MIDDLE EAST TECHNICAL UNIVERSTIY

DEPARTMENT OF COMPUTER ENGINEERING

SOFTWARE REQUIREMENT SPECIFICATION

prepared by

iTech

Search&Rescue

METU Department of Computer Engineering

CENG 491 Senior Design Project I

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1. Introduction

This document includes software requirement specification of Search & Rescue mobile and web application. The team structure will be shown at below.

Team Structure

1. Ebru Aydın Göl - Project Advisor
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3. Yasin Berk Gültekin - Developer
4. Abdulkadir Dalga - Developer
5. Tuğca Eker - Developer
6. Hasan Ali Duran – Developer

1.1. Problem Definition

In this project, a system that will be used in Search & Rescue operations will be designed and its software components will be implemented. Main components of the system are:

- Mission Planning and Coordination Center
- Rescue Team Member Computers
- Rescue Team Member Smart Glasses
- Unmanned Reconnaisance Vehicle(Quadcopter)

S&R System is used for planning and executing missions that are aimed to find and rescue people who are lost or injured in the field. It consists of some subsystems which are used in mission planning, tracking and execution of the rescue missions. A rescue mission is planned in computer at Mission Planning and Coordination Center.

During planning phase, last known position and estimated position of lost person, digital maps of field, rescue team's information etc.. are used as an input. Mission will be planned in Planning & Coordination Center by using a computer having internet access and after planning has been completed, necessary information will be loaded to devices that is going to be used by rescue team.

When mission starts, everyone in the rescue team will be able to see their planned route on the mission computers and on the smart glasses. Also they will be able to see their position and everyone else's position on their devices. Information on the smart glasses will be presented using augmented reality technology. Information on the computers and smart phones will be presented in two ways; by augmented reality technology over device's camera view and by placing information on digital maps.

If needed, rescue team will be able to use quadcopter for reconnaissance and the video taken by camera of quadcopter will be transferred to smart glass and/or mission computers. Everyone in the rescue team will be able to contact to each other by text messages or by talking using VoIP technology. They will also be able to transfer their device's video streams to each others when they have been asked.

Everyone in the rescue team will be wearing pulse sensors. Everyone's health information will be displayed on mission computers and planning center by using these pulse sensors' information. This information will also be shared among team members' computers. Also, the actions (walking, sitting, running, etc..) of members during the mission will be shown on the mission computers. During the mission, execution of the rescue operation can be monitored by the mission center. All the positions of rescue members, health states and their actions will be shown on the Planning Software using Geographical Information System. If needed, a member will be requested to transfer his video image to the center and watched from there.

If a member finds the lost person from a distance, he will be able to measure the distance with laser range finder and compute his geographic coordinate. Then he is going to be able to mark his position and inform the other members and planning center. When the lost person is found during the mission, rescue team will put a pulse sensor to the person and person's health status will also be shown in all mission computers and in mission planning center up to rescue operation completed.

1.2. System Overview

Project Search&Rescue is web and mobile application. Search&Rescue has two main parts.These parts are Mission Planning And Coordination Center and Rescue Team Member Mission Devices . For Mission Planning And Coordination Center there will be a web application which provides creating ,tracking and coordinating the missions. For Rescue Team Member Mission Devices there will be an android application that provides tracking other rescue team members , communicating with each others and coordination center and getting important data from external sensors such as pulse and muscle motions sensor. Since the project has an augmented reality part, also the camera is used for getting the real world data to be augmented.

1.3. Definitions, acronyms, and abbreviations

Terms	Definitions
SRS	Software Requirements Specification
S&R	Search And Rescue
AR	Augmented Reality
GPS	Global Positioning System
METU	Middle East technical University
GUI	Graphical User Interface
IDE	Integrated Development Environment
Android SDK	Software Development Kit which is officially released for Android
Android Studio	Official IDE designed for Android
UML	Unified Modeling Language
Use Case Diagram	Diagram of interactions of users with the system
Class Diagram	Diagram that describes the structure of a system by showing its classes, attributes of these classes and method
GIS	Geographical Information System

Table 1 : Terms-Definitions

1.4. Assumptions and dependencies

We plan to finish this project by June 2017. We divided our schedule to two main parts according to school semesters. In the first semester we worked to create Mission Planning And Coordination Center which includes back-end and front-end and main part of the Android application that communicates Mission Planning And Coordination Center. We created object and database models. In the second semester we plan to apply video stream and VoIP to android application to communicate with members and center. Also Augmented Reality will be added on Android application.

We held weekly meetings with team members to discuss current situation of the project. We held weekly meetings with our assistant to report our progress. Also once in every weeks we held meetings with our supervisor to obtain solutions for our problems in the project.

2. Overall description

2.1. Product functions

We have two actors which are Coordinator and Team Member . Their use cases are mentioned below.

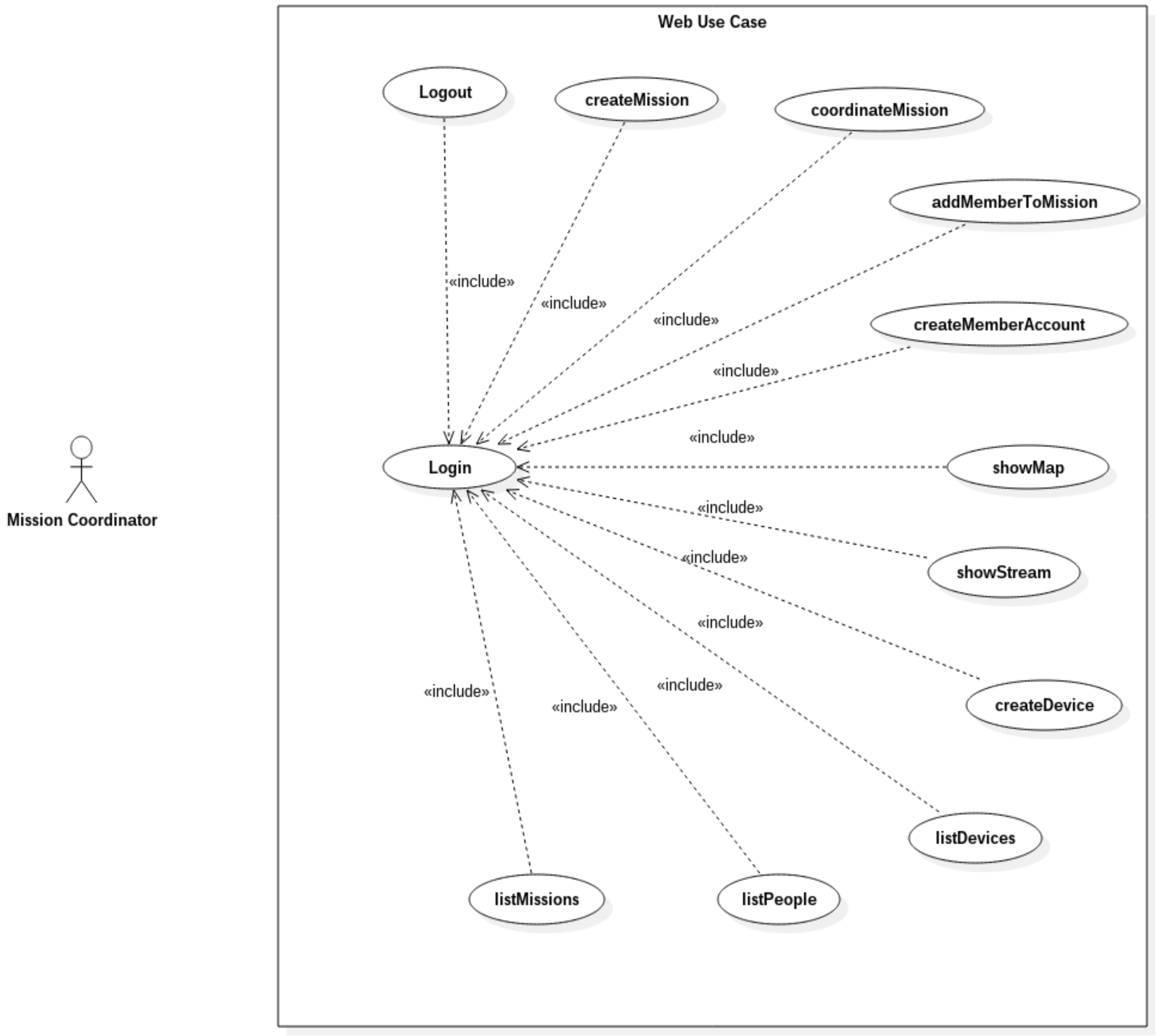

Figure 1 : Web Application Use Case Diagram

When actor is Mission Coordinator:

- Login: Coordinator will be logged in the system before executing any operation
- Create Mission: It creates a search and rescue operation
- Coordinate Mission: It coordinates the both mission and team members .
- AddMemberToMission: Coordinator can add team member to current mission
- createMemberAccount: Coordinator can create a new team member model on database .
- showMap: Coordinator can get all team member locations and show them on real search area map.

- ShowStream: Coordinator can play current video streams on web site
- createDevice: Coordinator can create a new device model on database .
- ListDevices: Coordinator can list all devices to use them in the mission
- listPeople: Coordinator can list all persons to select mission members
- listMissions: Coordinator can list all missions and mission details for current mission
- Logout: Coordinator can logout

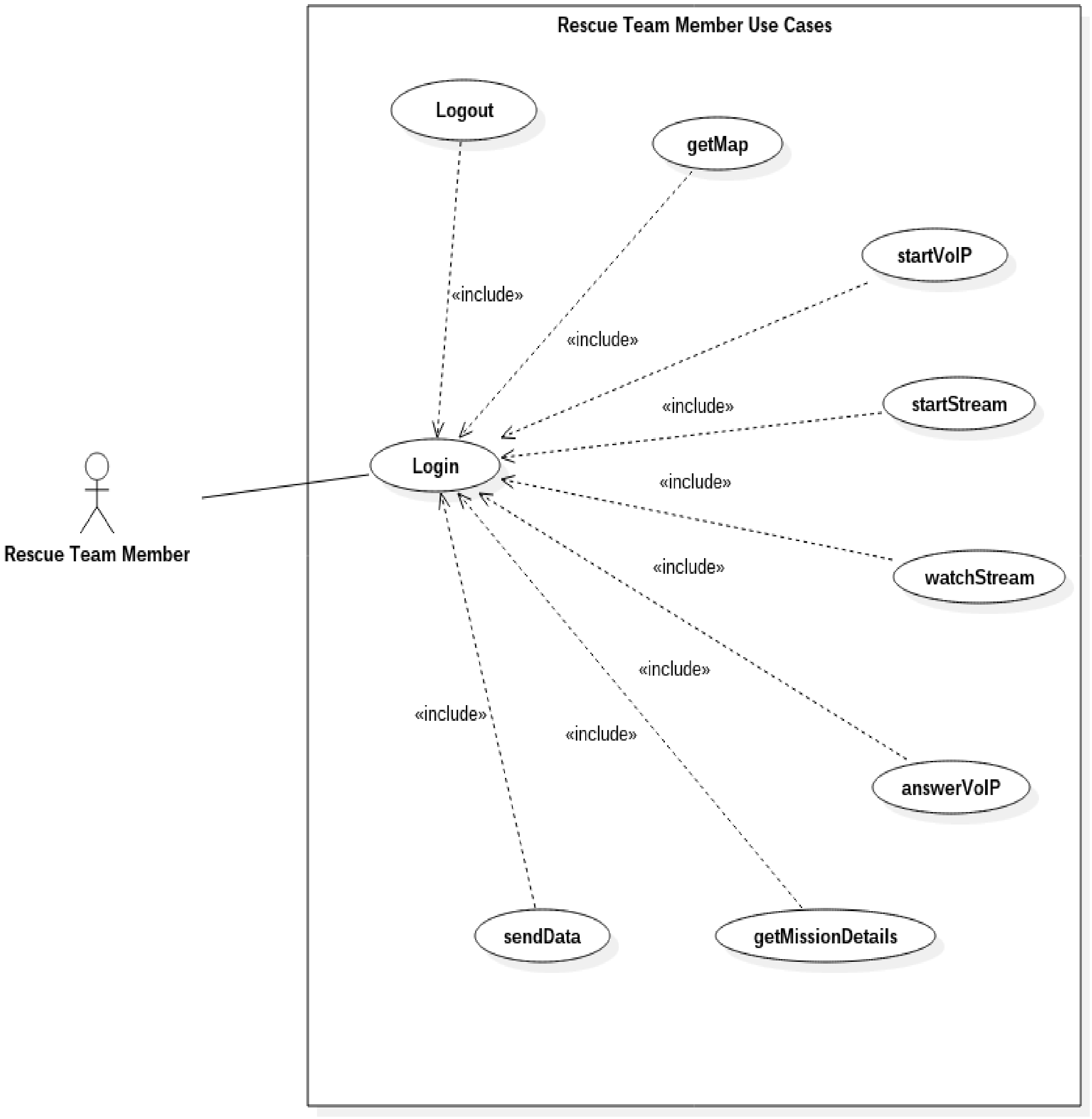

Figure 2 : Android Use Case Diagram

When actor is Team Member:

- Login: Team members will be logged in the system by using their android devices
- Logout: Team members can logout
- getMap : Team members can see other team members positions on the map view
- startVoIP: Any team member can start audio conversation
- startStream: Any team member can start live video stream
- watchStream: When someone is streaming any team member can watch this stream
- answerVoIP: When there is a started conservation user can join
- getMissionDetails: Any team member is able to see mission details
- sendData: Team members can send their informations to center

2.2. Interfaces

2.2.1. User Interfaces

Since our project has two main parts the team member application part will be an Android application that will run on smartphones, there will be a graphical user interface. The interaction with the application will be through touch screen. The other part of the project is mission coordination center is web application that will work on computer. There will also be graphical user interface on web browser. User will be interact through web browser.

2.2.2. Hardware Interfaces

We have several type of sensors as hardware interfaces such as pulse sensor , arm band and laser range finder. We also have Multicopter as a hardware.

2.2.3. Software Interfaces

Software used in this project include Jersey Grizzly Rest Server, Hibernate, DBMS , Intellij , Maven , OpenLayer, Android Studio, Android operating system and an augmented reality library.

MySQL is used in the server as DBMS, Communication between database and rest server is operated by hibernate.

The communication with the operating system is done through standard Android API.

2.2.4. Communications Interfaces

The application will communicate with the server via HTTP protocol over internet.

2.3. Constraints

- Email address should be valid.
- User Name should be an email address.
- Android version must be at least 5.0.

3. Specific Requirements

3.1. Functional Requirements

3.1.1. Web Application Functional Requirements

Functional requirements are listed below with use case scenarios for Web Application.

Use Case Scenario	Login
Use Case ID	UC1
Included Use Cases	-
Primary Actor(s)	Coordinator
Description	Coordinator has to login to use web application.
Precondition	Coordinator should have valid account on the system.
Trigger	Coordinator clicks the “Login” button.
Main Success Scenario	Step 1: Coordinator opens the login page. Step 2: Coordinator enters the required information. Step 3: System checks authorizations Step 4: If coordinator is authorized system directs to home page

Alternative Scenario	In Step 4, if information is invalid, system warns the user about information.
Post Condition	None

Table 2 : Login Use Case Scenario

Use Case Scenario	createMission
Use Case ID	UC2
Included Use Cases	UC1
Primary Actor(s)	Coordinator
Description	Coordinator can create a mission.
Precondition	Coordinator should be Login.
Trigger	Coordinator touches the "Create Mission" button.
Main Success Scenario	Step 1: Coordinator opens the home page. Step 2: Coordinator clicks the createMission button. Step 3: Coordinator should give required inputs to create mission. Step 4: Coordinator should click createMission button again to save data. Step 5: System directs to home page.
Alternative Scenario	In Step 3, if informations are missing , system warns the coordinator and doesn create missions
Post Condition	None

Table 3 : createMission Use Case Scenario

Use Case Scenario	coordinateMission
Use Case ID	UC3

Included Use Cases	UC1
Primary Actor(s)	Coordinator
Description	Coordinator can edit mission and finish it.
Precondition	Coordinator should have logged in to the Coordinator.
Trigger	Coordinator touches the “Edit Mission” button.
Main Success Scenario	Step 1: Coordinator selects a Mission that will be edited. Step 2: Coordinator edited required fields. Step 3: Coordinator click save button Step 4: If there is no invalid fields system updates mission
Alternative Scenario	If Step 4 fails, the system give error and does not update database
Post Condition	None

Table 4 : coordinateMission Use Case Scenario

Use Case Scenario	addMemberToMission
Use Case ID	UC4
Included Use Cases	UC1
Primary Actor(s)	Coordinator
Description	Coordinator can add a member to rescue team of a mission.
Precondition	Coordinator should have to login and should have been clicked createMission.
Trigger	Coordinator touches the “Add Person To Mission” button.
Main Success	Step 1: Coordinator selects a person that will be added to mission.

Scenario	Step 2: Coordinator clicks the addPersonToMission . Step3: Database will be updated accordingly.
Alternative Scenario	
Post Condition	None

Table 5 : addMemberToMission Use Case Scenario

Use Case Scenario	createMemberAccount
Use Case ID	UC5
Included Use Cases	UC1
Primary Actor(s)	Coordinator
Description	Coordinator can create a database record for new team member
Precondition	Coordinator must login to the system
Trigger	Coordinator clicks the “createPerson” button.
Main Success Scenario	Step 1: Coordinator clicks the “createPerson” button. Step 2: Coordinator enters the required information Step 3: Coordinator clicks “create” button to save the record on database
Alternative Scenario	If any information is missing or invalid it gives an error
Post Condition	None

Table 6 : createMemberAccount Use Case Scenario

Use Case Scenario	ShowMap
Use Case ID	UC6
Included Use Cases	UC1
Primary Actor(s)	Coordinator
Description	Coordinator can see all team members position on the rescue area map
Precondition	User should have logged in to the S&R
Trigger	User clicks the “showMap” button.
Main Success **Scenario**	Step 1: Coordinator clicks “showMap” button. Step 2: All team members locations shown on the map on screen
Alternative Scenario	
Post Condition	None

Table 7 : showMap Use Case Scenario

Use Case Scenario	ShowStream Settings
Use Case ID	UC7
Included Use Cases	UC1
Primary Actor(s)	Coordinator

Description	Coordinator can watch live stream videos which is streamed by team members .
Precondition	Coordinator should have logged in to the S&R
Trigger	Coordinator clicks the “ShowStream” button.
Main Success **Scenario**	Step 1: Coordinator clicks the “ShowStream” button. Step 2: Coordinator selects a stream that will be played. Step 3: The stream will be played on the screen
Alternative Scenario	None
Post Condition	None

Table 8 : ShowStream Use Case Scenario

Use Case Scenario	CreateDevice
Use Case ID	UC8
Included Use Cases	UC1
Primary Actor(s)	Coordinator
Description	Coordinator can create a database record for new device
Precondition	Coordinator must login to the system
Trigger	Coordinator should click “CreateDevice” button

Main Success Scenario	Step 1: Coordinator should click “CreateDevice” button Step 2: Coordinator enters the required information Step 3 : Coordinator clicks “Create” button Step 4 : System updates the database as desired
Alternative Scenario	In Step 3, if any information is missing it gives an error
Post Condition	None

Table 9 : CreateDevice Use Case Scenario

Use Case Scenario	List Devices
Use Case ID	UC9
Included Use Cases	UC1
Primary Actor(s)	Coordinator
Description	Coordinator can list and see information about devices
Precondition	Coordinator must login to the S&R system.
Trigger	Coordinator should click “ListDevices” button
Main Success Scenario	Step 1: Coordinator should click “ListDevices” button Step 2: Device list will be shown on the screen
Alternative Scenario	None
Post Condition	None

Table 10 : ListDevices Use Case Scenario

Use Case Scenario	List Missions
Use Case ID	UC10
Included Use Cases	UC1
Primary Actor(s)	Coordinator
Description	Coordinator can list and see information about missions
Precondition	Coordinator must login to the S&R system.
Trigger	Coordinator should click “ListMission” button
Main Success Scenario	Step 1: Coordinator should click “ListMission” button Step 2: Mission list will be shown on the screen
Alternative Scenario	None
Post Condition	None

Table 11 : ListMissions Use Case Scenario

Use Case Scenario	Logout
Use Case ID	UC11
Included Use Cases	UC1
Primary Actor(s)	Coordinator
Description	Coordinator can logout from the S&R system
Precondition	Coordinator must login to the S&R system.
Trigger	Coordinator should click “Logout” button
Main Success **Scenario**	Step 1: Coordinator should click “Logout” button Step 2: System directs to Login Page
Alternative Scenario	None
Post Condition	None

Table 12 : Logout Use Case Scenario

3.1.2. Mobile Application Functional Requirements

Functional requirements are listed below with use case scenarios for Android Application.

Use Case Scenario	Login
Use Case ID	UC1
Included Use Cases	-
Primary Actor(s)	Team Member
Description	Team Member has to login to use android application.
Precondition	Team Member should have valid account on the system.
Trigger	Team Member touches the “Login” button.
Main Success Scenario	Step 1: Team Member opens the login page. Step 2: Team Member enters the required information. Step 3: System checks authorizations Step 4: If Team Member is authorized system directs to home page
Alternative Scenario	In Step 4, if information is invalid, system warns the Team Member about information.
Post Condition	None

Table 13 : Login Use Case Scenario

Use Case Scenario	Logout

Use Case ID	UC2
Included Use Cases	UC1
Primary Actor(s)	Team Member
Description	Team Member can logout from the S&R system
Precondition	Team Member must login to the S&R system.
Trigger	Team Member should touch “Logout” button
Main Success Scenario	Step 1: Team Member should touch “Logout” button Step 2: System directs Login Page
Alternative Scenario	None
Post Condition	None

Table 14 : Logout Use Case Scenario

Use Case Scenario	GetMap
Use Case ID	UC3
Included Use Cases	UC1
Primary Actor(s)	Team Member
Description	Team Member can see all team members position on the rescue area map

Precondition	Team Member should have logged in to the S&R
Trigger	Team Member touches the “getMap” button.
Main Success Scenario	Step 1: Team member touches “getMap” button. Step 2: All team members locations shown on the map on screen
Alternative Scenario	
Post Condition	None

Table 15 : GetMap Use Case Scenario

Use Case Scenario	StartVoIP
Use Case ID	UC4
Included Use Cases	UC1
Primary Actor(s)	Team Member
Description	Team Member can start audio conversation to communicate with other team members
Precondition	Team Member should have logged in to the S&R
Trigger	Team Member touches the “startVoIP” button.

Main Success Scenario	Step 1: Team member touches “startVoIP” button. Step 2: The other members will be informed about conversation
Alternative Scenario	
Post Condition	None

Table 16 : StartVoIP Use Case Scenario

Use Case Scenario	StartStream
Use Case ID	UC5
Included Use Cases	UC1
Primary Actor(s)	Team Member
Description	Team Member can start video stream to share its vision to other team members
Precondition	Team Member should have logged in to the S&R
Trigger	Team Member touches the “startStream” button.
Main Success Scenario	Step 1: Team member touches “startStream” button. Step 2: The other members will be informed about streaming
Alternative Scenario	

Post Condition	None

Table 17 : StartStream Use Case Scenario

Use Case Scenario	WatchStream
Use Case ID	UC6
Included Use Cases	UC1
Primary Actor(s)	Team Member
Description	Team Member can watch video stream that is streamed by other team members.
Precondition	Team Member should have logged in to the S&R
Trigger	Team Member touches the “watchStream” button.
Main Success **Scenario**	Step 1: Team member selects stream to watch Step 2: TeamMember touches “watchStream” button. Step 3: Stream opens on device screen
Alternative Scenario	If any stream is not selected on step1 it gives an warning
Post Condition	None

Table 18 : WatchStream Use Case Scenario

Use Case Scenario	AnswerVoIP
Use Case ID	UC7
Included Use Cases	UC1
Primary Actor(s)	Team Member
Description	Team Member can answer VoIP call and join audio conversation
Precondition	Team Member should have logged in to the S&R
Trigger	Team Member touches the “answerVoIP” button.
Main Success **Scenario**	Step 1: TeamMember touches “answerVoIP” button. Step 2: Audio conversation opens on device
Alternative Scenario	None
Post Condition	None

Table 19 : AnswerVoIP Use Case Scenario

Use Case Scenario	Get Mission Details
Use Case ID	UC8
Included Use Cases	UC1
Primary Actor(s)	Team Member
Description	Any Team Member can get all information about mission and other team members information
Precondition	Team Member should have logged in to the S&R
Trigger	Team Member touches the "getMissionDetails" button.
Main Success **Scenario**	Step 1: TeamMember touches "getMissionDetails" button. Step 2: All Mission information are shown on the device screen
Alternative Scenario	None
Post Condition	None

Table 20 : GetMissionDetails Use Case Scenario

Use Case Scenario	Send Data
Use Case ID	UC9
Included Use Cases	UC1
Primary Actor(s)	Team Member
Description	Any Team Member can send their information to control center
Precondition	Team Member should have logged in to the S&R
Trigger	Every 10 seconds device automatically sends their location and current informations
Main Success **Scenario**	Step 1: If GPS is active on the device data will be automatically send
Alternative Scenario	If GPS is inactive it gives a warning
Post Condition	None

Table 21 : SendData Use Case Scenario

3.2. NonFunctional Requirements

3.2.1. Usability

- Team Members and coordiators will be trained before using this project so users can easily adapt on this project.
- Database hold past missions and records therefore which device or person problematic can easily be identified and replaced

3.2.2. Reliability

- System should be up for 99% of the time excluding scheduled system maintenance.
- In case of a system crash, system can be brought up within four hours.

3.2.3. Performance

- The server should capable of 100 mission at same time.
- The server should respond in 0.2 seconds at maximum.

3.2.4. Supportability

- The application will run on any mobile device that has Android version 5.0 and later versions.
- The web application will run on any web browser

3.2.5. Security

- The access permissions for system data can only be changed by the system’s administrator.
- The communication between the system’s data server and clients will be encrypted.

4. Data Model and Description

4.1. Data Objects

Class diagram of system can be shown at below.

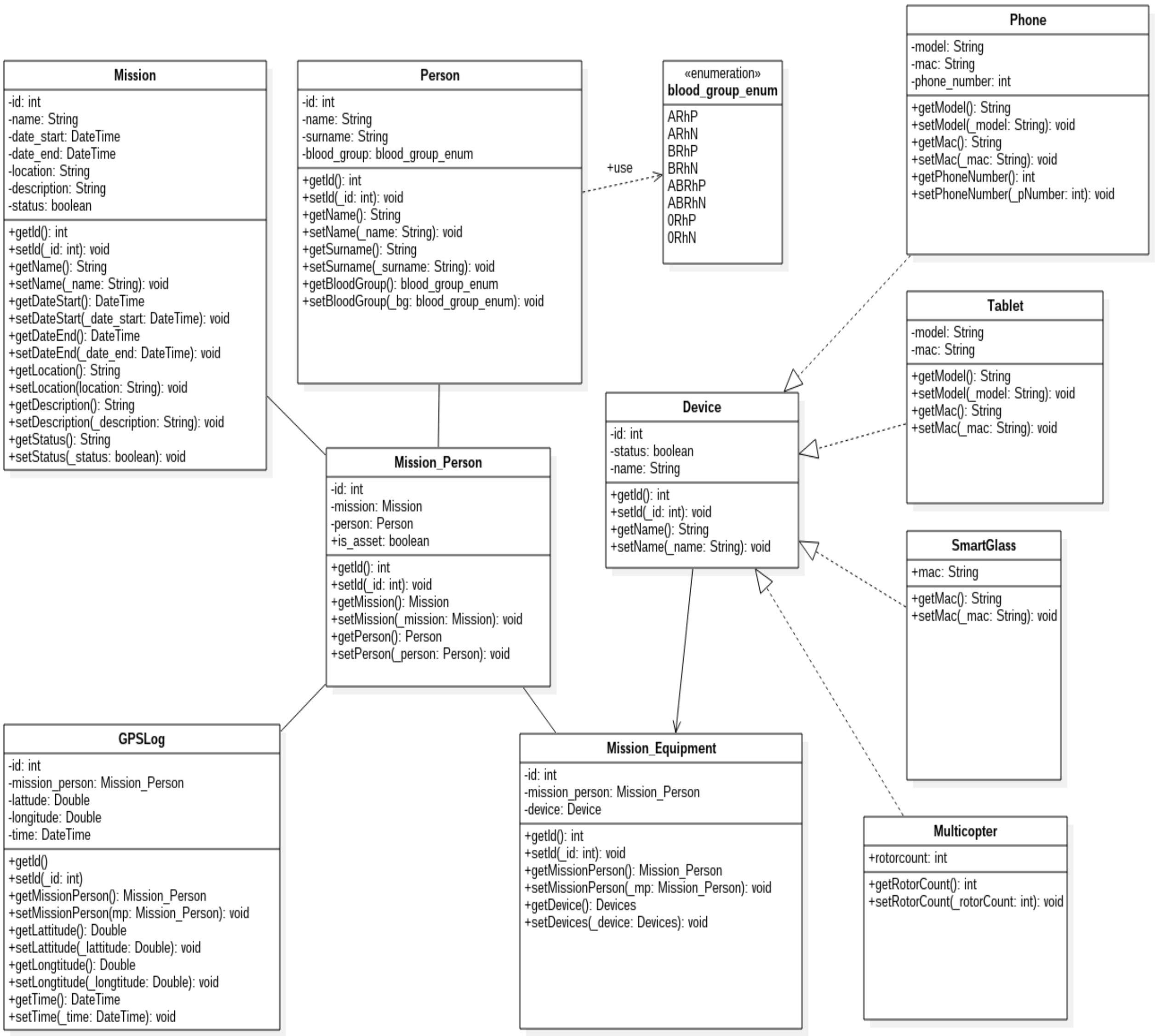

Figure 3 : Class Diagram

4.2. Logical Database

In this section, logical view of database and ER diagram can be shown.

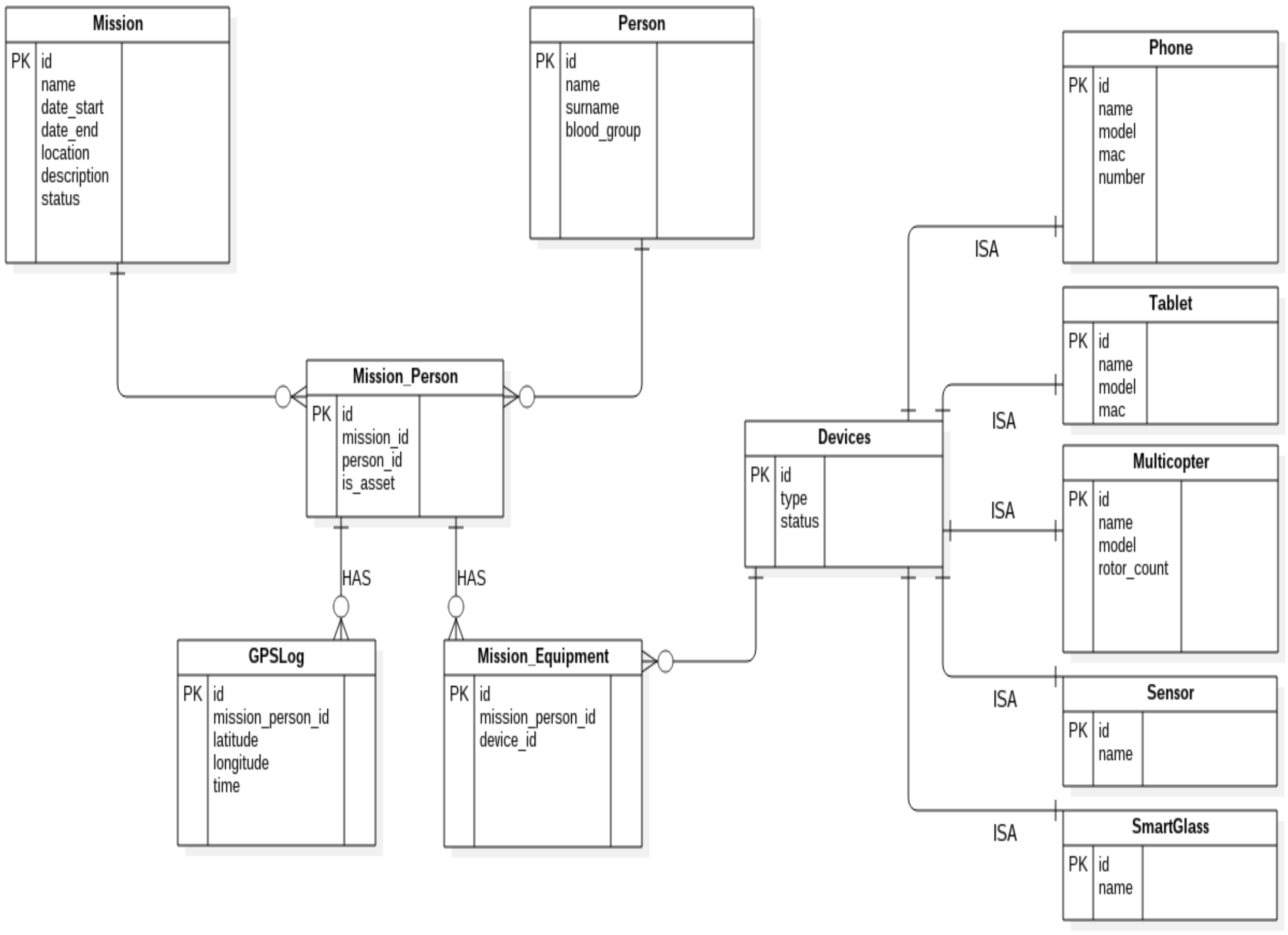

Figure 4 : ER Diagram

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