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Monitoring and Tracking Group Traveler Application Using GPS Technology

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ABSTRACT

Tourists who engage in recreational activities in a tourist area often use travel tours. They come to tourism destinations in groups and use travel tour services to lower travel expenses and make travel smoother when they are guided by the tour leader. Tourists sometimes fail to appreciate the environment in the recreation area so they enjoy the beauty of the tourist attractions so that they are far away from the community and want to know the location of the tour group or tour leader again. Travel management also needs to know the status of the tourist community it manages. Besides, travel management needs to know the route followed by the tour leader to ensure that the employees are on the path set by the organization. To help overcome this issue, a mobile and web-based application has been created in this research. Mobile Android-based apps are used by representatives of tourist groups and tour guides at tourist attractions. In the meantime, travel management uses web-based software to track the movements of their tour leaders. This application was built using the Unified Process (UP) software development system, which has four phases, namely inception, planning, construction, and transition. The key facility in this application is to see the list of names of the group members managed by the team leader, to see the location of the members of the tourist group on the google map and to see the route followed by the tourist group. This application is quite helpful for travel management and tour guides in monitoring the movement of the tourist group they handle.

Key words : Mobile traveler tracking, Tourist monitoring application, Tracking application.

1. INTRODUCTION

Tourists often group and use travel tour services in exploring tourist attractions. Especially tourists who are visiting a tourist place for the first time really need a tour guide [1]. Tour travel will plan visits at tourist attractions so that they are well organized and the comfort of tourists is maintained.

Generally, tourist objects are in open nature and a relatively large area. For example in Bali, the tourist area of Tampak Siring. Wisata Tampak siring has a wide area with various complexes in it. There is a temple area in which there is a bathing place to purify oneself, a fish pond, and a place for Hindu worshipers. Tourists will be dropped off in a large parking lot, then walk to the tourist area looking siring. Tourists can take photos of the sights and activities in the temple area or see the Indonesian Presidential Palace from a distance. Another example is the Tanah Lot Tabanan Bali tourist area, which has a very large area and has many natural scenic spots. Tourists will be given the freedom to take a walk in the tourist area with directions that they can stay in that area for a few hours before continuing to other tourist destinations.

Tourists who visit tourist attractions are very busy at high season. This situation often makes tourists confused looking for their group. Tourists. Sometimes, tourists accidentally follow a path that is far from their group because they too enjoy the sights of the tourist attractions. So the confusion is to return to the tour leader. Likewise, the tour leader at certain times needs to know the position and members of the tourist group.

Travel management also has an interest in overseeing the position of tour members and tour leaders. Because travel tour management must maintain the safety and comfort of its clients. Besides that, the management also wants to ensure that the route taken by the tour leader is following that determined by the company management.

Currently, there is a Global Positioning System (GPS) technology that can help monitor and track objects on this earth [2]. This GPS device receives signals from GPS satellites in the form of latitude and longitude coordinates of the position on earth. We need at least three satellites [3] for two dimensional positioning (latitude and longitude). The more satellites that provide signals to the GPS device, the more accurate the position coordinates will be. This GPS was first used by the US defense department for military purposes.

The Global Positioning System (GPS) is a valuable instrument for the planning, management [4], tracking [5],[6] and coordination of outdoor recreation [7]. GPS is a fairly inexpensive and very reliable method for gathering information about tourist movements [8],[9]. To analyze which attractions are commonly visited, GPS data can also be used [10]. All these applications include coordinates of an object's latitude and longitude. The coordinates of latitude and longitude will give the position of an object on this planet. These coordinates are the key data that an application can process again to create valuable information and to make it easier for humans to perform such activities. Because of the vast volume of data sent and received from and to the service, the database server would demand high performance.

In this study, a web-based and mobile-based application will be built to monitor and track tourist activities at tourist attractions. Applications for tourists and tour leaders are built on a web-based basis, with more flexible considerations in mobile activities. Tour leaders can see the movements of their tourist group members and can contact them if needed under certain conditions. As for the travel company, a web-based application was built. Travel parties can see the path taken by the tour leader whether it is as planned or not. So that the management can assess the performance of the tour leader from the discipline of escorting tourists according to time

2. RELATED WORK

Several studies use GPS to monitor the movement of objects or tourists, including research conducted by Tatjana Thimm [10], making an application for tracing the paths traversed by tourists in the tourist areas of Constance, Meersburg, Lindau, Mainau Island, Friedrichshafen, Hagnau and Wasserburg. In this study, an application was built where the client sends position data obtained from the GPS to the server with a JSON structure and stores it in the MongoDB database. The MongoDB database is a document database that is very suitable for storing large amounts of data.

Prashant Beldar et al., 2014, conducted research to build android-based applications by integrating GPS technology, Google Cloud Messaging (GCM) and Google Map [11]. Prashant Belder makes an application that can help tourists find the nearest bus stop, bus number data, bus departures, and bus destination locations, especially those who are first visiting Mumbai India. In designing applications that promote tourism, GPS technology is very helpful. In mobile travel applications, such as navigation applications, location determination, mobile tourist information assistant, and decision support system (DSS) software, GPS applications combined with Google Map are commonly used to support tourism services. GPS data is also used effectively to track the movements in the business world of workers who carry out

tasks outside the office. Management (superiors) can easily track their employees (subordinates) as to whether the employee, in compliance with workplace policies, has carried out activities outside the office. This will help to include an employee performance evaluation. An application was created in this study to map and track the movements of tourists using GPS on a group tour. Data in this framework is stored in the real-time database of Firebase

3. METHODOLOGY

This application uses the Unified Process (UP) [12]. One of the object-oriented methodologies for developing software is UP. UP has four stages of work, namely inception, elaboration, construction, and transition [13],[14]. The Inception process is the development phase of the program to communicate with the users of the application. This process is intended as a first step towards defining the application specifications that will be created. At this point, it is hoped that there will be a shared understanding between the software developer and the user of the program. It is used to plan the foundation of the project, including the planning of the business sector, the extent of the project and boundary description, main specifications, and potential approach for design. the elaboration phase is used to establish ideas that have been created during the Inception phase. This process is used for the configuration of the device. There is no coding operation at this point. Improvement and concept evaluation activities are also ongoing. You will use the Unified Modeling Language for an object-based framework approach (UML). Analyzing the choices available in each process design so that the possibility of device manufacturing failures can be avoided.

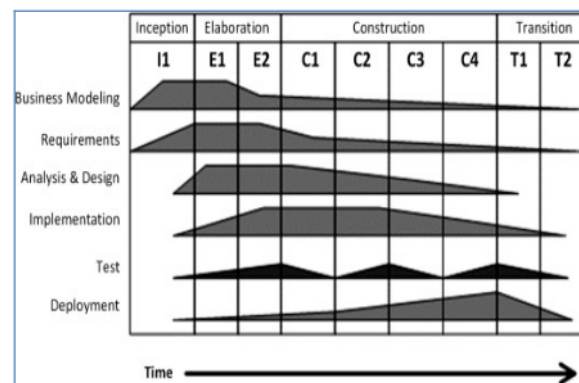


Figure 1: Unified Process [12].

The construction phase is the coding process. Computer programmers convert device prototypes made during the development process into programming language coding. The user interface (UI) is implemented according to the specification of the interface. Processes are carried out using

the parameters defined in the previous level. The transformation process is the point at which the completed end product is to be mastered. The final phase of the project that will deliver the new framework It's the end-users. The transformation process also involves data transfer from legacy applications and user training. This refinement has to be achieved to analyze whether the app has been configured to satisfy the needs of the user. Prepare everything needs such that the device can be used by the user, including hardware configurations and user-side setup. Prepare a manual book and instruct users on how to run the developed apps. The four phases in the UP methodology can be described in figure 1.

4. SOFTWARE DEVELOPMENT STAGE

This software development uses the UP method where there are four main phases, namely inception, elaboration, construction, and transition. In each phase, activities related to one another are carried out.

4.1 Inception Phase

In this phase, the system developer interacts with the user. This activity is carried out to equalize the perception between system developers and users. In this phase, a survey was conducted with questionnaires to tourist groups and tour leaders. Based on the analysis of the survey results determined several objects that interact in this system, including:

- a. Users are data of people who will use the application, users can be tourists or guides
- b. Location Tracks, i.e. data of locations of each recorded tourist movement.
- c. Role, i.e. data as a reference for the role of each user, for example, access rights to certain menus
- d. Chat Room, which is a place where users can communicate in the form of text chat
- e. Messages: i.e. messages sent or received by users when chatting via the Text Chat feature.

The properties of each object can be seen below

- a. The User object has the property `userId`, `userName`, `email`, `user category`, `address`, `handphone number`, `token`, `longitude` and `latitude last location`.
- b. Location object objects have property `id`, `longitude`, `latitude`, `user_id`, and `time`.
- c. Role objects have only `code` and `name` properties. But it has detailed roles as details to determine the access rights of users who use these roles. There is no visualization of the role data object.
- d. The Chat Room object has property `id`, `name`, `last-message`, `last-sender`, and `last-time`

From a survey of users, this application is expected to provide the following information:

- a. Information in the form of the location of each application user, this information is needed by all users to

supervise each other.

- b. Information of all users, this information is needed so that users can find out who can be contacted via text messages provided by the application. This information is required by all users.

4.2 Elaboration Phase

In the Elaboration Phase, diagrams are designed and the structure of the Firebase database is used to prepare the application. Use case diagrams are made in this phase. The use case diagram is a diagram of the UML (unified modeling language) which describes the interaction between systems and actors. Use cases are constructs to describe how the system will look to the user. This diagram can also be used to facilitate communication between system analysts and users, as well as between analysts and clients. The use case diagram of the Mobile Tourist Tracking Application can be seen in figure 2. Use case diagrams are diagrams that can explain the system's facilities. This software is intended for two core structures, namely the mobile base and the web base. Three players, namely tourist, tour leader, and travel management, were planned for this application. There is some use case on mobile base include sent position, member registration, see own position on map, view list member, view all member on a map, and trajectory tracking. There are use case maintenance group members, web base all members on map, web base trajectory tracking, and use case view reports on the web base.

Tourist actor can send data in the form of latitude and longitude position to the server. This position will be used by other actors to see the movement of tourists via the google map. A tourist actor can also see his own position on the map by first doing a mobile base login use case, if the user data matches and is valid then he can access the application. Tour leader actors can perform tour member registration activities, view the list of group members, send positions, see their own pointing positions on the map, see all members' positions on the map and see the history of the paths traversed by members of their tourist group.

A tour leader can handle several tourists, while a tourist is only a member of one tour group. A tour group leader can be more than one group tour leader at a different time. A tour leader can create one or more chat groups at different times. Tourists may chat on several chat groups at different times. Tourists can send messages more than once in a group chat.

In figure 2, the tour leader can register members of his tourist group. Registration of group members is carried out before conducting tour activities to tourist destinations. Tour leaders can chat with members of their tourist group to communicate via text. The latitude and longitude positions of the tour leader are also sent simultaneously to the server. The tour leader position data will be used by the travel tour management to

determine the movement of the tour leader. Tour leaders can see all positions of tourist group members on a map. The position of tourists is marked with red pointing so that the tour leader can easily observe the movements of his tourist group members. The names of tourist groups can also be seen on the mobile screen of the tour guide actor. Tour leaders can see trajectories that have been passed by members of the tourist group. This tourist trajectory can be used as a tool to trace if a tourist in the group does not return to the group and the tour leader loses the coordinates of the last position of the tourist.

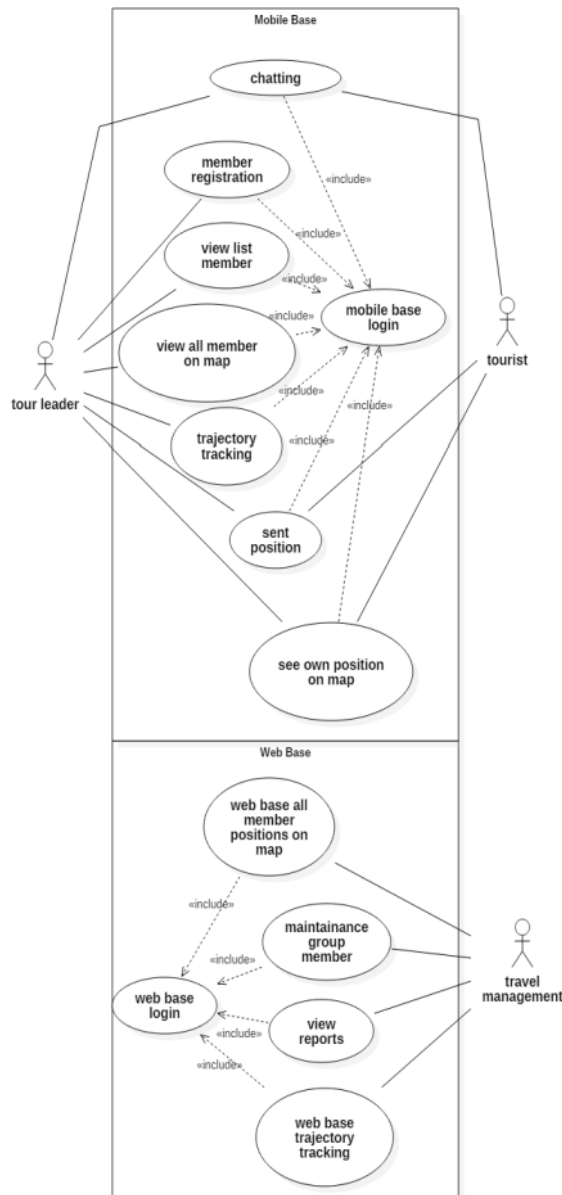


Figure 2 : Use Case Diagram System.

Travel management is the third actor in this system. Applications built on web-based for travel management. Travel management can perform maintenance on group member data, such as inserting data, updating data, or deleting member data. Travel management can see the position of all tour members in one group. To see all members in a group, you must choose the tour leader first. The positions of all members are displayed on a web-based google map. The trajectory of the member or tour leader can be seen again by selecting the name and date of the member or tour leader. Besides that, travel management can display several reports on the number of tourists based on the country of origin of the tourists and based on the tour leader.

The system architecture is also designed for the elaboration phase. Hardware and interconnections are described to see the required infrastructure and the relationship between the hardware of each entity involved in the system. The architecture of the group traveler tracking application can be seen in figure 3.

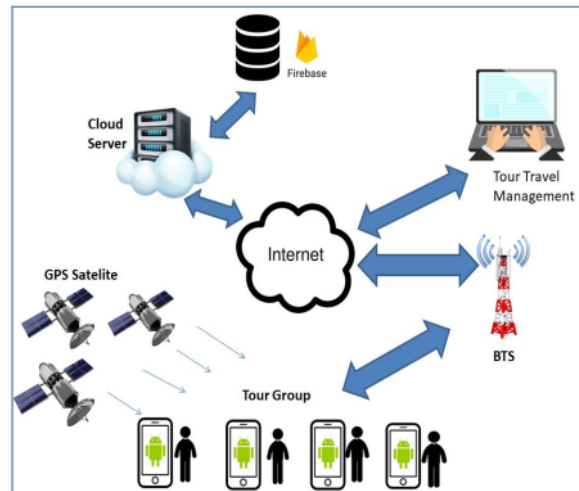


Figure 3 : Architecture System.

The GPS satellite will provide location data from each traveler to the traveler's GPS receiver and the tour leader's smartphone. Place data in the form of the latitude and longitude of the visitor and the tour guide will be transmitted to the cellular network. From this cellular network, go to the webserver address defined in the application on the internet network. The Web Server maintains the application data in the Firebase database. Both tour guides and tour travel operators use data collected in a firebase together. Tour leaders use these details to assess the location of group members, making it possible to track the movements of their group members. In the same way, tour travel management uses data contained in Firebase to display the trajectories of the trip.

4.3 Construction Phase

This process is coming from the device design that was performed in the previous stage to the Java programming language. Integrated Programming Environment (IDE) is Android Lab, the official IDE for Android operating system device development. This program uses the Google Map facility. We need an API key to access the Maps JavaScript API. The API key is a special key used to authenticate queries relevant to the framework that produce for the use of the google resource map. We used API level 16 (Jelly Bean) or later and Gradle 4.1 or later for the implementation of firebase databases in our applications.

Software testing is performed on the code that has been written and some views can be seen in this section. The display for creating a new user as a tour leader or as a member of a tourist group can be seen in Figure 4. If as a tour leader select the user guide option, while if as a tourist select the user guest option.

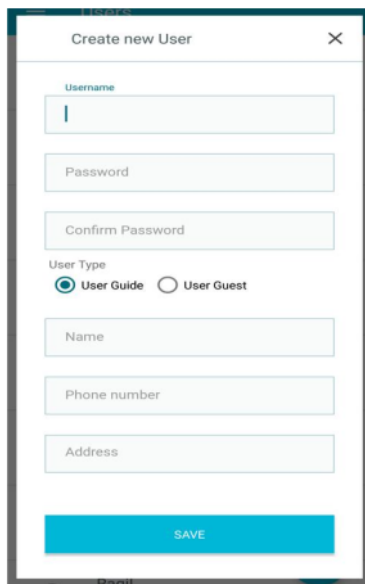


Figure 4: Display create new user interface.

To see the position of tourists, the tour leader can choose a map, then all the positions of the group members he/she handles will appear. The view can be seen in the position of tourists in Figure 5. To see the track of a traveler, select the name of the traveler on the horizontal scroll view button at the bottom of the Android screen. Then select the site you want to see the trajectory for. The web-based view can be seen in Figure 7, Figure 8, and Figure 9. Figure 7 is the add new guide form view, Figure 8 is the tourist position view and Figure 9 is the traveler trajectory view.

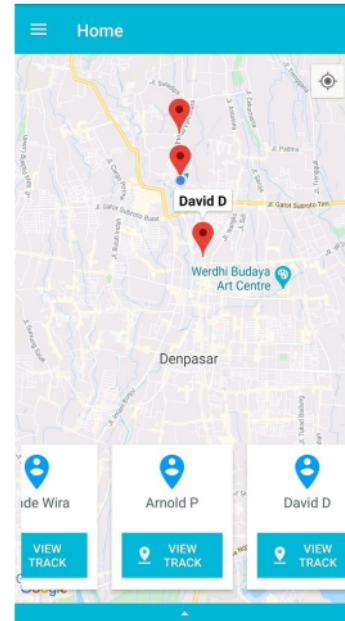


Figure 5: Tourist position view on the mobile application

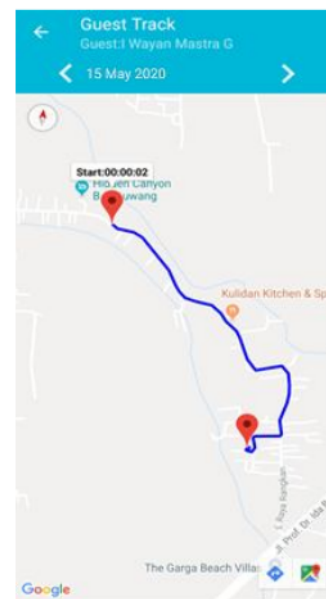


Figure 6: Display of traveler tracking on the mobile application.

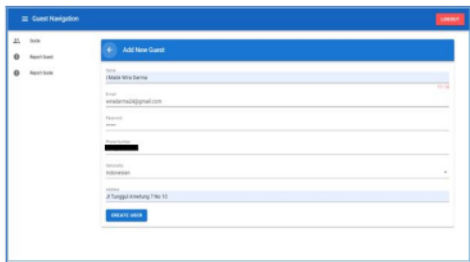


Figure 7: Display the add new guide on the web application

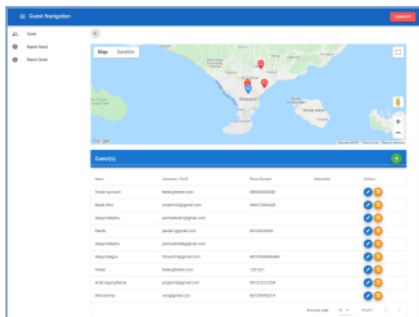


Figure 8: Display of traveler position on web application

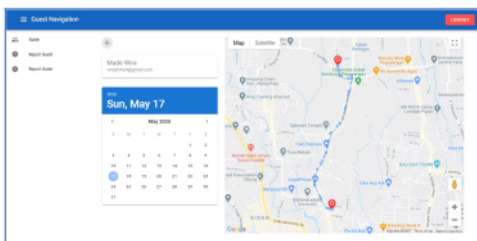


Figure 9: Display of traveler trajectory on web application

4.4 Transition Phase

This phase is testing the software in its real environment. Testing is done on users, namely tourists, tour leaders and travel management. As a result, this software can work well and can help travel operations.

5. CONCLUSION

This is quiet helpful tool for travel managers and tour guides to track the progress of visitor groups and to map the routes that visitors or tour leaders have taken. This application is made up of three key players, namely visitors, tour managers, and travel management. This mobile and web-based application have several main facilities, namely the facility to see a list of group member names handled by a team leader, to see the position of tourist group members on the google map, and to review the path that has been traversed by tourist groups.

ACKNOWLEDGEMENT

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