Assignment: Python Programming for GUI Development

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Problem 1: Real-Time Weather Monitoring System

Scenario:

You are developing a real-time weather monitoring system for a weather forecasting company. The system needs to fetch and display weather data for a specified location.

Tasks:

1. **Model the data flow for fetching weather information from an external API and displaying it to the user.**
2. **Implement a Python application that integrates with a weather API (e.g., OpenWeatherMap) to fetch real-time weather data.**
3. **Display the current weather information, including temperature, weather conditions, humidity, and wind speed.**
4. **Allow users to input the location (city name or coordinates) and display the corresponding weather data.**

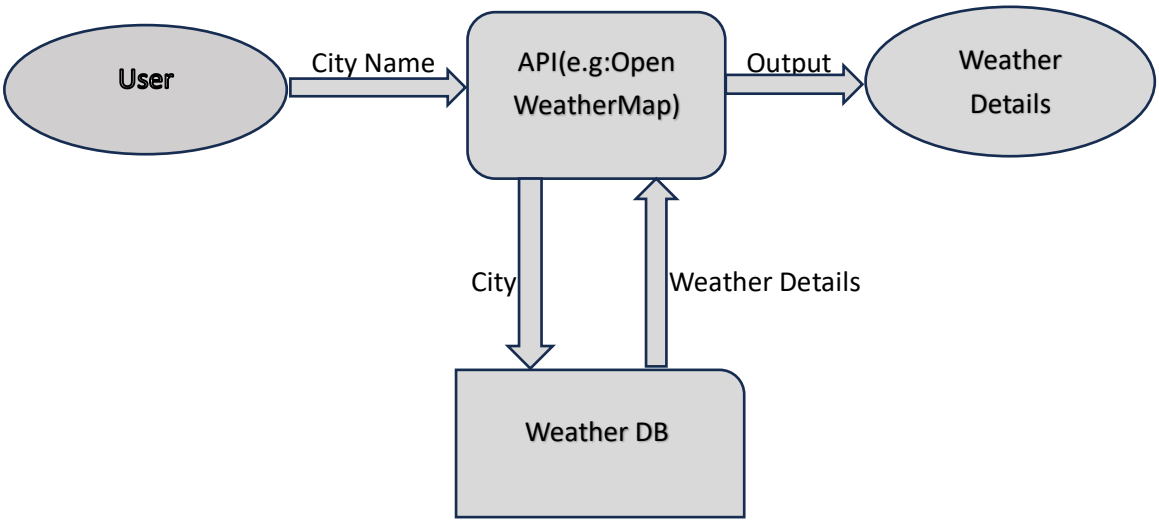
Deliverables:

- Data flow diagram illustrating the interaction between the application and the API.
- Pseudocode and implementation of the weather monitoring system.
- Documentation of the API integration and the methods used to fetch and display weather data.
- Explanation of any assumptions made and potential improvements.

Solution:

Real-Time Weather Monitoring System

1.Data Flow Diagram



2. Implementation

Pseudocode:

1. **Initialize**:
   - Define API endpoint and API key.
2. **Get User Input**:
   - Prompt the user for a city name or coordinates.
3. **Fetch Weather Data**:
   - Construct API request URL with user input.
   - Send HTTP request to the weather API.
   - Parse the API response.
4. **Display Weather Data**:
   - Extract temperature, weather conditions, humidity, and wind speed from the response.
   - Print the data to the user.

Python code Implementation:

```
import requests
def get_weather_data(location):
 api_key = "c54317e14daca59511658fe14ba42a4c"
 base_url = "http://api.openweathermap.org/data/2.5/weather"
 params = {"q": location, "appid": api_key, "units": "metric"}
 response = requests.get(base_url, params=params)
 weather_data = response.json()
 return weather_data
def display_weather_data(weather_data):
 print("Current Weather:")
 print(f"Temperature: {weather_data['main']['temp']}°C")
 print(f"Weather Conditions: {weather_data['weather'][0]['description']}")
 print(f"Humidity: {weather_data['main']['humidity']}%")
 print(f"Wind Speed: {weather_data['wind']['speed']} m/s")
def main():
 location = input("Enter location (city name or coordinates): ")
 weather_data = get_weather_data(location)
 display_weather_data(weather_data)
if __name__ == "__main__":
 main()
```

Output:

Enter location (city name or coordinates): kadapa

Current Weather:

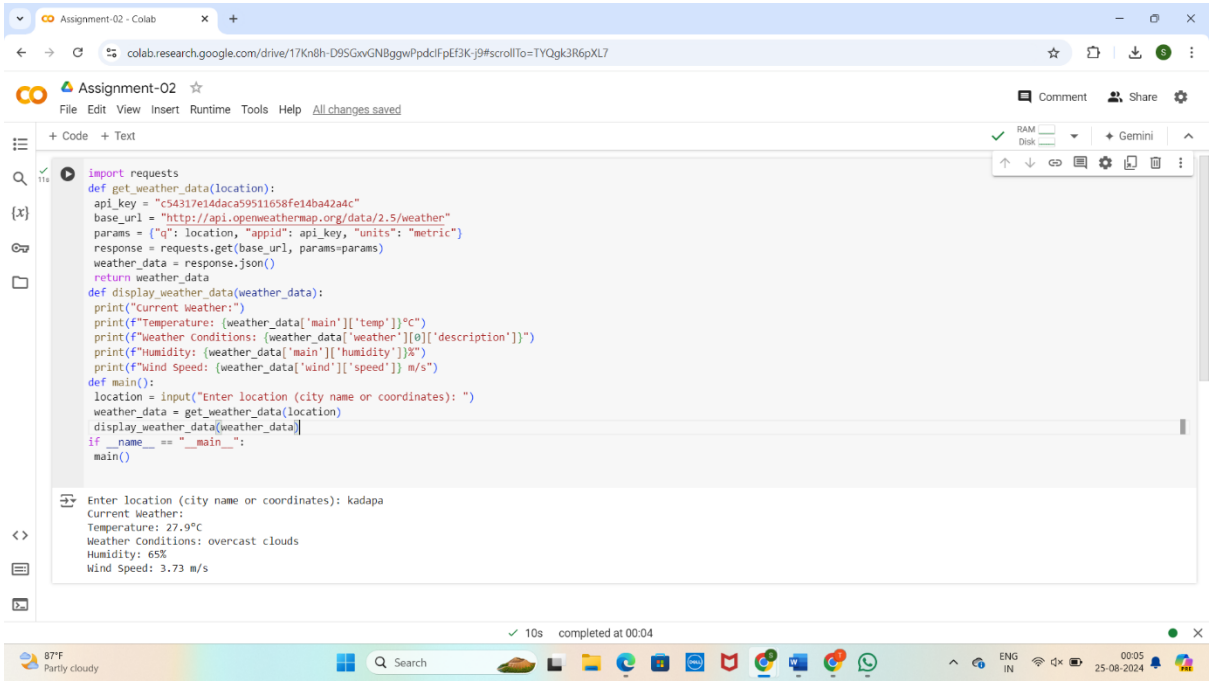
Temperature: 27.9°C

Weather Conditions: overcast clouds

Humidity: 65%

Wind Speed: 3.73 m/s

4.User Input:



5.Documentation :

1.API Integration: We use the Open Weather Map API to fetch real-time weather data.

2. Methods: The get weather function handles the API request and response processing.

The main function handles user input and displays the data.

3. Assumptions:

- The API key is valid and the quota limits are not exceeded.
- The user inputs valid city names or coordinates.
- The API response structure remains consistent with the example.

4.Potential Improvements:

- Error Handling: Enhance error handling to manage different types of API errors (e.g., invalid city names, API downtime).
- User Interface: Develop a graphical user interface (GUI) or a web-based front-end for a better user experience.
- Advanced Features: Include additional weather details such as forecast data, sunrise and sunset times, etc.
- Caching: Implement caching to reduce the number of API calls for frequently requested locations.