

Development Of Service Deployment Models In Private Cloud

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ABSTRACT

One model for gaining access to computer resources that is gaining popularity is cloud computing. There are three main types of services offered by cloud providers. These include software as a service, platform as a service, and infrastructure as a service. Private cloud computing is defined and its advantages are discussed in this project. After that, we'll go into the features, architecture, and implementation of private clouds. One of the main goals of this project is to provide the groundwork for future research on private cloud computing. Both the private cloud provider's and the consumer's duties are detailed in this project. The server's processing capacity may be used by any user with authorization to run applications, save data, or execute any other kind of computational operation. Since the application no longer requires a specific personal computer to run, users are free to do so from any location within the college grounds; this is because the processing power for the application is provided by a server, which is also accessible via a network that is linked to the internet or other connection platforms. Because of Moore's law, which states that the price of computing power continues to fall as the amount of accessible processing power increases, all of this is now within reach..

Keywords: Cloud computing, Ansible tool, VS code editor

I. INTRODUCTION

One definition of "cloud computing" is "the practice of storing data and processing resources in a remote location and making them available on demand through an Internet connection rather than on-premises servers" (or "the cloud"). It is common practice for large clouds to use several data centers, or sites, to house their various operations. While the pay-as-you-go model and resource sharing that characterize cloud computing might help bring down capital expenditures, they can also surprise customers with unforeseen running costs [3]. It is possible to trace the roots of cloud computing back to developments in grid computing. It was Eric Schmidt, CEO of Google, who popularized the phrase "cloud computing" at the end of 2006 [3]. Although it is based on some older concepts, cloud computing is a relatively new phenomenon that has emerged from a variety of different corporate, technological, and societal viewpoints. Cloud computing, from an architectural standpoint, is an obvious extension of grid computing; it makes use of grid services while incorporating new technologies, such as virtualization, and business models [4]. Simply said, the cloud is a collection of shared, virtualized, commodity computers located in the same or separate physical locations that can handle a wide variety of workloads and user requests on an as-needed basis. With the pay-as-you-go approach, cloud services are offered to customers in the same way as utility services like water, electricity, and telephones. When describing these useful services, people often use the acronym XaaS, which stands for "software, platform, infrastructure, etc." [5].

In order to create and distribute applications to end users, cloud users make use of the services offered by cloud providers. Cloud computing eliminates the requirement for users to install and maintain their own gear and software. Since they just pay for what they use, they are able to afford these services as well [6]. As a result, by using cloud services rather than building their own IT infrastructure, cloud consumers may save money and time in the IT sector. Mainly, massive, dispersed data centers are responsible for providing cloud services. The cloud is often constructed on top of grid services provided by these data centers. Users of cloud services have access to digital replicas of the actual hardware housed in data centers [7].

Because it creates an abstraction over the actual system, virtualization is a fundamental idea in cloud computing [7]. Because of its convenient approach, scalability, availability, and dependability, many cloud apps are becoming more popular. With these apps, remote computing became a breeze, as the cloud provider took care of all the important parts.

Cloud computing is now attracting a lot of attention from tech and commercial groups, but it also has the potential to help with societal problems. Developing nations have recently begun to use E-Governance in an effort to improve the efficacy and efficiency of government operations [10].

Cloud computing, as opposed to more conventional forms of information and communication technology, may greatly enhance this method. The majority of Indians still reside in rural regions, and the country's economy is heavily dependent on agriculture. When used correctly, cloud computing has the potential to raise living standards, agricultural production, and other related metrics. There are societal and technical obstacles to overcome in each of these cloud computing uses. [5].

1.1 OBJECTIVES

- The approach offers a whole cloud platform as a service, allowing users to design, operate, and manage applications without the hassle, expense, or rigidity of traditional methods.
- Author builds a server-side graphical user interface (GUI) for usage in a private cloud, which allows them to provide platforms as a service.
- Creating a private cloud where the author hosts the necessary software applications and users' virtual machines is an example of software as a service.
- Working on a private cloud where the author offers IaaS by creating a virtual machine according to the user's specifications.
- Users may tailor their experience in IAAS by choosing from a variety of OS, RAM, and CPU flavors to meet their specific needs.
- The designated virtual computer will function as a secure credential.
- Adding new features (if requested by the user).

1.2 SCOPE

Infrastructure as a service (IaaS), platform as a service (PaaS), software as a service (SaaS), identity as a service (IDaaS), and network as a service (NaaS) are all examples of cloud service models that private servers provide. Platform as a service allows businesses to provide a wide range of cloud-based apps, from basic ones to complex corporate ones. Users are able to access software programs over the internet using SaaS. IDaaS is a service that manages identities and controls access. Network as a service (NaaS) offers VPNs and firewalls, among other network services. The security and privacy afforded by private cloud services are unmatched by those of public cloud options, thanks to the combination of in-house firewalls and the lower maintenance costs associated with conventional data center ownership.

II. LITERATURE SURVEY

The authors of the cited work are Ling Qian, Yujian Du, Zhiguo Luo, and Leitao Guo [1]. Cloud Computing: A General Introduction. covers the fundamentals of cloud computing, including what it is, how it came to be, its current state, its architecture, the many types of cloud computing, the benefits and drawbacks of cloud computing, the challenges it faces, and the need of standardization. Cloud computing was established by Internet service providers in order to accommodate the highest number of users and elastic services with the smallest resource requirements. New cloud computing has quickly risen to the top of the computer industry. Cloud computing has transformed from an internal IT system into a public service, from a tool to save costs into a source of revenue, and from an Internet service provider (ISP) into a telecom company, with milestones such as Google's core paper publication in 2003, Amazon's EC2 commercialization in 2006, and AT&T Synaptic Hosting's service offering. This article provides an

overview of cloud computing, including its idea, history, pros and disadvantages, value chain, and standardization effort.

In his article "Cloud Computing Basics," Srinivas Jagirdar delves into the many ideas that make up cloud computing. Making use of our prior work with different clouds, the author takes a look at clouds from both a technical and service perspective. The author emphasizes the significance of clouds and demonstrates why this technology must be successful by highlighting some of the potential in cloud computing. The author concludes by outlining some of the problems that need fixing in this sector. When looking for a simple and affordable way to get access to externalized IT (Information Technology) resources, many are turning to cloud computing. When it comes to hosting their applications, more and more organizations are realizing the benefits of cloud computing. This includes research institutions and companies. By use of virtualisation. Cloud computing provides virtualized resources as a measured and billable utility on demand, rather than an application-oriented model. Cloud computing is an adaptable technology that has many potential uses. Cloud computing is a game-changer for small businesses, especially in developing nations, because to its cheap cost and dynamic scalability. Potentially reaching millions of users are cloud-deployed software for corporate resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), healthcare (PHARM), and mobile devices.

In reference 3, the writers are Chunye Gong, Jie Liu, Qiang Zhang, Haitao Chen, and Zhenghu Gong. In an effort to aid in the development and acceptance of this quickly growing technology, "The Characteristics of Cloud Computing" attempts to describe broad characteristics of cloud computing and examines cloud computing in detail. Details of internal implementations are abstracted by the service-oriented conceptional feature. Every sort of cloud computing system has loose coupling as its defining technological feature. Cloud computing's robust fault tolerance makes it a natural fit for the prevalent network architecture. Several other branches of computer science, including high-performance computing (HPC), virtualization, utility computing, and grid computing, provide the foundation for cloud computing. The author aims to clarify the core concepts of cloud computing by outlining the features that define the field and set it apart from others. There are conceptual, technological, economic, and user-experience aspects unique to cloud computing. Some of the most distinguishing features of cloud computing are its service orientation, lack of tight coupling, robust fault tolerance, economic model, and user-friendliness. Parallel computing encompasses a wide range of technologies, including cloud computing, grid computing, HPC, supercomputing, and data center computing. Computing-intensive and delay-sensitive scientific computing is the main emphasis of HPC. The most critical criterion, as in HPC, are high processing performance and low latency. An HPC center is the foundation of grid computing.

In reference 4, the writers are Mohammed Dogan, Berker Uysal, and Pinar Kirci. Cloud Computing: Issues and Challenges. primarily addresses the problems and difficulties encountered by cloud computing. To many, Cloud represents a revolutionary shift that will alter the whole ICT sector. The purpose of this research is to identify the problems and difficulties associated with cloud computing. The author begins by outlining the connections between Cloud computing, two related paradigms in computing, and Grid computing. The author continues by outlining many obstacles to cloud computing adoption. Finally, the author will bring attention to the Cloud interoperability problem, which needs a great deal of further study and improvement.

To what extent do cloud suppliers and users alike face the same overarching problems?

By defining important research topics and outlining future research challenges and prospects for cloud computing, the author hopes to address these questions. In order to do this, the author structures this work from the outside in. First, the author takes a look at a bunch of cloud apps that have a few common traits. Next, the author delves into the connections between Cloud and SOC, as well as Cloud and Grid, which is a sort of High-Performance Computing. The author draws attention to the ways in which these three computing paradigms will complement one another by comparing them. Cloud computing's service models and deployment models will be covered next by the author. A number of data-related concerns and difficulties, including multi-tenancy, security, and others, are discussed after the author elaborates on the cloud's service architecture and deployment methodology.

C.N. Höfer and G. Karagiannis. Cloud computing services: classification and comparison. takes a look at the several cloud computing options and describes and highlights their key features. A taxonomy based on trees is proposed and these features are organized in this study. This taxonomy facilitates comparisons

between various cloud computing services by allowing for rapid categorization of them. This taxonomy expands upon previous ones by providing more precise features and hierarchies. The author provides a brief introduction to cloud computing before moving on to discuss current cloud computing services, their key features, taxonomy design, and taxonomy classification. Now available services for cloud computing: First, storage and processing capacity; second, platforms for deploying one's own software; and third, online software applications, including web-email and business analysis tools, are the primary differentiating factors among the various cloud computing services. Data privacy and security: When crucial information is stored on servers in the cloud, data privacy and security become paramount. Data loss or breach may lead to legal action in addition to financial losses. Designing Taxonomies: The structure of the taxonomy is based on trees. All cloud services are at the very bottom of the tree. The three primary types of services constitute the first level. Levels 2–4 reflect shared traits, whereas levels 5–7 reflect service-specific traits. A taxonomy for categorizing existing cloud computing services was devised and explored in this study. This study covers the features shared by all cloud computing services and those that are unique to the infrastructure, platform, and software service categories.

III. SYSTEM REQUIREMENTS

3.1 HARDWARE REQUIREMENTS:

IBM POAUTHORR9 SERVER: Technology built on the POWERR9 CPU powers the IBM Power System (9006-22P). The IBM POAUTHORR9 Linux server is a mission-critical piece of hardware that comes with specs like 256 GB of RAM, 1 TB of hard drive space, and the ability to use one or two CPU sockets for 40 cores.

3.2 SOFTWARE REQUIREMENTS:

ANSIBLE TOOL: Among the numerous things that Ansible, an open-source IT automation engine, can automate are application deployment, orchestration, configuration management, and provisioning. When it comes to cross-platform computer assistance, Ansible is a software solution that offers basic but effective automation. Many more IT operations may be automated using Ansible, an IT automation engine. These include application deployment, orchestration, configuration management, and provisioning. A systems administrator's daily or weekly tasks may be fulfilled with its help, including application deployment, server and workstation upgrades, cloud provisioning, configuration management, intra-service orchestration, and pretty much anything else. Deploying Ansible is a breeze since it doesn't need any extra security infrastructure or reliance on agent software.

UBUNTU 16.04: Enterprise servers, desktops, clouds, & Internet of Things (IoT) may all benefit from Ubuntu, a cutting-edge, open-source Linux operating system. Free and supported by both the Ubuntu community and experts, Ubuntu is a full-featured desktop Linux OS. The Ubuntu community is based on the principles stated in the Ubuntu Manifesto, which include the following: that software should be freely available to everyone, that software tools should be accessible to people in their native language and with disabilities, and that software should be freely customizable. "Ubuntu" means "humanity to others" in its original African. The Ubuntu distribution introduces the Ubuntu philosophy to the software industry.

VS-CODE EDITOR: For Windows, Linux, and macOS, Microsoft offers Visual Studio Code, often abbreviated as VS Code, a source-code editor built using the Framework. Embedded Git, syntax highlighting, intelligent code completion, snippets, and assistance for debugging are all features. A user's settings, keyboard shortcuts, theme, and the ability to install extensions are all customizable. Desktop users on Windows, macOS, or Linux may take use of Visual Studio Code, a lightweight but powerful editor for source code.

IV. DESIGN OF THE PROPOSED SYSTEM

4.1 Flowchart of Infrastructure as a service:

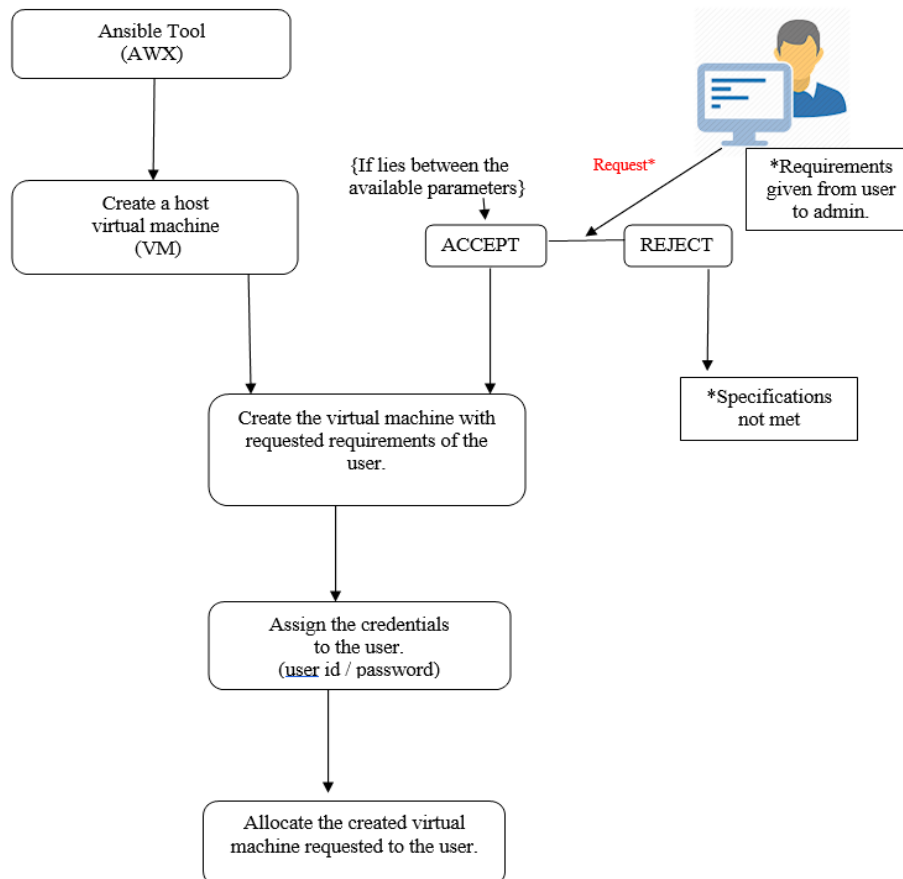


Figure-1 Block diagram for allotment of VM (operating system) to the user.

Steps Involved In The Above Methodology Is As Follows: -

Requirements: -

User accesses the built user interface (website) and sets his or her needs and the services they need. Therefore, the customer may request the specs they wish by selecting from the available versions of RAM, CORES, and MEMORY on the homepage.

Specifications: -

The procedure continues if the requested needs fall within the server specifications; otherwise, they are rejected if they exceed the system standards.

Creating virtual machine: -

The operator (admin) builds a virtual computer that meets the user's specifications after receiving their requests.

Credentials:

The credentials (id/pass) are sent to the user when the appropriate virtual machine is created.

Allotting the VM:

At last, give the user access to the newly-created virtual computer by giving them the necessary credentials. (Ip address, for example)

V. IMPLEMENTATION

5.1 HOSTING A WEBPAGE ON A PRIVATE SERVER:

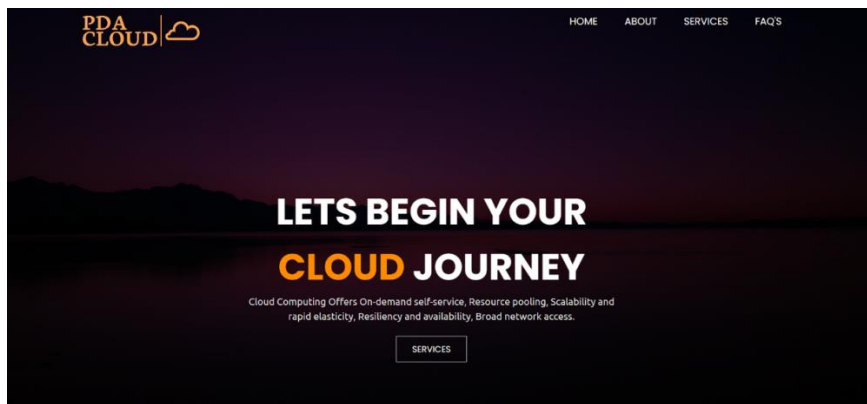


Figure – 2 Webpage.

The author must first deploy the website to the private server, in this case using the Apache server program, in order for the remote access to the webpage to be possible.

The following procedures are necessary to submit a website to a private server with Apache server:

1. Make your website's directory: Make a directory for your website on the command terminal that Apache can access. There, you may save all the data for your website and online apps.
2. Manage file access: For reasons of security, identify the owner(s). By default, the root user has full access to all folders.
3. Build a web page with an index.html: Make a file called index.html in the directory you made in the first step. Open the file and make a basic HTML document.
4. Set up the virtual host for Apache: Apache needs a virtual host in order to deliver content. An Apache-served website is more formally known as a virtual host. A single Apache server may support several virtual hosts. Actually, your only real constraints will be the processing power and network throughput of your hosting provider.
5. Submit data to the hosting service: Go to the directory that was mentioned in the right pane. Wherever you save your index.html file and other components, this directory serves as the virtual foundation of your website. To upload files to the server, just drag & drop them from the left pane to the right pane when you've located the suitable remote directory.

5.2 SERVICES SECTION:

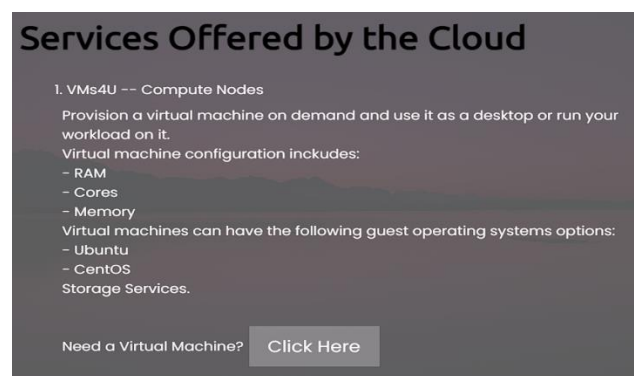


Figure-3 Services Section.

VIRTUAL MACHINES:

While public clouds provide features like scalability and self-service, private clouds use a unique architecture to provide the same benefits. With private cloud solutions, businesses may design their data centers with SDN and VMs in mind. Platform as a service (PaaS) apps may run on private clouds, which can also host storage, networking, and computing services. A private cloud may span the world, connecting several server farms or leasing space in data centers across the world. Companies in the software industry, including OpenStack, Red Hat, Microsoft, VMware, and others, provide private cloud services. By using VMware technology, private cloud solutions may be virtualized. The vSphere interface enables users to construct an infinite number of virtual machines (VMs). Users may establish a private cloud by choosing a site, the quantity of nodes, and examining the configurations using the Google Cloud VMware Engine interface. You may use our private server to host virtual machines (VMs) that have access to hardware resources like CPUs and RAM. With private cloud solutions, businesses may design their data centers with SDN and VMs in mind. Businesses may manage data security on-premises using private cloud solutions, which provide software tools for complicated network orchestration on bare-metal servers.

STORAGE:

One way that businesses may provide their employees with access to data storage is via private cloud storage. Without sharing these resources with another organization, application and data operations may operate in a private cloud, which is a virtualized hosting environment that employs computer, network, and storage resources. Collaborative cloud storage, data security, and other cloud services are all part of private cloud storage solutions.

Examples of services provided:

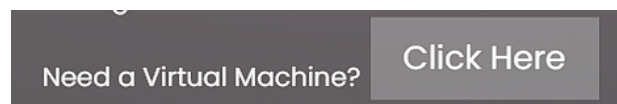


Figure- 4 Infrastructure As A Service (IAAS).



Figure- 5 Software As a Service (SAAS).

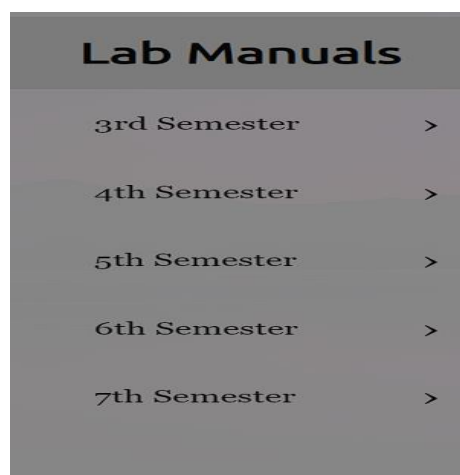


Figure-6 Platform As a Service (PAAS)

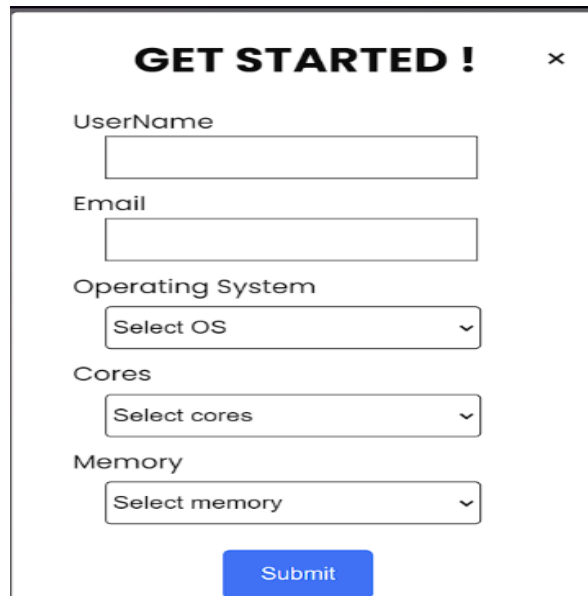


Figure – 7 Request Form.

REQUESTING FORM:

Users may request virtual machines with specific configurations by visiting the server's webpage and filling out the form above, which is located in the services section. A user's username and email address are required fields. The user may choose the operating system (CentOS, Ubuntu, etc.), the number of cores they want for their virtual machine, and the amount of RAM they want before submitting their request. If the user's chosen virtual machine falls within the available parameters, our administrators will construct it after retrieving the necessary email. The user's request form email contains the IP address and credentials (ID, PASS) that are handled when the virtual machine is created.

5.3 Tools Used:

Software tools: -

1. ANSIBLE tool.
2. VS code editor.

ANSIBLE TOOL: Among the numerous things that Ansible, an open-source IT automation engine, can automate are application deployment, orchestration, configuration management, and provisioning. When it comes to cross-platform computer assistance, Ansible is a software solution that offers basic but effective automation. Many more IT operations may be automated using Ansible, an IT automation engine. These include application deployment, orchestration, configuration management, and provisioning. A systems administrator's daily or weekly tasks may be fulfilled with its help, including application deployment, server and workstation upgrades, cloud provisioning, configuration management, intra-service orchestration, and pretty much anything else. Deploying Ansible is a breeze since it doesn't need any extra security infrastructure or reliance on agent software.

VS-CODE EDITOR: For Windows, Linux, and macOS, Microsoft offers Visual Studio Code, often abbreviated as VS Code, a source-code editor built using the Framework. Embedded Git, syntax highlighting, intelligent code completion, snippets, and assistance for debugging are all features. A user's settings, keyboard shortcuts, theme, and the ability to install extensions are all customizable. Desktop users on Windows, macOS, or Linux may take use of Visual Studio Code, a lightweight but powerful editor for source code.

5.4 Configuring A Virtual Machine:

Considering that CentOS Stream 8 is the OS that we use here. Consequently, you can find the instructions for setting up a remote desktop connection below.

To configure CentOS Stream 8 for RDP with GUI, you can install and configure the xRDP server using the following steps:

Step 1: Install the GNOME desktop environment on CentOS Stream 8 using the command:

```
sudo dnf groupinstall "Server with GUI"
```

Step 2: Install the xRDP server on CentOS Stream 8 using the command:

```
sudo dnf install xrdp
```

Step 3: Start and enable the xRDP service using the commands:

```
sudo systemctl start xrdp
```

```
sudo systemctl enable xrdp
```

Step 4: Configure the firewall to allow incoming RDP connections on port 3389 using the command:

```
sudo firewall-cmd --add-port=3389/tcp --permanent
```

```
sudo firewall-cmd --reload
```

Step 5: Connect to the CentOS Stream 8 server using a Remote Desktop Connection (RDP) client from a Windows machine. Open the Remote Desktop Connection client and enter the IP address of the CentOS Stream 8 server.

Step 6: enter your username and password to log in to the GNOME desktop environment on the CentOS Stream 8 server.

After you've established a remote desktop connection (RDP) to the CentOS Stream 8 server, you'll be able to access the CentOS Stream 8 desktop environment and launch programs. Modifying the RDP client's connection settings is another way to enhance the speed of the remote connection.

VI. RESULTS AND DISCUSSION.

6.1 Snapshots

Accessing the GUI (webpage):

To reach the website that has been set up on the server.

Launch your default web browser and type 172.0.0.1 into the address bar. This is often the localhost address. The IP address you provide may be customized to your liking.

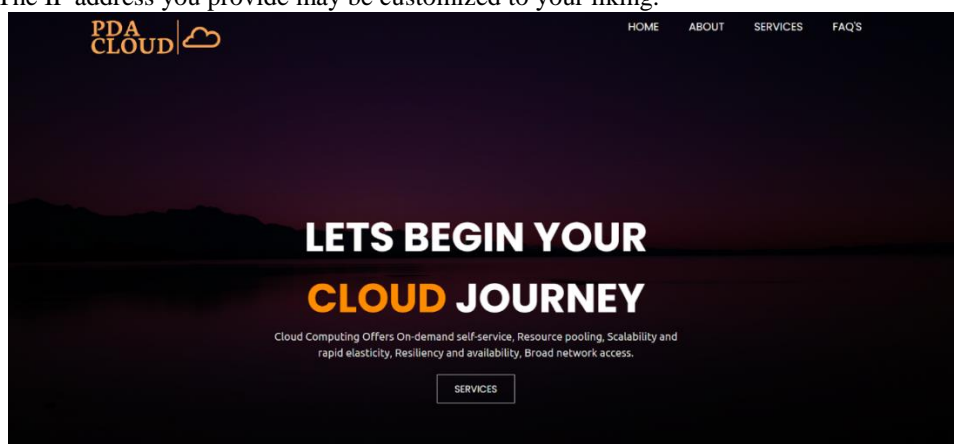


Figure – 8

For infrastructure as a Service:

Using the Remote Desktop Protocol (xRDP) to connect to a virtual machine (VM) from another computer

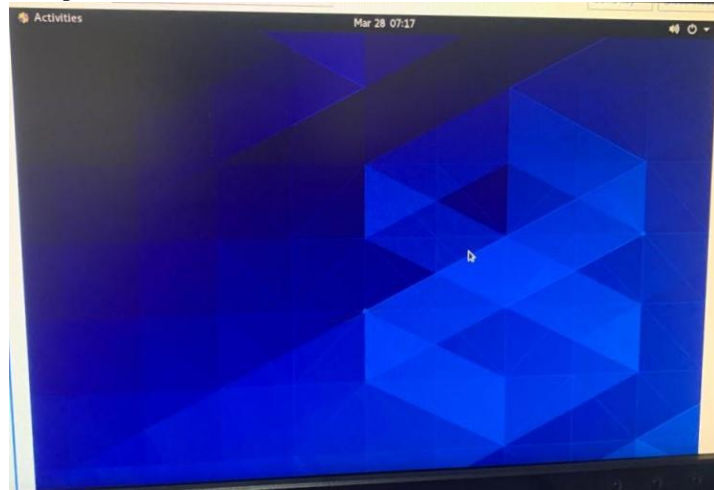


Figure-9

```
guest@localhost:~  
File Edit View Search Terminal Help  
[guest@localhost ~]$ ip a  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
    inet 127.0.0.1/8 scope host lo  
        valid_lft forever preferred_lft forever  
    inet6 ::1/128 scope host  
        valid_lft forever preferred_lft forever  
2: enp0s1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP gr  
    link/ether 52:54:00:db:36:7d brd ff:ff:ff:ff:ff:ff  
[guest@localhost ~]$
```

Figure-10 Terminal Window.

Step 1. Launch the newly-created VM and look for its IP address in the console.

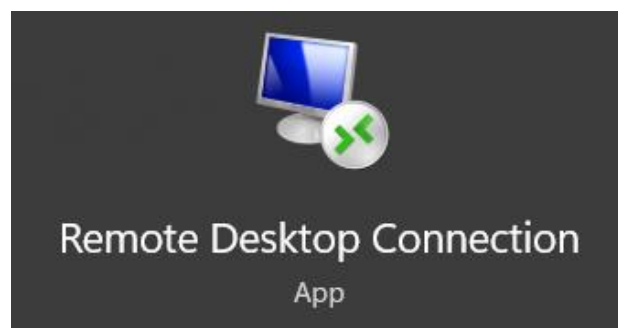


Figure-11 Remote desktop application.

Step 2. To find, either use the desktop's search box or use the command terminal. Entering RDP and the command terminal (mstsc) into the search box will show the following.

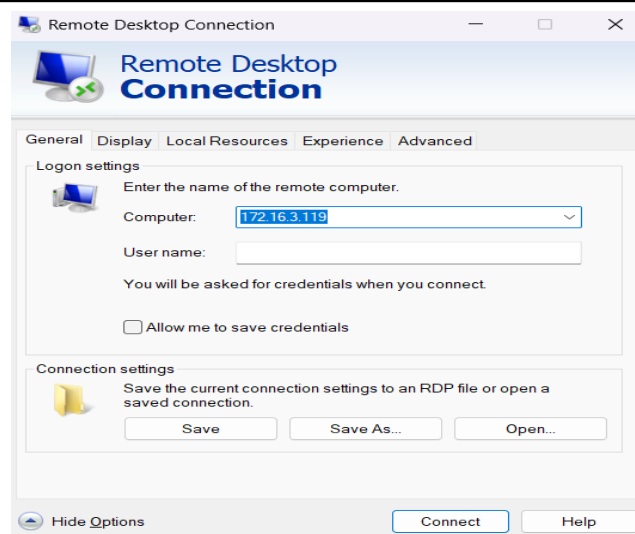


Figure-12 RDP user interface.

Step 3. To establish a remote desktop connection, insert the virtual machine's IP address. Verify that the server is running your virtual machine and that you have logged out of it.

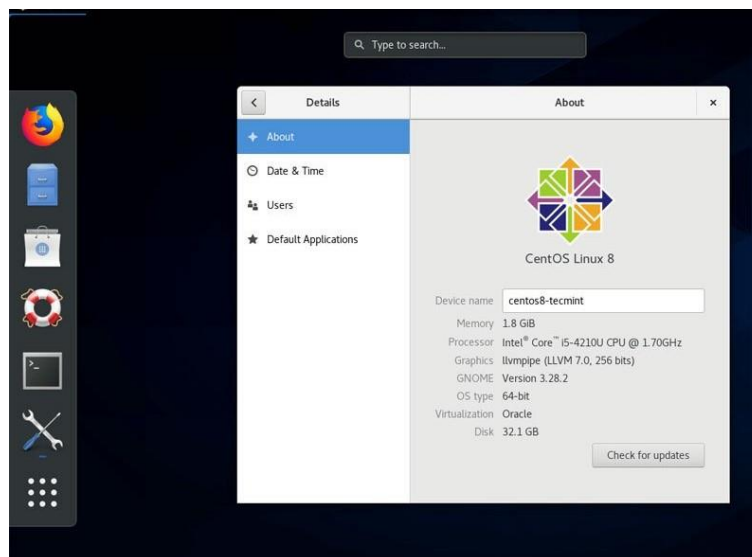


Figure – 13 Console of the VM.

Step 4. After few minutes the console of the Virtual Machine with GUI will be displayed.

6.2 DISCUSSION:

Public clouds lack the control, personalization, and security that private cloud services provide. Any combination of public, private, or hybrid clouds may host infrastructure as a service solutions. A private cloud is another option for deploying PaaS and SaaS. To be clear, infrastructure as a service (IaaS) is not a substitute for or competitive with private clouds when it comes to being an appropriate cloud computing option.

As opposed to public cloud services, which share resources among many users, private cloud computing focuses on a single user's or organization's specialized computer equipment and environment.

With private clouds, which may be set up either on-premises or in a data center, businesses have access to the scalability, flexibility, and self-service features of the cloud without worrying about other parties gaining unauthorized access.

The advantages of a private cloud are as follows:

- Superior than public clouds in terms of control, personalization, and security.
- Local programs and users experience zero latency.
- Exceptional control and security provided by a very adaptable approach.
- It is compatible with both on-premises and cloud deployments.
- Great for companies that deal with mission-critical tasks.
- No problems with multitenancy or infrastructure sharing.

Private clouds, on the other hand, need more investment and upkeep than public clouds. Every aspect of a private cloud's security, including physical protection, encryption, and cybersecurity, is the responsibility of the business.

VII. CONCLUSION

In terms of security, a private cloud may be preferable than a public one. In order to reap the advantages of private cloud computing, enterprises need take proactive measures to guarantee robust and current security. Assuming the company is not careless with security, the private cloud has several advantages. The increasing popularity of cloud computing has led us to focus on private clouds, where we will be developing a graphical user interface (GUI) that users may use to specify their server requirements. We plan to provide all three services—SaaS, PaaS, and IaaS—through our server to our users. We typically provide private architecture with features like scalability and self-service. Unlike public clouds, which cater to a wide range of companies, private clouds are tailored to the specific requirements of an individual firm. With a private cloud, you may enjoy the scalability, self-service capabilities, and flexibility of the cloud while still maintaining full control over your on-premises IT infrastructure.

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