Hydrel- A Water and Electricity Tracker

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Abstract- Hydrel is an innovative project developed for the crucial need of efficient management and conservation of two vital resources-Water and Electricity. In a growing era of environmental consciousness and resource depletion, effective management of water and electricity is paramount. By realizing the urgent need for the solutions to maintain the environmental sustainability by monitoring the usage and optimize its consumption. Hydrel offers a user-friendly platform equipped with advanced tracking mechanisms to monitor the usage of water and electricity in real-time. By keeping pace with the advancement in technology, integrating Cloud environment and necessary smart algorithms, Hydrel provides clear cut idea to the users regarding the wastage, detecting leaks, and optimize the consumption patterns. Through its customizable features and accessible interface, Hydrel empowers people and organizations to make pre-informed decisions, leading to significant reduction in unwanted usage and wastage of the precious life sustaining resources without which life will be difficult. The objective of Hydrel is to make every individual contribute to sustainable living practices. Hydrel is an initiative project to conserve vital resources, priorly to reduce consumption and manage its usage, cost savings, and to create a positive impact in the environment.

Keywords: Hydrel; Water tracker; Electricity tracker; efficient tracking; Consumption units; Electric meter; Water meter; IoT (Internet of Things); Cloud-based platforms; eco-friendly interface; innovative; life sustaining; sustainable life practices; sustainable development; conservation; vital resources; water; electricity; management; database; encrypted data; decrypted data; safe transfer route; TLS(Transport Layer Security); SSL(Software Security Layer); global level; sensors; internet connectivity; network availability; remote areas; commercial areas; urban regions; comprehensive; solution; tracker; manage use; easy-to-use; future scope; future challenges; proposed methods; existing methods; advantages; disadvantages; modules of implementation; software used; demerits; merits; less-traffic route; access data; manipulate data; data breach; data theft.

INTRODUCTION

Hydrel is a comprehensive project aimed at monitoring and optimizing the electricity and water consumption in residential, commercial, and industrial settings. This tracker provides real-time analysis of data and recommendations for efficient usage of water and electricity. This is a highly sophisticated project designed to revolutionize the and water consumption in residential, commercial, and industrial settings. This tracker centralized database server, facilitating a unconventional analysis and reporting the connected to internet and cloud-based platform, the consumption units it records.

Due to this facility, the system captures the usage units in real-time, ensuring reliability Hydrel is a comprehensive project aimed at monitoring and optimizing the electricity management practices across the consumption behavior of electricity and water. With patterns and store it for data analysis. Since the electric meter and water meter are provides real-time analysis of data and recommendations for efficient usage of water the internet connectivity could be easily accessed by our server to track their usage the seamless integration with advanced technology, the places available with will be sent to cloud, where it can be processed and accessed by the central server. Due to this facility, the system captures the usage units in real-time, ensuring reliability and accuracy to the users. All the usage information is securely stored in the centralized database server, facilitating a unconventional analysis and reporting the activities and functionalities This modern approach enables

users to monitor and optimize consumption of water and electricity. This makes individuals to contribute effortlessly, regardless of their location and position, to contribute not only to the nation but on a global scale. This initiative fosters sustainable use of resources among people from different backgrounds to contribute globally. Furthermore, by promoting resource efficiency, our tracker contributes to broader societal goals with aim to preserve and conserve ecosystems.

This pioneering solution is to empower users to identify their inefficiencies and enhance usage for significant cost savings and environmental benefits. Through this approach, our tracker provides an improved view of resource utilization, enabling and fostering a sustained lifestyle. This tracker represents a transformative step towards a more interconnected future, where the link between the electricity and water management emphasizes meaningful progress towards a better word for all and evolved resource management and efficiency on a global level.

PERFORMED ANALYSIS OF EXISTING METHODOLOGY

1. Introduction to model

The available water and electricity trackers have different design and functionality, but they involve sensors, data collecting meters fixed to the main board and wired connections to calculate the consumption units. A wide range of used technology monitors water usage and electricity usage separately which are discussed below.

2. Flume Smart Water Monitor

This a device developed for attaching to the water meter to provide real-time water usage data to a smartphone app. It detects leaks and abnormal water usage patterns, helping users to conserve water and save on bills.

3. Phyn Plus Smart Water Assistant

This is a smart water monitor uses pressure-sensing technology to detect leaks. It also monitors the real-time usage of water and offers insights into water consumption patterns. It helps users to identify problems and help to reach out the potential plumbing needs that have to be taken care of.

4. Stream labs Smart Home Water Monitor

This uses installation on the main water line connecting houses. It monitors the water usage, detects the leaks, and provide insights into water consumption patterns and help users identify potential plumbing issues.

5. Sense Energy Monitor

It works on the basis of device installation fixed on electrical panel. Sensors are attached to it Which monitors the electrical consumption of individual devices by analyzing their unique Electrical signatures. It provides detailed message of energy consumption of devices and Identifies opportunities for savings.

6. Neurio Home Energy Monitor

This is a monitoring device that supervises the energy usage in real-time. It provides data related to consumption units, cost of bill, etc. It helps users to make decisions to reduce usage as cost of billing is increasing and crossing limit.

DEMERITS AND DISADVANTAGES

- Cost of setting up a new sensor installed electric meter and water meter cannot be affordable by every individual. Even cost of setting up the tracker is more expensive making them inaccessible to the people living under certain demographic regions.
- Accuracy of the measurement of consumption units may vary depending on the quality of and design of the tracker. Due to this, inaccurate readings may arise which may lead to incorrect assumption of usage patterns leading to user's disintegration from the application use.
- Since trackers are reliant on Wi-Fi or Bluetooth, users may experience an ambiguity in connecting to the application interface designed as other devices nearby interfere while indulging in connection to the server leading to inefficient data gaps.
- The insights provided by the tracker may not create much impact on the users regarding the conservation and limited usage of water and electricity. They have many limitations regarding the reactivity towards the insight, they produce.

- Users also have issues regarding privacy concerns, especially when the details are regarding the personal details, as details are not travelled along encrypted data transfer route. This may lead to illegal data access by unauthorized servers creating threat to the users.
- The application used for the tracking electricity and water usage differs due to which people not indulge in using any of these apps to involved in conservative use of these resources.

RESEARCH ON THE PROPOSED METHODOLOGY

Hydrel-A Efficient Water and Electricity Tracker-
This is a comprehensive project developed based on an initiative to integrate both water and electricity trackers to facilitate easy use among users from different background with a culminating effect to integrate communities globally. It aims to make people to save two vital resources among many that is electricity and water. To manage the problem of electricity and water scarcity prevailing in different parts of world and to make people indulge in an act of maintaining sustainable living practices.

Layout of Dashboard interface-
This tracker has a customizable feature of users accessing their consumption data and analytics through a database interface, which will notify the users regarding their usage patterns and trends. This is to make users understand that the data stored in their device is the basis for analysis of the consumption units.

Consumption Alerts and Notification-
Hydrel can send alerts and notifications to users in case of abnormal usage patterns or potential leaks when observed. Also, notifications are given compulsorily as warning message but silently until the notifications to send messages to users is enable in settings

Data Encryption-
This is a built-in facility provided to all the users who have registered their personal information on this tracker site. All the data transmitted between the meters and the central server are encrypted to prevent unauthorized access or data breach. The latest encryption techniques such as SSL (Software Socket Layer) and TLS (Transport Layer Security) to ensure that even the data if accessed will still remain illegible to the unauthorized parties.
Hydrel employs a highly configured data transfer route, ensuring that the data transmission between the meters and the cloud server occur through the secure channels. By utilizing encryption protocols, it protects from the tampering or interference of data during transit.

Access controlled mechanisms-
Hydrel implements the robust access control mechanisms to restrict data access to the sensitive data of user. A role-based access control ensures that only the authorized personnel or the systems have permission to modify or view the consumption data records, reducing the risk of data corruption.

Data integrity checks-
Hydrel performs regular data integrity checks to detect the presence of anomalies or discrepancies in the consumption of the data. By verifying the integrity of the data at the various stages of transmission and processing, Hydrel mitigates the risks of data corruption or manipulation.

Compliance with the Data Privacy Regulations-
Hydrel adheres with the relevant data privacy regulations and standards to safeguard user's policy and data security. In accordance with the strict guidelines, Hydrel strictly complies with the legal requirements reducing the task of regulatory violations and penalties.

Continuous Monitoring and Auditing-
Hydrel implements the continuous monitoring and auditing processes to track data access and usage. By monitoring the activities of the user and system interactions, the tracker can detect and respond to the suspicious behavior or unauthorized access attempts when observed. This is an effort taken for the minimizing the risks of data theft.

Transparency Privacy Policies-
Hydrel maintains transparent privacy policies that clearly outline how user data is collected, processed, protected and tabulated. By, providing the clarity to the users regarding the data handling techniques and

practices, so that Hydrel can foster trust and confidence among its users, enhancing the quality and overall satisfaction from users.

SOME IMPORTANT SOFTWARE USED AND ITS DESCRIPTION

1. SSL (SOFTWARE SOCKET LAYER)

Secure Sockets Layer (SSL) is a deprecated predecessor to TLS, used for secure communication over a network, typically the internet. It encrypts data transmitted between a client and server, ensuring confidentiality and integrity. SSL operates at the transport layer, securing protocols like HTTP, FTP, and SMTP. It employs a handshake process to establish a secure connection, authenticating the server's identity through digital certificates. SSL provided a foundation for secure online transactions and communication; it's now considered obsolete due to vulnerabilities.

2. TLS (TRANSPORT LAYER SECURITY)

Transport Layer Security (TLS) is a cryptographic protocol that ensures secure communication over a network, commonly the internet. TLS encrypts data sent between a client and a server preventing unauthorized interception or tampering. The TLS handshake is a crucial initial step, where the client and server exchange necessary information and agree on encryption parameters. There is verification process ensuring clients that they are communicating with legitimate servers and not impostors.

Overall, TLS provides confidentiality, integrity, and authenticity in communication, crucial for secure online transactions, data exchange, and user privacy. It's an essential component of internet security, ensuring that sensitive information remains protected from unauthorized access or modification

3. HTML (HYPER TEXT MARKUP LANGUAGE)

HTML, or Hypertext Markup Language, is the standard markup language for creating web pages and web applications. It defines the structure and layout of content using tags and attributes. HTML documents are interpreted by web browsers to display text, images, links, and multimedia content on the internet. It is a collection of markup icons or symbols or codes inserted in a file for intended display of content on webpage by creating a website layout based on preferrable templates and wireframes. It is a semantic language used to control the format of displaying the information on websites and structure the content. This helps users to navigate and interact with webpages easily.

4. CSS (CASCADING STYLE SHEETS)

CSS, or Cascading Style Sheets, is a styling language used to control the presentation and layout of HTML documents. It enables web developers to define colors, fonts, spacing, and other visual aspects of web pages. CSS rules cascade, allowing for consistent and customizable design across multiple web pages. It is a computer language used for laying out and structuring webpages using HTML (Hyper Text Markup Language) or XML (Extensible Markup Language) language. This defines styles for our webpages which includes design, variations, orientations and layout on displaying on various platforms.

5. PHP (HYPERTEXT PREPROCESSOR)

PHP is a server-side scripting language used for web development. It allows developers to create dynamic web pages and applications by embedding PHP code within HTML. PHP can interact with databases, manage sessions, handle forms, and perform various server-side tasks, making it a versatile tool for building interactive websites.

6. JS (JAVASCRIPT)

JavaScript (JS) is a versatile scripting language primarily used for web development. It enables dynamic and interactive features on web pages, such as user interaction, content updates, and form validation. JS runs on the client-side, executing within web browsers, and can also be used on server-side platforms like Node.js for backend development.

7. MYSQL (MY STRUCTURED QUERY LANGUAGE)

MySQL is an open-source relational database management system (RDBMS) renowned for its reliability, scalability, and performance. It employs Structured Query Language (SQL) for managing data stored in tables. MySQL is widely used in web

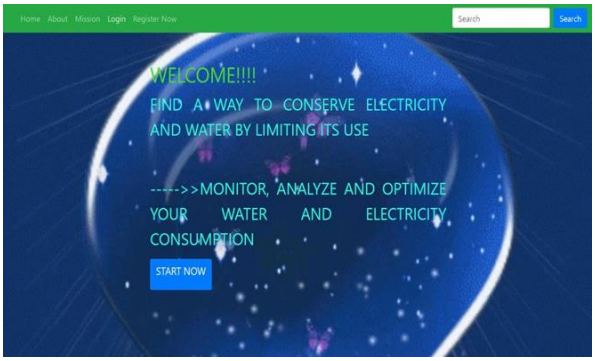
applications for data storage and retrieval, powering dynamic content and user interactions. It ensures data integrity and transactional reliability. MySQL offers features like replication, clustering, and high availability configurations, making it suitable for a range of applications from small-scale websites to enterprise-level systems.

RESULTS AND DISCUSSION

Home Page:

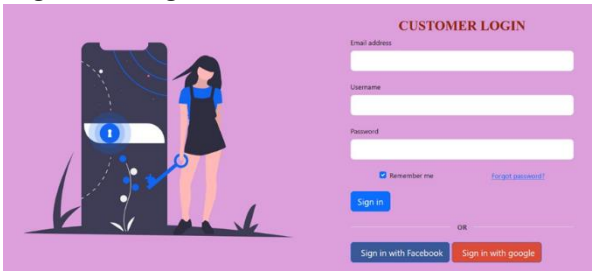
This is our welcome page for our innovative water and electricity tracker app, which greets people for taking part in our mission towards conservation of valuable resources and for progressing nation towards sustainable development.

User First time Approach Page:



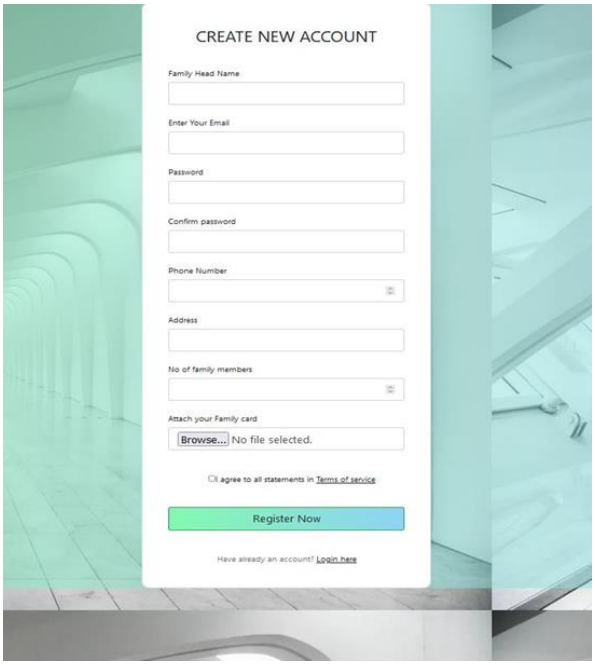
This page is to provide a new account by getting users details from the users. This will generate login credentials for the users when needed to log in at a different place to check consumption unit. It is designed in such a way that when the page is not active it will automatically get logged out from the other device when not in use due to security policies.

Registration Page:



This to Welcome personnels to the registration page for Hydrel to make users register in this form to get connected to our application features. This form is to be filled by agreeing to all the privacy terms and conditions to make users aware of the policies and get started here.

Dashboard Page:



This page is to be designed for showing the details of their consumption units of electricity and water to the users. This includes the tabs like settings, alerts and notifications, status of electric meter configuration, status of water meter configuration, profile details, water consumption level and electricity consumption level analyzed in line graph, pie chart and bar graphs. Also, by setting the calendar to any month after setting up to use this application, to check the consumption units and bill calculated accordingly to tally the growth or reduction of the usage. The advantage of goal setting by reducing the consumption based on previous month statistic report generated. This is to make people move towards a goal of sustainable management practices to conserve nature for a better tomorrow in the world.

Configuring to the Cloud-Platform:

Configuring electric and water meters to connect to a cloud platform for communication with central servers to store the tracked consumption units involves several steps. Here's a general outline of the process:

1. To Select a Cloud Platform:

Choose a cloud platform that supports IoT (Internet of Things) applications and provides the necessary infrastructure for data collection, storage, and analysis.

Some popular choices include Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP), and IBM Cloud.

2. Installing an IoT Hardware:
To install IoT hardware or sensors on each electric and water meter to collect data such as consumption readings, meter status, and other relevant information. This hardware may include communication modules like Wi-Fi, Bluetooth, Zigbee, or cellular connectivity, depending on the specific requirements and available infrastructure.

3. Development of a Firmware:
To develop firmware or software for the IoT hardware to collect data from the meters and transmit it to the cloud platform securely. This software should handle tasks such as data encryption, authentication, and error handling to ensure the integrity and confidentiality of the transmitted data.

4. Implementing Communication Protocols:
To implement communication protocols between the IoT devices and the cloud platform. This may involve using standard protocols like MQTT (Message Queuing Telemetry Transport), HTTP (Hypertext Transfer Protocol), or CoAP (Constrained Application Protocol) to facilitate data exchange over the internet.

5. Setting Up Cloud Infrastructure:
To set up the necessary infrastructure on the selected cloud platform to receive, store, and process the data transmitted by the IoT devices. This typically involves creating data pipelines, databases, and computing resources such as virtual machines or containers to handle data ingestion and analysis.

6. Configuring for Data Processing:
To Configure data processing pipelines on the cloud platform to clean, aggregate, and analyze the incoming meter data in real-time or batch mode. This may include tasks such as anomaly detection, forecasting, and generating insights to optimize resource usage and improve operational efficiency.

7. Steps to ensure Security and Compliance:
To implement security measures to protect the data transmitted between the meters and the cloud platform, including encryption, access control, and regular security audits. Additionally, ensure compliance with relevant regulations and standards governing data privacy and security in your industry or region.

8. Continuous Monitoring and Managing:
To set up monitoring and management tools to track the performance and health of the IoT devices, cloud infrastructure, and data processing pipelines. This allows you to identify and address any issues or anomalies promptly, ensuring the reliable operation of the system.

9. Integrating with Central Servers:
To integrate the cloud platform with the central servers or backend systems used for billing, reporting, and administrative purposes. This enables seamless data exchange between the metering infrastructure and other enterprise systems, facilitating activities such as billing reconciliation and customer support.

10. Testing and Debugging:
Thoroughly testing the configured system in a controlled environment to validate its functionality, performance, and reliability. Once testing is complete, deploy the solution in production, and monitor its operation closely to ensure optimal performance and customer satisfaction.
By following these steps, you can effectively configure electric and water meters to connect to a cloud platform and communicate with central servers, enabling efficient management and analysis of metering data for various applications.

CONCLUSION AND FUTURE SCOPE

Conclusion

In conclusion, Hydrel offers a comprehensive solution for tracking electricity and water consumption, ensuring safety and efficiency. Through cloud-interfaces, users can securely access real-time data, fostering a sense of satisfaction and control over their usage. By prioritizing their needs, they will also adapt to lifestyle that involves sustainable practices. Hydrel not only focuses on giving importance to the user's need but also empowers individuals to monitor their consumption by making them to contribute to a sustainable development across the globe. This is an innovative and efficient solution to manage utility

consumption. This involves clear and precise utility records which involves detailed analysis of the data captured through cloud-based interface. It coordinates all the actions without disturbing the user-friendly interfaces. With real-time tracking, detailed consumption reports, personalized tips for conservations, Hydrel not only enhances awareness but also drives actionable insights. As we move forward, continuous improvements and user feedback will be pivotal in refining our tracker's future and expand its impact. Together we can make a significant contribution to environmental conservation, resource management and sustainable development.

FUTURE SCOPE

Looking ahead, Hydrel can explore several future scopes to align with both present and future goals. Expanding its features to include predictive analysis would help users to anticipate consumption patterns and optimize resources further. Integration with smart home systems can enhance the productivity to a greater extent by enabling automated adjustments based on the consumed units. Moreover, partnerships with Municipalities can enhance greater adoption and supportive initiatives for improving and promoting to a greater extent of sustainable learning. Continual innovations in Hydrel's relevance and effectiveness in meeting and evolving consumers' needs and environmental challenges.

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