**ENVIRONMENTAL MONITORING IN PARKS**

Deploying IoT devices, such as temperature and humidity sensors, in various locations within public parks to measure environmental conditions involves several steps. Here's a guide on how to do this:

**1. Sensor Selection:** Choose the appropriate sensors for your project. For temperature and humidity monitoring, you can use sensors like DHT22, DHT11, or BME280.

**2. Hardware Procurement:** Purchase the required sensors and any additional components, such as microcontrollers (e.g., Arduino, Raspberry Pi), power supplies, and protective enclosures.

**3. Sensor Placement:** Identify the locations within the public park where you want to deploy the sensors. Ensure they are placed in areas that are representative of the park's environmental conditions.

**4. Power Supply:** Ensure a stable power supply for your IoT devices. Depending on the locations, you may use batteries, solar panels, or access to a nearby power source.

**5. Data Communication:** Choose a suitable communication method for your sensors to transmit data to a central location. Options include Wi-Fi, LoRa, cellular, or a combination of these, depending on the park's connectivity.

**6. Data Logger or Microcontroller:** Connect the sensors to a data logger or microcontroller. For example, a Raspberry Pi can serve as a data logger that collects data from sensors and communicates with a central server.

**7. Data Storage and Management:** Set up a data storage system or database to store the collected environmental data. You can use cloud-based solutions or local servers.

**8. Data Transmission:** Develop a data transmission protocol or method. MQTT and HTTP are commonly used for this purpose. Ensure that the data transmission is secure and reliable.

**9. Data Visualization:** Create a platform for visualizing the data. This can be a web-based dashboard, mobile application, or desktop application that displays real-time and historical data.

**10. Data Analysis and Alerts:** Implement data analysis tools to detect anomalies or trends in the environmental data. Set up alerts to notify relevant personnel or authorities in case of unusual conditions.

**11. Remote Monitoring:** Ensure you can remotely monitor and manage your IoT devices and the data they collect. This may include remote configuration and troubleshooting.

**12. Power Management:** Implement power-saving measures to maximize the IoT device's uptime, especially if you're using battery-powered sensors.

**13. Security:** Implement security measures to protect the data and the IoT devices from unauthorized access and tampering.

**14. Compliance and Regulations:** Ensure that your project complies with local regulations, especially when deploying IoT devices in public areas. This may involve privacy considerations and compliance with environmental regulations.

**15. Maintenance:** Regularly maintain and calibrate your sensors. Ensure that the devices are protected from vandalism and environmental factors.

**16. Scaling:** If necessary, expand your deployment by adding more sensors in other locations or parks.

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Here's a simplified example of how you can collect and transmit data using Python on a Raspberry Pi with a DHT22 sensor (for temperature and humidity):

**Python program:**

import Adafruit\_DHT

import requests

# Sensor setup

sensor = Adafruit\_DHT.DHT22

pin = 4

# Monitoring platform URL

platform\_url = "https://your-monitoring-platform.com/api/data"

while True:

# Read sensor data

humidity, temperature = Adafruit\_DHT.read\_retry(sensor, pin)

if humidity is not None and temperature is not None:

# Prepare data for transmission

data = {

"temperature": temperature,

"humidity": humidity

}

# Send data to the monitoring platform

response = requests.post(platform\_url, json=data)

if response.status\_code == 200:

print("Data sent successfully")

else:

print("Failed to send data")

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