System Analysis and Design Report
for CENG 415 Senior Design Project & Seminar I

Title
Location Based Note and To-do List Mobile Application

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1. THE DESCRIPTION OF WORK

The mobile technology is becoming more popular day by day thanks to developing technology rapidly nowadays. This cause the huge amount of increase in the usage of mobile devices. Companies and developers started to give more interest to this area. Therefore, applications about the mobile technology to make the lives of people easier became in demand more. It is well known thing that people do not want to think so much about their simple stuff, and they want some applications to disencumber themselves. One of the troubles for people is to not be able to keep everything about their lives in their mind, they want to solve this issue by taking some notes on their mobile phone to remind them later. Our first thought is focusing on how we can give a service to people to provide that ease in the light of this information.

Taking notes and creating to-do lists are significant for people so that they can organize our daily life. There are many different methods like using paper, getting help from our friends and using our mobile phones. In this project, we want to develop an android application which we can create to-do lists in to improve the efficiency of a to-do list by adding location support.

2. PROJECT MANAGEMENT

We manage our project using scrum method. Scrum method has three phases that are pre-game, game, and post-game. Firstly, planning and architecture are important in pre-game phase. Project team structure is defined, software architecture and technologies that will be used are determined and product backlog is prepared in the pre-game. Secondly, game phase is also called development phase. In game phase, sprints are run. Sprints can last 1 to 4 week and consist analysis, design, develop, test and documentation steps. Thirdly, post-game phase is a closer phase and the product is ready to release it. The post-game includes integration, testing, user documentation and marketing. [1]

According to our plan, pre-game is done in November and December, game phase is done in January, February, March, and April. We will run four sprints and each one lasts one month. Post-game is done in May.

Table 1 - Gantt Chart

Scrum Phases	2015		2016				
	November	December	January	February	March	April	May
Pre-game							
Game							
Post-game							

Table 2 – Work package List

Work package No[1]	Work package title	Type of activity[2]	Lead participant No[3]	Lead participant short name	Person-months[4]	Start month[5]	End month
WP1	Analyzing Similar Products	SUPP	1	Ünver	1	November	November
WP2	Mockup	SUPP	1	Ünver	2	November	December
WP3	How the Application Will Be Used	SUPP	2	Emre	2	December	December
WP4	Determining Technologies Will Be Used	SUPP	3	Ünver	3	December	December
WP5	Determining User Stories	SUPP	3	Emre	3	December	December
WP6	Product Backlog	SUPP	3	Ünver	3	December	December
WP7	Sprint 1	SUPP	3	Ünver	3	January	February
WP8	Sprint 2	SUPP	3	Ünver	3	February	March
WP9	Sprint 3	SUPP	3	Ünver	3	March	April
WP10	Sprint 4	SUPP	3	Ünver	3	April	May
WP11	Testing	SUPP	3	Özenç	3	May	May
WP12	Documentation	SUPP	3	Emre	3	May	May
		TOTAL			31		

1 Workpackage number: WP 1 – WP n.

2 Please indicate one activity per work package:

SUPP = Support activities; MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

3 Number of the participant leading the work in this work package.

4 The total number of person-months allocated to each work package.

5 Measured in months from the project start date (month 1).

Table 3 – Deliverable List

Del. no. [6]	Deliverable name	WP no.	Nature[7]	Dissemination level [8]	Delivery date[9]
2.1	Mockup	WP2	D	PU	November
4.1	Architecture and Technologies	WP4	O	PP	December
4.2	Architecture Diagram	WP4	D	PP	December
5.1	User stories and themes	WP5	O	PP	December
6.1	Product Backlog	WP6	O	PP	December
7.1	Sprint 1 Backlog	WP7	O	PP	January
7.2	Sprint 1 Review	WP7	R	PP	January
7.3	Sprint 1 Increment	WP7	D	PP	January
8.1	Sprint 2 Backlog	WP8	O	PP	February
8.2	Sprint 2 Review	WP8	R	PP	February
8.3	Sprint 2 Increment	WP8	D	PP	February
9.1	Sprint 3 Backlog	WP9	O	PP	March
9.2	Sprint 3 Review	WP9	R	PP	March
9.3	Sprint 3 Increment	WP9	D	PP	March
10.1	Sprint 4 Backlog	WP10	O	PP	April
10.2	Sprint 4 Review	WP10	R	PP	April
10.3	Sprint 4 Increment	WP10	D	PP	April
11.1	Test Analysis	WP11	R	PP	May
12.1	User Manual	WP12	D	PU	May

6 Deliverable numbers in order of delivery dates. Please use the numbering convention <WP number>.<number of deliverable within that WP>. For example, deliverable 4.2 would be the second deliverable from work package 4.

7 Please indicate the nature of the deliverable using one of the following codes:
R = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

8 Please indicate the dissemination level using one of the following codes:
PU = Public
PP = Restricted to other programme participants (including the Commission Services).
RE = Restricted to a group specified by the consortium (including the Commission Services).
CO = Confidential, only for members of the consortium (including the Commission Services).

9 Measured in months from the project start date (month 1).

Table 4 - Work Package 1

Work package number	WP1	Start date or starting event:			18.11.2015		
Work package title	Analyzing Similar Products						
Activity Type[10]	SUPP						
Participant number	1						
Participant short name	Ünver						
Person-months per participant:	1						

Objectives
We research and analyze similar to-do list mobile application.

Description of work (possibly broken down into tasks), and role of participants
Similar to-do list applications are searched in Google Play.
Most similar applications are installed and used.
Similarities and differences with the project are found.

Deliverables (brief description and month of delivery)
Results are written in the report.

[10] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 5 - Work Package 2

Work package number	WP2	Start date or starting event:			27.11.2015		
Work package title	Mockup						
Activity Type[11]	SUPP						
Participant number	1						
Participant short name	Ünver						
Person-months per participant:	1						

Objectives
Mockup is prepared for having the idea about how the application will be used.

Description of work (possibly broken down into tasks), and role of participants
Android studio is used for mockup application.
Mockup contains important activities that have basic UI components.
Some activities contain dummy data.

Deliverables (brief description and month of delivery)
Mockup is developed as an android application.

[11] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 6 – Work Package 3

Work package number	WP3	Start date or starting event:		3.12.2015		
Work package title	How the Application Will Be Used					
Activity Type[12]	SUPP					
Participant number	1	2					
Participant short name	Emre	Ünver					
Person-months per participant:	1	1					

Objectives
How user use the application is determined.

Description of work (possibly broken down into tasks), and role of participants
First use of the application is determined.
Which information will be got from user while signup is defined?
What kind of reminder can be set by user is determined?

Deliverables (brief description and month of delivery)
Results are written in the report.

[12] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 7 – Work Package 4

Work package number	WP4	Start date or starting event:		6.12.2015			
Work package title	Determining Technologies Will Be Used						
Activity Type[13]	SUPP						
Participant number	1	2	3				
Participant short name	Ünver	Emre	Özenç				
Person-months per participant:	1	1	1				

Objectives
Architecture and Technologies of the project is determined.

Description of work (possibly broken down into tasks), and role of participants
Each technology is determined on the purpose of fast and effective development.
Each determined technology is written in a document.
After the document is finished, diagram is drawn.

Deliverables (brief description and month of delivery)
Architecture diagram is drawn.
Architecture and technologies are written in the report.

[13] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 8 – Work Package 5

Work package number	WP5	Start date or starting event:		9.12.2015		
Work package title	Determining User Stories					
Activity Type[14]	SUPP					
Participant number	1	2	3				
Participant short name	Emre	Ünver	Özenç				
Person-months per participant:	1	1	1				

Objectives
User stories is determined.

Description of work (possibly broken down into tasks), and role of participants
The members brainstorm about what users can do and cannot do while using the application.
Each determined user stories are written in a document.
The user stories are divided by themes.

Deliverables (brief description and month of delivery)
User stories and themes document are written.

[14] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 9 – Work Package 6

Work package number	WP6	Start date or starting event:		17.12.2015			
Work package title	Product Backlog						
Activity Type[15]	SUPP						
Participant number	1	2	3				
Participant short name	Ünver	Emre	Özenç				
Person-months per participant:	1	1	1				

Objectives Product backlog is defined.

Description of work (possibly broken down into tasks), and role of participants According to the application's features, what we need to do is determined. Determined technologies and tools are considered.

Deliverables (brief description and month of delivery) Product Backlog is written in the report.

[15] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 10 – Work Package 7

Work package number	WP7	Start date or starting event:		1.1.2016			
Work package title	Sprint 1						
Activity Type[16]	SUPP						
Participant number	1	2	3				
Participant short name	Ünver	Emre	Özenç				
Person-months per participant:	1	1	1				

Objectives
Sprint 1 is run.

Description of work (possibly broken down into tasks), and role of participants
Product backlog refinement is done. Daily scrum is held. Increment is developed Sprint 1 Review meeting is held. Sprint 1 Retrospective meeting is held.

Deliverables (brief description and month of delivery)
Sprint 1 Backlog, Sprint 1 Review and Sprint 1 increment is prepared.

[16] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 11 – Work Package 8

Work package number	WP8	Start date or starting event:		1.2.2016			
Work package title	Sprint 2						
Activity Type[17]	SUPP						
Participant number	1	2	3				
Participant short name	Ünver	Emre	Özenç				
Person-months per participant:	1	1	1				

Objectives
Sprint 2 is run.

Description of work (possibly broken down into tasks), and role of participants
Product backlog refinement is done. Daily scrum is held. Increment is developed Sprint 2 Review meeting is held. Sprint 2 Retrospective meeting is held.

Deliverables (brief description and month of delivery)
Sprint 2 Backlog, Sprint 2 Review and Sprint 2 increment is prepared.

[17] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 12 – Work Package 9

Work package number	WP9	Start date or starting event:			1.3.2016		
Work package title	Sprint 3						
Activity Type[18]	SUPP						
Participant number	1	2	3				
Participant short name	Ünver	Emre	Özenç				
Person-months per participant:	1	1	1				

Objectives
Sprint 3 is run.

Description of work (possibly broken down into tasks), and role of participants
Product backlog refinement is done. Daily scrum is held. Increment is developed Sprint 3 Review meeting is held. Sprint 3 Retrospective meeting is held.

Deliverables (brief description and month of delivery)
Sprint 3 Backlog, Sprint 3 Review and Sprint 3 increment is prepared.

[18] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 13 – Work Package 10

Work package number	WP10	Start date or starting event:		1.4.2016		
Work package title	Sprint 4					
Activity Type[19]	SUPP					
Participant number	1	2	3				
Participant short name	Ünver	Emre	Özenç				
Person-months per participant:	1	1	1				

Objectives
Sprint 4 is run.

Description of work (possibly broken down into tasks), and role of participants
Product backlog refinement is done. Daily scrum is held. Increment is developed Sprint 4 Review meeting is held. Sprint 4 Retrospective meeting is held.

Deliverables (brief description and month of delivery)
Sprint 4 Backlog, Sprint 4 Review and Sprint 4 increment is prepared.

[19] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 14 – Work Package 11

Work package number	WP11	Start date or starting event:		1.5.2016			
Work package title	Testing						
Activity Type[20]	SUPP						
Participant number	1	2	3				
Participant short name	Özenç	Emre	Ünver				
Person-months per participant:	1	1	1				

Objectives
Product is tested before marketing.

Description of work (possibly broken down into tasks), and role of participants
Unit test is used.
How user is reminded when he/she reaches target location.
Examination the test results is done.

Deliverables (brief description and month of delivery)
Test Analysis is delivered.

[20] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 15 – Work Package 12

Work package number	WP12	Start date or starting event:		10.5.2016			
Work package title	Documentation						
Activity Type[21]	SUPP						
Participant number	1	2	3				
Participant short name	Emre	Özenç	Ünver				
Person-months per participant:	1	1	1				

Objectives
Documentation step of the application is done.

Description of work (possibly broken down into tasks), and role of participants
How user to use the application is documented.

Deliverables (brief description and month of delivery)
User manual is prepared.

[21] Please indicate one activity per work package:
SUPP = Support activities); MGT = Management of the consortium; OTHER = Other specific activities, if applicable.

Table 16 - Summary of staff effort

Participant no./short name	WP1	WP2	WP3	WP4	WP5	WP6	Total person months
Participant 1 - Ünver	1	1	1	1	1	1	6
Participant 2 - Emre	0	0	1	1	1	1	4
Participant 3 - Özenç	0	0	0	1	1	1	3
Total	1	1	2	3	3	3	13

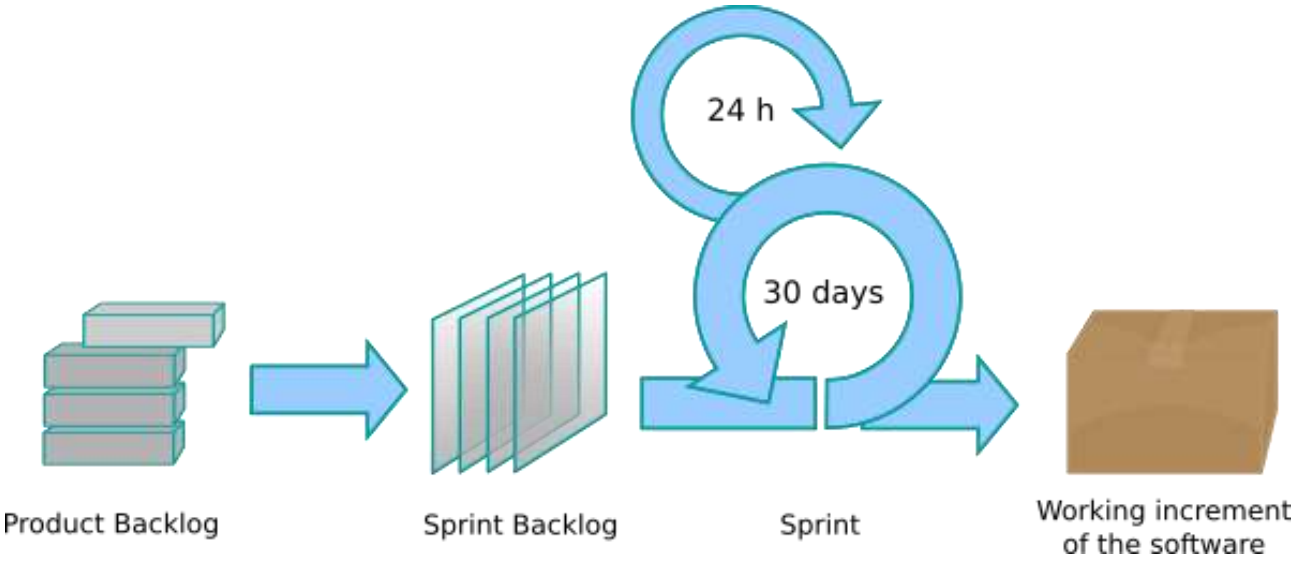
3. METHODOLOGY & ANALYSIS

We decided to use scrum methodology for this project. Scrum is an iterative and incremental agile software development methodology. Scrum focuses on production process. Unlike traditional approach, scrum is very flexible. The customers can change a feature of the production according to their needs.

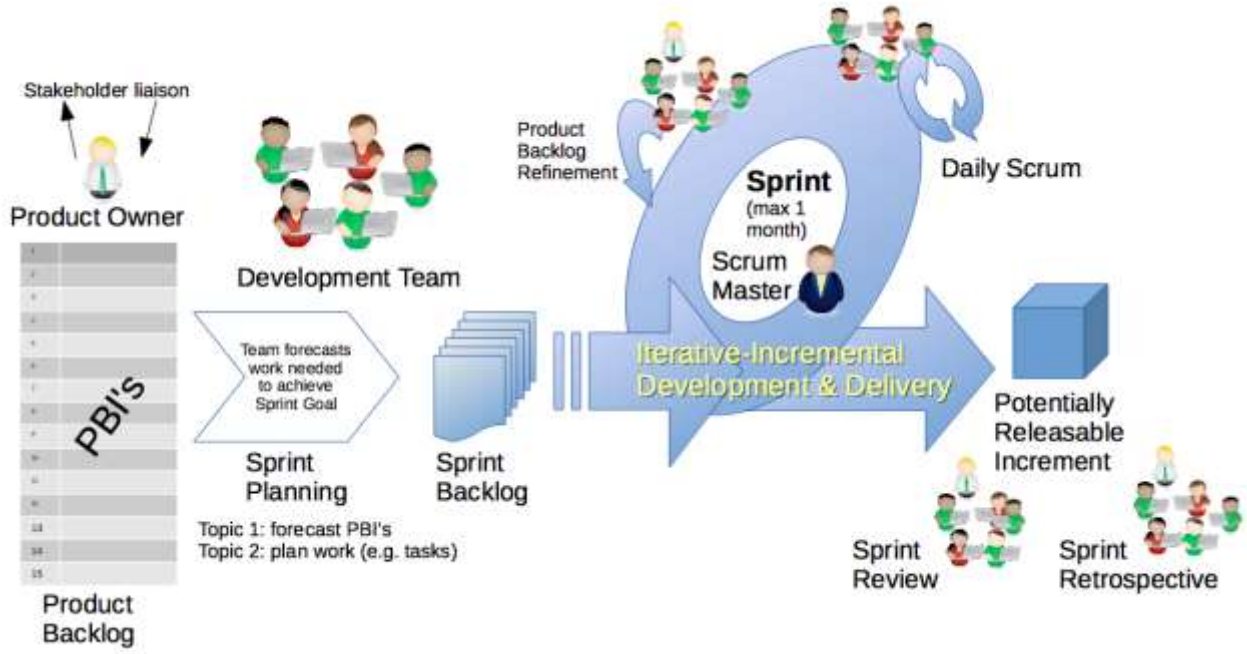
There are three core roles that are product owner, development team and scrum master in scrum methodology. Firstly, Product owner is stakeholders and the persons who define customers' not technical expectations and demands. The product owner defines user stories, set their priority orders and it helps to form the product backlog. The product owner is all the group members in this project. Secondly, development team is responsible for delivering potentially shippable increments at the end of each sprint. A sprint is a specific time duration and contains analyses, design, develop, test and documentation. Each sprint firstly starts with sprint planning. After each spring planning, a sprint backlog is prepared. During each day of a sprint, development team meets up for answering what each member did yesterday, what each member will do on the same day and there is any barrier that prevents each member. After each sprint, the development team reviews the sprint using sprint burndown chart. In our project, each sprint lasts one month. The development team is all the group members. Thirdly, scrum master is not the same project manager. The scrum master helps ensure the development team follows the scrum processes, facilitating team events, helping the development team to avoid or remove barriers to the scrum progress. Scrum master in our project is Ünver Can Ünlü.[2]

Table 17 - Project Members Roles

Roles	Person (or People)
Product Owner	Ünver Can Ünlü, Emre Telli, Özenç Taşdelen
Development Team	Ünver Can Ünlü, Emre Telli, Özenç Taşdelen
Scrum Master	Ünver Can Ünlü



Graphic 1 - Scrum Process[3]



Graphic 2 - Scrum Framework[4]

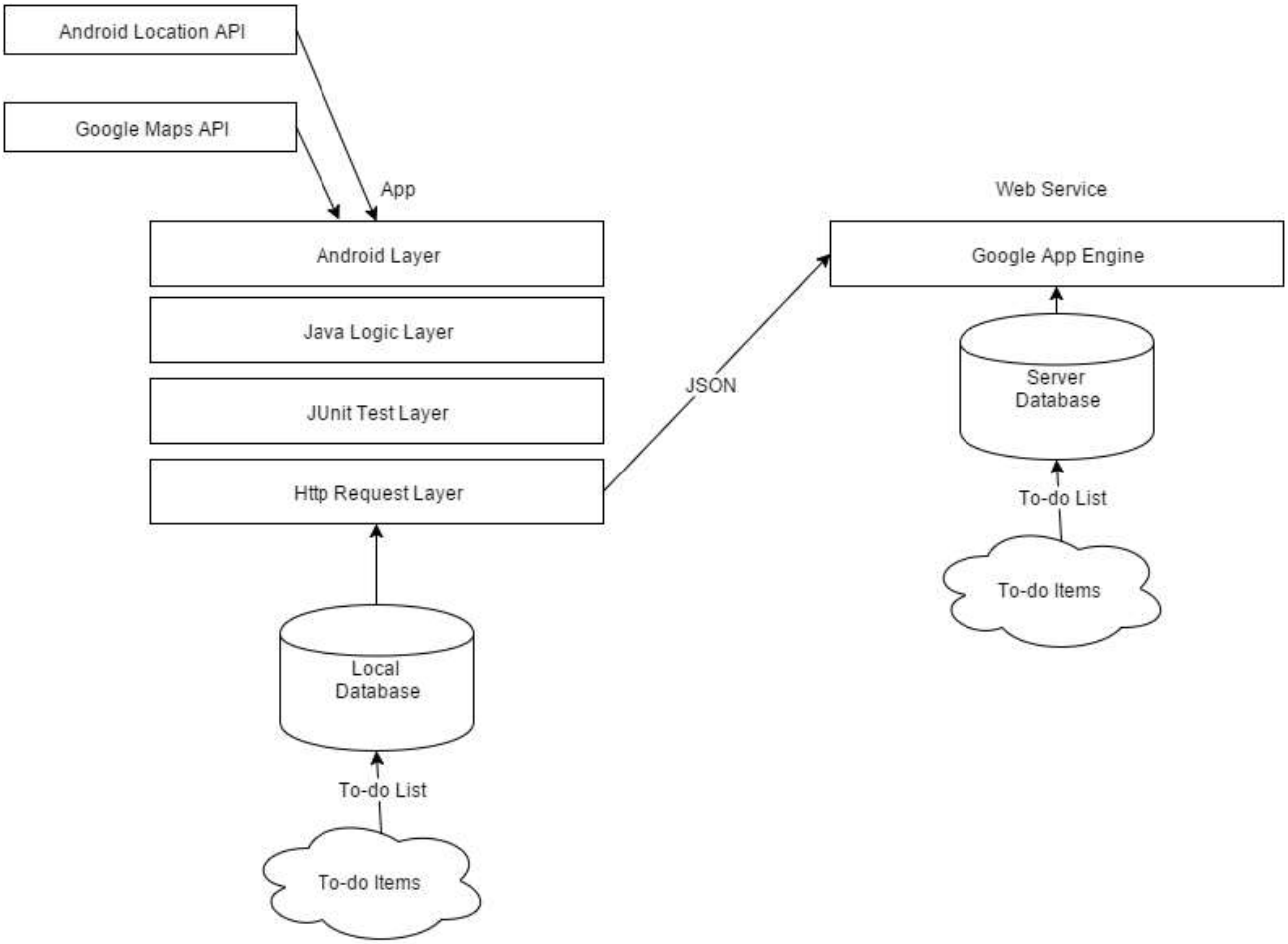
Deliverables of scrum method are product and sprint backlog, sprint review, sprint and release burndown chart, definition of done and potentially shippable increment (or increment). Firstly, product backlog is an ordered work list that can be features, bug fixes or requirements. Each product backlog items are assigned business value according to estimated complexity or effort. Secondly, sprint backlog is prioritized list whose items are task to complete during the sprint and they are selected from product backlog. Thirdly, sprint review is a document that prepared after sprint review meet-up and it presents completed and not completed works after the sprint. Later, the development

team meets-up for sprint retrospective which in the team handle the last sprint and identifies process improvement actions. Fourthly, sprint burndown chart is a chart showing remaining work in the sprint backlog to give a simple view of the sprint progress because it updates every day. Fifthly, release burndown chart is like sprint burndown chart and it updates at the end of each sprint to track the project progress. Sixthly, definition of done is requirements that determine whether the development progress is finished, or all items of the product backlog are completed. Finally, potentially shippable increment is a resulting product after the sprint backlog items completed and the product owner decide whether it will be released or not according to definition of done. [5]

We prepared the documents which are technology and architecture diagram, product backlog, definition of done, user stories and as analysis of the project. According to these analysis documents, we will run four sprints. The contents of these documents are shown below.

These are technologies that we use in our project:

- Mobile application will work on Android OS.
- Project will develop using Android Studio IDE.
- Android Location API will provide user' location.
- Google Map API will provide map of to-do item.
- Junit will be used for testing framework.
- Trello will handle agile concepts as agile project management.
- GitHub will be used for repository hosting service.
- Google App Engine will be the server as a web service.
- JSON format will provide data flow between the server and app.
- Google Cloud SQL will be used for server database.
- SQLite will be used for local database.



Graphic 3 - Architecture of the project

These are our project's definition of done:

- Working collaboratively with all project members.
- Users can create to-do items that set location-based reminder.
- Users can be reminded successfully when they reach target location.
- All code is working.
- All unit tests passed.
- Database interaction is working.
- Whole project pushed into GitHub.

We determined user stories and themes as shown below:

1. **Theme 1**: To-do list stories
    a. A registered user can create a to-do list.
    b. A registered user can add a new item to an existing to-do list.
    c. A registered user can edit a new item to an existing to-do list.
    d. A registered user can mark done or undone an item from an existing to-do list.
    e. A registered user can delete an item from an existing to-do list.
    f. A registered user can set a location-based reminder for an item from an existing to-do list.

g. A registered user can change reminder location of an item from an existing to-do list.
h. A registered user can remove location-based reminder for an item from an existing to-do list.

2. **Theme 2**: Registration, login, and logout stories
   a. A non-registered user can register to the system.
   b. A registered user can login to the system.
3. **Theme 3**: Mobile application customizing
   a. A registered user can change reminder sound.
   b. A registered user can add home, work and education locations with estimated start and finish hour of them to the system.
   c. A registered user can edit work, home and education locations with estimated start and finish hour of them.
   d. A registered user can remove work, home and education locations with estimated start and finish hour of them.
4. **Theme 4**: Reminder stories
   a. A registered user can stop reminder sound while reminding.

Table 18 - Product Backlog

Product Backlog Item	Estimated effort as Fibonacci Number
Creating a GitHub repository for the application	1
Creating an android application and setting up Android Studio and Android SDK	2
Creating a Google App Engine account and setting up it	2
Creating a new Trello board	1
Creating all required activities and fragments with UI items	5
Designing the system database structure	8
Implementing SQLite for the local database	5
Implementing Google Cloud SQL for the server database	8
Integrating Google Maps API with the application	3
Implementing JSON request and response for the server	13
Implementing JSON request and response for the application	13
Providing new users to register the system	8
Providing existing user to login the system	8
Implementing Android Location API	5
Creating reminder for the application	13
Providing user to select distance from target location	13
Providing user to select specific date and time for reminder	13
Implementing synchronization between the server data and local data	13

4. PLANNED SOLUTION/PRODUCT

The first configuration of this project will include login and the data related to this part will be synchronized thanks to the Google App Engine (Cloud based system). After the application is opened with login, datum which is about the user such as name, gender will be stored in that cloud platform and in addition to that users will be able to give their home, school and work addresses optionally in order to provide ease to them. The purpose of our project the solution of this project mainly contains items which are entered by users and will be notified to the user with the location based. This location-based reminder has two parts, one is related to place where the user will go and the other one is related to location where the user leave at that moment. Therefore, the user will be able to choose that the notifications will be sent either when the user arrive that location or when the user come out of that location which is specified with the item. Lastly, these items will depend on radius of that location and time interval which will be selected by the user.

5. RELATED WORK/SIMILAR SOLUTIONS

There are four similar to-do list mobile applications in Google play market. These are Google Keep, Any.do, Wunderlist and Todoist in the most like the least similar order. Firstly, Google Keep's users can create to-do lists and assign a to-do item time or location-based reminder. However, the reminders are not both time and location based although the reminder in our application will be able to both based. Google Keep gives a notification when application when the application's user reaches the given location. Secondly, similarly in Google Keep, to-do lists whose items can be assigned time or location-based reminder can be created in Any.do but only premium users can assign a to-do item location-based reminder. Lastly, there is no option for assigning a to-do item location-based reminder in Wunderlist and Todoist. Users can assign a to-do item only time based reminder.[6][7][8][9]

Table 19 – Similar Applications' Features

Similar Application Name	Logo	Time Based Reminder	Location Based Reminder	Totally Free
Google Keep		Yes	Yes	Yes
Any.do		Yes	Yes	No
Wunderlist		Yes	No	Yes
Todoist		Yes	No	No

6. IMPACT

There are two possible impact of this application. Firstly, daily life of people is organized more after they use the application as the main purpose of the project. Usage of more effective to-do list application will probably improve the user life quality when they manage their time easily. Also, the application will be useful for preventing their faults in some important circumstances about users' lives. Secondly, some people may not use the application because lack of personal security. This kind of people is less than the other. The application will use cloud and web server. Therefore, some people do not want to use the application since their location and some home, education or work-related information will be stored in the server.

7. CONCLUSION

The developing technology all around the world increase the expectation of people. They might be able to want to reach everything with one click or get information which they do not want to keep their mind about their lives always, with only one notification. For this purpose, to do list applications are developed. To-do lists help people organizing their life. After people start to use mobile phone, there is increasing in to-do list application for their mobile phones. However, time-based reminder for a to-do item can be insufficient. We think to bring innovation to this application with location-based reminder. People will be able to get notification according to their items with location based on to do list. All in all, this application will improve daily life efficiency after the user can be reminded location based in this application.

7. REFERENCES

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