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Dynamic Environment Monitoring and Alerting System in WSN

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Abstract - *Advantage of the data gathering capability in wireless sensor networks (WSNs) and the data storage ability in mobile cloud computing (MCC) are integrated in this paper. In the real world, no system is developed to monitor the environmental conditions and providing alert for the system. It describes the environmental monitoring dynamically and alerting to the specific system using wireless sensor network and mobile cloud computing. The sensors are used for sensing the environmental conditions. These sensory data would be collected, managed and observed frequently. The data traffic monitoring, data filtering, data prediction, and data compression are performed in the WSN gateway. The deviation would be detected and the particular data are updated to the authority through smart phones. In this developed system, notify the irregularity of the environment automatically.*

Keywords: Mobile Cloud Computing (MCC), wireless sensor networks (WSNs), ECC, RSA.

I. INTRODUCTION

1.1. Wireless Sensor Networks

Wireless Sensor network is the network, consist of collection of sensor nodes, sink node and sensor field. Wireless networks use some sort of radio frequencies in air to transmit and receive data instead of using physical cables [9]. The most positive information in these networks is that it reducing the need for laying out expensive cables and maintenance costs. The positioning of the nodes is set up based on the requirement. Accordingly the network protocol and algorithm is used in the closed system [2]. Each sensor node has micro controller, storage memory, transceiver, ADC and power supply for gathering and processing the data. These sensor nodes are randomly distributed in the sensor field. Instead of raw data, the sensor nodes send the partially processed data while transmits to other connected nodes and route the data back to the sink node and end user.

The topology of the network keeps changing and supports point to point communications. WSN have numerous advantages to provide important applications such as health monitoring, industrial process monitoring, traffic monitoring, military & security and home automation. WSN is the widespread reality concept with additional advantages such as low power, low cost, less cable, efficient monitoring, flexibility and resource constrained.

1.2. Mobile Cloud Computing

Mobile cloud computing is the sharing of knowledge which employed in the mutual grouping which allow accessing the number of services in the cloud [4]. Cloud computing has many resources such as application, network, storage, process and services which are used over the internet. It reduces the usage of resource, rack space, and power. The important feature of MCC are lower operating cost, virtualization, high scalability, low maintenance cost, service oriented and no open investment. To avoid the drawbacks of mobile computing (i.e. battery and storage) integrating the cloud computing platform. The concept of MCC is wide spread application topic which perform both the storing and the communication in the same time. MCC helps to communicate the data anywhere at any time. It also supports the interaction environment to the user from the devices. The main advantage of MCC is simple and flexible.

1.3. Integration of WSNs and MCC

The integration of WSN and MCC provides the robust and scalability for many applications. The processing capacity of MCC and the data gathering of WSN is the major factor of integration. Due to the increasing demand of Wireless sensor network and the support of mobile cloud useful for a number services. WSN help us to collect the humidity, traffic, temperature. The sensory data are stored in the cloud and processed further it is transferred to the mobile users based on the requirement [8].

Initially the sensor node in the WSN cluster gathers the sensory data and it pass to the sensory gateway. The sensory data process the data using the five components: 1) Traffic monitoring; 2) Filtering; 3) Predicting; 4) Compression and decompression; 5) Encryption and decryption. The processed sensory data is transferred to the Cloud gateway which sends to the Smartphone users based on the request [10]. In this request and response scenario the data compression and decompression, data encryption and decryption takes place. The integrated concept helps to communicate the data in the efficient manner.

II. ARCHITECTURE

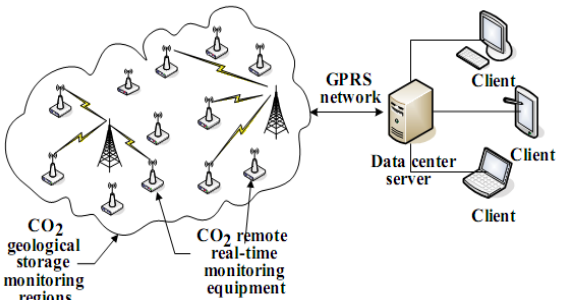

Figure-1: Integration of WSN-MCC

The main idea is to utilize the powerful CC platform to store and process the sensory data such as humidity, temperature, and traffic and then further offer these processed sensory data to the mobile users. The sensing physical parameters are gas, pressure, humidity, light and temperature. The single node performs processing, sensing and communicating. Initially the data are gathered and processed which is stored in the data center. In the sensor field, the nodes are organized properly and communicate the data to the cluster head.

The head of the cluster only send the data to the respective base station. Next to that, the processed sensory data is transferred to the mobile users on the demand. The figure-1 indicates the integration of WSN-MCC to utilize the powerful CC platform to store and process the sensory data (e.g., humidity, temperature, and traffic). These concepts offer the resource sharing at any time anywhere and also provide the continuous update. In order to enhance the security the algorithms are used. When the client (Mobile user) sends the request to the server, it responds the decrypted data which is stored in the cloud.

III. PROPOSED SYSTEM

At present there is no system to auto monitor the gas leakage in the storage areas. It's fully manual checking so possibilities of the human error. The goal of using WSN-MCC is to automate the monitoring of environment and sharing the alert to the authority. After the data processing, for encryption and decryption in WSN gateway RSA algorithm is used which has long key length and, computation cost will be high. Instead of RSA, using ECC to encrypting and decrypting the data that has very short and difficult to find the key. If any abnormality detected by any sensor that alert information will be update in the computer. Using GPRS we can identify the location of that place. The information will update using the GSM modem. So we can monitor the status at anywhere. The buzzer will be invoking about the abnormality in the place and the monitored status will be display in LCD. These all data can be viewed through mobile Cloud.

IV. ALGORITHM

ECC stands for Elliptic Curve Cryptography which has small size of key with less level of security. The main advantages of ECC are faster computation and procure only low space for storage. This algorithm is recommended for secure deployment in real time application.

The Signature Algorithm as follows [11]:

For signing a message m by client A, using A's private key d_A and public key $Q_A = d_A * G$

1. Calculate e = HASH (m), where HASH is a cryptographic hash function, such as

SHA-1

2. Select a random integer k from [1,n – 1]

3. Calculate $r = x_1 \pmod n$, where $(x_1, y_1) = k * G$. If r = 0, go to step 2

4. Calculate $s = k^{-1}(e + d_A r) \pmod n$. If s = 0, go to step 2

5. The signature is the pair (r, s)

ECC use the parameter for Elliptic curve domain over field Fp such as p, a, b, G, n and h and over F2 such as m, f(x), a, b, G, n and h. The m is the finite field of integer length, points on the elliptic curve for the cryptosystem secure. This curve lies in the range of 113 to 571bits.

Working Mechanism:

The system has sensors such as Temperature, humidity and gas sensor. With the help of sensory nodes, the data are collected together and transmit to the server end. The cloud is already stored with the fixed limit of values for each sensor. Each Sensor's data are monitored with the values in the server [3]. In the monitoring process, the server monitors each sensor's value. If the values are not in the limit, then an alert message will be sent to the authority. If the values are in the limit, then the reports about the sensors are sent to the authority.

V. CONCLUSION

The integration of WSNs and MCC is a very timely and important research topic. Enhancing the security on the sensory data processing aspect in integrated WSN–MCC, in this paper, we have proposed the auto monitoring environmental condition and notifying the authority to avoid the accidents. The transmission of desirable sensory data to mobile users in fast, reliable, and secure manner. Specially, data traffic monitoring, filtering, prediction, encryption & decryption, compression and decompression capabilities are incorporated in the sensor gateway and the cloud gateway. The large processing capacity of the cloud is exploited to provide data recommendation capability. Data encryption and decryption techniques are applied in the cloud, mobile devices, and sensor and cloud gateways to enhance capacity.

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