Analysis of cloud Computing Services and their Challenges to cloud user

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Abstract: Cloud computing enables scattered, optimized, virtualized equipment and software infrastructure for easy access to a wide range of internet users. It also have different computing services servers, storage, databases, networking, software, analytics, intelligence and more over the Internet ("the cloud") to offer faster innovation, flexible resources and economies of scale. In this paper, highlight some of the major challenges and costs, and the role of cloud computing architecture in the field of industry has an opportunity to migrate to cloud computing systems with low investment. It will describe major cloud services & Development models to illustrate how cloud vendors can improve their businesses.

Index Terms - ***Cloud computing, Services, Development Model.***

I. INTRODUCTION

Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. The term is generally used to describe data centers available to many users over the Internet. Large clouds, predominant today, often have functions distributed over multiple locations from central servers. If the connection to the user is relatively close, it may be designated an edge server.

Clouds may be limited to a single organization be available to many organizations (public cloud,) or a combination of both (hybrid cloud). The largest public cloud is Amazon AWS. Cloud computing relies on sharing of resources to achieve coherence and economies of scale.

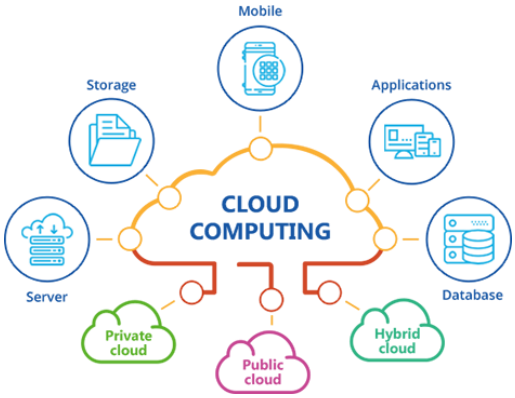

Figure 01. Cloud Computing

Advocates of public and hybrid clouds note that cloud computing allow companies to avoid or minimize up-front IT infrastructure costs. Proponents also claim that cloud computing allows enterprises to get their applications up and running faster, with improved manageability and less maintenance [3], and that it enables IT teams to more rapidly adjust resources to meet fluctuating and unpredictable demand. Cloud providers typically use a "pay-as-you-go" model, which can lead to unexpected operating expenses if administrators are not familiarized with cloud-pricing models.

The availability of high-capacity networks, low-cost computers and storage devices as well as the widespread adoption of hardware virtualization, service-oriented architecture, and autonomic and utility computing has led to growth in cloud computing. The cloud aims to cut costs, and helps the users focus on their core business instead of being impeded by IT obstacles. The main enabling technology for cloud computing is virtualization. Virtualization software separates a physical computing device into one or more "virtual" devices, each of which can be easily used and managed to perform computing tasks. With operating system–level virtualization essentially creating a scalable system of multiple independent computing devices, idle computing resources can be allocated and used more efficiently. Virtualization provides the agility required to speed up IT operations, and reduces cost by increasing infrastructure utilization. Autonomic computing automates the process through which the user can provision resources on-demand. By minimizing user involvement, automation speeds up the process, reduces labor costs and reduces the possibility of human errors.

Users routinely face difficult business problems. Cloud computing adopts concepts from Service-oriented Architecture (SOA) that can help the user break these problems into services that can be integrated to provide a solution. Cloud computing provides all of its resources as services, and makes use of the well-established standards and best practices gained in the domain of SOA to allow global and easy access to cloud services in a standardized way.

Cloud computing also leverages concepts from utility computing to provide metrics for the services used. Such metrics are at the core of the public cloud pay-per-use models. In addition, measured services are an essential part of the feedback loops in autonomic computing, allowing services to scale on-demand and to perform automatic failure recovery. Cloud computing is a kind of grid computing; it has evolved by addressing the QoS (quality of service) and reliability problems. Cloud computing provides the tools and technologies to build data/compute intensive parallel applications with much more affordable prices compared to traditional parallel computing techniques.

II. USES OF CLOUD COMPUTING

You are probably using cloud computing right now, even if you don't realize it. If you use an online service to send email, edit documents, watch movies or TV, listen to music, play games or store pictures and other files, it is likely that cloud computing is making it all possible behind the scenes [5]. The first cloud computing services are barely a decade old, but already a variety of organizations from tiny startups to global corporations, government agencies to non-profits are embracing the technology for all sorts of reasons.

Here are a few examples of what is possible today with cloud services from a cloud provider:

Create new apps and services

Quickly build, deploy and scale applications—web, mobile and API—on any platform. Access the resources you need to help meet performance, security and compliance requirements.

Test and build applications

Reduce application development cost and time by using cloud infrastructures that can easily be scaled up or down.

Store, back up and recover data

Protect your data more cost-efficiently—and at massive scale—by transferring your data over the Internet to an offsite cloud storage system that is accessible from any location and any device.

Analyse data

Unify your data across teams, divisions and locations in the cloud. Then use cloud services, such as machine learning and artificial intelligence, to uncover insights for more informed decisions.

Stream audio and video

Connect with your audience anywhere, anytime, on any device with high-definition video and audio with global distribution.

Embed intelligence

Use intelligent models to help engage customers and provide valuable insights from the data captured.

Deliver software on demand

Also known as software as a service (SaaS), on-demand software lets you offer the latest software versions and updates around to customers—anytime they need, anywhere they are.

III. BENEFITS OF CLOUD COMPUTING

Cloud computing is a big shift from the traditional way businesses thinking about IT resources. Here are some common reasons organizations are turning to cloud computing services:

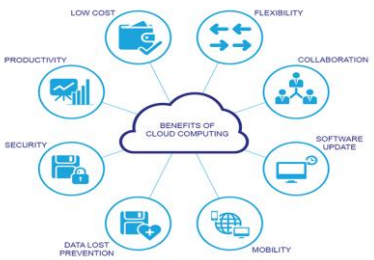

Figure 02. Cloud Computing Benefits

- *Cost*

Cloud computing eliminates the capital expense of buying hardware and software and setting up and running on-site datacenters—the racks of servers, the round-the-clock electricity for power and cooling, the IT experts for managing the infrastructure. It adds up fast.

- *Speed*

Most cloud computing services are provided self service and on demand, so even vast amounts of computing resources can be provisioned in minutes, typically with just a few mouse clicks, giving businesses a lot of flexibility and taking the pressure off capacity planning.

- *Global scale*

The benefits of cloud computing services include the ability to scale elastically. In cloud speak, that means delivering the right amount of IT resources—for example, more or less computing power, storage, bandwidth—right when it is needed and from the right geographic location.

- *Productivity*

On-site datacenters typically require a lot of "racking and stacking" hardware set up, software patching and other time-consuming IT management chores [7]. Cloud computing removes the need for many of these tasks, so IT teams can spend time on achieving more important business goals.

- *Performance*

The biggest cloud computing services run on a worldwide network of secure datacenters, which are regularly upgraded to the latest generation of fast and efficient computing hardware. This offers several benefits over a single corporate datacenter, including reduced network latency for applications and greater economies of scale.

- *Security*

Many cloud providers offer a broad set of policies, technologies and controls that strengthen your security posture overall, helping protect your data, apps and infrastructure from potential threats.

IV. SERVICES OF CLOUD COMPUTING

Cloud computing is a general term for anything that involves delivering hosted services over the Internet. These services are broadly divided into three categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS).

The name cloud computing was inspired by the cloud symbol that's often used to represent the Internet in flowcharts and diagrams.

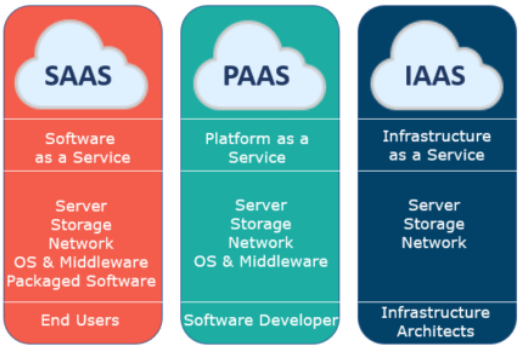

Figure 03. Cloud Computing Services

A cloud service has three distinct characteristics that differentiate it from traditional web hosting. It is sold on demand, typically by the minute or the hour; it is elastic -- a user can have as much or as little of a service as they want at any given time; and the service is fully managed by the provider (the consumer needs nothing but a personal computer and Internet access) [9]. Significant innovations in virtualization and distributed computing, as well as improved access to high-speed Internet, have accelerated interest in cloud computing.

A cloud can be private or public. A public cloud sells services to anyone on the Internet. (Currently, Amazon Web Services is the largest public cloud provider.) A private cloud is a proprietary network or a data center that supplies hosted services to a limited number of people. Private or public, the goal of cloud computing is to provide easy, scalable access to computing resources and IT services.

V. *DEVELOPMENT MODEL*

There are different types of Cloud Development Model some of it are as follows,

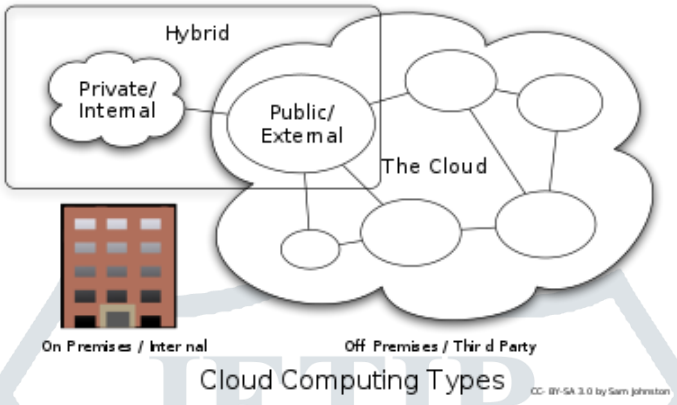

Figure 04: Models of Cloud Computing

Private cloud

Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third party and hosted either internally or externally. Undertaking a private cloud project requires significant engagement to virtualize the business environment, and requires the organization to reevaluate decisions about existing resources. It can improve business, but every step in the project raises security issues that must be addressed to prevent serious vulnerabilities. Self-run data centers are generally capital intensive. They have a significant physical footprint, requiring allocations of space, hardware, and environmental controls. These assets have to be refreshed periodically, resulting in additional capital expenditures. They have attracted criticism because users "still have to buy, build, and manage them" and thus do not benefit from less hands-on management, essentially "[lacking] the economic model that makes cloud computing such an intriguing concept".

Public cloud

A cloud is called a "public cloud" when the services are rendered over a network that is open for public use. Public cloud services may be free [10]. Technically there may be little or no difference between public and private cloud architecture, however, security consideration may be substantially different for services (applications, storage, and other resources) that are made available by a service provider for a public audience and when communication is effected over a non-trusted network. Generally, public cloud service providers like Amazon Web Services (AWS), Oracle, Microsoft and Google own and operate the infrastructure at their data center and access is generally via the Internet. AWS, Oracle, Microsoft, and Google also offer direct connect services called "AWS Direct Connect", "Oracle Fast Connect", "Azure Express Route", and "Cloud Interconnect" respectively, such connections require customers to purchase or lease a private connection to a peering point offered by the cloud provider.

Hybrid cloud

Hybrid cloud is a composition of two or more clouds (private, community or public) that remain distinct entities but are bound together, offering the benefits of multiple deployment models. Hybrid cloud can also mean the ability to connect collocation, managed and/or dedicated services with cloud resources Gartner defines a hybrid cloud service as a cloud computing service that is composed of some combination of private, public and community cloud services, from different service providers. A hybrid cloud service crosses isolation and provider boundaries so that it can't be simply put in one category of private, public, or community cloud service. It allows one to extend either the capacity or the capability of a cloud service, by aggregation, integration or customization with another cloud service.

Varied use cases for hybrid cloud composition exist. For example, an organization may store sensitive client data in house on a private cloud application, but interconnect that application to a business intelligence application provided on a public cloud as a software service.This example of hybrid cloud extends the capabilities of the enterprise to deliver a specific business service through the addition of externally available public cloud services. Hybrid cloud adoption depends on a number of factors such as data security and compliance requirements, level of control needed over data, and the applications an organization uses.

Another example of hybrid cloud is one where IT organizations use public cloud computing resources to meet temporary capacity needs that can not be met by the private cloud. This capability enables hybrid clouds to employ cloud bursting for scaling across clouds. Cloud bursting is an application deployment model in which an application runs in a private cloud or data center and "bursts" to a public cloud when the demand for computing capacity increases. A primary advantage of cloud bursting and a hybrid cloud model is that an organization pays for extra compute resources only when they are needed. Cloud bursting enables data centers to create an in-house IT infrastructure that supports average workloads, and use cloud resources from public or private clouds, during spikes in processing demands. The specialized model of hybrid cloud, which is built atop heterogeneous hardware, is called "Cross-platform Hybrid Cloud". A cross-platform hybrid cloud is usually powered by different CPU architectures, for example, x86-64 and ARM, underneath. Users can transparently deploy and scale applications without knowledge of the cloud's hardware diversity. This kind of cloud emerges from the rise of ARM-based system-on-chip for server-class computing.

Others

Community cloud

Community cloud shares infrastructure between several organizations from a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third-party, and either hosted internally or externally. The costs are spread over fewer users than a public cloud (but more than a private cloud), so only some of the cost savings potential of cloud computing are realized.

Distributed cloud

A cloud computing platform can be assembled from a distributed set of machines in different locations, connected to a single network or hub service. It is possible to distinguish between two types of distributed clouds: public-resource computing and volunteer cloud.

- **Public-resource computing**—This type of distributed cloud results from an expansive definition of cloud computing, because they are more akin to distributed computing than cloud computing. Nonetheless, it is considered a sub-class of cloud computing.
- **Volunteer cloud**—Volunteer cloud computing is characterized as the intersection of public-resource computing and cloud computing, where a cloud computing infrastructure is built using volunteered resources. Many challenges arise from this type of infrastructure, because of the volatility of the resources used to built it and the dynamic environment it operates in. It can also be called peer-to-peer clouds, or ad-hoc clouds. An interesting effort in such direction is Cloud@Home, it aims to implement a cloud computing infrastructure using volunteered resources providing a business-model to incentivize contributions through financial restitution.

Multicloud

Multicloud is the use of multiple cloud computing services in a single heterogeneous architecture to reduce reliance on single vendors, increase flexibility through choice, mitigate against disasters, etc. It differs from hybrid cloud in that it refers to multiple cloud services, rather than multiple deployment modes (public, private, legacy).

Big Data cloud

The issues of transferring large amounts of data to the cloud as well as data security once the data is in the cloud initially hampered adoption of cloud for big data, but now that much data originates in the cloud and with the advent of bare-metal servers, the cloud has become a solution for use cases including business analytics and geospatial analysis.

HPC cloud

HPC cloud refers to the use of cloud computing services and infrastructure to execute high-performance computing (HPC) applications. These applications consume considerable amount of computing power and memory and are traditionally executed on clusters of computers. In 2016 a handful of companies, including R-HPC, Amazon Web Services, Univa, Silicon Graphics International, Sabalcore, Gomput, and Penguin Computing offered a high performance computing cloud. The Penguin On Demand (POD) cloud was one of the first non-virtualized remote HPC services offered on a pay-as-you-go basis. Penguin Computing launched its HPC cloud in 2016 as alternative to Amazon's EC2 Elastic Compute Cloud, which uses virtualized computing nodes.

VI. CHALLENGES IN CLOUD COMPUTING

Following are the some of major challenges of clouding computing to end user.

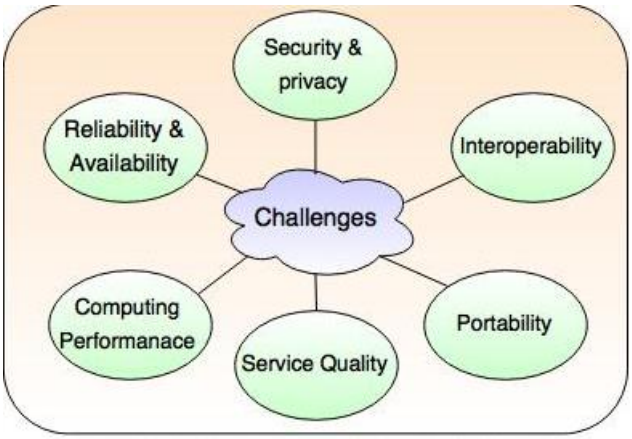

Figure 05: Challenges of Cloud Computing

Security and Privacy

- Security and privacy are the main challenge in cloud computing.
- These challenges can reduced by using security applications, encrypted file systems, data loss software.

Interoperability

- The application on one platform should be able to incorporate services from the other platform. This is known as **Interoperability.**
- It is becoming possible through web services, but to develop such web services is complex.

Portability

- The applications running on one cloud platform can be moved to new cloud platform and it should operate correctly without making any changes in design, coding.
- The portability is not possible, because each of the cloud providers uses different standard languages for their platform.

Service Quality

The Service-Level Agreements (SLAs) of the providers are not enough to guarantee the availability and scalability. The businesses disinclined to switch to cloud without a strong service quality guarantee.

Computing Performance

- High network bandwidth is needed for data intensive applications on cloud, this results in high cost.
- In cloud computing, low bandwidth does not meet the desired computing performance.

Reliability and Availability

Most of the businesses are dependent on services provided by third-party, hence it is mandatory for the cloud systems to be reliable and robust.

VII. CONCLUSION

This paper presents an overview of Cloud computing, focusing on its architecture, characteristics, services and model. Also, some of the major challenges of Cloud computing are described. I present open research issues found in this area and related approaches. The Cloud computing able to provide seamless communication between cloud users and cloud providers. I will encourage thinking about the problems and opportunities about cloud computing.

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