Project: Environmental Monitoring

Phase1: Problem Definition and Design Thinking

1.INTRODUTION:

IoT-based environmental monitoring is the consistent collection of measurements and data from our physical environment, using sensors and connected devices. Sensors embedded in irrigation systems, pipelines, tanks, weather stations, oceanic applications, and industrial equipment anywhere on the planet can detect temperature, moisture, water levels, leaks, and other physical properties. Intelligent, connected devices with embedded communications modules can then process that information using edge computing technology, and rapidly send critical data to the cloud or a data centre for further action or analysis. These monitoring systems can be programmed to detect abnormalities or specific conditions, then trigger alerts via email or text, as well as automated processes. These can include anything from launching service tickets to shutting systems down to thwart a disaster.

2.PROJECT OBJECTIVIES:

The objectives of this project are defined as follows;

* Setting up an IoT device to monitor environmental conditions in public parks, such as temperature and humidity, is a great way to ensure the well-being of park visitors and the surrounding ecosystem. IoT-based environmental monitoring systems utilize sensors and connected devices to collect measurements and data from the physical environment. These sensors can be embedded in various locations, such as weather stations, irrigation systems, and industrial equipment. The collected data can then be processed using edge computing technology and sent to the cloud or a data centre for further analysis.

By deploying IoT-based environmental monitoring systems in public parks, you can gain insights into the temperature and humidity levels in real-time. This information can be used to make informed decisions about park maintenance, visitor safety, and resource allocation.

Real-time environmental data: Can be a valuable resource for park visitors. It can provide insights into the current state of the environment and help visitors make informed decisions. There are several platforms that offer real-time environmental data to the public. For example, the United Nations Environment Programme (UNEP) provides data resources that feature data sets, reports, publications, fact sheets, interactives, and more.It offers environmental IoT and AI solutions for a sustainable future. Their air monitoring system is known for providing accurate environmental data using patented e-Breathing technology.

To integrate IoT technology and Python to provide real-time environmental data to park visitors through a public platform, you can use several IoT platforms such as** AWS IoT**, **Microsoft Azure IoT**, **Google Cloud IoT**, or **IBM Watson IoT** . These platforms offer various services such as device management, security, analytics, and more. You can use Python libraries such as **patho-matt** or **AWS SDK for Python (Boto3)** to connect your devices to these platforms and publish real-time environmental data. Additionally, you can use web frameworks such as **Django** or **Flask** to develop your public platform and display real-time environmental data to park visitors.

DESIGN THINKING:

PROJECT OBJECTIVIES:

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IOT DEVICES DESIGNS:

1. **Identify the requirements**: Determine the specific temperature and humidity ranges you want to monitor, the desired accuracy of the measurements, and any other relevant factors.

2. **Select suitable sensors**: Choose sensors that are capable of accurately measuring temperature and humidity. Common options include DHT11, DHT22, or HTU21D sensors.

3. **Choose a microcontroller**: Select a microcontroller board such as Arduino UNO or ESP8266 that can interface with the sensors and communicate with other devices.

4. **Design the circuit**: Connect the sensors to the microcontroller following the pin configuration guidelines provided by the sensor manufacturer.

5. **Write code**: Develop code to read data from the sensors using appropriate libraries or APIs. You can use platforms like Arduino IDE to program the microcontroller.

6. **Connect to the internet**: Use Wi-Fi or other connectivity options (e.g., Ethernet) to enable communication between the microcontroller and the internet.

7. **Configure data transmission**: Set up your microcontroller to send temperature and humidity data to the cloud platform at regular intervals.

8. **Deploy and test**: Install the IoT sensor system in public parks, ensuring proper power supply and protection from environmental factors. Test the system's functionality and accuracy.

ENVIRONMENTAL MONITIORING PLATEFORM:

To design a web-based platform for displaying real-time environmental data to people using IoT, you can follow these steps:

1. **Define the purpose**: Determine the specific environmental data you want to display and the target audience for your platform. This could include air quality, temperature, humidity, pollution levels, or any other relevant parameters

2. **Choose IoT sensors**: Select appropriate IoT sensors that can measure the desired environmental parameters. For example, you might use air quality sensors, temperature sensors, or water quality sensors.

3. **Connect the sensors**: Connect the IoT sensors to a microcontroller or development board such as Arduino or Raspberry Pi. These devices will collect data from the sensors and transmit it to a central server or cloud platform.

4. **Set up a cloud platform**: Choose a cloud platform such as Microsoft Azure, AWS IoT, or Google Cloud IoT Core to store and process the sensor data. These platforms provide tools for data ingestion, storage, and analysis.

5. **Develop a web application**: Create a web application using HTML, CSS, and JavaScript to visualize the real-time environmental data. You can use frameworks like React, Angular, or Vue.js to build interactive and responsive user interfaces.

6.**Test and deploy**: Thoroughly test your web-based platform to ensure its functionality and performance. Once you are satisfied with the results, deploy it to a hosting provider or cloud service for public access.

INTEGRATION APPROACH:

IoT devices can send data to an environmental monitoring platform using various communication protocols such as Wi-Fi, Bluetooth, Zigbee. The specific protocol used will depend on the type of IoT device and the requirements of the monitoring system.

For example, low-power wide-area network (LPWAN) technology is often used for environmental monitoring systems as it allows sensors to stay in a location for long periods and send data over long distances. LPWAN sensors can be powered by batteries and can operate for several years without requiring maintenance.

CONCLUSION:

In phase1 of this project, we have defined the problem, established clear objectives, and outlined our design thinking approach. The next phase will involve the actual implementation and deployment of the IoT sensor network and the development of the environmental monitoring.