ENVIRONMENTAL MONITORING

Phase 5: project

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INTODUCTION:

Environmental monitoring refers to the tools and techniques designed to observe an environment, characterize its quality, and establish environmental parameters, for the purpose of accurately quantifying the impact an activity has on an environment. Results are gathered, analyzed statistically, and then published in a risk assessment and environmental monitoring and impact assessment report

. As human population, industrial activities, and energy consumption continues to grow, the continued development of advanced, automated monitoring applications and devices is crucial for enhancing the accuracy of environmental monitoring reports and the cost-effectiveness of the environmental monitoring process.

OBJECTIVES:

The main objective of environmental monitoring is to manage and minimize the impact an organization's activities have on an environment, either to ensure compliance with laws and regulations or to mitigate risks of harmful effects on the natural environment and protect the health of human beings.

Formulate SMART objectives and questions:

The third step is to formulate SMART objectives and questions for your environmental monitoring project. SMART stands for Specific, Measurable, Achievable, Relevant, and Time-bound. Your objectives should state what you want to achieve with your monitoring in clear and measurable terms. Your questions should specify what you want to know or learn from your monitoring in precise and answerable terms. By using the SMART criteria, you can ensure that your objectives and questions are realistic, meaningful, and feasible.

Prioritize your objectives and questions

The fourth step is to prioritize your objectives and questions for your environmental monitoring project. You may have multiple objectives and questions that are important and relevant, but you may not have enough resources or time to address them all. Therefore, you need to rank your objectives and questions according to their urgency, importance, feasibility, and impact. You can use various methods and tools to prioritize your objectives and questions, such as scoring, ranking, matrix, or criteria analysis. By prioritizing your objectives and questions, you can focus on the most critical and valuable ones for your monitoring.

Review and refine your objectives and questions

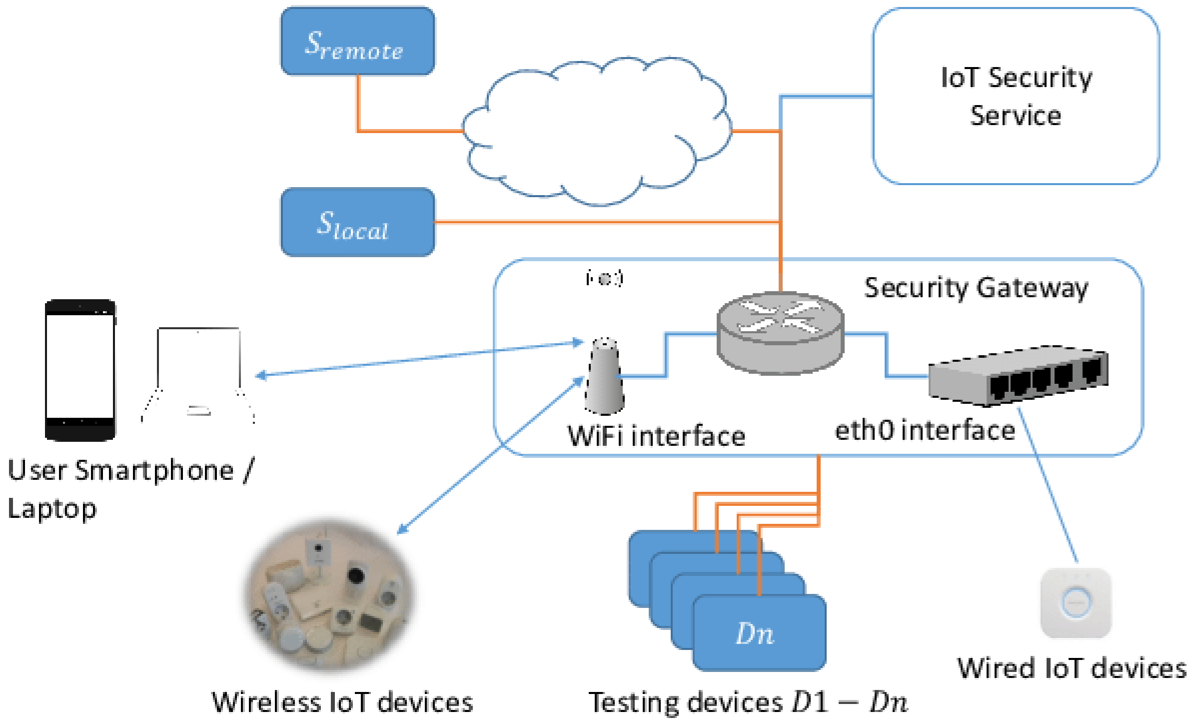
The final step is to review and refine your objectives and questions for your environmental monitoring project. You should check if your objectives and questions are consistent with your purpose and scope, aligned with your key issues and stakeholders, and supported by your data sources and methods. You should also solicit feedback from your team, partners, and users on your objectives and questions and make adjustments as needed. By reviewing and refining your objectives and questions, you can improve the quality and relevance of your monitoring.

Results

The huge amount of data collected makes efficient data management and stringent quality assurance indispensable. Quality-assured data are then stored in a central environmental database. The environmental database is linked to a geographical information system which allows the interpretation, presentation, and goal-oriented analysis of environmental data.

IOT DEVICE SETUP::

IoT sensing devices pick out key points of the data that indicate everything from chemical and water leaks to air pollution levels. This data analysis can help businesses measure their environmental footprint and make informed decisions about how to reduce their environmental impact.



IOT SECURITY SERVICE:

Internet of things (IoT)security is the practice of securing IoT devices and the network these devices use. Its primary goals are to maintain the privacy of users and confidentiality of data, ensure the security of devices and other related infrastructures, and allow the IoT ecosystem to function smoothly.

IoT security is a broad topic, but a necessary one. The IoT is a broad field in itself as it involves adding internet connectivity to “things” or devices that have specific functions, which has proven to have an expansive and ever-growing range of applications

SECURITY GETWAY:

A web security gateway, also known as a secure web gateway, is a device, cloud service, or application that is deployed at the boundaries of a network to monitor and stop malicious traffic from entering the organization, and to block users from accessing malicious or suspicious web resources.

Security Gateway means a set of control mechanisms between two or more networks having different trust levels which filter and log traffic passing, or attempting to pass, between networks, and the associated administrative and management servers. Examples of Security Gateways include firewalls, firewall management servers, hop boxes, session border controllers, proxy servers, and intrusion prevention devices

USER SMART PHONE/LAPTOP:

A smartphone is a cellular telephone with an integrated computer and other features not originally associated with telephones, such as an operating system (OS), web browsing and the ability to run software applications.

Smartphones are used by consumers and as part of a person's business or work. They provide access to many mobile applications and computing functions, and have become integral to everyday modern life.

LAPTOP:

A laptop is a personal computer that can be **easily moved** and used in a variety of locations. Most laptops are designed to have all of the functionality of a desktop computer, which means they can generally run the same **software** and open the same types of **files**. However, laptops also tend to be more expensive than comparable desktop computers.

Because laptops are designed for portability, there are some important differences between them and desktop computers. A laptop has an **all-in-one design**, with a built-in **monitor**, **keyboard**, **touchpad** (which replaces the mouse), and **speakers.** This means it is fully functional, even when no peripherals are connected. A laptop is also quicker to set up, and there are fewer cables to get in the way.

You'll also have to the option to connect a regular mouse, larger monitor, and other peripherals. This basically **turns your laptop into a desktop computer**, with one main difference: You can easily disconnect the peripherals and take the laptop with you wherever you go.

WIRELESS IOT DEVICE:

continu The Internet of Things (IoT) involves different kinds of ously evolving technology, allowing for many connectivity options for connected device manufacturers. Each of these options has a range of advantages and disadvantages that must be weighed together. This article will help you evaluate the best IoT wireless technology solution for your business.

Wireless technology is a method of connection within an IoT system that includes sensors, platforms, routers, applications, and other systems. Each option has trade-offs between power consumption, bandwidth, and range. At a high level, there are standard wireless options like cellular (3G, 4G, 5G) and WiFi, and there are long-range options like LoRaWAN and LPWAN. Connected device companies should understand the basics of the top IoT technologies to determine the best wireless technology option for their needs.

TESTING DEVICE D1-Dn:

Test Device means a device, reference platform, or circuit board assembly (including form factor accurate (FFA) handset device or a subscriber unit reference platform (SURF)) that is designed to be used to aid in the test, development, validation, and/or design of a Device or network infrastructure equipment and is not

Testing Device means that certain testing device, developed under the Development Program, containing the Reagents and constituting a component of the Product.

A procedure for critical evaluation; a means of determining the presence, quality, or truth of something; a trial: *a test of one's eyesight; subjecting a hypothesis to a test; a test of an athlete's endurance*.

A series of questions, problems, or physical responses designed to determine knowledge, intelligence, or ability.

WIRED IOT DEVICE:

Wired connections are reliable, secure and can support high data rate. Therefore, this type of connection can be considered as a suitable IoT connectivity scheme for stationary IoT devices that are close to each other.

A wired network is a common type of wired configuration. Most wired networks use Ethernet cables to transfer data between connected PCs. In a small wired network, a single router may be used to connect all the computers. Larger networks often involve multiple routers or switches that connect to each other. One of these devices typically connects to a cable modem, T1 line, or other type of Internet connection that provides Internet access to all devices connected to the network.

Wired may refer to peripheral devices as well. Since many keyboards and mice are now wireless, "wired" is often used to describe input devices that connect to a USB port. Peripherals such as monitors and external hard drives also use cables, but they are rarely called wired devices since wireless options are generally not available.

DEVELOPMENT:

The objective of this project which consists of high priority components of the Environmental Investment Program, is to put in place the policy and institutiional arrangements necessary to have physical planning, land use control, infrastructure investments and environmental protection managed in a coordinated and rational way. The project would also enable the government to take immediate remedial measures including selective investments to reverse

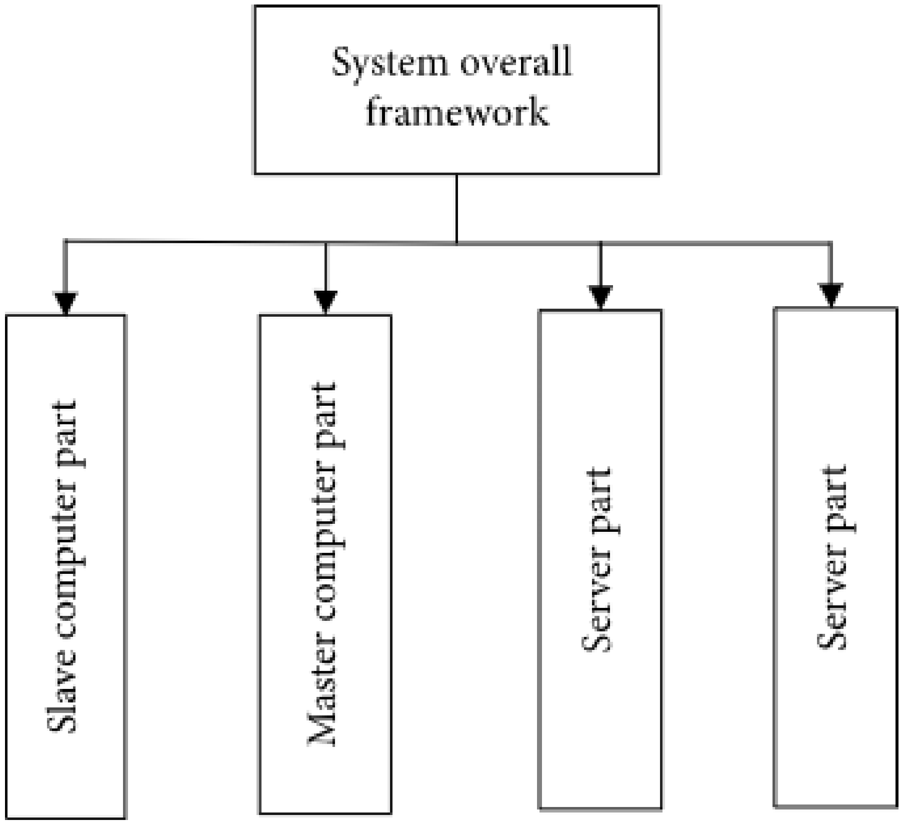
DEVELOPMENT ABSTRACT:

Wireless Sensor Network (WSN) is widely used in field environmental monitoring recently, because of its ease of use and being able to simplify the complexity installation in real application. Indonesia is an agricultural country with more than 16.5 million of farming land, most of the farming land is located in a rural area. The problems on the implementation of IoT-based environmental monitoring system in a rural area is the limited signal and energy. Accordingly, the objective of this study was to develop an Environmental Monitoring System based on LoRa in a rural area with the implementation of the Local Management Subsystem (LMS) and Global Management Subsystem (GMS) framework to optimize the existing development of the Environmental Monitoring System with focused on optimum distance by measuring the *RSSI*, signal strength and packet loss. The research was conducted in Bulaksumur Universitas Gadjah Mada, Yogyakarta, with four zones and various obstacles. As the result, Zone D with line of sight was the best result for getting the affordable distance for data transmission. This Zone can reach over 800 m distance with only 20% packet loss

Environmental monitoring uses tools that identify and analyze environmental conditions to assess the impact an activity has on the environment. There are five main types of environmental monitoring: air, soil, water, waste, and noise, all of which are vital in providing key information about the environment

CODE IMPLEMENTATION:

After analyzing the system requirements, an integrated communication method is adopted, including slave computer, master computer, server, and client. STM32 is used as the master controller, QT is used to design the human-machine interactive interface, and TCP network communication is adopted to realize the communication with the client, so that the master computer, server, and client have the function of observing the environment. The system framework is as shown in Figure



The slave computer of this system realizes data acquisition and transmits the data to the master computer through the wireless module. The master computer transmits the data to the server through the serial port, and the client obtains the server data through network communication. Various modules work in coordination to achieve real-time monitoring of the environment. This system mainly completes the design of the following four parts:

Slave computer part:

Slave computer part Temperature-humidity sensor module, photosensitive sensor module, smoke sensor module, and flame sensor module are used to collect data on surrounding environmental parameters

Master computer part:

Master computer part NRF24L01 wireless transmission module, digital tube module, and LCD screen module are adopted, which are connected to the slave computer through wireless technology to acquire data through wireless technology, so as to display these acquired data on the digital tube and LCD screen

Server part:

A computer is used as the server to realize communication with master computer through serial port. A QT interface is established to display environmental data and realize network communication with the client

Server part:

Client An Android phone is used as the client terminal to establish a client terminal display interface and implement network communication with the server.

This system will be applied in the wireless monitoring of the environment. It adopts the communication method integrating slave computer, master computer, server, and client so that users can monitor online through the client and PC to ensure the safe and high-quality production of the environment such as greenhouses and factories. This system is built on the basis of wireless, serial, and network communication, and various modules are interconnected through different communication methods to achieve human-computer interaction. Based on these functions, this system adds functional modules to the slave computer, such as temperature-humidity sensor, photosensitive sensor, smoke sensor, and flame sensor as well as NRF24L01 module to achieve real-time monitoring of the environment.

IOT DEVICE:

IoT devices are pieces of hardware, such as sensors, actuators, gadgets, appliances, or machines, that are programmed for certain applications and can transmit data over the internet or other networks.

Pretty much any physical object can be transformed into an IoT device if it can be connected to the internet to be controlled or communicate information.

A lightbulb that can be switched on using a smartphone app is an IoT device, as is a motion sensor or a smart thermostat in your office or a connected streetlight. An IoT device could be as fluffy as a child's toy or as serious as a driverless truck. Some larger objects may themselves be filled with many smaller IoT components, such as a jet engine that's now filled with thousands of sensors collecting and transmitting data back to make sure it is operating efficiently. At an even bigger scale, smart cities projects are filling entire regions with sensors to help us understand and control the environment.

The idea of adding sensors and intelligence to basic objects was discussed throughout the 1980s and 1990s (and there are arguably some much earlier ancestors), but apart from some early projects -- including an internet-connected vending machine -- progress was slow simply because the technology wasn't ready. Chips were too big and bulky and there was no way for objects to communicate effectively.

Processors that were cheap and power-frugal enough to be all but disposable were needed before it finally became cost-effective to connect up billions of devices. The adoption of RFID tags -- low-power chips that can communicate wirelessly -- solved some of this issue, along with the increasing availability of broadband internet and cellular and wireless networking. The adoption of IPv6 -- which, among other things, should provide enough IP addresses for every device the world (or indeed this galaxy) is ever likely to need -- was also a necessary step for the IoT to scale.

DATA SHARING PLATFORM:

Open data platforms allow different entities to register their datasets for public consumption; you only have to prepare and submit the data. The platform provides the infrastructure for storage and access. Anyone can access your data.

The term “data platform” refers to technology that is used for collecting and analyzing large amounts of structured and unstructured data for business purposes. Data platforms can be used for multiple purposes such as storage, management, analysis, processing, visualization, and sharing across an organization or company’s network infrastructure.

A data platform can be a single tool or application, or it can encompass multiple components — depending on the size of your team and the scope of your project. A larger organization may use multiple applications or tools to support their data science workflows. However, several vendors offer all-in-one data platforms as well.

A data platform can also be viewed as a service or product that is used to connect various types of large datasets. It can also be defined as a hosting solution where analytical queries are executed against a database. Data platforms are designed to enable the extraction of meaningful information from large datasets with the goal of improving business objectives.

Data platforms can be customized based on what kind of analysis needs to be done and what the company goals are.

Components of a Data Platform

Platforms are made out of layers. The data platform is no different. There are three main layers:

Data Infrastructure Layer - this layer is analogous to the hardware and the software that runs on top of the hardware that enables the storage, movement, transformation, and retrieval of data.

Data Science/Analytics Layer - this layer consists of a collection of tools and technologies that empower analysts and data scientists to explore and derive insights from data in an efficient manner.

If you’re like most companies, you have many different data systems. Your e-commerce team is running a CRM system, your marketing group has its own marketing automation software, and your customer service system generates yet another set of data. You might even have a machine learning or artificial intelligence system that adds to the pile.

Choosing the right Data Platform

Because of the robust needs of businesses and their reliance on consistent, well organized data, there are a plethora of data platforms in the market to address almost all of your needs. Choosing the right tool for you is dependent on the volume of data your organization works with, who's accessing your data, what you're using your data for, and what your data governance principles are.

Examples

Secoda offers several compelling reasons to use it as your data platform:

1. **Streamlined Data Workflows:** Secoda simplifies the development and management of data pipelines, making it easier and more efficient to work with data. This streamlining saves time and reduces the complexity of data engineering tasks.
2. **Enhanced Collaboration:** Secoda provides a centralized platform for data teams to collaborate effectively. It offers version control, documentation, and sharing features, promoting seamless teamwork and knowledge sharing among team members.
3. **Data Quality and Governance:** The platform includes data validation and cleaning features, ensuring data quality and reliability. It also offers robust security measures and auditing capabilities, helping organizations maintain data compliance and mitigate risks.
4. **Cost Efficiency:** Secoda's efficiency and collaboration features can lead to cost savings by reducing development and maintenance time, minimizing errors, and optimizing resource allocation within data teams.
5. **User-Friendly Interface:** Secoda's intuitive interface makes it accessible to a wide range of users, from data engineers to data analysts, reducing the learning curve and enabling quicker adoption.
6. **Scalability:** Secoda is designed to scale with your organization's growing data needs, ensuring that it can accommodate increased data volumes and complexity as your business expands.
7. **Flexibility:** Secoda supports a variety of data sources and integration options, providing flexibility in connecting to different data systems and platforms.
8. **Cloud-Native:** Being a cloud-native platform, Secoda seamlessly integrates with popular cloud providers, such as AWS, Azure, and Google Cloud, allowing organizations to leverage the power and scalability of the cloud.
9. **Data Documentation:** Secoda offers robust data documentation capabilities, making it easier to understand and manage data assets, which is essential for data governance and compliance.

In summary, Secoda enhances data engineering and data management processes by providing a user-friendly, collaborative, and efficient platform. It promotes data quality, governance, and cost-effectiveness, making it a valuable choice for organizations looking to maximize the potential of their data.

CONCLUSION:

Environmental monitoring is critical to the protection of human health and the environment. As the human population continues to increase, as industrial development and energy use continues to expand, and despite advances in pollution control, the continued production of pollution remains inevitable.

Air, land, and water pollution have an impact on all ecosystems and our lives and can jeopardize our future and future generations. The importance of policies on public awareness and perception is recognized and can have an effective role in the protection of the environment.