Models in Cloud Computing

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Abstract : This Research paper deals with various service models and deployment models provided by cloud. Cloud computing is the delivering of compute services such as databases, storage facilities, virtual machines, servers etc. Thus, cloud reduces the cost for infrastructure and maintenance, which in turn will allow the enterprises to focus on core business processes. Cloud-based computing also allows the users to pool the resources to its users effectively and efficiently. According to NIST, there are three recognized service models and three recognized deployment models. Service models include Infrastructure as a Service, Software as a Service and Platform as a Service. Deployment models include A) Public cloud, B) Private cloud, C) Community cloud, D) Health cloud E) Hybrid cloud. This study paper discusses these models, along with the other models which are provided by the cloud and service providers who provide these kinds of services.

Keywords – cloud computing, Deployment Models, models, Public Cloud, services.

I.   INTRODUCTION

Cloud computing is an internet-based computing which helps in sharing various processed resources and data to computers and devices. Cloud computing is booming technologies which provides many services such as, computing, databases, storages, virtual machines, servers, analytics, AI (artificial intelligence). Cloud provides these services over internet which makes it scalable and helps the enterprises to eliminate the capital expenditure on purchasing hardware for their firm. [1]

There are two types of cloud models Service models & Deployment models. Service models are classified on the basis of services provided by the cloud and Deployment models are classified on the basis of how they are used and by whom the cloud services are used. Service models are broadly classified to three types:1) IaaS (Infrastructure as a Service), 2) PaaS (Platform as a Service) and 3) SaaS (Software as a Service). These three models are recognized by NIST officially and there are many other known services by cloud like MBaas (Mobile Backend as a Service), DaaS (Data as a Service), MaaS (Monitoring as a Service). Deployment models include public cloud, private cloud, community cloud and hybrid cloud. There are other deployment models for cloud such as Distributed cloud, Inter cloud etc.

Why will we require cloud computing?

The traditional infrastructure provisioning model is inefficient and cannot fulfill the requirements of the internet. In this system intermedial model, once the need for a business application is identified, its infrastructure needs are recognized and a request for infrastructure is placed with the IT infrastructure team that procures and provisions the infrastructure. The application then developed and deployed on that infrastructure. Some of the challenges with this model include Poor Utilization of Resources: Application usage is not going to be constant yet the infrastructure is provisioned for peak demand, to be able to guarantee application SLAs. So, the twelve infrastructure remains under-utilized for a major part of the time.

Slow Time-to-Market: This model of provisioning and procuring infrastructure usually requires significant time and reduces the agility of an organization in creating new business solutions. This is referred as infrastructure-as-a-service, platform-as-as Service and software-as-a-service. This cloud computing model offers many appealing benefits for enterprises including.

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Faster Time-to-Market: Enterprises can avoid the step of initial infrastructure setup and procurement, thus allowing the business solutions to be taken to market faster. On-Demand Elastic Infrastructure: Unexpected spikes from business growth, functionality additions or promotional offers can be addressed easily with Service Request Assign.

II.   MODELS
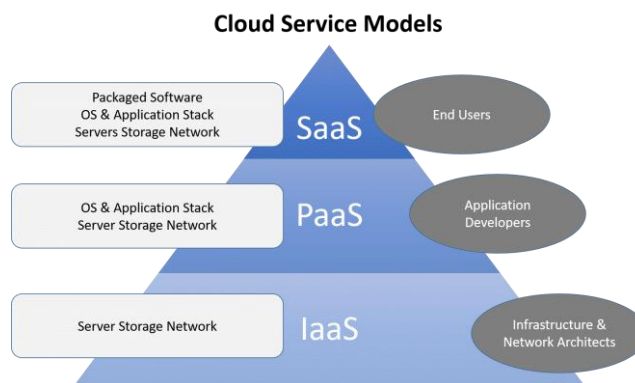
2.1 Service models

Figure 1. Cloud Service Models

Infrastructure as a Service(IaaS) This service model delivers computer infrastructure as a service. This service is made available over virtualized machines.Unlike, traditional hardware machines which require maintenance and some flexibility, cloud makes these machines easily available virtually on the internet with flexible specifications and improved performance, optimized according to the requirements of the customer.

Some Advantages:
1. Maintenance such as software updates, latest versions can be readily available on the internet.
2. Reduces the maintenance cost for the hardware which is quite expensive.
3. Data stored on the virtual machine is secured and can be recovered in case of any failure of host allocation.

Some of the IaaS service providers are:
1.Amazon Elastic Cloud Compute (EC2) service from Amazon Web Services by Amazon.
2. Google Compute Engine from Google Cloud Services by Google.
3. Windows Azure Virtual Machines from Windows Azure by Microsoft.
4. IBM Smart Cloud Enterprise by IBM.

Platform as a Service(PaaS) This model delivers platforms for building and running web-based applications. It provides facilities required to support the complete software development life cycle. This service delivers a computing platform for the customer who includes operating system, programming platforms, web servers, databases etc. Since everything is run on web, there is no need to worry about the infrastructure and minimum requirements for the platform. [2] This model can eliminate the worry of incompatibility of software environment on the machine,Anyone with good internet connection can now develop powerful and efficient applications without worrying about the infrastructural and cost issues. The traditional on models were expensive and complex, which required specific, set of hardware and software specifications. For every problem statement, there is a business solution, which meant different set of hardware and software specifications. This situation used to force the developers to change the application many times. Extensive electricity power was also required to run the hardware. With an entry of PaaS model of cloud, application development became cost effective, quick and efficient. PaaS provides infrastructure along with the workflow facilities needed for the software development. It also provides application services for the software development such as storage, security, database integration, instrumentation etc. Another characteristic of PaaS models is the integration of mobile applications and web and services with the databases using Simple Object Access Protocol [3].

PaaS consists of three main components 1. Stack consisting of all the backend implementation components such as virtual machine, servers, load balancers, caching mechanisms etc. 2. Deployment Machinery consist of scripts and services for deploying the developed applications on the internet. 3. User Experience-

Contains of all the frontend components such as user interface, customized abstraction, flexibility to choose the environments and design.
Advantages:

1. Can develop and deploy agile applications.

2. Can focus on the important resources for the enterprise without worrying about the cost of infrastructure.

3. The platforms provided by a PaaS provider are revised editions which are updated time to time, thus applications can be built using best technologies.

Some of the PaaS service providers are:

1. Google App Engine by Google Cloud services from Google.

2. Windows Azure PaaS services by Microsoft.

3. Amazon Elastic BeanStalk by Amazon Web Services from Amazon.

4. Openshift by Red Hat from Linux.

5. Engine Yard run on AWS by Amazon.

Software as a Service(SaaS) Cloud service providers take care of the platforms and infrastructure required to run the software applications on the Internet. It is referred to as 'on-demand software', which can be used after paying the subscription fees. cloud users directly install the subscribed applications on the cloud and can directly access the software from their cloud clients. The cloud users need not manage the infrastructure or the platforms required to run the software application. Some of the SaaS applications are Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), accounting and other business software, which are mainly non-core-competency software.

Some of the SaaS service providers are:

1. CRM from Salesforce.

2. CRM from Oracle On-Demand

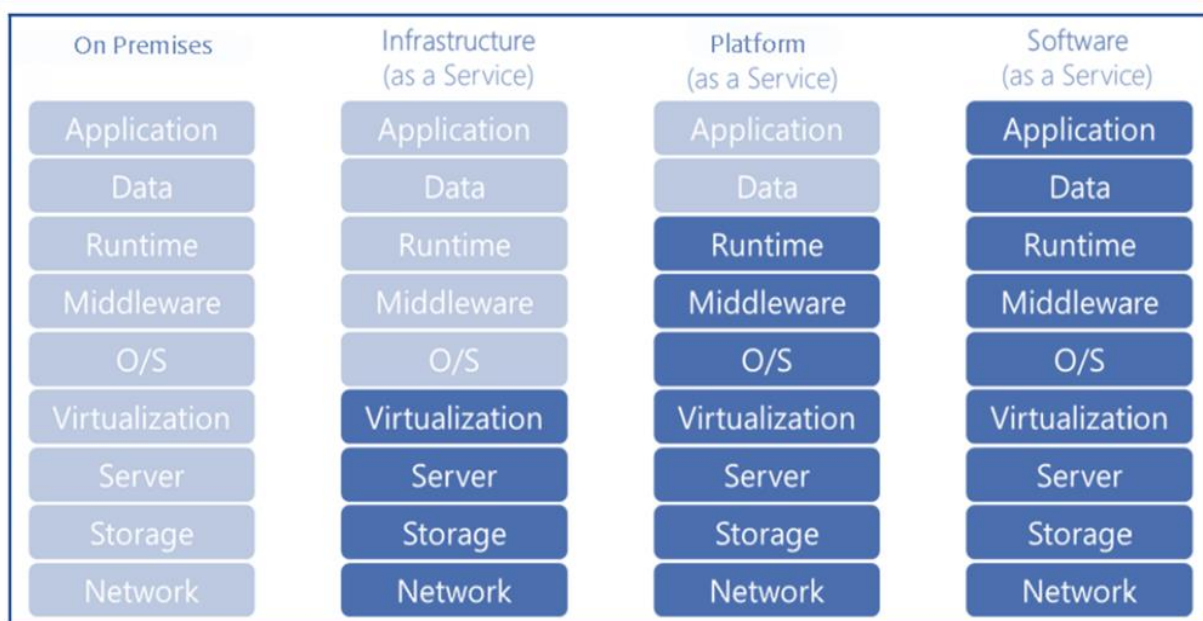3. ERP and CRM by SAP Business by Design from SAP.

Figure 2: Cloud Services

Communication as a Service(CaaS) This service model is responsible for managing hardware and software required for communication services such as Voice over IP (VoIP), Instant Messaging (IM), Collaboration and Video conferencing capabilities using fixed and mobile devices.[5] This service model offers guaranteed Quality of Service (QoS), flexibility and expandability of small or medium -sized businesses which

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cannot afford the cost for devices or modes. This model allows the user/customer to select the types of communication services which are to be deployed by the organization for their core business processes. Network Some of the communication features provided by CaaS are:

1. Chat
2. Multimedia Conferencing
3. Software based telephones
4. Unified messaging and mobility.

Data as a Service(DaaS) This service model provides data on demand to the customers, without any constraint of geographical distance between the customer and the service provider.
This service primarily was started by web mashups in 2015, and now an extensively used feature by organizations such as UN. The primary reason for this service model to come into existence is the increasing costs for combined software and data customer packages, and the necessary EAI (Enterprise Application Integration) middleware, which act as an interface between the software and data. This service model separates the data cost and data usage from the cost of the software or the environment required to run it, making itself attractive to the customers. The pricing for this model is done either on the basis of the volume of the data required or the type of the data required. Hence, now customers can easily access the business data on the cloud platform with an existing data center. This service model ensures the agility in accessing data, quality of data provided and also cost effective for the enterprises. Advancements are made on this service model to launch it as Big Data as a Service (BDaaS). Informatica Cloud and Oracle are some of the vendors who provide DaaS solutions.

Mobile Backend as a Service(MBaaS) It is also referred as Backend as a Service (BaaS), which delivers a model for the web and mobile applications developers for linking their applications to the backend cloud storage.[6] It also provides application interfaces for other services such as push notifications, integration with social networking services and user management, in the backend. Most of the service providers who provide BaaS solutions focus on providing SDKs and APIs for web and mobile application development compatible with operating systems and web languages such as iOS, Android, Windows, Blackberry, HTML 5 and others. This service, though a commercial service, also gives open source options to the user. Customer can pay for the set of APIs and SDKs as a package which are required for developing his/her own web/mobile based application exclusively. Efficient applications can be developed since these APIs are lighter in weight and also powerfully developed. Developers can easily abstract the server side infrastructure while using this service model.

Monitoring as a Service (MaaS) It is a service which is mean to monitor a certain part of an application, server or any other IT device. This service helps in monitoring many other applications and services running within the cloud. Online state monitoring is the most common service of MaaS model. This state monitoring service continuously monitors and tracks the instances, networks, applications deployed within the cloud. This service is mainly used by organizations to regulate and monitor their security, server logs, and integrity of their systems. For maintaining the integrity ,confidentiality and availability of IT assets and this is done by a strong security team. MaaS provides real time monitoring services to the organizations, and immediate incident response across a strong security infrastructure. This service model is based on Security Operations Centers (SOCs) [7]. This kind of model improves customer security infrastructure, and quickly detects threats. These monitoring services also keep a log of events happening within the cloud and hence can report to the customer in case of any log-in failures. Flexibility and scalability is offered to all the available instances in the cloud effectively. AWS and Monitis are some of the vendors who provide MaaS solutions.

2.2 Deployment models

Public cloud This deployment model of cloud renders all its applications and services available and open to public use, over a network. These services may be free most of the times. The user can meet his needs for little or no cost sometimes. These clouds can be used by anyone, a single user or an organization. Some of the public clouds are Amazon Web Services, Google AppEngine, Windows Azure, IBM Blue Cloud, etc

Private cloud This model of cloud is operated by a single organization. It can be managed by the organization itself, or by a third party service provider, located internally or externally. This kind of cloud is preferred by the businesses with dynamic needs and which require direct control to the work environment. Community cloud This deployment cloud is operated by a community of group of organizations which share common concerns such as storage or security. These clouds can also be hosted and managed, both internally and externally. This model of cloud follows multi-tenant infrastructure. Some of the community clouds are QTS and Salesforce.

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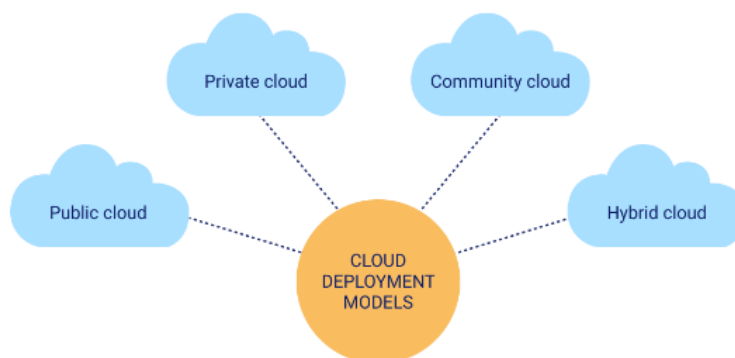10th National Conference on Role of Engineers in Nation Building – 2022 (NCRENB-2022)

Figure 3. Deployment model

Hybrid cloud This deployment cloud is a combination of two or more clouds (public, private or community). In this model, the privacy of the organization along with the availability for multi-tenancy with the ability to connect with other organizations is satisfied [8].

For example, an organization uses a private cloud to store its client-sensitive data, uses community cloud to connect with other similar organizations and uses a public cloud that connect a business intelligence tool to a software application. Other deployment clouds are like:

III.   METHODOLOGY

The work presented in this paper addresses an important problem to cloud management solutions that of providing resources for cloud applications, during the process. These relations are being defined through the use of policies that dynamic provisioning of virtualized applications raises new challenges not addressed by prior work on provisioning technique for cloud environment. We proposed a novel dynamic provisioning technique, which was a hybrid model for a virtualized multi-tier application in cloud data center.

IV.   FIGURES AND TABLES

Cloud computing offers three high level cloud service models. These services are selected according to the requirement of the organization.

Infrastructure As a Services	Platform As a Services	Software As a Services
• Amazon web Services • AT & T • IBM • NIT	• Microsoft Azure • Google App Engine • Keynote • Wavemaker	• Salesforce • Google • Microsoft • Ramco

Figure 2: Services and Service providers of Cloud Computing.

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V.   CONCLUSION

A Cloud Computing can be beneficial to all those businesses which are in the stage of development. The services models and deployment models provided by cloud form the basic functionality of cloud. Cloud computing, provides the benefits of resources at economical scale, with flexibility, scalability and multi-tenancy. Cloud can be the platform for executing all the core business processes. Cloud computing is a promising and emerging technology for the next generation of IT applications. The barrier toward the rapid growth of cloud computing are data security and privacy issues. Reducing processing and data storage cost is a mandatory requirement of any organization, while analysis of data and information is always the most important tasks in all the organizations for decision making. So no organizations will transfer their data to the cloud until the trust is built between the cloud service providers and consumers. A number of techniques have been proposed by researchers for data protection and to attain data security in the cloud. However, there are still some gaps to be filled by making these techniques more effective. More work is required in the area of cloud technology to make it acceptable by the cloud service consumers.

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