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A Review on Wireless Smart Home Automation using IoT

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ABSTRACT

The Internet of Things (loT) is an extension of the existing internet that enables contact, interaction, and internet functioning between different devices or physical objects referred to as "Things." The Internet of Things (IoT) concept refers to the ability of network devices to sense and gather data from their environment, and then exchange the data through the Internet where it can be processed and used for a number of interesting purposes. The Internet of Things is made up of smart machines that connect and communicate with other machines, artifacts, environments, and infrastructures. Nowadays, everyone is linked to everyone else through a variety of communication networks, the most common of which is the internet, so we can assume that the internet, which connects people, can also connect things.

Keywords : Home Automation, IoT, Smart Home, LAN, Internet, Home security

I. INTRODUCTION

The Internet of Things can be described as connecting various types of objects to the internet, such as smart phones, personal computers, and tablets, allowing for very novel types of communication between things and people, as well as between things [2]. With the introduction of IoTs, home automation research and development have become increasingly popular in recent years. Many machines are regulated and tracked in order to assist humans. Furthermore, various wireless technologies assist in communicating from remote locations in order to enhance the intelligence of the home world. When a human being needs to communicate with other objects, an advanced network of IoT is created. IoTs technology is used to come up with creative concepts and exponential development for smart homes in order to boost people's living standards. The internet enables us to provide immediate solutions to several problems while also allowing us to communicate from any remote location, which leads to overall cost savings and energy consumption [3]. In recent years, there has been a surge in customer interest in the smart home model. The status of the connected devices is described and recorded by the home automation

system in an intuitive, user-friendly interface, enabling the user to communicate with and monitor different devices with the touch of a few buttons. Bluetooth, Wi-MAX and Wireless LAN (Wi-Fi), ZigBee, and the Global System for Mobile Communication (GSM) are some of the main communication technologies used by today's home automation systems [1]. In this case, we're making use of a Wi-Fi module. It provides the user with full access control over the appliances through a remote interface. The use of control systems and information technology to control equipment, industrial machinery, and processes reduces the need for human interaction [2]. A software development environment that connects applications, command, control, and routing processing, and node and system protection is required for the broad range of potential IoT applications. Although the role of software in MCU solutions has grown in recent years, MCUs supporting IoT will require even more software, resources, and enablement. To allow the development of embedded processing nodes and IoT applications, a wide ecosystem with easily accessible support is important.

Nowadays, IoT is being used all over the world to make the world smarter. We can see many smart devices around us as a result of IoT. Many people, including myself, believe that cities and the environment will be overlaid with sensing and actuation, with many embedded in "things," resulting in what is known as a smart world. Many homes, for example, already have sensors for attempting to save energy and home automation; automobiles, taxis, and traffic lights have systems to attempt to enhance safety and transportation; people have smart phones with sensors for running many useful apps; industrial plants are connecting to the Internet; and healthcare facilities are relying on increased home sensing to help remote medicine. A global sensing and actuation utility linked to the Internet is one possibility. Water and energy are two utilities that can be used for a number of purposes. Sensing and actuation in the form of an IoT platform will be made available as a service. IoT would be viewed as a vital, interconnected framework upon which many applications and services will operate, rather than as individual systems. Some applications will be personalized, such as digitizing everyday operations, while others will be city-wide, such as reliable, on-time transportation, and still others will be global, such as global distribution systems. Perhaps there will be no traffic lights and even 3D transportation vehicles in cities. Smart buildings can incorporate personal comfort, energy savings, protection, and health and wellness elements into comfortable and efficient spaces, rather than only managing energy or security. Individuals can be fitted with patches of bionic skin that detect physiological parameters and transmit them to the cloud, which houses his digital health, as well as to the surrounding smart spaces, for enhanced comfort, health, performance, and protection. Indeed, smart watches, tablets, body nodes, and clothing can serve as customized feedback to optimize city-wide services that support both individuals and community [10]. Gartner listed ten “critical” developments and innovations influencing IT over the next five years, including the Internet of Things [5]. All of these objects have an IP address and can thus be monitored. The Internet is expanding into enterprise properties as well as consumer products such as vehicles and televisions. The issue is that most businesses and technology suppliers have yet to investigate the possibilities of an expanded Internet and are thus not operationally or organizationally prepared.

This can be extended to people, objects, facts, and locations, and hence the "Internet of Things" will be replaced by the "Internet of Everything." Figure 1 illustrates the Internet of Things. The following are the basic features of the Internet of Things:

Figure 1 Internet of Things

- Interconnectivity: With regard to the IoT, anything can be interconnected with the global information and communication infrastructure.
- Things-related services: The IoT is capable of providing thing-related services within the constraints of things, such as privacy protection and semantic consistency between physical things and their associated virtual things. In order to provide thing-related services within the constraints of things, both the technologies in physical world and information world will change.
- Heterogeneity: The devices in the IoT are heterogeneous as based on different hardware platforms and networks. They can interact with other devices or service platforms through different networks.
- Dynamic changes: The state of devices change dynamically, e.g., sleeping and waking up, connected and/or disconnected as well as the context of devices including location and speed. Moreover, the number of devices can change dynamically.
- Enormous scale: The number of devices that need to be managed and that communicate with each other will be at least an order of magnitude larger than the devices connected to the current Internet.

The ratio of communication triggered by devices as compared to communication triggered by humans will noticeably shift towards device-triggered communication. Even more critical will be the management of the data generated and their interpretation for application purposes. This relates to semantics of data, as well as efficient data handling.

II. RELATED WORK

As a consequence, we will often be implicitly connected into the new utility. New services provide instant and constant access to the right information for the job at hand, whether it is commuting to work or a conference, exercising, shopping, socializing, or visiting a doctor. Often these things will be interactive, including the use of avatars or robots. Many user outputs and displays can be holographic. Credit cards can be phased out, and biometrics such as speech or retina recognition can provide secure access to homes, ATMs, and transportation systems. A sensing and actuation utility would be accessible not only in public spaces, but also in houses, apartments, and condominiums. On the infrastructure, people will be able to run health, energy, protection, and entertainment apps. Installing and running new applications would be as simple as plugging in a new toaster into the power outlet. One app may help track and regulate heart rate, another may perform financial and investment services, another may automatically order food and wine, and yet another may foresee an imminent medical condition that should be resolved as soon as possible to alleviate or even prevent the problem. Humans can often be essential components of the IoT scheme. The Industrial Internet is a subset of the Internet of Things in which the computers (things) are artifacts in manufacturing plants, dispatch centers, process control industries, and so on[11].

According to Jayavardhana [12], Kevin Ashton coined the word "Internet of Things" in 1999 in the sense of supply chain management. However, over the last decade, the term has become more inclusive, encompassing a broader spectrum of applications such as healthcare, utilities, transportation, and so on.

While the concept of 'Things' has changed as technology has progressed, the main objective of making a machine sense knowledge without human interference has remained constant. A fundamental transformation of the current Internet into a network of interconnected objects that not only gather information from the environment (sensing) and communicate with the physical world (actuation/command/control), but also use existing Internet protocols to provide services for information transfer, analytics, applications, and communications. IoT has emerged from its infancy, fuelled by the proliferation of devices allowed by accessible wireless technologies such as Bluetooth, radio frequency identification (RFID), Wi-Fi, and telephonic data networks, as well as embedded sensor and actuator nodes, and is on the verge of transforming the existing static Internet into a fully integrated Future Internet. The Internet revolution resulted in unparalleled levels and rates of interconnection between citizens. The interconnection of artifacts to create a smart world would be the next revolution. According to John A. Stankovic's vision [10], Many technological communities are actively exploring research topics that relate to the Internet of Things. Today, as sensing, communication, and control become more sophisticated and widespread, there is considerable overlap in these cultures, although from slightly different perspectives. More group cooperation is welcomed. A vision for how IoT will improve the world in the near future to serve as a foundation for discussing open research issues in IoT.

Salah Addin Ahmed created the Smart GSM-Based Home Automation System in 2013. In recent years, there has been a surge in customer interest in the smart home model. Home entertainment consoles, security systems, lighting, access control systems, and surveillance are all examples of connected devices in smart homes. Intelligent home automation systems are integrated into smart homes to provide homeowners with comfort, convenience, and security. The status of the connected devices is described and recorded by the home automation system in an intuitive, user-friendly interface, enabling the user to communicate with and monitor different devices with the touch of a few buttons. Bluetooth, WiMAX and Wireless LAN (Wi-Fi), ZigBee, and the Global System for Mobile Connectivity are some of the main communication technologies used by today's home automation systems (GSM). GSM is one of the world's most commonly deployed cellular technologies. With the increasing number of GSM subscribers, research and development are being heavily funded to further investigate GSM implementation [1].

Clients may use cloud data to migrate data from their machines to cloud servers. As a result, the customer is relieved of the responsibility of maintenance while still providing high-quality data storage facilities [5]. Cloud storage raises many security concerns. Cloud service providers and data servers are not without defects. The user is worried with whether or not the information stored on the cloud is in place. The homomorphic hash algorithm is used in this article. Furthermore, for data dynamics, this facilitates dynamic operations such as insert, update, remove, and alter at the block stage. The Merkle Hash Tree is used to aid in determining the position of each complex operation. A third-party inspector verifies the correctness of the user's data and certifies the consistency of the data stored on the cloud server. The overhead of communication and computation is minimized. The deduplication technique is used to determine whether or not the file that the user wants to store in cloud storage already resides on the cloud server. This system is successful and safe against malicious server-launched replace attacks.

Nikhil Singh, Shambhu Shankar Bharti, Rupal Singh, and Dushyant Kumar Singh developed the Remotely Controlled Home Automation System in 2014. They developed a server and an android-based home automation system. The software is structured in such

a way that if no one is at home, all home appliances are turned off automatically. Proteus Design Suite was used for design purposes. The design consists of a basic home automation design with a "motion sensor" for counting the number of people inside the house, "a speed operated fan," "a light bulb," and "a LCD" for displaying the status of home appliances. “a microcontroller ic” for device control “a port” for device link

III. RESEARCH GAP AND FUTURE PROSPECTS

If a GPRS link is not accessible in an existing GSM-based home automation device, the entire system will not work. Budget-friendly: As we all know, most devices use GPRS, which is more costly than Wi-Fi. Data Pack is required: Some systems rely on GPRS, which necessitates the use of a data pack, which must be recharged every month. Some architectures employ the Wi-Fi idea, but these architectures usually employ the Raspberry Pi, which is costly. Some basic features, such as automatic monitoring of outside lighting, are still missing from home automation systems. Home automation systems often lack a feedback feature that enables users to take action in response to the notification.

As can be shown, there are several defects in previous methods. This segment focuses on the use of the Internet of Things (IoT) for advanced, energy-efficient, and self-learning home automation systems. The key goal is to develop and incorporate a low-cost, smart home automation system. For connectivity between the server and the home appliances, we use a Wi-Fi-based approach. This smart home automated system will be built with software and hardware implementation. The project proposes the implementation of an Internet of Things (IoT)-based smart home automated system that allows users to monitor home appliances remotely via Wi-Fi. The ESP8266 low-cost Wi-Fi module is used to build Smart Units. The user can use the Android App to monitor home appliances such as lights, fans, and televisions. The server will be connected to relay hardware circuits that will power the home appliances.

IV. CONCLUSIONS

A study of various home automation systems demonstrates that various technologies are used to implement this type of system. In this paper, all of the proposed systems have been discussed and compared, revealing some of the systems' advantages and disadvantages. Web-based, Bluetooth-based, mobile-based, SMS-based, ZigBee-based, Arduino microcontroller-based, android app-based, IOT-based, and cloud-based home automation systems were addressed in this study. Because of its accuracy, simplicity, low cost, and dependability, home automation systems are gaining traction in the global market, and the day when every home is a smart home is not far off. So, in this article, we primarily investigate the internet of things and conduct a comparative analysis of home automation techniques. IoT-enabled home automation has a lot of potential in the future.

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