | UC:2.5 |
| **Use Case Name:** | Manually assign camera to tier 1 server |
| **Actors:** | Admin |
| **Description:** | Admin will be able to manually assign a camera to tier 1 server. |
| **Trigger:** | Admin presses ‘Assign Camera to the sever’ button. |
| **Preconditions:** | 1. Admin is logged in and authorized to view system’s network. |
| **Post conditions:** | A camera will be assigned to a selected tier 1 server. |
| **Normal Flow:** | 1. Admin opens the application 2. Admin logs in the application with their login credentials. 3. Admin clicks on ‘Tier 1 Servers’ button. 4. Admin searches for the server by entering keywords into the search area. 5. Admin is displayed a list of tier 1 servers. 6. Admin selects a tier 1 server. 7. Admin clicks on ‘Connect a Camera’ button. 8. Admin enters required details about the camera in the search bar. 9. Admin presses the ‘Search’ button. 10. Admin selects the camera. 11. Admin clicks on ‘Assign Camera to Server’ button. 12. Admin confirms the action by providing the login credentials. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Admin is not authorized to edit/modify system’s network. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

## Module 6: Location tracker

1. View locations where the suspects were detected

|  |  |
| --- | --- |
| **Use Case ID:** | UC:6.1 |
| **Use Case Name:** | View locations where the suspects were detected |
| **Actors:** | Authoritative person |
| **Description:** | Authoritative person will be shown the locations on map where the suspects were detected. |
| **Trigger:** | Authoritative person toggles “Locations where suspects were detected” button. |
| **Preconditions:** | 1. The server is up and running. 2. The Authoritative person is logged in |
| **Post conditions:** | The Authoritative person will be shown a map of all the locations where the suspects were detected. |
| **Normal Flow:** | 1. The authoritative person opens the desktop application 2. The authoritative person enters the required credentials for logging in. 3. The authoritative person presses the “Login” button. 4. The authoritative person clicks on “City Map” button. 5. Authoritative person selects the suspect. 6. The Authoritative person toggles the “Locations where suspects were detected” button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. System cannot fetch the nearby places. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. View suspect’s probable path

|  |  |
| --- | --- |
| **Use Case ID:** | UC:6.2 |
| **Use Case Name:** | View suspect’s probable path |
| **Actors:** | Authoritative person |
| **Description:** | Authoritative person will be shown a probable path the suspect may have went through. |
| **Trigger:** | Authoritative person toggles “Suspect’s movement” button. |
| **Preconditions:** | 1. The server is up and running. 2. The authoritative person is logged in. |
| **Post conditions:** | The Authoritative person will be shown a map with a probable path the suspect took. |
| **Normal Flow:** | 1. Authoritative person opens the desktop application 2. Authoritative person enters the required credentials for logging in. 3. Authoritative person presses the “Login” button. 4. Authoritative person clicks on “City Map” button. 5. Authoritative person selects the suspect. 6. Authoritative person toggles the “Suspect’s movement”. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. System cannot fetch the locations where the suspect was detected. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. View predicted path

|  |  |
| --- | --- |
| **Use Case ID:** | UC:6.3 |
| **Use Case Name:** | View predicted path |
| **Actors:** | Authoritative person |
| **Description:** | Authoritative person will be able to view the predicted path that the system has calculated |
| **Trigger:** | Admin toggles “Predict next location” button. |
| **Preconditions:** | 1. The server is up and running. 2. Authoritative person is logged in 3. The suspect is caught on at least one camera |
| **Post conditions:** | The Authoritative person will be shown a predicted location where the suspect might go. |
| **Normal Flow:** | 1. Authoritative person opens the desktop application 2. Authoritative person enters the required credentials for logging in. 3. Authoritative person presses the “Login” button. 4. Authoritative person clicks on “City Map” button. 5. Authoritative person selects the suspect. 6. Authoritative person toggles the “Predict next location”. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. System cannot fetch the locations where the suspect was detected. 2. System cannot predict the next location. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Create map

|  |  |
| --- | --- |
| **Use Case ID:** | UC:6.4 |
| **Use Case Name:** | Create map |
| **Actors:** | Admin |
| **Description:** | Admin will be able to create a map for the area that is being surveilled by the system |
| **Trigger:** | Admin clicks on the “create map” button. |
| **Preconditions:** | 1. The server is up and running. 2. Admin is logged in |
| **Post conditions:** | A interface will be displayed through which admin will be able to create a map |
| **Normal Flow:** | 1. Admin opens the web application 2. Admin enters the required credentials for logging in. 3. Admin presses the “Login” button. 4. Admin clicks on “City Map” button. 5. Admin selects the area. 6. Admin clicks the “Create map” button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | N/A |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

## Module 7: Alert System

1. Real-time operation’s monitoring

|  |  |
| --- | --- |
| **Use Case ID:** | UC:7.1 |
| **Use Case Name:** | Real-time operation’s monitoring |
| **Actors:** | Authoritative person |
| **Description:** | Authoritative person will be able to monitor the on-going operation using QR units’ locations. |
| **Trigger:** | Authoritative person selects an alert he/she wants to monitor the on-going operation of. |
| **Preconditions:** | 1. The server is up and running. 2. On-going alert exists. 3. Authoritative person is logged in |
| **Post conditions:** | The Authoritative person will be shown a map with locations of all the QR units assigned to handle the alert. |
| **Normal Flow:** | 1. Authoritative person opens the desktop application 2. Authoritative person enters the required credentials for logging in. 3. Authoritative person presses the “Login” button. 4. Authoritative person clicks on the “Manage alerts” button. 5. Authoritative person selects an alert he/she wants to monitor. 6. Authoritative person is shown a map with locations of all the QR units assigned to handle the alert as well as all the updates regarding the said alert. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. System cannot access the locations data. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

## Module 8: User Management

1. Authoritative person login

|  |  |
| --- | --- |
| **Use Case ID:** | UC:8.1 |
| **Use Case Name:** | Authoritative person login |
| **Actors:** | Authoritative person |
| **Description:** | Authoritative person will be able to login to access the control panel. |
| **Trigger:** | Authoritative person clicks on “Login” button. |
| **Preconditions:** | 1. The server is up and running. |
| **Post conditions:** | Authoritative person will be logged into the system’s control panel. |
| **Normal Flow:** | 1. Authoritative person opens the desktop application 2. Authoritative person enters the provided credentials for logging in. 3. Authoritative person presses the “Login” button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot fetch data from the database. 2. Entered credentials are invalid/incorrect. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Sign up a QR unit

|  |  |
| --- | --- |
| **Use Case ID:** | UC:8.2 |
| **Use Case Name:** | Sign up a QR unit |
| **Actors:** | Admin |
| **Description:** | Admin will be able to add new QR units into the system’s database. |
| **Trigger:** | Admin click on the “Add” button. |
| **Preconditions:** | 1. The mobile application is up and running. 2. The server is up and running. 3. Mobile device has internet access. |
| **Post conditions:** | A QR unit will be signed up. |
| **Normal Flow:** | 1. Admin opens the desktop application. 2. Admin logs in the application with their login credentials. 3. Admin clicks on “Add QR unit” button. 4. Admin enters the required credentials about the QR unit. 5. Admin clicks on “Add” button. 6. Desktop application displays a one-time login QR code. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot login. 2. Admin is not authorized to sign up new QR units. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Sign up an admin

|  |  |
| --- | --- |
| **Use Case ID:** | UC:8.3 |
| **Use Case Name:** | Sign up an admin |
| **Actors:** | Authoritative person |
| **Description:** | Authoritative person will be able to add an admin into the system’s database. |
| **Trigger:** | Authoritative person clicks on the “Add an admin” button. |
| **Preconditions:** | 1. The server is up and running. 2. Authoritative person is logged in |
| **Post conditions:** | An admin will be signed up. |
| **Normal Flow:** | 1. Authoritative person opens the desktop application. 2. Authoritative person logs in the application with their login credentials. 3. Authoritative person clicks on “Add an admin” button. 4. Admin enters the required credentials about the admin. 5. Admin clicks on “Next” button. 6. Admin sets privileges for the new admin. 7. Admin clicks on “Add” button. 8. Desktop application notifies the Authoritative person about the status of the action performed. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | There is already an admin registered |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Sign up an authoritative person

|  |  |
| --- | --- |
| **Use Case ID:** | UC:8.4 |
| **Use Case Name:** | Sign up an authoritative person |
| **Actors:** | Authoritative person |
| **Description:** | Authoritative person will be able to add new authoritative person into the system’s database. |
| **Trigger:** | Authoritative person clicks on the “Add an authoritative person” button. |
| **Preconditions:** | 1. The server is up and running. 2. Authoritative person is logged in |
| **Post conditions:** | Authoritative person will be signed up. |
| **Normal Flow:** | 1. Authoritative person opens the desktop application. 2. Authoritative person logs in the application with their login credentials. 3. Authoritative person clicks on “Add an authoritative person” button. 4. Admin enters the required credentials about the authoritative person. 5. Admin clicks on “Next” button. 6. Admin sets privileges for the new person. 7. Admin clicks on “Add” button. 8. Desktop application notifies the Authoritative person about the status of the action performed. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | N/A |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. One-time login for QR units

|  |  |
| --- | --- |
| **Use Case ID:** | UC:8.5 |
| **Use Case Name:** | One-time login for QR units |
| **Actors:** | QR unit |
| **Description:** | QR unit will be able to login at the time of account creation. |
| **Trigger:** | QR unit scans the QR code shown on the desktop application. |
| **Preconditions:** | 1. The server is up and running. 2. Mobile application is up and running. 3. Mobile device has internet access. |
| **Post conditions:** | A QR unit will be logged in. |
| **Normal Flow:** | 1. QR unit opens the application. 2. QR unit scans the QR code to login. 3. QR unit is logged into the system. 4. Desktop application hides the QR code and notifies the status of the action to the admin. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. QR code is invalid. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Logout for Admin

|  |  |
| --- | --- |
| **Use Case ID:** | UC:8.6 |
| **Use Case Name:** | Logout for admin |
| **Actors:** | Admin |
| **Description:** | Admin will be able to logout |
| **Trigger:** | Admin presses the logout button |
| **Preconditions:** | 1. Admin is logged in |
| **Post conditions:** | Admin will be logged out |
| **Normal Flow:** | 1. Authoritative person signs up the admin 2. Admin opens the web application 3. Admin logs in with his credentials given in his email 4. Admin logs out |
| **Alternative Flows:** | N/A |
| **Exceptions:** | N/A |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Logout for QR unit

|  |  |
| --- | --- |
| **Use Case ID:** | UC:8.7 |
| **Use Case Name:** | Logout for QR unit |
| **Actors:** | Authoritative person |
| **Description:** | QR unit will be logged out |
| **Trigger:** | Authoritative person presses the logout button next to the specific QR unit |
| **Preconditions:** | 1. QR unit is logged in 2. Authoritative person is logged in |
| **Post conditions:** | QR unit will be logged out |
| **Normal Flow:** | 1. Authoritative person opens the web application 2. Authoritative person logs in with his credentials given in his email 3. Authoritative person signs up the QR unit through QR code 4. Authoritative person logs out the QR unit |
| **Alternative Flows:** | N/A |
| **Exceptions:** | N/A |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Logout for Authoritative person

|  |  |
| --- | --- |
| **Use Case ID:** | UC:8.8 |
| **Use Case Name:** | Logout for authoritative person |
| **Actors:** | Authoritative person |
| **Description:** | Authoritative person will be logged out |
| **Trigger:** | Authoritative person presses the logout button |
| **Preconditions:** | 1. Authoritative person is logged in |
| **Post conditions:** | Authoritative person will be logged out |
| **Normal Flow:** | 1. Authoritative person opens the web application 2. Authoritative person logs in with his credentials given in his email 3. Authoritative person logs out |
| **Alternative Flows:** | N/A |
| **Exceptions:** | N/A |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

## Module 9: QR units communication system

1. Send Message

|  |  |
| --- | --- |
| **Use Case ID:** | UC:9.1 |
| **Use Case Name:** | Send message |
| **Actors:** | Quick Response Unit |
| **Description:** | QR units will be able to message each other |
| **Trigger:** | QR unit click on the “Send Message” button. |
| **Preconditions:** | 1. The mobile application is up and running. 2. The server is up and running. 3. Mobile device has internet access. 4. QR unit is registered |
| **Post conditions:** | The message will be sent to the receiver device. |
| **Normal Flow:** | 1. QR unit opens the application. 2. QR unit selects the QR units that he/she wants to communicate with. 3. QR unit writes a message. 4. QR unit presses the “Send Message” button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot send messages to the server. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Make Audio call

|  |  |
| --- | --- |
| **Use Case ID:** | UC:9.2 |
| **Use Case Name:** | Make Audio call |
| **Actors:** | Quick Response Unit |
| **Description:** | QR units will be able to communicate with each other through audio calls. |
| **Trigger:** | QR unit click on the “Call” button. |
| **Preconditions:** | 1. The mobile application is up and running. 2. The server is up and running. 3. Mobile device has internet access. 4. QR unit is registered |
| **Post conditions:** | An audio call will be placed between the callers. |
| **Normal Flow:** | 1. QR unit opens the application. 2. QR unit selects the QR units that he/she wants to communicate with. 3. QR unit presses the “Call” button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot send call request to the server. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Ping location

|  |  |
| --- | --- |
| **Use Case ID:** | UC:9.3 |
| **Use Case Name:** | Ping location |
| **Actors:** | Quick Response Unit |
| **Description:** | QR unit will be able to ping his/her location to other QR units for quick assistance |
| **Trigger:** | QR unit click on the “Ping Location” button. |
| **Preconditions:** | 1. The mobile application is up and running. 2. The server is up and running. 3. Mobile device has internet access. |
| **Post conditions:** | Nearby QR units will be notified of a unit requesting assistance. |
| **Normal Flow:** | 1. QR unit opens the application. 2. QR unit presses the “Ping location” button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot send ping request to the server. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Engaging on apprehending the suspect

|  |  |
| --- | --- |
| **Use Case ID:** | UC:9.5 |
| **Use Case Name:** | Engaging on apprehending the suspect |
| **Actors:** | QR units |
| **Description:** | QR units will select the engaging button when they proceed to catch a suspect to update their status on the system |
| **Trigger:** | QR unit click on the “Engaging” button. |
| **Preconditions:** | 1. The mobile application is up and running. 2. The server is up and running. 3. Mobile device has internet access. |
| **Post conditions:** | System will be notified of active QR force and the necessary details will be sent to the authoritative person |
| **Normal Flow:** | 1. QR unit opens the application. 2. QR unit sees the suspect’s current and predicted location 3. QR unit presses on the ‘engaging’ button |
| **Alternative Flows:** | N/A |
| **Exceptions:** | N/A |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. See locations of QR units

|  |  |
| --- | --- |
| **Use Case ID:** | UC:9.6 |
| **Use Case Name:** | See location of QR units |
| **Actors:** | Quick Response Unit |
| **Description:** | QR unit will be able to see locations of the nearby QR units on map. |
| **Trigger:** | QR unit clicks on the “See nearby units” button. |
| **Preconditions:** | 1. The mobile application is up and running. 2. The server is up and running. 3. Mobile device has internet access. |
| **Post conditions:** | QR unit will be informed about the whereabouts of the nearby OR units. |
| **Normal Flow:** | 1. QR unit opens the application. 2. QR unit opens the map. 3. QR unit swipes around to locate nearby QR units. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot access location data |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. View alert details

|  |  |
| --- | --- |
| **Use Case ID:** | UC:9.7 |
| **Use Case Name:** | View alert details |
| **Actors:** | Quick Response Unit |
| **Description:** | QR unit will be able to view the severity of the alert along with the details of the suspect and latest current and predicted location |
| **Trigger:** | QR unit clicks on the ‘view details’ button |
| **Preconditions:** | 1. The mobile application is up and running. 2. The server is up and running. 3. Mobile device has internet access. |
| **Post conditions:** | QR unit will be able to view the details of the suspect to formulate a strategy |
| **Normal Flow:** | 1. QR unit opens the application. 2. QR unit presses the “View details” button upon receiving a notification for an alert. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | N/A |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Update status

|  |  |
| --- | --- |
| **Use Case ID:** | UC:9.8 |
| **Use Case Name:** | Update status |
| **Actors:** | Quick Response Unit |
| **Description:** | QR unit will be able to update their status after they have engaged on apprehending the suspect as successful or not successful |
| **Trigger:** | QR unit clicks on the ‘update’ button |
| **Preconditions:** | 1. The mobile application is up and running. 2. The server is up and running. 3. Mobile device has internet access. 4. QR force had pressed the ‘engaging’ button earlier. |
| **Post conditions:** | Authoritative person will be updated about the status of the QR unit |
| **Normal Flow:** | 1. QR unit opens the application. 2. QR unit presses the “Update status” button |
| **Alternative Flows:** | N/A |
| **Exceptions:** | N/A |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

## Module 10: Information Management

1. View list of all suspects with images

|  |  |
| --- | --- |
| **Use Case ID:** | UC:10.1 |
| **Use Case Name:** | View list of all suspects with images |
| **Actors:** | Authoritative person |
| **Description:** | The actor will be able to view list of all the suspects with their pictures in the system’s database. |
| **Trigger:** | Actor clicks on “Suspects” button. |
| **Preconditions:** | 1. The server is up and running. 2. Admin or authoritative person is logged in |
| **Post conditions:** | Actor will be shown a list of all the suspects with their pictures. |
| **Normal Flow:** | 1. Actor opens the application 2. Actor logs in the application with their login credentials. 3. Actor clicks on the “Suspects” button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot fetch data from the database.  2. Admin does not have the privilege |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Search for suspects

|  |  |
| --- | --- |
| **Use Case ID:** | UC:10.2 |
| **Use Case Name:** | Search for suspects. |
| **Actors:** | Authoritative person |
| **Description:** | The actor will be able search for suspects in the database. |
| **Trigger:** | Actor clicks on “Search” button. |
| **Preconditions:** | 1. The server is up and running. 2. Admin or authoritative person is logged in |
| **Post conditions:** | Actor will be shown a list of searched the suspects with their pictures. |
| **Normal Flow:** | 1. Actor opens the application 2. Actor logs in the application with their login credentials. 3. Actor clicks on the “Suspects” button. 4. Actor types in relevant information about suspects. 5. Actor clicks on the “Search” button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot fetch data from the database.  2. Admin does not have the privilege |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Add a new suspect

|  |  |
| --- | --- |
| **Use Case ID:** | UC:10.3 |
| **Use Case Name:** | Add a new suspect |
| **Actors:** | Authoritative person |
| **Description:** | The actor will be able to add a new suspect to system’s database. |
| **Trigger:** | Actor clicks on “Add” button. |
| **Preconditions:** | 1. The server is up and running. 2. The admin or authoritative person is logged in |
| **Post conditions:** | Actor will be shown the newly added suspect with his/her information. |
| **Normal Flow:** | 1. Actor opens the application 2. Actor logs in the application with their login credentials. 3. Actor clicks on the “Suspects” button. 4. Actor clicks on the “Add a new suspect” button. 5. System opens a form. 6. Actor enters the required information in the form. 7. Actor clicks on “Add” button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot add data to the database.  2. Admin does not have the privilege |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Remove a suspect

|  |  |
| --- | --- |
| **Use Case ID:** | UC:10.4 |
| **Use Case Name:** | Remove a suspect |
| **Actors:** | Authoritative person |
| **Description:** | The actor will be able to remove a suspect to system’s database. |
| **Trigger:** | Actor clicks on “Remove from database” button. |
| **Preconditions:** | 1. The server is up and running. 2. The admin or authoritative person is logged in |
| **Post conditions:** | Actor will be notified of the status of record deletion. |
| **Normal Flow:** | 1. Actor opens the application 2. Actor logs in the application with their login credentials. 3. Actor clicks on the “Suspects” button. 4. Actor clicks on the suspect whose data needs to be removed. 5. Actor clicks on the “Remove from database” button. 6. Actor confirms the action by providing their login credentials again. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot fetch data from the database. 2. Application cannot remove the suspect’s information. 3. Admin is not authorized to remove a suspect. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Update suspect’s information

|  |  |
| --- | --- |
| **Use Case ID:** | UC:10.5 |
| **Use Case Name:** | Update suspect’s information |
| **Actors:** | Authoritative person |
| **Description:** | The actor will be able to update suspect’s information in the system’s database. |
| **Trigger:** | Actor clicks on “Update information” button. |
| **Preconditions:** | 1. The server is up and running. 2. The admin or authoritative person is logged in |
| **Post conditions:** | Actor will be notified that the record is updated |
| **Normal Flow:** | 1. Actor opens the application 2. Actor logs in the application with their login credentials. 3. Actor clicks on the “Suspects” button. 4. Actor clicks on the suspect whose data needs to be updated. 5. Actor updates the information fields. 6. Actor clicks on the “Update information” button. 7. Actor confirms the action by providing their login credentials again. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot fetch data from the database. 2. Application cannot update the suspect’s information. 3. Admin is not authorized to update suspect’s information. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. View suspect’s tracking history

|  |  |
| --- | --- |
| **Use Case ID:** | UC:10.6 |
| **Use Case Name:** | View suspect’s tracking history |
| **Actors:** | Authoritative person |
| **Description:** | Actor will be able to view suspect’s tracking history on the map. |
| **Trigger:** | Actor clicks on “View tracking history” button. |
| **Preconditions:** | 1. The server is up and running. 2. Admin or authoritative person is logged in |
| **Post conditions:** | Suspect’s tracking history will be displayed |
| **Normal Flow:** | 1. Actor opens the application 2. Actor logs in the application with their login credentials. 3. Actor clicks on the “Suspects” button. 4. Actor clicks on the suspect whose tracking history needs to be viewed. 5. Actor clicks on “View tracking history”. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Application cannot fetch data from the database. |
| **Business Rules** | N/A |
| **Assumptions:** | N/A |

1. Transform picture

|  |  |
| --- | --- |
| **Use Case ID:** | UC:10.7 |
| **Use Case Name:** | Transform picture |
| **Actors:** | Authoritative person |
| **Description:** | Authoritative person will be able to transform suspect’s picture |
| **Trigger:** | Authoritative person clicks on “Transform picture” button. |
| **Preconditions:** | 1. The server is up and running. 2. Authoritative person is logged in |
| **Post conditions:** | Suspect’s picture will be transformed |
| **Normal Flow:** | 1. Authoritative person opens the application 2. Authoritative person logs in the application with their login credentials. 3. Authoritative person clicks on the “Suspects” button. 4. Authoritative person clicks on the suspect whose picture needs to be transformed 5. Actor clicks on “Transform picture” button. |
| **Alternative Flows:** | N/A |
| **Exceptions:** | 1. Suspect’s information is already a latest/elder one and cannot be transformed further |
| **Business Rules** | N/A |
| **Assumptions:** | 1. Suspect’s picture is of childhood or adulthood |

## Event response tables

## Module 3: Preprocessing images

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Event** | **System State** | **System Response** |
| **1** | Video captured in low brightness | Processing video for brightened image. | Increases brightness of the video |
| **2** | Video captured with noise | Processing video for noiseless image. | Convolves the video with a mask that represents a smoothing operation |
| **3** | Video captured with low contrast | Processing videos for higher contrast. | Applies histogram equalization method to enhance contrast |

## Module 4: Video analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Event** | **System State** | **System Response** |
| **1** | Searching for a face. | Detecting nothing. | Displays no stats. |
| **2** | Face is turned towards the camera. | Detecting Face and facial features. | Captures multiple images of the face and sends to facial recognition module |
| **3** | Running object detection algorithms | Detecting nothing | Display no stats |
| **4** | Person is carrying an object | Detecting object and recognizing it | Send camera feed and object information to alert system |
| **5** | Person is carrying a weapon | Detecting weapon and recognizing it | Send camera feed and weapon information to alert system |
| **6** | Person is wearing accessories on face/face is occluded | Detecting objects on face | Runs face recreation algorithm and sends recreated face to facial recognition algorithm |
| **7** | A person leaves an object within camera’s view range | Detecting abandoned object and recognizing it | Send camera feed and object information to alert system |

## Module 5: Face recognition

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Event** | **System State** | **System Response** |
| **1** | Facial features don’t match with the stored faces in the database | Running facial recognition algorithm | Sends no alerts |
| **2** | Facial features match with the stored faces in the database | Running facial recognition algorithm | 1. Saves image of the matched face 2. Sends image to the server along with the matched suspect’s information 3. Sends camera location to the server |

## Module 6: Location analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Event** | **System State** | **System Response** |
| **1** | Suspect is caught on camera | Running machine learning algorithm | Predicts path that the suspect might take based on trained algorithm |

## Module 7: Alert system

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Event** | **System State** | **System Response** |
| **1** | Suspect is caught on a camera at a red-alert area | Processing severity of the threat | 1. System notifies the nearby QR units with level 1 alert 2. System sends all the relevant information to the QR units |
| **2** | Suspect is caught on a camera at a market place | Processing severity of the threat | 1. System notifies the nearby QR units with level 2 alert 2. System sends all the relevant information to the QR units |
| **3** | Suspect is caught on a camera around an area he is best known for spreading terrorism | Processing severity of the threat | 1. System notifies the nearby QR units with level 3 alert 2. System sends all the relevant information to the QR units |
| **4** | Suspect is caught on multiple cameras around the same area multiple times | Processing severity of the threat | 1. System notifies the nearby QR units with level 4 alert 2. System sends all the relevant information to the QR units |
| **5** | The person is carrying a weapon | Processing severity of the threat | 1. System notifies the nearby QR units with level 5 alert 2. System sends all the relevant information to the QR units |
| **6** | An abandoned object up is detected on the camera feed through our object tracking algorithm | Processing severity of the threat | 1. System notifies the nearby QR units with level 6 alert 2. System sends all the relevant information to the QR units |
| **7** | The person is in an unauthorized area | Processing severity of the threat | 1. System notifies the nearby QR units with level 7 alert 2. System sends all the relevant information to the QR units |
| **8** | The person is carrying a bag or a suitcase | Processing severity of the threat | 1. System notifies the nearby QR units with level 8 alert 2. System sends all the relevant information to the QR units |

## Module 9: QR units communication system

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Event** | **System State** | **System Response** |
| **1** | QR unit has not pressed the ‘update status’ button for 30 minutes | Getting locations of QR units | 1. Alerts nearby units that the respective unit may be in need of backup 2. Alerts authoritative person that the respective unit may be in danger |
| **2** | QR unit presses ‘Engaging’ button | Getting locations of QR units and suspect they are chasing | Alerts authoritative person about the active mission and provides them with a map through which they can monitor in real time |

# Functional Requirements

## Functional Requirements

Following are the functional requirements for DARTS

### Camera’s IP Address

|  |  |
| --- | --- |
| **Identifier** | FR 1.1.1 |
| **Title** | Camera’s IP Address |
| **Requirement** | Admin will provide the IP address of the camera. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To fetch camera feed. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Camera’s Geo-location

|  |  |
| --- | --- |
| **Identifier** | FR 1.1.2 |
| **Title** | Camera’s Geo-location |
| **Requirement** | Admin will enter the latitude and longitude of the camera. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To store camera’s location (latitude and longitude). |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Camera’s Address

|  |  |
| --- | --- |
| **Identifier** | FR 1.1.3 |
| **Title** | Camera’s Address |
| **Requirement** | Admin will enter the camera’s address. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To store camera’s location in order to enable searching based on location names. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Camera ID

|  |  |
| --- | --- |
| **Identifier** | FR 1.1.4 |
| **Title** | Camera ID |
| **Requirement** | System will generate a unique ID for the camera. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To assign each camera unique ID. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Object to keep a lookout for

|  |  |
| --- | --- |
| **Identifier** | FR 1.1.5 |
| **Title** | Object to keep a lookout for |
| **Requirement** | System will show all available objects that can be detected |
| **Source** | Arbaz Ajaz |
| **Rationale** | The user will select the objects to lookout for on the specific camera’s feed |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Intruder alert

|  |  |
| --- | --- |
| **Identifier** | FR 1.1.6 |
| **Title** | Intruder alert |
| **Requirement** | System will ask the user if the camera is in an unauthorized area |
| **Source** | Arbaz Ajaz |
| **Rationale** | The user will notify the system to watch for intruders |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Camera ID

|  |  |
| --- | --- |
| **Identifier** | FR 1.2.1 |
| **Title** | Camera ID |
| **Requirement** | System shall remove the camera from the system with this ID. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To remove camera from the system. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Query String

|  |  |
| --- | --- |
| **Identifier** | FR 1.3.1 |
| **Title** | Query String |
| **Requirement** | Admin will enter the query string to filter the cameras that match the criteria. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To search for cameras. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 1.3.2, FR 1.3.3, FR 1.3.4 |
| **Priority** | Low |

### Cameras’ IP Addresses

|  |  |
| --- | --- |
| **Identifier** | FR 1.3.2 |
| **Title** | Cameras’ IP Addresses |
| **Requirement** | System will need the IP address of the cameras to find ones that match the query string. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To search for cameras based on their IP addresses. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Cameras’ Geo-location

|  |  |
| --- | --- |
| **Identifier** | FR 1.3.3 |
| **Title** | Camera’s Geo-location |
| **Requirement** | System will need cameras geo-locations to find the ones close to the location passed as query string. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To search for cameras based on their geo-locations. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Cameras’ Addresses

|  |  |
| --- | --- |
| **Identifier** | FR 1.3.4 |
| **Title** | Camera’s Address |
| **Requirement** | System will need the addresses of the cameras to find the ones that match the query string. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To search for cameras based on their addresses. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Camera’s IP Address

|  |  |
| --- | --- |
| **Identifier** | FR 1.4.1 |
| **Title** | Camera’s IP Address |
| **Requirement** | System will need the new IP address of the camera. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To update the current IP address. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Camera’s Geo-location

|  |  |
| --- | --- |
| **Identifier** | FR 1.4.2 |
| **Title** | Camera’s Geo-location |
| **Requirement** | System will need the new latitude and longitude of the camera’s location. |
| **Source** | Arbaz Ajaz |
| **Rationale** | The user will enter camera’s location. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Camera’s Address

|  |  |
| --- | --- |
| **Identifier** | FR 1.4.3 |
| **Title** | Camera’s Address |
| **Requirement** | System will need the new address of the camera. |
| **Source** | Arbaz Ajaz |
| **Rationale** | The user will enter camera’s address. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Object to keep a lookout for

|  |  |
| --- | --- |
| **Identifier** | FR 1.4.4 |
| **Title** | Object to keep a lookout for |
| **Requirement** | System will show all available objects that can be detected |
| **Source** | Arbaz Ajaz |
| **Rationale** | The user will select the objects to lookout for on the specific camera’s feed |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Intruder alert

|  |  |
| --- | --- |
| **Identifier** | FR 1.4.5 |
| **Title** | Intruder alert |
| **Requirement** | System will ask the user if the camera is in an unauthorized area |
| **Source** | Arbaz Ajaz |
| **Rationale** | The user will notify the system to watch for intruders |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Camera ID

|  |  |
| --- | --- |
| **Identifier** | FR 1.5.1 |
| **Title** | Camera ID |
| **Requirement** | System will need ID of the camera. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To get the IP address of the camera. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Camera’s IP Address

|  |  |
| --- | --- |
| **Identifier** | FR 1.5.2 |
| **Title** | Camera’s IP Address |
| **Requirement** | System will need the IP address of the camera. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To view the live footage. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 1.5.1 |
| **Priority** | High |

### List of servers

|  |  |
| --- | --- |
| **Identifier** | FR 2.1.1 |
| **Title** | List of servers |
| **Requirement** | System will need the list of servers to distribute the cameras evenly. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To calculate number of cameras to be handled by each server. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### List of cameras

|  |  |
| --- | --- |
| **Identifier** | FR 2.1.2 |
| **Title** | List of cameras |
| **Requirement** | System will need the list of cameras to be evenly distributed to the servers. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To assign cameras servers. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Server name

|  |  |
| --- | --- |
| **Identifier** | FR 2.2.1 |
| **Title** | Server name |
| **Requirement** | Admin will enter the name of the server. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To store the name into the servers’ database. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Server Geo-location

|  |  |
| --- | --- |
| **Identifier** | FR 2.2.2 |
| **Title** | Server geo-location |
| **Requirement** | Admin will enter the geo-location of the server. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To store the geo-location into the servers’ database. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Server ID

|  |  |
| --- | --- |
| **Identifier** | FR 2.2.3 |
| **Title** | Server ID |
| **Requirement** | System will generate a unique ID for the server. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To assign each server a unique ID. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Server ID

|  |  |
| --- | --- |
| **Identifier** | FR 2.3.1 |
| **Title** | Server ID |
| **Requirement** | Admin will provide the ID of the server. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To remove the server from the system. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Server ID

|  |  |
| --- | --- |
| **Identifier** | FR 2.4.1 |
| **Title** | Server ID |
| **Requirement** | Admin will provide the ID of the server. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To fetch all the cameras connected to the server. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Cameras’ IDs

|  |  |
| --- | --- |
| **Identifier** | FR 2.4.2 |
| **Title** | Cameras’ IDs |
| **Requirement** | System will fetch IDs of the cameras that are connected to this server. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To fetch the IP Addresses of cameras. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 2.4.1 |
| **Priority** | Medium |

### Cameras’ IP Addresses

|  |  |
| --- | --- |
| **Identifier** | FR 2.4.3 |
| **Title** | Cameras’ IP Addresses |
| **Requirement** | System will fetch the IP Addresses of the cameras from the database. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To show admin the live feeds. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 2.4.2 |
| **Priority** | High |

### Server ID

|  |  |
| --- | --- |
| **Identifier** | FR 2.5.1 |
| **Title** | Server ID |
| **Requirement** | Admin will provide the ID of the server. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To manually assign the server a camera. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Camera ID

|  |  |
| --- | --- |
| **Identifier** | FR 2.5.2 |
| **Title** | Camera ID |
| **Requirement** | Admin will provide the ID of the server. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To connect the camera to the server. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 2.5.1 |
| **Priority** | Medium |

### Locations with timestamps where the suspects were detected

|  |  |
| --- | --- |
| **Identifier** | FR 6.1.1 |
| **Title** | Locations with timestamps where the suspects were detected |
| **Requirement** | System will fetch all the locations with timestamps where and when the suspects were detected. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To visualize them on the map. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Suspects’ IDs

|  |  |
| --- | --- |
| **Identifier** | FR 6.1.2 |
| **Title** | Suspects’ IDs |
| **Requirement** | System will fetch the IDs of the suspects that were detected in FR 7.1.1. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To fetch the names and pictures from the database. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 6.1.1 |
| **Priority** | High |

### Suspects’ Names

|  |  |
| --- | --- |
| **Identifier** | FR 6.1.3 |
| **Title** | Suspects’ Names |
| **Requirement** | System will fetch the names of the suspects that were fetched in FR 7.1.2. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To display their names at the locations they were detected. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 6.1.2 |
| **Priority** | High |

### Suspects’ Pictures

|  |  |
| --- | --- |
| **Identifier** | FR 6.1.4 |
| **Title** | Suspects’ Pictures |
| **Requirement** | System will fetch the pictures of the suspects that were fetched in FR 7.1.2. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To display their pictures at the locations they were detected. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 6.1.2 |
| **Priority** | High |

### Locations with timestamps where the suspects were detected

|  |  |
| --- | --- |
| **Identifier** | FR 6.2.1 |
| **Title** | Locations with timestamps where the suspects were detected |
| **Requirement** | System will fetch all the locations with timestamps where and when the suspects were detected. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To visualize them on the map. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Suspects’ IDs

|  |  |
| --- | --- |
| **Identifier** | FR 6.2.2 |
| **Title** | Suspects’ IDs |
| **Requirement** | System will fetch the IDs of the suspects that were detected in FR 7.1.1. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To group locations where they were detected based on their IDs. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 6.1.1 |
| **Priority** | High |

### Created Path

|  |  |
| --- | --- |
| **Identifier** | FR 6.2.3 |
| **Title** | Create Path |
| **Requirement** | System will create a path based on the group locations and the timestamps where and when each suspect was detected to visualize on map |
| **Source** | Arbaz Ajaz |
| **Rationale** | To visualize their movement pattern on the map. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 6.2.1, FR 6.2.2 |
| **Priority** | High |

### Locations with timestamps where the suspects were detected

|  |  |
| --- | --- |
| **Identifier** | FR 6.3.1 |
| **Title** | Locations with timestamps where the suspects were detected |
| **Requirement** | System will fetch all the locations with timestamps where and when the suspects were detected. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To visualize them on the map. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Suspects’ IDs

|  |  |
| --- | --- |
| **Identifier** | FR 6.3.2 |
| **Title** | Suspects’ IDs |
| **Requirement** | System will fetch the IDs of the suspects that were detected in FR 7.1.1. |
| **Source** | Arbaz Ajaz |
| **Rationale** | To group locations where they were detected based on their IDs. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 6.1.1 |
| **Priority** | High |

### Created Path

|  |  |
| --- | --- |
| **Identifier** | FR 6.3.3 |
| **Title** | Created Path |
| **Requirement** | System will create a path based on the group locations and the timestamps where and when each suspect was detected to visualize on map |
| **Source** | Arbaz Ajaz |
| **Rationale** | To visualize their movement pattern on the map. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 6.3.1, FR 6.3.2 |
| **Priority** | High |

### Predicted location

|  |  |
| --- | --- |
| **Identifier** | FR 6.3.4 |
| **Title** | Predicted location |
| **Requirement** | To visualize where the suspect might go next, system will predict the next location that it might go to through machine learning |
| **Source** | Arbaz Ajaz |
| **Rationale** | To predict the next location. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | FR 6.3.3 |
| **Priority** | High |

### Vertices

|  |  |
| --- | --- |
| **Identifier** | FR 6.4.1 |
| **Title** | Vertices |
| **Requirement** | To get the vertices |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to generate a graph |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Edges

|  |  |
| --- | --- |
| **Identifier** | FR 6.4.2 |
| **Title** | Edges |
| **Requirement** | To get edges |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to link vertices together in the graph |
| **Business Rule (if required)** | N/A |
| **Dependencies** | 6.4.1 |
| **Priority** | Medium |

### Scale

|  |  |
| --- | --- |
| **Identifier** | FR 6.4.3 |
| **Title** | Scale |
| **Requirement** | To get the scale |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in fitting the created graph at the location of the selected area on the map |
| **Business Rule (if required)** | N/A |
| **Dependencies** | 6.4.1 and 6.4.2 |
| **Priority** | Low |

### QR unit’s IDs

|  |  |
| --- | --- |
| **Identifier** | FR 7.1.1 |
| **Title** | QR unit’s IDs |
| **Requirement** | To fetch information regarding the QR unit |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in monitoring the QR unit |
| **Business Rule (if required)** | N/A |
| **Dependencies** | 8.2.1 and 8.5.1 |
| **Priority** | Low |

### QR unit’s location

|  |  |
| --- | --- |
| **Identifier** | FR 7.1.2 |
| **Title** | QR unit’s location |
| **Requirement** | To map their movement on the map |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in monitoring the QR unit |
| **Business Rule (if required)** | N/A |
| **Dependencies** | 8.2.1 and 8.5.1 |
| **Priority** | Low |

### Enter ID

|  |  |
| --- | --- |
| **Identifier** | FR 8.1.1 |
| **Title** | Enter ID |
| **Requirement** | To get the ID of the authoritative personnel |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to ensure only the authorized personnel use the system |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter password

|  |  |
| --- | --- |
| **Identifier** | FR 8.1.2 |
| **Title** | Enter password |
| **Requirement** | To get the password of the authoritative personnel |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to ensure only the authorized personnel use the system |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter QR unit’s ID

|  |  |
| --- | --- |
| **Identifier** | FR 8.2.1 |
| **Title** | Enter QR unit’s ID |
| **Requirement** | To get the ID of the QR unit that is to be registered |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to keep a track of all the QR units in the system |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter admin’s full name

|  |  |
| --- | --- |
| **Identifier** | FR 8.3.1 |
| **Title** | Enter admin’s full name |
| **Requirement** | To get the full name of the admin |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to store information regarding the admin |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter admin’s ID

|  |  |
| --- | --- |
| **Identifier** | FR 8.3.2 |
| **Title** | Enter admin’s ID |
| **Requirement** | To get the ID of the admin |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to access information regarding the admin and will be used by the admin to log in |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Show privileges

|  |  |
| --- | --- |
| **Identifier** | FR 8.3.3 |
| **Title** | Show privileges |
| **Requirement** | To show privileges to the authoritative person so they can enable/disable them accordingly for the admin |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used restrict access of the admin |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Generate password

|  |  |
| --- | --- |
| **Identifier** | FR 8.3.4 |
| **Title** | Generate password |
| **Requirement** | To generate new password for the admin that is being registered |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used by the admin to login to the system |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter authoritative person’s full name

|  |  |
| --- | --- |
| **Identifier** | FR 8.4.1 |
| **Title** | Enter authoritative person’s full name |
| **Requirement** | To get the full name of the authoritative person. |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to store information regarding the authoritative person. |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter authoritative person’s ID

|  |  |
| --- | --- |
| **Identifier** | FR 8.4.2 |
| **Title** | Enter authoritative person’s ID |
| **Requirement** | To get the ID of the authoritative person |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to access information regarding the authoritative person and will be used by that person to login |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Generate password

|  |  |
| --- | --- |
| **Identifier** | FR 8.4.3 |
| **Title** | Generate password |
| **Requirement** | To generate new password for the authoritative person that is being registered |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used by the authoritative person to login to the system |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### QR code

|  |  |
| --- | --- |
| **Identifier** | FR 8.5.1 |
| **Title** | QR code |
| **Requirement** | To generate a QR code for the QR unit to be registered through |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used by the QR unit for a one time login |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Date and time

|  |  |
| --- | --- |
| **Identifier** | FR 8.6.1 |
| **Title** | Date and time |
| **Requirement** | To get the date and time when the admin logs out |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to keep a log file of the system |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Date and time

|  |  |
| --- | --- |
| **Identifier** | FR 8.7.1 |
| **Title** | Date and time |
| **Requirement** | To get the date and time when the authoritative person logs out a QR unit |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to keep a log file of the system |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Date and time

|  |  |
| --- | --- |
| **Identifier** | FR 8.8.1 |
| **Title** | Date and time |
| **Requirement** | To get the date and time when the authoritative person logs out |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to keep a log file of the system |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Sender ID

|  |  |
| --- | --- |
| **Identifier** | FR 9.1.1 |
| **Title** | Sender ID |
| **Requirement** | To get the sender ID from the phone |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to direct and send the message |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Receiver ID

|  |  |
| --- | --- |
| **Identifier** | FR 9.1.2 |
| **Title** | Receiver ID |
| **Requirement** | To get the receiver ID from the phone |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to direct and send the message |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Caller ID

|  |  |
| --- | --- |
| **Identifier** | FR 9.2.1 |
| **Title** | Caller ID |
| **Requirement** | To get the caller ID from the phone |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to direct the call |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Receiver ID

|  |  |
| --- | --- |
| **Identifier** | FR 9.2.2 |
| **Title** | Receiver ID |
| **Requirement** | To get the receiver ID from the phone |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to place the call |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### QR unit’s IDs

|  |  |
| --- | --- |
| **Identifier** | FR 9.3.1 |
| **Title** | QR unit’s IDs |
| **Requirement** | To fetch information regarding the QR unit |
| **Source** | Kanwal Shariq |
| **Rationale** | It will be used to ping their location in need of backup |
| **Business Rule (if required)** | N/A |
| **Dependencies** | 8.2.1 and 8.5.1 |
| **Priority** | Low |

### QR unit’s location

|  |  |
| --- | --- |
| **Identifier** | FR 9.3.2 |
| **Title** | QR unit’s location |
| **Requirement** | To map their movement on the map |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in providing backup to the unit through pinging their location |
| **Business Rule (if required)** | N/A |
| **Dependencies** | 8.2.1 and 8.5.1 |
| **Priority** | Low |

### QR unit’s IDs

|  |  |
| --- | --- |
| **Identifier** | FR 9.4.1 |
| **Title** | QR unit’s IDs |
| **Requirement** | To fetch information regarding the QR unit |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in monitoring the QR unit |
| **Business Rule (if required)** | N/A |
| **Dependencies** | 8.2.1 and 8.5.1 |
| **Priority** | Low |

### QR unit’s location

|  |  |
| --- | --- |
| **Identifier** | FR 9.4.2 |
| **Title** | QR unit’s location |
| **Requirement** | To map their movement on the map |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in monitoring the QR unit |
| **Business Rule (if required)** | N/A |
| **Dependencies** | 8.2.1 and 8.5.1 |
| **Priority** | Low |

### Alert ID

|  |  |
| --- | --- |
| **Identifier** | FR 9.4.3 |
| **Title** | Alert ID |
| **Requirement** | To get information related the alert they are engaging on |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in monitoring the QR unit and the engaging alert |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### All QR locations

|  |  |
| --- | --- |
| **Identifier** | FR 9.5.1 |
| **Title** | All QR locations |
| **Requirement** | To get the locations of all the QR forces registered |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in monitoring the QR unit and the engaging alert |
| **Business Rule (if required)** | N/A |
| **Dependencies** | 8.2.1 and 8.5.1 |
| **Priority** | Low |

### Alert ID

|  |  |
| --- | --- |
| **Identifier** | FR 9.6.1 |
| **Title** | Alert ID |
| **Requirement** | To get information related the alert they are engaging on |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in viewing information regarding engaging alert |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Alert severity

|  |  |
| --- | --- |
| **Identifier** | FR 9.6.2 |
| **Title** | Alert severity |
| **Requirement** | To get the severity of the alert |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in strategizing the QR unit’s plan of attack |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Suspect’s location

|  |  |
| --- | --- |
| **Identifier** | FR 9.6.3 |
| **Title** | Suspect’s location |
| **Requirement** | To get the location of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in viewing the location of the suspect and formulating a strategy |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Suspect’s path

|  |  |
| --- | --- |
| **Identifier** | FR 9.6.4 |
| **Title** | Suspect’s path |
| **Requirement** | To visualize actual and predicted path of the suspect on the map |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in viewing the path of the suspect and formulating a strategy |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Suspect’s information

|  |  |
| --- | --- |
| **Identifier** | FR 9.6.5 |
| **Title** | Suspect’s information |
| **Requirement** | To get the information of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in viewing the information of the suspect and formulating a strategy |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Get list of all suspects

|  |  |
| --- | --- |
| **Identifier** | FR 10.1.1 |
| **Title** | Get list of all suspects |
| **Requirement** | To get the list of all the suspects stored in the database |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in viewing all the suspects that are stored in the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Enter full name

|  |  |
| --- | --- |
| **Identifier** | FR 10.2.1 |
| **Title** | Enter full name |
| **Requirement** | To get the full name of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in searching for the suspect in the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter age

|  |  |
| --- | --- |
| **Identifier** | FR 10.2.2 |
| **Title** | Enter age |
| **Requirement** | To get the age of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in searching for the suspect in the database |
| **Business Rule (if required)** | N/A |

### Enter gender

|  |  |
| --- | --- |
| **Identifier** | FR 10.2.3 |
| **Title** | Enter gender |
| **Requirement** | To get the gender of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in searching for the suspect in the database |
| **Business Rule (if required)** | N/A |

### Enter city

|  |  |
| --- | --- |
| **Identifier** | FR 10.2.4 |
| **Title** | Enter city |
| **Requirement** | To get the city of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | It will help in searching for the suspect in the database |
| **Business Rule (if required)** | N/A |

### Enter full name

|  |  |
| --- | --- |
| **Identifier** | FR 10.3.1 |
| **Title** | Enter full name |
| **Requirement** | To get the full name of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | To add a suspect in the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Enter age

|  |  |
| --- | --- |
| **Identifier** | FR 10.3.2 |
| **Title** | Enter age |
| **Requirement** | To get the age of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | To add a suspect in the database and add as much information about him as possible |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Enter gender

|  |  |
| --- | --- |
| **Identifier** | FR 10.3.3 |
| **Title** | Enter gender |
| **Requirement** | To get the gender of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | To add a suspect in the database and add as much information about him as possible |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Enter city

|  |  |
| --- | --- |
| **Identifier** | FR 10.3.4 |
| **Title** | Enter city |
| **Requirement** | To get the city of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | To add a suspect in the database and add as much information about him as possible |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Attach pictures

|  |  |
| --- | --- |
| **Identifier** | FR 10.3.4 |
| **Title** | Attach pictures |
| **Requirement** | To get the pictures of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | To add pictures of the suspect so the facial recognition algorithm can work on them |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | High |

### Suspect ID

|  |  |
| --- | --- |
| **Identifier** | FR 10.4.1 |
| **Title** | Suspect ID |
| **Requirement** | To get the suspect’s ID |
| **Source** | Kanwal Shariq |
| **Rationale** | To remove a suspect from the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter Suspect’s ID

|  |  |
| --- | --- |
| **Identifier** | FR 10.5.1 |
| **Title** | Enter suspect ID |
| **Requirement** | To get the suspect’s ID |
| **Source** | Kanwal Shariq |
| **Rationale** | To update a suspect from the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter full name

|  |  |
| --- | --- |
| **Identifier** | FR 10.5.2 |
| **Title** | Enter full name |
| **Requirement** | To get the full name of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | To update a suspect in the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter age

|  |  |
| --- | --- |
| **Identifier** | FR 10.5.3 |
| **Title** | Enter age |
| **Requirement** | To get the age of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | To update a suspect in the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter gender

|  |  |
| --- | --- |
| **Identifier** | FR 10.5.4 |
| **Title** | Enter gender |
| **Requirement** | To get the gender of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | To update a suspect in the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Enter city

|  |  |
| --- | --- |
| **Identifier** | FR 10.5.5 |
| **Title** | Enter city |
| **Requirement** | To get the city of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | To update a suspect in the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Attach pictures

|  |  |
| --- | --- |
| **Identifier** | FR 10.5.6 |
| **Title** | Attach pictures |
| **Requirement** | To get the pictures of the suspect |
| **Source** | Kanwal Shariq |
| **Rationale** | To update a suspect in the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Low |

### Suspect ID

|  |  |
| --- | --- |
| **Identifier** | FR 10.6.1 |
| **Title** | Suspect ID |
| **Requirement** | To get the suspect’s ID |
| **Source** | Kanwal Shariq |
| **Rationale** | To get tracking history from the database |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Get locations

|  |  |
| --- | --- |
| **Identifier** | FR 10.6.2 |
| **Title** | Get locations |
| **Requirement** | To get the locations where the suspect was detected |
| **Source** | Kanwal Shariq |
| **Rationale** | To view the tracking history of a suspect |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Transformation options

|  |  |
| --- | --- |
| **Identifier** | FR 10.7.1 |
| **Title** | Transformation options |
| **Requirement** | To show the transformation options to the user |
| **Source** | Kanwal Shariq |
| **Rationale** | To get the transformation criteria i.e. transforming from childhood to adult, or childhood to elder or adult to elder |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

### Picture

|  |  |
| --- | --- |
| **Identifier** | FR 10.7.2 |
| **Title** | Picture |
| **Requirement** | The picture that needs to be transformed |
| **Source** | Kanwal Shariq |
| **Rationale** | To get the picture to apply the transformation algorithm on |
| **Business Rule (if required)** | N/A |
| **Dependencies** | N/A |
| **Priority** | Medium |

# Non Functional Requirements

Following are the non-functional requirements for the proposed system.

## Supportability

Internationally accepted set of coding standards will be followed by the developers in development of the proposed system and proper coding documentation will be followed.

### International standard set of coding standards.

Internationally accepted set of coding standards will be available to all the developers to follow.

## Design Constraints

### Android Application used by the QR units will be written in Java and XML using Android Studio.

### Server-side application that will be used by the authoritative personnel and admins will be written in Javascript using NodeJS.

### Server will be written in Python to achieve high efficiency.

## Security

Functionalities of the system will only be accessible after logging in.

### The admins will only be allowed to manage system’s architecture, cameras, servers and registration of new QR units.

### The authoritative personnel will only be allowed to view cameras’ live-feed, locations of QR units, movements of suspects, monitoring of on-going interventions and manage suspects’ database.

### The QR units will only be allowed to communicate through texts and audio calls with other QR units, locate nearby QR units, request for assistance and view details of the alert they have been assigned to engage.

### The QR units will only be able to login once right after the creation of the account.

## Performance

### Response Time

As we’re maximizing system’s efficiency by evenly distributing workload between multiple servers so our system will be able to perform processing in reasonable time i.e. 3 seconds.

### Storage Capacity

In order to maximize system’s response-time, the number of suspects that the system will be looking for will be 50.

### Throughput

The number of faces scanned per second will be between 1 to 10.

# Project Gantt Chart

# References

Blogs:

* <https://medium.com/@madhawavidanapathirana/https-medium-com-madhawavidanapathirana-real-time-human-detection-in-computer-vision-part-1-2acb851f4e55>

Websites:

* <https://us.norton.com/internetsecurity-iot-how-facial-recognition-software-works.html>

Publications:

* <https://www.researchgate.net/publication/308387275_Face_recognition-based_real-time_system_for_surveillance>

Similar product descriptions:

* <https://speechpro.com/product/facial-recognition/smart-tracker-frs#tab1>
* <https://analyticsindiamag.com/run-but-you-cant-hide-ai-based-facial-recognition-systems-are-now-tracking-down-criminals/>
* <https://www.mathworks.com/discovery/image-enhancement.html>