Requirements Document

Mobile App for Forest Ecology Research

CS461 - First Term - Team Name : MAFE

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Abstract

This document aims to summarize the project requirements agreed upon between the Mobile App for Forest Ecology (MAFE) capstone group and the Pacific Northwest Permanent Sample Plot Program (PNW-PSP). The document opens by defining the purpose, scope and function of the application to be built, as well as defining the function of the app within the larger systems it must function in. Following that, this document will define more specific requirements the application must meet as well as specific qualities it must possess.

CONTENTS

1 Introduction 2
1.1 Description . . . 2
1.2 Scope . . . 2
1.3 Product Overview . . . 2
1.3.1 Product Perspective . . . 2
1.3.2 Product Functions . . . 3
1.3.3 User Characteristics . . . 3
1.3.4 Limitations . . . 4
1.3.5 Definitions . . . 4

2 References 4

3 Specific Requirements 4
3.1 External Interfaces . . . 4
3.2 Functions . . . 5
3.3 Usability Requirements . . . 5
3.4 Performance Requirements . . . 5
3.5 Design Constraints . . . 5
3.6 Software System Attributes . . . 5

1 INTRODUCTION

1.1 Description

The purpose of our project is to help the Pacific Northwest Permanent Sample Plot Program (PNW-PSP) transition away from their old digital data-collection toolset, towards a more modern solution using Open Data Kit X (ODK-X).

1.2 Scope

The primary product of our project will be an Android app running on ruggedized tablets which will be built on top of the ODK Tables application. This app will allow PNW-PSP field crews to easily record the necessary sample data while on-site by allowing for complex forms which can both fetch previously recorded data and change in accordance with responses the user inputted earlier in the form. After the user finishes collecting data it will be stored locally on the device until conditions allow for it to be synced back to a remote server.

Should time allow for it, we would also implement visualizations of previously collected data. This app would act as the entrypoint to the data collection app, allowing users to easily find the sample plot they are going to collect data from, as well as view visualizations of previously collected data for that plot.

Work will also have to be done to prepare a server to act as the endpoint to which the data collection app will sync with.

1.3 Product Overview

1.3.1 Product Perspective

The workflow which ODK-X creates uses several Android apps in conjunction, as well as a server which both stores and serves collected data from the mobile device.

ODK Tables is where the actual data collection takes place. The forms which it uses are written in Excel, then converted to proper form definitions by the ODK XLSX Converter, and finally copied onto the appropriate devices. The data collected from the user by ODK Survey is stored locally on the device's disk. When the user has internet connectivity, they then can launch the ODK Services app to send that data back to the server. We would also be able to implement the various visualizations here. [1]

ODK Services is where all of the synchronization between the user's device and the remote server takes place. This app is what manages access to both the local database and the remote server's database for all other ODK applications which run on the device. [1]

ODK Sync Endpoint is the name for the server and database software which runs on the remote server. Devices we have set up for PNW-PSP will use ODK Services to connect to this endpoint to store and request new data. [1]

ODK Survey is another app provided by ODK-X, however it is designed for simpler applications which don't need to do much else than provide forms which users can enter info into. We need to be able to dynamically fetch previously recorded data and display it in the form, as well as include many complicated validations on that data. Survey does not seem capable of handling these kinds of features, and cannot be used.

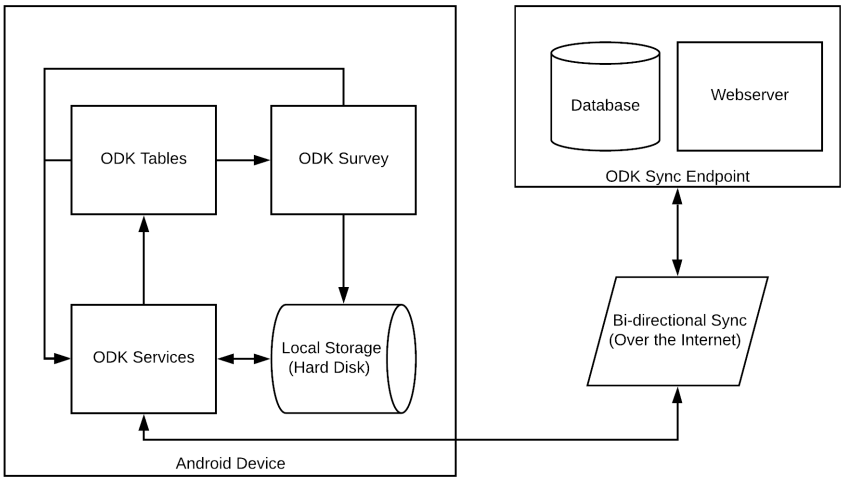

Fig. 1: ODK-X System Diagram

1.3.2 Product Functions

ODK Tables is where most of the vital functionality lives and is where development is focused. This app is what actually runs the forms and stores the user's input until it can be synced to an endpoint. These forms support branching based on user input to previous questions in the form, autofill with previously recorded data, and input validation among other things. Users can navigate through the form as they see fit, for the most part, excepting areas which only open up to them if they gave certain input to previous questions. This app could also allow the user to both manage and view visualizations of previously recorded data. Plot locations could be displayed over map data, allowing users to quickly find which sample plot they need to fill out a form for. ODK Tables can also support the generation of graphs and other displays based on existing data.

ODK Services is mainly a service used by other ODK Android apps to communicate with the ODK Sync Endpoint. ODK Services lets the user sync data between their device and the main server.

ODK Sync Endpoint is what manages all the data collected by the Android devices and exposes a web frontend for managing the data as well as creating the form definitions used by ODK Survey.

1.3.3 User Characteristics

In general there are two types of users our project has to consider: the field workers who are out on the plots recording data with the Android tablets, and those who manage the Sync Endpoint and use it to retrieve the data within it to use it for research.

The field workers top priority is collection of data meaning the actual flow of the data collection form, as well as the general usability of the Android applications, is of utmost importance. By nature of their work, the applications will likely only ever be used outside. Internet access at the plots is unlikely to be reliable or even present, so the apps will have to be able to function as intended without internet access for extended periods. Internet access will be required at some point in order to sync the data recorded locally to the server.

Those who manage the Sync Endpoint will need to have an internet connection in order to access the web-frontend run by the server. They will manage data stored on the server as well as use the other tools in the webpage to create new forms and transfer them onto the Android devices.

1.3.4 Limitations

As ODK-X will be used to meet most of the required features set by the client, the limitations of the project will largely be defined by the limitations inherent to working within the ODK-X framework. Features typically will have to be implemented within the customizability of the various Android apps allowed for by ODK-X.

Given that the project is open source it should be possible to get the source code for the suite of Android apps ODK-X uses, however, modifications at this level will be more complicated and time intensive.

1.3.5 Definitions

Term	*Definition*
MAFE	Mobile App for Forest Ecology
PNW-PSP	Pacific Northwest Permanent Sample Plot Program
ODK-X	The Open Data Kit X toolkit. An open source project which aims to create an accessible data collection platform.
ODK Survey	An Android app supplied by ODK-X which serves static forms to the user to be filled out. (Unused in the final form of our project.)
ODK Tables	An Android app supplied by ODK-X which houses our custom UI and forms and other visualizations.
ODK Services	An Android app supplied by ODK-X which manages interactions with both the database which exists locally on the device, as well as the database which exists remotely on the server acting as a ODK Sync Endpoint.
ODK Sync Endpoint	Server software provided by ODK-X which talks to the various mobile devices running ODK Services in order to store the data they collect in a database running on the server, as well as sync data back to the mobile devices when requested.

2 REFERENCES

[1] "Open data kit tool suite x's (odk-x) documentation," *Open Data Kit Documentation*, 2017.

3 SPECIFIC REQUIREMENTS

3.1 External Interfaces

User Interface: The user interface of this application will be written in HTML, CSS, and JavaScript.

Hardware Interface: The software will be deployed on ruggedized Samsung Tablets.

Software Interface: We will use the Open Data Kit X tool suite to build this application. The database which we will be using is SQLite.

3.2 Functions

The application will need to support the following features.

1) *Look-ups for populating populating data collection forms with prior measurement data.*
2) *Real-time data checks.*
3) *Cascading forms depending on responses to certain inputs.*
4) *Synchronization with a database hosted on a virtual server at OSU.*

3.3 Usability Requirements

The software application which we will be building has to have a fairly straightforward and simple user interface. The reason for this, is because the people who will be using the software are currently performing a large number of repetitive and tedious tasks throughout out the day. Therefore our goal is to help speed up and modernize their process as much as possible. We believe that simplicity and ease of use, within our software's user interface, will be one of the primary factors that will help us achieve this goal.

3.4 Performance Requirements

Not enough information on the project at this point.

3.5 Design Constraints

With regards to hardware, this product is solely limited to Android devices, specifically tablets. In terms of the user interface, ultimately, there are no constraints. As long the software application supports all of the functions listed in section 3.2, the overall layout and design is completely up to us.

3.6 Software System Attributes

Reliability: The researchers who will be using our software, will solely be depending on it as their primary means for storing and managing their data while out in the field. Because of this, it is of utmost importance that our software is functioning properly without crashes or any other major issues. If any issues do occur, we will provide a means for our users to contact us and report any issues that have occurred.
Availability: Many times while out in the field, the individuals who will be using are software will often have little to no Internet access. Therefore our software has to be capable of functioning in any environment irregardless of a data connection.

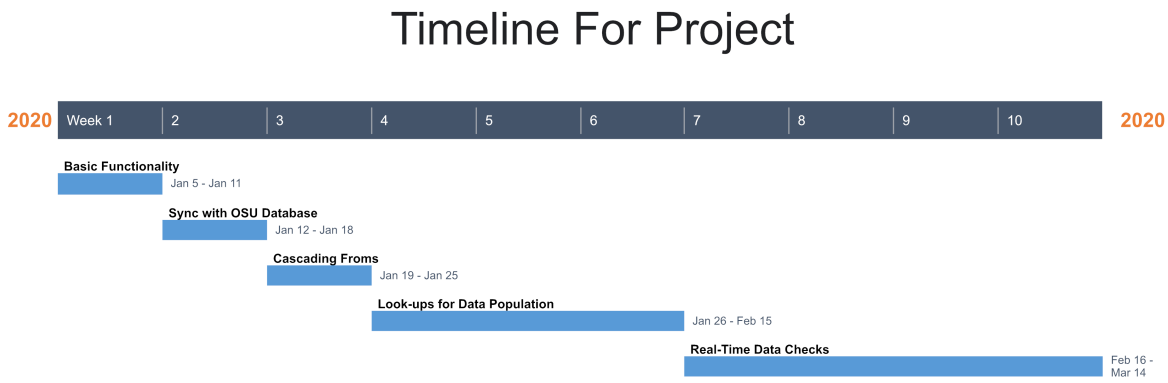

Fig. 2: Gantt Chart