Cloud Computing: Opportunities and Challenges

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In the field of IT, cloud computing introduces a new era. Almost every part of the IT depends on this cloud computing. It is the latest technique of providing computational resources as a service. It reduces many hurdles in the field of IT. This technology allows for much more efficient computing by centralizing data storage, processing and bandwidth. The popularity of cloud computing is increasing day by day. The main theme of this paper is to show some important features of cloud computing, its deployment model and some of its dark sides. This paper is prepared based on theoretical research on many literatures about this topic and duration was over a few months.

I. Introduction

The formal definition of cloud computing is "cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the internet). The name comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. This technology provides service to the customer to access large scale of data, which is termed as 'cloud'. Cloud computing entrusts remote services with a user's data, software and computation."[11] By elaborating this definition, we can see that the idea of cloud computing is to store data centrally rather than individual. And providing necessary services to the user as per demand. That is a service by internet 'as per you go' basis. The US National Institute of Standards and Technology (NIST) has given a complete definition of cloud computing, that is "a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, web servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction". This new, web-based generation of computing utilizes remote servers housed in highly secure data centers for data storage and management; so, the organizations get relief from managing its own database administration. The possibility of introducing cloud computing to the new places will be considered here.

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Figure 1: Cloud Computing Logical Diagram
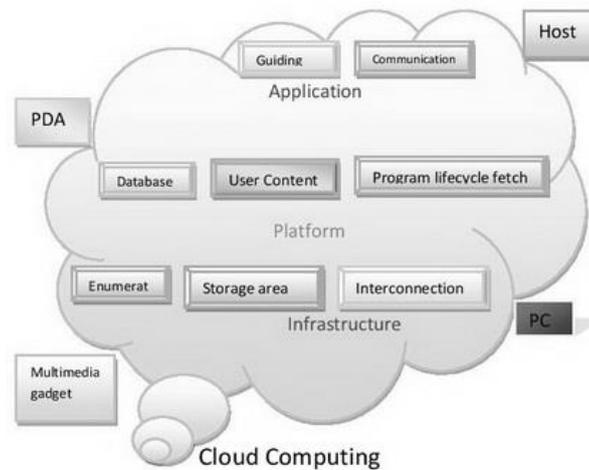
II. Related Research

A good number of research works has done on cloud computing. Again this author found a huge number of white papers on this topic. A research paper titled 'Research Agenda in Cloud Technologies' by Ilango Sriram and Ali Khajeh-Hosseini, where the authors provide a very clear concept on basic cloud computing. A white paper named 'Cloud computing a collection of working papers' by Thomas B Winans and John Seely Brown. Here the authors described the architectural structure of cloud computing. Another white paper named 'Cloud computing logical diagram' by ThinkGrid business IT on demand. In this paper the logical structure of the cloud computing, types of cloud computing and some major services of cloud computing are mentioned.

III. Brief History of Cloud Computing

At the very beginning of the 20th century, a trend of investing huge amount to establishing the data center and network was introduce by many companies. But at the end of the year 2000 this market had fallen down. Some large companies, who dreamed to earn a good profit from data center, had seemed that only 5% capacity of their data center was used. Rest of the time the system remained unused. Then the idea of cloud computing was introduced, like they can rent their computer on hour basis. This idea has introduced us to a new era of computing. Then the Amazon.com has established the Elastic Compute Cloud (EC2). At present many giant companies like IBM, Microsoft, and Google etc are involved with cloud computing business. [12]

IV. Architectural Model of Cloud Computing

To describe the architectural model of the cloud computing, we can relate it to a pyramid shape. [13]

Figure 2: Architecture of Cloud Computing
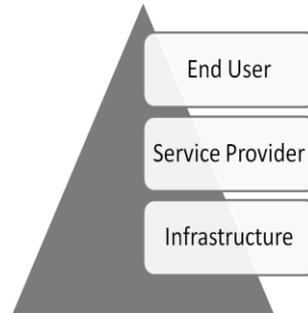
End user runs the application. They are equipped with a computer interacted by web browser. There is no requirement to pay for the purchasing the application for the end user. They have to pay only the subscription fees. They do not install the application to their own computer. They are free from maintaining or updating of the software. The middle layer is the service provider. The min the contact between the end user and the infrastructure. They customize the services according to the end users demand. The foundation of this architecture is the infrastructure. It contains several hardware components like CPU, RAM, hard disks. It also includes the server and the networking items.

V. Essential Characteristics of Cloud Computing

According to the US National Institute of Standards and Technology (NIST), there are five essential characteristics of cloud computing they are as following:

- ⇨ On-demand self-service: Customer can achieve to customize the computing resources according to his demand without the necessity of other human interaction.
- ⇨ Broad network access: The software should be compatible to the maximum types of devices over the networks, like desktop computer, laptop computer, PDA, smart phones etc.
- ⇨ Resource pooling: cloud computing should be accessible to many users at a time. The users can share resources to the other user. Cloud service providers pool their resources that are then shared by multiple users. This term is called *multi-tenancy.*
- ⇨ Rapid elasticity: Any user can get any resource at any time very rapidly. And also, when it is done, it becomes free.
- ⇨ Measured service: The services received by a customer is measured by standard meter, like calculate the usage of bandwidth, storage etc.

VI. Service models

US National Institute of Standards and Technology (NIST) introduce three most common service models.
- ➢ SaaS (Software as a Service): This is the most popular form of cloud services. The software is built by the service provider while the end users can configure it to suit their needs. Mozy is an example of SaaS. (A backup service that offers software to help people back up their data). We just have to pay a monthly or annual fee to use the service.

Figure 3: SaaS Services

➢ PaaS (Platform as a Service): Offers a platform to clients for different purposes. For example: The Windows Azure offers a platform to developers to build, test, and host applications that can be accessed by the end users. The storage space for user data may be increased or decreased per the requirement of the applications. No need to build the platform. Just pay a nominal fee for using the service.

Figure 4: PaaS Services
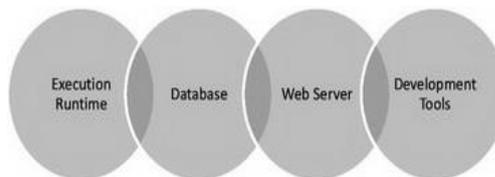
➢ IaaS (Infrastructure as a Service): Offers infrastructure on demand. The infrastructure can be anything from storage servers to   applications to operating systems. Saves a lot on expenses, space, and personnel required to set up and maintain the infrastructure. The cloud service provider takes care of setting up and maintaining the infrastructure. Just pay a fee to use it per our requirements.

Figure 5: IaaS Services
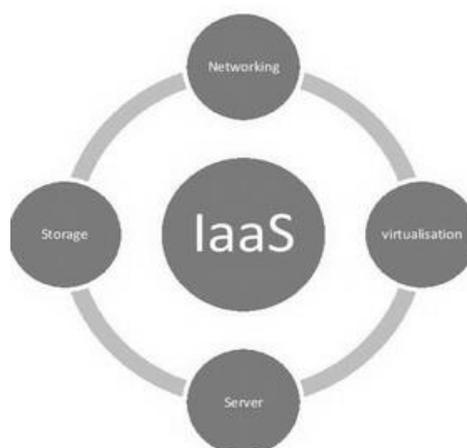
VII. Deployment models

There are four common models for deployment of cloud computing.[12] They are:

- Public cloud: This cloud can be used by any one. Generally it required significant investment. Practically large organizations owned them like Microsoft, Amazon, and Google.
- Community cloud: This type of cloud is generally set up a group or organization, to share information among them. Outside of this group, no one can share information from this cloud. Generally research based organization built this type of cloud.
- Private cloud: This type of cloud exclusively used by an organization. It may be handled by the organization itself, or by any third party.
- Virtual private cloud: Sometimes it is termed as hybrid cloud. This is mixture of the Combinations of public and private clouds. It may be worked independently.

Figure 6: Interrelation [characteristics, Service model, Deployment model]
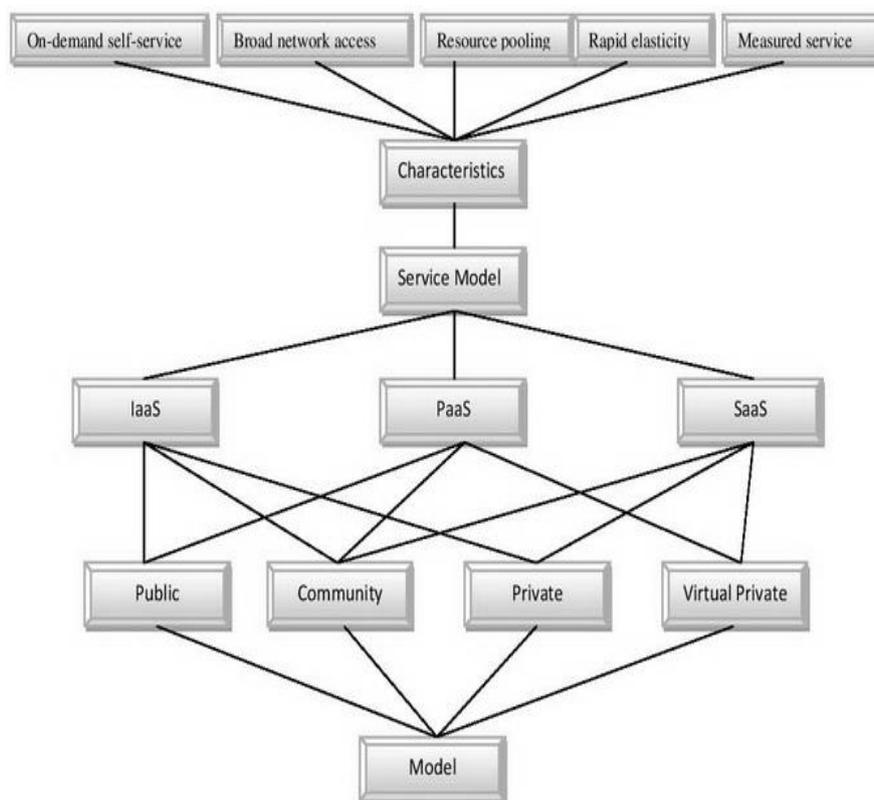
There are some dark side of cloud computing. Requires a constant Internet connection, doesn't work well with low-speed connections, can be slow, Even on a fast connection, features might be limited, stored data might not be secure; stored data can be lost, difficult to migrate massive amount of data.

VIII. Our proposal

Our proposal is to study on the possibility of implementing cloud storage centrally. It will contain the whole information of each and every citizens of the country. The information include from the birth to present situation of every citizen. Selected authority and a fixed amount of informnation will be accessible by the person himself/ herself. The information will be updated on a regular basis.

The storage will be maintained by the government (government will be the main authority but government can take help from any reputed private company which has experience as well as ability to help in this kind of maintenance issue). So the government has the correct information of all the citizen of the country thorough this database. In case of admission, job requirement, census or other purposes; related institutes would gather data from that central database. This system will lessen the server maintenance cost of those institutes as they can fetch information from that central database. In the storage every citizen will have a unique id that will be based on his/her birth registration number. S/he can view his/her profile by this id with the help of a password. There will be an option of generating code of that id holder for allowing other person or company for any transaction or other purposes. By typing this code generated by that id holder that person or company may get the access of that account to fetch necessary information from that account. But they have to get the acknowledgement from the id holder that their typed code is correct and they can get the access. There are some portions that can be changed or corrected by that particular citizen such as, recent photograph, new mobile number, marital status, job status etc.

The information will be saved in this way: Suppose there is a citizen "A". His birth place is at Narshingdi which is at Dhaka division. Suppose the district code of Narshingdi is 12, his birth year is 1985, and birth registration number is 1234. Then his id will be like this: Dha-12-85-1234. He applied on a company "C" for job and he only provide his id: Dha-12-85-1234. Then "C" will fetch the necessary information from central database. To ensure that only "C" can access the account; "A" has to generate a code which will be provided with that id. "C" has to type the id and that generated code to collect info from database. Then an automatic signal will be generated and sent to A that someone is trying to fetch info from your account. After seeing that "C" is trying to collect info then "A" will send an acknowledgement that "C" may access to and collect info. At present Teletalk Bangladesh limited has the storage that contains all public examinations (PSC, JSC, SSC & HSC) based information of each and every student. Besides all public institute of undergraduate program fetch necessary information from the Teletalk's server. Our proposal is to build a central database that holds all the information that Teletalk holds and with this it will also gather any citizens' personal information with a recent photos, print of thumbs, license number, passport number(if any), national ID number(if any), Contact number, mailing address etc.

IX. Advantages of proposed system

We can describe the advantages of our proposed system sequentially with examples.
- ➤ At present only the people of aged 18 years or older have the national ID card. But in our proposal, there is national ID card for all.

- ➤ It will dispel data redundancies. For example: to apply for a new job. The candidate has to submit the profile ID to the desired office. The authority of that office will get the information of the candidate from the central database. It will help to reduce to submit the wrong information. Again, if the candidate wants to apply multiple institutions at same time, s/he does not require giving the same

information again and again. It will help to reduce the redundancy of the data flow.

➢ The job provider can easily verify the candidate's details information.

➢ There some case, where the police verification is a must, like for getting passport, government or some other company's job, or visa processing purpose. By our proposed system, it will be very easy by our proposed system. Because the updated information of every citizen will be kept.

➢ From this system, it will be possible to check the background of a person. Like, the previous working place, types of jobs performed by that person. His/her current working place, his designation, his working arena etc.

➢ The government law enforcing agencies can trace any person and can be able to know the background of any person so rapidly.

➢ It will help the government about the idea about the people in a country. Like the number of people is illiterate or number of jobless people in the country.

X. Conclusion

The theme of this paper was to find out the way to make the implementation of cloud computing in an efficient way, such that data which will be saved in cloud should be safe, easy to be fetched, cost should be minimized. To find this, we have observed some back draws of cloud computing. If it will possible to set up the cloud storage centrally, then the end users will be more beneficiary.

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