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Cloud Computing and Service Oriented Architecture

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Abstract: ***Cloud Computing is used to allow efficient sharing of equipment and services. It facilitates to run the applications of an organization on a central data center rather than running them at themselves. This goal is achieved using an architectural approach of offered services on a network of consumers. Cloud is emerging as a phenomenon and it is happening at the confluence of several trends in the software industry. Service oriented architectures; virtualization and internet based application delivery have grown up to meet out the expectations of the end customers. Cloud is a major next step in this area. Cloud computing allows various tasks to be executed over a network using various services. Different types of services including infrastructure as a service, platform as a service, software as service have been proposed for cloud computing. Some of the benefits of cloud computing include reduced cost, scalability, better performance, service oriented and availability of easily and quickly movable application development. There are many types of cloud computing services available from various vendors. Computational cloud services provide on demand commuting resources that are scalable, inexpensive and can run any type of application. Storage cloud services allow all clients to store their large datasets on provider's storage banks. Application cloud allows access too many services that a developer can integrate to build their application. The goal of this paper is to provide detailed understanding of cloud computing framework and its relation to service oriented architecture. The Paper also highlights the idea of virtualization, cloud computing services, some advantages and the challenges.***
Keywords: Cloud Computing, Framework, Virtualization

I. INTRODUCTION

Cloud computing [1-3] is an emerging computing technology that uses the internet and central remote servers to maintain data and applications. Cloud computing is the need of today's business applications [4]. Cloud computing allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access. This technology allows for much more efficient computing by centralizing storage, memory, processing and bandwidth [5]. Some of the accepted cloud computing applications are given in [6-7]. Cloud computing is broken down into three segments viz applications, platforms and infrastructure. Each segment serves a different purpose and offers different products for businesses and individuals around the world.

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With a better and disciplined use of these cloud segments companies can reduce their IT budget and data center power cost. Traditional business applications of various companies have always been too complicated and expensive because they run a data center with office space, power, cooling, bandwidth, networks, servers, and storage. A complicated software stack and a team of experts to install, configure, and run them. They need development, testing, staging, production, and failover environments. These headaches across dozens or hundreds of applications grow in a multiplicative way. It gives a solid reason to the biggest companies with the best IT departments to run their application on a central data center by using different clouds. When an application runs in the cloud, customer just logs in, customize the application, and start using it on a pool data center with the power of cloud computing. Today's Businesses are running all kinds of applications in the cloud these days. They cost less, because there is no need to pay for all the people, products, and facilities to run them.
Clouds turns out more scalable, more secure, and more reliable than most applications. Additionally, upgrades are taken care so that applications get security and performance enhancements and new features automatically. The way a consumer pay for cloud-based apps is also different. Forget about buying servers and software. When consumer's applications run in the cloud, consumer buys nothing. It is available with a predictable monthly subscription, so consumer only pay for what is actually used.

II. CLOUD COMPUTING FRAMEWORK AND VIRTUALIZATION

Cloud computing framework has five key components. The first, virtualization technology [9], can be thought of as an underpinning of cloud computing. By abstracting software from its underlying hardware, virtualization lays the foundation for enabling pooled, shareable, just-in-time infrastructure. On top of this technology base, cloud computing principal offerings can be categorized into three main groups: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (Paas), and Software-as-a-Service (SaaS). Cloud optimization is the final, critical piece of the framework—encompassing the solutions that enable cloud computing to scale and to deliver the levels of performance and reliability required for it to become part of a business's core infrastructure The concept of cloud computing and how virtualization enables it offers so many innovation opportunities.

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Customers need dig into new product offerings to understand if something is really utilizing the full potential of virtualization and cloud computing. In many cases the collaboration, efficiency, high utilization, and productivity enabled by a combination of virtualization and cloud computing is not available because many firms are using fancy regrinding to create the appearance of innovation. IaaS is the ability to provide computing resources, processing power, network bandwidth, and storage as a service. Some traditional hosting providers claim to have IaaS, but in reality they provision dedicated hardware to customers, put virtualization on top and call it IaaS. True IaaS offerings, however, are truly pay-as-you-go services that can be turned on and off at any time with almost no notice. When a provider has the ability to serve truly transient burst requirements, then they are capable of claiming they offer cloud-based, pay as you go IaaS. IaaS offers cost savings and risk reduction by eliminating the substantial capital expenditures required when deploying infrastructure or largescale applications in-house. Cloud providers generally offer a pay-as you- go business model that allows companies to scale up and down in response to real-time business needs, rather than having to pay up front for infrastructure that may or may not get used, or having to overprovision resources to address occasional peaks in demand. IaaS has been well adopted among small to mid-sized businesses that don't have the resources or economies of scale to build large IT infrastructures.

Another fast-growing category of cloud computing offerings is Platform-as-a-Service (PaaS), which consists of offerings that enable easy development and deployment of scalable Web applications without the need to invest in or manage any underlying infrastructure.

By providing higher-level services than IaaS, such as an application framework and development tools, PaaS generally provides the quickest way to build and deploy applications, with the trade off being less flexibility and potentially greater vendor lock-in than with IaaS.

The best enterprise-ready examples of are cloud computing in the Software-as-a-Service (SaaS) category, where complete end-user applications are deployed, managed, and delivered over the Web. SaaS continues the cloud paradigm of low-cost, off-premises systems and on-demand, pay-per-use models, while further eliminating development costs and lag time. This gives organizations the agility to bring services to the market quickly and frees them from dependence on internal IT cycles. The speed and ease with which SaaS applications are purchased and consumed has made this category of cloud computing offerings the most widely-adopted today.

The final piece of the cloud computing framework, cloud optimization services provide performance, scale and reliability for all of the previously-described components of cloud computing. They enable cloud offerings to operate across an unpredictable and unreliable Internet while delivering the robust levels of service required by enterprises. The value of cloud optimization services can be understood as a direct function of application adoption, speed, uptime, and security. Without optimization services, cloud offerings are dependent to the Internet and its many bottlenecks with resulting poor performance.

III. SYSTEM ORIENTED ARCHITECTURE (SOA)

System Oriented Architecture (SOA) [10-12] builds on computer engineering approaches of the past to offer an architectural approach for enterprise systems, oriented around the offering of services on a network of consumers. A focus of this service-oriented approach is on the definition of service interfaces and predictable service behaviors.

Cloud computing and SOA have important overlapping concerns and common considerations [3][8], as shown in Table 1.

The most important overlap occurs near the top of the cloud computing stack, in the area of Cloud Services, which are network accessible application components and software services, such as contemporary Web Services. Both cloud computing and SOA share concepts of service orientation. Services of many types are available on a common network for use by consumers. Cloud computing focuses on turning aspects of the IT computing stack into commodities that can be purchased incrementally from the cloud based providers and can be considered a type of outsourcing in many cases. Cloud computing is currently a broader term than SOA and covers the entire stack from hardware through the presentation layer software systems. SOA, though not restricted conceptually to software, is often implemented in practice as components or software services, as Web Service standards used in many implementations. These components can be tied together and executed on many platforms across the network to provide a business function.

Both cloud computing and SOA depends on a robust network to connect consumers and producers and in that sense, both have the same foundational structural weakness when the network is not performing or is unavailable. If the future of a service depends on the network, than it must ensure that network can stand the strain.

Both cloud computing and SOA require forms of contractual relationships and trust between service providers and service consumers. Reuse of an SOA service by a group of other systems is in effect an outsourcing of that capability to another organization. With cloud computing, the outsourcing often has a fully commercial flavor. Storage, platforms, and servers are rented from commercial providers who have economies of scale in providing those commodities to a very large audience.

`Cloud Computing	**Overlap**	**SOA Via Web Services**
Software as a service(SaaS)	Application Component /Services on Layer	System of System Integration Focus
Utility Computing	Network Dependence	Driving Consistency of Integration
Data Distribution in a Cloud	Cloud /IP WAN –supported Service invocations	Enterprise application Integration
Platform as Service	Levering Distributed Software Assets	Reasonably Mature Implementing Standards
Standards Evolving for Different Layers of the Stack	Producer/Consumer Model	----------

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Table 1. Overlapping Concepts for Cloud Computing and SOA

Cloud computing allows the consumer organization to leave the detailed IT administration issues to the service providers

IV. CLOUD COMPUTING: ADVANTAGE AND CHALLENGES

Cloud computing infrastructures can allow enterprises to achieve more efficient use of their IT hardware and software investments. They do this by breaking down the physical barriers present in isolated systems, and automating the management of the group of systems as a single entity. Cloud computing is an example of a virtualized system, and a new evolution for data centers that employ automated systems management with workload balancing and virtualization technologies.

A cloud infrastructure can be a cost efficient model for delivering information services, reducing IT management complexity, promoting innovation, and increasing responsiveness through real-time workload balancing. Although it may be true on a machine-to-machine level, it is not true in all applications of Cloud Computing it is tied to specific data centers operated by the Cloud vender. An application may run on any single or number of servers in a data center it is a small step forward in cloud computing to achieve some advantages like scalability and and reduced start-up costs. The technology is moving to where applications and web services will exist on multiple data centers in different finite locations. This important concept changes the way we will think about true scalability, stability, performance, and security as Cloud Computing develops and gains adoption. Cloud of Clouds is a revolutionary concept that will bring advances to Internet ubiquity where space and bandwidth are delivered like anything. Still there is a long way to travel for cloud computing to reach to its maturity. With the help of local and individual neighborhoods different ideas about how services should be delivered over clouds with different requirements of the consumers can be traced out. Each Cloud under development is unique and incompatible. Applications and sites will need to be developed for a specific cost basis cloud platform. But this will change in the long term One of the problems with most contemporary Cloud Computing providers is that they still see the creation of cloud networks as a way to lock in customers for other products and services not as the viable multi user access model. Cloud to Cloud migrations are still very complex or not available at all. But it can be done in future with rigorous efforts.

V. CONCLUSION

Cloud applications do not waste valuable IT resources and utilizes them optimally. This feature of cloud computing attracts the attention on deploying more applications, new projects, and innovations in clouds. Cloud computing is a simple idea, but it can have a huge impact on business.

Most of the attention has focused on offerings in the public cloud, where centralized architectures are currently commonplace. The drawbacks of this type of architecture have already begun to surface, as many of the major cloud vendors have suffered widely-reported outages and downtime over the last year. Now, as cloud computing has come out discussions and experimentation mode enables it into more mainstream adoption, businesses running applications on cloud platforms will rely on cloud optimization services to make the cloud responsive, scalable, and secure. Cloud Computing do not have a single vendor or a single solution rather it may vary as the applications and services varies. The computing era will be highly benefited with cloud environments, in private and public modes of clouds as they will come in all shapes and sizes. Most of the clouds supposed to be interconnected to enable an end consumer to run its application at any instance of time. Irrespective of the existing cloud services, cloud optimization services will play a critical role in driving its growth, with innovative solutions that enable success for both cloud computing providers and the enterprises that use them.

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