INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 4, Issue 3)
Available online at: www.ijariit.com

Integrate IoT with cloud

Jitendra Anil Dixit
dixit.jitu@yahoo.com
Institute of Management and Computer Studies, Thane, Maharashtra

Prashanth Thatikonda
prashanth.thatikonda234@gmail.com
Institute of Management and Computer Studies, Thane, Maharashtra

ABSTRACT

In today's world, integrating IoT with cloud computing is gaining popularity with cloud computing.To integrating IoT with the cloud can be done by using sensor nodes. This paper focused on the secure integration of cloud platform with IoT to achieve the data requirements of IoT. Cloud computing and IoT both regards to the wireless communications. Thus, it shows how the cloud computing technology improves the function of IoT. Thus we discussed the security challenges of IoT with cloud computing.

Keywords: *Internet of things, IoT, Cloud computing, Integration, Networking*

1. INTRODUCTION

The IoT has been introduced to the field of wireless communications several years ago. This concept was enhanced by the Kevin Ashton in his demo in 1998, from this year the importance of IoT has been increased. It plays an important role in the transformation of corporations. The idea of IoT has been scrutinized in the 20th Tyrrhenian workshop on digital communication. IoT can describe as the connection of various objects like sensors, mobile phones & Radio Frequency Identification which function through unique addressing system with which these apparatus are able to communicate by all of each at variance and complete their task successfully. IoT is organized in three layers such as perception layer, network layer, and application layer. In the past decade, the field of IoT becomes more advanced. There is a need to integrate the IoT with the cloud to the enhancement of zettabytes of data from the IoT devices. Cloud computing is a new era in the recent years. it can provide anything as a service. The major services provided by the cloud are infrastructure as a service, software as a service and platform as a service. The main aim of the cloud computing is to offers services with pay-as-you-use policy. This paper focused on the integration of cloud platform with IoT to achieve data requirements of IoT. We focused on discussing the issues of cloud IoT integration and proposed a framework for communication between the cloud and IoT.

2. The layered architecture of IoT

Perception layer: This layer acts as a sensing layer. The data gathered from environment carry from this layer. It includes the sensor devices like RFID tags, environment monitoring, and health monitoring sensors. The main functionality of this layer is to sense and combine the data.

Network layer: this layer combines the data from perception layer and sends to the internet. This layer is a combination of both network layer and transport layer.

Application layer: this layer receives the data from network layer and provides it to the application layer. It includes health environment, smart homes.

3. Cloud computing: cloud computing provides Storage, services, and applications over the internet. In general to make Smartphone energy efficient and computationally capable some changes are required in hardware and software. Mobile cloud computing is defined as an integration of cloud computing technology with mobile devices in order to make mobile device resource full in terms of computational power, memory. The mobile cloud computing is nothing but combining the mobile computing with cloud computing. Mobile cloud is divided into two that is infrastructure based, ad-hoc cloud. The infrastructure-based cloud, the infrastructure remains static and also provide services to mobile users.

3.1 cloud computing features

Storage over internet

This technology uses TCP/IP protocol to link server and devices. The storage over Internet Protocol (SoIP) is also known as storage over internet protocol. SoIP provides high performance and scalable IP and storage solutions.

Service over internet

The purpose of service over the internet is to provide services over the internet to the overall world.

Applications over internet

It includes the applications like which performs the task onto the server side rather than the uses the traditional technology that performs an execution on the local machine.

Energy Efficiency

As an example, when a Compact Fluorescent Light (CFL) bulb uses less energy (1/3–1/5) than an incandescent bulb to produce the same amount of lights, the Compact Fluorescent Light (CFL) is considered to be more energy efficient.

3.2 mobile cloud computing security issues

Cloud computing security or cloud security is an evolving sub-domain of computer, network and information security. It refers to the set of broad policies, controls to protect data. Cloud computing and storage solutions provide users and enterprises with various capabilities to store and process their data in third-party data centers. Organizations use the variety of different service models and deployment models. There are a number of security concerns associated with cloud computing. These are categorized as:

- Security issues faced by cloud providers
- Security issues faced by customers

The provider must ensure that their infrastructure must secure and their clients and applications data are protected. To provide security over communication network the encryption algorithm plays an important role. This algorithm provides a shield or security to the data. In this algorithm, the data is encrypted with the key and the user can decrypt the data with the corresponding key. No other user can decrypt it. In symmetric key encryption, only one key is used for encryption as well as decryption. In this encryption technique, the most used algorithm is AES. AES is a new encryption algorithm which overcomes the disadvantages of DES Algorithm. Brute force attack is the only effective attack known against it, in which the attacker tries to test all the characters combinations to unlock the encryption. It has a variable key length of 128, 192, or 256 bits; default 256. It encrypts data blocks of 128 bits in 10, 12 and 14 round depending on the key size. AES encryption is fast and flexible; it can be implemented on various platforms especially in small devices. A small part of AES algorithm is represented in this work.

AES algorithm considered better than others for a number of reasons.

- AES performs compatibly in both the hardware and software platforms under the wide range of environments.
- Its original parallelism facilitates effective use of processor resources leads to the very good software performance.
- It takes less memory for implementation and also suitable for limited space environments.
- There are no weak keys in AES algorithm.
- It can work with any block sizes that are multiples of 32 bits.
- None of any attack has been proving on AES.

There is another encryption technique is asymmetric key encryption. In this algorithm, two keys are used that is a public key and private key. The public key is used for encryption and the private key is used for decryption.

RSA is an Internet encryption and authentication system that uses an algorithm invented in 1977. Till now this algorithm is used for private key and public key generation and encryption. It is a fast encryption.

4. INTEGRATION OF IOT WITH CLOUD SERVICES

In this phenomenon, the cloud computing provides data storage and data processing for IoT. The services provided by cloud at the rental basis and IoT are intact with small sensor nodes which are limited in their capacity and storage space. That's what cloud computing provides all needs of IoT.

Issues in the integration of IoT and Cloud

To integrate the cloud with IoT is not the simple task. IoT does not allow each and everything to intact with the cloud. There are some issues which have to be solved before integration. Some issues are as follows:

QoS Provisioning: In IoT, the data size produced by the sensor nodes is more, due to this unpredictability and quality of service occurs. The sensor nodes produce data at any time and sometimes it might be an important data. Therefore, the cloud should provide prioritization to the data. Quality of service is measured in terms of packet loss ratio, bandwidth, jitter and delay to the data.

Protocol Design: in IoT, there is a number of devices connected through the internet each device use different protocols. Some device used ZigBee and some use IEEE 802.11. The protocol for the device depends on the type of sensor and gateway. Protocol support is one of the issue one of the concerned at the time of communication.

Resource Allocation: one of the issues is Resource allocation. In IoT, the sensor nodes are heterogeneous in nature, that's why each sensor nodes have different capabilities. Therefore it is difficult to provide resources with IoT.

Energy Efficiency: the sensor nodes which are exerted in IoT environment must connect to cloud and lots of communication happens due to communication it leads to energy consumption. All devices are making of sensing unit, processing unit and transmission unit and power supply unit. Most of the sensor nodes are operated limited power supply. For efficient utilization of energy efficient mechanism is needed. The major issue in IoT is that any node can join in the network at any time. Due to this reason, we require continuous monitoring on the sensor node. In large IoT network, Iot manager is needed.

Privacy and Security: in IoT, the data produced by sensing nodes may be confidential and it requires security mechanism to preserve data.

Identity management: communicating nodes over the internet are differently identified. Here objects are also the part of internet so we required it to identify uniquely. Also in case of mobile devices, for ex-mobile sensor nodes, on vehicles else on other objects also have to require an identity mapping just to enter in the new network. Since Ipv6 address is more reasonable than the existing ones.

IPv6 Deployment: if communicating objects will be identified by IPv6 then it will lead to generating an issue. Unless we

cannot get the standardized and proper mechanism then objects would assign by IPv6 is not beneficial.

Service discovery: with the cloud of things, the clod manager must discover new services for the user. In IoT, any object can become a part of it or at any moment any object can leave it. This is difficult to monitor the new services and their status. a uniform way of service would be required.

Unnecessary communication of data: in communication, there is a situation in which it is no longer necessary to upload data onto the cloud or sync device. This kind of gateway is called as called a smart gateway. We can use it for better utilization.

5. APPLICATIONS

i. **Healthcare**:
Comprehensive healthcare applications generate a wide amount of sensor data that have to be managed properly for future analysis and processing. The use of cloud in this scenario leads to the abstraction of technical details, it represents the promising solution for managing healthcare sensor data efficiently.

ii. **Smart city** :
It requires obtaining the information from different sensing infrastructures and accessing all kind of geolocations and IoT technologies, and exposing information uniformly. Frameworks include sensor platform as well as a cloud platform.

iii. **Smart home and smart metering**:
IoT has a large application in home automation where various embedded devices enable the automation of various activities related to the home. Smart home access reusable service over the internet. For that purpose, it takes three crucial requirements. Internal network interconnection (i.e. all digital appliances could connect with each other), intelligent remote control(i.e. appliances can be controlled by any device from anywhere), Automation(i.e. interconnected appliances should implement their functions via cloud).

iv. **Intelligent video surveillance**:
This application is mostly used for the security purpose. The complex videos like house security and self-contained management systems require cloud-based storage. That cloud storage system must be fault tolerant, on-demand, scalable and accessible at high speed.

v. Automotive and smart mobility:
The IoT components like WSN, RFID, satellite networks integrate with cloud represents the opportunity to prevent current challenges. IoT based new generation technology can be developed and deployed to achieve many business benefits like road safety, reducing congestion, managing traffic-related issues.

vi. Smart energy and smart grid:
IoT and cloud can be combined to manage the energy distribution effectively in both local as well as the wide area. For example, lighting only provides when there is a necessary otherwise it should be off. First of all, we have to sense the objects with different types of nodes. Each node has sensing, processing, and networking capabilities. Hence computing task should be distributed among them or where more complex and comprehensive decisions can be made.

6. CONCLUSIONS

In this paper, we have discussed IoT integrate with the cloud. We can enhance the services and provide it to the user and improves the resources which required to utilized the services. To integrate IoT with the cloud is not an easy it consists of some challenges which have been discussed in this paper. some of theData is created by specific IoT, for a moment data may not be required. In this case, either the data creation process should be stopped by the device or stopes the data uploading process by the gateway device and not gives access to the resources of network or that while. It will be very helpful in the utilization of power. For this purpose, it requires some functionality to do a little processing before sends it to the internet as well as a cloud.

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