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Data Centre Temperature Monitoring with ESP8266 Based Wireless Sensor Network and Cloud Based Dashboard with Real Time Alert System

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Abstract:

Wireless sensor networks have become more trendy in the domains like environmental sensing, health monitoring, home and building automation, elegant energy, green computing, etc. The application of wireless sensor networks can be extended for the effective monitoring of the data center environment. Almost all the data centres are equipped with high end servers, data storage equipments which must be protected against cooling failures by providing necessary monitoring tools and alerting mechanism to the administrators. It is therefore very essential to design a system that monitors and alerts about the environmental conditions of the data centres. The job carried out to design an effective information centre monitoring organism has been discussed in this document. This paper discusses both hardware and software development aspects to achieve the desired goal. The wireless personal area network has been established in the data centres using low power wireless sensor motes which are powered by Zig bee protocol and Zigbee to internet gateway system. This will enable the monitoring of data centre environmental parameters such as temperature and the relative humidity over the internet. This organism also has a SMS/e-mail based alerting provision whenever the sensed parameters go beyond the preset threshold ideals.

Keywords **—Put your keywords here, keywords are separated by comma.**

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I. INTRODUCTION

In nowadays's scenario the WSN (Wireless Sensor Networks) are being heavily used in the domain of ecological monitoring of information centers to measure the a variety of parameters like temperature, humidity, heat dissipation, etc. The wireless sensor networks for the most part comprise low power, small information speed hardware which formsat PAN (Personal part Networks) among themselves and communicates with every other wirelessly. The sensor can be thus attached to this hardware gather the information about required parameters at various places. The PAN thus established can be connected to the internet by using dedicated Zigbee to internet gateway so that the data centers can be monitored over the web. The protocol stacks used in this WSN hardware platform areZigbee, which is one of the most widely used WSN protocols nowadays and is defined over and above TEEE802. 1 S.4 MAC and PRY specification.Additional protocol layers on top of the IEEE 802. 1 S.4 specification to make it full-fledged WSN protocol. It supports the position of connections topologies such as leading light mesh as well as ncluster raking. In this work mesh topology has been used. The paper discusses both the hardware and software aspects of the work. The wireless PAN network is achieved using a Indigenously developed hardware Ubimote and Ubisense with Zigbee protocol. The web connectivity to WSN is provided through

indigenously developed entry and the SMS (Short Message Service) base alert is accomplished by using GSM worldwide System for movable) modems.

II.LITERATURE REVIEW

2.1 WIRELESS SENSOR NETWORK FOR information-midpoint ecological MONITORING

Michael Uriarte [1]discussing with information centers' authority consumption has involved global concentration because of the quick development of the information technology (IT) industry. According to a U.S. Environmental Protection group (EPA) report, U.S. data centers consumed 61 billion kilowatt-hours (kWh), or 1.5 percent of full amount U.S. electrical energy consumption in 2006, and this quantity could potentially twice by 2011 [1]. This forecast indicates that if not power efficiency is improved beyond current trends, the federal government's electricity cost for servers and data centers could be almost $740 million once a year by 2011. Around 60 percent of the energy consumed in a information center goes to cooling in wasteful ways as a product of lack of green information and overcompensated cooling systems [2]. an additional trend at data centers is that the heat density of computing systems has increased at an accelerated rate.

This increase in heat width is brought about by the increasing density of computing resources, which yields more computing power consumption. Such utilization is expected to add to values upwards of 6 kW per square foot of tools for compute servers and over 10 kW per square foot of contact tools by 2014, based on . This forecast indicates that if not power efficiency is improved beyond current trends, the federal government's electricity cost for servers and data centers could be almost $740 million once a year by 2011. Around 60 percent of the energy consumed in a information center goes to cooling in wasteful ways as a product of lack of green information and overcompensated cooling systems [2]. an additional trend at data centers is that the heat density of computing systems has increased at an accelerated rate.

This increase in heat width is brought about by the increasing density of computing resources, which yields more computing power consumption. Such utilization is expected to add to values upwards of 6 kW per square foot of tools for compute servers and over 10 kW per square foot of contact tools by 2014, based on EPA projections [3]. Such analytical research is used to power tools that control and supervise the cooling resources in computer machine rooms. Furthermore, studies have been made of the effect of the placement of the CRAC units on a data center's thermal map [5]. It has been established as well that the efficiency of datacenter cooling processes can be increased by implementing automatic controls that respond to feedback from temperature sensors located at key locations throughout the data center [6].

The data collected from sensors, as well as knowledge of how environmental variables affect the conditions in the room, can be used to plan control systems that can alter the cooling resources, such as the fans and outlet temperatures, to maintain the space in its working choice. The Microsoft Research Group [7], for example, has changed wireless sensor networks for data centers using a string of sensors as workers to a transmitter.

The workers were all wired to the master, 2011 Fifth International Conference on Sensing Technology 978-1-4577-0167-2/11/$26.00 ©2011 IEEE 533 which in turn polls the different sensors under it and broadcasts the readings to a base station. Wireless antenna networks provide an best and integrated answer for distributed information group release and analysis in many applications including data-center environmental monitoring. In conditions of a data-center application, the wireless sensor

nodes are to be deployed in the predetermined locations, which contain the computer racks and structural area through the space (e.g., ramparts table, or other stationary location) and at the air conditioner inlets and outlets. Also, movable nodes may be placed for helpful freepoint data collection.

These data gathering points collect data according to which in rank is relevant in their specific site For cooling purpose, hotness and humidity data will be collected, providing a real-time, high-resolution thermal map of the rack environment that could be used for dynamic controlling of the data center. The intention of this investigate is to build up a wireless sensor network for data-center environmental monitor in order to pick up its energy efficiency and best data-center performance at Argonne open Laboratory.

2.2 EDGE COMPUTING IN INDUSTRIAL INTERNET OF THINGS

Tony paine [2]discuss with theInternet of Things (IoT) is a self-motivated global network infrastructure with self-configuring capabilities base on standard and interoperable communication protocol, making all things communicate with each other, and realizing information distribution and collaborative decision-creation [1]. In IoT, all kinds of things with independent address or identity are interconnected through heterogeneous transmission networks to realize dynamic information interaction. The application of IoT to the industrial field has spawned a new research .

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(Corresponding authors: Xiaobo Zhou and Zhaolong Ning) Tie Qiu, Jiancheng Chi and Xiaobo Zhou are with the College of Intelligence and Computing, Tianjin University, Tianjin 300350, China; and also with the Tianjin Key Laboratory of Advanced Networking, Tianjin 300350, China. (e-mail:qiutie@ieee.org, chijiancheng@tju.edu.cn, xiaobo.zhou@tju.edu.cn). Zhaolong Ning is with the School of Software, Dalian University of Technology, Dalian, 116620, China (e-mail:zhaolongning@dlut.edu.cn) Mohammed Atiquzzaman is with the School of Computer Science, University of Oklahoma, Norman, Oklahoma, USA (e-mail:atiq@ou.edu). Dapeng Oliver Wu is with the Department of Electrical & Computer Engineering, University of Florida, Gainesville, Florida, USA (email:dpwu@ieee.org). quarter called the developed Internet of equipment (IIoT). IIoT is a new service-oriented industrial ecosystem using the network interconnection of industrial resources, data interoperability, and system interoperability to enable flexible resource allocation, on-demand execution of processes, rational optimization of processes, and rapid adaptation of environments [2].

IIoT abstract industrial processes into data types, turns devices into data terminals, collects underlying basic data in all directions, and combines the powerful data storage and computing functions of cloud computing to perform deeper data analysis and mining to improve efficiency and optimize operations. Its deployment will introduce profound changes to the production, operation, and management modes of industry, laying a solid foundation for the rational allocation of supply chain resources and improvements in production and service efficiency. A. IIoT and Related Concepts IoT and IIoT have their respective focuses on concepts and practical application scenarios although the IIoT is derived from the IoT.

The IoT widely accepted by people is mainly consumption-oriented and aims to improve

people's life quality. The most typical application scenarios of IoT are smart home, health monitoring and indoor localization, etc [3]. The IIoT is production-oriented and aims to improve industrial production efficiency. Typical application scenarios of IIoT include smart logistics, remote maintenance and intelligent factories [4]. The system frameworks of different IoT application scenarios generally need to be built from scratch, and the deployment scale of sensors is relatively small with low precision requirements [2].

However, the arrangement frameworks of IIoT application scenarios are build based on customary industrial infrastructure, so the deployment scale of sensors is very big with high precision requirements. For the IoT, devices generally have physically powerful mobility, generate intermediate data volume and have high tolerance for delay; while for the IIoT, most of the strategy are fixed in position, generate great amount of perceived data and have low tolerance for delay. Table I gives a qualitative comparison of IoT and IIoT. The concept of IIoT is closely related to some widely accepted concepts, such as cyber-physical systems (CPS), IoT, the Industrial Internet, and Industry 4.0. CPS, proposed by Helen Gill in 2006, emphasizes the deep integration of various information technologies, such as sensing technology, embedded technology, and software & hardware technology, aiming to achieve the highly synergistic and autonomous informationization capabilities, real-time and flexible feedback, and Authorized licensed use limited to: Newcastle University.

III. SYSTEM ANALYSIS

System investigation is the overall analysis of the system previous to execution and for arriving at a pse answer. Careful analysis of a system before implementation prevent post implementation problems that might arise due to bad analysis of the problem report.

Thus the necessity for systems analysis is justified. Analysis is the first crucial step, detailed study of the various operations performed by a system and their relationships within and outside of the system. Analysis is defining the boundaries of the system that will be followed by design and implementation.

3.1 Existing System

- offered system in the area of data center monitor. part TIT discusses in relation to the a variety of hardware used to achieve the objective.
- The elaborates on the software architecture and application software developed to monitor the data centers.
- Data centers base on the WSN are having the periodicity of sensing set and the sensor module work only in one way in the sense they don't agree to any commands, queries sent by the user applications, also it is extremely important to give real time aware over SMS/e-mail at the administrators so that they can take necessary actions.

3.2 Proposed System

- The proposed system offers some of the unique features which will make data centre monitoring easy and flexible.
- The system offers a dedicated user friendly web GUIs to monitor the sensor values of the wireless sensor nodes placed at different places of the data centre. It also logs all the data for the period of one month for further processing.
- It also offers two threshold values such as "warning threshold" and "critical threshold" which can be preset for individual sensor motes. If any mote sensor sensed value crosses these threshold values will be indicated to the administrators over SMS.
- The system also offers two way communication between zig bee PAN and web covering both monitoring and configuring the wireless sensor network.

IV.SYSTEM IMPLEMENTATION

Accomplishment is the stage in the project where the theoretical plan is turned into a working organism The implementation phase constructs, installs and operates the fresh system. The most crucial stage in achieving a fresh successful system is that it will job efficiently and effectively.

There are several activities involved while implementing a fresh project.

- End user Training
- End user Education
- preparation on the relevance software

This project is entitled —"**Cloud Documents Security Using Interactive Zero Knowledge Proof Prevent**" using Java as Front end and SQL Server as back end.

Cloud-based outsourced storage relieves the client's burden for storage management and maintenance by providing a comparably low-cost, scalable, location-independent platform. However, the fact that clients no longer have physical possession of data indicates that they are facing a potentially formidable risk for missing or corrupted data.

To keep away from the security risk, audit prepared forces are dangerous to ensure the integrity and availability of outsourced data and to achieve digital forensics and credibility on blur computing. Provable data control (PDP), which is a cryptographic technique for verifying the integrity of data without retrieving it at an untrusted server, can be used to realize audit services. In this project, profiting from the interactive zero-knowledge proof system, we address the construction of an interactive PDP protocol to prevent the fraudulence of prover (soundness property) and the leakage of verified data (zero-knowledge property). We establish that our manufacture holds these property based on the calculation Diffie–Hellman assumption and the reverse able black-box data extractor.

4.1Modules

- Data Centre Creation
- VirtualMachine Creation
- VirtualMachine Monitoring
- Detection and alerting Machines
- Performance Evaluation

Module Description

4.1.1 Data Centre Creation

Datacenter is a blur supply whose hostList are virtualized. It contract with dealing out of VM query (i.e., handling of VMs) in its position of dispensation Cloudletlinked queries. So, still though an AllocPolicy will be instantiated (in the init() method of the great class, it will not be used, as processing of cloudlets are handle by the CloudletScheduler and processing of VirtualMachines are handled by the VmAllocationPolicy.

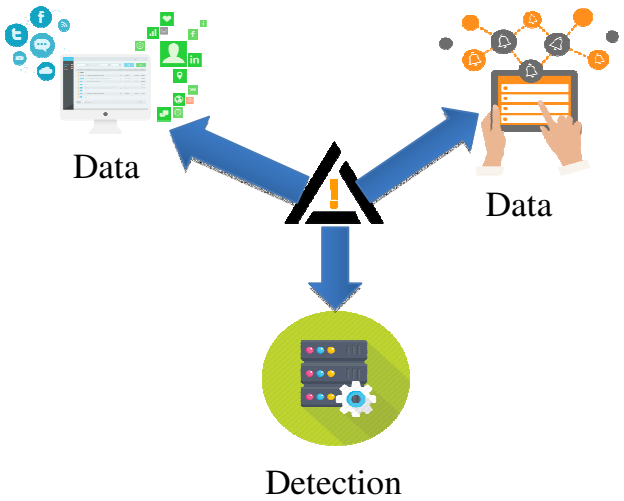
4.1.2 VirtualMachine Creation

Vm represents a VM: it runs inside a Host, sharing hostList with other VMs. It processes cloudlets. This processing happens according to a policy, defined by the CloudletScheduler. Each VM has a owner.

4.1.3 VirtualMachine Monitoring

A Virtual Machine Monitor (VMM) that enables the creation, management and governance of virtual machines (VM) and manage the operation of a virtualized surroundings on pinnacle of a substantial host machine.VMM is also acknowledged as Virtual mechanism Manager and Hypervisor.

V. SYSTEM ARCHITECTURE



Data Flow Diagram

The Data Flow Diagram is a graphical model showing the inputs, processes, storage & outputs of a system procedure in structure analysis. A DFD is also known as a Bubble Chart

The Data flow diagram provides additional information that is used during the analysis of the information domain, and server as a basis for the modeling of functions. The description of each function presented in the DFD is contained is a process specification called as PSPEC.

VI. CONCLUSION& FUTURE ENHANCEMENTS

The web based data centre monitoring and alerting system is discussed in this paper. The system fulfills many of the basic requirements of the data centre monitoring like to report cooling system malfunctioning, alerting, temperature and humidity monitoring etc. It also provides dedicated web GUT which the administrators can use to effectively monitor their data centres. The software can also be improved to support monitoring multiple data centres. The system can further improved by controlling the cooling system instead of alerting. But for already deployed systems this may not feasible because of proprietry nature of the controlling protocol. Future systems can be designed as wireless controllable cooling systems.

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