Monitoring Wireless Sensor Network using Android based Smart Phone Application

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Abstract: *Wireless Sensor Network application's is use in detection of natural calamities like forest fire detection, flood detection, , earth quick early detection ,snow detection, traffic congestion and various other applications. However still it fails to provide dynamism in detection of sensing data. Centralized Computing is a profitable extension of computing resources which offer scalable resources to its users over the communication network. It work as software and provides data access and storage services which don't need the information of the end users physical location and the systems configuration that provides the computing resources. Android based Smart phone application, integration of all this technologies makes the availability of data dynamically at mobile phone on one click.*
Keywords: *Wireless Sensor Network, sensor mote, Centralized Computing, Android.*

I. INTRODUCTION

Existing processes for gathering data from wireless sensor network require a great deal of work that requires large amount laborious and manual work. Collecting data from sensor node requires dealing with hard complexity of network in wireless sensor network. Wireless sensor networks are applied to field where a human cannot reach like in dense forest to detect fire, flood sensitive where a person cannot sit for long to determine the level of water. So, deployment of sensors in such places makes it easier to get data from such remote places which are unreachable from human. Wireless sensor network also gives application in GPS detection of user position according to longitudinal latitude data provided by the satellites.

Objective of the project is to gather information from sensor network using tinydb store it onto base station or gateway and by making it available to centralized environment makes it easily accessible to android phone through a simple application. By doing this, the information at the remote place can be gathered easily and also natural disasters like flood and fire can be detected very easily from centralized server through android application.

A. Wireless Sensor Network

A wireless sensor network consists of spatially circulated autonomous sensors to monitor changes on physical or environmental conditions, such as temperature, sound, pressure, vibration etc. and to cooperatively pass sense data through the network to a main location. The WSN is collection of "nodes"[6]. Each type of WSN contains a few number of nodes or hundreds or even thousands, where each node is connected to one or sometimes several sensors [1]. Each such sensor network node has multiple components: a radio transceiver with an internal which perform functionality of transmit the data and receive the data, a microcontroller is use to control the other component, an electronic circuit for interfacing with the sensors and a power source used to providing energy for communication, usually a battery or an embedded form of energy harvesting. The variation in topology of WSNs can be from a simple star network to an advanced multi-hop wireless mesh network. Routing of flooding could be the propagation technique b/w the hops of the network [10].

There are several applications that can be approached through the use of sensor networks and nodes. The applications are as follows:

- Flexible management of lighting, heating, and cooling systems from anywhere in the home by Sensing applications facilitate
- Sensing applications allow one to configure and run multiple systems from a single remote control.
- The reception of automatic notification upon detection of unusual events, facilitate by sensing applications.
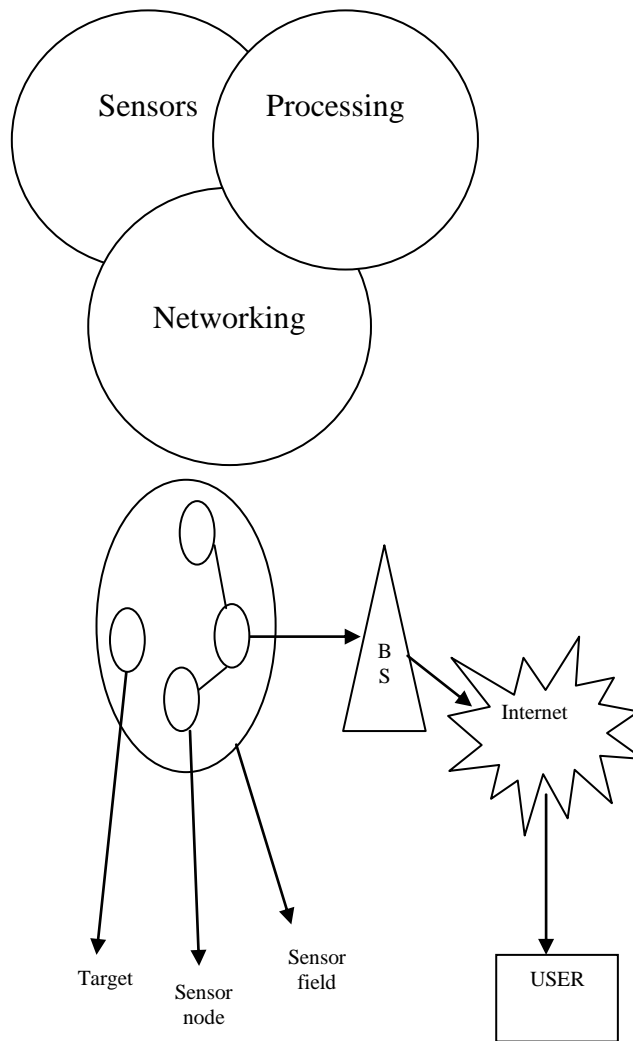
B.Wireless Sensor Network Architecture

Fig. 1- Architecture of Wireless Sensor Network

C. Centralized Computing
- Centralized Computing involves a multiple computers connected to the central server through a communication network.
- The clients only connect to the server and not to each other.
- In a centralized network computing model, data is stored on the server. This increases the reliability of data because all data modifications are stored at a central location.
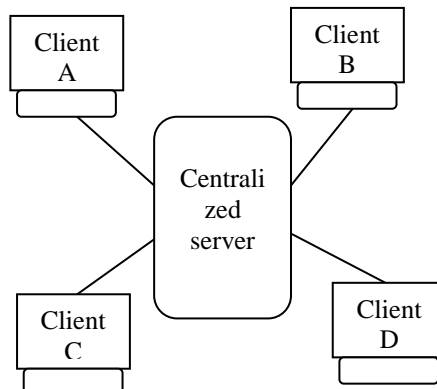
D. Centralized Computing Architecture

Fig. 2 - Architecture of Centralized Computing

E. ANDROID

Android is a mobile operating system that is based on a modified version of Linux with java programming language. It was originally developed by a startup of the same name, Android, Inc. In 2005, as part of its strategy to enter the mobile space, Google purchased Android and took over its development work. Google wanted Android to be open and free; hence, most of the Android code was released under the open-source Apache License[17], which means that anyone who wants to use Android can do so by downloading the full Android source code. Moreover, vendors can add their own proprietary extensions to Android and customize Android to differentiate their products from others[16].

F. Android Architecture

APPLICATION
APPLICATION FRAMEWORK

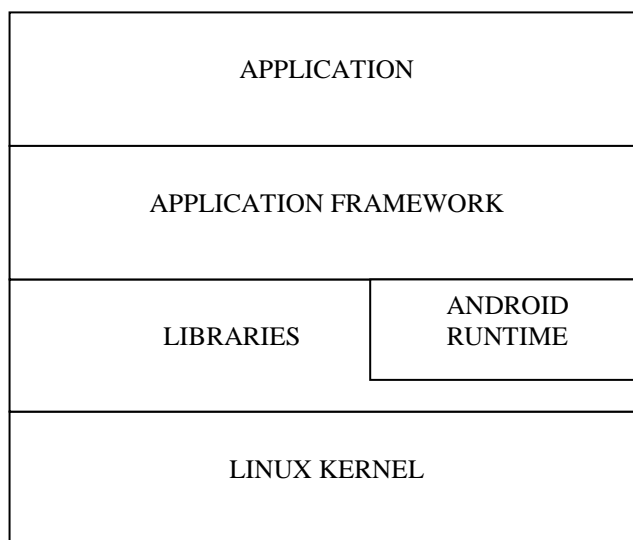| LIBRARIES	ANDROID RUNTIME

LINUX KERNEL

Fig. 3 - Architecture of Android

II. Literature Survey

As per Kwang-il Hwang, proposed "A Design and Implementation of Wireless Sensor Gateway for Efficient Querying and Managing through World Wide Web".

This project want to achieve the web base management for wireless sensor networks the sensor network are connect with sensor gateway and the fixed Internet is inevitable[1]. This paper has presented the architecture of the sensor gateway for web-based management and its implementation details. For efficient management of wireless sensor networks, paper recently defined the three layers for the sensor gateway; DAP (data analysis process), SQML (sensor query management layer) and SDAL (sensor data aggregation layer).

As per AKhan AkBULUT praposed "Accessing to DATA in WSN's" The goal of this paper is to provide a complete review of different data transfer techniques in WSN middleware. Describes the implementation of the WSN and accessing data using middleware's such as publisher/subscriber systems. Other method to use for data accessing from wireless sensor network is Database Inspired Solutions, Tuple Space Solutions, Service Discovery Based Approaches, and Virtual Machine Approaches.

As per Carlos Oberdan Rolim proposed "A Cloud Computing Solution for Patient's Data Collection in Health Care Institutions".Paper propose a solution to automatically collect patient's information like sugar,tempreture,BP by using "sensors". Sensors attached to existing medical equipments that are inter-connected to exchange service. The proposal is based on the concepts of wireless sensor networks and cloud computing. The information are available in the "cloud" from where it can be processed by expert systems and distributed to medical staff.

As per Wei Wang, Kevin Lee proposed "Integrating Sensors with the Cloud Using Dynamic Proxies" This paper proposes a general architecture to support the integration of sensors with the Cloud. It uses a lightweight component model and dynamic proxy-based approach. This is used to connect sensors to the Cloud. Dynamic proxy configuration is done to get integration of sensor network and cloud computing.

III. Proposed Work

The proposed work of our project, improve the existing system to modified or enhanced with the technologies of **Centralized computing** and **android programming** for the development of the application. Data from sensor node send to the cluster head, cluster head transfer data to the base station ,all information collected at the base station is transferred to the centralized server .all information are stored in the centralized

server ,by doing so large amount of database can be managed without the intervention of the receiver. Centralized management is done by the third party, so no overhead of data management by the receiver. Dynamism also possible by the centralized computing.

Android application is made to be installed on android based smart phone and make the data available instantly at one click.

Data is collected from the wireless sensor network and transfer the data to the cluster head of network. When cluster head collect the data, it transfers the useful information to the sink node. Sink node analysis the data and transfer the information to Gateway. in Each and every node installed Tinydb will make it easy to get the useful information from the nodes in Network. From nodes it saves the data to the postgresql database platform and through query processing it will go directly to centralized server.

From the Centralized server it will be easy to get the information from with the help of android application.

- All data are collected on the base station or sink node through cluster head of wireless sensor network.
- Data is transfer from base station to centralized server.
- Data is accessible from the centralized server through android application on android smart phone.

IV. Implementation Design

Implementation has some steps:

- Deploy Sensor node
- Sensing of information & Data Gathering
- Clustering from sensors
- Cluster Head are selected based on energy level
- Cluster head will collect the information from the sensor node & forwards to the sink node
- Sink Node collect the information & forward to the power efficiency Gateway
- Information will be forwarded to the power efficiency gateway to centralized server there it will be stored and finally send to the requested mobile node.
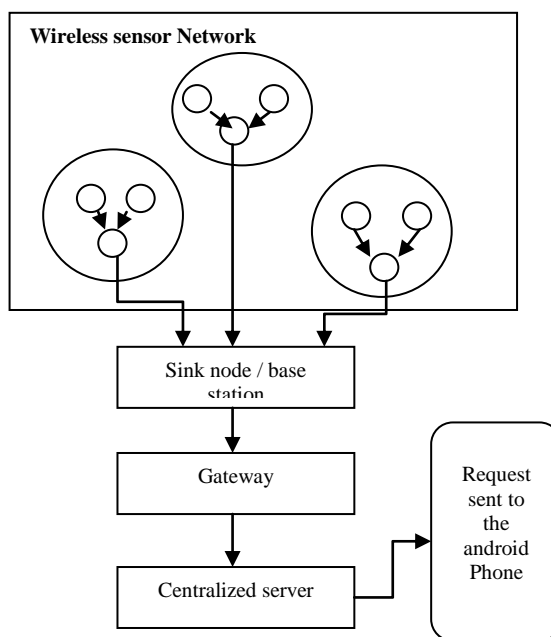

Fig. 4 – Overall Architecture

V. Result

After implementation of Wireless Sensor Network, the information from various nodes of wireless sensor network is sent to the base station .The information from base station is forwarded to the centralized database server using java API .For implementing the wireless sensor network and obtain the information from various nodes of wireless sensor network we create Blink application and store the Blink application on Centralized database server using Java API. Now the Blink application stored on the Centralized server gather the reading of various nodes of the wireless sensor network .This application get synchronized with the WSN app installed on the Android based smart phone device, when connected.
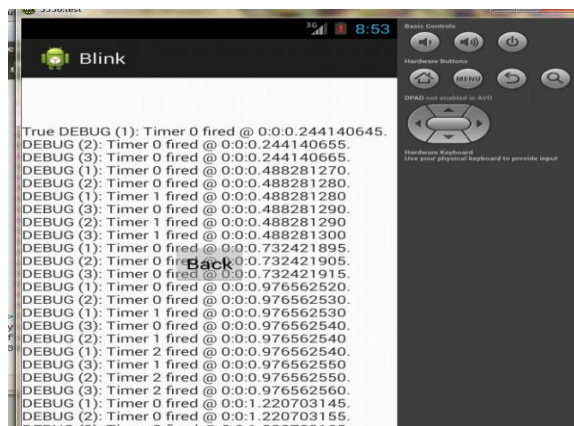
Fig-4 Data from sensor nodes to android

VI. Conclusion and Future Work

When the technology wireless sensor network, centralized database server and android operating System are integrated together we have develop an android based WSN app that operates on any android based smart phone. This WSN app when installed on android device, get synchronized with the centralized database server having the reading of the various nodes of wireless sensor network. This small application manages to monitor places which are very sensitive to some kind of natural calamities.

Presently our application monitors sensor nodes installed at some remote area .In future we can extend the work by providing facility to manage the sensor node remotely and also provide the customer a cloud based wireless sensor network management solution.

Acknowledgment

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