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IoT: A Boon for Advancement of Technology

Amitvikram Nawalagatti
Karnataka State Rural Development and Panchayat Raj University

Abstract: ***Internet of Things (IoT) is a new model that has turned the traditional lifestyle into a high-tech lifestyle. Smart city, smart home, pollution control, energy saving, smart transportation, smart industry are such transformations due to IoT. A large number of important studies and surveys have been carried out to improve technology through IoT. However, there are still many challenges and problems that need to be addressed by the to reach the full potential of IoT. These challenges and issues need to be considered from different aspects of IoT such as application, challenge, enabling technology, social and environmental impact, etc. The main purpose of this review article is to provide a detailed discussion from both a technological and social perspective. Article discusses various key IoT challenges and issues, architecture, and key application areas. In addition, the paper highlights the existing literature and illustrates their contribution in different aspects of IoT. In addition, the importance of big data and its analysis in relation to IoT was discussed. This article will help readers and researchers understand IoT and its real-world applicability.***

Keywords: Internet of Things (IoT), IoT architecture, IoT challenges, IoT applications

I. INTRODUCTION

The Internet of Things (IoT) is an emerging paradigm that enables the communication between electronic devices and sensors through the internet in order to facilitate our lives. IoT use smart devices and internet to provide innovative solutions to various challenges and issues related to various business, governmental and public/private industries across the world [1]. IoT is progressively becoming an important aspect of our life that can be sensed everywhere around us. In whole, IoT is an innovation that puts together extensive variety of smart systems, frameworks and intelligent devices and sensors (Fig. 1). Furthermore, it takes advantage of quantum and nanotechnology in terms of storage, detection and processing speeds that were previously unimaginable [2]. Extensive studies were performed and are available as scientific articles, presses both on the Internet and in print to illustrate the potential effectiveness and applicability of IoT transformations. It can be used as a foundation for the before coming up with new innovative business plans while considering the security, assurance of the and interoperability.

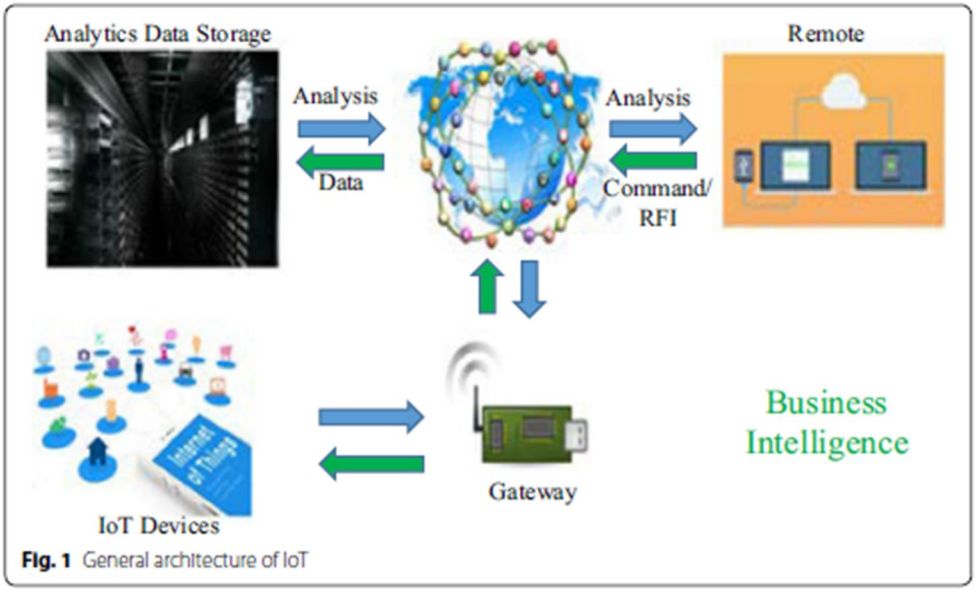


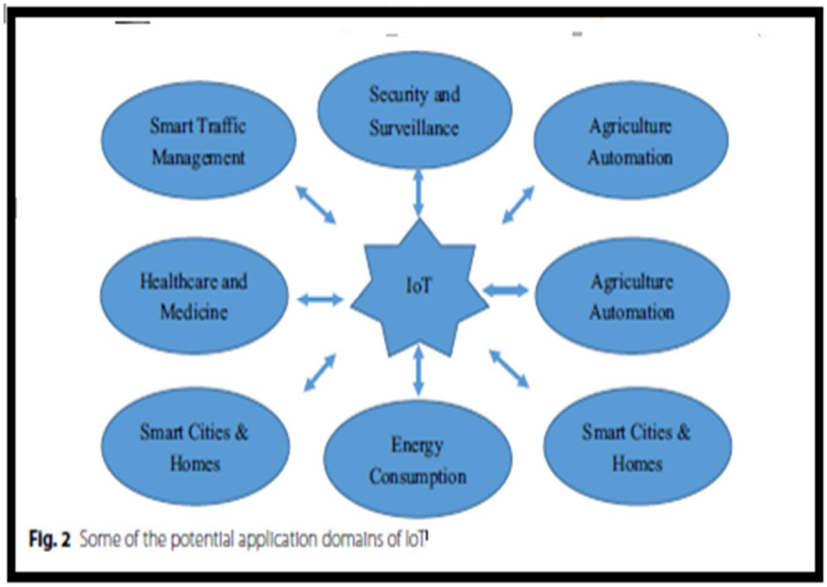
Fig. 1 General architecture of IoT

Source: Research gate paper

A great transformation can be observed in our daily routine life along with the increasing involvement of IoT devices and technology. One such development of IoT is the concept of Smart Home Systems (SHS) and appliances that consist of internet based devices, automation system for homes and reliable energy management system . Besides, another important achievement of IoT is Smart Health Sensing system SHSS incorporates small intelligent equipment and devices to support the health of the human being. These devices can be used both indoors and outdoors to check and monitor the different health issues and fitness level or the amount of calories burned in the fitness center etc. In addition, it is also used to monitor vital health conditions in hospitals and trauma centers. Thus, it changed the whole scenario of the medical field by facilitating it with high technology and smart devices. In addition, IoT developers and researchers are actively involved in improving the lifestyles of people with disabilities and the elderly. IoT has shown a strong performance in this field and given a new direction to the ordinary life of these people. Since these devices and devices are very cost effective to develop and are available in the normal price range, most people use them . Thanks to IoT, because they can live a normal life. Another important aspect of our lives is transportation. IoT has brought new advancements to make it more efficient, comfortable and reliable. Smart sensors and drones now monitor traffic at differently signaled intersections in major cities.

II. LITERATURE RIVEW

IoT has a multidisciplinary vision to provide its benefit to several domains such as environmental, industrial, public/private, medical, transportation etc. Different researchers have explained the IoT differently with respect to specific interests and aspects. The potential and power of IoT can be seen in several application domains. Figure 2 illustrates few of the application domains of IoTs potentials. Various important IoT projects have taken charge over the market in last few years. Some of the prominent IoT projects that have captured most of the market are shown in Fig. 3. the global analysis of these IoT projects is represented between the US, Europe and Asia/Pacific regions. It can be seen that the American continent contributes more in healthcare and smart supply chain projects while the European continent's contribution is more than in smart city projects.



Source research paper

Smart city is one of the trendy application areas of IoT that incorporates smart homes as well. Smart home consists of IoT enabled home appliances, air conditioning/heating system, television, audio/video streaming devices, and security systems which are communicating with each other in order to provide best comfort, security and reduced energy consumption. All this communication takes place through IoT based central control unit using Internet. The concept of smart city gained popularity in the last decade and attracted a lot of research activities. The smart home business economy is about to cross the 100 billion dollars by 2022. The smart home not only provides comforts in the home, but also benefits the home owner by reducing costs in several aspects i.e. low energy consumption will lead to energy bills. relatively lower amounts. Besides smart homes, another category in smart city is smart car.

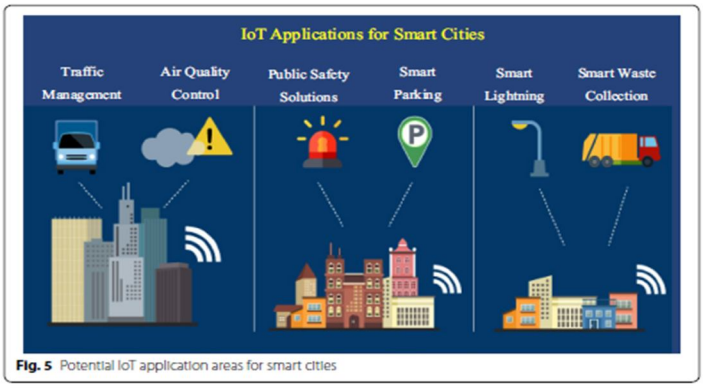


Fig. 5 Potential IoT application areas for smart cities

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The movement of people from the countryside to the city led to an increase in the population of the cities. Therefore, needs to provide smart solutions for mobility, energy, health and infrastructure. Smart cities are one of the key application areas for IoT developers. It explores a number of issues such as traffic management, air quality management, public safety solutions, smart parking, smart lighting and smart waste collection . They mentioned that IoT is working hard to solve these difficult problems. The need to improve smart city infrastructure with increasing urbanization has opened the door for entrepreneurs in the field of smart city technology.

The authors conclude that IoT-enabled technology is crucial for the development of sustainable smart cities. Another important IoT issue that needs much attention and research is security and privacy. Weber [1] focuses on these issues and suggests that a private organization using IoT should integrate data authentication, access control, resistance to attacks, and privacy customers into their commercial activities, which would be an added advantage.

A. IoT Key Issues and Challenges

The involvement of IoT-based systems in all aspects of human life and various technologies related to data transmission between devices Embedding made it complicated and led to a number of problems and challenges. These issues are also a challenge for IoT developers in the advanced smart technology society. As technology evolves, so do the challenges and needs in for an advanced IoT system. Therefore, IoT developers should think about the emerging problems and should provide solutions to them. Security and Privacy Issues :One of the biggest and most challenging issues in IoT is security and privacy due to a number of threats, cyber attacks, security risks and vulnerabilities secret Issues that give rise to device-level privacy are insufficient authorization and authentication, insecure software, firmware, web interface, and poor transport layer encryption . Security and privacy issues are very important parameters for developing trust in IoT systems regarding various aspects .Security mechanisms should be built into every layer of the IoT architecture to prevent security threats and attacks . Several protocols are effectively developed and implemented on each communication channel layer to provide security and privacy in IoT-based systems.

B. Interoperability / Standards ISSUES

Interoperability is the ability to exchange information between IoT devices and systems. This information exchange is not based on the software and hardware being developed. declare. The problem of interoperability arises due to the heterogeneous nature of the different technologies and solutions used to develop IoT. The four levels of interoperability are technical, semantic, syntactic and organizational [7]. Various features of are provided by IoT systems to enhance interoperability, providing communication between different objects in a heterogeneous environment.

III. QUALITY OF SERVICE

Quality of Service (QoS) is another important factor for IoT. QoS can be defined as a measure to evaluate the quality, efficiency and performance of IoT devices, systems and architecture . The important and required QoS metrics for IoT applications are reliability, cost, energy consumption, security, availability and service time. A smarter IoT ecosystem must fulfill the requirements of QoS standards.

A. Major IoT Application

1) Emerging economy, environmental and health-care
2) Smart city, transport and vehicles
3) Agriculture and industry automation

B. Importance of IoT

An IoT system comprises of a huge number of devices and sensors that communicates with each other. With the extensive growth and expansion of IoT network, the number of these sensors and devices are increasing rapidly. These devices communicate with each other and transfer a massive amount of data over internet. This data is very huge and streaming every second and thus qualified to be called as big data. Continuous expansion of IoT based networks gives rise to complex issue such as management and collection of data, storage and processing and analytics. The IoT dataframe for smart buildings is useful to solve several smart building problems such as oxygen level management, smoke/hazardous gas measurement, and brightness . One such framework is capable of collecting data from sensors installed in buildings and performing data analysis for decision making. Furthermore, industrial production can be enhanced by using an IoT-based network-physical system equipped with information analysis and knowledge acquisition techniques . Traffic congestion is a serious problem for smart cities. Real-time traffic information can be collected through IoT devices and sensors installed in traffic lights and this information can be analyzed in an IoT based traffic management system. sixty one]. In healthcare analytics, IoT sensors used with patients generate a wealth of information about the patient's health status every second.

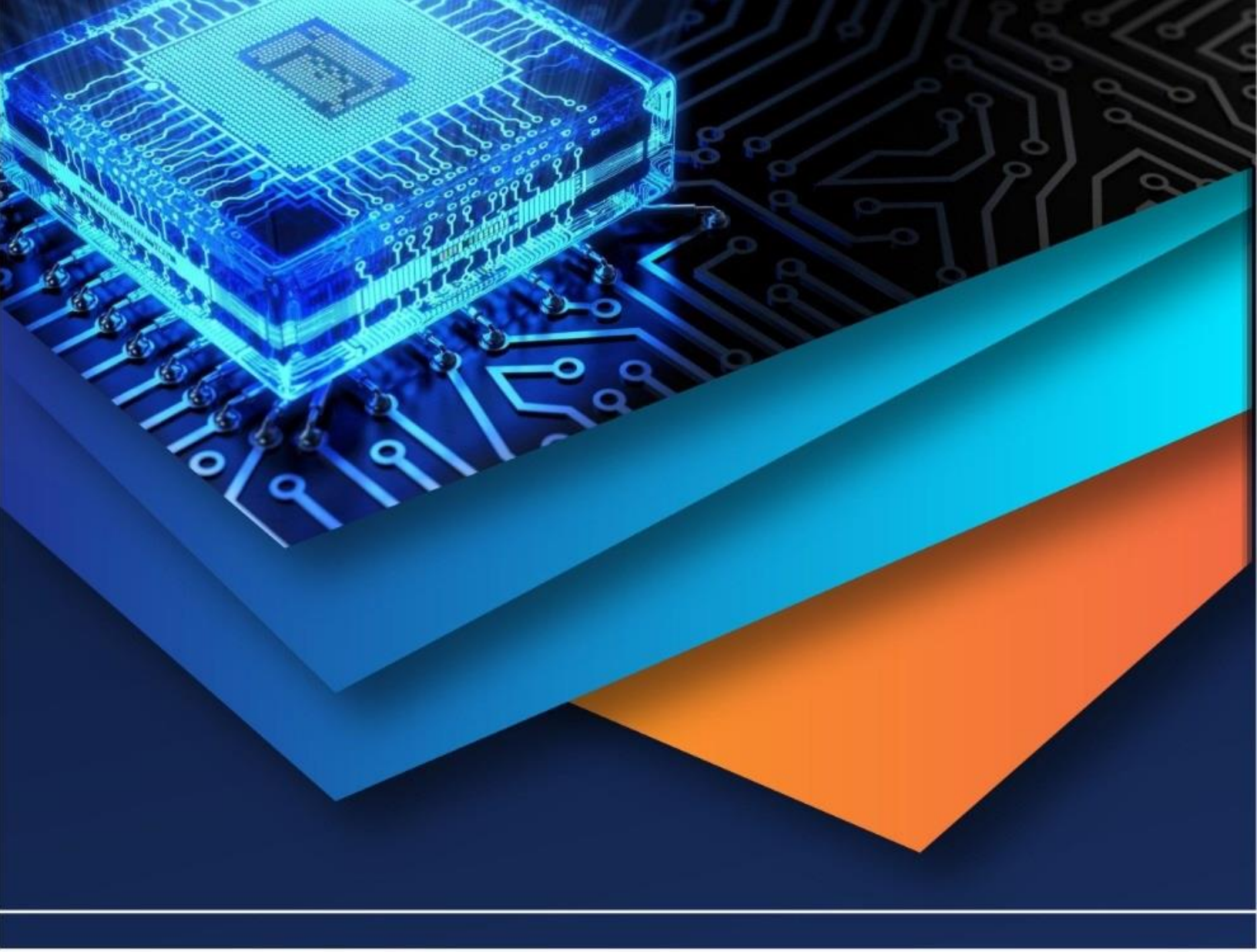
IV. CONCLUSION

Recent advancements in IoT have drawn attention of researchers and developers worldwide. IoT developers and researchers are working together to extend the technology on large scale and to benefit the society to the highest possible level. However, improvements are possible only if we consider the various issues and shortcomings in the present technical approaches. In this survey article, we presented several issues and challenges that IoT developer must take into account to develop an improved model. Also, important application areas of IoT is also discussed where IoT developers and researchers are engaged. Since IoT not only provides services, it also generates large amounts of data. Hence, the importance of big data analytics is also discussed, which can make accurate decisions that can be used to develop an improved IoT system.

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