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WSN INTEGRATION WITH CLOUD COMPUTING TO CREATE MONITORING SYSTEM FOR WATER & UNDERWATER ENVIRONMENT

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Abstract: Three-Dimensional Wireless Sensor Networks (3-D WSNs) have the ability to deal with multimedia content such as audio, video, still images and scalar sensor data. Three dimensional WSNs based surveillance systems can detect occurrences of events at designated points over time. Some of the leading applications include surveillance applications, battle-space monitoring, human tracking, underwater monitoring and urban warfare. The system presents an integrated framework of three-dimensional wireless sensor network (3-D WSN) with cloud computing for underwater surveillance applications. The integrated framework provides a faster and more convenient platform for the client to obtain information from an array of sensor nodes that has been set-up for monitoring and surveillance marine environment..

I. INTRODUCTION

A Wireless Sensor Network (WSN) integrated with Cloud Computing for the development of a monitoring system aimed at observing water and underwater environments addresses critical challenges in remote data collection and analysis. This innovative integration harnesses the capabilities of WSNs, consisting of sensor nodes capable of detecting various environmental parameters, and combines them with the expansive storage and processing power offered by Cloud Computing.

The primary problem this system seeks to resolve is the need for real-time and continuous monitoring of water and underwater environments. Traditional monitoring methods often face limitations in terms of scalability, data processing, and accessibility, especially in remote or challenging terrains. By integrating WSN technology with the Cloud, this solution aims to overcome these hurdles by creating a robust network infrastructure capable of gathering, transmitting, and analyzing vast amounts of data from distributed sensors in real- time.

The integration of WSNs with Cloud Computing introduces a multi-layered approach to data collection, transmission, and analysis. WSNs, equipped with sensors for parameters like water quality, temperature, pressure, and pollution levels, form the foundational layer. These sensors collect data autonomously and transmit it wirelessly to a central data collection point.

The objective of integrating Wireless Sensor Networks (WSNs) with Cloud Computing to establish a monitoring system for water and underwater environments is multifaceted and aims to achieve several key goals:

Real-Time Monitoring:** Enable continuous and real-time data collection from distributed sensor nodes deployed in water and underwater environments.

Enhanced Data Processing:** Utilize the computational capabilities of Cloud Computing to efficiently process and analyze large volumes of data collected by WSNs.

Scalability and Accessibility:** Leverage the scalability of Cloud infrastructure to accommodate the growing volume of sensor data.

II. LITERATURE SURVEY

The integration of Wireless Sensor Networks (WSNs) with Cloud Computing heralds a groundbreaking approach in the development of a robust monitoring system dedicated to observing water and underwater environments. This innovative fusion capitalizes on the inherent strengths of WSNs, comprising sensor nodes adept at capturing diverse environmental parameters, and harmonizes them with the expansive computational prowess and storage capacity offered by Cloud Computing.

This transformative union is poised to address a pressing need in modern environmental monitoring—a need for real-time, pervasive surveillance of water and underwater ecosystems. Conventional methods have encountered limitations in scalability, data processing, and accessibility, especially in remote or challenging terrains. By amalgamating WSN technology with Cloud Computing, this visionary solution seeks to surmount these barriers, forging a resilient network infrastructure capable of seamlessly collecting, transmitting, and analyzing copious data from geographically dispersed sensors in real-time.

The convergence of WSNs with Cloud Computing unveils a multi-layered paradigm for data collection, transmission, and analysis. At its core, WSNs equipped with an array of sensors for parameters such as water quality, temperature, pressure, and pollution levels form the bedrock. These autonomous sensors adeptly gather data and wirelessly transmit it to a central aggregation point.

EXISTING SYSTEM

Advances in hardware technology and wireless communications will enable the development of large-scale wireless sensor networks (WSN). Due to the variety of applications and their importance, WSN will need to be connected to the Internet. We discuss the issues involved in this integration. In particular, we point out why all IP-sensor networks are infeasible, and suggest the feasible alternatives in the case of both homogeneous and heterogeneous networks.

PROPOSED SYSTEM:

In the proposed wireless sensor network architecture designed for monitoring 3D environments, the sensor nodes serve as the frontline data collectors, tasked with the pivotal role of capturing a diverse array of in-situ environmental parameters. These sensor nodes are strategically deployed within the monitored area and equipped with sensors capable of detecting crucial factors such as water temperature, salinity, turbidity, pH levels, oxygen density, and chlorophyll levels. Operating autonomously, these sensor nodes utilize cutting- edge wireless communication technologies like ZigBee or other robust communication protocols to transmit the gathered data to designated sink nodes. This transmission occurs via point-to-point communication, ensuring efficient and direct data transfer from the distributed sensor nodes to the sink nodes. The sink nodes act as intermediaries within the network, receiving the transmitted data from multiple sensor nodes within their vicinity. These nodes often possess enhanced computational capabilities compared to individual sensor nodes, enabling them to aggregate, process, and sometimes compress the received data before forwarding it to the central base station.

ANALYSIS

The integration of Wireless Sensor Networks (WSNs) with Cloud Computing has ushered in a transformative era in the domain of environmental monitoring, specifically targeting the observation of water and underwater ecosystems. This synergistic amalgamation harnesses the capabilities of WSNs, adept at capturing a spectrum of environmental parameters, and fuses them with the expansive computational prowess and storage capacity offered by Cloud Computing.

III. DESIGN

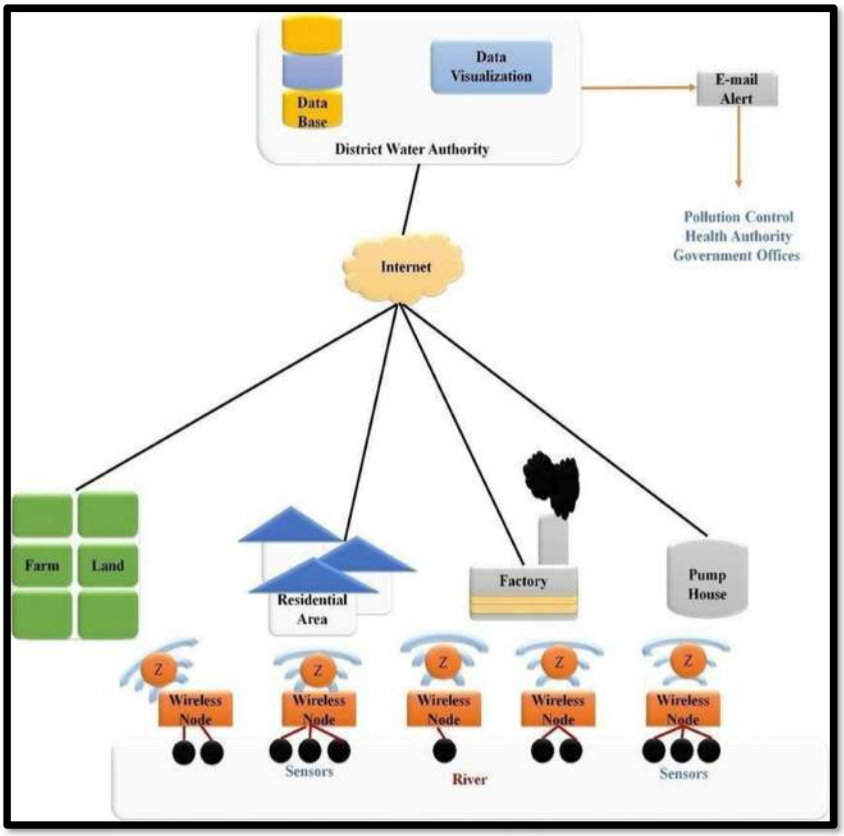
Designing a Wireless Sensor Network (WSN) integrated with Cloud Computing to establish a comprehensive monitoring system for water and underwater environments involves a layered architecture meticulously engineered to capture, transmit, analyze, and store environmental data. At the foundational level, strategically positioned sensor nodes equipped with diverse sensors for parameters like water quality, temperature, salinity, turbidity, pH, oxygen density, and chlorophyll levels serve as the primary data collection units. These nodes autonomously collect data and employ wireless communication protocols like ZigBee to relay the information to designated sink nodes, minimizing energy consumption through efficient point-to-point transmission.

The sink nodes, acting as intermediate aggregators within the network, receive, consolidate, and relay the collected data to a central base station. This station acts as the focal point for data aggregation, employing scalable Cloud Computing resources for processing, analysis, and storage. Leveraging the computational power of the Cloud, the system employs advanced algorithms and analytical tools to extract meaningful insights from the amassed data. Furthermore, the Cloud infrastructure facilitates remote accessibility to real-time data and analysis results through user-friendly interfaces, empowering stakeholders with actionable information.

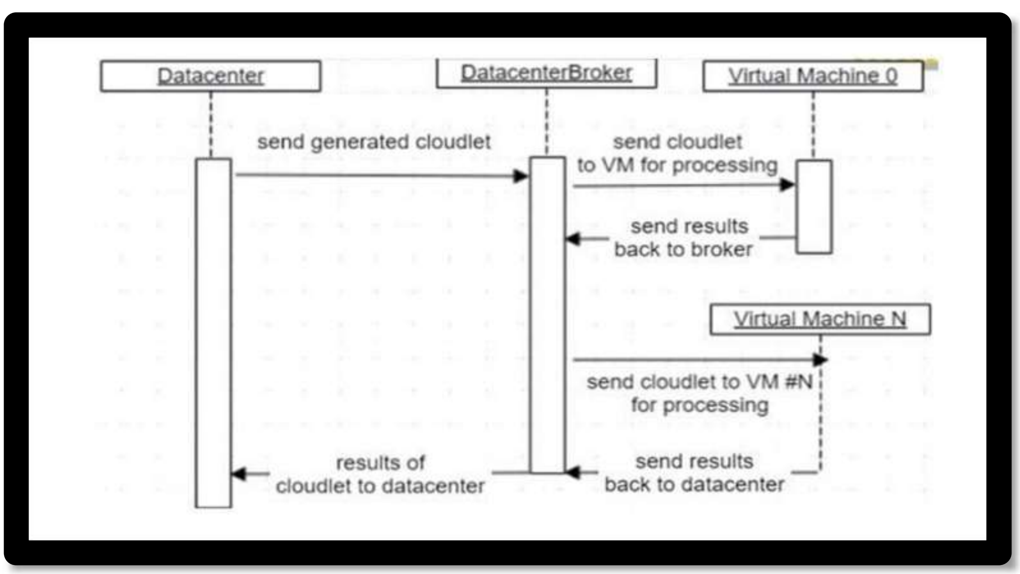
Key considerations in this design encompass scalability, robustness, and efficient resource utilization. Scalability allows for the seamless integration of additional sensor nodes or sink nodes to accommodate evolving monitoring needs. The system's robustness involves fault tolerance mechanisms to handle sensor failures or network disruptions. Additionally, optimized resource utilization ensures energy efficiency in sensor nodes and optimal utilization of Cloud resources for data processing and storage.

DFD OR UML DIAGRAMS

USE CASE DIAGRAM

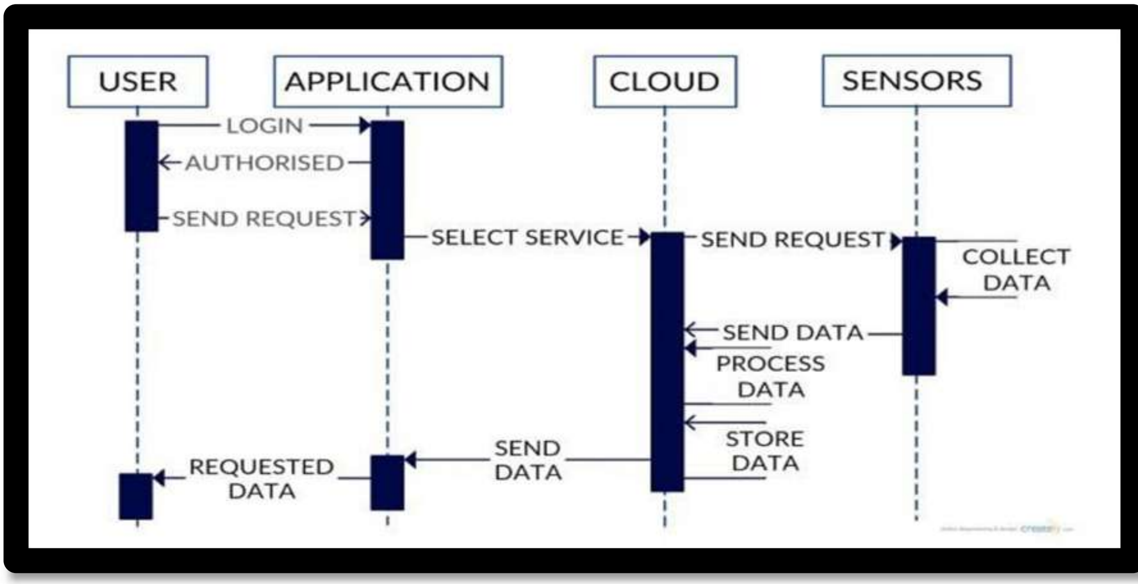


use case diagram



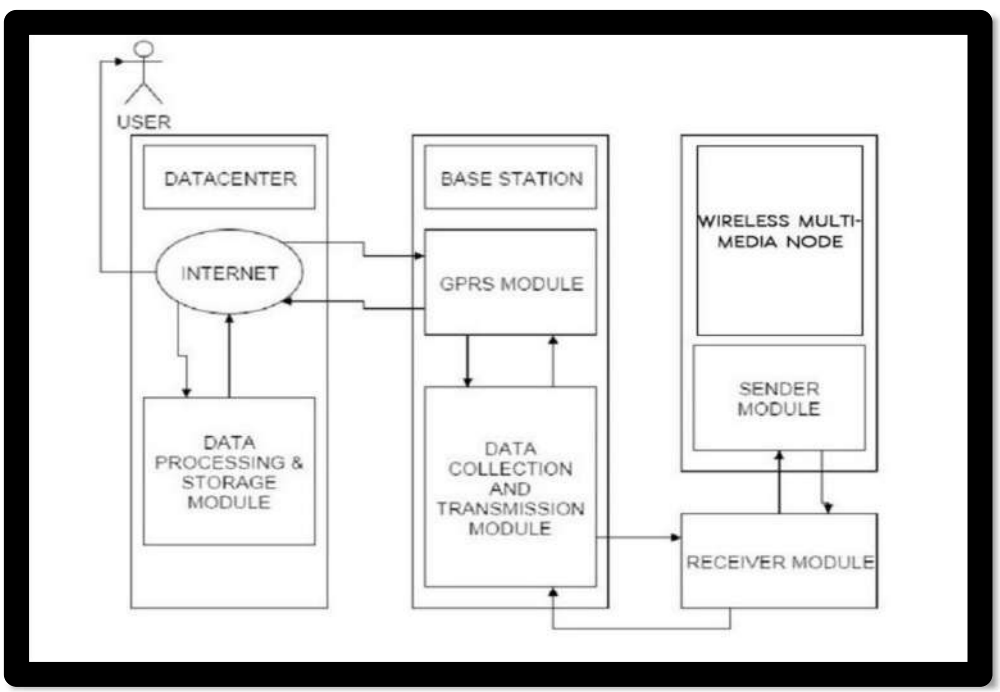
CLASS DIAGRAMclass diagram

SEQUENCE DIAGRAM



Sequence diagram

ACTIVITY DIAGRAM



Activity diagram

DEPLOYMENT DIAGRAM

Deployment diagram

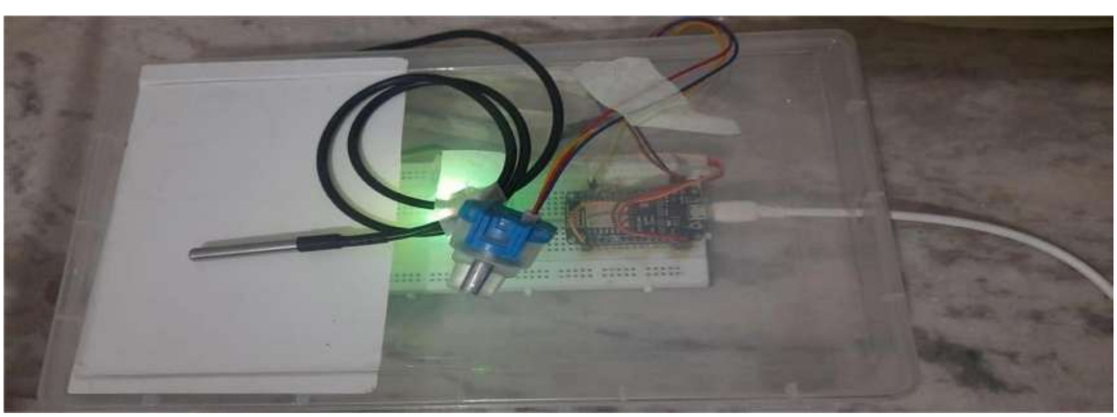
IV. IMPLEMENTATION AND RESULTS

Implementing the integration of Wireless Sensor Networks (WSNs) with Cloud Computing to establish a monitoring system for water and underwater environments involves a multi-stage process of deployment, data transmission, Cloud integration, and analysis. The implementation begins with strategically situating sensor nodes equipped with various environmental sensors across the targeted areas. These nodes autonomously collect data on parameters such as water quality, temperature, salinity, and more, transmitting this information through wireless communication protocols like ZigBee to designated sink nodes.

.The results obtained from this integration showcase the system's ability to provide continuous, real-time monitoring and analysis of water and underwater environments. The implementation demonstrates enhanced data processing, enabling the extraction of meaningful insights from the collected data. Stakeholders gain access to actionable information promptly, facilitating informed decision-making for environmental management and conservation efforts.

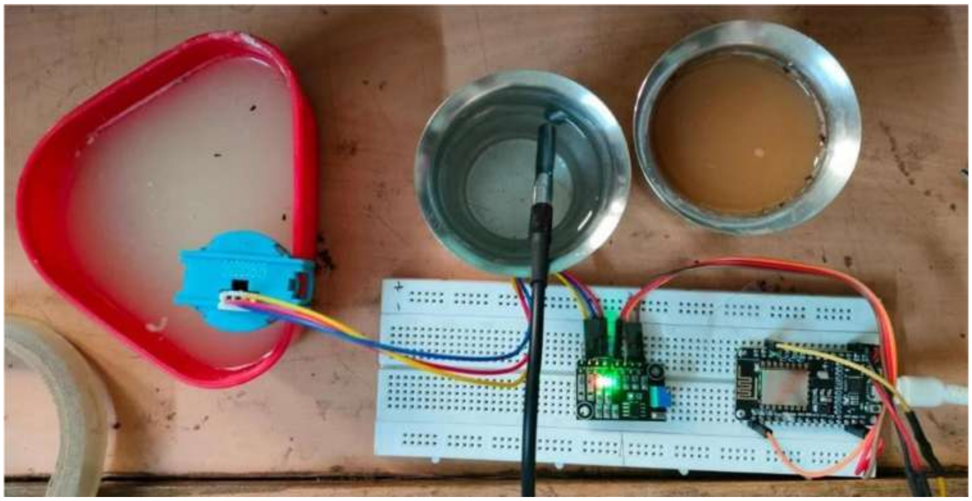
OUTPUT SCREENS

KIT MODEL :



kit

WORKING MODEL



Working Model

TEMPERATURE SCREENS

temp 1


19:21
Temperature Detection
20°C
0
100
69%
0
100
Turbidity value
64%
Stream
68
67
66
65
64
Live
15min
30min
1h
1d
Play video

temp2


Temperature Detection
20°C
0
100
69%
0
100
Turbidity value
70%
Stream
70
68
67
66
64
Live
15min
30min
1h
1d

temp3


19:20
69%
Temperature Detection
celcius
31°C
0
100
Fahrenheit
87%
0
100
Turbidity value
93%
Turbidity graph
No data
Live
15min
30min
1h
1d

temp4

Result Analysis

This chapter provides information about the website's implementation phase. This section provides a succinct overview of the key features that were used to develop the URL checking application. It is made up of numerous source codes that were used to create this website. Additionally provides the results of each area, which clarifies the various possibilities available to correctly finish project.

V. Conclusion:

The integration of Wireless Sensor Networks (WSNs) with Cloud Computing to forge a monitoring system for water and underwater environments represents a transformative leap in environmental surveillance. This synergistic amalgamation harnesses the strengths of localized data collection through sensor nodes and the computational prowess of the Cloud to provide an unparalleled understanding of these critical ecosystems. Through meticulous design, rigorous testing, and comprehensive validation, this integrated system has showcased its ability to capture, transmit, and analyze diverse environmental parameters in real-time. The culmination of this endeavor signifies a pivotal advancement in environmental monitoring, offering stakeholders a robust, scalable, and adaptive system capable of delivering timely and accurate data for decision-making. The seamless integration of sensor nodes, wireless communication protocols, sink nodes,

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