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Characteristics of Cloud Computing

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Abstract

Cloud computing is the upcoming environment in the use of computer technology. Numerous users are keen to put their information in cloud; since balancing load in cloud a risky. Load balancing resource allocation plays a vital role. This chapter deals with the research motivation, the objectives and the thesis organization.

Keywords: Load, Balancing, Cloud, Literature

Introduction:

The term "Cloud" in Cloud computing refers to the communication system which is integrated with the computing structure.Cloud computing system is accessed using a network which provides software, hardware, processing power etc. to the user when demand is generated. It is essential for computing resources that provide a pool to users by internet. It (Alexander S, 2014) provides various services to theuser by creating a group of clusters and grids of computers. The main objective of this is to provide services in a virtualized manner to reduce burden for the user in maintaining everything by itself. It also refers to web-based computing which provides devices with shared numerous resources, data or software on need and pay per-use basis. Instead of having local servers or own devices for managing applications, people use sharing computing resources model of a cloud. It is the way to service computing grasp adopted by important IT companies like Apple, HP, Microsoft Oracle, Amazon, Google and IBM. Its structure refers to the different elements and sub-elements of cloud that establish a network design.

Benefits of Cloud Computing

It provides numerous benefits as follows:

Instant scalability: CC facilitates rapid scalability of framework quantity based on business requirements. It uses limitless IT source which is scaled up or down to meet user demands.

Anywhere accessibility: Numerous aspects use facilitates globalization and getting one key technology and maximum speed internet connection. Cloud grants enterprises to the use of their application in globe which services their customer's fraction of traditional cost motor-brick business, due to customers in world getting a similar digital for use of applications.

Increased speed and operational agility: Business has the capacity to instant scale for cloud size by access bandwidth need from remote servers of a certain cloud service provider. Business needs are high in area of computing capacity and IT source with the click of a button. Such ability increases organizational productivity, efficiency and agility for creating the scope to experiment with fresh thoughts and offers competitive ability and advantage for the sector of any size to disturb market.

Reduced expenditure: Enterprises target to create their own business rather data centers and hardware framework investments whichstand idle or under utilized. Cloud expense based on use is variable.

Automatic updates/patches: An enterprise deals with varioustypes of OS, software and apps from different dealers for daily performance and has security updates and software that change from time to time. It is time use method and system downtime management indicates productivity loss. Cloud service provider or maintenance takes care of automatic save time and maintenance of manual effort.

Disaster recovery: The world is getting digital making disaster recovery crucial and powerful backup for all size business. On- premises investment for hazard resumption are things or previous today. CC helps huge sectors in this effort in exercise and mini enterprises thatsave time.

High security: The challenges for CIOs are personal identifiability, financial data and sensitive protect. Issues of cyber stealth and data loss are minimized by the use of advanced cloud security feature. **Reduced carbon footprint:** Last but not the least, cloud framework minimizes power, resource consumption and IT framework by providing resources as per need and minimizes e-waste and adverseeffect on environment.

Flexibility: Closed cabins bring internet facility devices to process, global assets or device types. Cloud provides vast empowerment and flexibility to business houses and their personnel.

Enterprise collaboration: Company data are not any more in silos. Centralized document management on file-sharing, social communication apps and cloud based provides visibility and transparency into streamlining data flow, work processes, and facilitate good combination among teams, employees and department placed in various time zones all these causes increase bottom line as well as productivity.

Risk and Challenges in Cloud Computing

CC found use in companies which have the requirements to store data. There are numerous protection problems faced by them. Companies have produced easy and automated methods for increasing CC management.

Challenges and issues faced by CC are:

- Interoperability & Portability
- Cost
- Lack of resources
- Security & Privacy
- Reliable and flexible
- Downtime
- Management of Multi-Cloud Environment

Security and Privacy of Cloud - Data store in cloud is protected and gives guaranteed. Customers have a high dependence on the cloud provider who has significant protection measures to protect customer data. There is a big need for security of information stored. Clouds have robust passwords shared with others and are periodically modified. Data outside the firewall has a few problems of cancelation by the cloud provider. Malware and hacking has significant issues and affect numerous customers. Hacking causes data loss, disturbs encryptedfile network and has other issues to be addressed.

Portability and Interoperability –The customer is provided migration services in and out of the cloud. There is no bond period and built customer hindrance. Cloud has the ability to provide premises facility. Remote access is one of cloud challenges which precheck cloud provider hence the customer care use the cloud from anywhere.

Reliable and Flexible - It is one of the limitations in cloud faced by customers and cancelled a way to ensure no leakage of information given to cloud the host must ensure reliability to the customer. Challenge services given by a third party has supervision monitored based on operation, business dependency and robustness for the cancellation.

Cost - Cloud computing is economical through a modified cloud service provider to customers need is expensive sometimes. Further it leads to hindrance to the small-scale sector modify cloud based on their needs as expensive. Transfer of data from cloud to premises is costly.

Downtime - It is basic challenge of CC as no cloud provider promises a platform which is free from downtime. Internet connection has a significant role when a company has unsafe internet connection there is the issue faced when downtime occurs.

Lack of resources -It is one of significant limitations experienced by cloud many companies hoped to reduce the limitation by appointing numerous workers. These employees not only help meeting challenges of companies but they also teach the staff. Today numerous IT workers are working on the improvement of expertise CC CEO's find this a challenge as employees are not skilled. It trusts employees with idea of current development and innovation.

Management of Multi-Cloud Environment – Many sectors do not utilize just one cloud but numerous clouds. On an average they utilize 4.8 various private and public clouds. When company utilizes multi-cloud there are faced by IT team. These are managed by well trained employees, use of proper tools and research undertaken.

Issues in Cloud Computing

Cloud computing is new name from an old concept. It provides computing services from remote locations. It is an internet based computing in which software, data and shared resources are given tocomputers and other devices on the need. Significant features are CC.

1. **Privacy:** User information is used by the basis of the host company with or without permission. Service provider uses data which is on cloud at any point of timewith change or deletion voluntarily.
2. **Compliance:** There are numerous regulations in places combined for hosting as well as data provision. User must adopt deployment modes for satisfying the resolution which is costly.
3. **Security:** Cloud-based services have a third party for security and storage. Assuming the cloud based company is secure and protects information when utilizing services free or for a change, user's data are shared with others.
4. **Sustainability:** The Problem refers to a reduction in the effect of CC environment. Citing server's effects onenvironmental CC, in areas where climate promotes renewable electricity and natural cooling is usable, countries with suitable conditions like Sweden, Switzerland and Finland are attempting to attract CC data centers. Rather, nature favors these countries having enough technical framework to save high end clouds.
5. **Abuse:** Offer of cloud services provides determination of the client not availing the services of CC fornefarious purpose. In 2009, banking Trojan not legally utilized in Amazon service as command as well as control channel which issues malicious instruction and software updates to PC which is affected by malware.

Resource Allocation & Scheduling in Cloud

CC, has certain common portion of resource management. These are discussed below.

Resource Allocation

Resources on the cloud are not frequently shared by multiple cloud users other than those dynamically reallocated for any demand. Resources can be allocated and reallocated for the utilization by the user. There may be variations in the demand from of the user over a period of time. But the aim is to is allocate the resources efficiently. Resource allocation (Zhenxiao et al., 2013) constrains have a set of restrictions on scheduling resources, and allocating them to a particular task. The machines are situated in dissimilar regions with each machine having different processing abilities, and different characteristics such asprocessors, CPU core, size of main memory, cost, etc. The parameters of cost, time and processing capacity are considered at the time of scheduling and allocation. Task scheduling and resource allocation require careful matching for the achievement of reduced time and confusion of optimized results. Effective cloud environment is possible only with optimized results.

Computing time in task scheduling with a set of times such as that in receiving, processing and waiting. The main core of this work is calculated to attain optimal task schedules using skewness algorithm to minimize total time.

RAS is the process of incorporating numerous activities for use and allotment of limited sources within the limits of the cloud environment to so attain requirements of cloud apps. Completion of the user job requires details of the type and number of resources required for each application (Vinayak Awasare, 2014). Normally when the service providers allocate resources to the users, this is done based on the user's requirements and requests. A major issue which is addressed significantly in cloud environment is how to maintain QoS and manage SLA for cloud users which share cloud resources (V.P. Anuradha, 2014).

Cloud users target application availability, performance, cost- effective scaling of available resources. The core of cloud computing is the offer of resources with high availability, reliability and scalability in distributed environments (Singh Aditya, 2015).

Resource Scheduling

It refers to various techniques which the service provider utilizes for sending and allotment of various resources in a virtual environment. Premise which is a resource is limited with users and tenants not actually owning or maintaining resources allotted to them, instead the allotted resources are need based on scheduling techniques and advertised number of resources have ceiling values. This allows the

system to learn with no resources pinned down, unused and wasted. It is a hotspot area of research in cloud due to the huge time for implementation and the cost of resource. Various

resource scheduling schemes and specifications are directed to various types of RSAs.

Need of Resource Scheduling

The first objective is to find available resources for scheduling appropriate workloads on time and improving resource use effects. Especially, the number of resources must be the least for workload to manage the needed level of service quality or reduce the time of workload. Good resource scheduling requires finding adequate workload which supports scheduling multiple workloads for fulfilling high QoS needs like CPU use, reliability, security and availability etc. for the cloud workload (Singh, S, 2015a). It has the implementation time for each distinct workload but the overall efficiency depends on the type of workload i.e. with different QoS need (heterogeneous workloads) as and with the same QoS need (homogenous workloads) (Singh, S, 2015b).

Open Issues

Basis of survey scheduling fabric is required for various parametric quantities. Performance of energy usage is an important problem which means a lot of concern. Scheduling is an unmatchable problem in cloud environment.

It targets on time, load balancing, cost and energy efficiency of data centers. Resource imagination allotment sets a major use in scheduling.

Parameters to use for Resource Scheduling

In CC, each cloud user wants a huge service efficiency which is offered by the cloud provider. Performance is achieved by minimizing makespan, response time, implementation time and improvement in speed or bandwidth. Specifications utilized for performance aware scheduling are:

Makespan It is related to finding high completion time of task or cloudlet and sources allotted to users. It is important in the minimizing of the makespan of some cloudlet demand not satisfied(Abdulhamid et al., 2015).

Cost of implementation It is a variance of SLA and ideal cost and used in the implementation of cloudlets or task (Deelman et al., 2008).

Time of implementation It means the time which is used for the execution of task or cloudlet. Reduction in implementation time is needed for the user and the cloud provider for improving performance. It affects energy consumption, use, overall performance and load balancing (Puschner and Koza, 1989; Xiong and Perros, 2009).

Time of reaction It is the time, task or cloudlet feedback to some input start process. It is evaluated by the sum of the submission and the waiting time. It affects the waiting time of the task or the cloudlet (Bashir et al., 2013).

Bandwidth/ velocity It is the amount of information which is implemented or transferred in a fixed time. It is processed in (bps) (Buyya et al., 2009).

Priority It is specified by task or cloudlet, treated or considered as more significant than others. It has the ability to take further or to process before others (Ghanbari and Othman, 2012).

Load Balancing in Cloud

Thousands use websites at some point of time for other. Cloud has limitation in maintaining load obtained from all demands at time any point of time. It results in destroy of the entire network. It is the process in which computing resources and workloads are distributed to more than one server. Workload is divided between two or more servers, hard drives, system interface and other computing resources resulting in good use and system response time. A huge traffic web site requires a high powerful load balancing for smooth performance in business. It helps maintaining network firmness, operation and security against network failures.

This sort of distribution gets a high output in a reduced feedback time. Workload is divided between two or more servers, network interface, hard drives or other computing sources that enable better resource use and system feedback time.

Working of Load Balancing

First, load in load balancing refers not only to website traffic but also of memory capacity, CPU load and network on server. Its main function is to ensure every network of system has

the same amount of work. It means neither that the system is under used or overloaded. It makes equal distribution of data based on how busy the server is. Without this the client has to wait long for processing this data thiscould be a frustrating for them. During this process, data like CPU process and job arrival rate in the processors are modified. Failures in application of this head have severe consequences like data loss. Different companies utilize various load balancers with numerous load balancing techniques. The most commonly used model or techniques is the "Round Robin" load balancing.

Load indicates not only a traffic website but includes network load, memory capacity and CPU load of any server. This method promises that every network in system has similar number of work at a time. Any of them is highly under or over-loaded use. It gives data based on how busy every node or server is.

Data include job arrival rate, CPU processing rate and queue waiting etc. Changes are made between processors under this method. Failure in the right application of these causes serious consequences andinformation getting lost in one of them.

Importance of Load Balancing

1. **Better Performance** - This method involves less cost and means ease in implementation compared to counterparts. Sectors work on client's applications faster and means good efficiency at reduced cost.
2. **Maintain Website Traffic** – Cloud balancing offers scalability to manage website traffic. Due to effective load balancers that easily maintain high end user traffic with the presence of network and servers. It plays a vital role for e-commerce websites such as Flipkart and Amazon who deals with numerous visitors each single second.
   Load balancers help them in maintaining anddistribution of workloads at the time of sale and promotional offers.
3. **Handle Sudden Traffic Burst** - Load balancers have the ability to handle rapid traffic at any point of time.For instance, a University or College website shuts down during results declared due to too many requests arriving at the same time.
4. **Flexibility** – The main objective of utilizing a load balancer is to secure a website from any rapid mishap. Workload is distributed among many network units or servers. When one node fails, the load is shifted to another. This gives flexibility, handling and scalability ability of traffic.

Characteristics of Cloud Computing

There are many characteristics of Cloud Computing here are few of them :

1. **On-demand self-services:** The Cloud computing services does not require any human administrators, user themselves are able to provision, monitor and manage computing resources as needed.
2. **Broad network access:** The Computing services are generally provided over standard networks and heterogeneous devices.
3. **Rapid elasticity:** The Computing services should have IT resources that are able to scale out and in quickly and on a need basis. Whenever the user require services it is provided to him and it is scale out as soon as its requirement gets over.
4. **Resource pooling:** The IT resource (e.g., networks, servers, storage, applications, and services) present are shared across multiple applications and occupant in an uncommitted manner. Multiple clients are provided service from a same physical resource.
5. **Measured service:** The resource utilization is tracked for each application and occupant, it will provide both the user and the resource provider with an account of what has been used. This is done for various reasons like monitoring billing and effective use of resource.
6. **Multi-tenancy:** Cloud computing providers can support multiple tenants (users or organizations) on a single set of shared resources.
7. **Virtualization:** Cloud computing providers use virtualization technology to abstract underlying hardware resources and present them as logical resources to users.

8. **Resilient computing:** Cloud computing services are typically designed with redundancy and fault tolerance in mind, which ensures high availability and reliability.
9. **Flexible pricing models:** Cloud providers offer a variety of pricing models, including pay-per-use, subscription-based, and spot pricing, allowing users to choose the option that best suits their needs.
10. **Security:** Cloud providers invest heavily in security measures to protect their users' data and ensure the privacy of sensitive information.
11. **Automation:** Cloud computing services are often highly automated, allowing users to deploy and manage resources with minimal manual intervention.
12. **Sustainability:** Cloud providers are increasingly focused on sustainable practices, such as energy-efficient data centers and the use of renewable energy sources, to reduce their environmental impact.

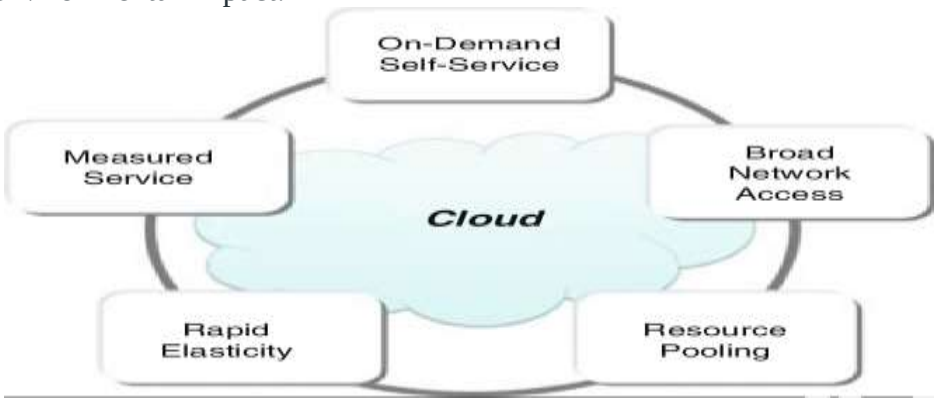

Fig – characteristics of cloud computing

Advantages of Cloud Load Balancing

- **High Performing applications –** This method is not like their traditional on-premises counterparts being low cost and easy to execute. Companies make their customer application work faster and achieve good efficiency potentially at reduced cost.
- **Increased scalability -** It uses agility and cloudscalability for managing website traffic. Use of powerful load balancers matches high user traffic and present it in different networks or servers. This is specifically significant for website ecommerce which uses thousandsof visitors of the website each second. A powerful balancing load is requested during promotion offers and sale for presenting workloads.
- **Ability to handle sudden traffic spikes –** During any result declaration, normal running of a University website gets completely slow down. This is due to the numerous requests that arrives simultaneously. It uses cloud load balancers with no requirement of fear of traffic surges, without taking note of how huge the demand is. It is widely distributed in various servers for producing high results in a low feedback time.
- **Business continuity with complete flexibility –**The objective of balancing load is to secure the website fromrapid outages. Workload is distributed among various networks or servers when one node does not work it is changed to another operating node. Improved scalability, redundancy and other load balancing simply handle application traffic and website, making it a simple task.
- **Lower-cost computers for users:** It is the financial advantage of CC. There is no requirement to purchase any robust and costly tool for utilizing the CC and process is not all local computer in cloud. The application runs in cloud not on PC desktop which does not require power process or hard disk space needed for desktop software.
- **Better performance:** Not all files or programs on local PC users sense a lag for switching on or off internal the computer system is faster when no traffic occurs.
- **Less IT infrastructure costs:** IT departments of huge sectors sense reduction in expenses while considering a framework with the adoption of cloud computing innovation. Rather than finding huge number of most robust servers, IT staff utilize the computing capacity of cloud for changes in or addition to internal computing resources.

- **Less maintenance costs:** Maintenance costs are minimized through use of cloud computing when the management of software and hardware for sectors of all sizes is low. For instance, a few servers important in sector have maintenance costs that became suddenly low. No software is available on organization of a computer for IT staff to manage software.
- **Lower software costs:** There is no requirement to buy software packages for each computer in a sector using cloud computing. Only these employees use application requirement access to cloud application.
- **Automatic software updates:** Software requires great and updated idea with CC without any concern for updation and a sector not having further expenses for new updation or upgradation found required.
- **Increased computing power:** Using cloud computing, one utilizes cloud computing power for not as long to one desktop computer perform.
- **Unlimited storage capacity:** Cloud provides essentially limited storage at any point of time storage forincreasing capacity with a further little charge on a monthly fee.
- **Increased data safety:** No point to set for failure of disk in office. All information is kept in cloud
- **Anywhere access to your documents:** There is no needto take documents. The access to actual PC can be from any place for the user with internet use.
- **Latest version availability:** Another factor in documents the editing of one document at office and going to another place and opening it. A new form is shown and as already mentioned, the entire work donein cloud.
- **Use your computer from anywhere:** This is an advantage of CC. Normally this technology is utilized by the user with no work limit on one PC. Utilize "cloud PC" any place and PC and present documents and applications follow by cloud. There is the shift to portable device documents as well as applications are there.

Disadvantages of Cloud Computing

- **Internet connection is needed:** Processing is not possible without internet connection. Use of internet to link "cloud PC" is necessary, Internet is not able to connect.
- **Low-speed connections are not recommended:** There is no significant limitation because everyone has 1 Mbpsconnection at work and home. CC does not work with a slow Internet like dial-up for web- based applications need numerous bandwidths to download, do huge documents.
- **Sometimes is slow:** With fast connections, delays with web-based apps may be slower to access the same software program on the PC desktop. Due to upload of demand and bandwidth download requires web apps.
- **Stored data might not be secure:** Data is kept "in cloud". Where absolute cloud is and is it really secure are questions that arise, these queries arise produced during users for guaranteed data.
- **Your data is 100% in cloud:** All available information in local PC is kept in cloud. Hypothetically the data keptin cloud is secure and the cloud hosting company utilizes numerous paths of backup to establish any case of data lost. If data is missed, there is no local or physical backup of user data.

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