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Cloud Computing Overview: Services and Features

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ABSTRACT

The cloud computing revolution is hitting full gear. Cloud Computing is an inventive method that improves the services of distributed network. Cloud computing is an on demand service in which distributed resources, information, software and other devices are provided according to the clients requirement at specific time. The goal of this paper is to analyze the comparisons between grid computing and cloud computing, issues and challenges of Cloud Computing. Cloud Computing is a term which is generally used in reference to Internet. The whole Internet can be viewed as a cloud. The term "cloud" refers to the computing power that is available across the Internet. The cloud is quickly changing a worldwide network of computers into the largest single, "virtual" computer in the world. Capital and operational costs can be cut using cloud computing.

KEYWORDS

Cloud Computing: services, cloud service types, motivation, benefits and limitations, issues and challenges;

INTRODUCTION

The use of cloud computing is expanding, and by 2016 this growth will rise to become the bulk of new IT spend. 2016 will be a defining year for cloud as private cloud begins to give way to hybrid cloud and nearly half of large organization will have hybrid cloud deployments by the end of 2017.A model for computing in which something is done in the cloud. "A dummy for on-demand network access to a common pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider Interaction" by *National Institute of Standards and Technology[1]*. "In general, there are very real trends toward cloud platforms, and also toward massively scalable computing. Service orientation, virtualization and the Internet have converged to sponsor a phenomenon that enables individuals and businesses to choose how they'll acquire or deliver IT services, with less emphasis on the constraints of traditional hardware and software licensing models". "Services provided by the cloud will foster an economy based on delivery and consumption of everything from storage to computation to video to finance deduction management."[2].Cloud Computing is not purely new technology but it is a new name for grid computing. The vision is same that is to reduce the cost of computing ,storage ,increasing reliability and flexibility by transforming computers from something we buy and operate ourselves to something is operated by a third party[3]. The problems are mostly same in Clouds and Grids. There is a general need to be able to manage large facilities; to define methods by which consumers request, use resources and discover provided by the central facilities; and to implement the often highly parallel computations that execute on those resources. Explanation differs, but the two technologies are struggling with many of the same issues. Cloud Computing is used by many governments, research institutes and industries to solve the problem of large computing and storage required at lesser cost[4].

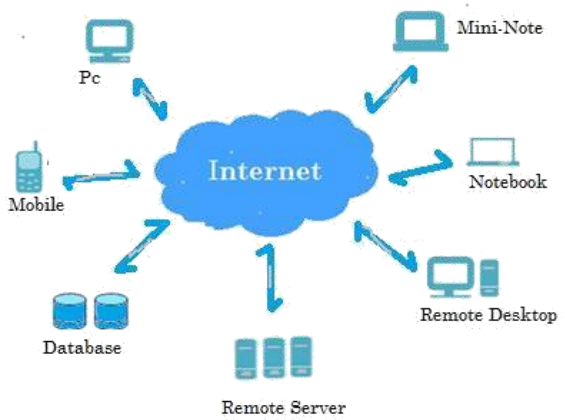

Fig 1 Cloud computing visual scheme

MOTIVATION FOR CLOUD COMPUTING

Over the years, CIOs have been continually challenged with how to enable their organizations to rapidly and cost-effectively deliver infrastructure and services to support end-user applications[5]. To solve this problem there is need of highly computing system with high network performance, high storage and having lesser cost. Cloud Computing is a highly scalable and efficient technology

technology that delivers services very fast on user demand and at lesser cost(pay for what you use). It can deploy, allocate or reallocate computing resource dynamically and monitor the usage of resources at all times[6].This is a revolution because cloud computing is opening up new business models and opportunities for both enterprise IT and service providers[5].It needs minimal startup cost and should be used as utility. It is a Pay-per-use model and trustworthy.

CLOUD COMPUTING VERSUS GRID COMPUTING

Both are used to economize computing by maximizing resources. This section goals to correlate Grid computing and Cloud Computing across a wide variety of perspectives[3].In traditional business model customer paid one time for unlimited use while in cloud based business model payment is done by client on consumption basis to the provider very similar like electricity and gas bill .Grid computing architecture consist of 5 layers: application, resource, collective, connectivity and fabric layers where as Cloud Computing consist of 4 layers namely Application, Unified Resource, Platform and Fabric Layer .The difference between the two lies in the way the tasks are computed in each respective environment. In a processing grid, one large job is divided into many tiny portions and executed on different machines. This feature is fundamental to a grid; not so in a cloud. The computing cloud is intended to allow the client to avail of different services without checking in the underlying architecture. While grid computing also offers a same facility for computing power, cloud computing is not restricted to just that. A cloud can offer several types of services, from word processing, right down to web hosting. In fact, a computing cloud can merge services to present a user with a homogenous optimized result.

CLOUD SERVICE MODEL

"Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services and the services themselves have long been known to as Software as a Service (SaaS), so. The datacenter software and hardware is what we will call a Cloud".

This definition itself completely explains meaning and concept of Cloud Computing. A wide-area distributed computing paradigm that is driven by economies of scale, in which a pool of dynamically-scalable, storage, managed computing power, abstracted virtualized, platforms and services are delivered on demand to external customers over the Internet[3]. It means cloud computing is specialized scalable entity that delivers different level of services to the third party. These services are Platform as a service(PaaS), Software as a service(SaaS) and Infrastructure as a Service(IaaS)[7]. Other key components in anything as a service (XaaS) are described in a comprehensive taxonomy model published in 2009[8]. Such as Database-as-a- Service, Business Process-as-a Service, Strategy-as-a-Service, Collaboration-as-a-Service, etc. In 2012, network as a service (NaaS) and communication as a service (CaaS) were officially included by ITU (International Telecommunication Union) as part of the basic cloud computing models, recognized service categories of a telecommunication-centric cloud ecosystem[9].In SaaS Cloud consumers release their applications on a hosting environment, that can be accessed through networks from many clients (e.g. web browser, PDA, etc.) by application users. PaaS is a development platform supporting the full "Software Lifecycle" which allows cloud consumers to develop cloud services and applications (e.g. SaaS) directly on the PaaS cloud[3].Thus the difference between SaaS and PaaS is that SaaS only host completed application while PaaS hots both completed and in-progress applications. In IaaS Cloud consumers directly use IT infrastructures (processing, storage, networks, and other fundamental computing resources).

Five essential elements(characteristics) of cloud computing explained in table 1 defined by *The National Institute of Standards and Technology's*

Table 1. Characteristics of Cloud Computing[10]

Characteristics	Description
On-Demand Self Service	Users determine on demand the resources to be deployed. service
Broad Network access	Resources access anywhere through the Internet (e.g., tablets, workstations, laptops and mobile phones).
Resource pooling	Many users sharing the actual physical resources from different locations. Examples of resources include storage, computation, network bandwidth and memory.
Rapid elasticity	Rapidly increase or decrease amount of resources depending on demand.
Measured Service	Cloud structure automatically handle and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service.

DEPLOYMENT MODELS

Cloud Computing has four types of deployment models shown in fig 2.These are public, private, community and hybrid. The services of public cloud are available to the public, and in general provided by a single provider. In this model, scalability and resource pooling can be fully exploited. A private cloud can be run internally or by a (third-party) provider. The advantages of the cloud cannot be fully exploited, and the degree of customization possible may be limited. In public cloud the service is available to the public, and in general provided by a single provider. In this model, scalability and resource pooling can be fully exploited. The service in community model is used by several members of a defined group. The services may be offered by several providers who are either

internal or external to the community. Hybrid clouds offer a combination of various organization forms, combing their respective advantages and disadvantages. For example, data that need to be protected can reside in a private cloud, whereas public data and/or applications can run in the public cloud. Advances in Service-Oriented Computing can profit cloud computing in many ways. These are Service Description for Cloud Services, Service Discovery for Cloud Services, Service Composition for Cloud Service, Service Management for Cloud Service . Similarly Cloud Computing can also benefit Service-Oriented Computing in many ways and these are Cloud for Web Service Development, Cloud for Web Service Testing, Cloud for Web Service Deployment, Cloud for Service Process Enactment, Cloud for Service Process Enactment.

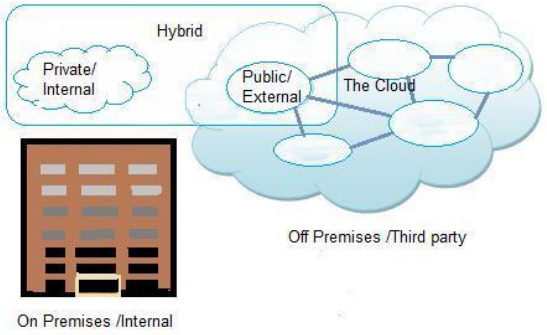

Fig 2. Different deployment models of Cloud Computing

Besides many benefits current adoption of Cloud Computing is still a challenges faced by the world. Cloud consumers must consider tradeoffs amongst communication, storage, computation and integration. Thus security is the most crucial issue. Other than security, cost of model, what is to migrate and when to migrate, Service Level Agreement is the major challenges faced by Cloud Computing.

CLOUD SERVICES TYPES[11]

1.Cloud Compute Service

Compute services are used by cloud clients to compute their workload. To do so,client may deploy their own application modules on the cloud service provider's infrastructure. Different Cloud Service Models may be used in this scope: Infrastructure as a Service – the customer controls the complete operating systems and middleware that the application requires; Platform as a Service – the customer only maintains the application itself. The complete required runtime environment is completely maintained by the cloud service provider. These services are Elastic Infrastructure, High Availability Computing Node and Low Availability Computing Node.

2. Cloud Storage Service

Cloud storage services offer centralized cloud-based storage for applications or application components. Basically, if compute services do not offer the required availability, centralized storage is required to integrate several replicas of application components. These methods are employed in componentized applications and the watchdog pattern specifically addresses availability concerns. These services are: Blob Storage**,** Block Storage**,** Relational Data Store**,** Strict Consistency**,** Eventual Consistency and NoSQL Storage **.**

3. Cloud Communication Services

Applications running in the cloud rely on different communication services, due to the distributed nature of cloud resources. These communication methods are used in cloud internal, for example, communication between different application modules. Further, communication services enable the integration of clouds with each other or with traditional data centers into hybrid clouds. These services are: Message-Oriented Middleware**,** At-least-once delivery, Reliable Messaging and exactly-once delivery.

BENEFITS

Users have access to their applications and data from anywhere at any time and they can access their information from multiple machines; their data and software is no longer confined to a single machine[10].It relieves the users for the burden of buying, installing, managing and maintaining hardware and allows a better (more efficient) use of resources, including space (real estate) and electrical power. Cloud computing is often presented in connection with Green Computing. Allows services to scale up and down quickly in order to follow the demand, typical example is a service that gets demand peaks in which case more resources should be allocated to this service, and these resources are released when the demand peaks are over. Allows services to be offered more quickly to end-users, spare the time to buy, install and configure hardware systems (often two to three months) and Self-service activities(managing servers and software, allocating processing power and memory, change software versions, stop and restart servers etc.) can be done in few minutes and 24 hours a day.

LIMITATIONS

The most obvious one is that it depends completely on the Internet, which means you must have Internet connection whenever you wish to work, either in collaboration or by yourself[10].some other limitations are data compatibility, security, control, cost, openness. Data

compatibility is necessary during transferring of data over a cloud. Like different services use different data format to save data which are not compatible with each other For security one should always check security to make sure that evil people will not mess up your system while it is running in the cloud?.It is a major challenge of the Cloud Computing. Sharing and storing information or important data over cloud means that you have to trust the cloud service provider but what if it goes bankrupt, is taken over or goes mad?. Once data leaves your hands and lands in the lap of a service provider, you've lost a layer of control. In the long run, cloud hosting is a lot cheaper than traditional technologies; the fact that it is currently new and has to be researched and improved actually makes it more expensive[11].

ISSUES & CHALLENGES

There are many issues like privacy, confidentiality, reliability and many more. Example of these problems is Conference Management Systems based on Cloud Computing in academic research field. This example is very interesting problem as it is a specific and tiny, making it simpler to extract the nature of privacy and find a solution for it[13]. Some challenges and issues are described in the table 2.

Table 2. Challenges and issues in Cloud Computing

ISSUE	**DESCRIPTION**
SECURITY	Safety measures are taken while sharing confidential document.
INTEROPERABILITY	The primary goal of interoperability is to realize the seamless fluid data across clouds and between cloud and local applications[13].It is required at different layers between different providers.
Compliance	Cloud Computing bridges the gap between provider and user (by internet) thus available globally not locally. It is not only issue of provider not being trustworthy.For eg. Being able to deliver cloud computing services to customers in USA and Russia is technically the same problem, but legislation and regulations differ and thus it is a big issue for both providers and customers not to break a law while implementing and using cloud computing service that is not completely complaint with legislation.
Service level agreement (SLAs)	It is an agreement between the service provider and user on which both parties are agreed and it is the most common way to maintain the quality of service.
Integration	Interfaces need to be integrated together by upgrades in data flow unification, data transformation and data consolidation. It is a difficult task
Governance	Cloud computing like many other IT trends (virtualization, outsourcing, SOA) has deep impact on IT governance and cannot succeed without its proper incorporation into business.
Cost	By paying what you use significantly decrease the infrastructure cost but it increases the data communication cost, data integration cost and encryption and decryption cost for security issues. Thus overall cost is increased

CONCLUSIONS

Cloud Computing reshape the IT world as a revolution. Cloud gives infinite chances for users to use different services at lesser cost. This paper discusses the various features, services offered, benefits, limitations and issues

of cloud computing. As far as cloud computing is concerned it is very secure but still some efforts are being made in this area to make cloud computing more secure. By paying what you use significantly decrease the infrastructure cost but it increases the data communication cost, data integration cost and encryption and decryption cost for security issues.

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