A SURVEY ON CLOUD COMPUTING APPLICATIONS

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ABSTRACT

Cloud computing is technique that is used to access the remote servers hosted on the Internet. It helps to manage and process the data on the servers and it does not require any local server or personal computer to store that data. In cloud, the data can be accessed from anywhere and it is available to all the users. In cloud computing, hardware infrastructure cost can be minimized because the data can be stored in cloud via Internet and it requires a computer or laptop to do so. This paper mainly focuses on the concept of cloud architecture and its applications in which the cloud computing technologies are used. Cloud computing is used in many applications like transportation, gaming, health care industry, etc.

Keywords: Cloud Computing, Electronic Record, Smart Grid, Avionics, Underwater Sensor Network, Internet of Things.

I. INTRODUCTION

Cloud computing is an Information Technology method in which the data can be accessed from the shared pool of resources with the use of Internet connection. In general, cloud computing can be defined as sharing of resources. Cloud always provides more benefits when compared to other services. The data in the cloud can be accessed from anywhere and the data are hosted by the outside parties. Most of the companies are migrating to the cloud technologies to cut down the infrastructure cost. Cloud feature does not require any hardware infrastructure so that the services can be provided at low cost. In the cloud based applications the user needs to login into the application and start using the application by accessing whatever they want. Once the data are accessed then the user need to pay for the resources they have accessed. It also provides better security for the data available in the cloud storage. Only the authorized users can access the resources with proper authentication procedure.

Cloud computing deployment models [1] can be categorized into three different types: Public cloud, Private cloud and Hybrid cloud. In public cloud, the service providers make the resources to be available to all the users over the Internet. In private cloud, the services are provided to the internal users of the particular business data center. Hybrid cloud is termed as the combination of public and private cloud model. Hybrid cloud service can be accessed by the internal and external users. Some companies use the hybrid model to protect the sensitive data by using the private cloud feature.

II. CLOUD ARCHITECTURE

Cloud computing has many components and subcomponents for creating the cloud architecture. It consists of two cloud components names as Frond end and Back end and these two ends are connected via internet. Some of the other components of cloud can be middleware, cloud resources, etc. In cloud, the front end can be used by the clients, customers or users. Clients can access the cloud platforms with the help of their devices by using different user interfaces. It can be the web browsers like Chrome, Firefox, etc. Back end is referred as service providers or cloud section of the system. Back end consists of servers, storage devices, virtual servers, etc. The cloud computing architecture is represented in Fig 1.
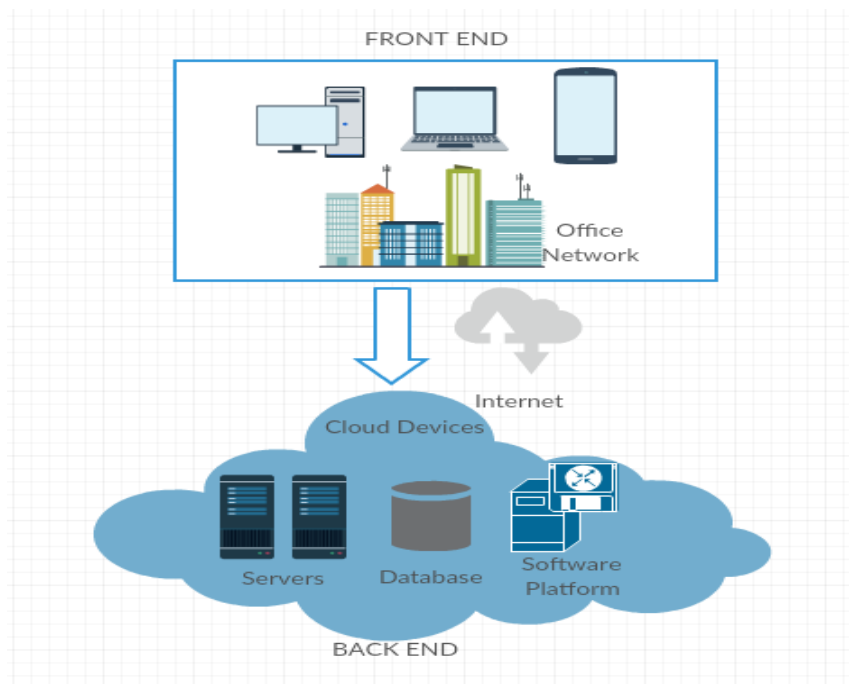
Fig 1: Cloud Computing Architecture

The applications in the cloud can be managed by the dedicated servers. The central server in the cloud helps to monitor the traffic in the system and ensuring that all the systems run without any issues and this process can be done by following the protocol rules. A middleware is also a type of software that is used for connecting the

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devices to each other. Cloud computing service providers provide storage space for the clients based on their demand. In general, cloud will be providing twice the amount of storage space that is requested by the client. In case of any issues like system failure, this method helps to keep a copy of client data in a separate storage.

III. CLOUD CHALLENGES

Cloud computing technologies are used all over the world and many companies are migrating to cloud computing to enjoy the benefits like massive storage, security and availability. In cloud, any number of data can be stored and can be accessed from anywhere at any time. Since the data are stored in cloud, the companies need not invest more capital for designing the hardware infrastructure. Cloud provides more benefits when compared to other services but it also has few challenging issues.

3.1 Security and Privacy

Most of the sensitive data of the company will be stored in the cloud and those data can be accessed by the hackers. The hackers can get access to data and affect multiple clients data if one site is attacked. The cloud can provide best security to the data by the encryption methods. The data that are in the cloud should be in the encrypted format and the proper authentication procedures should be followed for entering into the cloud application.

3.2 Interoperability and Portability

Interoperability is the ability of a system to interact with one other and portability is the other type of issue where the system that is designed to work in one environment should be able to run in other environment also. When the business is migrated to cloud feature this type of issues can be faced so it should be avoided by selecting a cloud environment which is compatible with more than one service provider.

3.3 Performance and Bandwidth Cost

Company need not invest more on hardware infrastructure but they need to spend more for bandwidth cost. Without internet connection, the data in the cloud cannot be accessed. Sometimes performance issues can be raised due to poor internet connection.

IV. CLOUD APPLICATIONS

Cloud computing are widely used in many applications. In this section, we are going to discuss about how the cloud features are used in different scenarios and their implementation methodologies.

4.1 Health Care Industry

Health Care Industries [1] are migrating to the cloud computing feature for providing the cost effective and efficient health care services to the people. The health care sectors are changing to provide best services at low cost. The technique named as Health Insurance Portability and Accountability Act (HIPAA) was used in this study to protect the patient's health record. Electronic Health Record is the collection of the patient's information in the electronic form. When this information is moved to cloud then, it can be accessed by various health care centres. Some of the benefits of cloud computing in healthcare industry are mobility of records – patient's record can be shared to many health centres at the same time, speed – faster and easy access of records, security and privacy – storing records online using encryption method and periodic backup, reduction of cost – investments on hardware requirements and maintenance can be reduced.

4.2 E-Commerce Models

Cloud computing in E-commerce [2] is used to supply the products and the services to various providers through the internet. Since many service providers also provide these features with more cost so that cloud computing is used where it does not require lot of manpower and financial and material resources. When cloud computing is combined with E-commerce model, it will lead to change of enterprise organization, profits and marketing management. Electronic outsourcing of cloud computing technology is used to avoid the hardware and software resources and the development cost. It also helps to provide services to multiple clients at the same time with better security. Data in the cloud can be protected by encrypting the saved files and the E-mails that are sent and received. Security problems in cloud can be reduced by selecting the best cloud feature and the service providers should be monitored regularly.

4.3 Intelligent Transportation System

Intelligent Transportation System [3] helps to reduce the traffic control in the roads to increase the safety measures and reduce fuel consumption and carbon emission. To improve the traffic performance, Intelligent Transportation System (ITS) is used. It also helps to improve the traffic flow control methods. MIRA a part of Network Assisted Vehicle project and it develops the off board control system. It is proposed to develop a vehicle which can able to interact with the road infrastructure. Safespot is a project which helps to improve safety by gathering information from vehicles and road side infrastructure for predicting dangerous situations and making decisions. ITS is developed with the cloud computing and grid computing methods where grid computing is used to share resources and cloud computing creates the dedicated resources using the virtualization methods. Multicast geographical addressing is used to reduce the bandwidth requirements by identifying the radio services within the certain region.

4.4 Smart Grids

Smart Grids [4] are used for tracking the consumption of electricity. It can be used in many places like hospitals, universities, multinational corporations, etc. It can supply quality power without power leakage and can repair itself when any device fails. A smart grid uses the analog technology where it can control the use of appliances with two way communication technique. Some features of smart grids are, when there is an increase of power load in smart grid then the energy consumption will be minimized. It can automatically reduce the low need electronic gadgets when the rates are lower. A smart grid uses the bidirectional communication network by supplying power to the end users. Energy intake of customers should be controlled by developing smart metering and micro grids along with the smart grid system. Smart metering can be installed at the customer's device for recording real time energy consumption data. Micro grids are used for splitting the power distribution into sub groups for managing the flow of electricity in parallel to all the sub groups.

4.5 Mobile Learning

Mobile learning methods [5] are used with cloud feature for providing education all over the world at low cost. In the present scenario, the education system is providing web based teaching at very high cost. The proposed system for education is implemented with cloud model and the client model. Cloud model is designed with a device which has memory control and device control and it is used with high bandwidth support for better maintenance of data. Cloud model provides data manipulation operation and high authentication and authorization. In the client model, the data is distributed in the cloud and the knowledge resources can be shared by all the users. It mainly focuses on the valid clients of the cloud system. With the help of mobile learning techniques data can be accessed from the centralized resources at any time. In the cloud model of mobile learning, data can be accessed from cloud feature with proper authentication. In client model of mobile learning, the application can be downloaded in the mobile.

4.6 Avionics

Avionics [6] are the electronic systems that are used in the aircraft and artificial satellites. The individual functions that are performed in the aircraft are managed, communicated and displayed with the avionics system. Cloud computing in the aircraft networks helps to provide services like Voice over IP and Voice on Demand features for passengers. It also helps to reduce power consumption and maintenance cost. With the cloud feature data can be transferred and the avionics performance will be improved. The devices like PDA's, laptops and mobile phones inside the aircraft are able to communicate with the ground station with the help of satellite link. Multiplexing and de-multiplexing methods are done in satellite communication at the transport layer. To make the satellite to fix in a position then the aircraft should interact with the cloud features. Security plays the vital role in computer networking so that the data should be encrypted using the symmetric key before sending and once it is received it can be decrypted using the same symmetric key.

4.7 Underwater Sensor Network

Underwater sensors [7] are used for monitoring the water environments. The sensors that are used are connected to the cloud system using the reconfigurable wireless transceiver systems. This helps to provide a solution for integrating the underwater network with the low cost sensors for accessing the real time information. In Wireless Sensor Networks, the underwater sensor nodes are expensive and the underwater communications are made with wireless transmissions. It can lead to many problems like signal fading issue, bandwidth limitation and sensor node failure. Some of the underwater sensor network limitations are mobility and it is difficult to find the location because the GPS signal does not pass though water. The proposed system is the underwater sensor, where it is connected to the transceiver using the wireless connection. This sensor can be powered using the local battery and solar panel. The transceivers and access points are used with USB ports for creating the real time software where it motherboard provides the high speed processing signals.

4.8 Mobile Cloud Games

Mobile cloud gaming systems [8] are used with the open source software for identifying the user satisfaction. To interact with the cloud games, the client devices collect the input from the games and send them to the servers. The gamers always demand for the games with high quality and low response delay feature. The cloud gaming are always satisfied with the games that has good graphics quality and control quality on desktops. The android features are used for providing long network latency and best gaming experience for the users. The experiment setup focuses on three host functions; they are server, desktop client and mobile client. Whenever the mobile phone or PC is used the gamer should expect for lower graphics quality because both the PC and mobile phone provides different graphics quality. Smoothness is almost equal for mobile and PC. PC provides more control over mobile because the PC's can be controlled using the keyboard keys.

4.9 Banking Sectors

Cloud computing is used for sharing the services for developing the banking system [9] by reducing the need of hardware and software requirements. The banks that are migrating to cloud feature must be selected with following criteria: gather the general information, specialized technical information and systems with database servers and software's. In the old organizational model, the servers are located at different places so that the processing time varies and more energy is consumed by the service providers. In the new organization model, the cloud feature is used so that the service providers are connected with multiple resources. It provides the services to the users with low cost. The currently used data centre cost and new data centre cost are compared and the new centre uses the lowest cost for parameters like racks, switches, routers, monitoring systems and software's.

4.10 Cloud Based Smart Homes

In Smart homes [10], the home appliances like Personal computers, smart phones, embedded devices and sensors are connected via the wireless connectivity and high speed broadband connections. Some of the advantages of cloud based smart homes are flexibility and scalability, pricing, energy efficiency, mobility, network management and security, etc. The proposed architecture for the cloud design is the clome architecture in which the appliances inside the network are connected to the outside world via the switches. It uses the simple storage and transactional database so that users can interact with the systems via the natural user interface. Open flow complaint switch is used as the backbone for connecting the devices. The low level display commands are used to reduce the computation and bandwidth overheads. User centric applications focus on storage, automated surveillance functions and health monitoring feature. System level applications focus on security, traffic monitoring and smarter network.

4.11 Smart City Deployments

Cloud computing features can be used with Internet of Things (IOT) for the deployment of Smart Cities [11]. In this the data will be gathered from the distributed IoT systems in which the decentralized cloud services are managed and reused. The proposed work uses the existing M2M resources for providing the cloud open platform integration. SaaS delivery models are used for developing the smart cities with reduced capital and infrastructure costs. Another type of open source cloud operating system named as slapos is used where its factions are based on master and slave design. Slave node requests the master node for the software installation and the master node tracks the capacity of the slave node and the software's. Master nodes are used as the web portals and web services for the end users and the software bots requests the slave nodes on which software should run on the system. Slapos, master nodes always tracks the users involved in the process of cloud resources.

V. CONCLUSION

Cloud computing is the latest technology that is used in all the business environments for providing better services. The overview of cloud computing technology and the cloud architecture have been presented in this paper. This paper also describes about various cloud models and some of the challenging issues in the cloud. Various types of cloud applications and the how the cloud provides services to these applications have been described.

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