

## International Journal of Innovative Research in Science, Engineering and Technology

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# Implementation of Private Cloud based Collaboration Platforms: AWS Amazon VPC and OwnCloud

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**ABSTRACT:** In modern times, Cloud Computing has become increasingly popular since it allows users to use various resources on an on-demand basis. Cloud provides users with innumerable lucrative features such as virtual machine instances, cheap computing capabilities, efficient file storage, so on and so forth. All these advantages have encouraged several professional and non-professional individuals, organizations and industries to engineer cloud based solutions for several business problems. Likewise, several tools are now available for developing a particular cloud based solution. One such cloud based solution is Private Cloud Computing. The paper aims to throw light on how to create a private cloud using two different cloud based collaboration platforms and compare them in terms of various parameters. The two private cloud based collaboration platforms discussed are Amazon Web Services (AWS) Virtual Private Cloud (VPC) and ownCloud

**KEYWORDS:** Cloud Computing; Private Cloud; Virtualization; VPC; ownCloud; AWS

## I. INTRODUCTION

Cloud Computing has revolutionized the way organizations manage their businesses with the advent of Private Cloud Computing. Private Cloud Computing confers upon industries, a number of measurable benefits such as scalability, availability, security and efficiency at a cheaper price. The advent of several novel innovations such as high speed internet and smart devices have boosted the growth of Cloud Computing platforms.

However, when several options to solve a general problem are available, it becomes crucial to determine the most efficient option depending on one's requirements. Some good solutions to business problems concerned with private clouds are now available in the form of private cloud based collaboration platforms such as AWS Amazon VPC and ownCloud. Comparing and contrasting these in terms of certain requirements and parameters turns out to be a good way of determining a suitable cloud based solution.

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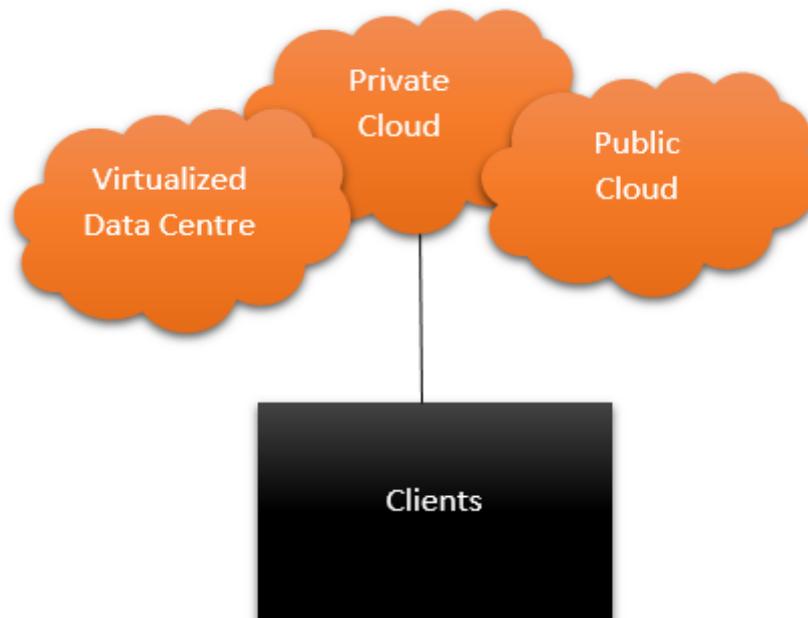


Fig 1. Cloud Connectivity.

## II. RELATED WORK

In [1], the basic architecture of AWS Amazon VPC has been discussed. It also details fundamental concepts, functionality, features and use cases of AWS VPC. In [2], an overview of ownCloud has been provided and its software and hardware requirements have been discussed. The context also describes the technical architecture of ownCloud stack. In [3], authors performed a comparative study on I/O Performance between Compute and Storage Optimized Instances of Amazon EC2. Various features and modules of the EC2 instances have also been discussed. In [4], the authors detail the methodology used to deploy and extend on premise cloud storage on ownCloud. The parameters affecting the effectiveness of working and support of cloud based storage on ownCloud have also been discussed clearly by the author. In [5], a survey on building private cloud computing implementation tools has been conducted by the authors. In this survey, the authors clearly evaluate the effect of on premise parameters on private cloud computing. The authors offer an explanation for the varied nature of private cloud computing implementation tools as a function of their completeness and optimality.

## III. PRIVATE CLOUD COMPUTING

Private Cloud corresponds to a subset of Cloud Computing where cloud based services are provided to a single private organization. It consists of hardware, software, resources, platforms and infrastructure that are shared among a group of people belonging to a particular private organization. These resources and services are provided to any particular group of individuals based on an on demand basis. The accumulation and dissemination of these services is controlled by a virtual instance known as a Virtual Private Cloud (VPC). Most commonly, such VPC's allow us to launch network services and resources in an environment which we have defined.

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Private Cloud Computing has the following **advantages**:

- **Security:** Private cloud involves a single organization. This ensures that data is protected from unauthorized access and even clients in the same data centre cannot access such data.
- **Utility Model:** Public clouds incorporate a pay as you use model where in customers are charged money according to only the resources that they have consumed. This turns out to be economic in the long run for individuals who require only a small portion of such services on a daily basis.
- **Hybrid Deployments:** Even if a specific server is needed in order to run a high-speed application, it is possible to integrate hardware within the cloud.
- **Shared Hardware:** Private Cloud allows the system to share its environment among different modules. This means that your server will share the same hardware, memory and corresponding agents as the other modules in the cloud.
- **Customizable:** Private cloud offers the functionality to customize the performance of your network, storage and hardware devices as per the requirements of the user.
- **Self Managed:** Private Clouds are self managed, meaning that they take care of certain trivial details of the server on their own. However, this can be a downside for developers who want to alter the nuances of the server to meet their own requirements.
- **Compliance:** Since all the components in the cloud are connected to a single client, compliance and coordination among the individual components is easily achieved.

## IV. AWS AMAZON VPC

Amazon allows users to create an IPsec VPN connection between VPCs and customer networks which are far away from each other over the internet. This means that Amazon VPC permits users to launch Amazon Web Services (AWS) instances into an environment that you have defined. This virtual environment can be thought of as a conventional network that one would operate in his own data center, with an added advantage of a scalable infrastructure. It is a commercial cloud computing service that provides an isolated section of a cloud to individual users or groups of people. It allows a developer to create a virtual network for resources in an isolated section of the Amazon Web Services cloud. Amazon VPC allows a much better control of the network. A user can define network configurations such as route tables, internet network gateways and subnets. Amazon VPC allows a developer to set rules on inbound and outbound traffic to Amazon Elastic Compute Cloud (EC2) instances and ACLs to allow or deny traffic to subnets.

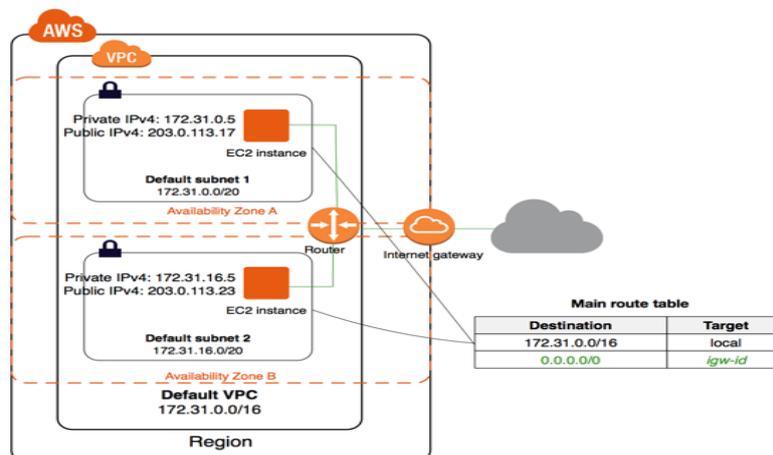


Fig 2. AWS Amazon VPC architecture[1]

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## V. OWN CLOUD

ownCloud is a cloud based platform that provides file hosting services that can be created and used via client server software provisioned by ownCloud. It allows users to create a private cloud and confers services similar to Dropbox. The server edition of ownCloud is open source, free of cost and allows users to store their files without charge on their own private server. ownCloud supports extensions such as online document editing, calendar and contact synchronization, and many more, that allow it to work as an efficient file hosting and private cloud platform.

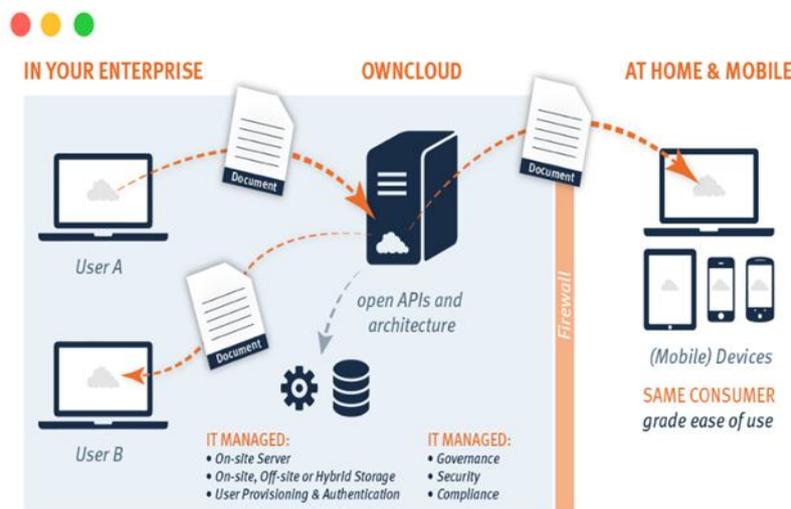


Fig 3. ownCloud architecture[2]

## VI. CREATING A PRIVATE CLOUD

As discussed above, we are now aware that based on the advantages that different tools offer as well as the requirements and disadvantages of each of them, the right model needs to be selected so as to completely satisfy business needs. When a private cloud is to be created, one must decide on whether to create a Virtual Private Cloud (VPC) or their own Private Cloud. Each of these tools have their own pros and cons. Given below are the steps to be followed in order to implement Private Cloud Computing using two different tools: AWS Amazon VPC and ownCloud

### A. Private Cloud using AWS Amazon VPC

In order to create a private cloud using AWS Amazon VPC, one, you need to have an account on AWS. So, open the Web Browser and visit <https://aws.amazon.com/console/>. Now, sign in to the console with your AWS Account.

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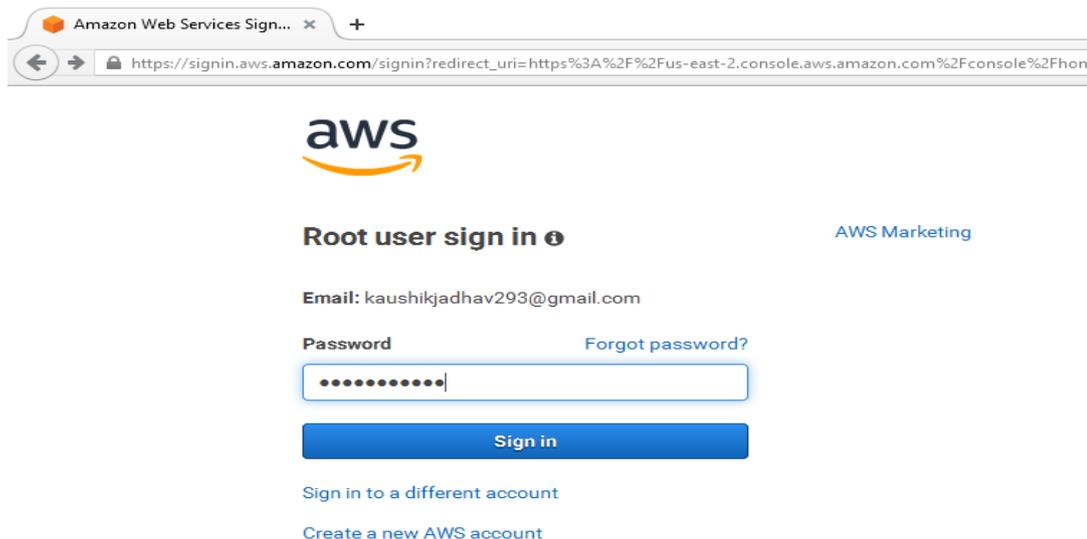


Fig 4. AWS Sign In

Next, to create a VPC, click on the Services Tab. In the Services Tab, click on the VPC option. It will be redirected to the VPC Dashboard. To start using Amazon Web Services Private Cloud, it is necessary to first create a Virtual Private Cloud(VPC). So, on the Left Hand Side Panel, click on the VPCs. Next, click on Create VPC. Specify the credentials of the VPC. For our example, the IPV4 CIDR block is taken as: 10.0.0.0/26

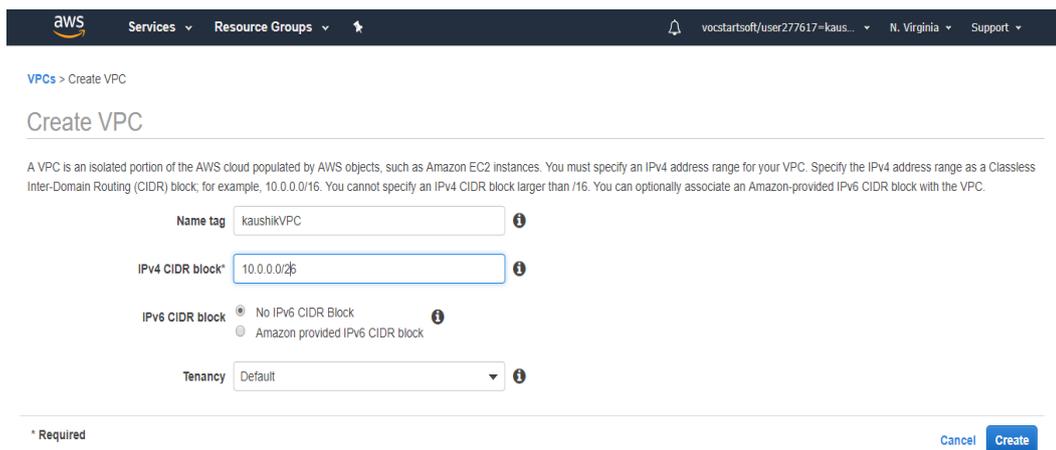


Fig 5. VPC Creation

Next, it is needed to create subnets. A VPC will be divided into 4 Blocks or Subnets. So, create 4 Subnets, 2 Public Subnets and 2 Private Subnets. To do so, on the Left Hand Side Panel, click on Subnets. The IPV4 CIDR credentials for the subnets are taken as follows:  
private-a 10.0.0.0/28

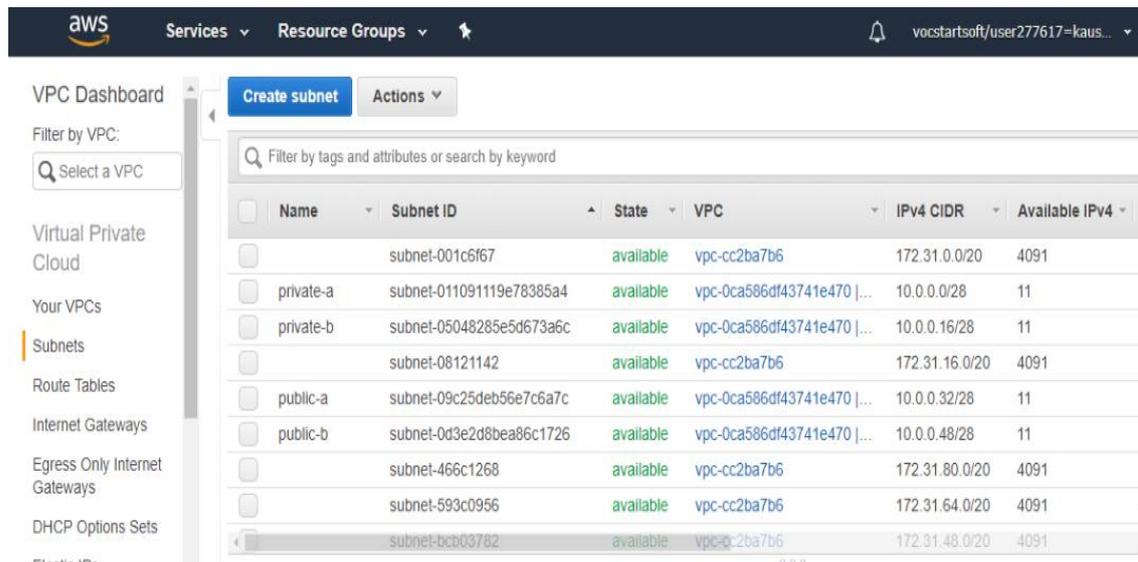
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private-b 10.0.0.16/28  
public-a 10.0.0.32/28  
public-b 10.0.0.48/28

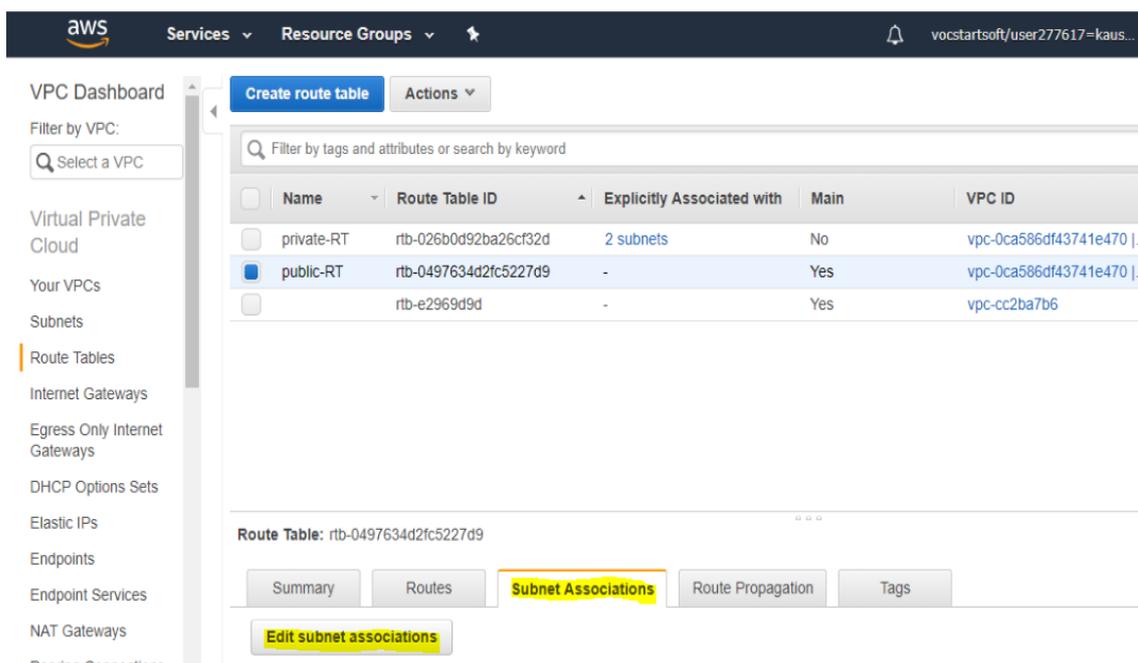


The screenshot shows the AWS VPC Subnets console. The left sidebar contains navigation options: VPC Dashboard, Filter by VPC, Virtual Private Cloud, Your VPCs, Subnets (selected), Route Tables, Internet Gateways, Egress Only Internet Gateways, DHCP Options Sets, and Elastic IPs. The main area displays a table of subnets with columns: Name, Subnet ID, State, VPC, IPv4 CIDR, and Available IPv4. The table lists several subnets, including private-a, private-b, public-a, and public-b.

Name	Subnet ID	State	VPC	IPv4 CIDR	Available IPv4
	subnet-001c6f67	available	vpc-cc2ba7b6	172.31.0.0/20	4091
private-a	subnet-011091119e78385a4	available	vpc-0ca586df43741e470  ...	10.0.0.0/28	11
private-b	subnet-05048285e5d673a6c	available	vpc-0ca586df43741e470  ...	10.0.0.16/28	11
	subnet-08121142	available	vpc-cc2ba7b6	172.31.16.0/20	4091
public-a	subnet-09c25deb56e7c5a7c	available	vpc-0ca586df43741e470  ...	10.0.0.32/28	11
public-b	subnet-0d3e2d8bea86c1726	available	vpc-0ca586df43741e470  ...	10.0.0.48/28	11
	subnet-466c1268	available	vpc-cc2ba7b6	172.31.80.0/20	4091
	subnet-593c0956	available	vpc-cc2ba7b6	172.31.64.0/20	4091
	subnet-bcb03782	available	vpc-cc2ba7b6	172.31.48.0/20	4091

Fig 6. Subnets

Now, it is needed to create Route Tables for the subnets. Create two Route Tables, one for private subnets and one for public subnets and associate them with their respective subnets.



The screenshot shows the AWS VPC Route Tables console. The left sidebar contains navigation options: VPC Dashboard, Filter by VPC, Virtual Private Cloud, Your VPCs, Subnets, Route Tables (selected), Internet Gateways, Egress Only Internet Gateways, DHCP Options Sets, Elastic IPs, Endpoints, Endpoint Services, NAT Gateways, and Peering Connections. The main area displays a table of route tables with columns: Name, Route Table ID, Explicitly Associated with, Main, and VPC ID. The table lists three route tables, including private-RT and public-RT. Below the table, the 'Route Table: rtb-0497634d2fc5227d9' is selected, and the 'Subnet Associations' tab is active, showing an 'Edit subnet associations' button.

Name	Route Table ID	Explicitly Associated with	Main	VPC ID
private-RT	rtb-026b0d92ba26cf32d	2 subnets	No	vpc-0ca586df43741e470  ...
public-RT	rtb-0497634d2fc5227d9	-	Yes	vpc-0ca586df43741e470  ...
	rtb-e2969d9d	-	Yes	vpc-cc2ba7b6

Fig 7. Routing Tables

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Now, create an Internet Gateway (IGW) and attach it to the VPC you had created earlier. Following this, it is mandatory to link the IGW with the Route Tables we had created earlier.

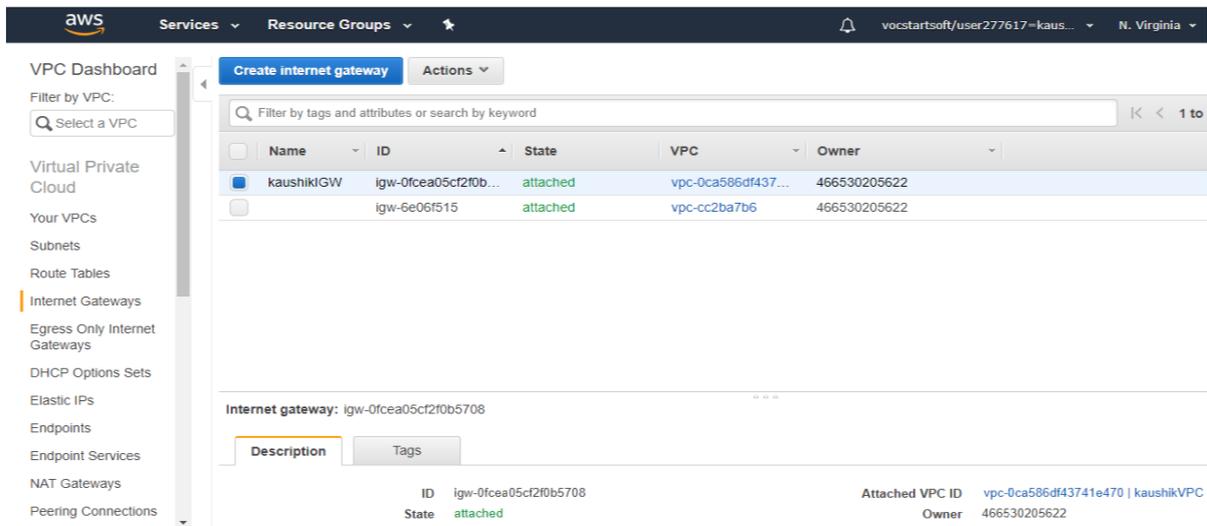


Fig 8. Internet Gateway Configuration

The next step is to create a NAT Gateway which allows us to host the VPC services for public subnets. To create a NAT Gateway, select the NAT Gateways option in the Left Hand Side tab and then, click on Create NAT Gateway. Select the Subnet ID of your First Public Subnet. An Elastic IP address(EIP) may be needed for the creation of your NAT Gateway. So, click on Create a new EIP. Next, click on Create a NAT Gateway. After successful creation, note down the NAT Gateway ID of your NAT Gateway. Now, we need to include a route to the NAT Gateway for our Private Subnets. So, click on Edit route tables. Then, select the Private Routing Table and in the Routes tab, click on Add another route. Specify the Destination as 0.0.0.0/0 and Target as the NAT Gateway ID of the NAT Gateway. Next, click on Save.

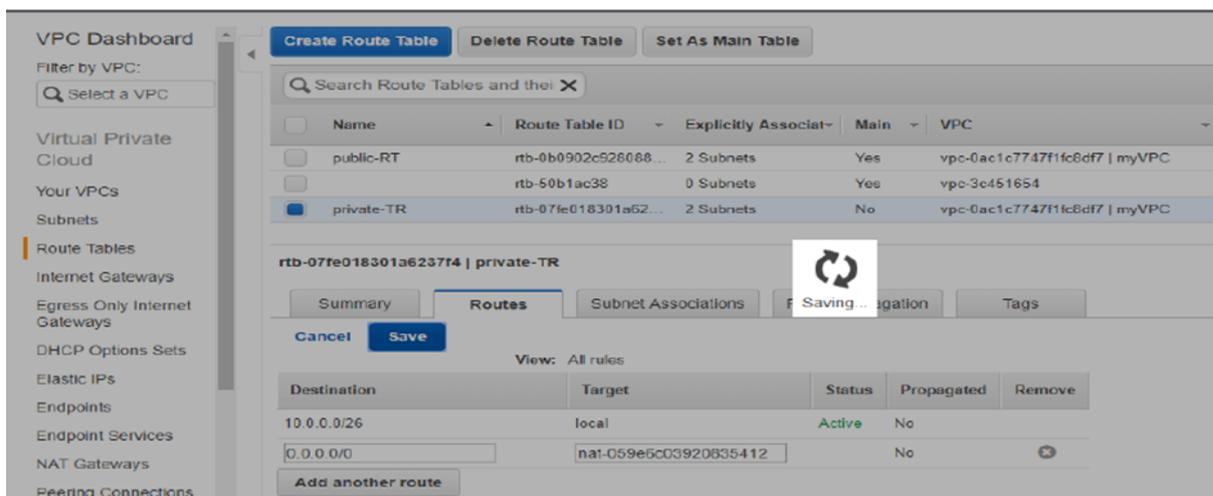


Fig 9. NAT Gateway and Route Tables

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The NAT Gateway translates Private IPs to Public IPs. We will launch the NAT instance from within EC2 instances. You can also set up and configure ACLs and Security Groups if you want. When you are done, you can launch the instances. In order to check whether it is properly working, open Terminal and try to ping and finally, log in using the address of your VPC.

```

ec2-user@ip-10-200-1-163:~$
┌───(───)───┐
└───┬───┬───┘
    https://aws.amazon.com/amazon-linux-ami/2017.09-release-notes/
6 package(s) needed for security, out of 8 available
Run "sudo yum update" to apply all updates.
ec2-user@ip-10-200-0-215 ~]$ ping 10.200.1.163
PING 10.200.1.163 (10.200.1.163) 56(84) bytes of data:
64 bytes from 10.200.1.163: icmp_seq=1 ttl=255 time=0.933 ms
64 bytes from 10.200.1.163: icmp_seq=2 ttl=255 time=0.885 ms
64 bytes from 10.200.1.163: icmp_seq=3 ttl=255 time=0.956 ms
64 bytes from 10.200.1.163: icmp_seq=4 ttl=255 time=2.05 ms
64 bytes from 10.200.1.163: icmp_seq=5 ttl=255 time=0.942 ms
64 bytes from 10.200.1.163: icmp_seq=6 ttl=255 time=0.899 ms
64 bytes from 10.200.1.163: icmp_seq=7 ttl=255 time=0.916 ms
^C
--- 10.200.1.163 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6019ms
rtt min/avg/max/mdev = 0.885/1.083/2.054/0.398 ms
ec2-user@ip-10-200-0-215 ~]$ ssh ec2-user@10.200.1.163
Warning: Permanently added '10.200.1.163' (ECDSA) to the list of known hosts.
Permission denied (publickey).
ec2-user@ip-10-200-0-215 ~]$ vi demol.pem
ec2-user@ip-10-200-0-215 ~]$ chmod 400 demol.pem
ec2-user@ip-10-200-0-215 ~]$ ssh -i demol.pem ec2-user@10.200.1.163
┌───(───)───┐
└───┬───┬───┘
    https://aws.amazon.com/amazon-linux-ami/2017.09-release-notes/
ec2-user@ip-10-200-1-163 ~]$ ping google.com
PING google.com (172.217.160.206) 56(84) bytes of data.

```

Fig 10. Instance Output

### B. Private Cloud using AWS Amazon VPC

There are several approaches for creating a private cloud via ownCloud on Windows system. However, the most secure approach is to do so via a Linux Virtual Machine set on top of a Windows host. So, create a Virtual Machine for Ubuntu 16.04 LTS Desktop on Oracle Virtual Box and Log In to your Virtual Machine.

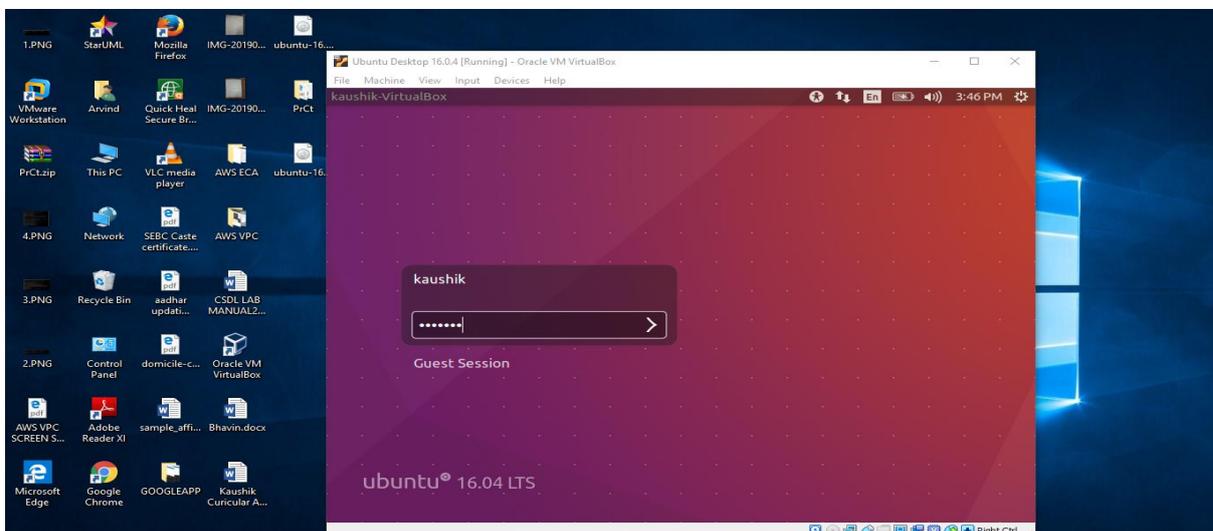


Fig 11. Linux VM Log In

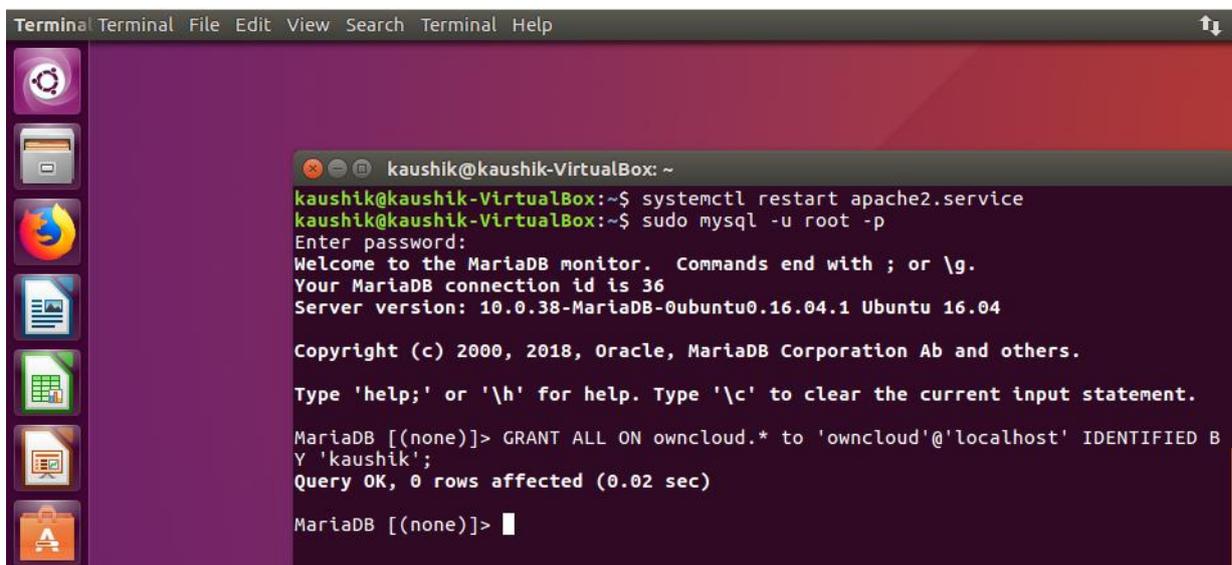
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Open Terminal. Follow the instructions given on the official ownCloud website installation page and execute the respective commands in Terminal to install required packages like LAMP sever, curl, Apache and MariaDB. After all the packages are installed, restart Apache service. Now, create a database for ownCloud and grant all privileges on that particular database to the current user. In this case, the command used is: GRANT ALL ON owncloud.\* to 'owncloud' @ 'localhost' IDENTIFIED BY 'owncloud';



```
Terminal Terminal File Edit View Search Terminal Help
kaushik@kaushik-VirtualBox: ~
kaushik@kaushik-VirtualBox:~$ systemctl restart apache2.service
kaushik@kaushik-VirtualBox:~$ sudo mysql -u root -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 36
Server version: 10.0.38-MariaDB-0ubuntu0.16.04.1 Ubuntu 16.04

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> GRANT ALL ON owncloud.* to 'owncloud'@'localhost' IDENTIFIED BY 'owncloud';
Query OK, 0 rows affected (0.02 sec)

MariaDB [(none)]> |
```

Fig 12. Configuring Apache and MariaDB

Now, it is possible to launch ownCloud in the Web Browser. But first, it is needed to get the IP address of the Ubuntu machine, that is, the address of the localhost. The ifconfig command can be used to determine the IP address of the machine. In thus case, the IP address turned out to be 192.168.0.107. Now, open the Web Browser and type in the following URL: 192.168.0.107/owncloud. Enter the credentials, configure the database and click on Finish set up

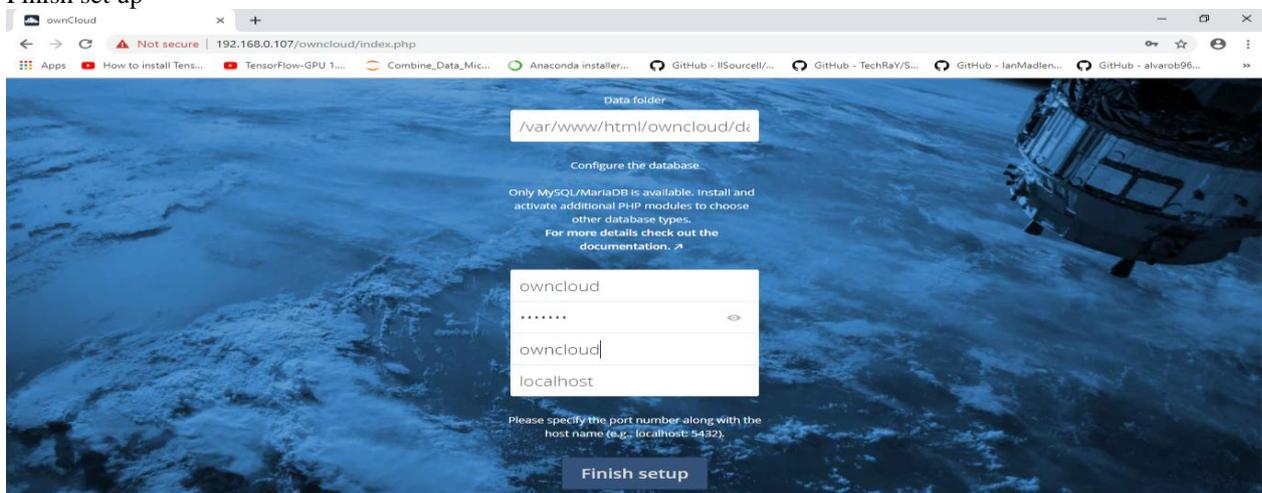


Fig 13. ownCloud database setup

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It is seen that one has successfully configured and set up ownCloud which can be accessed by the host machine as well as the virtual machine. Try uploading files to it and explore its features in order to gather data for its comparison with Amazon VPC.

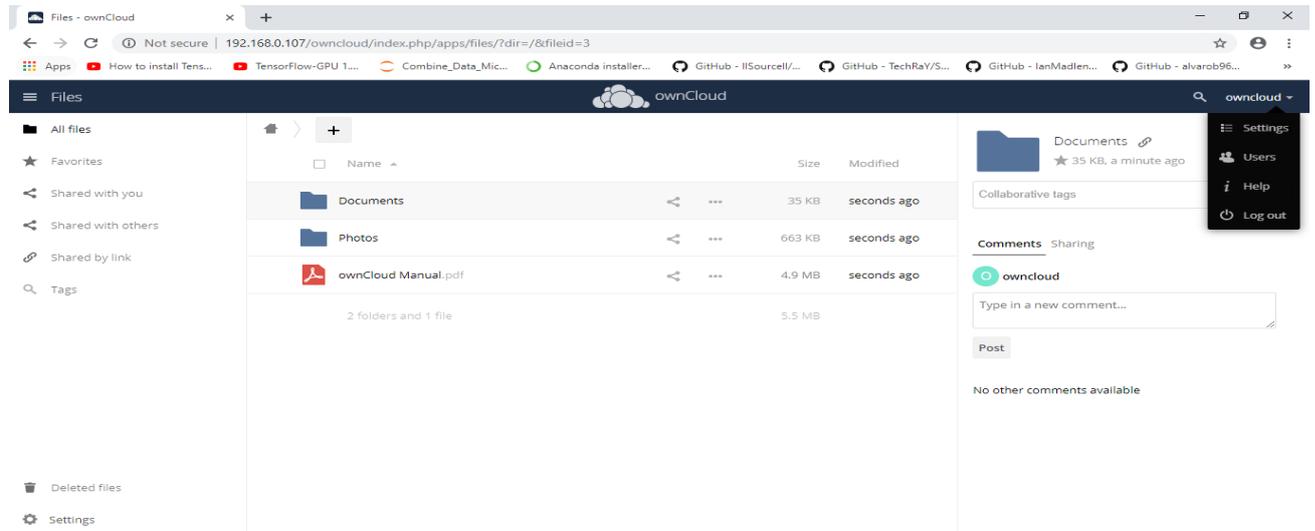


Fig 14. ownCloud usage and data collection

## VII. RESULTS

Table 6.1: Comparison Chart

Parameter	AWS Amazon VPC	ownCloud
Back End Integration	Not Feasible	Feasible
Nature	Assets are stored on shared resources in a multi-tenant environment	Non-shared resources provisioned in a cloud infrastructure
Security	Not as secure as ownCloud	More Secure
Instance RAM	Variable	Fixed
Server OS	Microsoft Windows, Linux, FreeBSD	Linux only
Quality of Support (QoS)	Higher	Lower
Mobility and Scalability	Higher	Lower
Business size	Preferred for Medium and Large Businesses	Preferred for Small Businesses
Ease of Use	Easy	Not Easy
Ease of Setup	Easy	Not Easy
User Experience	Appealing	Not Appealing
Associated Costs	On demand, Pay as you use	Open Source, Free of Cost

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Table 6.1 displays the results of comparison between the two platforms obtained on the basis of data collected after they were set up and used. The concerned data was collected when the two private cloud platforms Amazon VPC and ownCloud were configured and used on the same machine for a period of 5 days. The parameters which formed the basis of comparison include back end integration, nature of the system, security, instance RAM, server OS, QoS, scalability, preferred business size, ease of use, user experience and associated costs of each model. It is seen that Amazon VPC has better quality of service and user experience whereas ownCloud offers more security. However, since ownCloud runs on an individual's private server, it is more preferred for small businesses in contrast to Amazon VPC. Amazon VPC also has the advantage of a user specified instance RAM over ownCloud where the RAM is fixed and predefined.

## VIII. CONCLUSION

This paper presents an analysis of performance differences between two popular private cloud collaboration platforms, AWS Amazon VPC and ownCloud. We used standard PC benchmarks to obtain measurements and describe how each of the cloud platforms have their own pros and cons. It is observed that Amazon VPC provides better scalability and workability functionality whereas, ownCloud offers more secure usage. Also, VPC has better user experience and ease of setup whereas ownCloud leads in Back End Integration. Amazon VPC provides the freedom of choosing among many different instance RAM in contrast to the fixed RAM in ownCloud. ownCloud is open source and free to use whereas Amazon VPC has some costs associated with it. Therefore, it is safe to conclude that ownCloud is recommended for personal use and for small businesses while VPC is feasible for large enterprise businesses.

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