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A Survey on Wireless Sensor Networks : Software As A Service(SAAS) Integration System and Service Creation and Renovation Capability in Several Applications

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Abstract*—Wireless Sensor Network provides easy and reliable remote access to data. And also describes the Service Creation and Renovation Capability in Several Applications. Number of services can be provided to the users which include different fields like it may be employed into health applications, environmental monitoring, and surveillance, senior residents monitoring etc.*

Index Terms—Cloud Computing; Wireless Sensor Network (WSN); Virtualization.

1. INTRODUCTION

The infield data acquisition (DAQ) can be made using measuring instruments, weather stations and Wireless Sensor Networks (WSNs). Compared with instruments and weather stations WSNs have the following advantages for agricultural monitoring: low maintenance, reliability, robustness, and scalability.

Remote access to data collected by DAQ tools like WSNs can be done using ad-hoc applications or web servers. While these technologies allow access from Internet to WSNs data and setup, present the follow problems: (i) generally require that users have knowledge of WSN programming, (ii) they are not pre- pared to scale if will increase the volume of data due to new WSNs connected to the system and (iii) do not provide fault tolerance and high reliability. These problems can be solved using Cloud Computing technologies[1].

This paper describes the Service Creation and Renovation Capability in Several Applications. Number of services can be provided to the users which include different fields like it may be employed into health applications, environmental monitoring, and surveillance, senior residents monitoring etc[1].

2. WIRELESS SENSOR NETWORKS

Here is an introduction to WSNs including hardware, applications, characteristics and protocols.

2.1 Sensor Nodes

A new kind of embedded systems arises. These devices called sensor nodes are integrated by a micro-controller,
memory, different sensors, battery and a RF transceiver.Sensor nodes can be interconnected forming Wireless Sensor Networks (See Figure 1) and interact between them. Such networks are used for the study of the environment and to acquire different variables (temperature, humidity, pressure,etc.).

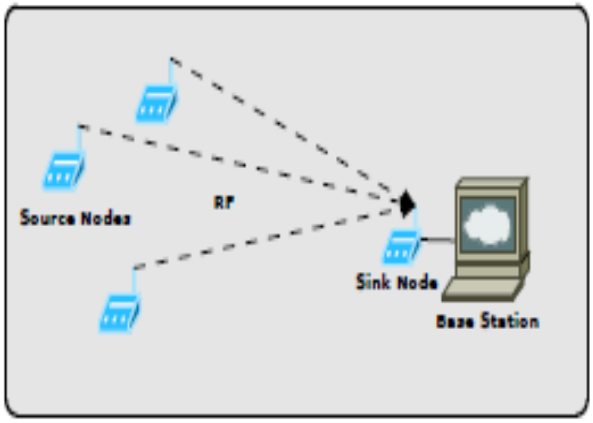

Fig 1. Wireless Sensor Networks

In a WSN, data are acquired by nodes called sources and sent via RF to a special node called base station. The base station coordinates the operation of the WSN and can be a personal computer (PC) or an embedded system. Furthermore, the base station can store or transmit via Internet all the information registered by the network. Nodes must meet requirements such as autonomy, low power consumption, low cost, robustness and reliability[2].

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2.2 WSNs Protocols

Unlike traditional wireless networks, WSNs are composed of nodes with limited hardware and energy resources. Therefore nodes must use communications protocols specifically designed to work with scarce energy sources and hardware resources. In addition, these protocols are not compatible with the TCP / IP stack protocols[3].

2.3 Cloud Computing

Cloud Computing is a new paradigm for application development and the use of computing and storage resources [2]. Through the use of virtualization techniques and web services, hardware resources and applications can be dynamically provided to the user.

It is defined as Cloud Computing as \a model for enabling ubiquitous, convenient, on demand network access to a shared pool of configurable computing resources (i.e. networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This Cloud model is composed of essential characteristics, three services models (Software / Platform / Infrastructure as a Service), and four deployment models, whereas the characteristics are: on- demand self-service, broad network access, resource pooling, rapid elasticity, and measured services. The deployment models include private, community, public and hybrid Clouds". One of the main advantages of Cloud Computing is the scalability of resources. Through scalability, Cloud Computing can solve the computational and storage requirements of the applications. Another advantage of Cloud Computing is that the users can easily access to development frameworks of applications that use Cloud Services in order to allow the scaling of resources. Cloud Computing offers different kind of services. These Cloud services can be grouped in: Infrastructure Services, Platform Services and Application Services[1]

Infrastructure as a Service (IaaS) : Through infrastructure services the users can access to virtualized high performance computing resources (CPUs, storage devices, etc.). The service provider delivers resources to the client in accordance to the specific requirements requested: type and CPU power, memory, storage, operating system, etc.

Platform as a Service (PaaS) : The Platform services provide Application Programming Interfaces (APIs) and standard development kits (SDKs) in order to allow users to develop and implement their own applications for Cloud Computing. Some of these platforms are Google App Engine and Amazon EC2.

Software as a Service (SaaS) : These services are applications that can be accessed by an end user through a Internet connection and a standard web browser. Furthermore, the applications can be developed with Platform Services and executed with Infrastructure Services.

3 WSNs: SOFTWARE AS A SERVICE

Cloud Computing Services are used in order to export the data and configuration of the WSNs to the users.

3.1 Architecture

The architecture of the proposed integration system is shown in Figure 2. It is based in two main modules and a web application. The first software module is the WSN-TCP/IP interconnection . The Cloud service module is designed in order to implement a data transfer service for the WSN. Both data and management commands are sent in this way through the WSN-TCP/IP interconnection module[3].

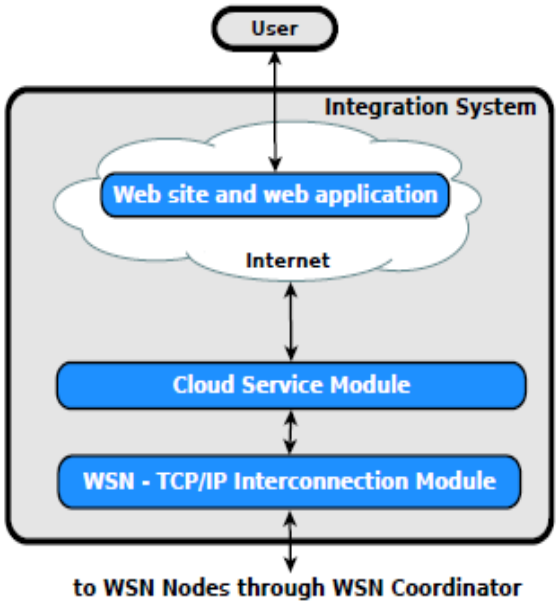

Fig. 2. WSN SaaS Integration System Architecture Overview.

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The website provides access to a web application that allows to the users to interact with the Cloud Service module in order to manage WSN data and configuration files. In addition the web appi process the WSN data and detect possible frost cases.

4 Service Creation and Renovation Capability in Several Applications

Sensors are very limited and are specific to their applications/ services when linked very closely to them, and thus very few organizations can provide the sensor services. But, if we move these services of sensors onto the cloud, it is possible to use it into several numbers of different applications[5].

Number of services can be provided to the users which include different fields like it may be employed into health applications, environmental monitoring, and industrial task (e.g. refining), surveillance, senior residents monitoring etc. During earthquake the vibration in building's can be monitored efficiently. But these services are provided by different organizations and the services of these sensors are limited to each organization.

Thus, these sensor services are exposed to cloud computing in order to enable it to be used by several numbers of different organizations without being interrupting the other one. It means that if these sensors and service templates are constructed as catalog menu service on the cloud computing service, the requesters can create new sensor services with the existing sensors in these service instances. For example, service requester can create a sensor service to analyze the impact of earthquake to each floor or room of the rehabilitation center or hospital also it can create sensor services to support the older residents with the same set of sensors (virtualized sensors) at the same time. This service will provide ease to helper in order to shifting the older adults one by one[5].

Using the same sensor services for healthcare another service requester can create dissimilar sensor service to track the patient's medicine intake and then to analyze the effectiveness of pills through the use of some selected healthcare sensors. Thus the service requesters can be provided new services using the same set of sensors on cloud computing service platforms. This will result in reduced cost for the resource usage and have numerous elastic merits to it.

In this section several typical applications are introduced[5] and these are:

(1) Ubiquitous Healthcare:

Sensors like heat sensors, bed sensors, stove sensor, camera and accelerometer sensors etc. can be used together in monitoring for very aged residents to prevent from any casualty without being harmed and interrupting them . These sensor services can provide the perception to older residents in health services.

(2) Environmental Monitoring for emergency/disaster detection:

In environmental applications it can be used to detect the earthquake and volcano explosion before its eruption by continuously monitoring them through the use of several numbers of different sensors like strain, temperature, light, image, sound, acceleration, barometer sensors etc through the use of wireless sensor networks.

(3) Telematics:

Sensor-Clouds can be used for telematics means to deploy the long distance transmission of our computerized or information to a system in continuum. It enables the smooth communication between system and devices without any intervention .

(4) Google Health:

It is a centralization service of Google that provides personal health information and serves as Cloud health data storages. Google users are allowed to monitor their health records by logging into their accounts at collaborated cloud health service providers into the Google health system.

(5) *Microsoft Health-Vault:*

This cloud platform is developed by Microsoft to store and maintain health and fitness related information . Health-Vault helps users to store, gathered and share their health relevant information and it's data can be acquired from several pharmacies, cloud providers, health employees, health labs, equipments and from the users itself.

(6) *Agriculture and irrigation Control (Field server sensors):*

Sensor-Cloud can be used in the field of agriculture to monitor the crop fields in order to upkeep it. For this a field server is developed that comprises of a camera sensors, air sensor, temperature sensor, CO2 concentration sensor, soil moisture and temperature sensors etc.

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These sensors continuously upload the field data via Wi-Fi access point to the field owner to track the health of their crops. This can also be used for harvesting.

(7) *Earth observation:*

A sensor grid is developed for data gathering from several GPS stations, to process, analyze, manage and visualize the GPS data.

This GPS data would then be uploaded onto the Cloud for efficient monitoring, early warning, and decisionmaking capability for critical situations like the volcanic eruptions, earthquakes, tsunamis, cyclones etc. to the users all around the world.

(8) *Transportation and Vehicular Traffic Applications:*

Sensor-Cloud can be used to provide an efficient, stable, equilibrium and sustainable tracking system. Earlier existing technologies like GPS navigation can only track the status and current location of vehicle but when we implement this vehicle monitoring using cloud computing, centralized web service, GPS and GSM enabled devices, embedded device with sensors fitted into it will enable

- to identify the current name of the location,
- to predict the time of arrival
- to predict the time of arrival
- to find the total distance covered

5 Abbreviations and Acronyms

WSN : Wireless Sensor Networks
DAQ : Data Acquisition
SaaS : Software as a Service

6 CONCLUSION

Number of services can be provided to the users which include different fields like it may be employed into health applications, environmental monitoring, and surveillance, senior residents monitoring etc. WSN provides easy and reliable remote access to data. Cloud computing provides Service Creation and Renovation Capability in Several Applications.

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