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# CLOUD COMPUTING

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## ASSIGNMENT 1



ALI AHMAD JAN

1910572

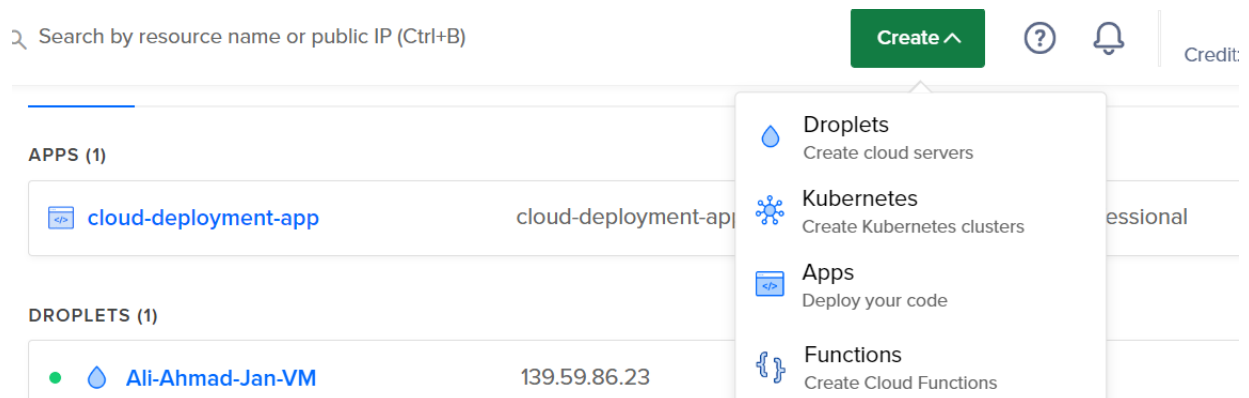
## Cloud Provider Selected

Digital Ocean

**Step 1:** Made an account on Digital Ocean

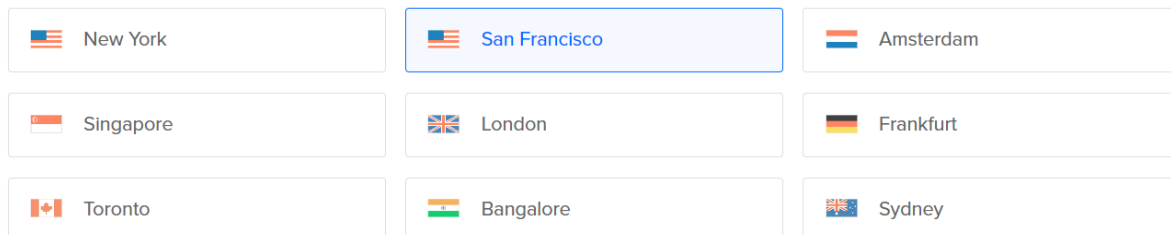
## Register and create a VM instance

**Step 2:** Select Droplet from the options and start to register the instance of VM



**Step 3:** Selected the regions from the given options

Choose Region



**Step 4:** Select the datacenter from the given options

Datacenter



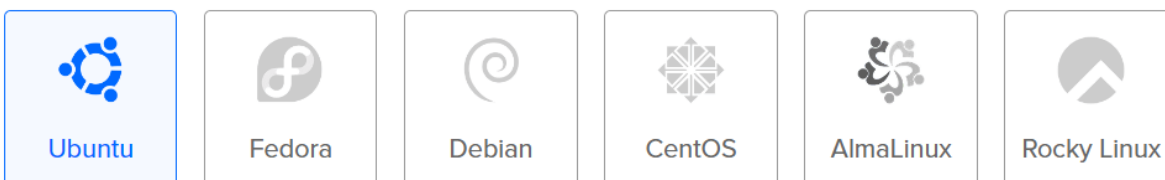
**Step 5:** Selected the VPC-Network as default

VPC Network - default-sfo3 DEFAULT

All resources created in this datacenter will be members of the same VPC network. They can communicate securely over their Private IP addresses.

**Step 6:** Choose an image "Ubuntu" from the given options

## OS Marketplace Custom images



### Step 7: Select the version and size of image

#### Version

22.10 x64

### Step 8: Select CPU Options

#### Choose Size

Need help picking a plan? [Help me choose](#)

#### Droplet Type

| SHARED CPU                    | DEDICATED CPU   |               |                  |                   |
|-------------------------------|-----------------|---------------|------------------|-------------------|
| Basic<br>(Currently selected) | General Purpose | CPU-Optimized | Memory-Optimized | Storage-Optimized |

#### CPU options

☒ Regular  
Disk type: SSD

☐ Premium Intel  
Disk: NVMe SSD

☐ Premium AMD  
Disk: NVMe SSD

|  |   |  |  |   |  |
|--|---|--|--|---|--|
| \$6/mo<br>\$0.009/hour                             | \$12/mo<br>\$0.018/hour                         | \$18/mo<br>\$0.027/hour                          | \$24/mo<br>\$0.036/hour                          | \$48/mo<br>\$0.071/hour                           | \$96/mo<br>\$0.143/hour                            |
| 1 GB / 1 CPU<br>25 GB SSD Disk<br>1000 GB transfer | 2 GB / 1 CPU<br>50 GB SSD Disk<br>2 TB transfer | 2 GB / 2 CPUs<br>60 GB SSD Disk<br>3 TB transfer | 4 GB / 2 CPUs<br>80 GB SSD Disk<br>4 TB transfer | 8 GB / 4 CPUs<br>160 GB SSD Disk<br>5 TB transfer | 16 GB / 8 CPUs<br>320 GB SSD Disk<br>6 TB transfer |

## Configure SSH keys for secure access to the VM

### Step 9: Choose SSH Key from the authentication method

## Choose Authentication Method ?

☒ **SSH Key**  
Connect to your Droplet with an SSH key pair

☐ **Password**  
Connect to your Droplet as the "root" user via password

Choose your SSH keys

☐ Select all ☒ SSH Key ☐ Cloud SSH K... ☐ Cloud Assig...

New SSH Key

## Step 10: Download PuTTY to generate the SSH Key to add in SSH Key

**PuTTY Key Generator**

File Key Conversions Help

**Key**

Public key for pasting into OpenSSH authorized\_keys file:

```
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQCAInPFWHCsd1E
+PZ2lHjABf/RG6UHddforjNdY5HZq1DdTCH1z/SPJ5j5Z2ZluVyoMfBAReMnUT1rPW7c05l9vBUNfUeMh03yrM.JP
l25Nj65cL2y4faQGj7cKhM9nQmyUqihSFmWm
+SpujG/L2x688Y1czPDx9YVHJMOSdTZQR3Lg7T4Vbgm5XwNGj17CmEDUsiBAAHnjkmUMf9aKaS0yBBbeaIF
M.JnbNeFz0JN403V23Opc2DgQMv1zU84h9hIWa9zfK5mVWFWJfNkn099u8pMw
```

Key fingerprint: ssh-rsa 2048 SHA256:wEc61Rhix0NtTY4T+mEGr5SKcXDxVoZnM5GphFVlekM

Key comment: rsa-key-20230216

Key passphrase:

Confirm:

**Actions**

Generate a public/private key pair Generate

Load an existing private key file Load

Save the generated key Save public key Save private key

**Parameters**

Type of key to generate: ☒ RSA ☐ DSA ☐ ECDSA ☐ EdDSA ☐ SSH-1 (RSA)

Number of bits in a generated key: 2048

## Step 11: Add the generated SSH Key in SSH Key section

## Add public SSH key

Copy your public SSH key and paste it in the space below. For instructions on how, follow the steps on the right.

SSH key content



ssh-rsa

```
AAAAB3NzaC1yc2EAAAADAQABAAQAC8kRLWYF9WGxVYcTOh5wdmRRU  
B4WMYmHWRG43SRAW9YsAcgu27g0G1FaxwMmkxEu/8qNTyagymAahZPhf7  
UiNurjdRu1lqyV4TAuyupy7c0e61x81t0iJM8OJXM2oE7TEvW0afZ4+Wb07U1vX  
QPC/glnwP9Nn2ez7/UNRf/heEAceqFEI1Zz2smkjcSyfqjW9+5fCMN8fR21MInvL
```

Name

Cloud



Add SSH Key

## Step 12: Save the private and public SSH Key

## Step 13: Create the Droplet. You will get Public IP (IPv4) Address

### Finalize Details

#### Quantity

Deploy multiple Droplets with the same configuration.

—

1 Droplet

+

#### Hostname


Give your Droplets an identifying name you will remember them by.

ubuntu-s-4vcpu-8gb-sfo3-01

#### Tags

Type tags here

#### Project

 first-project



\$48.00/month

\$0.071/hour


[CREATE VIA COMMAND LINE](#)


Create Droplet

Ali-Ahmad-Jan-VM

**Best Practices for Your Data** [Don't Show Again](#)

If you store data on this Droplet, we recommend these features:

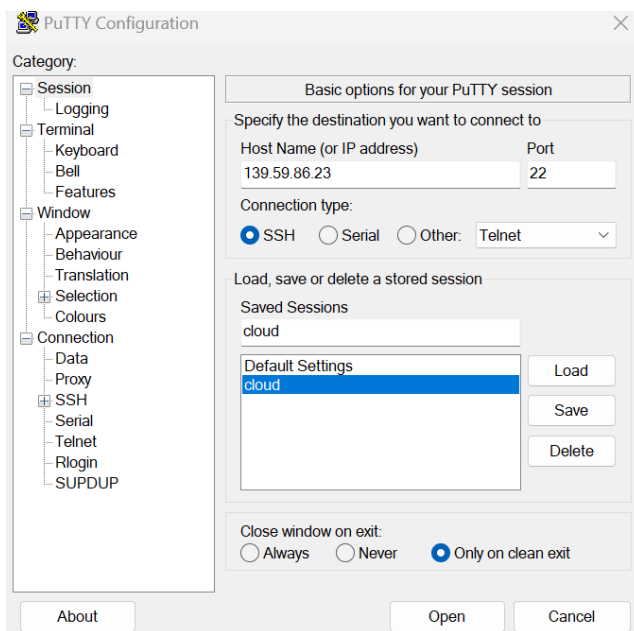
**Mount a block storage volume**  
Store more data for less and seamlessly move data between Droplets.

**Enable automatic backups**  
Add security with weekly disk images for easy restoration, no configuration required.

|       |   |            |                              |
|-------|---|------------|------------------------------|
| Image | Ubuntu 20.04 (LTS) x64  | Region     | BLR1                         |
| Size  | 2 vCPUs<br>4GB / 80GB Disk<br>(\$24/mo)<br><a href="#">Resize</a> | IPv4       | 139.59.86.23                 |
|       |   | IPv6       | 2400:6180:100:d0::8...       |
|       |   | Private IP | 10.122.0.2                   |
|       |   | VPC        | <a href="#">default-blr1</a> |

## Access the VM using SSH

### Step 14: Open PuTTY Configuration to access your VM using SSH Key



### Step 15: Access console using Droplet's public ip

```
Ali-Ahmad-Jan-VM - DigitalOcean Droplet Web Console - Opera
cloud.digitalocean.com/droplets/341193137/terminal/ui/
System information as of Sat Feb 18 07:03:47 UTC 2023

System load:          0.0
Usage of /:           6.8% of 77.35GB
Memory usage:         26%
Swap usage:           0%
Processes:            210
Users logged in:      1
IPv4 address for docker0: 172.17.0.1
IPv4 address for eth0:  139.59.86.23
IPv4 address for eth0:  10.47.0.5
IPv6 address for eth0:  2400:6180:100:d0::8b3:1001
IPv4 address for eth1:  10.122.0.2

* Introducing Expanded Security Maintenance for Applications.
  Receive updates to over 25,000 software packages with your
  Ubuntu Pro subscription. Free for personal use.

  https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

29 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

13 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

*** System restart required ***
Last login: Sat Feb 18 07:03:06 2023 from 39.32.173.229
root@Ali-Ahmad-Jan-VM:~#
```

## Using Droplet's console

```
IPv6 address for eth0:  2400:6180:100:d0::8b3:1001
IPv4 address for eth1:  10.122.0.2

* Introducing Expanded Security Maintenance for Applications.
  Receive updates to over 25,000 software packages with your
  Ubuntu Pro subscription. Free for personal use.

  https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

29 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

13 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

*** System restart required ***
Last login: Fri Feb 17 09:25:04 2023 from 162.243.190.66
root@Ali-Ahmad-Jan-VM:~#
```

## Using terminal to access the VM

## Add custom firewall rules in the subnet's security list

### Step 16: Add Custom Inbound Rules



#### Cloud-Assignment-Firewalls

6 Rules / 1 Droplet

**Rules** Droplets Destroy

Firewall rules control what inbound and outbound traffic is allowed to enter or leave a Droplet.

#### Inbound Rules

Set the Firewall rules for incoming traffic. Only the specified ports will accept inbound connections. All other traffic will be blocked.

| Type   | Protocol | Port Range | Sources  |          |                        |
|--------|----------|------------|----------|----------|------------------------|
| SSH    | TCP      | 22         | All IPv4 | All IPv6 | <a href="#">More</a> ▾ |
| HTTP   | TCP      | 80         | All IPv4 | All IPv6 | <a href="#">More</a> ▾ |
| Custom | TCP      | 3389       | All IPv4 | All IPv6 | <a href="#">More</a> ▾ |

### Add Custom Outbound Rules

#### Outbound Rules

Set the Firewall rules for outbound traffic. Outbound traffic will only be allowed to the specified ports. All other traffic will be blocked.

| Type    | Protocol | Port Range | Destinations |          |                        |
|---------|----------|------------|--------------|----------|------------------------|
| ICMP    | ICMP     |            | All IPv4     | All IPv6 | <a href="#">More</a> ▾ |
| All TCP | TCP      | All ports  | All IPv4     | All IPv6 | <a href="#">More</a> ▾ |
| All UDP | UDP      | All ports  | All IPv4     | All IPv6 | <a href="#">More</a> ▾ |

[New rule](#) ▾

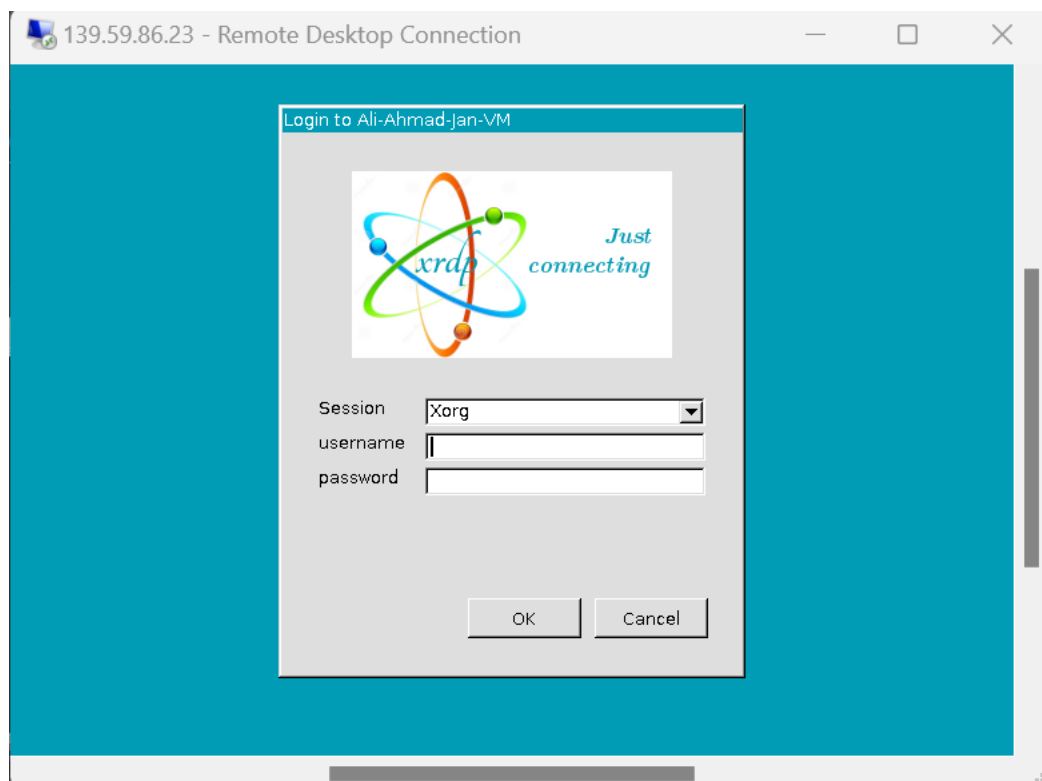
## Install RDP on the VM and access it using RDP from your PC

### Step 17: Write the following commands for RDP

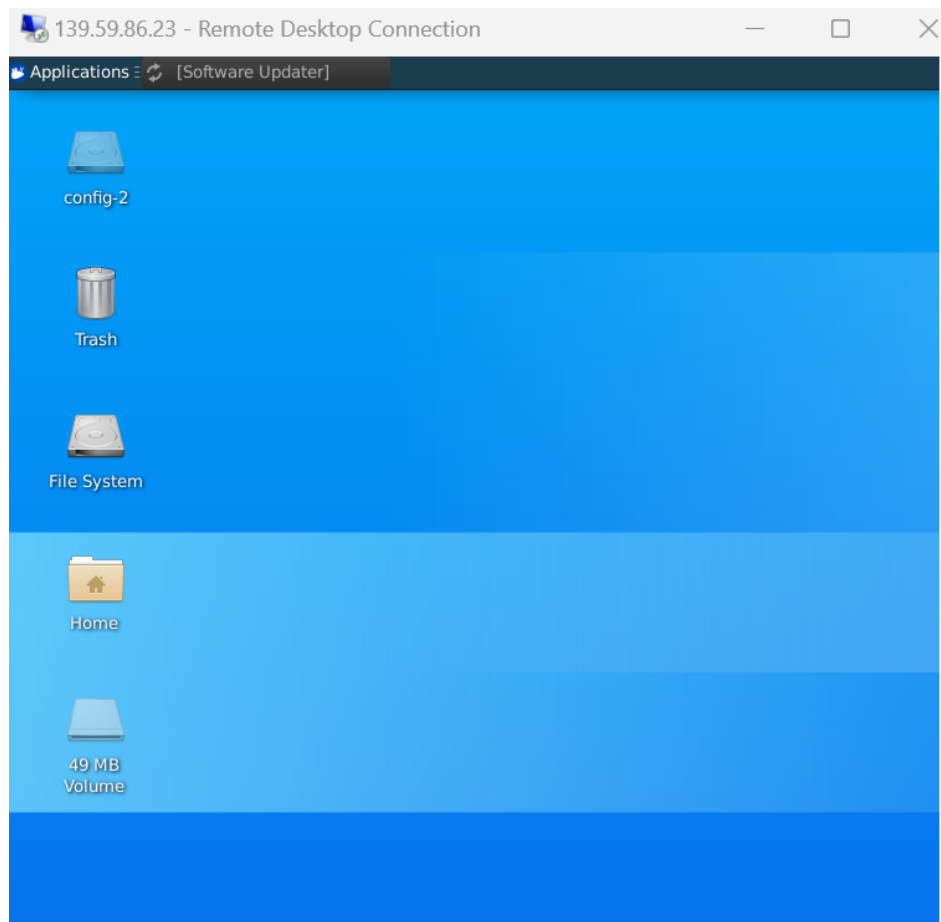


```
adduser (username)
usermod -aG sudo (username)
sudo apt update
sudo apt install xubuntu-desktop
sudo apt install xrdp
sudo systemctl status xrdp
sudo adduser xrdp ssl-cert
sudo ufw allow 3389
```

**Step 18:** Open “Remote Desktop Connection” and enter your public ip address to connect



**Step 19:** RDP is connected and you can use your xubuntu



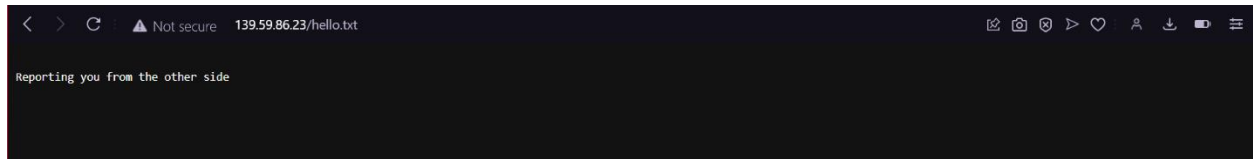
Host files using a simple HTTP server and access them using the public IP

**Step 20:** For hosting files using a simple HTTP server, install apache2 server using following commands

```
sudo apt install apache2
```

```
sudo systemctl status apache2 --no-pager
```

And add html of your choice and host it on your public ip



Which can be confirmed from our RDP

