

A Literature Review on Cloud Computing Application in Internet of Things (IoT)

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ABSTRACT: Cloud computing is a technique of connecting various networks to exchange big data. Cloud computing allows lay men to store their precious information in cloud. Free clouds as well as paid are available to use these days. In other words cloud computing becomes a trending technology of Today. Another recent technology is **Internet of Things (IoT)**. Internet of Things technology deals with the communication of smart objects or equipments. Equipments like AC's, Microwaves, washing machines can pass signals to one another or they are smart enough to self operate. With the entrance of Cloud Computing in Internet of Things the cloud act as an integral part between applications and smart objects that is used to store data and records that are generated due to conversation of these objects. Both technologies are in trend and share some common features in that way both can enhanced the capabilities of each other. The merger of cloud computing and Internet of Things (IoT) can give a high reward to society. It will raise the scenario of automation at high scale where large scale data will be generated through communication of devices for example in the field of industry. Innumerable cloud computing based applications already introduced for providing services to applications based on Internet of Things. This paper is a review based on research papers of integration of cloud computing and Internet of Things (IoT) in resented five years.

KEYWORDS: IoT (Internet of Things), Cloud computing, cryptography.

INTRODUCTION: “Cloud computing is a terminology or technology that became popular in the late 2000s. Cloud computing allows lay men to store their precious information in cloud. Cloud computing is a combination of various remote servers and networks of applications that allow regional data store and retrieval of resources with the facility of Internet from clouds. A scholar of computer science and engineering field defines **Cloud Computing** as scalable and portable. Another recent technology is **Internet of Things (IoT)**. The Internet of Things (IoT) is a latest technology based on the communication of self automated equipments (things) with each other and with corporeal of sharing resources with the Internet facility. The IoT technology comprises mainly ‘Physical objects’ (equipment); the wired or wireless networks required for connectivity; cloud computing system.

According to a research paper published in 2014 the amalgamation of cloud computing application and IoT technology in the Industry sector will come evolution. Already IoT based automated machines persuade

manufacturing sector. The existence of cloud computing along with this achieves new pillars. In contrast conventional Application software case tools has complexity issues, incompatibility problem and difficulty in portability according to the organizations. Internet of Things (IoT) is the latest technology in computer science field that is drastically varying commerce paradigms. In this paper, various methods and opinions are discussed to implement the latest technology features into conventional software case tools so that can be modified according to the requirement of enterprises. The features of IoT and cloud computing are projected to facilitate a traditional modeling system to convert into an advanced system, which is accomplished to deal with complications and updates repeatedly. To reach this target, an **assembly modeling system** is proposed. This system is facilitating with many innovations like the framework makes the machinery forceful, steadfast, elastic, and stretchy. Furthermore the proposed system has feature of reusability and automation based on object oriented programming (oops). [1]

Next review is based upon the key challenges that have to faced with the integration of Cloud computing and Internet of Things (IoT). Both technologies are distance apart from each other in some scenarios but Both technologies are in latest trend and share some common features. The author proposed CloudIoT framework - the combination of cloud computing and Internet of Things (IoT). Discussion about the applications available at that times based on CloudIoT, their implementations, complexities while running is presented in the research paper. The research lights up the future need of integration of these two latest technologies. Analysis of barriers that can arrive due to this merger and what can be the possible solutions of these barriers. [2]

In a research paper according to the researchers point of view it is very difficult to create and maintain the system applications based upon the cloud computing and Internet of Things (IoT) together. There are several reasons behind this opinion because there are variety of protocols available for communication purpose several development tools and programming languages. Interfaces are hard to design, develop and maintain. An amalgam architecture follows the flow chart mechanism is suggested by the author. The researcher gives an idea to isolating the structure of an applications into four parts – modularity, design, unite, organize, and manage – the application has to divided into various modules according to the functioning after that design each module isolated then unite them into one single framework and organize it into suitable format. Furthermore Calvin Programming language is proposed to implement lightweight runtime. [3]

Advances researches made IoT a reality in favor to general public, nature, industry and government sector. Despite of this it has some key issues to resolve. Cloud Computing can give a boost to solve these major issues that create lacking in Internet of Things (IoT) technology. On the other hand cloud computing receives reward from IoT to strengthen its own capabilities with the dealing of world's resources. With the entrance of Cloud Computing in Internet of Things the cloud act as an integral part between applications and smart objects that is used is store data and records that are generated due to conversation of these objects. . Both technologies can give advantage to one another tremendously because of sharing some common features can enhanced the powers of each other. [4]

The next research paper presented the impact of IoT reflects in professional field as well as in domestic area. Daily lives also affected by increase in these trends. These technologies are widely spread over the smart cities. The author illustrates some domestic application paradigms related to cloud computing and Internet of Things (IoT) in first half. For example operate the smart AC while driving your car or automatically turn on or off the AC according to the room temperature set. Biometric sensors installed at home lockers that checks the locking system and provides security against unauthorized usage and having alarms installed within to inform the owners about unbefitting activities. In second half, discussion about official organizational application software and dealing with IoT based equipments connected to each other and sharing signals and conversations. In automobiles industry smart machinery taking raw materials and perform operation on that and automatically passed the outcome material to next machine and so on. This will automate the task and reduced the need of workers in factories. [5]

This research paper deals with the security issues of Internet of Things (IoT) and Cloud Computing. Physical as well as conceptual security is discussed in the paper. The confidential data of general public stored on clouds and used by numerous companies and organization for their own purpose. Hackers can exploit the data at any cost. Network security is crucial aspects in the usage of cloud computing with internet of things. Passwords, security keys should be protected by encryption keys while sharing over the network. Protection of hardware devices concerned to IoT is also necessity of future. This paper has focus on security related to equipment as well as information. [6]

In this research paper a commerce oriented system is implemented. In the proposed system duties are automatically divided by the system to various employers working under organization according to their designations. Data is gathered from cloud devices. Now days, Enterprises use IoT devices to assemble factual data and use it for decision making, data mining for demand forecasting to satisfy the consumer utilities. The data eventually grows and the issue of big data arises. To overcome this problem organizations have to think about storage area having large capacity. Then cloud storage is introduced. Enterprises use the clouds for storing their mined data. The data retrieved from cloud devices are secured with RSA and AES encryption algorithms. The proposed paper recommends the authorities to store the IoT data on the cloud storage with implementation of security protocols and firewalls. [7]

This article is work on well known Internet of Things (IoT) and cloud computing based frameworks related to components management, data integrity, application deployments solutions tools for researching in the field of cloud IoT. Internet of Things (IoT) considered being management of interaction of different objects or things using internet as the milestone. Cloud, being the essential element of IoT, provides precious relevance in various application domains. A assessment is presented for general propagation of IoT into cloud computing as per their practicality. The general purpose of this theory is lights up the growth of cloud computing application into Internet of Things (IoT) and the limitations or challenges have to faced in future because of this integration. Various Internet of Things based cloud providers are currently present into the market to control apposite and

specific IoT based applications. No standardized study corresponding to IoT cloud services are found in history. For the development of these kinds of applications algorithms, system tools are described in this paper. Further, certain worst possible are also defined that can arise in near future. [8]

This article is concerned with the initiatives of smart cities with new Internet of Things (IoT) applications. It provides the facility to manage the remote devices, monitor, handle and operate different kind of devices. The Internet of Things is about installing biometric sensors for detecting unauthorized access and taking corresponding actions. Using GPS (Global Positioning system) applications connecting to the internet in order to detecting directions to go somewhere with the help of specific protocols. To become a Smart city there is a requirement of three main components good infrastructure, smart and educated people and interconnection of people and equipments with internet. In order to achieve intelligent interconnections of equipments recognition technical support of Internet of Thing (IoT) technology is required and to create new valuable and actionable information from substantial fields of real-time cloud computing is essential. The main characteristics of a smart city include major volume of terminology integration and a comprehensive study of resources. Along with all these features introduced in a city role of government plays a vital role in a growth of a smart city. New infrastructure is funded by governmental bodies then only a Smart City can be formed by combining all these intelligent features at its sophisticated arena. The volatile intensification of Smart City and Internet of Things applications creates many technical and engineering challenges that call for creative research efforts from both academic world and cooperate sector, especially for the development of competent, large, and trustworthy Smart City based on IoT. New frameworks, architectures, and platforms are in terrible desires to respond these obstacles. The goal of the special issue is to bring together scholars, professors, researchers, engineers and administrators to improve the field of Smart City based on IoT. [9]

This paper discusses that emerging technology trends coming with high speed. Digital and electronic technologies are bringing about extraordinary revolution and affected our daily routines in a smart way. The author discussed about technology transformation. Newly introduced technologies like Internet of Things (IoT), big data, social media, cloud computing, block chaining are the key pillars of ecosystem. These technologies bring the organizations to the next level of digital consumer rendezvous and deals with smart business agendas. Cloud computing is a widely used technology in digital transformation world. This paper highlights the cloud computing roles to achieve the digital transformation in Saudi Arabia, and it wants to examine the cloud computing aspects in the public sectors and commercial organizations of Saudi Arabia. An online opinion poll was uploaded to find out the exciting cloud computing espousal and its behavior in Saudi Arabia. Loss of governance sport and privatization are still the main obstacles for adopting cloud computing technology, although some organizations having their lack of knowledge in this field. The conclusion of this review is that government of Saudi Arabia and public sectors are not motivated to use cloud computing in their services. [10]

CONCLUSION: In order to achieve intelligent interconnections of equipments recognition technical support of Internet of Thing (IoT) technology is required and to create new valuable and actionable information from substantial fields of real-time cloud computing is essential. The Internet of Things (IoT) and Cloud Computing both are emerging technology of present and get a tremendous boost in coming Future. It will raise the scenario of automation at high scale where large scale data will be generated through communication of devices for example in the field of industry and cloud computing will be on high demand at that stage. However, the developments of Internet of Things (IoT) technology are assortment and are not portable. On the other hand, the cloud computing services are maintained by vendors and service providers. Cloud, being the central constituent of Internet of Things (IoT), provides valuable application specific paradigms in many application domains. Various Internet of Things based cloud providers are currently present into the market to control apposite and specific IoT based applications. Many international authorities are committed to work out towards their provision for providing a universal architecture of networks and security.

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