**Secure integration of IoT and Cloud Computing**

Shrawan kumar Sharma

**Assistant Professor, Department of Computer Science and Engineering**

**Mandsaur University, Mandsaur (M.P.)India**

[Shrawansharma3669@gmail.com](mailto:Shrawansharma3669@gmail.com)

Shiv Kumar

**Assistant Professor, Department of Computer Science and Engineering**

**Mewar University, Chittorgarh(Raj.),India**

[Shivkumar004@gmail.com](mailto:Shivkumar004@gmail.com)

ABSTRACT

Cloud Computing and the Internet of Things "IoT", an extraordinary technology, exists in every aspect of our lives. Their massive adoption and use is expected to increase, making them an essential part of the Internet of Destiny. A new paradigm combining cloud and IoT is predicted to be disruptive and disruptive in many applications. In this article, we are aware of our interest in the cloud and IoT, which we refer to as the "Cloud based IoT" paradigm various projects in data analytics cloud and IoT separately: their main products, features, core technologies and open issues. However, to our knowledge; there is no detailed evaluation of the "Cloud based IoT" paradigm in these studies. We set out to analyze and discuss the necessity of integration, the serious conditions involved in this integration, and how to solve the problems in the literature. We will explain platforms (both commercial and open source) and activities based on the 'Cloud in IT' paradigm, as well as software scenarios occurring in the data. Finally, we see the open questions, the main issues and the fate of this promising field.

Keywords—Internet of Things "IOT", Mobile Cloud Computing, Cloud Computing, Privacy, Security, MQTT.

# INTRODUCTION

It is important to consider the generalizations involved in the calculations. This is indeed true for cloud computing and the Internet of Things (IoT), two principles that share many characteristics. A combination of these various ideas can help and improve this technology. Cloud computing has changed the way technology is acquired, managed and deployed. It has been confirmed that the use of air can be used for future services. Although many people see cloud computing as a new technology, it actually owns and integrates many technologies such as grid, auxiliary computing virtualization, and network and data services. iCloud Computing provides services that allow them to share computer resources over the Internet. In fact, it is not surprising that the origin of cloud technology is networking, computing, communication and software services and distributed computers and the same computer. IoT, on the other hand, can be thought of as a dynamic and global network of devices that manages itself very intelligently. The Internet of Things is entering a stage where everything around us is connected to the Internet and can communicate with people with minimal effort. The Internet of Things usually has many products with limited storage and computing power. Cloud computing and IoT are the future of the Internet and new technologies. However, while cloud services rely on interchangeable service providers, IoT technology relies on diversity rather than dependency. Cloud Computing and IoT are two different disciplines, but both have their own statutes and specific concepts; they have a positive impact on our daily life. The combination of cloud and IoT is called cloud IoT image.By integrating these two technologies into the so-called Cloud IoT, we hope to influence the Internet now and in the future. Integrating Cloud and IoT is very important, interesting and useful in research, business or education. We will be sure to explore the importance of cloud and IoT integration and discuss the integration challenges we face and how we will solve them in a timely manner. We can also explore similar features and benefits of integrating Cloud and IoT. Not everything is cheap for everyone, nor is everything free for everyone. If you are an internet user, you have to buy everything for it. When it comes to IoT devices and cloud servers, it's too much for everyone. But using open source is good for us. In this article, we only use open source. We use inexpensive IoT devices to integrate IoT and cloud servers, and use Azure virtual machines and open source cloud available for students. This is usually the case if we send messages on the Internet. Spreading messages are easily intercepted by intruders and cause harm to both sender and receiver. Your personal information or comments will be kept confidential and treated with respect. From a security standpoint, this is very dangerous.

A message has been sent to you for your safety. For security reasons we use the proprietary MQTT protocol here. First we encode all text or strings and then we go through the MQTT protocol. From this moment on, if an intruder can have 2 ways to see the text, they won't see it, even if it's encrypted. Your information is completely sa-fe.When the text is transferred to the desired destination; the receiver can decode the encrypted data and write the data securely. Using the MQTT protocol can be very easy to secure. Here we transfer images via MQTT protocol and use a face recognition based application. When we use IoT devices for remote control and transfer images in the process it is very difficult and can cause errors. Otherwise, we can send any video files or other files of any size instead of image files.It also give you the option to transfer data securely.

# BACKGROUND AND LITERATURE REVIEW

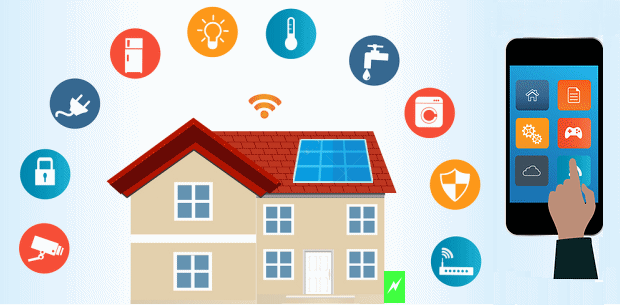
## **Birth of IoT**

Although the term Internet of Things is only 16 years old, the original idea of networked devices dates back to at least the 1970s. Prior to that, the idea was often referred to as the "embedded Internet" or "comprehensive computing" The original term "Internet of Things" was used by Kevin Ashton while working at Proctor Gamble in 1999. Ashton, who is working on supply chain optimization, wants to draw management's attention to an exciting new technology called RFID. Since the Internet was the latest trend in 1999, he called his show "The Internet of Things." Some milestones in the development of physical mashing with digital:

* On January 13, 1946, Dick Tracy and members of the police force wore a wristwatch 2-way wrist radio that first appeared and became one of the most recognizable symbols of the comic strip.
* In 1949, the bar code emerged when 27-year-old Norman Joseph Woodland of Miami Beach drew four drops of sand. Woodland, later an IBM engineer, received the first patent in 1952 for the linear bar code. More than twenty years later, another IBM, George Lohrer, was primarily responsible for improving the idea for the use of supermarkets.
* In 1955, Edward O. is the first inventor of the portable computer. Thoreau, an analog device in the form of a pack of cigarettes, served the sole purpose of evaluating roulette cycles.
* On October 4, 1960, Morton Heilig was patented for head-mounted performance.
* In 1967, Hubert Upton invented an analog wearable computer with a mirror display to help read lips.
* On October 29, 1969, the first message was sent to the Internet's predecessor, ARPANET.
* On June 26, 1974, the Universal Product Code (UPC) label was first used to shop in supermarkets.
* In 1977, Sisi Collins assisted the visually impaired, a five-pound wearable with a head-mounted camera that transforms images on a shirt into a tactile grid.
* In the early 1980s, members of the Carnegie-Mellon Computer Science Department installed micro switches in Coke vending machines and connected them to the PDP-10 department computer to see how many bottles were in their machines and whether they were cold.
* in 1990, Olivetti developed an active ID system that uses infrared signals to transmit a person's location.
* In September 1991, Mark Weiser of Xerox PARC published an article in Scientific American entitled "The Computer in the 21st Century," in which he described his vision in terms of "ubiquitous computing" and "embodied vitality." Related to this are specific aspects of hardware and software. "Stars, radio waves and infrared are so ubiquitous that no one notices their presence."
* In 1993, MIT's Thud Starr began using particularly tough computers and head-up displays as wearable.

## **Internet of Things (IoT)**

In short, IoT provides an unprecedented way for end users to communicate with each other using the Internet and the Web. In the rapid development of communication, the Internet of Things is leading to major changes, especially in wireless communication. The Internet of Things (IoT) footer is based on proper content and self-configuration, which essentially cuts across the connecting lines of the global network. You can easily observe and analyze everything in this world and by doing so, calculate costs, losses, waste, damage etc. we can reduce. By integrating smart products with IoT devices, we can bring something bigger than our core. IoT devices can connect to the Internet and collect and process data from various sources. The "Internet of Things" (IoT)" is a network of various physical devices, cars, houses, etc. that can be easily connected with various software, electronic devices and sensors that first collect and send data, big data, as well as its transmission and security in IoT. To understand IoT, we first need to understand the applications of IoT devices you need to know. What happened in the thermos, smart car, smart city, smart hospital, various electrical household appliances, electrical alarm clock and many other internet products? Now, we will talk about how these apps can help you use any IoT device easily. Let's say you came home after being away from home for a while. Check the current weather, if the sun is shining, is your house window, is the window fan on or is the window closed with the fan? How do you do this with some IoT devices that use the Internet, you can do this easily. You can easily control a smart hospital or car using the same technology.



**Figure 1: IoT based Smart Home**

## **Cloud Computing**

Cloud computing provides easy, on-demand and scalable network access for computing service providers. Cloud computing has almost no capacity in terms of storage and processing power. Some definitions of cloud computing are:

• Cloud computing is a model that provides access to a shared set of services (such as networks, servers, storage, applications, and service) with low effort or fast service as needed. network has been released to the market. (National Institute of Standards and Technology (NIST)).

• Using technology to provide comprehensive IT support to external customers is a form of distributed computing. (Gartner).

• An evolving IT development, deployment, and deployment model provides real-time delivery of products, services, and solutions over the Internet. (IDC).

• “Cloud computing” describes a service model that consists of IT delivery, infrastructure, infrastructure and business model, grid computing as a service, virtualization, ancillary computing, hosting and software (SaaS). But each research group defines cloud computing from their own perspective and perspective, so it's hard to define more.

• Public cloud computing infrastructure is hosted in a public cloud by a cloud provider.Clients have no visibility and control over where the computer is managed. The computing infrastructure is shared between organizations.

• Private Cloud: The computing infrastructure is dedicated to a specific organization and cannot be shared with other organizations. Some experts believe that the private cloud is not a true example of cloud computing. Private cloud is more expensive and more secure than public cloud.

• Hybrid cloud organizations can host complex applications in the private cloud with few security concerns in the public cloud. The use of private cloud and public cloud is called hybrid cloud.

• Community Cloud: Its is also a different type of cloud hosted in the common space of many organizations in a given community, such as banks and merchants. This is a multi-tenant installation shared between a specific group of different organizations with similar fears. Cloud computing is a disruptive technology that has had a significant impact on the entire IT industry, including Internet services. However, many economic and commercial problems remain unresolved. Each service model typically has specific concerns regarding security (eg data security and integrity, network security), privacy (eg personal information), and service level agreements that may affect customers.

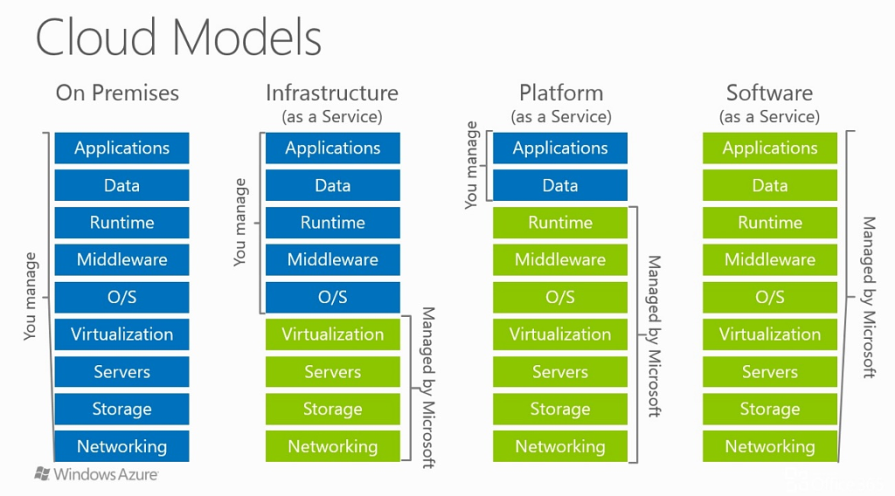
Three different types of cloud computing are shown in Figure 2:

• IaaS (Infrastructure as a Service)

• PaaS (Platform as a Service)

• SaaS (Software as a Service)

Consumption of any financial resource (such as cloud services) stored in the cloud. Cloud users (application developers or application users) can access cloud services over the Internet and cloud users only need to pay for the time and resource service they need. The cloud can also scale to support multiple service requests. Finally, cloud computing monitors the application's micro lifecycle and allows application administrators to focus on application development and maintenance. Cloud computing platforms provide a variety of services to build, test, run, run and manage applications in the cloud. Examples of cloud computing platforms are Amazon Web Services, Google App Engine, and Microsoft's Windows Azure platform.



**Figure 2: Different types of cloud computing**

# WHY CLOUD OF THINGS

The numbers of linked gadgets has already passed the entire populace of the Earth and is predicted to grow even faster. With web 3, the net is reaching nearly everywhere and the variety of related devices is increasing, an increase in the data generated. With IoT stuttering, it honestly contributes to a large chew of big data. Environmental sensors, tracking sensors, diverse actuators all generate information at extent, variant and speed. It isn't viable to procedure information on the give up of IoT. This is wherein cloud computing is available in both IoT and cloud computing have visible unique traits. However their integration has many shared pastimes which can be identified inside the literature and can be seen within the future years. It seeks the concept of the Assimilation Cloud of factors (COT) or Cloud-IoT example.

# INTEGRATION OF CLOUD AND INTERNET OF THINGS

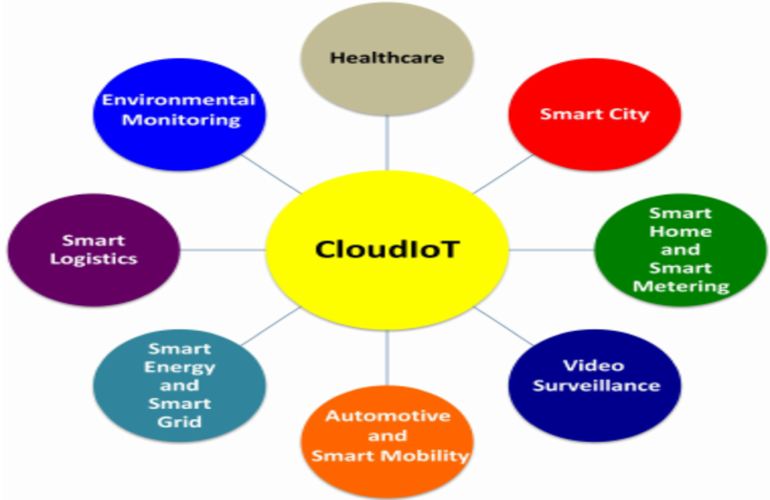
IoT combined with cloud computing has created a new model, which we call cloud IoT here. The two worlds of cloud and IoT have evolved independently. However, several beneficial effects obtained from their combination have been identified in the literature and will be discussed in the future. On the one hand, IoT can take advantage of almost unlimited resources and resources to overcome the technical limitations of the cloud (for example, storage, processing and power). Overall, the cloud provides the best solution for applications that use the interface and management of IoT services and the data or data they generate. On the other hand, the cloud can take advantage of IoT to provide many services in a distributed and dynamic way and in many life situations. These churches are very different from each other and, even better, their values often coincide. Such compatibility is the main reason why many researchers develop their integration, to benefit from certain conditions of use.

Most articles in the literature do not see the cloud in a broader sense, i.e., they believe that the cloud fills gaps in the IoT (e.g., limited storage). Alternatively, look for a cloud-based IoT environment (medium size). Due to the variety of devices, technologies, and methods that IoT has, it lacks important features such as vulnerability, connectivity, flexibility, reliability, efficiency, availability, and security. The Internet of Things in the cloud facilitates the flow between data collection and data processing, enabling rapid implementation and integration of new information while saving the cost of provisioning and processing data issues. As a result, unquantifiable analysis is possible and data-driven decisions and testing algorithms can be implemented at a lower cost, helping to increase revenue and reduce risk.

Cloud IoT has spawned new smart services and applications that have a major impact on daily life. Many of the tools described below are also useful for machine-to-machine (M2M) communication, not just when things need to be changed and sent to the cloud.

These tools include:

* + Health care
  + Smart cities and communities
  + Smart home and smart metering
  + Video surveillance
  + Motor and cognitive mobility
  + Smart power and smart grid
  + Smart Logistics
  + Environmental monitoring



**Figure 3 Application scenarios driven by the CloudIoT paradigm**

# QUALITY OF SERVICE IN THE INTEGRATION OF CLOUD AND THE INTERNET OF THINGS

Heterogeneous networks are (by default) a versatile resource; to provide more than one service or service. This does not mean that there are not only many types of traffic on the network, but also the ability of a single network to support all applications without compromising on the quality of the Service (QoS). There are two classes of applications: Navigation and traffic delay minimization (e.g., for low sample rate monitoring) and bandwidth- and delay-critical inelastic (real-time) traffic (e.g., noise or traffic monitoring), where a further distinction can be made between data-related services (e.g., high-resolution, low-resolution video) with different QoS requirements. Therefore, a controlled, appropriate way to provide different network vendors, each with its own QoS requirements is required. It is not easy to provide QoS authentication on wireless networks, as components often cause 'gaps' in device authentication due to resource allocation and administrative issues on shared wireless media. Service Quality in Cloud computing is another major area of ​​research that will require more attention as data and tools are available in the cloud. Dynamic planning and resource allocation algorithms based on the particle manufacturing process are being developed. With high power applications and as IoT grows, this can turn into a bottle. However, while working with the clouds has great benefits; there are issues in the area of ​​service quality (QoS). QoS refers to the level of performance, reliability, and availability provided by the operating system or platform or hosted infrastructure. QoS is important for cloud users, who expect providers to deliver the advertised quality characteristics, and for cloud providers, who need to find the right trade-off between QoS levels and operational costs. Any breach of the service level agreement (SLA) entails a loss to both cloud providers and cloud users. Surgery is often accepted by providers as a means of satisfying the SLA, but fails to maximize the use of resources, especially the private cloud.

Current approaches to the provision and support of service level agreements in IoT and cloud are very limited. In the light of CloudIoT, these processes will need to be reconsidered or redesigned to meet the challenges posed by future CloudIoT applications. However, QIS CloudIoT certification is expected to be challenging, with emerging discipline. This is due to the lack of standardized end-to-end QoS authentication methods (between end users, IoT and cloud devices), the complexity of multi-layer integration, and the presence of a plethora of QoS issues and parameters at each layer. We anticipate that the traditional QoS authentication method will not be sufficient from the perspective of CloudIoT applications, network communication, while important, is a minor issue. Cloud-related parameters (e.g., I / O power and CPU usage rate), devices (battery), network type and application must be used in conjunction with network parameters (bandwidth, delay and jitter) to determine the overall QoS of applications for CloudIoT. A comprehensive overview of CloudIoT, especially the sensor paradigm, is also important to understand and carefully develop QoS metrics and associated SLAs that take into account the complexity of each layer.

**Table 1: Benefits of integration IOT with Cloud Computing**

|  |  |  |
| --- | --- | --- |
| **Item** | **IoT** | **Cloud Computing** |
| Characteristics | IoT is Pervasive (things and everything). These are real world objectives. | Cloud is a ubiquitous (recourse are available is everywhere) These are virtual resources. |
| Processing capabilities | Limited computational capabilities | Virtually unlimited computational capabilities |
| Storage capabilities | Limited storage or no storage capabilities | Unlimited storage capabilities |
| Connectivity | It uses the Internet as a point of convergence | It uses the Internet for services delivery |
| Big data | It is a source of big data |  |

# BENEFITS OF INTEGRATING IOT WITH CLOUD

As the IoT suffers from limited capacity in terms of operational capacity and storage, it should also contend with issues such as performance, security, privacy, reliability. IoT integration in the cloud is the best way to overcome most of these obstacles. Cloud can even benefit IoT by expanding its scope with real-world applications in a powerful and distributed way, and providing new services for millions of devices in different health contexts. In addition, iCloud provides easy-to-use and low-cost utility and end-user services. Cloud also simplifies the flow and collection of IoT data, and provides fast, inexpensive installation and integration of complex data processing and distribution. The benefits of integrating IoT on the Cloud are discussed in this section next.

**1) Communication:-** App sharing and data are two important aspects of the Cloud-based IoT paradigm. Ubiquitous applications can be transmitted over the IoT, while automation can be used to facilitate distribution and low-level data collection. The cloud is an effective and economical solution that lets you connect, manage and track everything through integrated services and platforms. Availability of fast systems enables robust monitoring and control of remote objects, as well as access to real data. It is worth mentioning that, though Cloud can significantly expand and leverage IoT connectivity, it is still weak in certain areas. Thus, significant limitations can arise when large amounts of data need to be transferred from the Internet to the Cloud

**2) Storage: -** Since IoT can be used on billions of devices, it has a huge number of data sources, producing large amounts of informal or random data. This is known as Big Data, and it has three components: variety (e.g. data types), speed (e.g. frequency of data births), and volume (e.g. data in size). The cloud is considered one of the most affordable and convenient solutions when it comes to managing the huge amounts of data generated by the Internet of Things. In addition, it creates new opportunities for data integration, integration, and sharing with third parties

**3) Processing: -** The power of IoT devices characterized by reduced measurement capabilities that block the location and performance of complex data. Instead, the data collected is transferred to high-skilled areas; indeed, it is here that consolidation and consolidation are performed. However, achieving scalability remains a challenge without proper infrastructure. To provide a solution, Cloud provides unlimited virtual operating capabilities and the desired operating model. Predictive algorithms and data-driven decision-making can be integrated into IoT to maximize revenue and reduce risks at a low cost

**4) Scale: -** With billions of users interacting with each other and various data being collected, the world is rapidly shifting to the Internet of Things (IoE) space - a network of networks with billions of objects that create new opportunities and risks. Cloud-based IoT approach provides new applications and services based on Cloud expansion using IoT features, which allow Cloud to work with real-world new environments, and lead to the emergence of new services.

**5) New skills: -** IoT is characterized by the heterogeneity of its devices, principles, and technologies. Therefore, reliability, vulnerability, teamwork, security, availability and efficiency can be very difficult to achieve. Integrating IoT in the Cloud solves most of these problems. It offers other features such as ease of use and easy access, with low shipping costs.

**6) New models:-** Cloud-based IoT integration enables new contexts for smart devices, applications, and services. Some new models are labeled as follows:

* SaaS (Sensitivity as a service), which provides access to sensor data;
* EaaS (Ethernet as a Service), the primary role of providing broadband connectivity to control remote   
   devices;
* SAaaS (Sensitivity and Actuation as a Service), which provides automation management capabilities.
* IPMaaS (identity and policy management as a service), which provides access to policy and   
   management of identity documents.
* DBaaS (Database as a Service), which provides intelligent data management;
* SEaaS (Sensor Event as a Service), which sends messaging services generated by sensor events;
* SenaaS (Sensation as a Function), which provides remote sensing management;
* DaaS (Data as a Service), which provides full access to any type of data

## **CLOUD-BASED IOT ARCHITECTURE**

According to several previous studies, the architecture of known IoT devices is generally divided into three distinct layers: application, understanding and network. Many think that the network layer is the cloud layer, known as the Cloud based IoT architecture.

The cognitive layer is used to identify objects and collect data, collected from its surroundings. In contrast, the main purpose of the network is to transmit the collected data to the Internet / iCloud. Finally, the application layer provides a variety of services connectors.

## **CLOUD-BASED IOT APPLICATIONS**

The cloud-based IoT concept has introduced a number of applications and smart services that have impacted the daily lives of end users. TABLE in Section 2, we briefly review some applications that have been enhanced by the cloud-based IoT paradigm.

**Table 2 Cloud-Based IoT Applications**

|  |  |
| --- | --- |
| **Application Field** | **Description** |
| Healthcare | Cloud-based IoT has brought many benefits and opportunities to the healthcare sector. It can effectively expand and improve health care services and keep the field innovative (e.g. drug / drug management, hospital management). |
| Smart Cities | The middleware of smart cities for the future can be provided through IoT, retrieving data from infrastructure acquisitions, IoT technologies and data transparency. This will lead to the development of services that can communicate with the surrounding environment (e.g. Smart street lamps, large belly, ShotSpotter). |
| Smart Homes | A large number of iCooud-enabled IoT applications have enabled automation for home tasks, where the acquisition of various embedded devices and Cloud computing enabled internal functionality (e.g. home security management, smart metering, energy saving). |
| Video surveillance | By adopting Cloud-based IoT, intelligent video surveillance will be able to manage, store and process video content from video sensors easily and efficiently; and this will automatically get the details out of the scenes. It has been one of the top tools for many security related applications (e.g. CCTV Wireless Cameras, Movement Detection System). |
| Automotive and Smart Mobility | The integration of cloud computing with the Global Positioning System (GPS) and other transportation technologies represents a promising opportunity to solve many of the existing challenges (e.g., traffic forecasting and reporting, remotely controlled vehicles). |
| Smart energy and smart grid | Cloud computing and IoT can work together effectively to provide consumers with good energy management (e.g. smart meters, useful materials, renewable energy sources). |
| Smart logistics | It allows, and reduces, the automated movement of goods between producers and consumers, while at the same time facilitating the tracking of freight (e.g., the shipping industry, tracking) |
| Environmental monitoring | By combining iCloud and IoT, a high-quality information system can be integrated, connecting an enterprise monitoring a large area with well-placed sensors (e.g., pollution source monitoring, water quality monitors, air quality monitoring). |

# CHALLENGES FACING CLOUD-BASED IOT INTEGRATION

There are many challenges that can hinder the successful integration of the cloud-based IoT paradigm. These challenges include:

### **Security and privacy:-** Cloud-based IoT makes it possible to move data from the real world to the cloud. One of the key unresolved issues is how to provide compliant rules and policies while ensuring that only authorized users receive sensitive information; this is important when it comes to maintaining user privacy and especially when data integrity must be ensured. When sensitive IoT applications are moved to the cloud, issues also arise due to lack of trust in the service provider, service level agreement (SLA) details, and the physical location of the data. Critical information leaks can also occur due to overload. In addition, public key cryptography cannot be deployed across layers due to capacity constraints of IoT objects. New challenges also require some attention; for example, a distributed system is characterized by a number of potential attacks, such as SQL injection, session rides, crossbite writing, and the Nearest Channel. In addition, high-risk attacks such as session hijacking and virtual machine escape are also problematic

### **Heterogeneity:-** One of the main challenges of the cloud-based IoT approach is the large heterogeneity of available devices, platforms, operating systems, and services that can be used for new or improved applications. Cloud platforms suffer from heterogeneity issues; for example, cloud services often have appropriate interfaces that allow integration of services depending on the provider. In addition, the problem of heterogeneity can increase when end users deploy multiple cloud solutions, so that services rely on multiple providers to improve the performance and robustness of applications.

### **Big data:-** Considering that many predict Big Data will reach 50 billion IoT devices by 2020, it is important to pay close attention to the journey, access, storage and processing at the expense of the Big Data that is produced. Indeed, if we are technologically advanced, it is clear that the IoT will be one of the main sources of Big Data and that iCloud will be able to shop data for the long term and incorporate it into complex analytics. Dealing with big data is a major problem, as the operation of the application depends on the characteristics of this data management service. Finding the right data management solution that enables the cloud to handle large amounts of data remains a major problem. In addition, data integrity is an important factor, not only because of its impact on the quality of service, but also because of security and privacy issues, many of which are related to the data being transferred.

### **Performance**:- Transferring large amounts of data generated by IoT devices to the cloud requires large bandwidth. For this reason, the main problem is to obtain sufficient network power to transmit data in cloud environments, because the growth of the broadband network is at odds with sustainability and environmental integration. In many cases, services and data transmission should be available with high performance. This is because time travel can be affected by prohibitive problems and real-time applications significantly impact efficiency.

### **Legal aspects:** Legal aspects are very important in recent research on specific programs. For example, service providers have to adapt to different international laws. On the other hand, users should make donations to contribute to the collection of data.

### **Monitoring: -** Monitoring cloud computing is the first line of action when it comes to performance, resource management, capacity planning, security, SLAs, and troubleshooting. As a result, the cloud-based IoT approach has the same monitoring requirements as the cloud, although there are still some challenges related to the speed, volume and various aspects of IoT.

### **Large scale:** - The cloud-based IoT paradigm allows us to develop new applications that aim to integrate and analyze real-world data on IoT devices. This requires working with billions of devices distributed across multiple locations. The sheer size of the resulting programs raises many new issues that are difficult to address. For example, it becomes difficult to meet consolidation performance and storage capacity requirements. In addition, the monitoring process has complicated the distribution of IoT devices as IoT devices struggle with communication issues and latency dynamics.

**Conclusion**

Cloud computing and IoT are on the rise in the computing age. Both technologies provide the ability to access data over the Internet. 2 In this paper, we discuss the combined architecture of cloud and IoT, privacy of IoTCloud (iCloud), security issues of both technologies, and improve the combined access methods of cloud and IoT. We also discuss the current challenges of both technologies.

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