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IMPLEMENTATION OF INTERNET OF THINGS IN RURAL SENSITIVE AREA OF CHHATTISGARH

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ABSTRACT

Internet of things (IoT) referred to as objects connected with the Internet. Each object can be uniquely identified by the Internet. It is estimated that (as per the analysis of CISCO), there are more than 4000 crores devices being wirelessly connected to the Internet of Things by 2020. The purpose of our research is to understand the feasibility of implementing Internet of Things in identification of Transport System, Military, Para Military Force, Weapons and persons. There is a need for the security agencies to find out locations, working conditions of vehicles, soldiers and weapons etc. in an efficient manner, here, Internet of Things infrastructure can help. The research helped us to gain immense knowledge in the field of IoT and helped us with the protocols for communication between the devices.

KEYWORDS

Internet of things, Transportation.

INTRODUCTION

The Internet of Things (IoT) is a large network of connected “things”. The relationship is between people-people, people-things, and things-things. IoT deals with having physical objects we see around us in a network in one form or the other. As the progress of technology, more objects are being installed with sensors and having the ability to communicate with each other. The way in which information is getting transferred is changing as the physical world outside is becoming more of an information system. It mainly deals with RFID, infrared sensors, global positioning systems and scanners. These have helped the objects to not only sense information but also interact with the physical world.

The Internet of Things (IoT) is ordinary objects have inter-connected with inside microchips. These microchips help to keep track of other objects and sense many devices surrounding and report it to other machines and to the humans. It is called M2M, means Machine to Machine, Machine to Man, Man to Machine or Machine to Mobile. The IoT intelligently connects humans, devices and systems. Analysts describe two distinct modes of communication in the IoT: thing to person and thing-to-thing communication (Raunio, 2005). Thing-to-person and person-to-thing communications encompass a number of technologies and applications which are use to remote access to objects by humans, and object that continuously report their status. Thing-to thing communications encompasses technologies and applications wherein everyday objects and infrastructure interact with the human. Objects can monitor other objects, take corrective actions and notify or prompt humans as required.

LITERATURE REVIEW

Zhang et. al. [1] propose the solution for dynamic access allocation. In this approach the device owner provides clients with one time token that can be used to access device in the network. This paper describes different approaches to perform token reuse detection. Some of these approaches involve replication of reused tokens and some suggest distributed token storage.

The proposal described in [2] applies usage control model for the IoT. This approach maps the UCON abstractions to IoT entities and is based on fuzzy theory. Unfortunately there are only few experiment present that does not provide enough data of evaluation of the approach on IoT nodes.

The work presented in [3] demonstrates delegated capability based approach and based on UDP and CoAP protocols. Access tokens are provided by issuer to a client with ECC digital signature in JavaScript Object Notation (JSON) format. A token contains information about resource to access, action that can be executed and additional conditions that is supposed to be checked by device. Server verifies digital signature and performs operation if permissions are granted by token.

In the Cooltown project [4] Kindberg et al. proposed to use the Internet and the Web as the information network of choice for smart things. Exploring this idea of merging RFID enhanced objects and the Web, Welbourne et al. [5] create an RFID-based microcosm for the Internet of Things.

THE IoT APPLICATION DOMAINS

1. MEDICAL TECHNOLOGY / HEALTH

In Sensitive area of Chhattisgarh villagers cannot keep their medical records for a long time, implantable wireless sensors can be adopted to keep health records of patients with chronic illnesses[6]. IoT applications have an massive impact on independent living and support for aging population by detecting daily living and support using the combination of sensors, Wi-Fi, etc.

2. BETTER MANAGEMENT OF THE WEAPONS

In military or paramilitary force smart lockers can be used. Smart lockers can track the present items in real-time[7]. Weapons can be monitored through Radio Frequency Identification (RFID) tags to alert the Store Keeper/authorized person to any changes.

3. FORCE MANAGEMENT

By using RF tag force can be counted and can be located in new positions[8].

4. AGRICULTURE

By using wearable sensors farmers can track in real-time their animals, crops and carts through RFID. By using sensor the moisture percentage of the soil can measured. Development of an intelligent scheduling platform for agricultural machinery working with integrated ICT such as the internet, mobile phone, fixed phone, satellite navigation systems, cloud computing to implement the guidance, promote the restricted flow of machinery and improve utilization of IoT is the key factor[9]. The platform commands and dispatches farm machines, cultivation and harvest according to factors such as crop maturity time, weather, farm machine distribution, etc. It can realise functions including inquiry of farm machine positions, tract review, information reception and release, remote failure diagnosis, and measuring farmland area and estimation of crop yields (Zhiguo, 2011).

5. EDUCATION

IoT can enable interaction with physical spaces for learning purposes or communication. Student attendance and curricular development can be traced. On demand Study matrial, lecture notes and video lectures can send to the students[10]. All activities of the student can be traced.

6. THE FOOD-IOT

Today’s food supply chain (FSC) is extremely distributed and complex. It has large geographical and temporal scale, complex operation processes, and large number of stakeholders[11]. The complexity has caused many issues in the quality management, operational efficiency, and public food safety. IoT technologies offer promising potentials to address the traceability, visibility and controllability challenges[12][13]. It can cover the FSC in the so-called farm-to-plate manner, from precise agriculture, to food production, processing, storage, distribution, and consuming. Safer, more efficient, and sustainable FSCs are expectable in the future[14][15][21].

It comprises three parts: the field devices such as WSN nodes, RFID readers/tags, user interface terminals, etc., the backbone system such as databases, servers, and many kinds of terminals connected by distributed computer networks, etc., and the communication infrastructures such as WLAN, cellular, satellite, power line, Ethernet, etc. As the IoT system offers ubiquitous networking capacity, all these elements can be distributed throughout the entire FSC. And it also offers powerful but economy sensing functionalities, all the environmental and event information during the lifecycle of food product can be gathered on a 24/7 basis[16][18]. The vast amount of raw data can be refined into high level and directly usable information for the decision making of all stakeholders.

FIG. 1

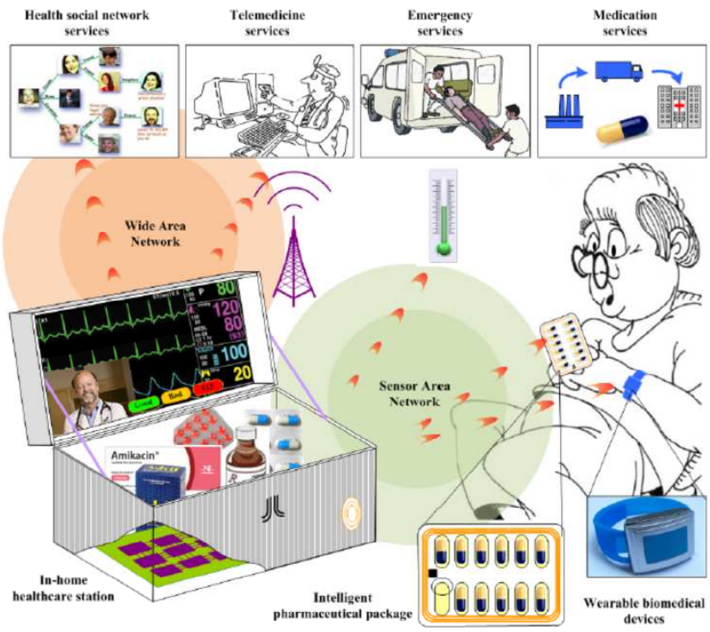
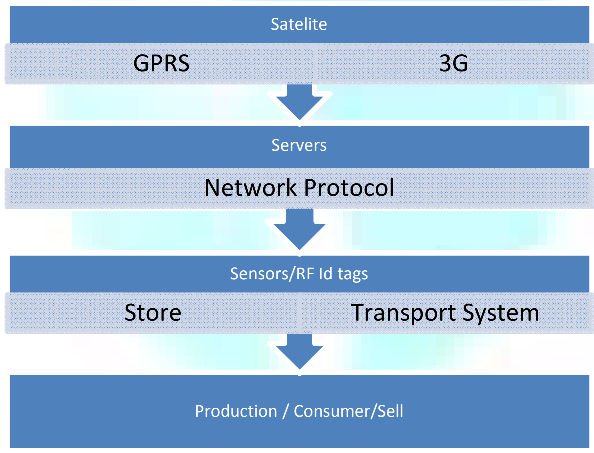


FIG. 2



TECHNOLOGIES OF THE INTERNET OF THINGS CAN BE USED IN REMOTE AREA

A number of technologies can be identified by analyzing a wide range of literature including:

1. RFID

Radio-frequency identification (RFID) uses radio waves to identify items. In contrast to bar codes, RFID tags can be read away from the line of sight. They track items in real-time to yield important information about their location and status. Early applications of RFID include automatic highway toll collection, keeping track of entire inventory, supply-chain management for large retailers, prevention of counterfeiting in pharmaceuticals, and for patient monitoring in e-health[17][20]. RFID tags are being implanted under the skin for medical purposes, e-government applications such as in drivers' licenses and passports and RFID-enabled phones are some of the applications.

2. SENSOR NETWORKS

To detect changes in the physical status of things is also essential for recording changes in the environment. In this regard, sensors play a pivotal role in bridging the gap between physical and virtual worlds, and enabling things to respond to changes in their physical environment, generating information and raising awareness about the context. Sensor networks need not be connected to the Internet and reside in remote sites, vehicles and buildings having no Internet connection.

3. MICROCONTROLLERS

Microcontrollers are computer chips that are designed to be embedded into objects. Embedded intelligence in things distributes processing power in the network, and empowers things and devices in the network to take independent decisions[18].

4. PROTOCOLS

Machine-to-machine interfaces and protocols of electronic communication set the rules of engagement for two or more nodes of a network. Internet Protocol (IP) has become the standard for all data communication and it is therefore easy to move things over the Internet. The Internet protocol for lower-power radio IPv6 plays a big role in the IoT. The advantage of IPv6 is that it meets the challenges of different existing systems having to work together. Because this interoperability is possible, the system of objects connected via the Internet can develop the same way that the current Internet developed. The version of IP currently in use, IPv4, supports only[15].

5. BIOMETRICS

Biometrics enables technology to recognize people and other living things, rather than non-living objects.

6. MACHINE VISION

Machine vision can be a channel for delivering the same type of information that RFIDs enable. Machine vision is an approach that can monitor objects having no on-board sensors, controllers or wireless interfaces.

7. ACTUATORS

Actuators detect an incoming signal and respond by changing something in the environment. Actuators such as motors, pneumatics and hydraulics can move objects and pump fluids. A relay, for example, is an actuator that toggles a mechanical switch, and can thus cause a good number of responses to occur such as enabling illumination, heating system, audible alarm and so on.

8. LOCATION TECHNOLOGIES

Location technology helps people and machines find things and determine their physical location. Sensors play a role, but that approach does not satisfy practical needs for geo-location resulting in the rise of wireless approaches including GPS and cellular towers[14]. In the automatic identification of tagged products quickly look up information or initiate a specific action, using bar codes for linking real-world objects to virtual information has a number of drawbacks when compared to an RFID-enabled feature with corresponding mobile RFID readers, such as Near Field Communication(NFC)-enabled mobile phones. Near Field Communication is a short-range wireless connectivity standard that enables communication between devices when they are brought within a few centimeters of each other through magnetic induction.

9. BAR CODES

A bar code is an optical representation of machine-readable data and can be seen on the majority of products that are on sale in the retail industry to speed up the checkout process. These linear symbologies or so-called one-dimensional (1D) barcodes represent data in vertical parallel lines with varying space and line width. A lesser well-known two-dimensional (2D) barcode or matrix code is also an optical representation resembling something like a crossword puzzle of even more machine-readable data and can normally be seen on larger packaging containers to assist with warehouse logistics and quality control. A Data Matrix code is made up of a two-dimensional matrix code consisting of black and white square modules arranged in either a square or rectangular pattern. The information to be encoded can be text or raw data. The code can be read quickly by a scanner which allows the media to be tracked. Semacode is machine-readable ISO/IEC 16022 data matrix symbols which encode URLs. It is primarily aimed at being used with cellular phones which have built-in cameras. A URL can be converted into a type of barcode resembling a crossword puzzle, which is called a “tag”. Tags can be quickly captured with a mobile phone’s camera and decoded with a reader application to obtain a web site address. This address can then be accessed via the phone’s browser.

10. AMBIENT TECHNOLOGIES

Ambient technologies refer to electronic environments that are sensitive and responsive to the presence of people. In an ambient intelligence world, devices work in concert to support people in carrying out their everyday life activities in easy, natural way using information and intelligence that is hidden in the network connecting these devices. The ambient intelligence paradigm builds upon pervasive computing, ubiquitous computing, profiling practices and human-centric computer interaction design.

METHODOLOGY

We run a survey in 2012 to identify the different IoT application scenarios in different domains. This survey was based on 180 responses from 14 villages. A farmer survey was done to get useful input regarding the farmer services. A survey was also carried out to examine the possible application layer protocols for sensor networks.

This research paper suggests a need for a public survey to understand the villager’s side for a particular IoT implementation. Also there is a need for a qualitative survey to understand the feasibility of implementing IoT in a certain area.

CHALLENGES AND DRAWBACKS OF INTERNET OF THINGS

One of the main challenges for the Internet of Things is in transformation of the connected objects into the real time sensing actors which also involves the societal and ethical considerations. IOT technologies enable or control the capabilities of the people and how this influences people’s capabilities to satisfy accountability demands. The multiple dimensions of accountability such as visibility, responsibility, control transparency and predictability should be taken into consideration to be controlled with the capacities of IOT technologies. Internet of things is spreading widely in the present world which accounts for at least two objects connected per person. It is expected that by 2015 an average person would be accompanied by eight objects. The key challenge that sparks for this innovation is protection of privacy. Three very important barriers that exist for IoT development are having a single standard, the development and transition to the newer IPv6 and developing energy sources for the huge number of sensors (Evans, 2011). Another challenge in building IOT is lack of common software fabric and how to combine all the software systems in building the common software platform (Internet and privacy concerns, 2012). The first direct challenge for this is that the generation of huge scale of data may have digital twin in cloud that could be generating regular updates as a result of which the messaging volume could easily reach between 100 to 10000 per person.

TECHNICAL ARCHITECTURE

Existing research on the topic of “Implementation of Internet of Things in Rural Sensitive Area of Chhattisgarh and Even in India” shows lack of research on its implementation.

The technology followed by our research team would establish a connection between the sensors, embedded device, satellite, mobile phone app and a cloud server cum database.

CONCLUSION

The research was aimed to find out the feasibility of using of Internet of things in the Vehicle, Animal and fields. The design proposed by us has capitalized on the advantages provided by IoT by giving real time data to the consumers. Through the Impact analysis and Competitive analysis, it was found that IoT application if implemented would clearly outweigh in almost all the parameters. These parameters include time management, time saving, efficiency management, crowd management and in the number of options being offered to users. It would cater to all the sections of the society satisfying their varying needs. Also, a robust analysis of the algorithm used for IoT confirmed that the IoT application with the use of direct communication between the devices would give the most accurate in all circumstances. The qualitative research with experts all over the world revealed that there is a challenge in terms of selecting a common protocol that facilitates a secure, efficient and real-time communication between system and the application.

FUTURE SCOPE

Making the model sturdier by taking the signal waiting time into consideration. This would require all the signals to be included as virtual objects. Usage of other sensors costing less than that of the RFID’s can be used in detecting the devices.

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