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SENIOR PROJECT

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Tarık Nural
Murat Baki Yücel

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LIST OF ABBREVIATIONS

API	Application Programming Interface
AWS	Amazon Web Services
CSS	Cascading Style Sheet
DAV	Distributed Authoring and Versioning
DBA	Database Administrator
FTP	File Transfer Protocol
GPS	Geographic Positioning System
GUI	Graphical User Interface
HTTP	Hyper Text Transfer Protocol
IDE	Integrated Development Environment
iOS	iPhone/iPad Operating System
Js	JavaScript
JSON	Java Script Object Notation
LOOP	Location and Observation Platform by Microsoft
MVVM	Model, View and ViewModel
Play Store	Google Play Store
RAM	Random Access Memory
RDS	Relational Database Service
SCP	Secure - Contain - Protect
SDK	Software Development Kit
SFTP	Secure File Transfer Program
SQL	Structured Query Language
SSH	Secure Shell

STS	Spring Tool Suit
UML	Unified Modelling Language
VCS	Version Control System
VNC	Virtual Network Computing
WebGL	Web Graphics Library

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ABSTRACT

Gezi-Yorum

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The goal of this project is to record travel routes of people's trips using mobile device location and to add and edit media on the route. The developed system can be used to organize personal or team trips and it will automatically detects type of vehicles using during the trip. If the trip organized as a team, the users will be able to share their in-team location via the Internet so that team members can follow each other. It is intended that a route created and shared by a user or a team can be examined by other users. Other users may choose the route they are reviewing as their route and they can start trips on this route as personal or team trip. Mobile application will show chosen path on the map different from user's. The system also need to create a social media environment to increase interaction between users. Friendship and tracking system between users is designed and also personalized news flow which includes shared trips by user's friends and popular trips, is provided. As a result of the project, a mobile application that stores route data of a trip and media like photos, videos, audio files tagged on the route is developed, also provides service to interact people with shared data. Sharing trips is an additional workload for travelers. This application offers users a practical solution to save the time spent on sharing a trip on any social media environment or on the Internet. In addition, the application generates convenience not only for travelers but also for people who want to share their daily life. It also provides an open environment for the interaction of people as it is considered to be a social media environment within the application.

Keywords: Trip, Tracker, Advisor, Social Media, Gallery Editor

ÖZET

Tarık Nural

Murat Baki Yücel

Bilgisayar Mühendisliği Bölümü

Bitirme Projesi

Danışman: Yrd. Doç. Dr. Ahmet Tevfik İNAN

Bu projenin hedefi insanların gezilerinin mobil cihaz konum verileri kullanılarak gezi güzergâhının kaydedilmesi ve güzergâh üzerinde medya ekleyip düzenlenmesini sağlamaktır. Gezilerin sadece kişiler olarak değil, takım hâlinde de düzenlenebilmesi, ayrıca yapılacak gezilerde varsa kullanılan ulaşım araçlarının neler olduğunu algılayabilecek bir sistem geliştirilmiştir. Takım olarak düzenlenen gezilerde kullanıcılar, takım üyelerinin birbirini takip etmesi amacıyla takım içi konum paylaşımını Internet bağlantısı olması şartıyla yapabilirler. Bir kullanıcının veya takımın oluşturduğu bir güzergâhı, diğer kullanıcılar da inceleyebilmektedir. Diğer kullanıcılar inceleme yaptığı güzerâhı kendi güzergâhı olarak belirleyebilir veya bu güzergâh üzerinde takım gezisi yapmak isteyebilir. Mobil uygulama belirlenen güzergâhı, kullanıcının güzergâhından farklı olarak gösterecektir. Sistemde kullanıcılar arasında etkileşimi artırmak amacıyla bir sosyal medya ortamı oluşturulmuştur. Kullanıcılar arası arkadaşlık ve takip sistemi tasarlanmıştır. Ayrıca kişiye kendi çevresinden tavsiye edilender, uygulama içinde bulunan popüler güzergâhlar ve arkadaş çevresindeki geziler derlenerek özel bir haber akışı içerisinde sunulmaktadır. Proje sonucunda bir gezinin rotasını, rota üzerine etiketlenen fotoğraflarını, videolarını, ses dosyalarını saklamaya imkan veren ve bunları diğer kullanıcıların etkileşimine açabilen bir mobil uygulama geliştirilmiştir. Gezilerin herhangi bir sosyal medya ortamında veya Internet üzerinde paylaşılması ve paylaşmak amacıyla düzenlenmesi geziciler için ek iş yükü teşkil etmektedir. Bu uygulama, kullanıcılarına gezi sürecinin paylaşımında sarf edilen emek ve zamandan tasarruf ettirecek pratik bir çözüm sunmaktadır. Ayrıca uygulama sadece gezicileri değil günlük hayatını paylaşmak isteyen insanlar içinde kolaylık üretmektedir. Uygulama içinde bir sosyal medya ortamının da olması düşünüldüğü için kişilerin

etkileşimine açık bir ortam sağlanmıştır.

Anahtar Kelimeler: Gezi, Takip, Öneri Sistemi, Sosyal Medya, Galeri
Düzenleyici

1 Introduction

On this project our purpose is to save navigation data (latitude, longitude, altitude, accuracy, speed) collected from GPS of mobile device and show the route of a trip on the map. There will be a mobile application and server side application to provide some features, lets users to share trips, review trips, communicate and socialize with each others. Various media records such as photos, videos and sound recorded from mobile device during the trip will be associated with the route. There will be a team trip option for the trips which includes more than one member. Team trip option lets every team member to see any other team member's location simultaneously if there is an Internet connection. In order to determine travelling method, using the temporal changes of the navigation data taken from the GPS, average and instant speed will be calculated. As result, trip type will be labelled as vehicle trip, walking trip, running trip or cycling trip using calculated speed data. In order to provide interaction between users a social media environment will be designed. People will be able to establish their friendship here. In the news flow, there will be a timeline section. Posts which are shared by friends of users will be shown there. The trips can be liked by other users in the news flow, they can leave a comment on trip or the users can follow trips they like by downloading it on their own mobile device. Users can create complaints about comments, other user profiles and trips. Complaints are evaluated by the system administrators. If admins think that regarding complaint are right, the content can be hidden.

1.1 Literature Review

The purpose to realize that project is to simplify planning, recording and sharing traveler's trips. We know that it is not easy to organize photos and media taken on a trip and later on sharing them on any social media or personal blogs. In any marketplaces including play store and appstore there are lots of applications for tracking and planning travel but most of them only saves location data and do not include media or user notes. There are only a few remarkable application which

saves location data, media and also provides a social media enviroment. However there is no application that provides trip tracking, organizing media, following other person's route, sharing memories and also doing all of these with friends at the same time.

1.2 Objective of the Thesis

For travelers it is not easy to organize media and associate media with saved locations. Also if trip has been organized with more than one person it is also difficult to merge media and organize additional material prior to share on any social media enviroment or on the Internet. It's important to say that every member of team has him/her own memory which is important and it must be saved.

1.3 Hypothesis

To do that it is neccessary to store locations data, store media and associate them with their location and store them with everthing in a trip. So that people can remember a every single detail of their trip.

2 General Information

The main purpose of this section to review projects that are already developed by others which have similarities with ours.

2.1 Trip Tracker (Android application)

Trip Tracker[1], a Microsoft Garage project, is a free application that automatically records your drives, runs, walks, and bike rides. This application has developed with LOOP [2]. This application can only track, store user's location and show stored data on the map.

2.2 Route Tracker (Android application)

Route Tracker [3] is a GPS application for tracking/loading routes in your android mobile phone that gives you a real time response on your location. It supports GPX tracks file import, GPX/KML/google map embedded HTML file export, sync workouts with RunKeeper account, auto-Lap for each mile/kilometer, audio reminder for auto lap time reminding, vibration for auto lap, sharing to friends, open street view for record locations, duration, distance, pace and calories indication.

2.3 Polarsteps - Travel Tracker (Android and Ios application)

Polarsteps [4] can provide tracking location of user, can show media as just photo and video on the trip path. They are claiming that it is a low power consuming application. User can use this application only for their personal trips. It is not possible to organize team trips. This application also provides a social media platform. Social media enviroment could only usable for sharing trips and comment on shared content. It is not possible to download and track any shared route.

2.4 Maps (Android and Ios application)

Google Maps [5] can save user's location continuosly. In this application there is no start trip option. This application determines kind of trip automaticaly. This application is not developed to track, it is developed to navigate users. User can watch his/her activity on the menu named 'TimeLine'. On users timeline any photos and videos are shown, there is no audio or text notes support. In this application social media or sharing trip option do not exist.

Gezi Yorum offers an extended trip tracking and organizing system. Gezi Yorum will include all of the feautures of the applications listed above and in addition Gezi Yorum will able to organize team trips and following member on a trip. Table 2.1 shows specifications of applications.

Table 2.1 Specifications of Applications

Specification	Trip Tracker	Route Tracker	Polarsteps	Maps	Gezi Yorum
Record trip	+	+	+	+	+
Show trip on map	+	+	+	+	+
Trip type	+	+	+	+	+
Media on location	-	-	+	-	+
Social media	-	-	+	-	+
Personal trip	+	+	+	-	+
Team trip	-	-	-	-	+
Live tracking	-	-	-	-	+

3 Feasibility

The system requirements are listed below:

- This system needs real time location of a user. The mobile phones have already a GPS sensor so this system needs to run on a mobile device.
- This system must provide interaction within users. So to provide interaction of multiple mobile devices this system needs a server side application.
- In process of development to provide version controlling Git must be used as VCS.

3.1 Technic Feasibility

As technical feasibility study, the software, hardware, communication, labor force, legal and economical needs for the project is defined on the following sections.

3.1.1 Software Feasibility

This project depends on web and mobile technologies.

Mobile Side Development

The tools and development environments used for mobile side development of the project are mentioned below.

- Android [6]: Android is a mobile operating system based on the Linux kernel. Its source code is licensed under open source licenses and it is developed by Google and Open Handset Alliance. The top layer of Android's architecture is called The Application Framework layer and it provides many higher-level services to applications in the form of Java classes. Android was chosen over iOS [7] because of publishing problems, restrictions and lack of design guidelines that come with iOS. Also Android has much more marketplace over iOS as shown in Figure 3.1.

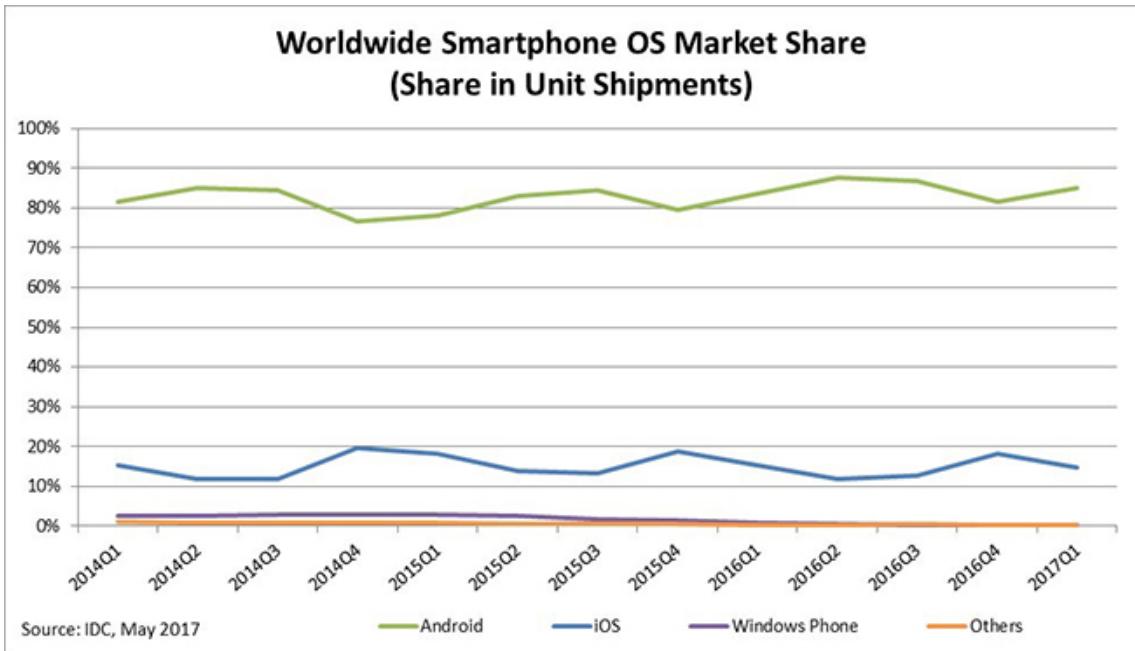


Figure 3.1 Smartphone OS Market Share [8]

- **Android Studio:** Android Studio is the official IDE for Android application development, based on IntelliJ IDEA. Android Studio offers some advantages over Eclipse, such as Gradle based flexible build system, advanced layout editor, built-in Git source control and Maven library support [9].
- **Android Sqlite Database:** SQLite is a opensource SQL database that stores data to a text file on a device. Android comes in with built in SQLite database implementation. SQLite supports all the relational database features [10].
- **Android Emulator:** Android emulator lets prototype, develop and test Android applications without using a physical device [11].
- **Google Map API:** Google Maps APIs give developers several ways of embedding Google Maps into web pages or retrieving data from Google Maps, and allow for either simple use or extensive customization [12].
- **Operating System:** An operating system is required for developing mobile application. Android Studio and Android Emulator can run on Windows, Linux or Mac OS [13]. We prefer to use Linux, because Linux needs relatively less resource and it's free to use.

Server Side Development

The tools and development environments used for server side development of the project are mentioned below.

- Java EE: Java EE is a collection of technologies and APIs for the Java platform designed to support "Enterprise" Applications which can generally be classed as large-scale, distributed, transactional and highly-available applications designed to support mission-critical business requirements. [14] We have chosen JAVA EE platform because it is widely used by developers, its community is larger than most of its competitors, also it is a better option to use same language which is Java for the server side and mobile side development
- Eclipse: Eclipse platform which provides the foundation for the Eclipse IDE is composed of plug-ins and is designed to be extensible using additional plug-ins. Developed using Java, the Eclipse platform can be used to develop rich client applications, integrated development environments and other tools. [15] Eclipse can be used as an IDE for any programming language for which a plug-in is available. Eclipse has support for JAVA EE and Spring projects within its marketplace there are few IDEs that have these functionalities but Eclipse is open source and free.
- Sublime Text: Sublime Text is a proprietary cross-platform source code editor with a Python API. It natively supports many programming languages and markup languages, and functions can be added by users with plugins, typically community-built and maintained under free-software licenses. [16] Sublime Text is one of the greatest text editor in the world, almost every programming language is supported, we chosen it because of its Angular JS editing skills.
- MySQL : A database is a structured collection of data. It may be anything from a simple shopping list to a picture gallery or the vast amounts of information in a corporate network. [17] MySQL is open-source and free. Developers didn't need to pay licence fee, also it gets updates regularly which makes it reliable.
- MySQL Workbench: MySQL Workbench is a unified visual tool for database architects, developers, and DBAs. MySQL Workbench provides data modelling, SQL development, and comprehensive administration tools for server configuration, user administration, backup and many more features. [18] It is best option for MySQL development platform, when we compare to others such as Apache PhpMyAdmin it contains reverse and forward engineering tools, embedded UML diagram chart drawer tools, generating tables from models without complexity.
- Bootstrap: Bootstrap is a front-end development framework that enables developers and designers to quickly build fully responsive websites. The framework contains global CSS settings with built-in components and extensible classes in the form of typography, navigation, buttons and many other html elements. [19] We have chosen bootstrap because bootstrap equals platform in dependency, by developing

on Bootstrap developers are able to run their code on every size of device such as phones,tables,computers,laptops and so on.

- Angular JS: AngularJS is a MVVM platform. AngularJS is a structural framework for dynamic web applications. It lets you use HTML as your template language and lets you extend HTML's syntax to express your application's components clearly and succinctly. AngularJS's data binding and dependency injection eliminate much of the code you would otherwise have to write. [20] We have chosen Angular JS because it is officially supported and created by the Google. What that means is that it is more reliable than others. Also it has more libraries than other frameworks its community larger than others.
- Javascript : Javascript is a dynamic computer programming language. It is lightweight and most commonly used as a part of web pages, whose implementations allow client-side script to interact with the user and make dynamic pages. It is an interpreted programming language with object-oriented capabilities. [21] We have chosen it because it is almost only option for front end development.
- Apache Tomcat : The Apache Tomcat software is an open source implementation of the Java Servlet, Java Server Pages, Java Expression Language and Java Web Socket technologies. The Java Servlet, Java Server Pages, Java Expression Language and Java WebSocket specification are developed under the Java Community Process. [22] We have chosen Apache Tomcat because it is platform independent, we can run web server in a Linux machine.
- Spring Framework : The Spring Framework provides a comprehensive programming and configuration model for modern Java-based enterprise applications - on any kind of deployment platform. [23] A key element of Spring is infrastructural support at the application level: Spring focuses on the "plumbing" of enterprise applications so that teams can focus on application-level business logic,without unnecessary ties to deployment environments. Spring framework makes things easy for developers, such as creating Web Services, Controllers, web pages, database integrations, query implementations and so on. It is easy because most of the trivial processes are implemented by the framework, for example you don't need to open and close database connections by yourself when you execute a query in Java it is done by Spring it makes code less complex.
- STS: The Spring Tool Suite is an Eclipse-based development environment that is customized for developing Spring applications. It provides a ready-to-use environment to implement,debug,run, and deploy your Spring applications,including integrations for Pivotal tc Server, Pivotal Cloud Foundry, Git, Maven, AspectJ,

and comes on top of the latest Eclipse releases. [24] We have chosen STS because it has embedded Eclipse plug-in integrated, there are other options such as Spring Incubator web page, but when you use others you have to implement some extra steps to import those projects in your local computer.

- Postman : API development tool that is a plug-in which comes as a packaged application in Chrome and is used to test the API services. Users can test the JSON REST based Web Services with this and make a API for cross device applications. [25] We have chosen Postman because its perfect GUI. You can save your REST calls and look it from other computers by registering.
- Google Map API: Google Maps APIs give developers several ways of embedding Google Maps into web pages or retrieving data from Google Maps, and allow for either simple use or extensive customization [12]. We have chosen Google Map API because it is free for the first 100.000 requests.
- PuTTy : PuTTy is a Telnet and SSH terminal software for Unix and Windows platforms that enables any users to remotely access computers over the Internet. [26] We have chosen PuTTy because it is platform independent and free.
- VNC : Virtual network computing (VNC) is a type of remote-control software that makes it possible to control another computer over a network connection. Keystrokes and mouse clicks are transmitted from one computer to another, allowing technical support staff to manage a desktop, server, or other networked device without being in the same physical location. [27] We have chosen TightVNC as a tool for accessing remote server. TightVNC is also free and it is recommended by the community.
- WinSCP : This program is an open source free SFTP client, FTP client, Web DAV client and SCP client for Windows. Its main function is file transfer between a local and a remote computer. [28] WinSCP is better option with its GUI for accessing remote file system.
- JMeter : JMeter is an open source testing software. It is Java application for load and performance testing. JMeter is designed to cover categories of tests like load, functional, performance, regression, etc., and it requires JDK 5 or higher. [29] We have chosen JMeter to make HTTP calls in order to get server's client limit. It makes simultaneous calls between defined time periods and shows the summary of call outputs.
- htop : htop is an interactive system-monitor process-viewer and process-manager. It is designed as an alternative to the Unix program top. It shows a frequently

updated list of the processes running on a computer, normally ordered by the amount of CPU usage. Unlike top, htop provides a full list of processes running, instead of the top resource-consuming processes. htop uses color and gives visual information about processor, swap and memory status.[30] We have chosen to monitor our server's stress test with htop because it has perfect GUI and it is really robust and easy to monitor.

3.1.2 Hardware Feasibility

The minimum hardware requirements for each program/IDE and a system requirement compilation for development is shown in 3.1, 3.2, 3.3 based on the requirements.

Table 3.1 Minimum System Requirement for Mobile Application Development

Software	CPU (Ghz)	RAM (MB)	Storage (GB)
Linux OS [31]	1	512	8
Android Studio [32]	1.6	3072	8 (7 GB for SDK)
Android Emulator [32]	unknown	2048	1.5
Minimum System Configuration	1.6	5632	17.5

Table 3.2 Minimum System Requirement for Server Side Application Development

Software	CPU (Ghz)	RAM (MB)	Storage (GB)
Linux OS [31]	1	512	8
Eclipse [33]	1.5	1024	1
MySQL [34]	1 (2 core)	2048	0.8
MySQL Workbench[18]	1	1024	0.2
Apache Tomcat[22]	1	512	0.1
JMeter[29]	1.2	512	0.2
htop[30]	1	512	0.1
Minimum System Configuration	1.5 (2 core)	8704	10.4
Recommended System Configuration	3 (4 core)	16384	256

Table 3.3 Android Hardware Requirements

	Minimum	Recommended
CPU (Ghz)	1	2
RAM (MB)	1024	1536
Storage (GB)	8	32
Version	5.0.0 (Lollipop)	7.1.1 (Nougat)
Sensors	GPS, Camera	
Other	Internet Connection	

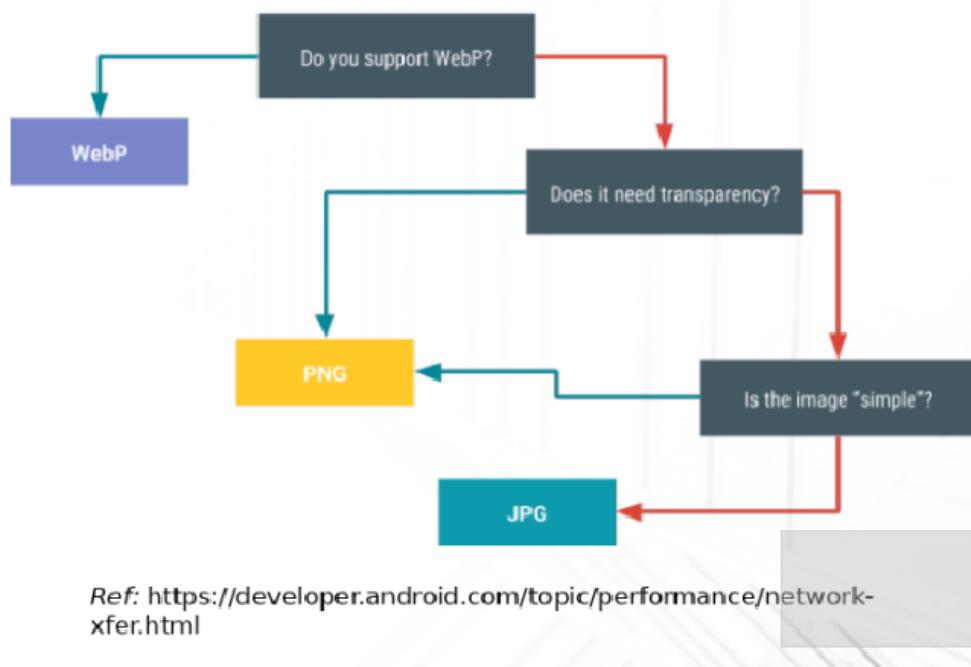
There is no restrictions for web clients. A web browser which supports WebGL and Internet connection is enough for using this system both for users and administrators.

3.1.3 Communication Feasibility

Media files and path files are separately stored on users android device. It is so hard to send all of trip data one by one to one device to another without any loss. So we thought about that to compressing all files in a zip file before sending from mobile device to web server or vice versa. So we send all data in one file. Also we will use less data bandwidth by compression.

We had to compress photo files also. An uncompressed photo can be 5 MB but if we compress a photo using a compression technic the size of file will decrease seriously. Android provides three types of compression technic; WEBP, PNG and JPEG. We use JPEG for compression. Our decide three and performance comparison shown in Figure 3.2.

Determining Compression Format



JPEG vs PNG

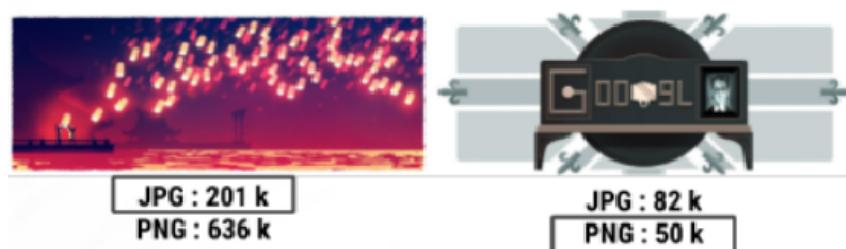


Figure 3.2 Photo Compression

Our web server do not support WEBP format. PNG format is more successful over JPEG when there is poor color variety in a photo. If there is rich variety of colors JPEG is more successful over PNG format. We thought about that our application will used in real life and our photos has rich variety of colors. So we have chosen JPEG format to compress photos.

The Internet is the main communication technology used in this project. The anticipated communication variables are shown in Table 3.4.

Table 3.4 Communication parameters

Description	Symbol	Values
Average Text File Size	A	50 kB
Average Video Size	B	10 MB
Average Video Number Per User	C	4
Average Photo Size	D	2 MB
Average Photo Number Per User	E	20
Average Sound Record Size	F	1 MB
Average Sound Record Number Per User	G	1
Average Number Of Members in a Trip	H	2
Average Trip Data Size on Mobile(Unzipped)	I	81 MB
Average Trip Data Size on Mobile(Zipped)	J	56,7 MB
Average Trip Data Size on Web(Unzipped)	K	162 MB
Average Trip Data Size on Web(Zipped)	L	113 MB
Average Number of Upload Rate	M	1000/month
Average Number of Download and View Rate	N	7500/month
Average Size of Uploaded Trips	O	55 GB
Average Size of Downloaded Trips	P	827 GB
Supposed Number of Users	R	10000
Average Zip Compression Ratio [35]	S	30%
Server Data Rate Per Month	T	827 GB

$$I = G * F + E * D + C * B + A$$

$$K = I * H$$

$$J = I * (1 - S)$$

$$L = K * (1 - S)$$

$$O = J * M$$

$$P = L * N$$

$$T = MAX(O, P)$$

For this project we selected to rent a cloud computing system to make this project scalable. Scaleway [36] provides cloud computing services. Scaleway can provide multiple datacenters on different locations and developer tools on the machines. We selected scaleway for renting cloud server(s).

Based on the calculations above, the monthly data size will be around 827 GB. Scaleway provide 8 GB RAM and 200 GB storage with expandable options on ARM64 package shown on Table 3.5. So we have to rent at least 5 ARM64 cloud servers from Scaleway.

Table 3.5 Scaleway package options [36]

Specification	Starter	C2	ARM64	C1
CPU	2x86 64bit	8x86 64bit	8xARMv8	4xARMv7
RAM	2GB	32GB	8GB	2GB
Storage	50GB SSD	50GB SSD	200GB SSD	50GB SSD
Number of public IPv4	1	1	1	1
Bandwidth	200Mbit/s	800Mbit/s	200Mbit/s	200Mbit/s
Price	2.99 Euro	5.99 Euro	9.99 Euro	24.99 Euro

3.2 Labor Force Feasibility

The resource chart for this project shown in 3.3.

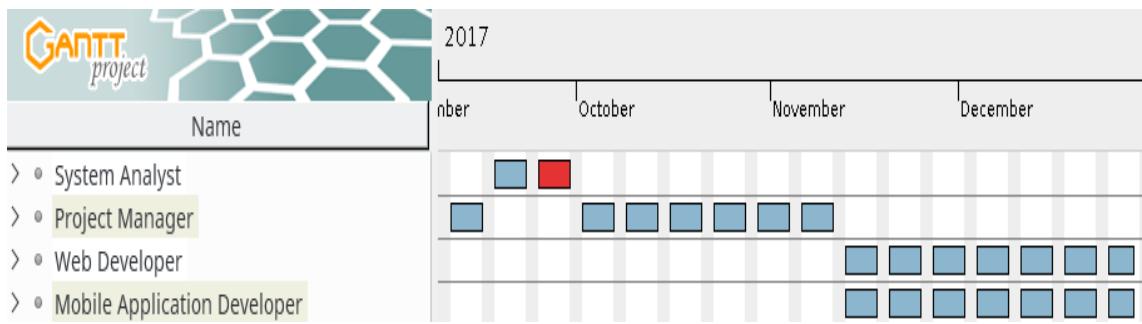


Figure 3.3 Resource Chart

3.3 Legitimate Feasibility

Software which is used within the project does not face any legal issues. All of the software used in the project contain license requirements. Users are responsible for all shared content so any misusing of any sharing content is their risk. Sharing and publishing content is on their own risk, but if the users think that a profile, trip or comment has inappropriate content, they can create complaints about that. System administrators are in charge of assessing complaints. Admins can hide that specific content if they think it is inappropriate. Content that violates the user's personal rights will be blocked by this mechanism.

3.4 Time Feasibility

Gannt diagram shown in Figure 3.4 and PERT diagram shown in figure 3.5.

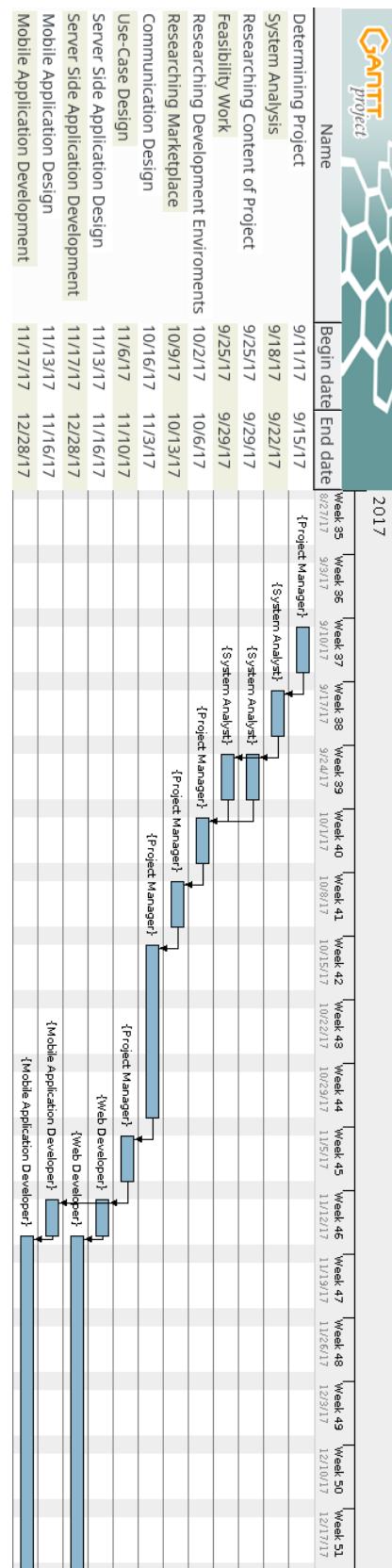


Figure 3.4 Gantt Diagram Drawing

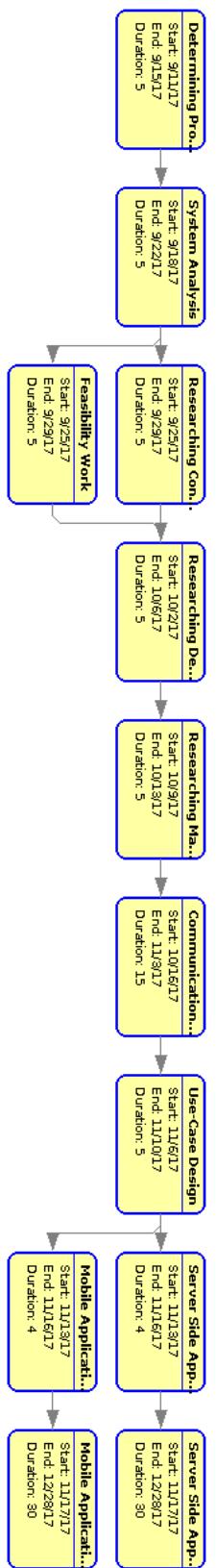


Figure 3.5 PERT Diagram Drawing

3.5 Economic Feasibility

The salary determined by the government of the Republic of Turkey for engineers is 3.500 TL [37]. In a month there are 22 work days on average so an employee's daily salary is $3500 / 22 = 159,10$ TL. We thought that project manager must get a salary higher than other roles because project manager has more responsibilities than other roles. So we decided to give 6000 TL/month to project manager. In this situations project manager's daily salary is $6000 / 22 = 272,75$ TL.

Table 3.6 Personnel cost table

	Time(Day)	Price(TL/Day)	Total(TL)
System Analyst	15	159,10	2.386,50
Project Manager	35	272,75	9546,25
Full Stack Developer	35	159,10	5.568,50
Mobile Application Developer	35	159,10	5.568,50
General Total:			23.069,75

The cost of computers used in the development process is 3.181 TL[38]. In the process 2 computer were used. A computer can be used for 2 years so 48 months in average lifetime. From here, we will find the cost of computer for 5 months is $(3.181 * 2) / (5 / 48) = 662$ TL. General Mobile GM6 used in the development process is 900,00 TL[39]. It can be used for 12 months in average lifetime. From here we will find the cost of phone for 5 months as $900,00 * (5 / 12) = 375$ TL. Monthly price of servers is $9.99 * 5 = 49,95$ Euro = 227,09 TL. We need this servers after 17 November 2017 due to 28 December 2017. For this 41 days servers price is $227,09 * (41 / 30) = 310,35$ TL. Considering these expenditures, the cost of hardware and software cost is 1.409,00 TL. The project development cost is $23.069,75 + 1.346,00 = 24.415,75$ TL.

Table 3.7 Hardware and software used for development cost table

Components	Price (TL)
Eclipse [33]	0,00
Android Studio [9]	0,00
2* Dell Vostro 5468 [38]	662,00
General Mobile GM6 [39]	375,00
2* Github Account	0,00
Scaleway Server	310,35
General Total:	1.346,00

An administrator is absolutely necessary to run monitor and maintain the system. This administrator can get 3.500,00 TL/month salary and can use an average configurated computer. Toshiba Satellite L9W [40] is 1.000 TL and it is enough for administrator. We must provide an Internet connection for administrator. Türk

Telekom provides an unlimited Internet package with 49,90 TL monthly ???. Server cost has been calculated as 227,09 TL per month. So maintaining this system costs 1000 TL for administrator computer paid for once and $3.500,00 + 227,09 + 49,90 = 3.121,99$ TL per month.

4 System Analysis

The project hosts two kinds of roles: admins and users.

The user will start a trip, save location and media, manipulate media share options and share all of contents on social media. Also user can download a shared content which that user has access privileges. User can follow the trip that downloaded. User can search other users; trips by location, name and trip type (walk, run, ride or car). User can organize team trips with other users. During the team trip users can see each other's location on the map.

The admins can view the content of trips or profile of users. They can also evaluate the complaints which has been created by users. They can decide whether they are right or not, if admins think the complaint that is created by users is right they can hide the content of profile,comment or the whole trip. They are also able to view the support messages.

The work model of the system is shown in Figure 4.1 and user roles shown in Figure 4.2.

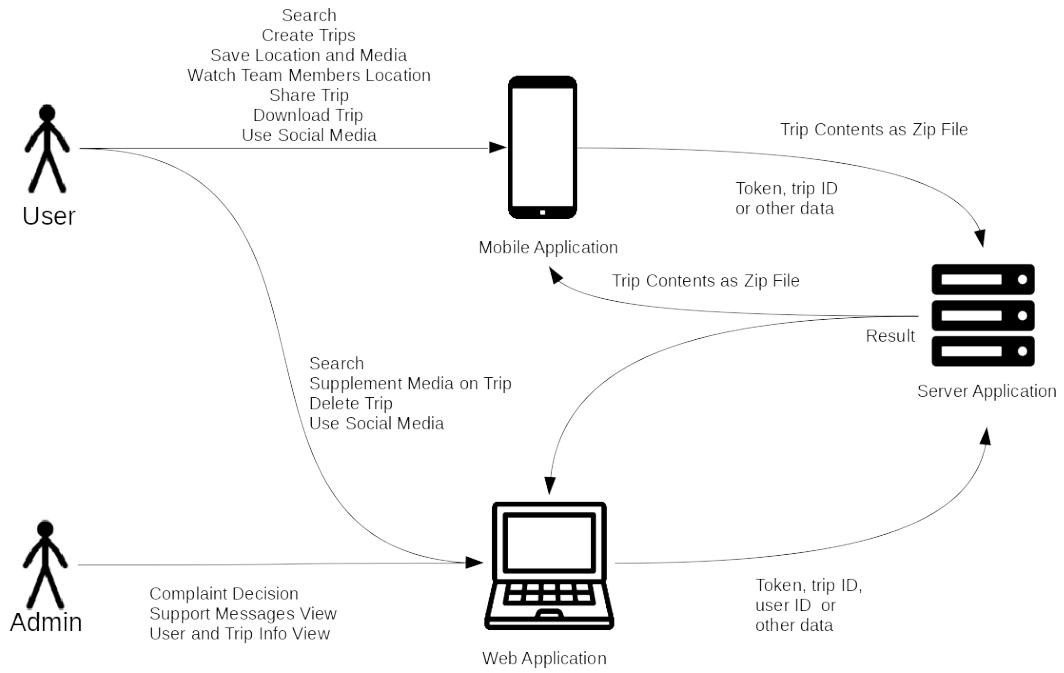


Figure 4.1 System Schema

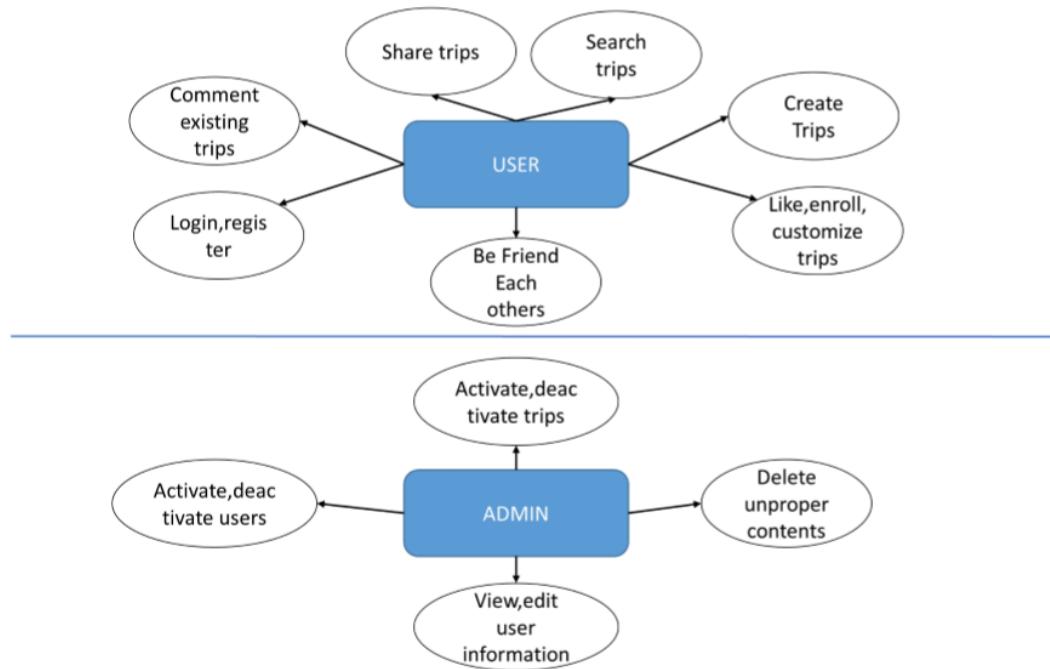


Figure 4.2 User Roles

In designed system while user creating personal trips, user can pause or continue location track. User can add media files when location track enabled. Workflow schema for creating a personal trip shown in Figure 4.3.

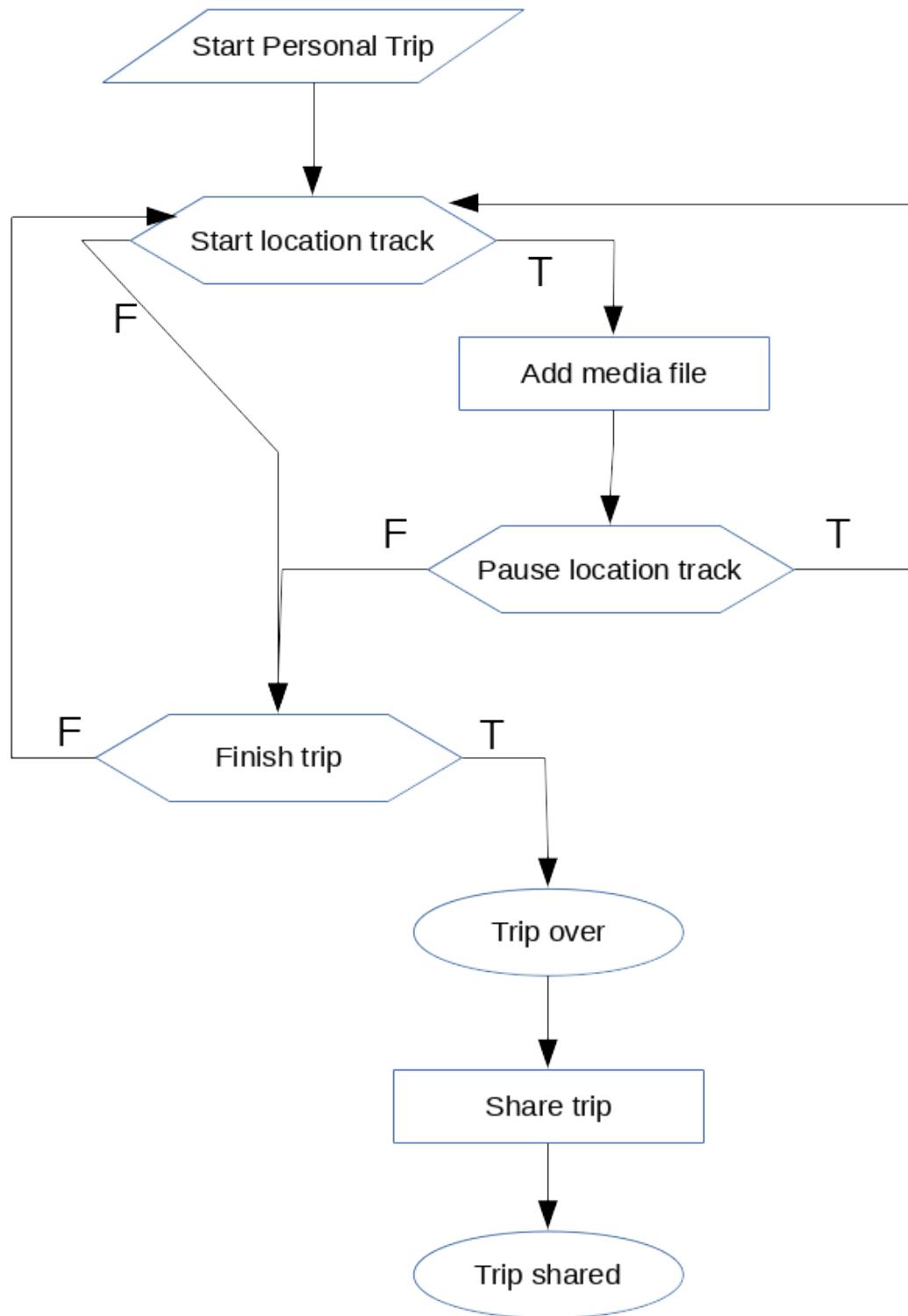


Figure 4.3 Workflow Schema For Creating Personal Trip

While creating team trips user must choose team members from his/her friend list before starting trip. When user starts trip user is selected as team leader and all of chosen member(s) will get a trip invitation notification for the trip. If member accepts invitation he/she will be in this team trip. During team trip all of the features of personal trip will be available. In addition, location sharing function with other team member(s) will be available and locations of team members will be shown on the map asynchronously. When trip finishes team leader may share the trip and selected media contents. After words other team members can only add their personal media to the published trip. Workflow schema for creating a team trip shown in Figure 4.4.

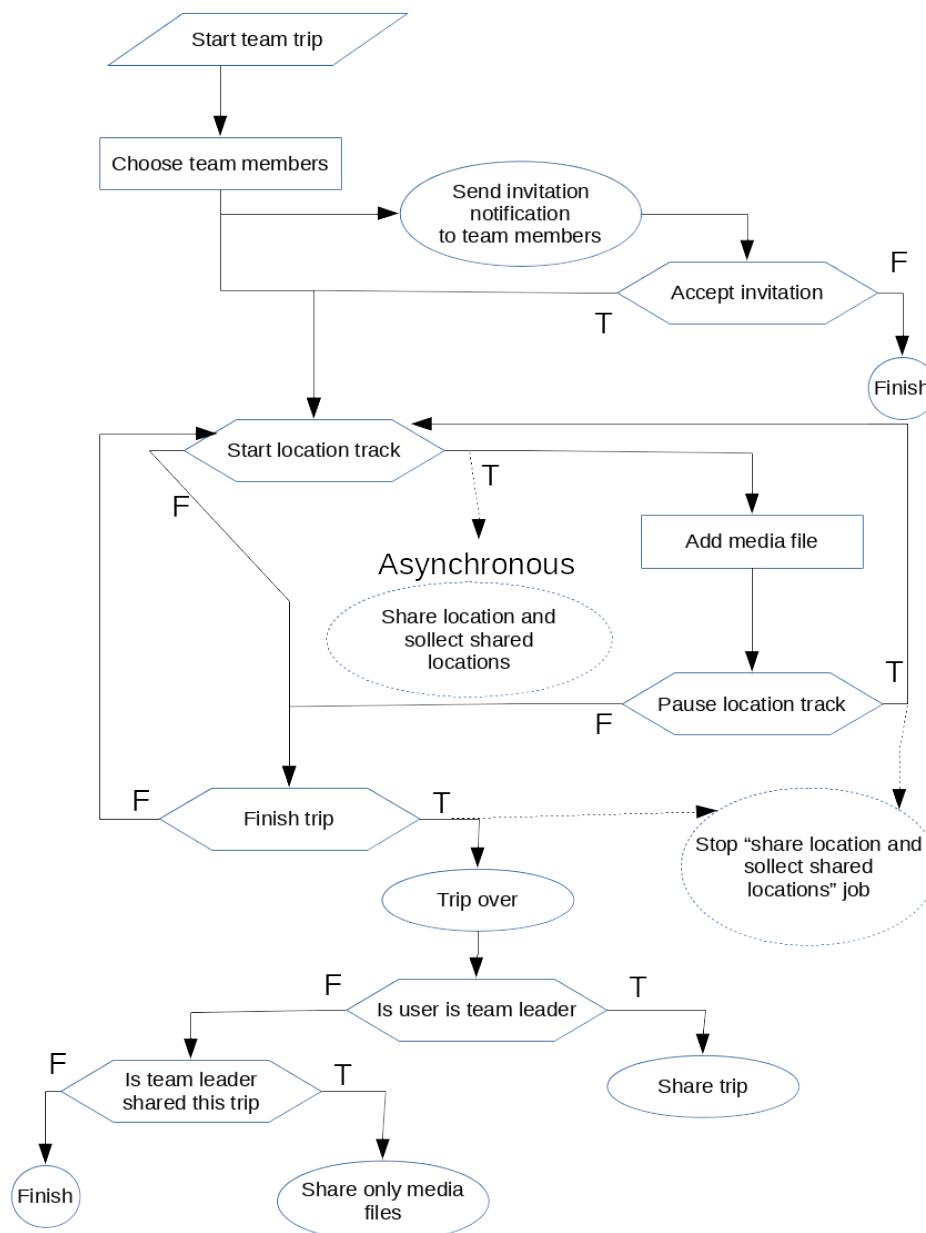


Figure 4.4 Workflow Schema For Creating Team Trip

5 System Architecture Design

Project details and descriptions also architectural design of project are explained in this chapter.

Mobile application will save location, notes and media files also location of media files to storage when user starts trip tracking feature of mobile application. Before starting a trip user can choose some of his/her friends to organize a trip with them when connected to Internet. If a person adds a trip, this person will send an invitation notification which asks user to accept joining or reject joining to trip. If user accepts invitation he/she can join trip as a member. Inviter is accepted as leader of team. During the trip all user's behaviour is saved separately. If location sharing feature is opened any member of this team can watch other members' location. However, as we mentioned, this feature requires Internet connection. At the end of trip when user wants to share his/her trip data, path data will be provided from team leader but all of media data will be merged. All users can select the content that they want to share separately.

In order to save location in the background, android application will use a location saving service. Using a service is a must because, Android services can provide to execute a process for long time in the background. This application must run a location save service for long time. User can watch his/her location path on map during trip. If user wants to follow a path which is shared by another user, he/she can follow the path by looking at map.

5.1 Communication Design

When user wants to share a trip, all of the trip contents will combined in a zip file. Combining all of the content in a zip file also provides to compress data. The trip zip file creating steps and zip file contents shown in Figure 5.1.

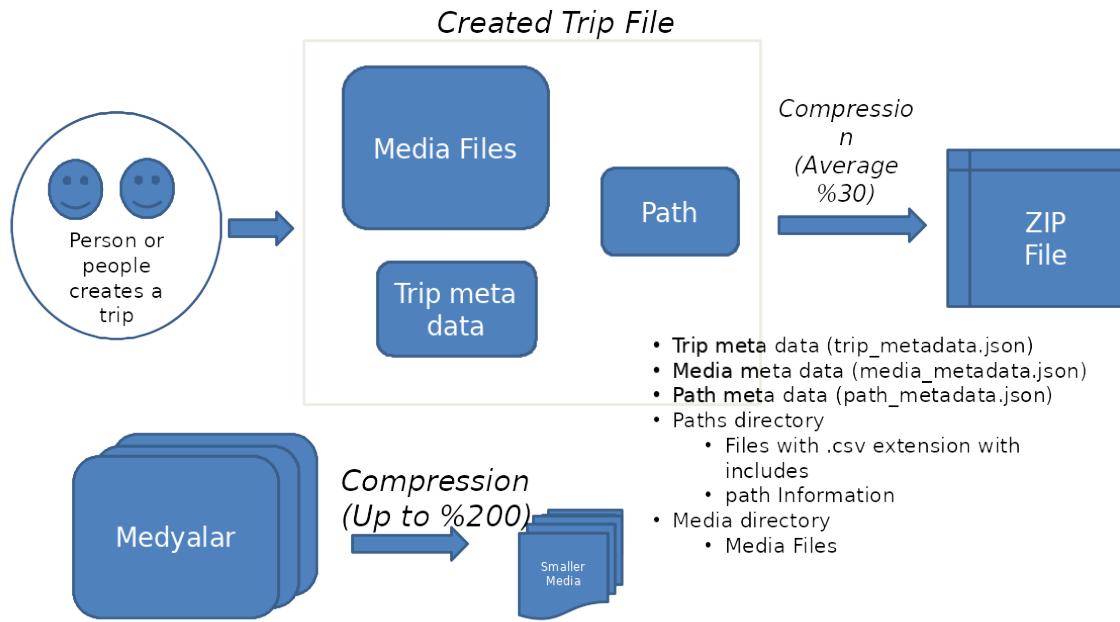


Figure 5.1 Trip zip file creating steps and zip file contents

An example of metadata files and path files in a zip file shown in Figure 5.2.

Trip meta data	Media meta data	Path meta data												
<pre>{ "startdate":1516171077002, "finishdate":1516171420343, "name":"Gezi Adı", "members":["uye"] }</pre>	<pre>[{ "path": "1516171388240.mp3", "type": "record", "longitude": 29.350654622306173, "altitude": 68.91624450683594, "latitude": 40.92184780558646, "share_option": "everybody", "note": "herkese açık ses", }]</pre>	<pre>[{ "start_date":1516171189647, "finish_date":1516171189647, "file": "path_1516171189647.csv", "type": "walk", "address": { "feature_name": "Anadolu Otoyolu", "district": "Fatih Mahallesi", "town": "Tuzla", "city": "İstanbul", "country": "Türkiye" } }]</pre>												
Path File														
<table border="1"> <thead> <tr> <th>Latitude</th><th>Longitude</th><th>Altitude</th><th>Time</th><th>Accuracy</th><th>Speed (m/sn)</th></tr> </thead> <tbody> <tr> <td>40.92199815 377531</td><td>29.3508656198049 35</td><td>65.6115036010 7422</td><td>151617119 6464</td><td>1.1333 6</td><td>0.565437 4</td></tr> </tbody> </table>			Latitude	Longitude	Altitude	Time	Accuracy	Speed (m/sn)	40.92199815 377531	29.3508656198049 35	65.6115036010 7422	151617119 6464	1.1333 6	0.565437 4
Latitude	Longitude	Altitude	Time	Accuracy	Speed (m/sn)									
40.92199815 377531	29.3508656198049 35	65.6115036010 7422	151617119 6464	1.1333 6	0.565437 4									

Figure 5.2 Metadata files and Path files example

5.2 Database Design

Mobile Application database design shown in Figure 5.3.

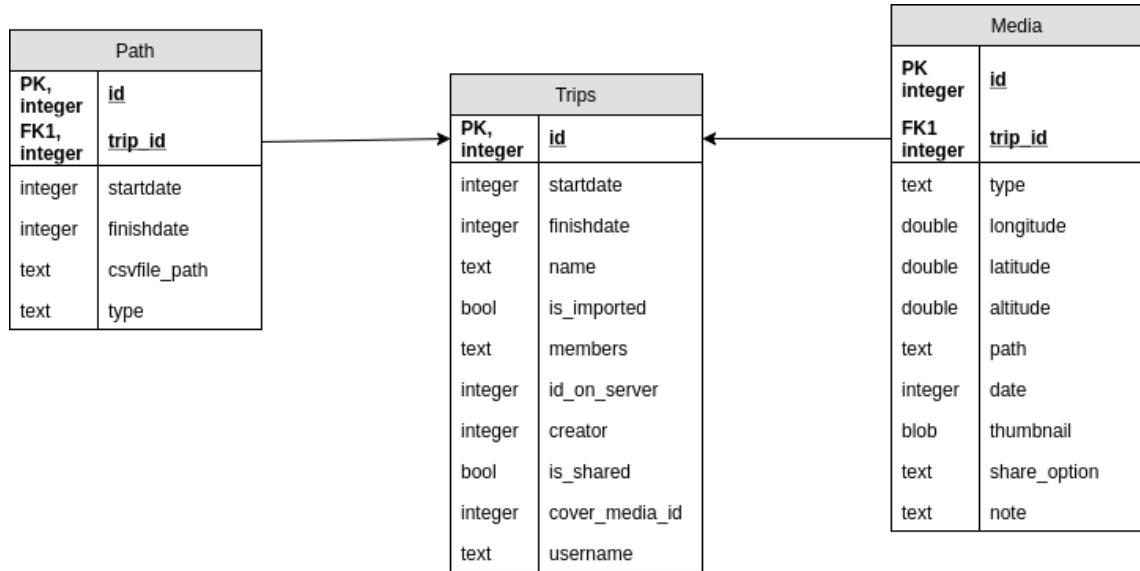


Figure 5.3 Mobile Application Database Diagram

Database designs of two different development side can be different in some aspects, the main reason of that server side also includes a social media platform which has more detailed information about users and the shared content.

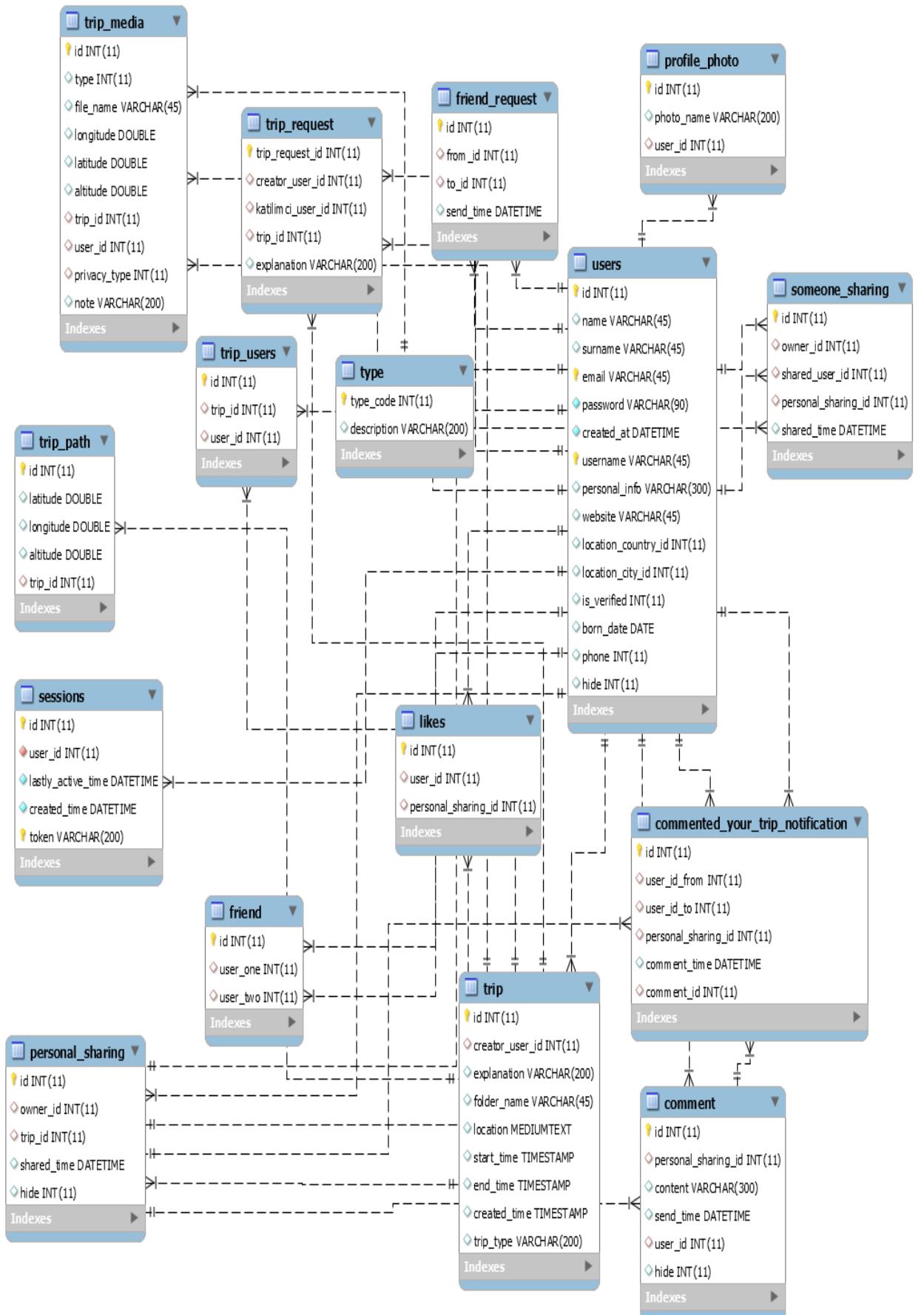


Figure 5.4 Server Side Database Diagram

5.3 Modules

There are system modules description in this section.

5.3.1 User Register Module

User register module provides creating new accounts, sends activation e-mails and activates user accounts. This module needs user name, password and e-mail from user to create a new account. This module runs on web application but user can use this module on mobile and web application.

5.3.2 User Login Module

User login module provides user to sing in into mobile and web application. This module needs user name and password from user to sing in. This module runs on web application but user can use this module on mobile and web application.

5.3.3 User Password Reset Module

This module provides password reset if the user forgets the password. This module available on both mobile and web application but this module runs on web application.

5.3.4 Search Module

This module provides user to search other users and shared trips by region, user, time and trip type. User can only search on trips which he/she have access rights to see. This module runs on web application but user can use this module on mobile and web application.

5.3.5 Location Save Module

This module runs as a background task on Android device and saves navigation(longitude, latitude, altitude) data provided from GPS to a CSV file. This module runs on mobile application.

5.3.6 Media Save Module

This module saves photo, video and sound record with their location data to SQLite database on Android device. This module runs on mobile application.

5.3.7 Feature Extraction Module

This module tags trips using trip path data by their country, province, distinct, members, time and trip type on the web application. This module runs on mobile application.

5.3.8 Trip Management Module

This module provides user to manage trip contents like deleting a photo or changing access privileges for contents. This module runs on mobile application.

5.3.9 Notification Sender Module

This module provides sending notifications to users about any topic. This module runs on web application but mobile application use this module as a web service.

5.3.10 Trip Upload Module

This module provides user to share trip content on social media with determined access rights. Mobile application prepares a zip file which includes all of contents belong to trip and upload this zip file to server side.

5.3.11 Trip Download Module

This module provides user to download chosen trip which he/she can access to his/her mobile device using application. Web application prepares a zip file using chosen trip and chosen media files, after that sends it to mobile application.

5.3.12 Team Trip Preparing Module

This module provides users to send team trip requests each others. They can accept or deny these requests, if they accept they can contribute trips by sending their media. This module works on both mobile and web application.

5.3.13 Team Content Merging Module

This module provides trip members to merge trip content easily for share on social media. Web application merges all of sent contents from members in one trip. This module runs on web application.

5.3.14 Team Members Location Tracking Module

This module can only be used on team trips and requires Internet connection, provides team members to track each others locations simultaneously. This module runs on both mobile and web application.

5.3.15 Content Complaint Module

This module can be used both mobile device and web applications. Users can make complaint about other users, trips, comments. Created complaints are evaluated by the administrators. This module runs on server side but mobile application also interacts with it.

5.3.16 Shared Content Interaction Module

This module can be used both on mobile application and web application. Users can like each others shared trip they can comment on those trips also can share the trips. This module runs on server side but mobile application also interacts with it.

5.3.17 Administrator Module

This module can only be used on web application. Administrator of system are able to interact with it, with the module administrators can evaluate created complaints by the users. Administrators can hide a content, user or comment if he or she thinks that complained content is inappropriate. This module runs on web side application.

5.3.18 Users Interaction Module

This module can be used both web and mobile application. Users can interact with other users by sending friend request, if they accept it they become friends and will be able see contents of each others. This module runs on web side application but can only be used both mobile and web applications.

5.3.19 Media Supplementation Module

This module provides user to add new media files to trip on stated location using Google map on web application. This module only runs on web application.

The dataflow diagrams are shown in Figure 4.2, 5.7, 5.8.

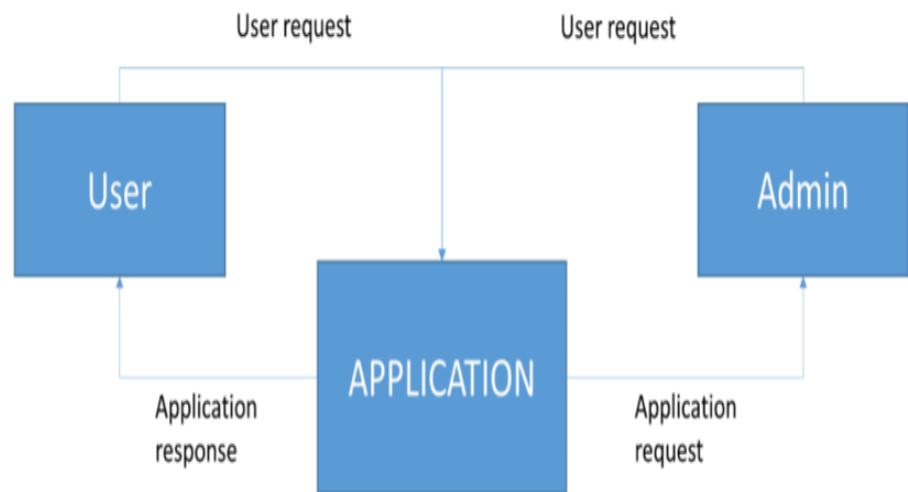


Figure 5.5 Level zero data flow diagram

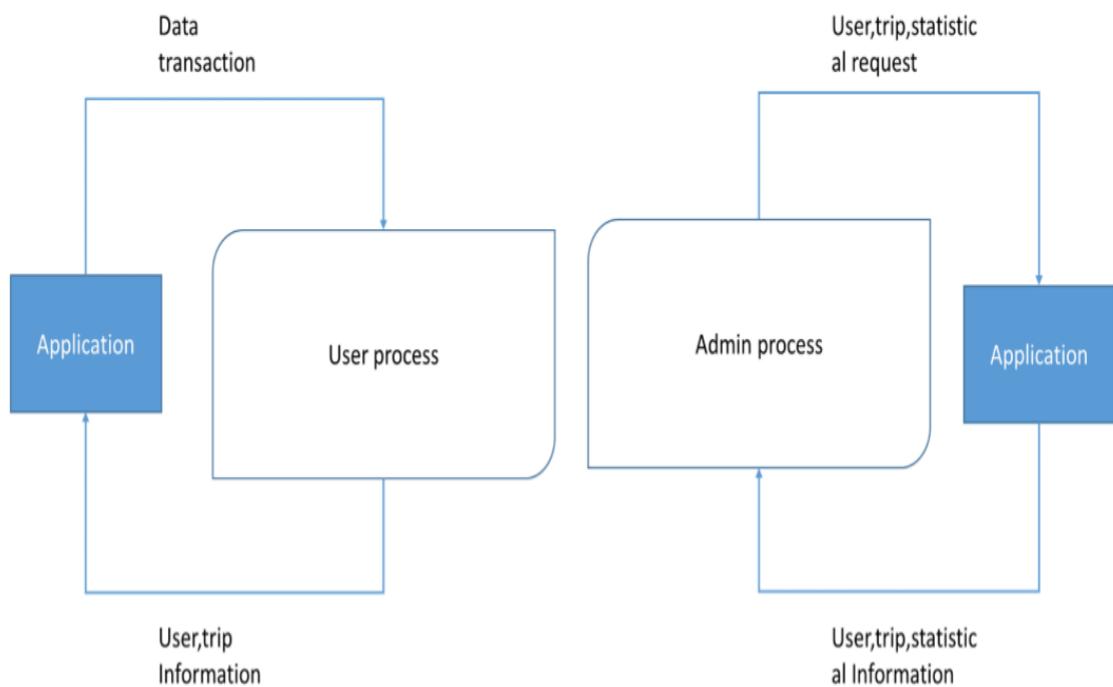


Figure 5.6 Level one data flow diagram

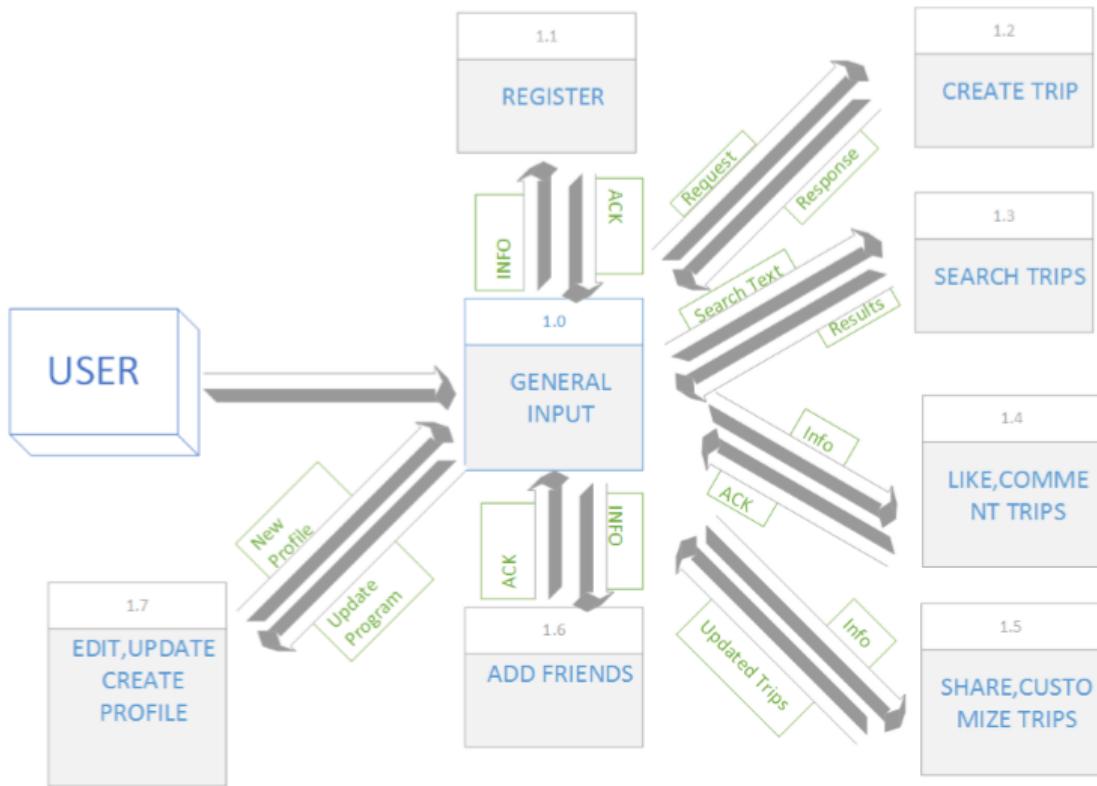


Figure 5.7 Level two user data flow diagram

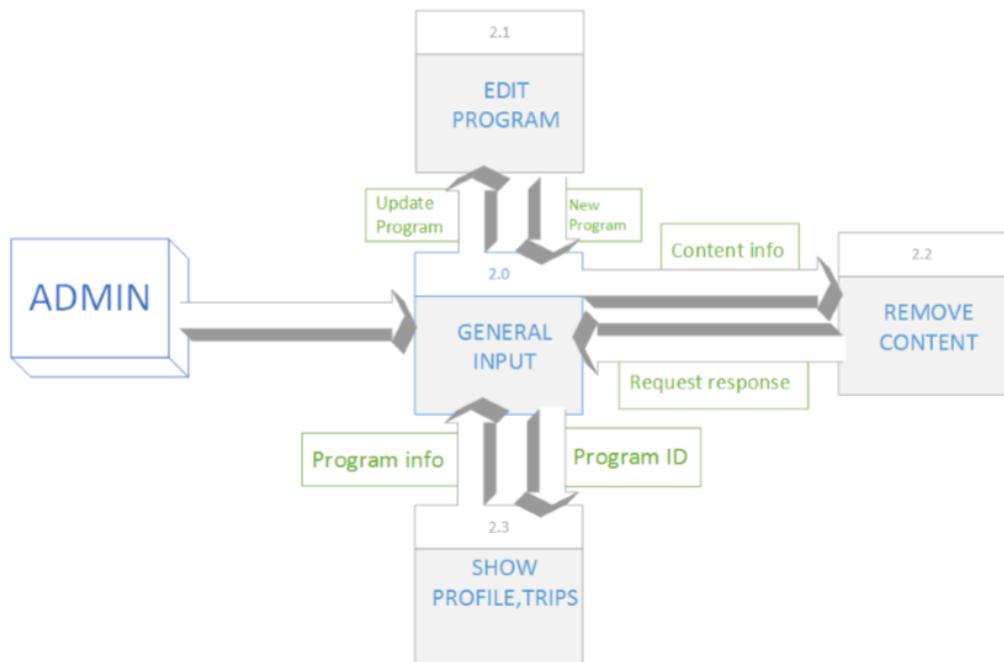


Figure 5.8 Level two administrator data flow diagram

6 Application

In this section screenshots of the system will be shown. Each screenshot represents different module of system.

6.1 Web Application

The main page of website is shown in Figure 6.1. For now it is only for a demo homepage. Only dynamic functions are register and login for now. There are different login pages for administrators and users. The page they are going to see are different from each other based on their roles.

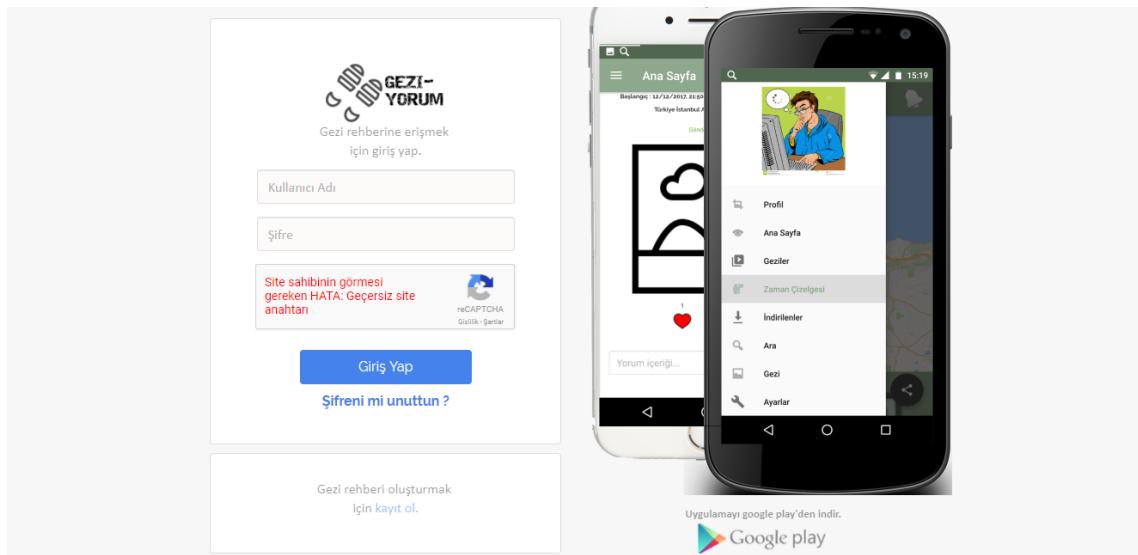


Figure 6.1 Main page of the website

Users can register from register page by typing their personal information. It is shown in Figure 6.4.

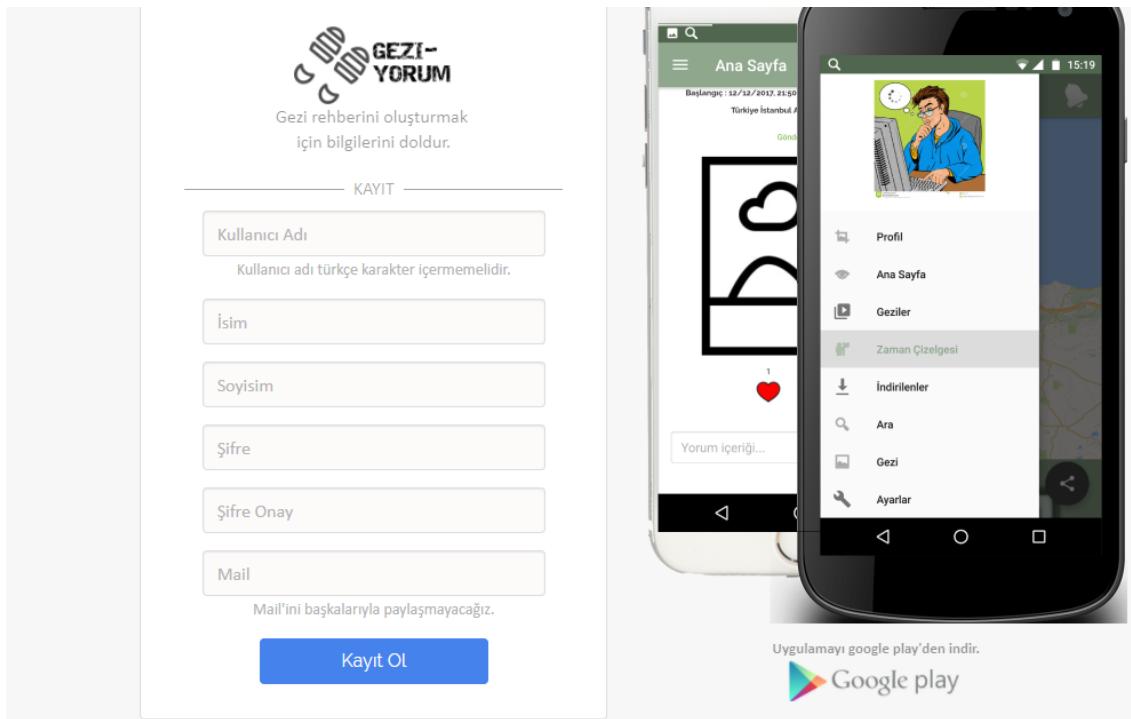


Figure 6.2 Register screen for users

Users must validate their account by redirecting the address that has been sent to them which provided by e-mail. It is shown in Figure 6.4.

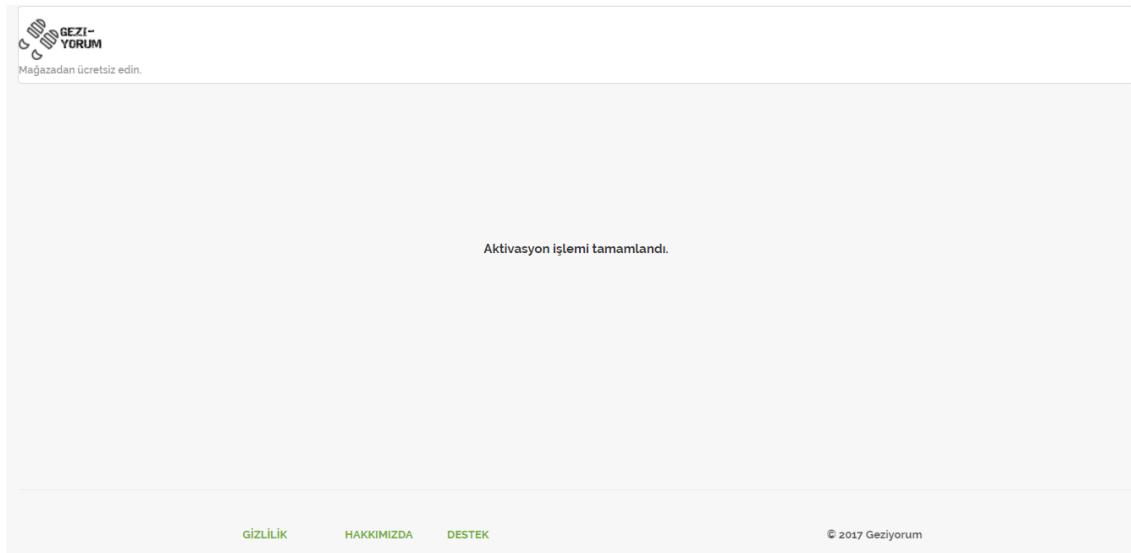


Figure 6.3 Activation screen for users

Users can change their account's password by clicking on the forgot password section and filling the username area in the main page, they can change their password by redirecting the address that has been sent to them via e-mail. It is shown in Figure 6.4.

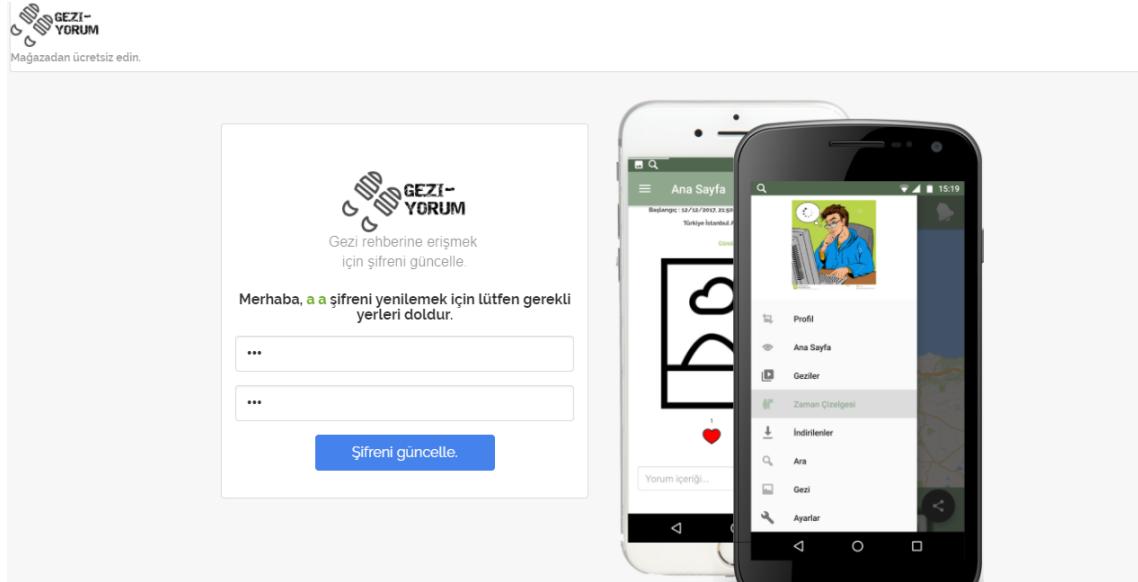


Figure 6.4 Forgot my password screen for users

Users can read the privacy principles for the permission they are going to give site owners about their usage. It is shown in Figure 6.5.



Figure 6.5 Privacy information screen for users

After being logged in users are going to see the home page of website. In this page, users are able to search through the site by typing what they looking for which can be not only users but also trips. It will redirect users to detailed search page afterwards. They can also navigate by using header section of the web page to the their personal profile page and notifications page and detailed search page.

Every page's screen can also turn into dynamic responsive web page no matter what kind of device users use. For example home pages responsive screen is shown in Figure 6.6.

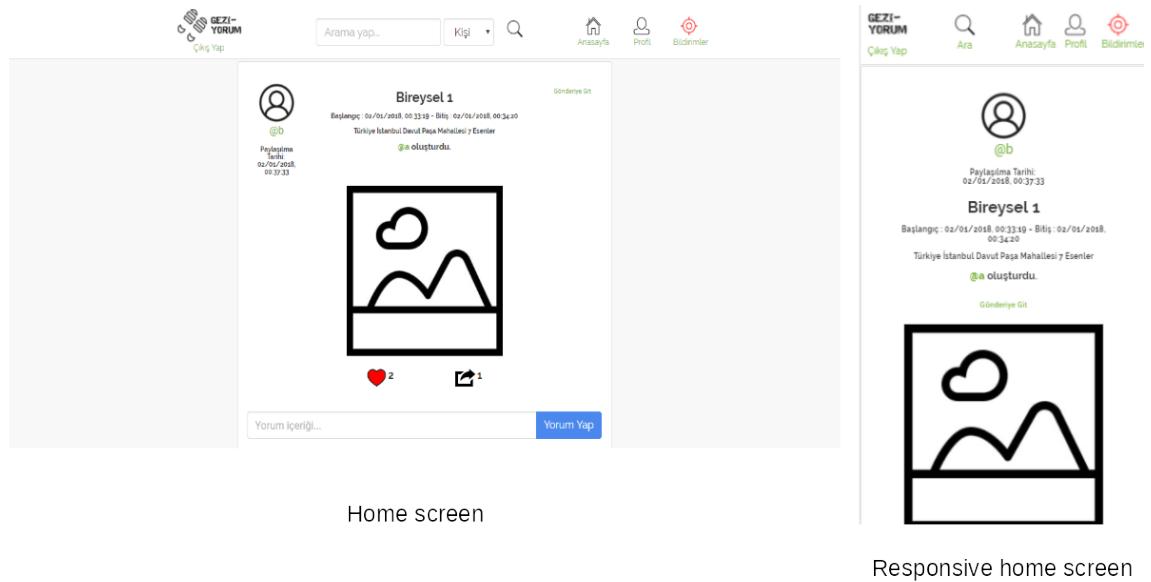


Figure 6.6 Home screen for users

Web page has a notification page which contains users interaction informations. When an user comments on other users trip, the owner will be informed. Also friend requests can be seen from this screen. Users can accept or deny these requests. The screen is shown in Figure 6.7.

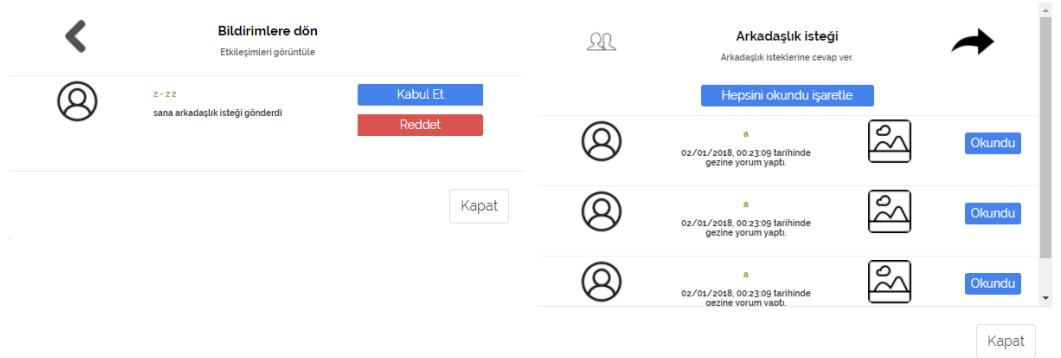


Figure 6.7 Notification screen for users

Users are able to see their personal screen through the profile page. It contains their personal trips list and the ones they shared. Also they can see their friends list they can also unfriend them if they want. The screen is shown in Figure 6.8.

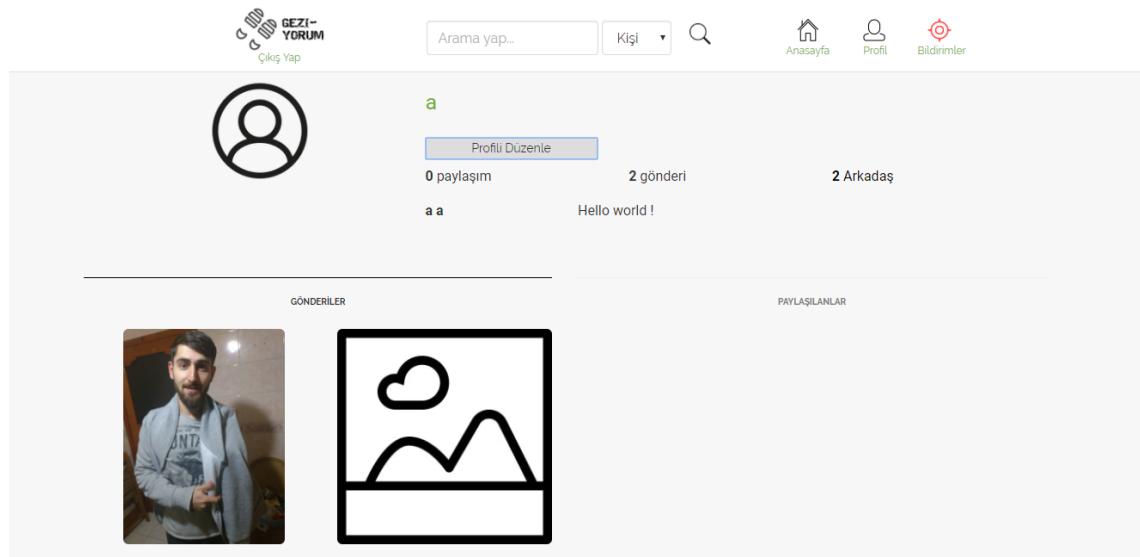


Figure 6.8 Profile page for users

Users can see their personal informations such as name, surname, e-mail, website and so on and they can change them if they want. The screen is shown in Figure 6.9.

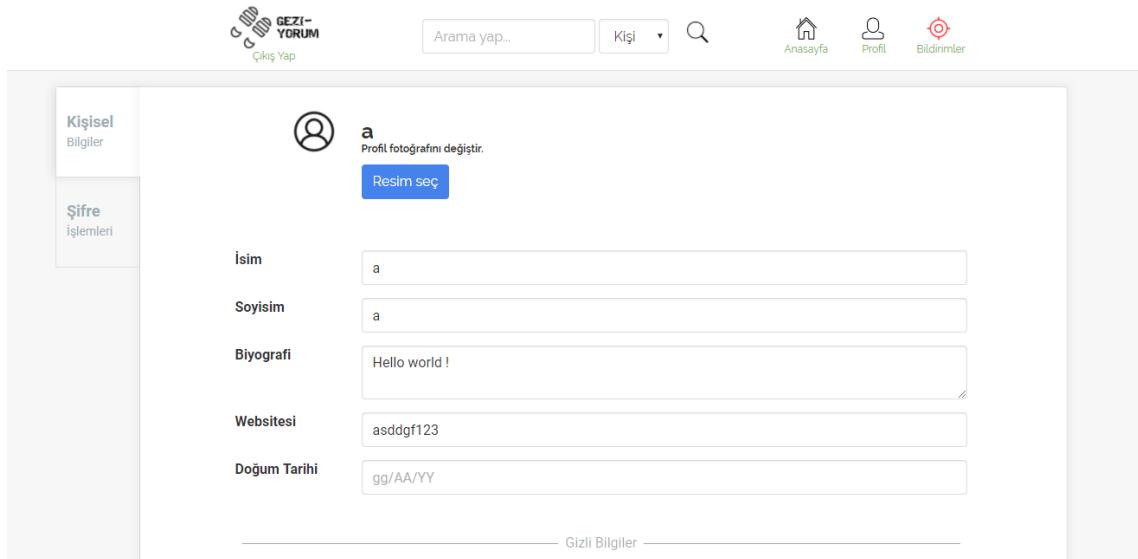


Figure 6.9 Profile page for users

Users can change their password and upload profile picture from this page. The page is shown in Figure 6.10.

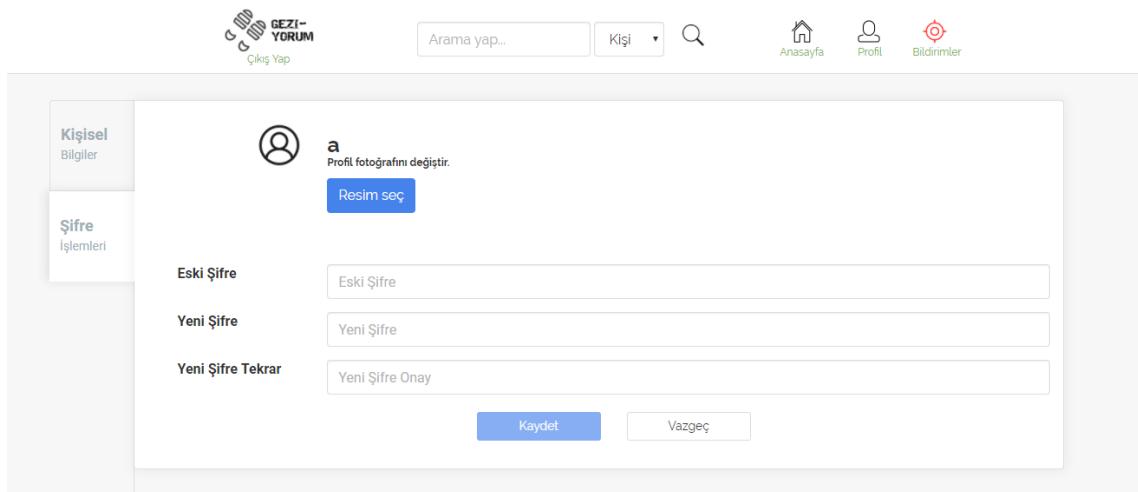


Figure 6.10 Profile page for users

Other users page can be seen through the users page they can send friend requests by using this page, also if they think the owner of the page have some inappropriate content they can create a complaint. The page is shown in Figure 6.11.

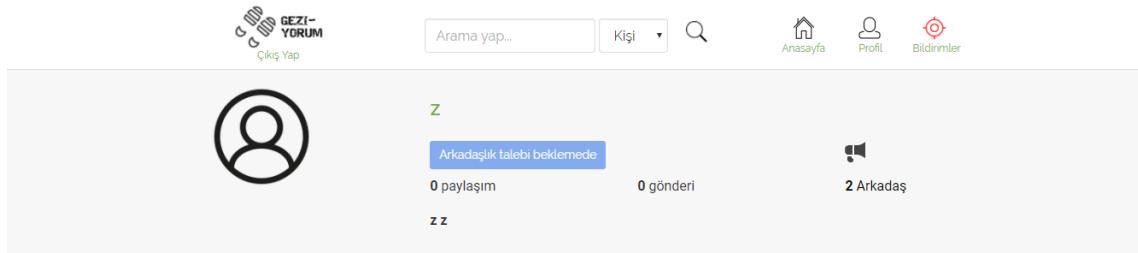


Figure 6.11 User page

Users can create complaints about profiles, shared trips or comments if they think the contents of them contains some harmful information, harassments or insulting. The page is shown in Figure 6.12.

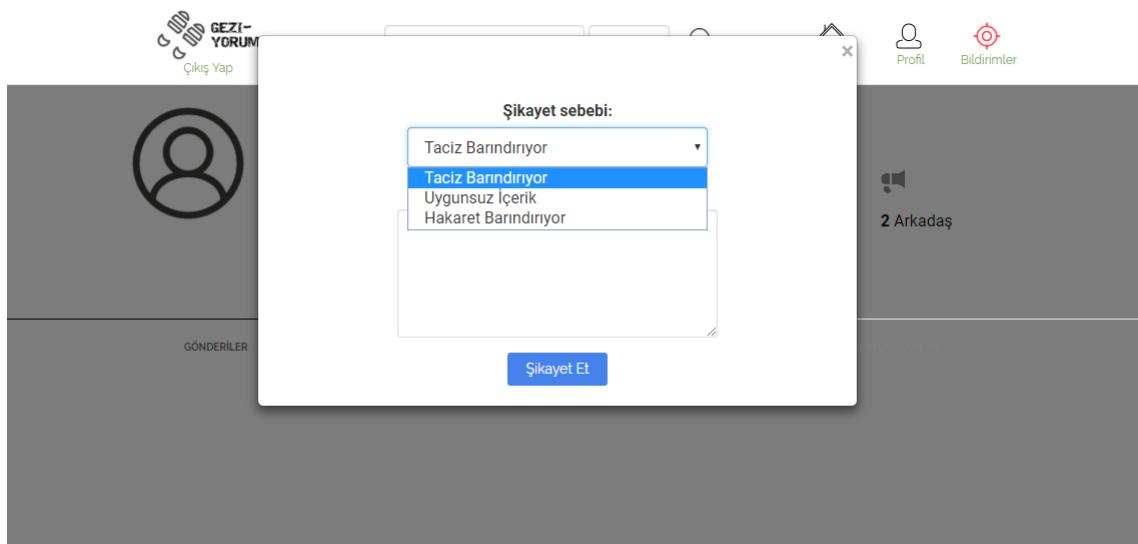


Figure 6.12 Creating complaint screen for users, trips and comments

Trips details can be seen by clicking on the trips cover photos. Its detailed screen contains information about location, persons who participated, the owner, creation time, the media and the comments of media, comments of other users. It also contains like and share buttons, and writing comment section, lastly complaint creating buttons for both the trip itself and the comments. This screen shown in Figure 6.13.

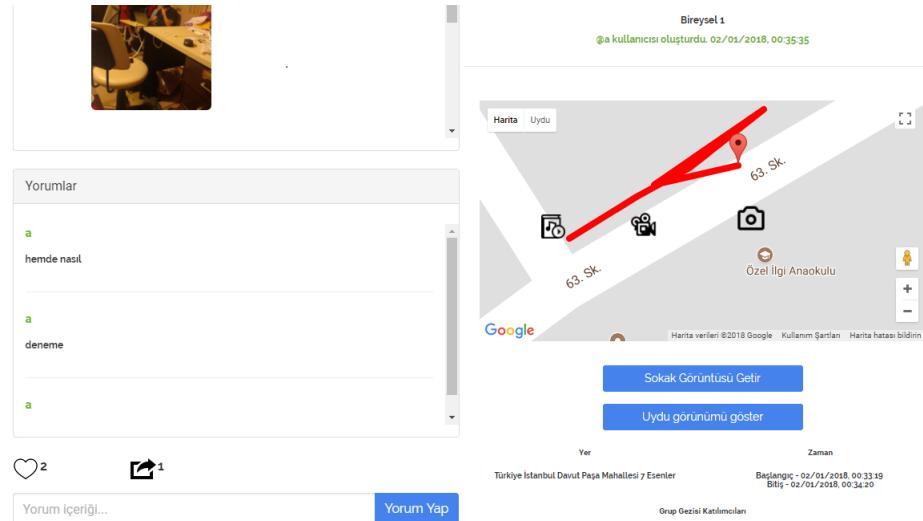


Figure 6.13 Trip details screen

Users can search trips, users from the search page they can also filter the searching by selecting what type of trip they looking for. They can also choose if they want to see trips created only by their friends or by any one on the site. The page is shown in Figure 6.14.

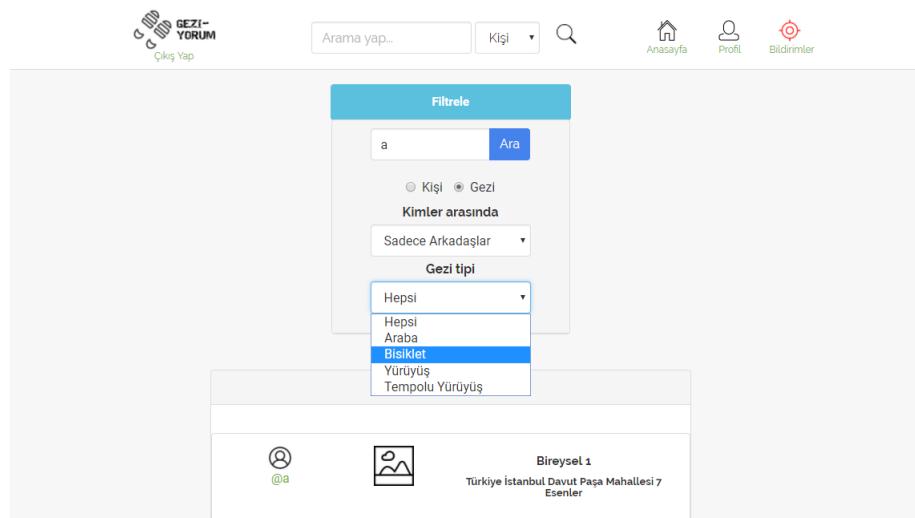


Figure 6.14 Search page

We have administrators management page. In this page administrators can see complaints related with users, trips and comments that are created by users. They can see, search, evaluate and list them with this screen which is shown in Figure 6.15.

ID	Yorum ID	Şikayetçi	Şikayet Edilen	Yorum İçeriği	Şikayet Nedeni	Şikayet Metni	Şikayet Zamanı	Değerlendirme	
6	32	dogus	ahmet	yorum 3	Taciz Barındırıyor	Taciz barındırıyor lütfen yetkililer ilgilenebilir	18/01/2018, 15:25:33	AÇIK	<button>Değerlendir</button>
5	30	dogus	ahmet	yorum 1	Hakaret Barındırıyor	Hakaret etmiş şikayet ediyorum	18/01/2018, 15:25:01	KAPALI	<button>Detayları Görüntüle</button>
4	30	bengu	ahmet	yorum 1	Uygunsuz İçerik	Gereksiz yere yazılmıştır	18/01/2018, 14:55:07	AÇIK	<button>Değerlendir</button>
3	3	c	b	asd	Hakaret Barındırıyor	şikayet 3	18/01/2018, 12:54:53	AÇIK	<button>Değerlendir</button>
2	5	c	b	123s	Taciz	şikayet 2	18/01/2018,	AÇIK	<button>Değerlendirir</button>

Figure 6.15 Administrator page

Administrators can decide whether the content is going to be hidden or not, we have a screen to decide hide the content or not, which is shown in Figure 6.16.

ID	Yorum ID	Şikayetçi	Şikayet Edilen	Yorum İçeriği	Şikayet Nedeni	Şikayet Metni	Şikayet Zamanı	Değerlendirme	
4	3	ati	a	C yorum 1	Uygunsuz İçerik	bu da çok uygunsunuz bir yorum olmuş	15/01/2018, 10:16:53	KAPALI	<button>Detayları Görüntüle</button>
3	13	deniz	can	C yorum 1	Uygunsuz İçerik	bu da çok uygunsunuz bir yorum olmuş	15/01/2018, 21:44:46	KAPALI	<button>Detayları Görüntüle</button>
2	8	deniz	ali	yorum 2	Hakaret Barındırıyor	bu yorumu şikayet ediyorum	15/01/2018, 21:44:21	KAPALI	<button>Detayları Görüntüle</button>
1	8	Vana	ali	yorum 2	Uygunsuz İçerik	gerekli bir yorum yazılmıştır	15/01/2018, 21:22:13	AÇIK	<button>Değerlendir</button>

Figure 6.16 Administrator page

6.2 Mobile Application

Users can login through mobile application to create, share and look for trips. It also contains the web application's every functionalities except media supplementation to a trip. Details of mobile application can be seen figures below.

The mobile application has register screen for users, users can register by using this screen which shown in Figure 6.17.

The mobile application has log-in screen for users, without logged in users are not able to use functionalities of creating trips or interact with other users, the screen is shown in Figure 6.17.

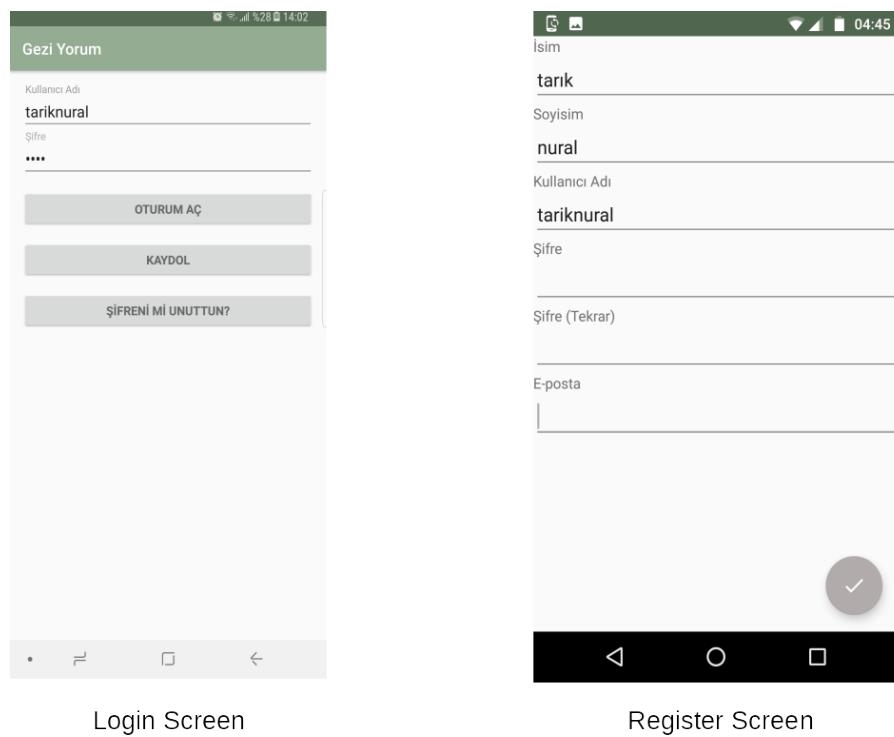


Figure 6.17 Mobile application register page

After user logged in welcome screen shown. User is navigated to other screens in here.

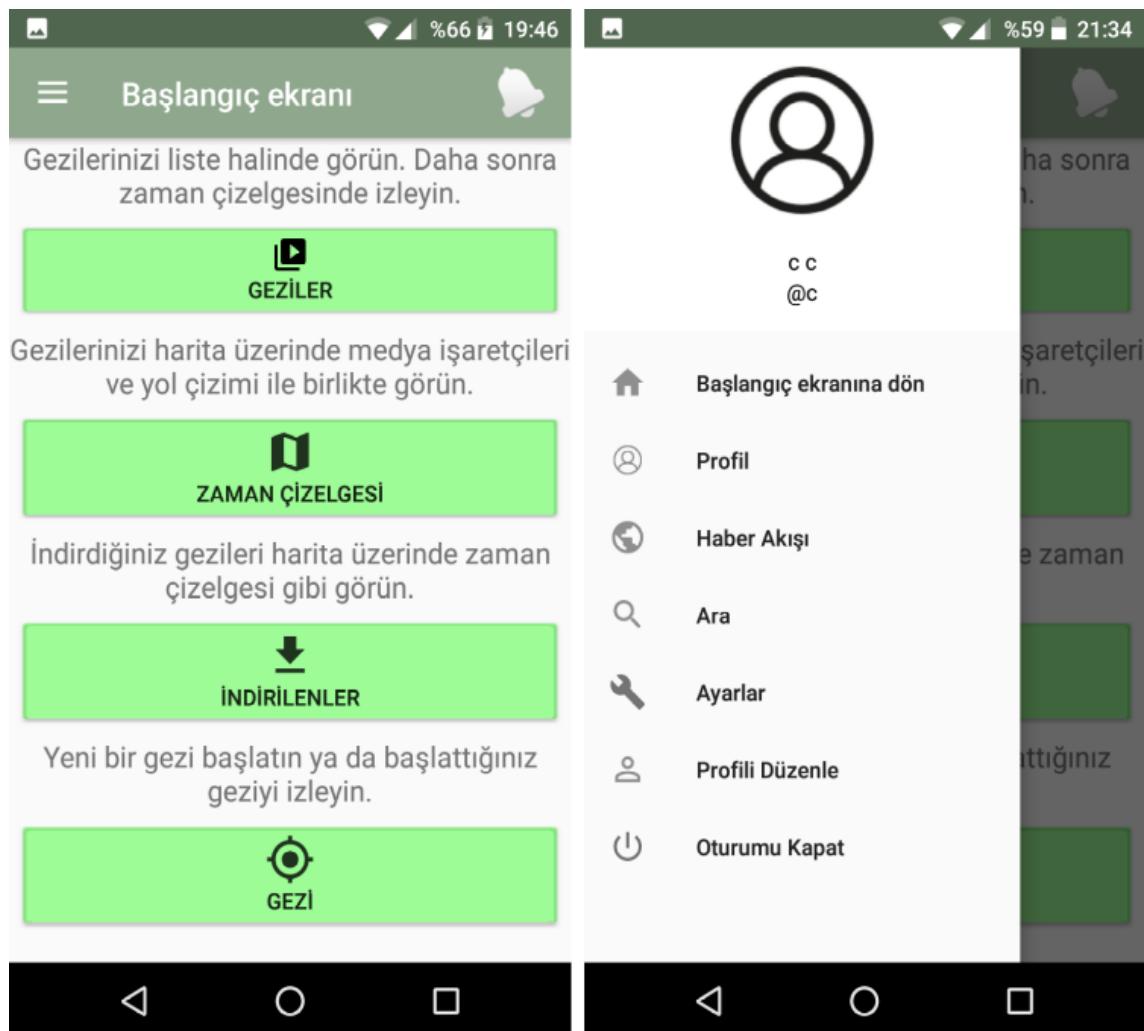


Figure 6.18 Mobile application Welcome Screen and Navigation Bar

Mobile application has a main section, this page is similar to the web application home page. In this section, users are able to see their friends shared or created trips listed in here. 6.19.

Mobile application has a profile section, users are able to see their personal screen through the profile page. It contains their personal trips list and the ones they shared. Also they can see their friends list they can also unfriend them if they want. It has same functionalities as web application's profile page. The screen is shown in Figure 6.19.

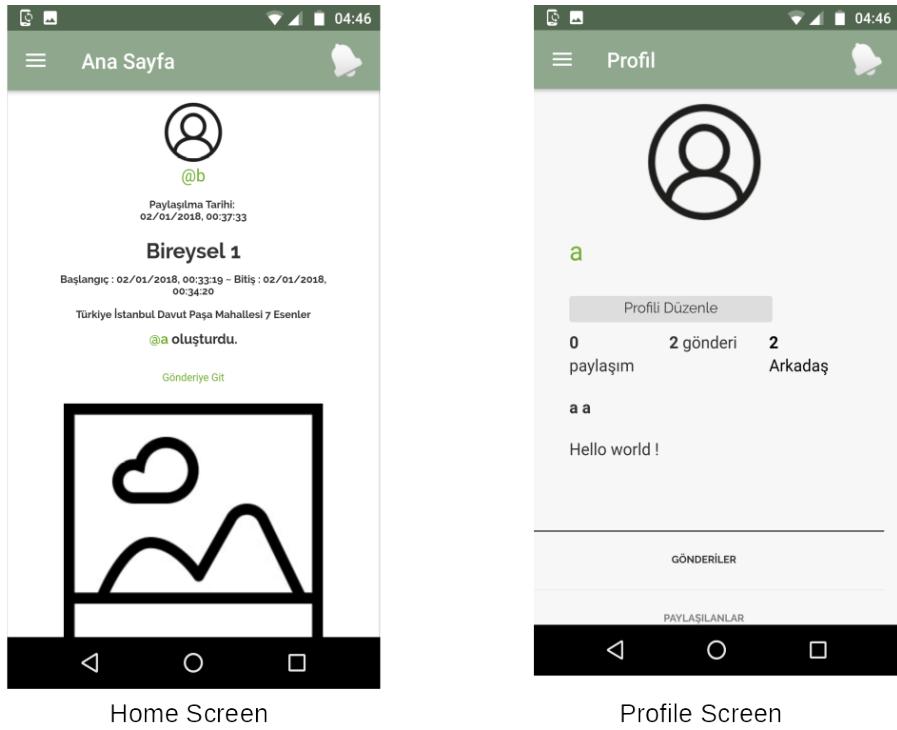


Figure 6.19 Mobile application home page

Mobile application has a notification section which includes friend requests and trip invitation requests. Users can accept or deny those requests in here.

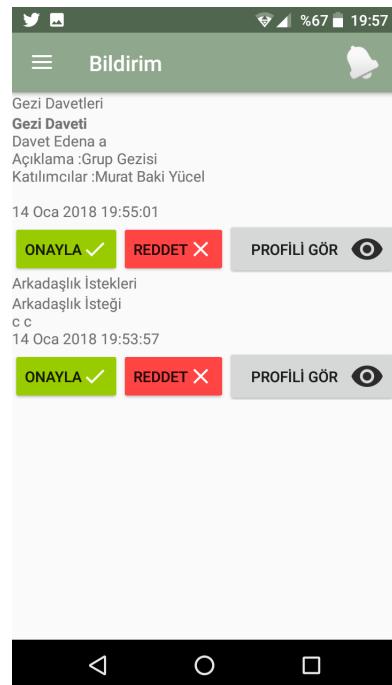


Figure 6.20 Mobile application notification page

Mobile application has trip search module it is same as web application. 6.21.

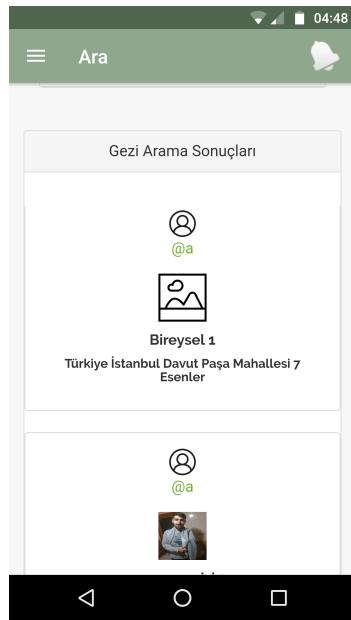


Figure 6.21 Mobile application search page

In mobile application users are able to download trips either from the ones which is shared by their friends or the ones they find in search section. When user click on download button, chosen trip contents including route data will be downloaded to the local storage of mobile application, after downloading it it will be listed in downloaded trips section users can follow the downloaded trip path whenever they want and create a new one by using it. The downloading event is shown in Figure 6.22.

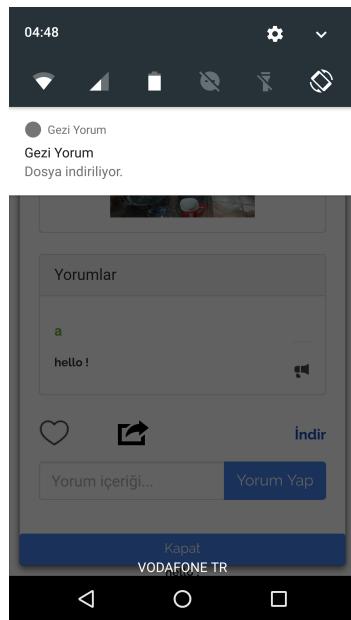


Figure 6.22 Mobile application trip download module

Downloaded trips are shown in the downloaded section, users can see the content of downloaded trip in here. The section is shown in Figure 6.23.

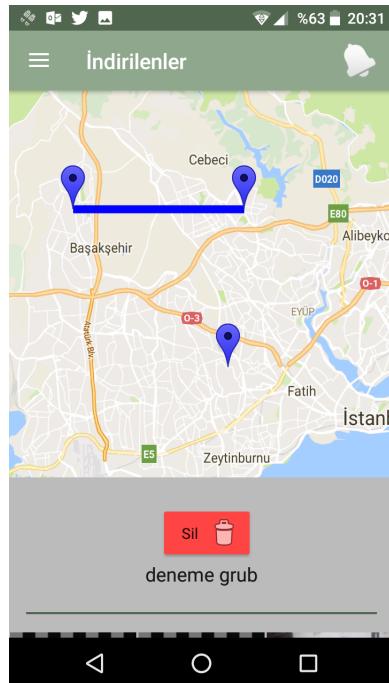


Figure 6.23 Mobile application downloaded trip section

Users can start a new trip by using downloaded trip which can be a single or group one. If they prefer to create a group trip by that they can create a trip request by adding their friends to participant list, this section is shown in Figure 6.24.

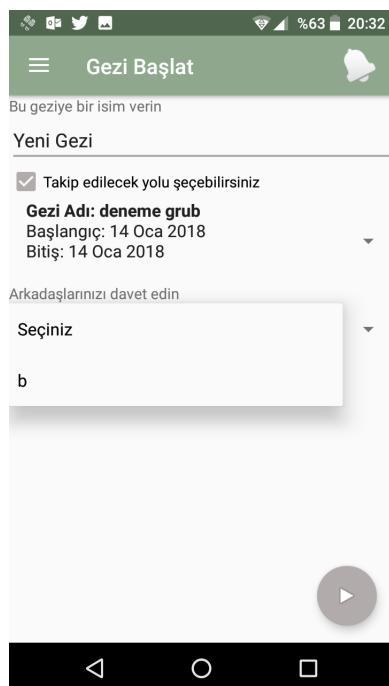


Figure 6.24 Mobile application downloaded trip section

Users can create a trip by using mobile application. If the user following a downloaded trip, downloaded trip's poly line will be different coloured than users own poly line. User can add media by clicking on little plus sign, then a pop-up is shown. Those pop-ups includes buttons to record audio, capture picture, or save video. User can also pause and continue the trip whenever he or she prefers. If trip organized as team trip, other members locations will sign on map with their profile photos. The section is shown in Figure 6.25.

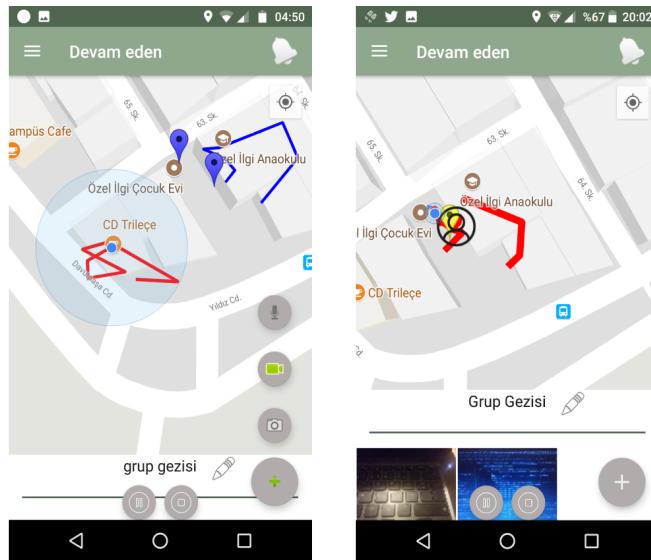


Figure 6.25 Mobile application trip creating module

By using trip creation module user may want to save some media, if so those are listed in the bottom section. User can change share options, leave comment or delete media files. This section is shown in 6.26.

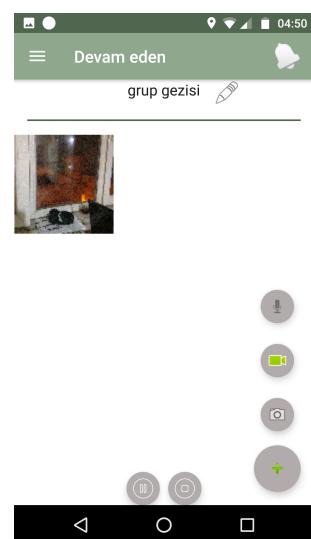


Figure 6.26 Mobile application trip creating module bottom view

After user finishes trips, the trip will be moved to the timeline section to be evaluated whether it is going to be shared or not. If they want to delete the trip after reviewing content users can delete. If they like the trip they can share by clicking on the share button. Before sharing they can choose a cover photo which will shown on social media to other people. This module is shown in Figure 6.27.

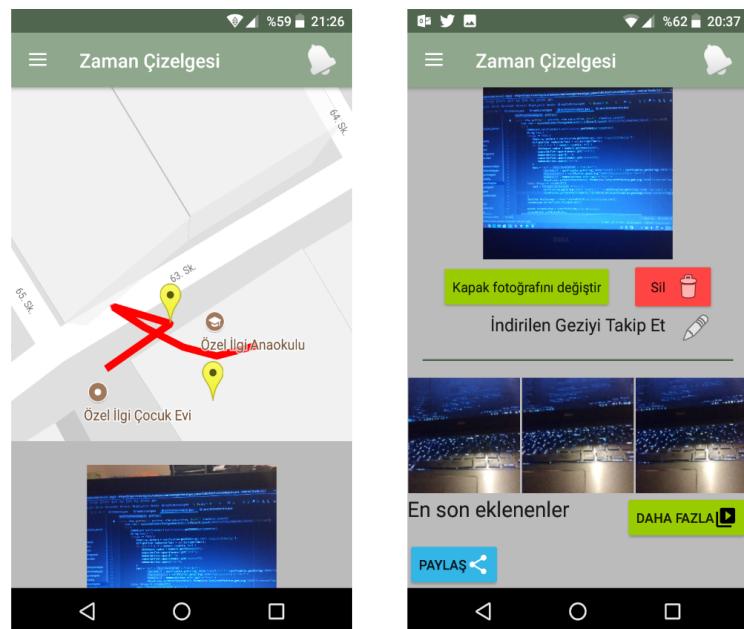


Figure 6.27 Mobile application timeline module

User can manipulate media files like changing sharing option, deleting file or leaving comment on media files using screens shown on Figure 6.28

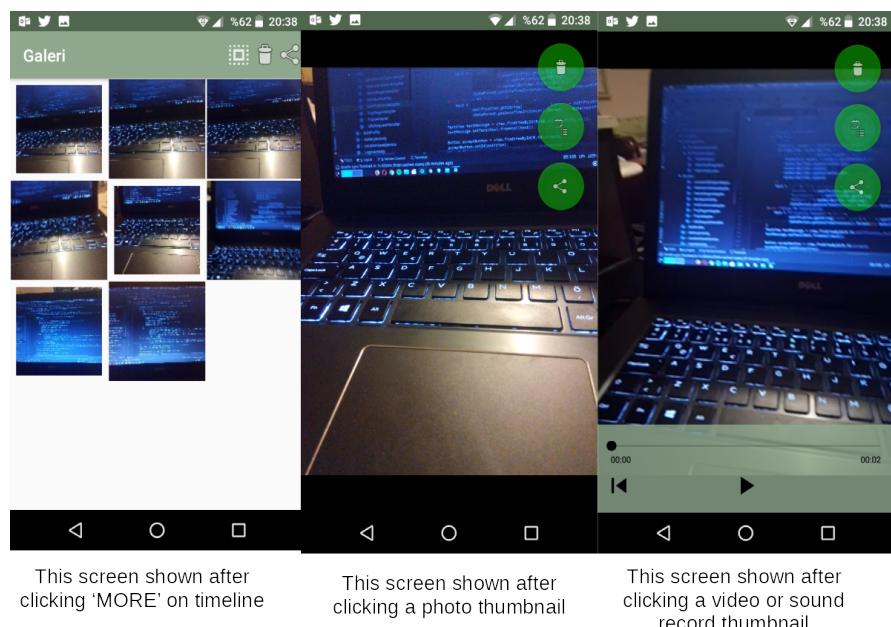


Figure 6.28 Media manipulation and view screens

Experimental Results And Performance Analysis

7.1 Experimental Results

Web and mobile platform has been tested in our project. Different scenarios were applied with these tests and there was 0.02 percent error observed.

7.2 Performance Analysis

Performance tests were calculated with Apache JMeter tool which makes HTTP request simultaneously depending upon call number that we give. We monitored the CPU and RAM percentage at the server side by using HTOP tool. Different outputs for different number of calls is shown below. HTTP calls loop count is 10 and time interval between loop counts is 10 seconds.

One of the example HTTP call is shown in Figure 7.1.

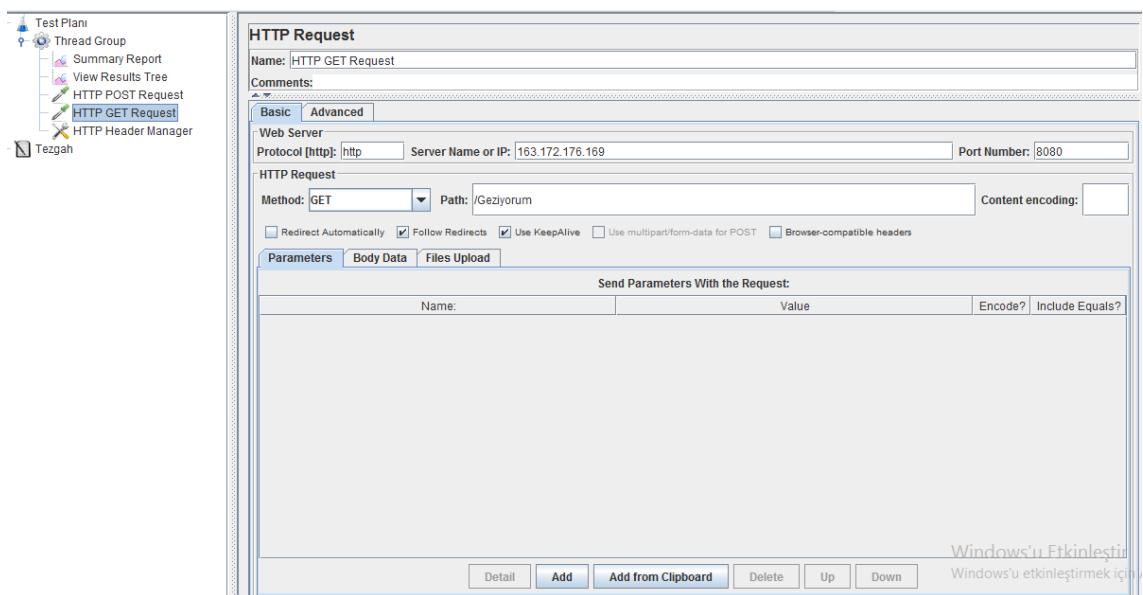


Figure 7.1 Example HTTP call

Server's idle performance is shown in Figure 7.2.

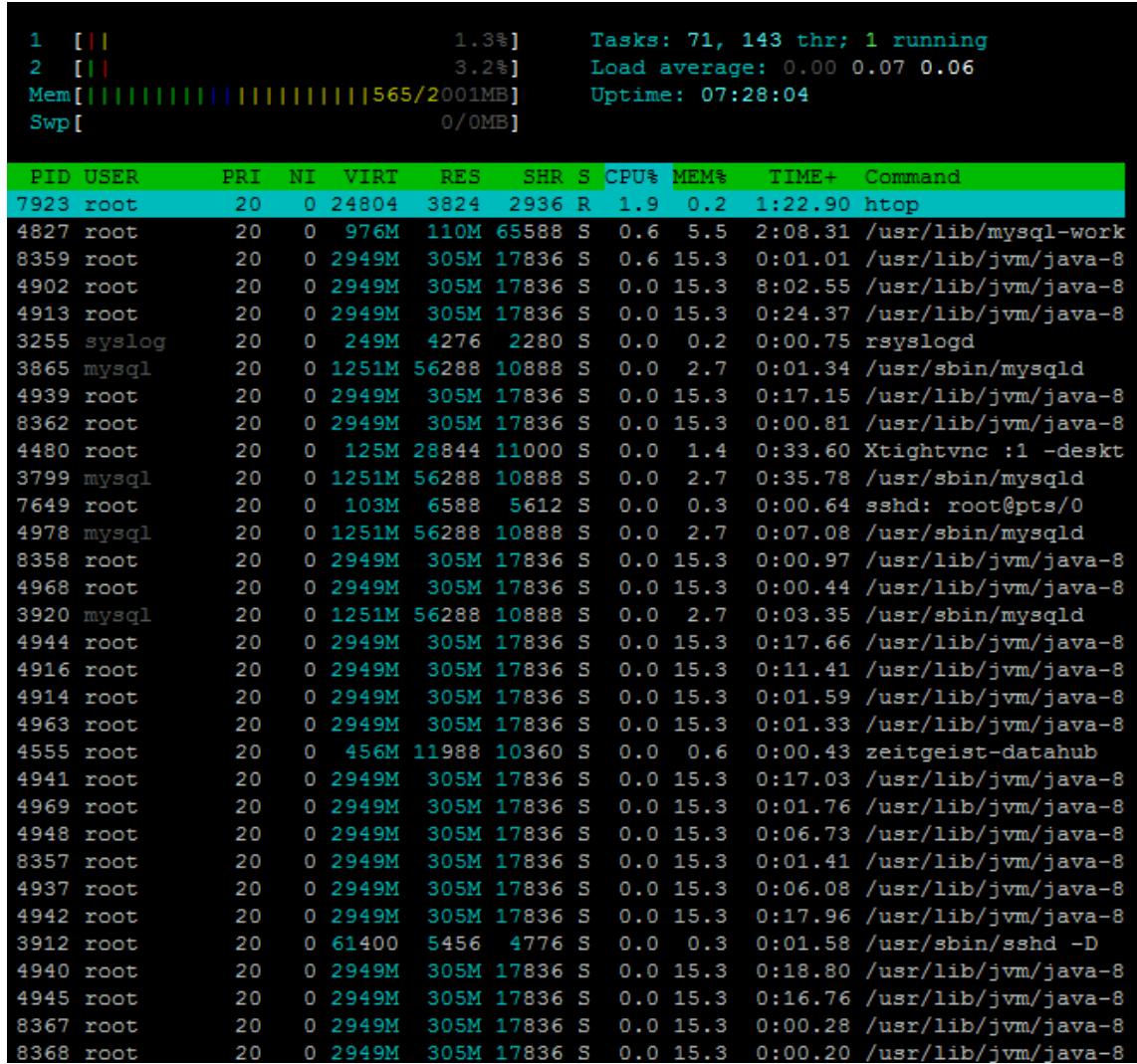


Figure 7.2 When server is idle position

7.2.1 Result

As we seen the results below, the server can handle up to 200 simultaneously HTTP calls, its bottleneck is its CPU power, because maximum RAM usage 20 percent even the highest limit of calls. If we assume that average HTTP calls per web page is 20, (the number can vary depending upon the demand of the user) as a result, if server can handle 200 simultaneous calls and user makes 20 calls per page we can say the average number of users that our server can handle is 10.

Table 7.1 Server performance test results

HTTP Calls (Requests)	Maximum Memory(%)	Maximum CPU(%)
30 GET	15.2	18.1
100 GET	15.2	56.6
130 GET and POST	15	68.8
180 GET and POST	15	89.4

Performance test results graphics is shown in Figure 7.3.

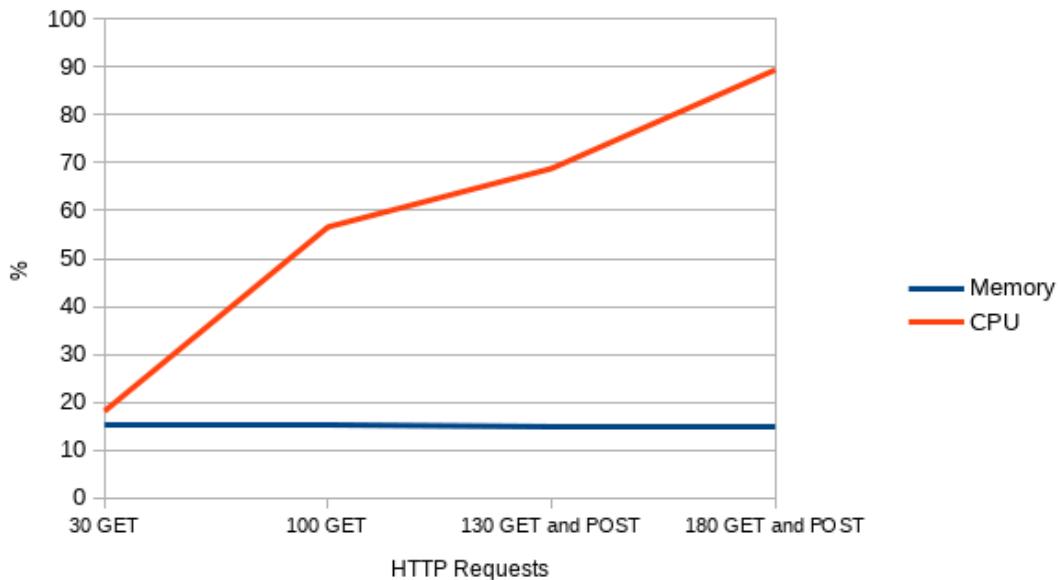


Figure 7.3 Performance test result graphics

Comparison between HTTP calls and the result outputs of error rate, throughput, Received KB/sec, Sent KB/sec, Avg Bytes are shown in Figure

7.4.

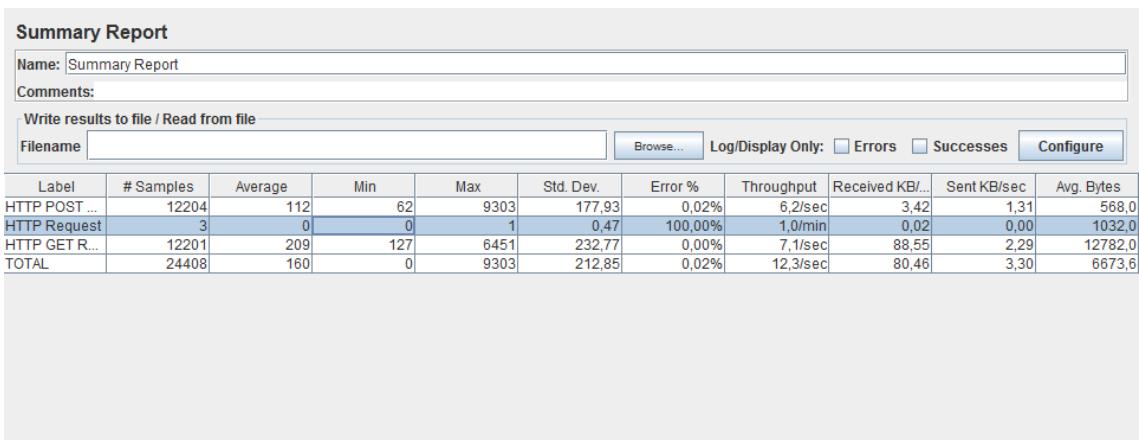


Figure 7.4 Statistical summary report of HTTP calls

8 Conclusion

With this project developed, the trips can be recorded by using mobile application and can be shown by using both mobile and web applications. For users, system is developed to manage trips to save time and effort. Users can save videos, photos, audios along to the route. The trips can be categorized as single and group. For single trips, only one user can create his or her own trip, can save the route and attach media to the path. For group trips, application allows users same functionality as single trip's in addition to that they can see each others locations simultaneously, trip participants can combine saved trip media to the creator user's media. Application can guess what the type of the trip by processing the speed and accuracy of the GPS signals received, there are 4 labels for that, these are walking, running, bicycle and riding. Users can share the created trips with the other users. They can choose privacy of trip content which can be only me, only my friends and everybody. This application will offer users a practical solution to save the time spent on sharing a trip on any social media environment or on the Internet, because it contains a social media platform inside. Users can add other users as friends to be able to contact with them and to be able to see the trips they participated, created and shared. Users can interact with other users, they can like or comment each others trips, if they think the trip has inappropriate content they can create a complaint. Complaints are evaluated by the administrators of the system. Administrators have right to hide them if they think the complainant is right. Users can also search trips depending upon the type, location or creator of it, they can also search for other users. Users can download the trips to their mobile device that are created by other users if they want, by downloading them they can prefer to follow the route same as downloaded one, or they can see the path of downloaded trip, monitor it but create a totally new one and use the downloaded one as a guide, application allows users every functionality even though user prefer to follow the downloaded one.

The project is suitable for used by travel agecys, city municipalities for advertising tourist attraction places and also building a trip guide for people.

The project could be improved with more complex social media platform which includes extensive trip search system, trip recommendation system, messaging system. Also mobile application could be improved with getting more details about trip like step count during trip, developing a better tracking system, implementing augmented reality features to application, improving compressing performance of trip files and using push notifications. These are evaluated and are among our future works.

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Project System Informations

System and Software: Linux, Java, Android Studio, MySQL, Android 5.0 or higher, Spring Boot, Javascript, AngularJS, Bootstrap, CSS, Android Emulator, Postman, JUnit, Google Map API, Mail Service, Android Phone, Git, Eclipse

Required RAM: Mobile Application: 1.5GB

Web Application: 8GB

Required Disk: Mobile Application: 8GB

Web Application: 1TB