COMPUTER ENGINEERING WORKSHOP

S.E. (CIS) OEL REPORT Project

Project Group ID:

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PROBLEM DESCRIPTION

The goal of this project is to fetch real-time weather data from the OpenWeatherMap API for a specific location (Karachi) but it can be changed inside the main.c file and process the data to extract and analyze key weather parameters such as temperature, humidity, pressure, and wind speed. The program also identifies anomalies, such as dangerously high wind speeds, and logs them for further review.

The main objectives include:

- Fetching raw weather data from an API.
- Parsing and storing weather data efficiently.
- Logging anomalies and notifying the user in case of dangerous weather conditions

METHODOLOGY

The Environmental Monitoring System Weather app (YRO Weather App) was developed following a systematic approach to ensure its reliability and usability across different Linux distributions. The methodology can be outlined in the following steps:

1. Development Environment and Setup:

- The application was developed in a Linux environment using the GCC compiler.
- Dependencies like `libcurl` for HTTP requests and `jannson` for JSON parsing were installed.
- A shell script (`automate.sh`) was created along with a makefile to automate the build and execution process.

2. API Integration and Data Parsing:

- The OpenWeather API was used to fetch real-time weather data.
- API responses were parsed using the `jannson` library to extract relevant details such as temperature, humidity, and wind speed.

3. Real-Time Alerts

- Alerts were implemented using Linux system calls. For example, an alert is triggered when the windspeed exceeds 35°C, the humidity exceeds 80%, or the wind speed surpasses 15 m/s.
- Alerts are logged using syslog, providing a record of critical events.

4. Background Execution

The application can run as a background process using `nohup`. This ensures it operates continuously without interruption, even if the user logs out of the system.

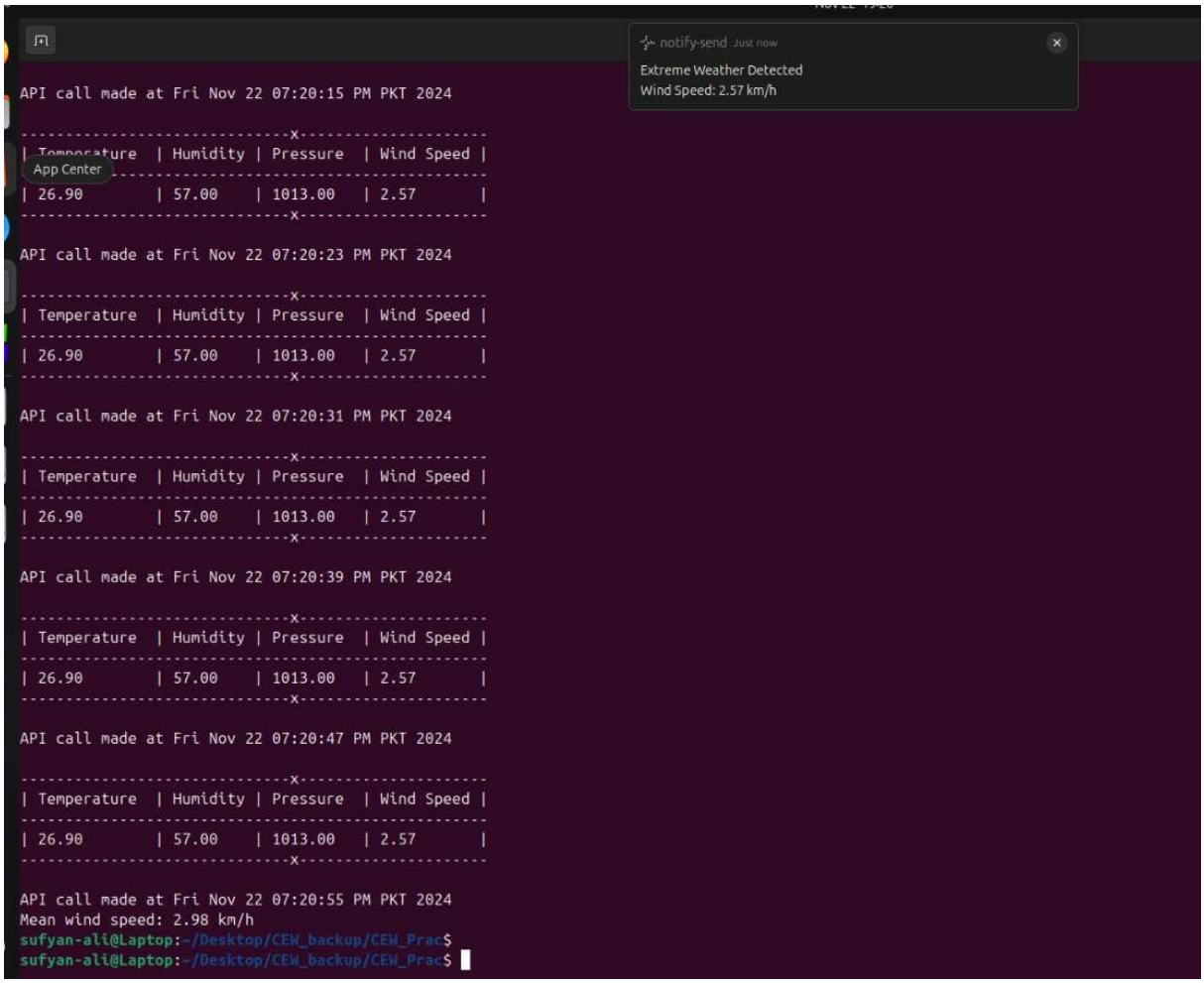
RESULTS

The Environmental Monitoring System Weather app delivered significant results in terms of functionality and performance. It effectively met its objectives by providing the following outcomes:

1. Real-Time Weather Data

- The application retrieves and displays weather information such as temperature, humidity, and wind speed accurately and in real-time.

i. If the user wishes to run the program on the terminal (`./automate.sh` must be used)

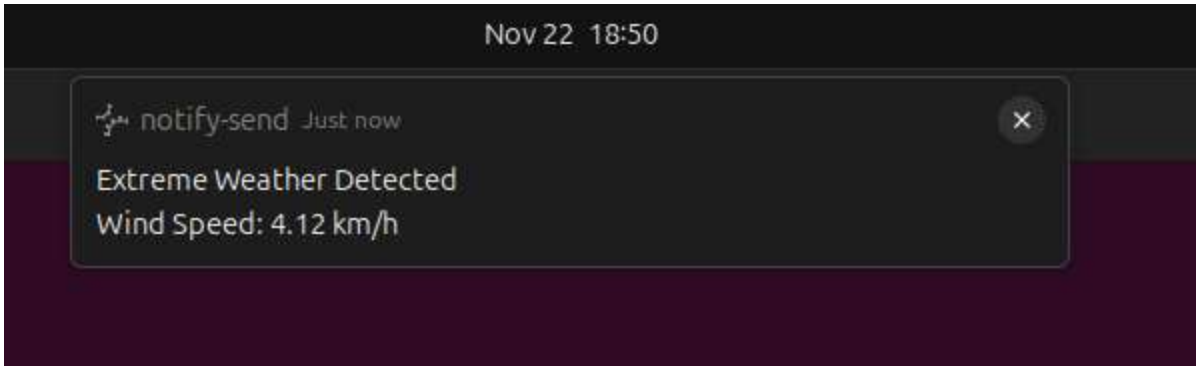


ii. If the user wishes to automate the application in the background (`nohup ./automate.sh`)

```
rm -f codefiles/main.o codefiles/api.o output mean
gcc -c codefiles/main.c -lcurl -ljansson   -o codefiles/main.o
gcc -c codefiles/api.c -lcurl -ljansson   -o codefiles/api.o
gcc codefiles/main.o codefiles/api.o -lcurl -ljansson   -o output

------------------------------x--------------------
| Temperature  | Humidity | Pressure  | Wind Speed |
-----------------------------------------------------
| 25.90        | 57.00    | 1013.00   | 2.06       |
------------------------------x--------------------

API call made at Fri Nov 22 08:01:35 PM PKT 2024

------------------------------x--------------------
| Temperature  | Humidity | Pressure  | Wind Speed |
-----------------------------------------------------
| 25.90        | 61.00    | 1013.00   | 2.57       |
------------------------------x--------------------

API call made at Fri Nov 22 08:26:43 PM PKT 2024
Mean wind speed: 2.23 km/h

------------------------------x--------------------
| Temperature  | Humidity | Pressure  | Wind Speed |
-----------------------------------------------------
| 25.90        | 61.00    | 1013.00   | 2.57       |
------------------------------x--------------------

API call made at Fri Nov 22 08:31:35 PM PKT 2024
Mean wind speed: 2.57 km/h

------------------------------x--------------------
| Temperature  | Humidity | Pressure  | Wind Speed |
-----------------------------------------------------
| 25.90        | 61.00    | 1013.00   | 2.57       |
------------------------------x--------------------

API call made at Fri Nov 22 08:31:36 PM PKT 2024
```

2. Critical Alerts:

- Alerts for hazardous weather conditions (e.g., high temperature, humidity, or wind speed) were successfully implemented and logged. Users are notified immediately of critical events.



3. Data Storage and Logging:

- The app stores both raw and processed weather data in files for future reference.

i. Raw Data:

{"coord":{"lon":67.0822,"lat":24.9056},"weather":[{"id":801,"main":"Clouds","description":"few clouds","icon":"02d"}],"base":"stations","main":{"temp":31.9,"feels_like":30.59,"temp_min":31.9,"temp_max":31.9,"pressure":1011,"humidity":29,"sea_level":1011,"grnd_level":1008},"visibility":6000,"wind":{"speed":2.06,"deg":330},"clouds":{"all":20},"dt":1732269929,"sys":{"type":1,"id":7576,"country":"PK","sunrise":1732240402,"sunset":1732279360},"timezone":18000,"id":1174872,"name":"Karachi","cod":200}
{"coord":{"lon":67.0822,"lat":24.9056},"weather":[{"id":801,"main":"Clouds","description":"few clouds","icon":"02d"}],"base":"stations","main":{"temp":31.9,"feels_like":30.59,"temp_min":31.9,"temp_max":31.9,"pressure":1011,"humidity":29,"sea_level":1011,"grnd_level":1008},"visibility":6000,"wind":{"speed":2.06,"deg":330},"clouds":{"all":20},"dt":1732269929,"sys":{"type":1,"id":7576,"country":"PK","sunrise":1732240402,"sunset":1732279360},"timezone":18000,"id":1174872,"name":"Karachi","cod":200}
{"coord":{"lon":67.0822,"lat":24.9056},"weather":[{"id":801,"main":"Clouds","description":"few clouds","icon":"02d"}],"base":"stations","main":{"temp":31.9,"feels_like":30.82,"temp_min":31.9,"temp_max":31.9,"pressure":1011,"humidity":31,"sea_level":1011,"grnd_level":1008},"visibility":6000,"wind":{"speed":2.06,"deg":240},"clouds":{"all":20},"dt":1732271095,"sys":{"type":1,"id":7576,"country":"PK","sunrise":1732240402,"sunset":1732279360},"timezone":18000,"id":1174872,"name":"Karachi","cod":200}
{"coord":{"lon":67.0822,"lat":24.9056},"weather":[{"id":801,"main":"Clouds","description":"few clouds","icon":"02d"}],"base":"stations","main":{"temp":31.9,"feels_like":30.82,"temp_min":31.9,"temp_max":31.9,"pressure":1011,"humidity":31,"sea_level":1011,"grnd_level":1008},"visibility":6000,"wind":{"speed":2.06,"deg":240},"clouds":{"all":20},"dt":1732271095,"sys":{"type":1,"id":7576,"country":"PK","sunrise":1732240402,"sunset":1732279360},"timezone":18000,"id":1174872,"name":"Karachi","cod":200}
{"coord":{"lon":67.0822,"lat":24.9056},"weather":[{"id":801,"main":"Clouds","description":"few clouds","icon":"02d"}],"base":"stations","main":{"temp":31.9,"feels_like":30.82,"temp_min":31.9,"temp_max":31.9,"pressure":1011,"humidity":31,"sea_level":1011,"grnd_level":1008},"visibility":6000,"wind":{"speed":2.06,"deg":240},"clouds":{"all":20},"dt":1732271095,"sys":{"type":1,"id":7576,"country":"PK","sunrise":1732240402,"sunset":1732279360},"timezone":18000,"id":1174872,"name":"Karachi","cod":200}
{"coord":{"lon":67.0822,"lat":24.9056},"weather":[{"id":801,"main":"Clouds","description":"few clouds","icon":"02d"}],"base":"stations","main":{"temp":31.9,"feels_like":30.82,"temp_min":31.9,"temp_max":31.9,"pressure":1011,"humidity":31,"sea_level":1011,"grnd_level":1008},"visibility":6000,"wind":{"speed":2.06,"deg":240},"clouds":{"all":20},"dt":1732271095,"sys":{"type":1,"id":7576,"country":"PK","sunrise":1732240402,"sunset":1732279360},"timezone":18000,"id":1174872,"name":"Karachi","cod":200}
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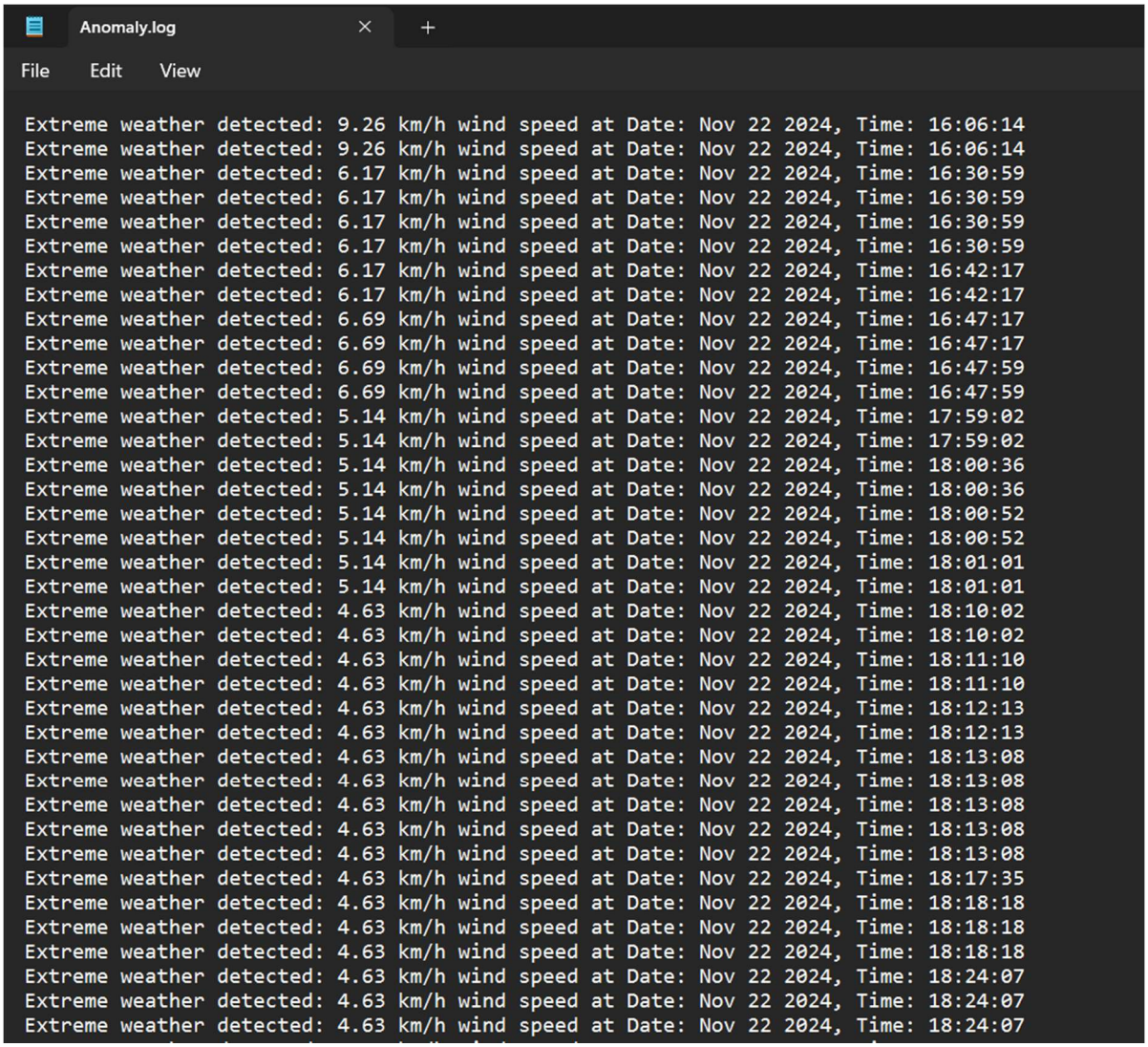
iii. Processed Data

	A	B	C	D
1	Temperatu	Humidity	Pressure	Wind Speed
2	31.9	29	1011	2.06
3	31.9	29	1011	2.06
4	31.9	31	1011	2.06
5	31.9	31	1011	2.06
6	31.9	31	1011	2.06
7	31.9	31	1011	2.06
8	5.46	74	1007	9.26
9	5.46	74	1007	9.26
10	5.9	73	1008	9.26
11	5.9	73	1008	9.26
12	5.9	73	1008	9.26
13	5.9	73	1008	9.26
14	5.9	73	1008	9.26
15	5.9	73	1008	9.26
16	30.9	42	1012	6.17
17	30.9	42	1012	6.17
18	30.9	42	1012	6.17
19	30.9	42	1012	6.17
20	30.9	42	1012	6.17
21	30.9	42	1012	6.17
22	29.9	45	1012	6.69
23	29.9	45	1012	6.69
24	29.9	45	1012	6.69
25	29.9	45	1012	6.69
26	27.9	54	1012	5.14
27	27.9	54	1012	5.14
28	27.9	54	1012	5.14
29	27.9	54	1012	5.14
30	27.9	54	1012	5.14

Weather_Processed

iv. High Alert Info stored in Anomaly file:



4. Conclusion

This program successfully demonstrates the integration of API data fetching, JSON parsing, anomaly detection, and user notification. It provides a robust framework for real-time weather monitoring and can be extended to include additional features such as periodic updates, support for multiple cities, or visual data representation.

DEPARTMENT OF COMPUTER & INFORMATION SYSTEMS ENGINEERING

BACHELORS IN COMPUTER SYSTEMS ENGINEERING

Course Code: CS-219

Course Title: Computer Engineering Workshop

Open Ended Lab

SE Batch 2023, Fall Semester 2024

Grading Rubric

TERM PROJECT

Group Members:

Student No.	Name	Roll No.
S1	**Prem Sagar**	**CS-23142**
S2	**Sufyan Ali**	**CS-23134**
S3	**Moiz Haider**	**CS-23137**

CRITERIA AND SCALES				Marks Obtained		
				S1	S2	S3
Criterion1: Has the student implemented an efficient and scalable solution for data retrieval, processing, and reporting?						
0	1	2	3			
The student has not even implemented a basic solution that meets the project's requirements.	The student has implemented a basic solution that meets the project's requirements but may lack optimization in certain aspects.	The student has implemented a proficient and well-optimized solution.	The student has implemented an exceptionally efficient and scalable solution.			
Criterion 2: Has student demonstrated a strong understanding of C programming fundamentals?						
0	1	2	3			
The student doesn't have basic understanding of C programming fundamentals.	The student exhibits a basic understanding of C programming fundamentals.	The student demonstrates a strong understanding of C programming fundamentals.	The student demonstrates an exceptional understanding of C programming fundamentals.			
Criterion 3: How well written is the report?						
0	1	2	3			
The submitted report is unfit to be graded.	The report is partially acceptable.	The report is complete and concise.	The report is exceptionally written.			
			Total Marks:			