GIS Lab Project

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Outline

This report outlines the steps taken to produce the system referred to as *GNS (Geospatial Notebook System)*.
GNS aims to provide a field notebook experience for researchers by enabling location-tracking of their field notes. A *raspberry pi* computer was used for the main functionality. A GPS device, and battery were connected to Pi. The GPS was used for fetching location data in the field, and the battery ensures operation of the device in the field.

Basic Workflow

The basic work flow of GNS is given as follows:

1. Start up the Raspberry Pi system, with the connected GPS, and battery.
2. Connect to the Raspberry Pi's Wi-Fi hotspot: *GNS-Hotspot*.
3. Navigate to the GNS web service on any device near the Pi. This IP address is *10.10.10.11*.
4. A list of notes will be presented that are already in the system.
5. Navigate using the web application to view, create, update, and delete notebooks as required.

Functionality

The system was built to provide the following functionality to the user:

1. **View Notes**
   The user would be allowed to login and view the notes that have been created so far. Each note would have in addition to the text information, geo-spatial data such as the latitude and longitude along with the data and time (UTC) of the note.
2. **View Note**
   The user would be allowed to view specific details on a specific note. This includes its text information, the user who created the note, and the geo-spatial information.
3. **Edit Note**
   The user would be allowed to make changes to a note. This includes editing the note's text data.

4. **Add Note**
   The user would be allowed to add a new note to the system. The date and time and location will be fetched from the GPS device.

5. **Delete Note**
   The user would be allowed to delete a note from the system. The note will no longer be visible to the users of the system.

Backend System

This section will highlight the development process of the backend system. The back-end system outlined in this report refers to the system residing on the Raspberry Pi. This system manages the database, and the GPS data streaming. It is also responsible for providing the web application with the required data and functionality.

Architecture

The GNS backend was built using *Java 11* and the Spring Boot Framework. The system was developed to provide a *REST based micro-service* running on the Raspberry-Pi. Spring Boot is bundled with its own *Apache Tomcat Java Server*, and the final artifact from the development was a *jar* file that was run on Raspberry Pi under the *JVM*.

These REST endpoints were exposed to interface with the system for carrying out basic operations on the notebook data, namely to create, read, update and delete notebooks. The user interface was a web application that was a client of this backend-system.

In addition to the REST API, the system also connected to the GPS system program, *gpsd*. This was accomplished with the use of a Java library: gps4j.

This allowed the system to become a client of the *gpsd* server, that was also running on the Pi. The library was used to *stream* the GPS data every second. This data was dumped to a *CSV file*, and was renamed according to the date. Hence, the location of the Pi is always being tracked, and is stored by day in CSV files. These log files can be found in the *gps_logs* folder.

REST API