Scale the Infrastructure through Custom Software in Public Cloud

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Abstract- Today there is so much buzz around cloud computing. Almost all the companies, organizations and own group parties are using cloud these days. In this paper, we will mention the present scenario of cloud computing and also simplified a problem faced by the user while accessing Amazon Web Services (AWS) – a public cloud.

Keywords- Virtualisation; cloud computing; public cloud; AWS; IAM; EC2

I. INTRODUCTION

Cloud computing is an emerging technology which is making use of the internet to access hardware and software service instead of keeping regular physical hardware and software in the office space. There is no need to worry about power, network access and maintenance of the servers in the cloud. [1].

II. VIRTUALISATION AND CLOUD COMPUTING

The core of cloud computing is virtualization, which is used to separate a single physical machine into multiple virtual machines in a cost-effective way. Virtualization is the formation of virtual resources such as a server, desktop, operating system, file, storage or network. It is an abstraction of computer resources. With virtualization, it is possible to run multiple operating systems on a computer system simultaneously and shares the underlying hardware resources [2]. It is the process by which one computer hosts the appearance of many computers. The virtualization environment allows users to create, copy, save, read, modify, share, migrate and roll back the execution state of VMs [3].

Virtualization is a way to run a single machine into multiple machines. In the virtualization, we can install multiple operating systems on the single machine. It is software that separates physical infrastructure to create different dedicated resources. It is the basic technology that powers cloud computing.

III. WHY VIRTUALISATION?

- Isolation: a) Virtual machines completely remain isolated from each other.
- b) Preserves performance by providing advanced resource controls.
- Encapsulation: a) Virtual machines encapsulate a complete computing atmosphere.
  b) Moving and copying VMs is as easy as with files [4].
- Portability: Virtual machines can be shifted among different hosts.
- Cost Reduction: Sharing of resources helps cost reduction.
- Easily migrate workloads as needs change: Migration refers to moving a server environment from one place to another. Without virtualization solutions, it is impossible to move a virtual machine from one physical device in the environment to another.
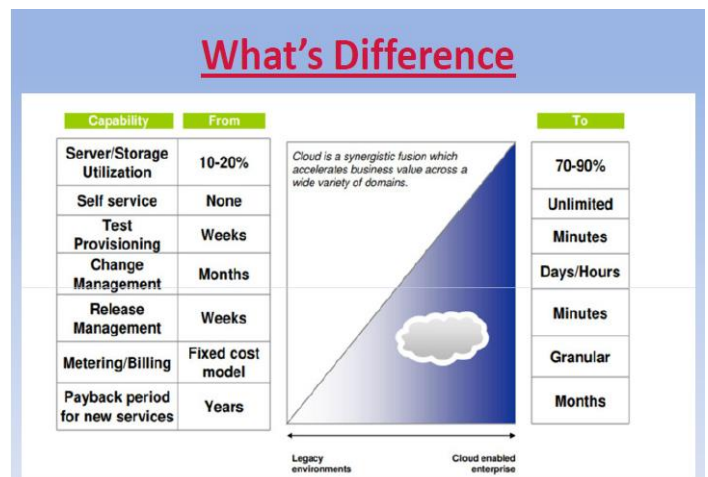

Fig.1: How Cloud is a difference from legacy environment `

Cloud computing is a method to deliver the IT services through the Internet. Any company provides services like infrastructure, database etc. are called cloud service provider(s) [5]. Cloud computing is a model for enabling suitable, on-demand self-service or computing resources (For example: networks, servers, storage, applications, and services) that can be quickly provisioned and released with minimal management effort or service provider interaction[6].

Cloud Model has:
- Five essential characteristics
- Three service models

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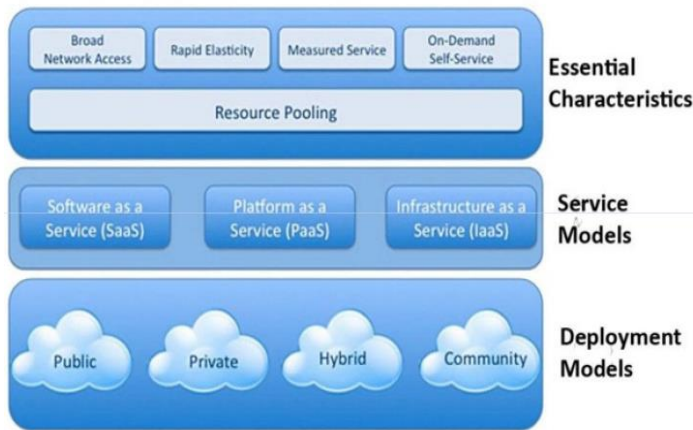
- Four deployment models
  (as shown in Fig 2):-

Fig.2: Cloud Model.

IV.   WHY AMAZONE WEB SERVICES – A PUBLIC CLOUD

Public cloud refers to a computing service model used for the provisioning of storage and computational services to the general public over the internet. Public cloud facilitates access to IT resources on a "pay as you go" billing model.

Public Cloud is operated and owned by a third-party cloud service provider. They distribute their computing resources like storage and servers over the Internet. For those organizations that cannot pay for huge IT investments and do not have a lot of confidential/private information, the public cloud appears to be an honest selection [7]. Example: Amazon Web Services (AWS), Microsoft Azure.

Amazon Web Services (AWS) - a subsidiary of Amazon is a cloud-focused service provider. It allows businesses and developers to use web services to make scalable, sophisticated applications. Gartner June' 17 magic quadrant for Cloud Infra, AWS is the leader in the Cloud Computing market (Fig. 3). According to Gartner" AWS is the most mature, enterprise-ready provider and has capabilities for governing a large number of users and resources" [8].

AWS dominates the public cloud market with a 47.1% market share (Q1' 17). AWS is the most popular public cloud infra platform, comprising 41.5% of workloads (Feb' 17 report). Today AWS certification is fast becoming and must have certificates for any IT professional working with Cloud [9].
Figure 3 depicts the magic quadrant for Cloud Infrastructure providing services worldwide.

Fig.3: Magic Quadrant for Cloud Infrastructure as a Service, Worldwide

Features of Amazon Web Services:
- Trade Capital expense for variable expenses
- Benefit from massive economies of scale
- Increase speed and agility
- Stop guessing about capacity
- Stop expenditure of money running and maintaining data centres
- Go global in minutes. It means that cloud service can be access from anytime and anywhere as shown in Fig. 4.
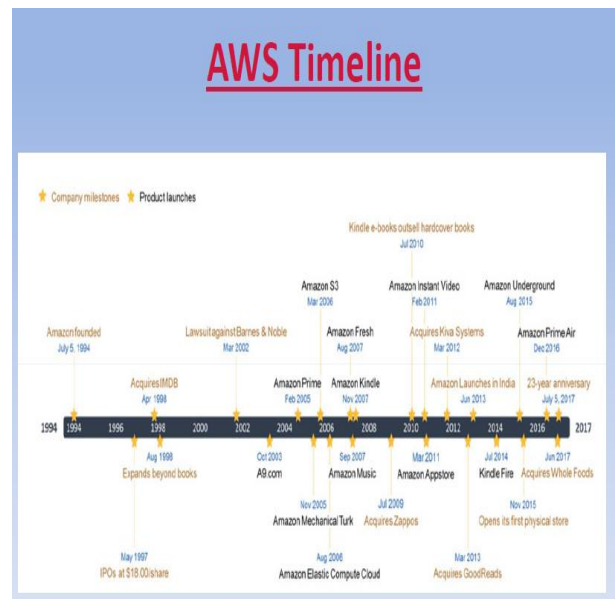

Fig.4: AWS Cloud Timeline

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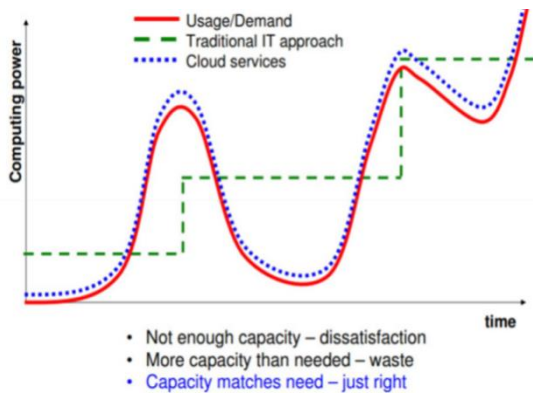## V. PRESENT SCENARIO OF CLOUD COMPUTING:

A. Capacity V/S Usages:

Fig.5: It shows capacity V/s usage of the cloud.

In the traditional data centre, the output of actual capacity and the desired capacity demands were so different, so customers were not able to fulfil their demands. But cloud services provide enough capacity to meet customer demands; their actual and desired capacity is almost same (Fig. 5).

B. Why Cloud Technology? :

1) Cloud Translation API: It is an API that dynamically translates between thousands of existing language pairs. Cloud Translation API provides an easy programmatic interface. This interface is used for translating a random string into any supported language using state of the art Neural Machine Translation. Translation API is very open, so websites and applications can integrate with change API for fast, dynamic translation. There is a translation of source text from the source language to a target language like French convert to English. Language detection is also presented in the case where the source language is unknown. The primary technology pushes the boundary of Machine Translation and is updated often to seamlessly improve translation and introduce new languages and language pairs [10].

2). Backup and Recovery: When we choose cloud for data storage the responsibility of the information also lies with service source. This saves from the capital layout for building infrastructure and maintenance. The cloud service provider is responsible for securing data and meeting legal and compliance requirements. The cloud also provides more flexibility in the sense that it can enjoy large storage and on-demand backups. Recovery gets faster in the cloud because the data is stored over a network of physical servers. Some popular examples of cloud backup solutions are Dropbox, Google Drive and Amazon S3 [11].

3). Productivity: Microsoft Office 365 and Google Docs are Office tools which use cloud computing and allowing using the most-productive tools over the internet. It can work on documents, presentations, and spreadsheets – from everywhere, at any time. With data stored in the cloud, there is no data loss in case machine is stolen, lost or damaged. It also helps in sharing documents and enables different individuals to work on the same file at the same time [11]. Because of these features of cloud computing, billions of dollars are spending on Cloud Architecture as shown in Fig 6.
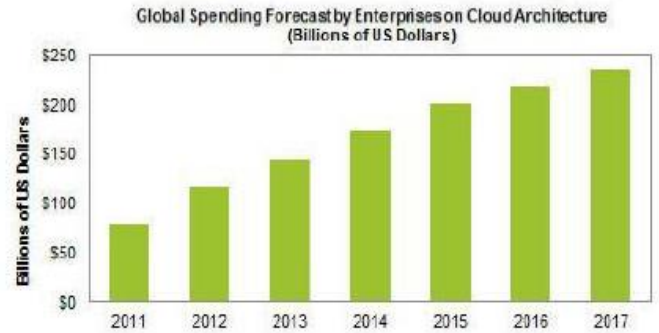

Fig.6: Global Spending Forecast Enterprises on Cloud Architecture (Billions of Us Dollars).

VI. PROBLEM DEFINITION

Amazon Web Services (AWS) is a cloud provider which provides the public cloud market with a 47.1% market share. It is accessible all the time, through the internet. It offers to compute power, storage, content delivery, and other functionality that organizations can use to deploy applications. AWS offers many services like:-

- EC2(Elastic Compute Cloud)
- S3(Simple Storage Service)
- IAM(Identify Access and Management)
- VPN(Virtual Private Cloud)
- AWS Auto Scaling
- RDS
- Lambda, and so on.

Fig.7: Snapshot of AWS services.

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Fig. 7 depicts the services offered by Amazon Web Services. The dashboard of AWS is complex and not user-friendly for the nontechnical user.

From those services let's take EC2 service.

- EC2 is a web service that provides resizable compute capacity in the cloud.
- It has the choice of multiple instance types, operating systems, and software packages [12].
- Amazon EC2 allows selecting a configuration of memory, operating system, CPU, RAM, and the boot partition size. E.g. choice of operating systems includes several Linux distributions and Microsoft Windows Server.
- They provide virtual computing environments, known as instances.
- Each user is allowed to run several pre-installed virtual machine image known as Amazon Machine Image or AMI on this service. To make simpler the setup of a server, Amazon offers an online list where users can select between a huge number of AMIs that come pre-installed with common services such as web servers, web applications, and databases [13].
- Secure login information for instances using key pairs (private key and public key).A variety of configurations of CPU, memory, storage, and networking capacity for the instances are called instance types. It has resizable compute capacity in the cloud, which can be customized according to the users need.
- It provides to scale up or down to handle changes in requirements, reducing needs to forecast traffic.

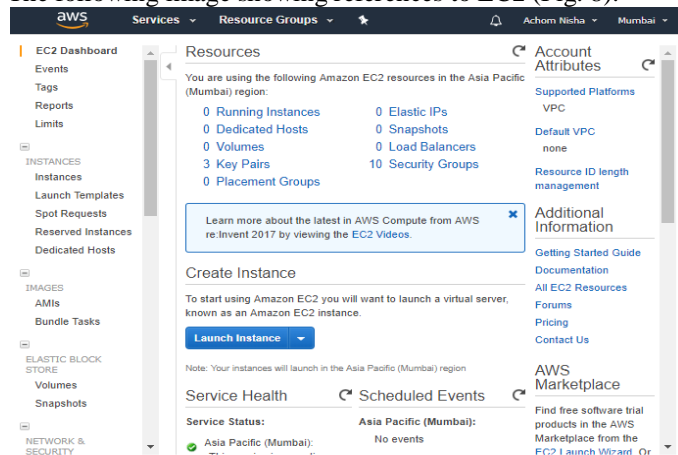The following image showing references to EC2 (Fig. 8):

Fig.8: Snapshot of EC2 Dashboard.

The user might get not handy and also it is hard to access all those services fully as it involves lots of typical technical terms. The users who are not technical enough finds difficult to access the services. To simplify the complexity of accessing the resources of EC2 we will provide a solution.

Solution:

We have simplified this problem by making an interface which is connected to AWS cloud where we can access all the resources of EC2. We have removed the complexity by creating a custom interface to launch an instance on AWS Cloud.

This interface will be connected to AWS cloud API by authenticating the credentials created by AWS IAM service. AWS IAM (Identify and access management) gives us to manage the AWS services and resources securely. Using IAM, we can create and manage AWS users and groups, and use permissions to allow and deny their access to AWS resources. By using this separate interface we will provide simple, easy and user friendly access to the users. This interface will help the users to manage the resources easily.
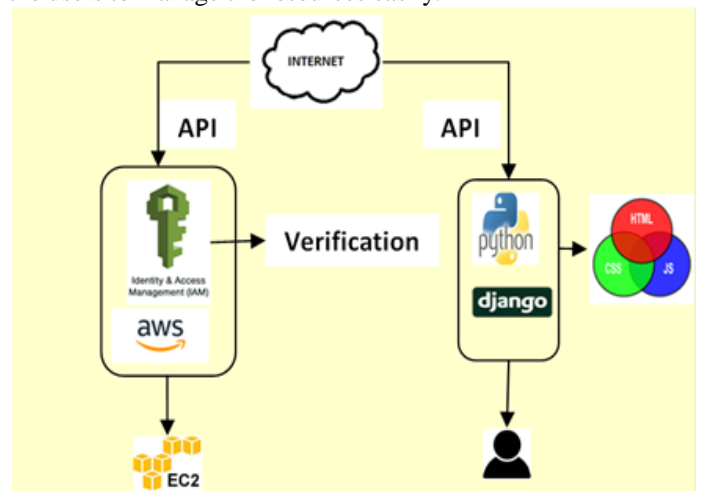

Fig.9: An Outline of Custom Interface

Fig. 9 shows the custom interface which is developed in Python's framework, Django. This interface will be communication with AWS APIs using the credentials created by AWS IAM.

After the successful authentication with AWS APIs, its interface will connect to EC2 API to create the instance (virtual machine on the cloud) with the configuration(s) provided by the user on the custom interface.

VII. FEATURES OF CUSTOM INTERFACE

- Reduced Complexity: A User can manage the resource easily by selecting many different features from the interface.
- Flexibility: It enables to select the operating system, CPU, memory storage, and other resources of EC2 that we need. It can access files using web-enabled devices such as Smartphone, laptops, and notebooks.
- Disaster Recovery: It is much faster and easier to restore a failed server in a virtual environment and can also easily build in a second Storage Area Network (SAN) that replicates all of the data.

VIII. CONCLUSION

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Here, we conclude that there are so many fields which we can work in the cloud. EC2 has so many features which make it difficult to launch instance(s) for non-technical users. The interface explained in this paper has only relevant features that ease the user's need and users will also be able to launch instances(s) without any hassle.

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