

# **CLOUD COMPUTING INFRASTRUCTURE**

BY

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This Report Presented in Partial Fulfillment of the Requirements of the degree of Bachelor of Science in Computer Science and Engineering.

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**DAFFODIL INTERNATIONAL UNIVERSITY**

**DHAKA, BANGLADESH**

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## **APPROVAL**

This internship titled "CLOUD COMPUTING INFRASTRUCTURE", submitted by Md. Alimuzzaman Alim, ID No: 153-15-6380 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 12/12/2018.

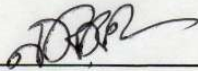
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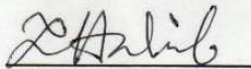


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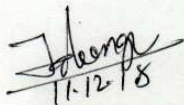
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## DECLARATION

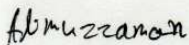
I hereby declare that, this internship report is prepared by me Md. Alimuzzaman Alim to the department of Computer Science and Engineering, Daffodil International University. Department of CSE, Daffodil International University. I also declare that internship report nor any part of this internship report has been Submitted elsewhere for award of any degree or Diploma. I also declare that, collected information's are from books and internet.

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## **ABSTRACT**

Cloud computing is a general term for the delivery of hosted services over the internet. Cloud computing is a network of interconnected computer systems which are generally configurable over the internet reducing the time for managing them. This technology enables the computer systems to share their resources on a common platform through the internet instead of employing local servers.

The aim of this internship is learning the concept of Cloud Computing Infrastructure and how to deploy Cloud Computing.

The objectives of this internship include a detailed view of the cloud computing technology and how it works and feature implementations, such as different types of service models such as SaaS, PaaS, IaaS etc.

Firstly, I get the conceptual knowledge about cloud computing and then practically implemented it.

After finishing the internship, I am expecting to gain enough knowledge about cloud computing infrastructure and how to deploy cloud computing services on my own.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Cloud computing is basically on demand delivery of different computing services like virtual machine (VM), database, storage, online access of different applications from different servers. All the programs and hardware systems are outsourced by a vendor and the users do not have to worry about anything such as power, storage etc. Cloud computing provides a simple way to access servers, storage, databases and a broad set of application services over the Internet. A Cloud services platform owns and maintains the network-connected hardware required for these application services, while you provision and use what you need via a web application.

Cloud computing helps the companies by providing effective solution for their business as with cloud computing companies do not need to buy and maintain large data centers. Costs for cloud computing are very low and users have to pay only for the time when they use the cloud services. All the maintenance is being done by the cloud service provider which significantly reduces the company's IT department's cost as well.

### 1.2 Motivation

Cloud computing has been growing the way businesses operate these days. Companies of all the shapes and sizes have been adapting to this new technology. Cloud computing will continue to benefit the mid-sized and large companies in the coming few years. Also, it has many benefits like:

- **Cost Effective:** It is cost effective as user data is stored on the remote servers and customer does not need to maintain large data centers for that.
- **Security:** The information is stored on a computer/laptop/mobile can be stolen easily but if it is stored on a cloud, only authorized persons will be able to access that data.
- **Scalability:** Cloud storage can be upgraded anytime if more storage is required without any issue.
- **Backup & Recovery:** All the data stored on cloud is backed up so risk of potential loss of data is minimized.
- **Device Diversity:** Data stored on a cloud can be accessed anytime anywhere just with an active internet connection. Also, this service is device independent, which means it works well with any kind of device with any OS.

So, keeping in view all these benefits, this technology is very great to be implemented and researched.

### **1.3 Internship Objectives**

The objectives of this internship include a detailed view of the cloud computing technology that how it works and its uses and future implementations. Also, different cloud services technologies, types of clouds along with different cloud service providers are learnt and future career scope of this newly fastest emerging technology is evaluated.

### **1.4 Introduction to the Company**

Unix Lab Bangladesh is a leading cloud service provider in Bangladesh. It offers cloud computing, cloud storage, Microsoft Azure, Amazon Web Services, Red Hat Enterprise Linux and Networking services.

### **1.5 Report Layout**

This report is about cloud computing. It contains 4 chapters.

**Chapter 1** is about the cloud computing technology introduction, why am I working on it, and a brief introduction about the company.

**Chapter 2** is about the Organization.

**Chapter 3** is about the roles and targets assigned to me.

**Chapter 4** is about the conclusion and the future scope of this new technology.

## **CHAPTER 2**

### **ORGANIZATION**

#### **2.1 Introduction**

Unix Lab Bangladesh provides cloud computing services to different clients as per their specified requirements. Also, it has a digital learning portal which provides the learning services for individual professionals in Bangladesh. Also, they have been well-known to provide individuals with required learning solutions and to advance skilled acquaintance and expertise in the field of technical job area. Along with the cloud storage facility they provide the support to learn the software/programs that are required to run the cloud services skills. A vast range of courses is offered by Unix Lab for the global organizations and individuals as well to help them grow.

#### **2.2 Product and Market Situation**

Unix lab Bangladesh offers cloud and networking services, web development, software development. They offer convenient public trainings, private programs with flexible delivery format by their expert trainers about their product and services.

They offer different models of Cloud technology ranging from IaaS, SaaS and PaaS. Also, they provide public as well as private cloud services to the customers as per their detailed requirements.

#### **2.3 Target Group**

Unix Lab Bangladesh offers its services around the world with customized choice of private programs for private companies or for the individuals who are intended to manage their large database system with a virtual platform.

#### **2.4 Organizational Structure**

They have provided the contact details of two of their team mates which can be approached via Facebook, Twitter, Skype or LinkedIn. They also have mentioned their contact number, address and email for further queries.

## **CHAPTER 3**

### **TASKS, PROJECTS AND ACTIVITIES**

#### **3.1 Daily Task and Activities**

##### **3.1.1 Cloud Computing**

Cloud computing refers to the use of the internet to access remote server to process, store and manage personal/business data.

Cloud computing can be broken into two parts: physical host and virtual servers, that apps/website uses [1].

##### **3.1.2 Cloud Service Models**

Customer can get cloud services using several service models. Service models are differed from one another by what service provider manage and what user manage. There are three types of cloud service model [2],

- I. Software as a Service (SaaS).
- II. Platform as a Service (PaaS).
- III. Infrastructure as a Service (IaaS).

##### **3.1.3 Cloud Deployment Models**

There are mainly three types of cloud deployment models, it's differed from one another where it's located and whether it's shared or dedicated.

- I. Public Cloud
- II. Private Cloud
  - A. Off-premises
  - B. On-premises
- III. Hybrid Cloud

##### **3.1.4 Virtual Servers**

VPS virtualize an OS or machine on top of host OS which is installed on physical machine. One physical server can be used or shared by one or more virtual server. Virtual Server acts like physical dedicated server. End users can have root or superuser level access. Virtual Server is almost identical to a dedicated server [4].

##### **3.1.5 Bare Metal Servers**

Bare Metal server also known as dedicated server is getting control over full physical server instead of a virtual instance. Bare metal server is the most expensive server and take longer

time to provisioning. Users get benefits of having full physical server and can take advantage of many hardware feature.

### **3.1.6 Containers**

Container is a type of OS virtualization, the main difference between the container and virtual machine is that container share the same OS of the host where virtual machine has one guest OS each virtualization. Containers uses resource isolation to separate resource from each other. Container package software with all its dependency, so it's convenient to move from one platform to another [5].

### **3.1.7 Serverless Computing**

Also known as function as a service, FaaS. In serverless computing there is no need to manage hardware or software, all is managed by the provider. User just provide the software or just a function. Functions are run by external events so therefore there are no need to reserve hardware. So, users don't have any monthly fixed fees, they only billed for how much resource they used. So, this is very cost effective for event driven apps [6].

### **3.1.8 Storage Types**

There are different types of storage being used in the cloud.

- I. Block storage
- II. File Storage
- III. Cloud Object Storage

### **3.1.9 Direct Attached Storage in the Cloud**

When virtual servers share physical storage of the physical server it's called Direct Attached Storage. Cloud vendors includes DAS with the virtual machine and it's called local storage. Operating system on the virtual machine can create and mount file system on DAS/local storage.

### **3.1.10 Block storage in the Cloud**

At the device level, computer storage devices persist sequences of bytes in blocks of various sizes and locations within the device. Such storage is called block storage. A hard drive, or solid-state storage device (SSD) is a block storage device. Storage devices may be physically attached to computer servers (Direct Attached Storage, or DAS), or they may be attached to servers over a network.

### **3.1.11 File Storage in the Cloud**

Storage at block level is only used in special cases, like database and quick backup. For programs and users. File storage protocol is used on top of block-level protocol, which implement abstraction of files and folders. File-level protocols are used in both local storage and networked storage.

### 3.1.12 Cloud Object Storage

Object storage is used to store unstructured data, like photos, videos and music. It's gaining popularity because of its high scalability, durability, security and high availability.

### 3.1.13 Review of Networking Basics

- I. OSI Model: Computer networks connect different computer components together. These components have their network interfaces connected by wire, fiber optic, radio, and satellite. Open Systems Interconnection model (OSI model) standardize the communications function between multiple devices. There are 7 layers of protocol in OSI model. These layers of protocol ensure that different types of device can communicate with each other. TCP/IP suite is one of the popular OSI stack. The IP protocol is responsible for network addressing and packets delivery. TCP split and reassemble packets with security [7].
- II. IP Addresses: IP address are used to address servers/network hosts. There are two types of IP address.
  - A. IP version 4 (IPv4). This is older and running out of address space
  - B. Version 6 (IPv6). This is the new version
- III. Private IP Addresses: In order for IPv4 addresses to be used efficiently, three blocks of IP addresses were separated and reserved. A local area network can have one public address on the gateway router to have access to internet and use private IP internally so they can use as many IP they use and they don't need to be unique.

The three private address block ranges are:

  1. 10.0.0.0 to 10.255.255.255 (class A)
  2. 172.16.0.0 to 172.31.255.255 (class B)
  3. 192.168.0.0 to 192.168.255.255 (class C)
- IV. CIDR Notation: Classless Inter-Domain Routing (CIRD) is a method for IP routing and IP addressing allocation. Cloud providers use it for specifying details of networks and subnets used when provisioning servers. CIDR uses variable-length subnet masking (VLSM) technique

### 3.1.14 VLANs

VLAN divide local area networks into logical segments to separate from each other. It's offers better security and maintenance. VLAN can be private or public. Public VLANs can be accessible from internet [8].

### **3.1.15 Virtual Network Security and Separation**

- I. Firewalls: Firewalls prevent unauthorized access to or from a network. Firewalls can be hardware or software, even both. Firewalls have a set of rules from which it decides whether to allow a request.
- II. VPN: VPN provides a secure encrypted connection between two networks. It emulates a point-to-point private link between two computers. VPN uses protocols such as Secure Socket Layer (SSL) or Internet Protocol Security (IPSec).  
Network Separation, Security Groups: To comply with security requirements, organizations have to make access rules strict for servers. Services which don't need to be accessible from the public internet, it should be in a separate private VLAN with private IP address and allow the local server to access it.

### **3.1.16 IaaS Application Programming Interfaces (APIs)**

- I. API: API is a set of functions which can access feature or data of OS, application or services. Cloud vendors provide API to manage their services.
- II. IaaS APIs: Frequently, cloud IaaS API calls are used when implementing cloud providers' web portals. Customers can use same functionality using APIs like they are used to do in web portal. API calls need to have authentication information to get access. It's possible to create a fully automated development environment IaaS APIs.

### **3.1.17 Auxiliary Services in IaaS Environments**

- I. IaaS Security: In cloud IaaS server's security is maintained by both vendor and the customer. Vendor take care the security of the hardware and the virtualization platform. Where customer take care of the virtualized OS.
- II. Monitoring Cloud Deployments: Customers can monitor the status of their servers and resources in the web portal given by provider. For example, customer can check health of their server, resource utilization and network inbound and outbound traffic.
- III. Database Services: Most of the application today need to interact with data and store the data. Many IaaS vendors offer managed database service with high availability and high scalability. So, it is possible for customer to grow in the future.

### **3.1.18 Typical Cloud IaaS Architectures**

- I. Single Server: Single server is the most used architecture in cloud computing. All required services are installed in a single server.
- II. Single Server with Services: Unlike the single server which have everything in one server, Single Server with Service use services offered by provider. The provider will manage those services.
- III. Load Balancing, Auto-Scaling: Load on server differ by many things and can be unexpected. Cloud provider offer load balancing and auto-scaling to maintain high availability server. Additional servers are provisioned by auto-scaling service when there is extra load. Load balancing service switch between different provisioned servers by the availability of the server.
- IV. Database Replication: Database replication service provide backup and fault tolerance with respect to database. The service replicate and synchronizes the database to keep more than one copies of the database.



- V. Fault Tolerance and High Availability: Replicating the server to more than one provision and also provision in different geographical area will provide high fault tolerance and high availability. Even if in natural disaster one node goes offline other node can keep working.

### 3.2 Project Task and Activities

#### 3.2.1 Creating Virtual Private Server

We are going to create a virtual server on DigitalOcean.

First, we are going to choose the operating system for the virtual server.

Here we choose the Ubuntu version 16.04.4 x64.

## Create Droplets

Choose an image ?

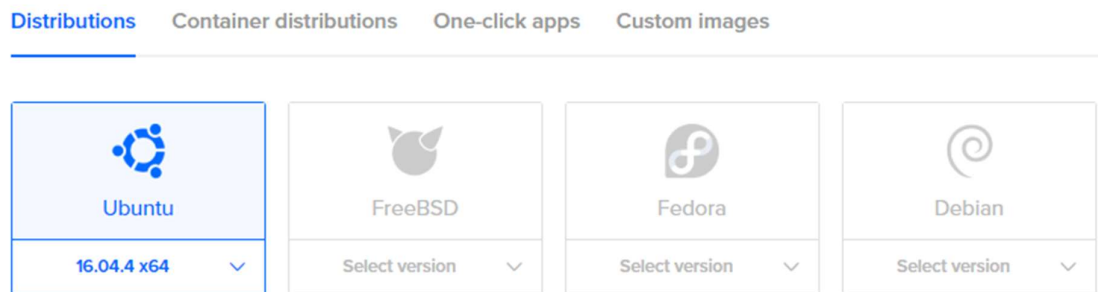


Figure 3.2.1: Choose OS and OS version to install

Next, we have to choose memory, disk, CPU

## Choose a size

### Standard Droplets

Balanced virtual machines with a healthy amount of memory tuned to host and scale applications like blogs, web applications, testing / staging environments, in-memory caching and databases.

MEMORY	vCPUs	SSD DISK	TRANSFER	PRICE
1 GB	1 vCPU	25 GB	1 TB	\$5/mo \$0.007/hr
2 GB	1 vCPU	50 GB	2 TB	\$10/mo \$0.015/hr
3 GB	1 vCPU	60 GB	3 TB	\$15/mo \$0.022/hr

Figure 3.2.2: Server resource to include in droplet.

Next, we can choose to add system level automatic backup.

## Add backups

Automatic system-level backups. Use the backup images to revert the server or create new Droplets. Backups cost 20% of the Droplet price.

Backups will be scheduled to start weekly.

Backups for this Droplet cost \$1.00 per month.



Figure 3.2.3: Automatic weekly backup

We can add additional storage if needed.

## Add block storage

Currently only available in AMS3, BLR1, FRA1, LON1, NYC1, NYC3,

SFO2, SGP1 and TOR1.

Block storage lets you add independent storage volumes that can be accessed like local disk and moved from one Droplet to another within the same region.

\$ <input type="text"/> /mo \$ <input type="text"/> /hour	<b>\$10</b> /mo \$0.015/hour	<b>\$25</b> /mo \$0.037/hour	<b>\$50</b> /mo \$0.074/hour	<b>\$100</b> /mo \$0.149/hour	<b>\$200</b> /mo \$0.298/hour
Enter siz	100 GB	250 GB	500 GB	1000 GB	2000 GB

Choose configuration options:

<p><b>Automatically Format &amp; Mount</b></p> <p><input checked="" type="radio"/> We will choose the appropriate default configurations. These settings can be changed later via ssh.</p>	<p><b>Manually Format &amp; Mount</b></p> <p><input type="radio"/> We will still attach the volume. You can then manually format and mount the volume.</p>
--	--

Choose a filesystem  Ext4  XFS

Figure 3.2.3: Additional storage

Next, we add IPv6 or private networking if needed.

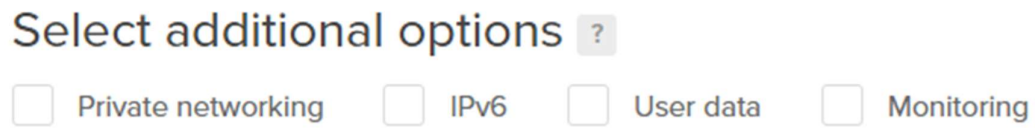


Figure 3.2.4: Additional options

Next, we have to add SSH key to the VM to securely access the terminal remotely. You can choose from existing one or can add new SSH key.

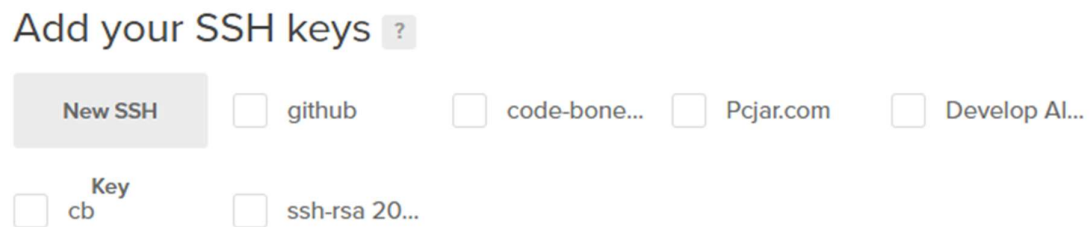


Figure 3.2.5: Adding SSH key to droplet

To generate SSH key we are going to use PuTTY Key Generator.

After opening the software click the Generate button.

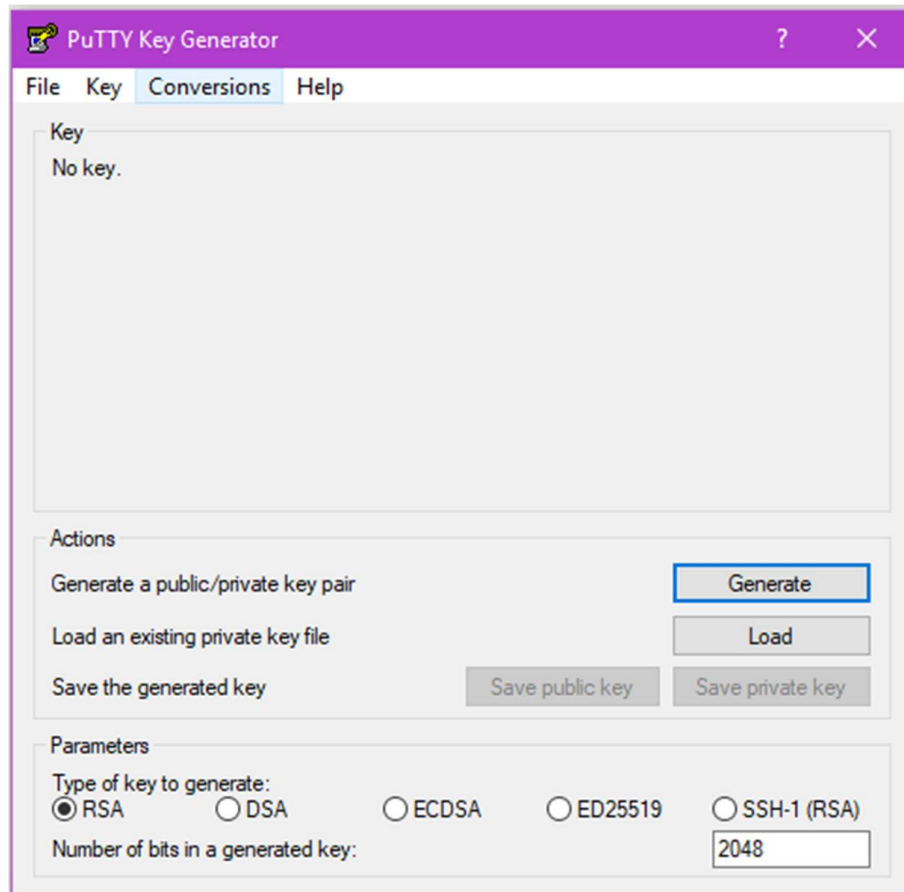


Figure 3.2.6: Generating SSH key using PuTTY Key Generator

After clicking the Generate button we need to follow the instruction on the screen.

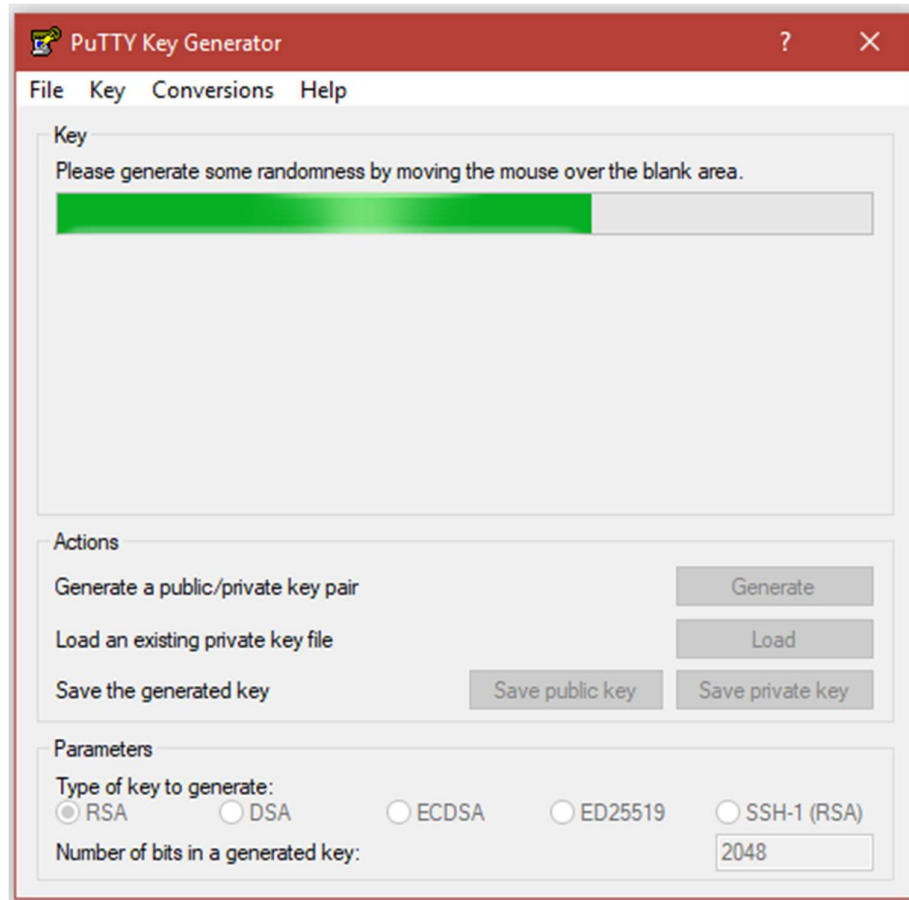


Figure 3.2.7: SSH key generation in process

When key generation is complete we will get a screen like this.

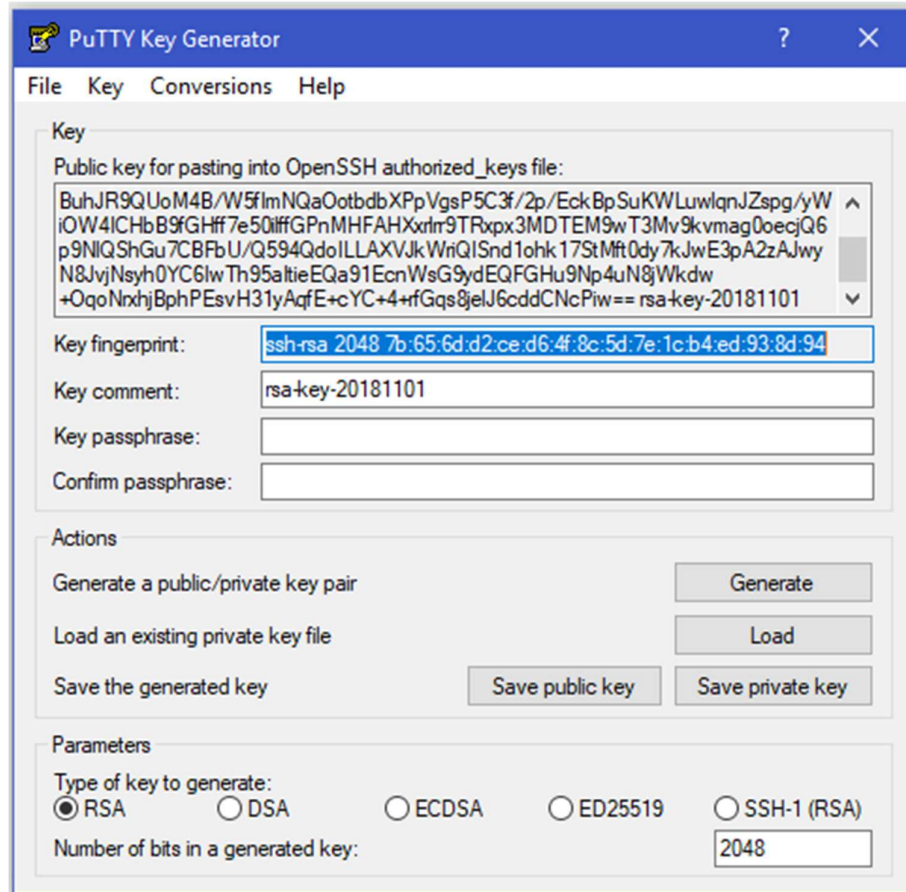


Figure 3.2.8: SSH key generation is complete

Then we save the public key and private key to use later.

We have to copy the public key from the above figure and paste into SSH key content field. Then we will provide a name for the key, here we used the Key fingerprint from the above figure.

New SSH key

Paste a copy of your **public key** in the space below. It should end in ``.pub``. [Learn more.](#)

SSH key content

```
ssh-rsa
AAAAB3NzaC1yc2EAAAABJQAAAQEAusqyjUreTAYmKoh2mV8bYrR
Om3e81z900CNBuhJR9QUoM4B/W5flmNQaOotbdbXPpVgsP5C3f
/2p/EckBpSuKWLuwIqnJZspg/yWiOW4ICHbB9fGHff7e50ilffGPnMH
FAHXxrlrr9TRxpx3MDTEM9wT3Mv9kvmag0oecjQ6p9NIQShGu7C
BFbU/Q594QdoILLAXVJKWriQISnd1ohk17StMft0dy7kJwE3pA2zAJ
wyN8JvjNsyh0YC6lwTh95altieEQa91EcnWsG9ydEQFGHu9Np4uN
8jWkdw+OqoNrxhjbphPEsvH31yAqfE+cYC+4+rfGqs8jelJ6cddCNcPi
```

Name

ssh-rsa 2048 7b:65:6d:d2:ce:d6:4f:8c:5d:7e:1c:b4:ed:93:8d:94

Add SSH Key

Figure 3.2.9: Adding SSH key in droplet

We will set our fully qualified domain name (FQDN) name as host name.

## Finalize and create

### How many Droplets? Choose a hostname

Deploy multiple Droplets with the same [configuration](#).

Give your Droplets an identifying name you will remember them by. Your Droplet name can only contain alphanumeric characters, dashes, and periods.

— 1 Droplet +

vps.code-bone.com

Figure 3.2.10: Adding FQDN to droplet



For organizing and billing we have to choose a project.

Finally, we need to click on the Create button to provision the VM.

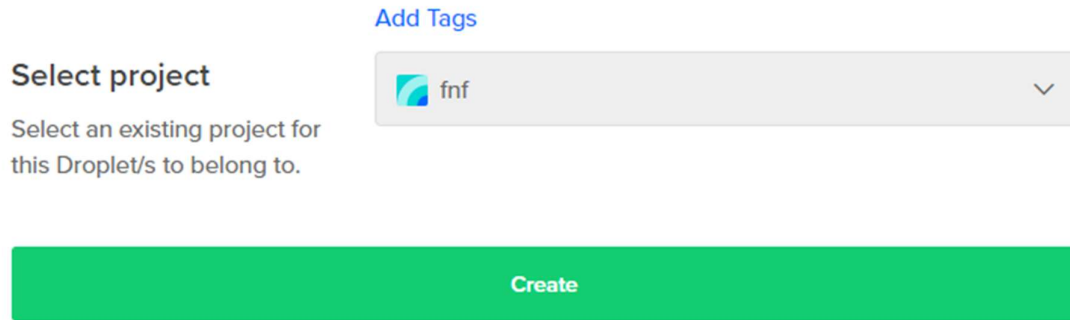


Figure 3.2.11: Organizing droplet using project

After clicking the start button, we will see progress bar, this may take a minute to complete.



Figure 3.2.12: Droplet is booting up

After completing the installation, we will see the details of the VPS, ex. IP address, status, backup options, etc.

**vps.code-bone.com** ON  
in fnf / 1 GB Memory / 25 GB Disk / SGP1 - Ubuntu 16.04.4 x64

---

ipv4: 206.189.81.24      ipv6: 2400:6180:0:d1::69a:1001      Private IP:  
10.130.98.128      Floating IP: [Enable now](#)      Console:

---

**Graphs**  
Access  
Power  
Volumes  
Resize  
Networking  
Backups  
Snapshots  
Kernel  
History  
Destroy  
Tags  
Recovery

**NEW!** Update Droplet to Monitoring [Learn How to Update](#) ×

**CPU** 6 hours ▾

No data available for this metric

**Disk I/O**

Figure 3.2.13: Settings page of droplet

Accessing the VPS from local computer: To access server console from local PC we will use PuTTY.

After opening the software,

We need to choose Session from left side, then we will get a figure like this one. We have to enter server hostname or IP address and use 22 as port and select SSH for connection type.

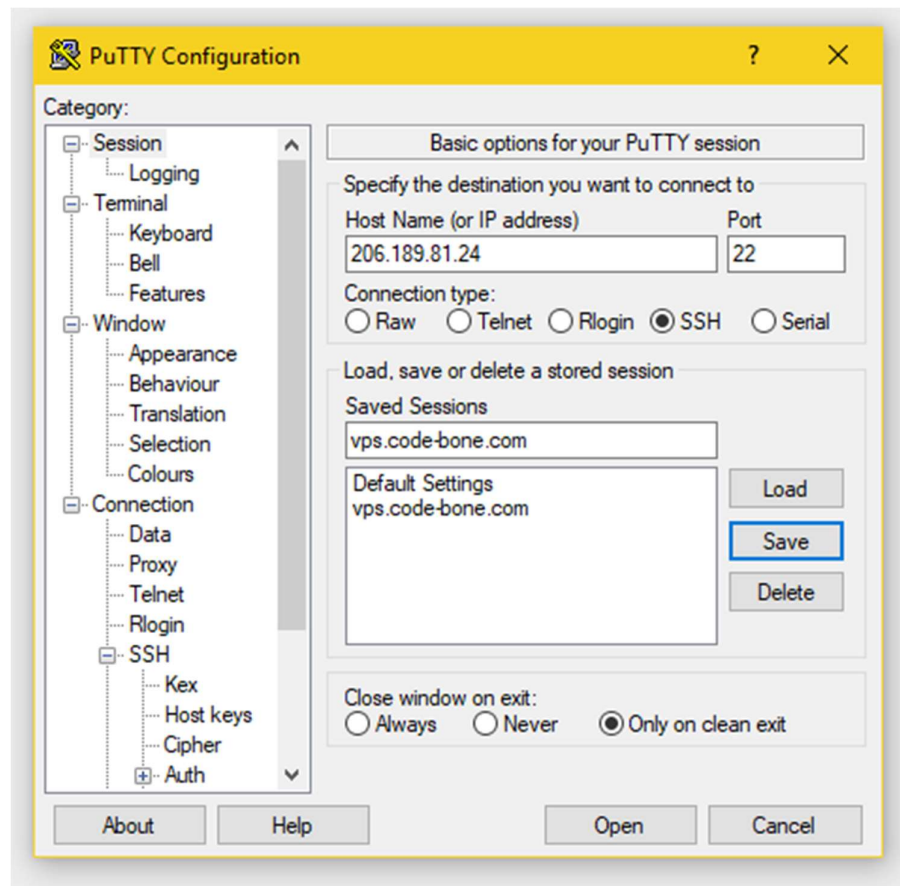


Figure 3.2.14: Connecting to droplet

Next from the left menu we select Connection > SSH > Auth. After getting a figure like this we need to select SSH key path in “Private key file for authentication” field. Then we click on the Open button.

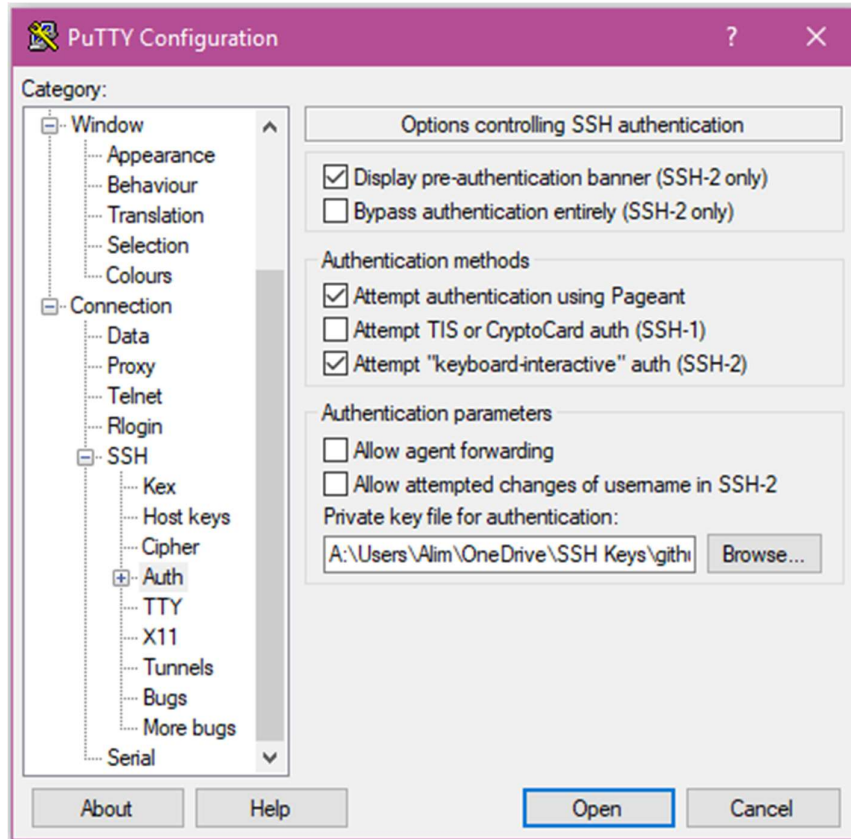
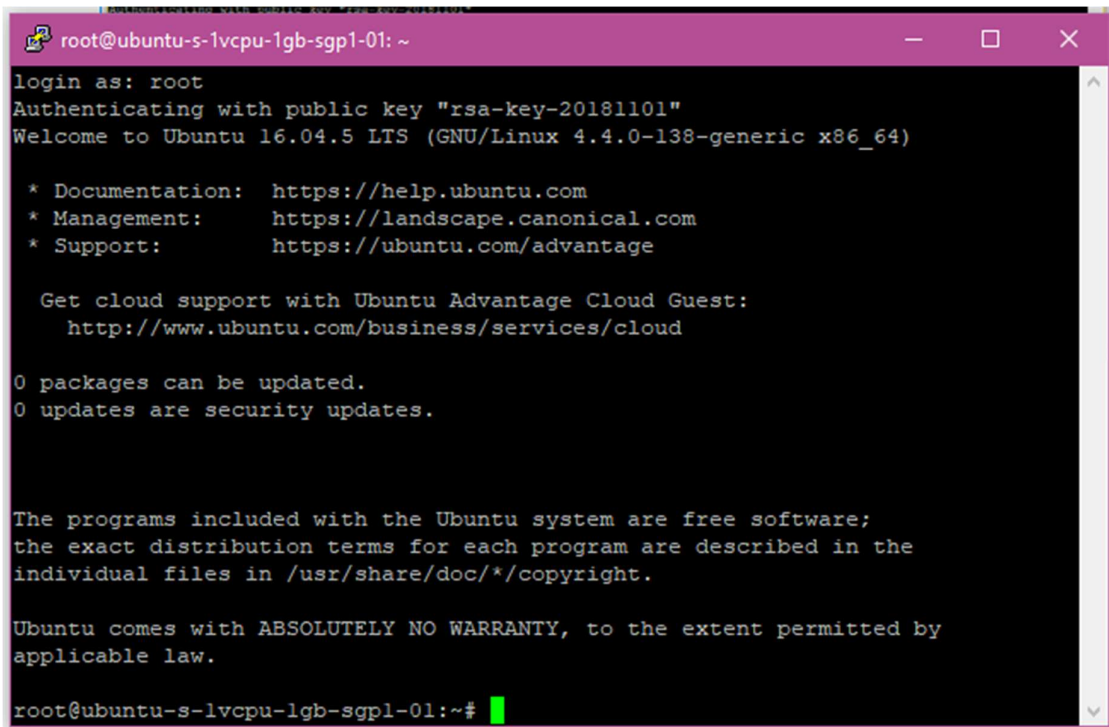


Figure 3.2.15: Configuring SSH key in PuTTY

After clicking the Open button, we will be asked for username, here we will use root as username. After entering the username, we will get the following figure.

A terminal window titled 'root@ubuntu-s-1vcpu-1gb-sgp1-01: ~' with standard window controls. The terminal output shows the login process for the 'root' user, including authentication with a public key, a welcome message for Ubuntu 16.04.5 LTS, and various system notices and disclaimers. The prompt ends with a green cursor.

```
root@ubuntu-s-1vcpu-1gb-sgp1-01: ~
login as: root
Authenticating with public key "rsa-key-20181101"
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.4.0-138-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

Get cloud support with Ubuntu Advantage Cloud Guest:
  http://www.ubuntu.com/business/services/cloud

0 packages can be updated.
0 updates are security updates.

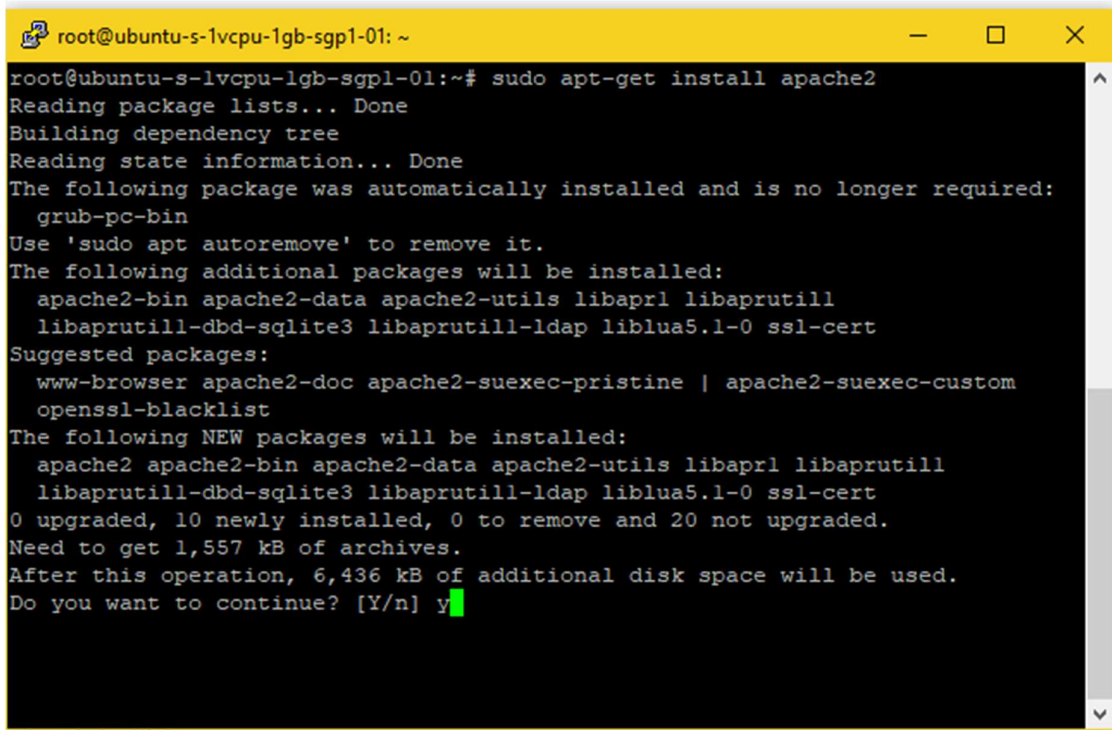
The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

root@ubuntu-s-1vcpu-1gb-sgp1-01:~#
```

Figure 3.2.16: Console of droplet, after connecting using SSH key

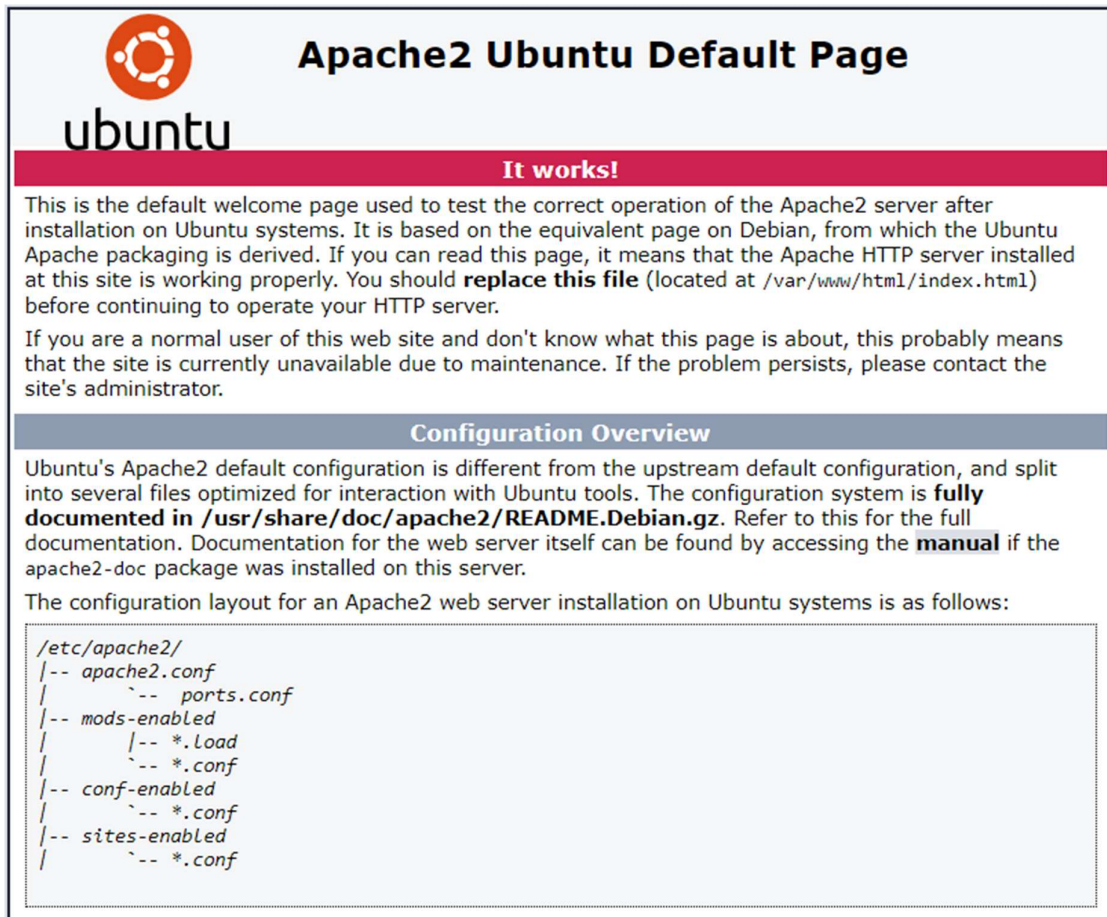
Next, we will install Apache for handle web request. To install we are using “sudo apt-get install apache2”. It will ask for confirmation, we need to enter “Y” to proceed.

A terminal window with a yellow title bar showing the command 'sudo apt-get install apache2' and its output. The output includes package lists, dependency tree building, state information, and a list of additional packages to be installed. It ends with a confirmation prompt 'Do you want to continue? [Y/n] y' where 'y' has been entered.

```
root@ubuntu-s-1vcpu-1gb-sgp1-01: ~  
root@ubuntu-s-1vcpu-1gb-sgp1-01:~# sudo apt-get install apache2  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following package was automatically installed and is no longer required:  
  grub-pc-bin  
Use 'sudo apt autoremove' to remove it.  
The following additional packages will be installed:  
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1  
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.1-0 ssl-cert  
Suggested packages:  
  www-browser apache2-doc apache2-suexec-pristine | apache2-suexec-custom  
  openssl-blacklist  
The following NEW packages will be installed:  
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1  
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.1-0 ssl-cert  
0 upgraded, 10 newly installed, 0 to remove and 20 not upgraded.  
Need to get 1,557 kB of archives.  
After this operation, 6,436 kB of additional disk space will be used.  
Do you want to continue? [Y/n] y
```

Figure 3.2.17: Installing Apache

After installation complete we will see a sample page if we visit our IP or hostname in browser.



**Apache2 Ubuntu Default Page**

**It works!**

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Ubuntu systems. It is based on the equivalent page on Debian, from which the Ubuntu Apache packaging is derived. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

### Configuration Overview

Ubuntu's Apache2 default configuration is different from the upstream default configuration, and split into several files optimized for interaction with Ubuntu tools. The configuration system is **fully documented in `/usr/share/doc/apache2/README.Debian.gz`**. Refer to this for the full documentation. Documentation for the web server itself can be found by accessing the **manual** if the `apache2-doc` package was installed on this server.

The configuration layout for an Apache2 web server installation on Ubuntu systems is as follows:

```
/etc/apache2/
|-- apache2.conf
|  |-- ports.conf
|-- mods-enabled
|   |-- *.Load
|   |-- *.conf
|-- conf-enabled
|  |-- *.conf
|-- sites-enabled
|  |-- *.conf
```

Figure 3.2.18: Sample page accessed by IP address

Adding our own web pages:

“`/var/www/html`” is default directory for web page. We need to upload our web apps or soft there.

### 3.2.2 Uploading files via sFTP: We are using FTP client called FileZilla

From file menu select “Site Manager...”

After entering the required information click connect.

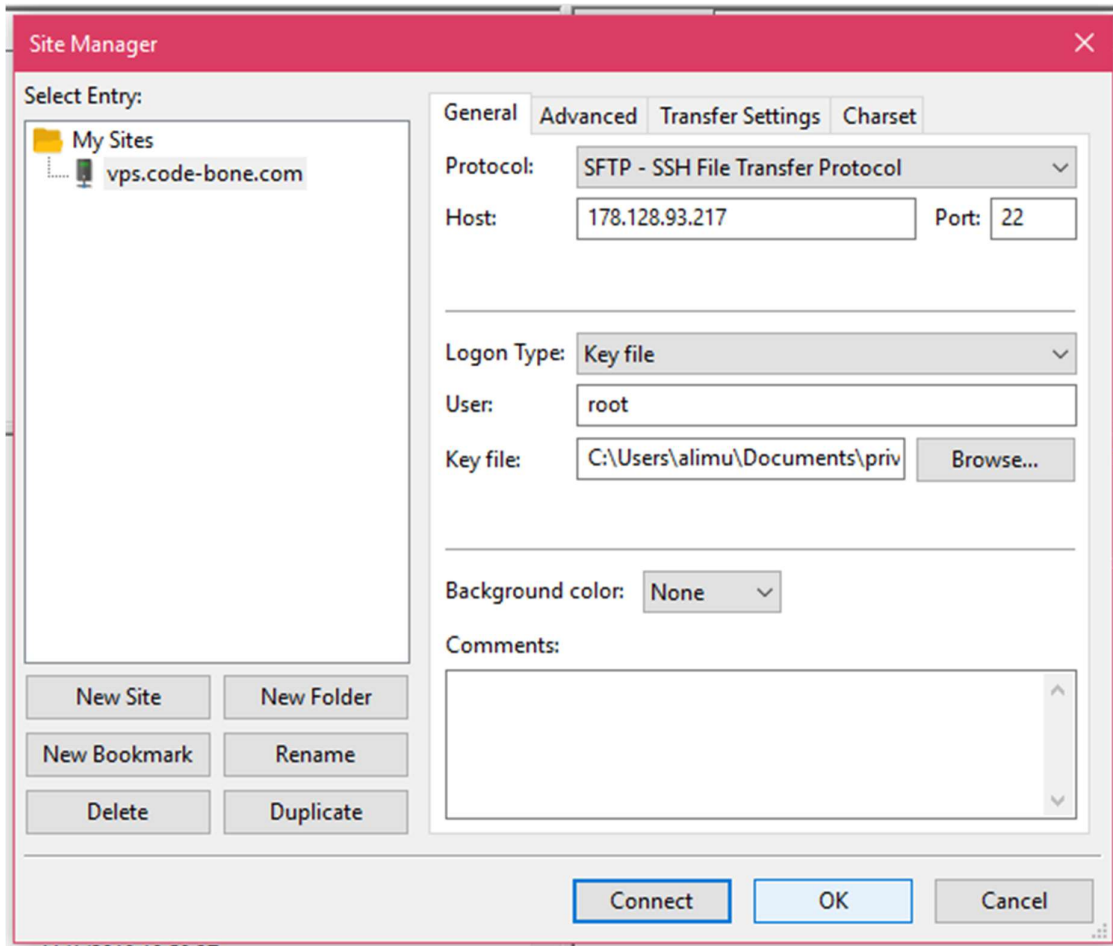


Figure 3.2.19: Configuring FileZilla



After connection complete we will see figure like the following. On the left side we will see our local directory and on the right side we will see directories of the server.

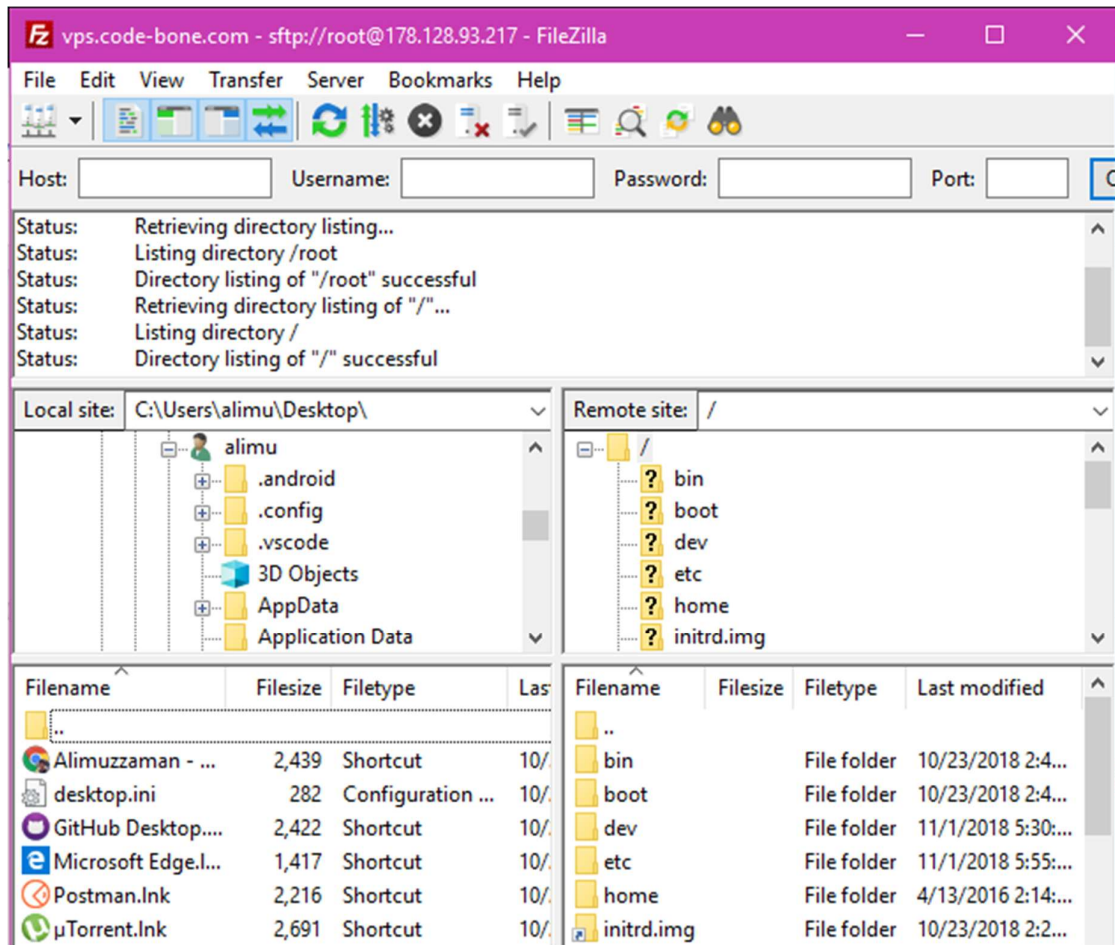


Figure 3.2.20: Connected to droplet using SFTP

From the left side we select directory where our files are located and from right side we need to choose “/var/www/html”. Then we will get figure like below [Figure 3.6.22]. Then select all file from left side then right click and select Upload. It will initiate file transfer.

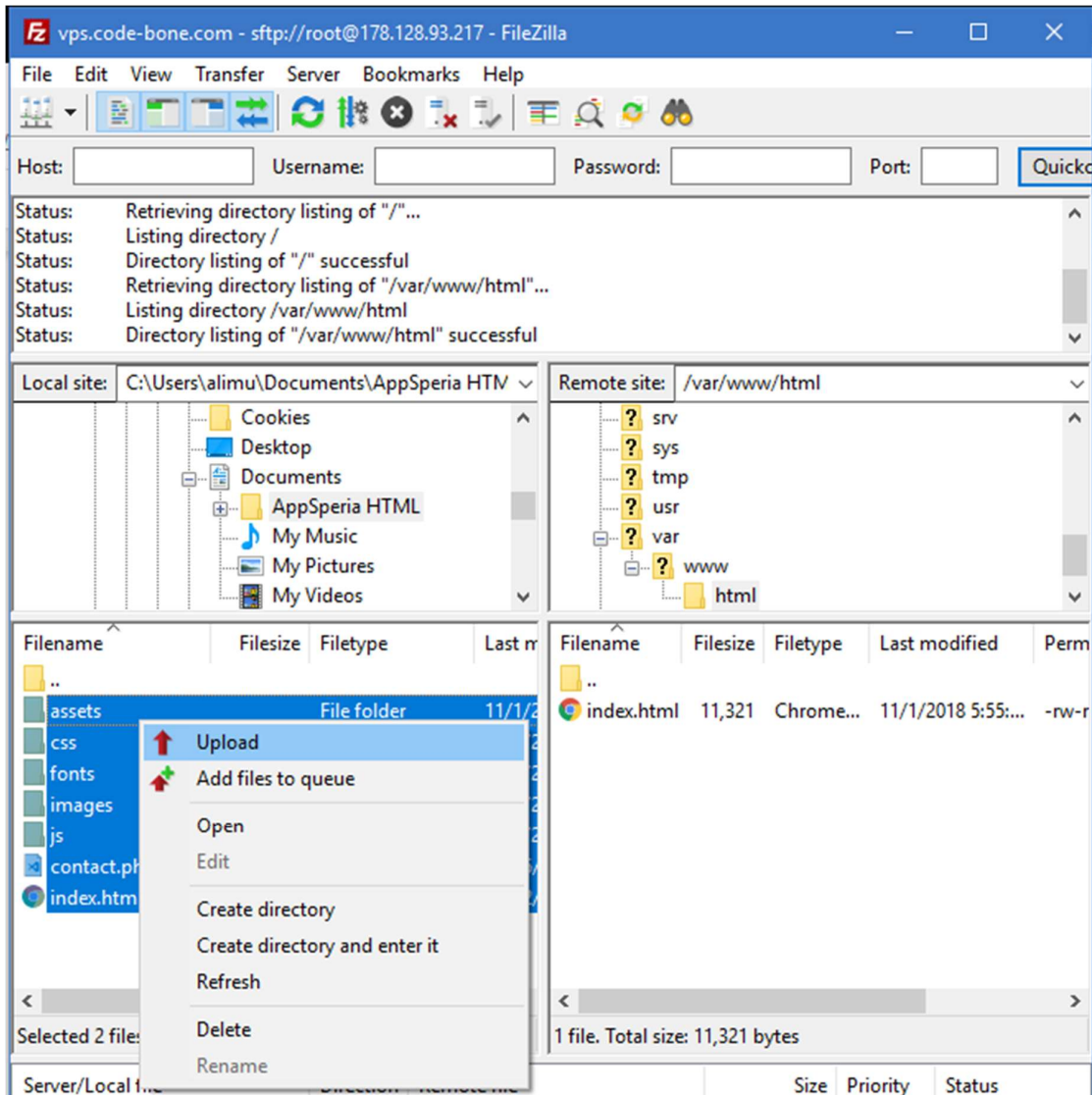


Figure 3.2.21: Uploading files using SFTP

Then we can visit our IP or hostname and we will see our newly uploaded website.

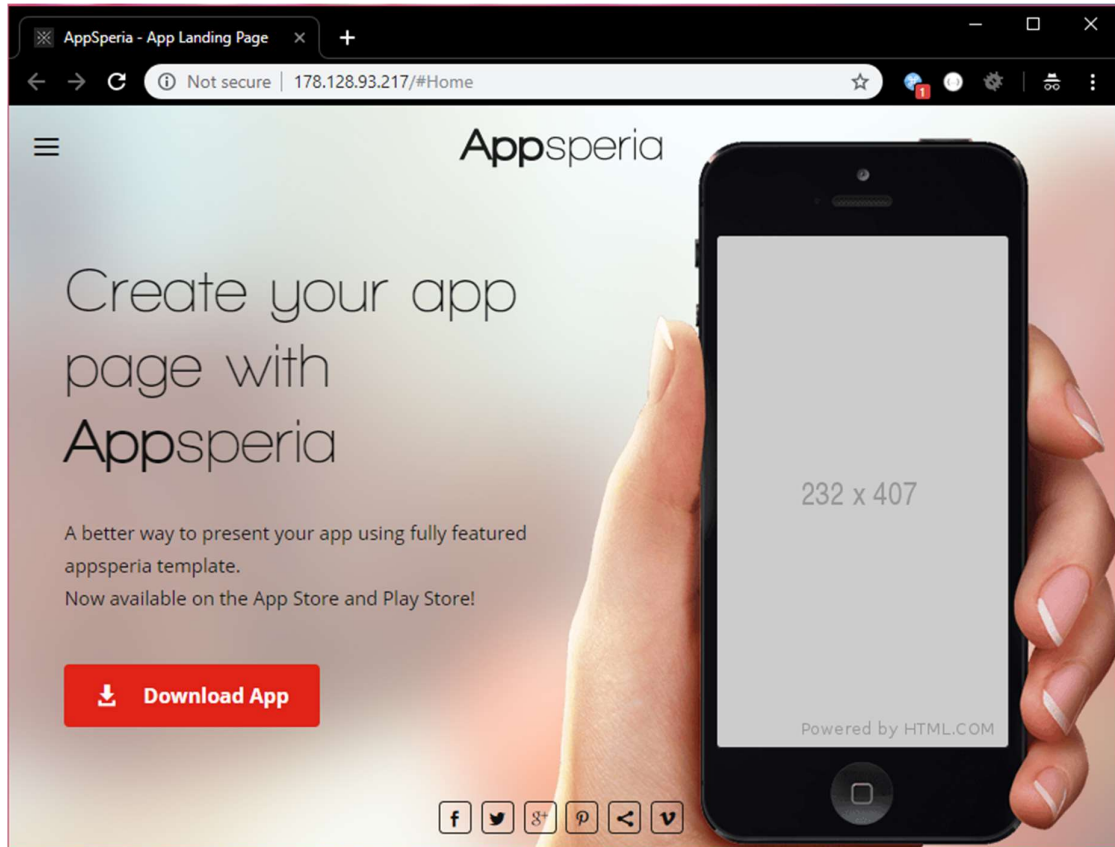


Figure 3.2.22: Newly uploaded web app in browser

### 3.3 Challenges

During internship period I have faced some challenging issues, such as sometimes huge amount of task, sometimes internet speed not reliable to work, some of tasks are high level so it is difficult to understand.

## CHAPTER 4

### CONCLUSION AND FUTURE CAREER

#### 4.1 Discussion and Conclusion

Advancement in the digital technologies has resulted in the ever-increasing trend of becoming more available and powerful, applications and cloud-based platforms are becoming widespread globally. Business startups are taking advantage of new PaaS capabilities to outsource tasks that would have otherwise relied on the typical local solutions. This all has been made possible through the advancement in cloud computing technology.

Some typical business applications have always been very expensive and complicated. The variety and the amount of hardware equipment and the software required to make them work are unnerving. A whole team of experts is required to install, configure, test, run, secure, and update the equipment.

When this effort is multiplied across dozens or hundreds of apps, it is easier to see that why the biggest companies with best IT departments are not getting the applications they need. Small and medium sized companies do not stand a chance. The affordability of cloud-hosted data makes it an important tool for such scenarios. Moreover, cloud computing allows the use of applications and adaptable programs that are customizable, while providing control to owners over the core code. It also provides opportunity to provide personalized applications and portals to a large number of tenants. And as it is hosted by a third party, businesses and other users have greater assurance of reliability, and in case, when there are problems, provide easy access to customer support. With the advent of Internet of Things (IoT), it is essential that software functions across almost every device and is able to integrate with other applications. Cloud applications can provide this service. Cloud computing can also guarantee a more secure environment for data storage, thanks to the increased resources for security and centralization of data.

#### 4.2 Scope for Further Career

Cloud Computing is the most popular and most talked about IT trend these days. Because it has assisted several organizations to save money, while adding convenience to its users. Both the big and small organizations, have deployed cloud technologies in their required suitable capacity depending on their need and requirements. Organizations need professionals with adept training and knowledge in both managerial and technical fields. So, the demand of IT professionals is keep on rising at exponential rates.

Candidates seeking to pursue a career in the field of Cloud Computing need to possess exceptional IT and programming abilities and skills. Required technical skills comprise of a strong hold on various programming languages, visualization technologies and the HTML.

Professionals seeking to get succeed in the managerial stream need to develop an understanding of issues associated with risk analytics, policy, agreements, online marketing strategies as well as the ability to deal more effectively with clients.

Most of the cloud technologies are virtualization environments. Aspirants, who are seeking to make best in the cloud, need to be adept in virtualization and networking and get hands-on exposure to some live deployments. Candidates can also experiment with their Cloud Technology Skills on some websites that offer online lab infrastructure. For example, Azure, Google Cloud and AWS among others [3].

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## APPENDICES

### Appendix: Company Detail



Head Office Name	Unix Lab Bangladesh
Address	8-9, West Agargaon, Flat #C5, Sher- E-Bangla Nagar, Dhaka-1207, Bangladesh.
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E-mail	admin@unixlab.com.bd
Website	<a href="https://unixlab.com.bd/">https://unixlab.com.bd/</a>

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