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An evaluation on Cloud Computing Research Challenges and Its Novel Tools

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Abstract- **Cloud computing is the Wide Research Area in the Recent World. Now Days All Data is stored in Cloud So This Technology is Very Good Usage for this Society anywhere any time. In this paper have focused variety types of tools, securities, models and different areas of the research which are helpful and marked as the important field of cloud services.**

Keywords- Cloud services, Technology, Securities.

I.INTRODUCTION

Cloud computing is a model for delivering information technology services in which resources are retrieved from the internet through web-based tools and applications rather than a direct connection to a server. Data and software packages are stored in servers; however, a cloud computing structure allows access to information as long as an electronic device has access to the web. This type of system allows employees to work remotely. Cloud computing is so named because the information being accessed is found in the "cloud" and does not require a user to be in a specific place to gain access to it. Companies may find that cloud computing allows them to reduce the cost of information management since they are not required to own their own servers and can use capacity leased from third parties. Additionally, the cloud-like structure allows companies to upgrade software more quickly.

Cloud computing is a type of computing that mainly depends on resource sharing instead of handling applications by local servers or individual devices.

Using the internet enabled devices, cloud computing permit the function of application software. Cloud computing, also known as the cloud, can be used as a synonym for the Internet. Cloud computing can serve a diverse range of functions over the Internet like storage and virtual servers; applications and authorization for desktop applications.

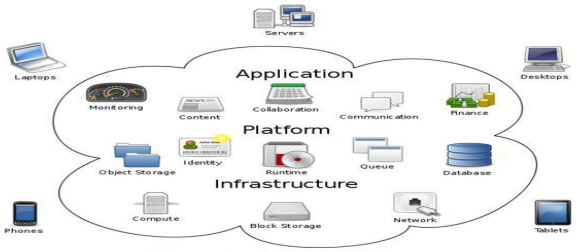

Fig1.1Architecture of Cloud computing

By taking advantage of resource sharing, cloud computing is able to achieve consistency and economies of scale. The types of cloud computing are classified based on two models. Cloud computing

service models and cloud computing deployment models [1][2].

II. Characterstitics of Cloud Computing

Cloud options are enticing various industries across the board, which is why it's important to know it's essential characteristics as a software offering. Here are the five main characteristics that cloud computing offers businesses today [3].

- *On-demand self-service:*

A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

- *Broad network access:*

Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops and workstations).

- *Resource pooling:*

The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state or datacenter). Examples of resources include storage, processing, memory and network bandwidth.

- *Rapid elasticity:*

Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

Fig 1.2 Cloud Characteristics

- *Measured service:*

Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth and active user accounts). Resource usage can be monitored, controlled and reported, providing transparency for the provider and consumer [4].

III. Types of Cloud Models

The cloud is a very broad concept, and it covers just about every possible sort of online service, but when businesses refer to cloud procurement, there are usually three models of cloud service under consideration, Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Each has its own intricacies and hybrid cloud models, but today we're going to help you develop an understanding of the high-level differences between SaaS, PaaS, and IaaS.

- *Software as a Service*

In some ways, SaaS is very similar to the old thin-client model of software provision, where clients, in this case usually web browsers, provide the point of access to software running on servers. SaaS is the most familiar form of cloud service for consumers. SaaS moves the task of managing software and its deployment to third-party services. Among the most familiar SaaS applications for business are customer relationship management applications like Salesforce, productivity software suites like Google Apps, and storage solutions brothers like Box and Dropbox.

Use of SaaS applications tends to reduce the cost of software ownership by removing the need for technical staff to manage install, manage, and upgrade software, as well as reduce the cost of licensing software. SaaS applications are usually provided on a subscription model.

- *Platform as a Service*

PaaS functions at a lower level than SaaS, typically providing a platform on which software can be developed and deployed. PaaS providers abstract much of the work of dealing with servers and give clients an environment in which the operating system and server software, as well as the underlying server hardware and network infrastructure are taken care of, leaving users free to focus on the business side of scalability, and the application development of their product or service.As with most cloud services, PaaS is built on top of virtualization technology. Businesses can requisition resources as they need them, scaling as demand grows, rather than investing in hardware with redundant resources.

Examples of PaaS providers include Heroku, Google App Engine, and Red Hat's OpenShift.

- *Infrastructure as a Service*

Moving down the stack, we get to the fundamental building blocks for cloud services. IaaS is comprised of highly automated and scalable compute resources, complemented by cloud storage and network capability which can be self-provisioned, metered, and available on-demand.

IaaS providers offer these cloud servers and their associated resources via dashboard and/or API. IaaS clients have direct access to their servers and storage, just as they would with traditional servers but gain access to a much higher order of scalability. Users of IaaS can outsource and build a "virtual data center" in the cloud and have access to many of the same technologies and resource capabilities of a traditional data center without having to invest in capacity planning or the physical maintenance and management of it.

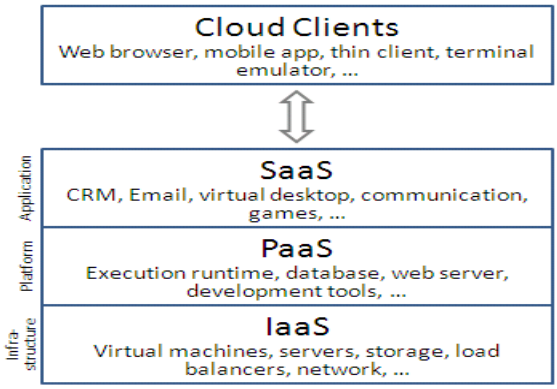

Fig.1.3 Cloud models

IaaS is the most flexible cloud computing model and allows for automated deployment of servers, processing power, storage, and networking. IaaS clients have true control over their infrastructure than users of PaaS or SaaS services. The main uses of IaaS include the actual development and deployment of PaaS, SaaS, and web-scale applications [5].

IV. Cloud Computing Deployment Models

Cloud hosting deployment models represent the exact category of cloud environment and are mainly distinguished by the proprietorship, size and access. It tells about the purpose and the nature of the cloud. Most of the organizations are willing to implement cloud as it reduces the capital expenditure and controls operating cost. In order to know which deployment model matches your website requirements it is necessary to know the four deployment models [6] .

- *Public Clouds*

A public cloud is a publicly accessible cloud environment owned by a third-party cloud provider. The IT resources on public clouds are usually provisioned via the previously described cloud delivery models and are generally offered to cloud consumers at a cost or are commercialized via other avenues (such as advertisement).

The cloud provider is responsible for the creation and on-going maintenance of the public cloud and its IT resources. Many of the scenarios and architectures explored in upcoming chapters involve public clouds and the relationship between the providers and consumers of IT resources via public clouds.

Examples of Public Cloud:

- Google App Engine
- Microsoft Windows Azure
- IBM Smart Cloud
- Amazon EC2

Figure 1.4 shows a partial view of the public cloud landscape, highlighting some of the primary vendors in the marketplace.

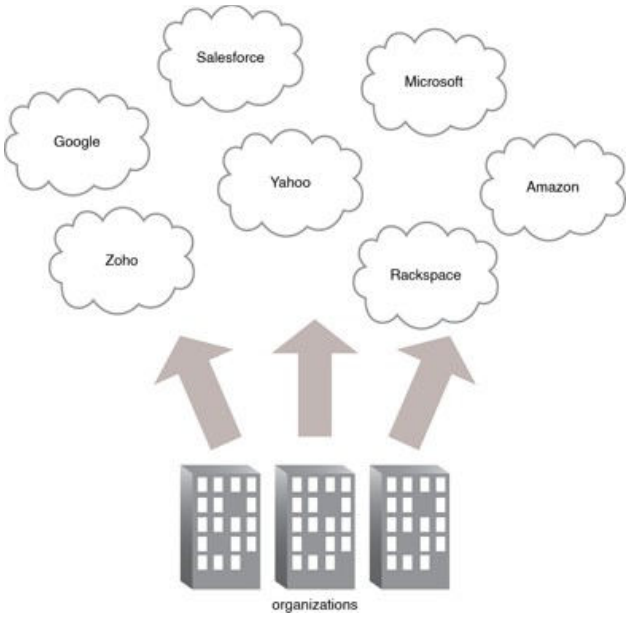

Figure 1.4 - Organizations act as cloud consumers when accessing cloud services and IT resources made available by different cloud providers [7].

- *Community Clouds*

A community cloud is similar to a public cloud except that its access is limited to a specific community of cloud consumers. The community cloud may be jointly owned by the community members or by a third-party cloud provider that provisions a public cloud with limited access. The member cloud consumers of the community typically share the responsibility for defining and evolving the community cloud (Figure 1.5).

Membership in the community does not necessarily guarantee access to or control of all the cloud's IT resources. Parties outside the community are generally not granted access unless allowed by the community.

Examples of Community Cloud:

- Google Apps for Government
- Microsoft Government Community Cloud

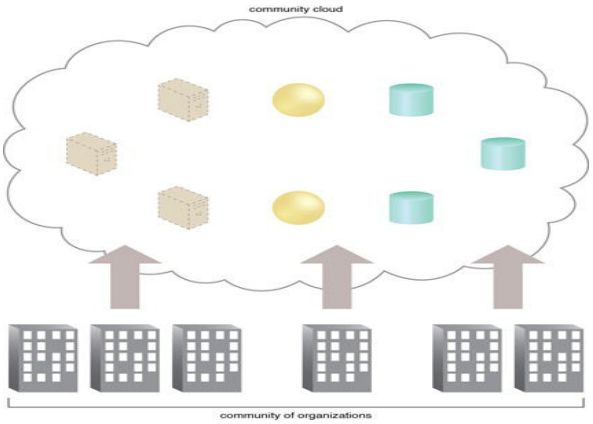

Figure 1.5 - An example of a "community" of organizations accessing IT resources from a community cloud [8].

- *Private Clouds*

A private cloud is owned by a single organization. Private clouds enable an organization to use cloud computing technology as a means of centralizing access to IT resources by different parts, locations, or departments of the organization. When a private cloud exists as a controlled environment, the problems described in the Risks and Challenges section do not tend to apply.

The use of a private cloud can change how organizational and trust boundaries are defined and applied. The actual administration of a private cloud environment may be carried out by internal or outsourced staff.

Examples of Private Cloud:

- Eucalyptus
- Ubuntu Enterprise Cloud - UEC (powered by Eucalyptus)
- Amazon VPC (Virtual Private Cloud)
- VMware Cloud Infrastructure Suite
- Microsoft ECI data center.

With a private cloud, the same organization is technically both the cloud consumer and cloud provider (Figure 1.6). In order to differentiate these roles:

- a separate organizational department typically assumes the responsibility for provisioning the cloud (and therefore assumes the cloud provider role)
- departments requiring access to the private cloud assume the cloud consumer role

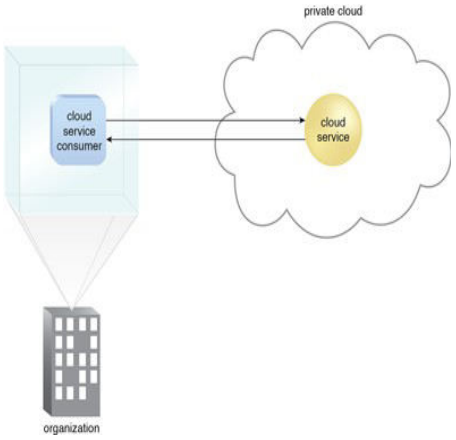

Figure 1.6 - A cloud service consumer in the organization's on-premise environment accesses a cloud service hosted on the same organization's private cloud via a virtual private network.

It is important to use the terms "on-premise" and "cloud-based" correctly within the context of a private cloud. Even though the private cloud may physically reside on the organization's premises, IT resources it hosts are still considered "cloud-based" as long as they are made remotely accessible to cloud consumers. IT resources hosted outside of the private cloud by the departments acting as cloud consumers

are therefore considered "on-premise" in relation to the private cloud-based IT resources [9].

➢ *Hybrid Clouds*

A hybrid cloud is a cloud environment comprised of two or more different cloud deployment models. For example, a cloud consumer may choose to deploy cloud services processing sensitive data to a private cloud and other, less sensitive cloud services to a public cloud. The result of this combination is a hybrid deployment model (Figure 1.7).

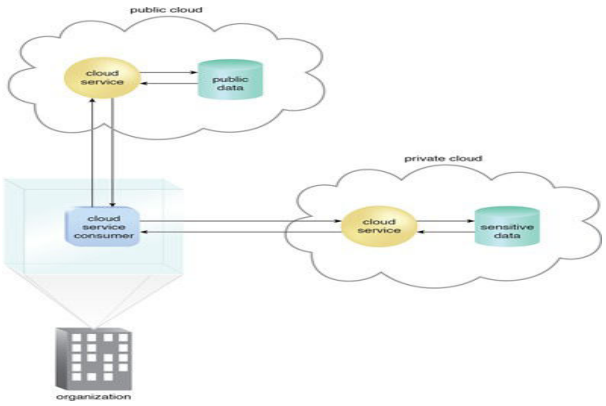

Figure 1.7 - An organization using a hybrid cloud architecture that utilizes both a private and public cloud.

Examples of Hybrid Cloud:

- Windows Azure (capable of Hybrid Cloud)
- VMware vCloud (Hybrid Cloud Services)

Hybrid deployment architectures can be complex and challenging to create and maintain due to the potential disparity in cloud environments and the fact that management responsibilities are typically split between the private cloud provider organization and the public cloud provider [10][11].

V. Cloud securities

➢ *Secure data transfer*

All of the traffic travelling between your network and whatever service you're accessing in the cloud must traverse the Internet. Make sure your data is always travelling on a secure channel; only connect your browser to the provider via a URL that begins with "https." Also, your data should always be encrypted and authenticated using industry standard protocols, such as IPsec (Internet Protocol Security), that have been developed specifically for protecting Internet traffic.

➢ *Secure software interfaces.*

The Cloud Security Alliance (CSA) recommends that you be aware of the software interfaces, or APIs, that are used to interact with cloud services. "Reliance on a weak set of interfaces and APIs exposes organizations to a variety of security issues related to confidentiality, integrity, availability, and accountability," says the group in its Top Threats to Cloud Computing document. CSA recommends learning how any cloud provider you're considering integrates security throughout its service, from authentication and access control techniques to activity monitoring policies.

➢ *Secure stored data.*

Your data should be securely encrypted when it's on the provider's servers and while it's in use by the cloud service. In Q&A: Demystifying Cloud Security, Forrester warns that few cloud providers assure protection for data being used within the application or for disposing of your data. Ask potential cloud providers how they secure your data not only when it's in transit but also when it's on their servers and accessed by the cloud-based applications. Find out, too, if the providers securely dispose of your data, for example, by deleting the encryption key.

➢ *User access control.*

Data stored on a cloud provider's server can potentially be accessed by an employee of that and you have none of the usual personnel controls over those people. First, consider carefully the sensitivity of the data you're allowing out into the cloud. Second, follow research firm Gartner's suggestion to ask providers for specifics about the people who manage your data and the level of access they have to it.

➢ *Data separation.*

Every cloud-based service shares resources, namely space on the provider's servers and other parts of the provider's infrastructure. Hypervisor software is used to create virtual containers on the provider's hardware for each of its customers. But CSA notes that "attacks have surfaced in recent years that target the shared technology inside Cloud Computing environments." So, investigate the compartmentalization techniques, such as data encryption, the provider uses to prevent access into your virtual container by other customers.

Although you should address these security issues with the cloud provider before you entrust your data to its servers and applications, they shouldn't be a deal breaker. Cloud computing offers small

businesses too many benefits to dismiss out of hand. After all, you already met many of these security challenges the first time you connected your network to the Internet [12].

VII. Tools of cloud computing

Since the introduction of the cloud, "*business as usual*" has transformed. This technology has allowed companies to better their IT performances, and ultimately, their services for consumers.

Just a few years ago, the cloud was a nearly incomprehensible concept to the world. Now, nearly every business uses the cloud and some even sell cloud computing services to other enterprises. Most recently, Verizon Internet and IBM announced their cloud computing services. And other major companies, like Cisco and Amazon have been in the business for several years [13].

The need for cloud tools for infrastructure automation is two-fold. First, DevOps engineers, IT professionals, and SysAdmins need to automate as many day-to-day tasks as possible so they have more time to design and engineer for business. Second, automation makes managing diverse, complex environments possible so that organizations can keep up with the demand for fast, flexible services.

Because cloud infrastructure encompasses so many areas of IT and cloud engineering, we here at ProfitBricks have searched for cloud infrastructure automation tools that can help cloud infrastructure engineers, IT professionals, and SysAdmins in nearly every niche of the field. You also will find everything from open source to enterprise tools in our list of the best cloud infrastructure automation tools, which is presented here in no particular order.

- *Cloudyn*

Cloudyn offers several tools exclusively focused on Amazon Web Services (AWS) cloud but will soon include Microsoft Azure, GoGrid and Rackspace. The tools help corporate IT gain financial intelligence in cloud investments while improving performance.

The average user saves approximately 40% of cloud-related costs. Use the Reserved Instance Navigator to purchase EC2 and RDS instances, reduce spending, manage RI inventory and simulate RI costs. Use the S3 Tracker to analyze how your storage is used so you can better your efficiency. In addition to these tools, four other tools are available to help save you money and enhance your business.

- *Enstratius*

Whether your business has a public, private or a hybrid cloud, Enstratius can help. The tool can be aligned with the governance and security requirements of a business. With Enstratius, you can easily manage each enterprise-class application in an effective manner.

The many features make this one of the best cross-platform cloud management tools. Login just once to manage every cloud resource. According to computerworld.com, "Features include self-service provision/de-provisioning; multi-currency cost/chargeback tracking; [and] customizable role-based access control."

- *RightScale*

Right Scale has many other tools beat in experience. It's been around since 2006 and has helped launch millions of servers. According to computerweekly.com, there are four main parts of Right Scale. The first is a cloud management environment. You'll also find a multi-cloud engine as well as an adaptable automation engine. Last, RightScale offers a cloud-ready ServerTemplate and Best Practice Deployment Library.

The cloud workload management service has a popular tool, PlanForCloud, that uses statistics to estimate cloud spending and to help companies save. Best of all, there is a free edition of RightScale that includes a web-based dashboard and can aid with configuration and management.

- *Puppet Enterprise*

This IT automation software allows for the ultimate management experiences in the cloud or on-premises. According to its website, Puppet Enterprise "gives system administrators the power to easily automate repetitive tasks, quickly deploy critical applications, and proactively manage infrastructure."

This tool helps out from the start of the IT infrastructure lifecycle to the end. It allows users to discover cloud nodes, to reuse previously-used configuration modules, deploy updates across multiple servers at once and even more! There is a

free version of this software that allows you to manage 10 nodes [14].

VIII. Advantages & Disadvantages of Cloud Computing

There is no doubt that businesses can reap huge benefits from cloud computing. However, with the many advantages, come some drawbacks as well. Take time to understand the advantages and disadvantages of cloud computing, so that you can get the most out of your business technology, whichever cloud provider you choose.

- *Cost Savings*

Perhaps, the most significant cloud computing benefit is in terms of IT cost savings. Businesses, no matter what their type or size, exist to earn money while keeping capital and operational expenses to a minimum. With cloud computing, you can save substantial capital costs with zero in-house server storage and application requirements. The lack of on-premises infrastructure also removes their associated operational costs in the form of power, air conditioning and administration costs.

- *Reliability*

With a managed service platform, cloud computing is much more reliable and consistent than in-house IT infrastructure. Most providers offer a Service Level Agreement which guarantees 24/7/365 and 99.99% availability. Your organization can benefit from a massive pool of redundant IT resources, as well as quick failover mechanism - if a server fails, hosted applications and services can easily be transited to any of the available servers.

- *Manageability*

Cloud computing provides enhanced and simplified IT management and maintenance capabilities through central administration of resources, vendor managed infrastructure and SLA backed agreements. IT infrastructure updates and maintenance are eliminated, as all resources are maintained by the service provider. You enjoy a simple web-based user interface for accessing software, applications and services – without the need for installation - and an SLA ensures the timely and guaranteed delivery, management and maintenance of your IT services.

- *Strategic Edge*

Ever-increasing computing resources give you a competitive edge over competitors, as the time you require for IT procurement is virtually nil. Your company can deploy mission critical applications that deliver significant business benefits, without any upfront costs and minimal provisioning time. Cloud computing allows you to forget about technology and focus on your key business activities and objectives. It can also help you to reduce the time needed to market newer applications and services.

- *Downtime*

As cloud service providers take care of a number of clients each day, they can become overwhelmed and may even come up against technical outages. This can lead to your business processes being temporarily suspended. Additionally, if your internet connection is offline, you will not be able to access any of your applications, server or data from the cloud.

- *Security*

Although cloud service providers implement the best security standards and industry certifications, storing data and important files on external service providers always opens up risks. Using cloud-powered technologies means you need to provide your service provider with access to important business data. Meanwhile, being a public service opens up cloud service providers to security challenges on a routine basis.. For instance, in a multi-tenant cloud architecture where multiple users are hosted on the same server, a hacker might try to break into the data of other users hosted and stored on the same server. However, such exploits and loopholes are not likely to surface, and the likelihood of a compromise is not great.

- *Vendor Lock-In*

Although cloud service providers promise that the cloud will be flexible to use and integrate, switching cloud services is something that hasn't yet completely evolved. Organizations may find it difficult to migrate their services from one vendor to another. Hosting and integrating current cloud applications on another platform may throw up interoperability and support issues. For instance, applications developed on Microsoft Development Framework (.Net) might not work properly on the Linux platform.

- *Limited Control*

Since the cloud infrastructure is entirely owned, managed and monitored by the service provider, it transfers minimal control over to the customer. The customer can only control and manage the applications, data and services operated on top of that, not the backend infrastructure itself. Key administrative tasks such as server shell access, updating and firmware management may not be passed to the customer or end user.

It is easy to see how the advantages of cloud computing easily outweigh the drawbacks. Decreased costs, reduced downtime, and less management effort are benefits that speak for themselves [15].

IX.REAL TIME EXAMPLES

- *Accounting Firms*

Accountants and auditors often times spend a good chunk of time "on-location at clients' offices. They are able to access QuickBooks or similar software in the cloud with minimal interaction with the IT team. There can be 300 accountants at different sites around the country, and if there's an issue the IT staff can resolve it for all users simultaneously.

- *Dealerships*

Back in the old days, car dealerships, parts dealerships and etc. had their servers located on-site, often times placed in the storage area or the broom closet. Employees had very limited knowledge of how to maintain the hardware, not much beyond power it on. With the addition of Citrix XenApp, corporate IT teams are able to provide these individual locations a centralized source for their applications and provide employees access through a Citrix receiver.

- *Law Firms*

With cloud computing by Citrix, lawyers are able to access their application on their laptops right from the court room. By also hosting their data in a secure data center vs. their personal computer they avoid the risk of having this data stolen or lost which as you can imagine, is of extreme importance when it comes to sensitive court documents.

- *Software Development*

Citrix enables software developers to sell their software in the cloud and easily set up licensing terms. This helps eliminate the need for customers to set up the applications on their own computers and bog down their in-house IT teams with maintenance and upgrades [16].

IX. Conclusion

This paper has presented a survey of the Cloud computing models, security and tools that have been proposed towards the enhancement of research in the field of big data analysis and cloud services. It gives ideas about the recent development, research challenges and novel tools usage of cloud computing.

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