Cloud-Computing: A milestone in Information Technology

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Abstract-In the recent booming era, the information technology is developed which offers human entertainment, convenience, enjoyment etc. Cloud computing is one of emerging development of IT industry. It is one of the IT services which based on leased and provide service to customer over a network. It also known as on-demand computing. The services of cloud-computing are managed by third party. It provides scalability, reliability, high performance and low cost as compared to dedicated infrastructure and saves managing cost and time. Most of sectors like Banking, public healthcare, and education are approaching towards the cloud due to efficient utilization of cloud services on pay-per-use basis. Cloud computing is completely an internet dependent technology where client data is stored and maintain in the data centre of cloud provider like Google, Amazon, Microsoft etc. The aim of this paper is better understanding about cloud computing and their design. This research paper outlines about cloud and all the details.

Keywords- Cloud-Computing, IT,

1. Introduction- With the rapid growth of Information Technology and success of internet, computing and storage resources become cheaper, more powerful and easily available than even before. This emerging technological trend developed a new computing era that is known as Cloud computing. It is latest trend in IT world. It is internet based computing in which resources like CPU and storage and provided as utilities which can be leased or unleashed by the users through the internet in an on-demand fashion.

Concept of this new technology was started from 1960's used by Telecommunication Company. In 1990 the technology is emerged as Virtual Private Network (VPN). Amazon, IBM, Google played a vital role to developing new and more data centers. Cloud computing is a parallel and distributed computing on the internet where more than one server is connected for sharing of data

processing, data storage and online accessing of computer services and resource or delivery of computing services over the internet. Example: - Yahoo, Gmail, Hotmail etc. Instead of running an e-mail program on your computer screen, you log into a webmail, the software or storage for your account does not exist on your computer. Suppose you save a document in Gmail account draft, it is saved on the service of cloud and all the emails on your Gmail account is also on cloud services. Cloud computing is mainly used for data storage which is stored in multiple third party. In general cloud provider provide basically three types of services, i.e. Saas (Software as a service), Paas (Platform as a service), Iaas(Infrastructure as a service).Private cloud, public cloud, community cloud, hybrid cloud (combined cloud) are the different types of cloud services based on the deployment.

Clouds are new trends in distributed system; there is no need to expertise the user about the infrastructure, it follows abstraction feature. It can be utilized as a service on internet with high scalability, higher throughput, quality of service, high computing power.

2. Cloud Computing- Cloud can be a single application, user document or device, all the things in cloud which is managed the services all the connections are invisible, It starts with an individual user and seen only to that user. Users can access the cloud by connecting the services. Users access the data as in form of e-mails, attachment and videos from any device which has internet connection. Users upload video and download e-mail or anything, the user does not know from where the data came and went, they simply know the data is stored somewhere in the form of cloud.

Cloud has four components-

Client computers-Clients are the device that the end user interacts with the cloud. Three types of clients are Mobile, Thick, Thin (most popular).

Data Centers- It is collection of servers where application is placed and accessed through internet.

Distributed Servers- Often servers are in geographically different place but server acts as they are working next to each other.

Central Servers- It manages the system such as monitoring traffic, client demands to ensure everything runs smoothly. It uses a special type of software called Middleware, It allow computer to communicate each other.

3. Cloud Computing Service Models- The cloud service providers provide three different types of services based on their different capabilities.

SaaS (Software as a Service) - In SaaS the Infrastructure (operating system, network, server, storage) and applications are managed by cloud provider. The software is delivered to clients on demand through thin client over the internet.

Google Docs and Salesforce.com are some example of SaaS.

PaaS (Platform as a Service) - In PaaS, the service provider will deliver the platform on the web so there is no need to invest millions of dollars to get that development platform which is required for your developers. In most of cases you can consume the platform using your browser i.e. no need to download any software. Main service provided is storage, database and connectivity. Some examples of PaaS are Google App Engine, Windows Azure, and Mosso.

IaaS (Infrastructure as a Service) - In IaaS the hardware resource is to be shared on-demand basis for the execution of services by using the concept of virtualization. The whole cloud infrastructure like servers, routers, hardware based load balancing, firewalls, storage and other network equipments are provided by the IaaS provider. It is also called as "hardware as a service". Some examples of IaaS are Flexiscale, AWS: EC2 (Amazon Web Services).

4. Cloud Computing Deployment Models-

The main concern for any services is security, trust and privacy. The security issues starts from deployment model of cloud computing. There are four different types of deployment model i.e.

Private Cloud-When cloud infrastructure has developed for single organization only by it may manage by the organization or third party on or off premises is known as private cloud. It is more secure and expensive as compare to public cloud.

Public Cloud-When cloud infrastructure is provided for more than one organization in parallel mode and managed by third party is considered as public cloud. It is beyond the organization firewall. Public cloud provider named Google and Amazon offer an access control to their clients. Microsoft Azure and Google App Engine are example of public cloud.

Hybrid Cloud- It is combination of two or more than two cloud model that bound together for offering the service of multiple deployment

models. A well constructed hybrid cloud provides efficient service utilization. Amazon Web Service (AWS) is an example of hybrid cloud.

Community Cloud- In community cloud infrastructure is shared by several organizations for a specific shared cause and it is managed by them or third party service provider. An example of community cloud is facebook.

5. Cloud Computing Architecture-

It consist all the component and subcomponent which is required for cloud computing. Cloud computing system is divided into two parts: front end and back end. They connect through a network called internet. Besides there are other components like middleware, cloud resources etc included in cloud computing architecture. Middleware connects network computers to each other. Front end is the side i.e. visible for computer user and client. Different cloud computing system has their different interface. The web browser like Chrome, Internet Explorer, and Firefox supports for email program. Unique applications are shared between client and service provider for different system. On the other hand Back end includes computers, data storage and different types of servers, virtual machines etc. it is basically used by service provider.

The security mechanism, traffic control and protocol for connection establishment between networks are also managed by back end. The central server is responsible for traffic management and entire cloud computing services. When client demanding, the cloud computing service provider provide the storage space. Service provider companies require huge number of data storage device. A cloud computing system maintains a back up (redundancy) of all client information and stores in different device for recovery when systems will be break down.

6. Cloud Computing Layers- The working principle of cloud computing is also categorize in different types of layers.

Virtualization Layer- It is the root of cloud system. When a user needs any type of infrastructure then cloud provider deploy all the virtual machines on the host.

Networking Layer- All the connection establishment is done by the TCP/IP protocol and domain name server (DNS). All the switching and routing principle are managed by this layer.

OS Layer- The cloud computing system is properly managed and establishes connection of server appropriately and all the cloud services and deploys deliver and maintain optimally under this layer.

Application Layer- This layer is responsible for the management of software and databases, including installation update and removal. Cloud developer should have knowledge in Perl, XML, and JavaScript etc and also have knowledge of back end infrastructure applications like Tomcat, Apache, and SQL.

7. Cloud Characteristics- The cloud demonstrate following basic characteristics-

On-Demand, Self Service-A client can demand a service through an internet at any point in time 24*7, which becomes immediately available for their use.

Elasticity and Scalability- Cloud services are more flexible and scalable; all the offered services depend on the need of client. You perform modification easily like add or remove client, software feature and client.

Broad Access Network-The cloud services are spread over the world by the internet. So you can access services at anywhere and anytime by using device like Smartphone, laptops, tablets and PDAs.

Resource pooling-In any organization, multiple clients can access the physical and virtual resource and infrastructure that are pooled together, by using multiple tenant-models.

Billing and Measured Services-Cloud services can be measured and control by using a metric capabilities i.e. transparent for both client and service provider. Services charged on pay-per-use basis.

Multi-Tenacity-A public cloud resource is used by multiple groups with the same specific privileges; all the groups may be same or different organization.

Performance Measuring-Cloud service provider manages a performance monitoring which integrate physical environment and IT systems in all the different service layers. To provide optimum service is main concern of it.

Security- All the valuable client data resides over company cloud so a cloud service provider provides security assurance for the information so it has not been accidently retrieved by another company(hackers).

Application Programming Interface (API) - The communication between two application and client with service provider takes places with an efficient interface.

8. Advantage of Cloud Computing-

Flexibility- Cloud Computing reduces the complexity of network. No need to buy licensed software.

Scalability-As a cloud computing is distributed system and it is growing faster and a client can access it from any location anytime.

Reliability- Cloud services are trust-worthy. Lots of users are connecting and utilize the services in efficient manner.

Efficiency- Multiple client with multiple issues are using different types of location independent services efficiently.

Mobility-Mobility is necessary for cloud computing success, access your data anywhere and anytime. This allows for collaboration and sharing among users in multiple locations.

Cost Efficiency- It reduces the cost for both user and owner because you have needed to pay as pay-per-use.

Backup and recovery- All the replicate copy of data is stored in data servers to recovery from any type of data and recourses loss.

9. Issues with Cloud Computing-

Security- The major issues is security because all your confidential data is handed over third party cloud service provider, then it's main concern how to data is secure from hackers.

Technical Issues-When the cloud system can have serious dysfunction then cloud services may be stopped for a instance of time.

Prone to Attack- As you know nothing on internet can be completely secure and hence, there is always the lurking possibility of stealth of sensitive data.

10. Emerging Trends in Cloud Computing-

- Cloud computing and Mobile computing are different technology both are merged as a new phenomenon called Mobile Cloud Computing, with the anticipated capacity of 5G mobile, mobile cloud services with experience large growth in 2015.
- Hybrid cloud used as data security and governance issues, continuous growth for this emerging trend will see in 2015.
- Cloud has become milestone for launch and distributes new software and services.
- Organizations are building their own clouds e.g. IBM "Blue Cloud", Microsoft "Azure", Salesforce "Successforce", Google "GooG". Amazon.com and IT staff managed data centers the private cloud.
- Cloud Computing deals technological implementation, this helps companies to concentrate on their business development. It improves quality and save time.
- Cloud computing also provides consultancy, on-demand service like

Salesforce's Successforce which helps client to get Salesforce consultancy or connect them to their partners Accenture, Deloitte.

- It is to be estimated that human intelligence will be incorporated into a new trend for Artificial Intelligence named "IT THING".
- A fewer natural resource will be utilized after merging of Green Technology with Cloud Computing.

11. Security Issues-Security issues started from deployment model. To protect information, applications and infrastructure associated with cloud computing technology is considered under security principle.

- Infrastructure Security
- Data Security and Storage
- Identity and Access Management
- Privacy

Infrastructure Security-This security mechanism applied on network level, host level and application level. To ensure confidentiality, integrity of organization data and ensuring proper access control (authentication, authorization and auditing) to whatever resources you are used at your public cloud service provider. Host Security responsibility are transferred to cloud service provider.

Data Security and Storage -When client put their large size data on the cloud, the integrity protection must be maintain. Data centers are full of server so the data centre must be physically secure against the unauthorized access. So confidentiality, integrity and availability are major issues for data security. Authentication and Identity, Application for Encryption for data in motion, Data masking these are some technologies which are used for data security in cloud computing.

Identity and Access Management- Cloud Computing services are diverse in multiple sectors. Personal, financial, medical data, software

applications are hosted in cloud so company's trust boundary became dynamic.

Privacy-The main concern of privacy is accountability all the data and information resides in cloud are user's confidential data so privacy must be required.

12. Future Scope of Cloud Computing- Cloud computing is emerged as a revolution in information technology. Business, organization and individual have benefited after using it because all the application, infrastructure, services, platform are available from cloud service provider as online. There are also some privacy and security concern but it is recovery in efficient manner. Cloud computing become more prominent in upcoming years. Most new software (applications) will be available on cloud and it will increase growth in the market of the cloud, increased development, more innovation and more hybrid cloud adoption.

13. Conclusion- Cloud computing is most talked IT word today because it has helped several organization to save money. It is totally internet based technology without internet it is meaningless. It has non restrictive platform for many application. This paper discusses cloud computing in detail and discusses service model, deployment model, layers, and trend. It is beneficial for everyone in their daily life.

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