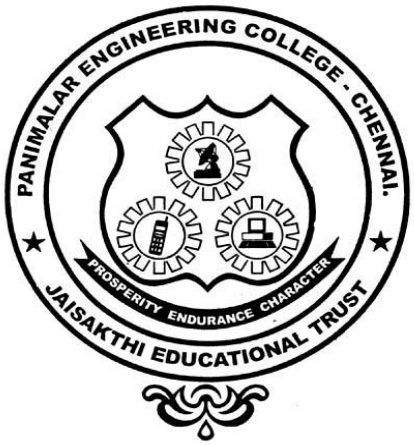
PANIMALAR ENGINEERING COLLEGE

(A CHRISTIAN MINORITY INSTITUTION)

JAISAKTHI EDUCATIONAL TRUST
ACCREDITED BY NATIONAL BOARD OF ACCREDITATION (NBA)
Bangalore Trunk Road, Varadharajapuram, Nasarathpettai,
Poonamallee, Chennai – 600 123.



RECORD NOTE BOOK

STUDENT NAME: ABHISHEK A R

DEPARTMENT : B.TECH. INFORMATION TECHNOLOGY

REGISTER NUMBER: 211419205002 **SEMESTERS:** SEVENTH

SUBJECT CODE & NAME: IT8711 – FOSS AND CLOUD COMPUTING LAB.

ACADEMIC YEAR: 2022 - 2023

TABLE OF CONTENTS

AVERAGE:

PANIMALAR ENGINEERING COLLEGE

(A CHRISTIAN MINORITY INSTITUTION)
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Bangalore Trunk Road, Varadharajapuram, Nasarathpettai,
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DEPARTMENT OF INFORMATION TECHNOLOGY

BONAFIDE CERTIFICATE

This is a Certified bonafide Record Book of Mr./Ms. ……

Register Number …..…… Submitted for Anna University Practical Examination held on _____ in IT8711 – FOSS AND CLOUD COMPUTING LABORATORY during December 2022.

Staff - In charge

External Examiner **Internal Examiner**

Exp. No. : 1
Date:22-08-2022

USE GCC TO COMPILE C-PROGRAMS. SPLIT THE PROGRAMS TO DIFFERENT MODULES AND CREATE AN APPLICATION USING MAKE COMMAND.

Aim̀ :

To create an application by split the programs to different modules using make command and gcc to compile c-programs .

Introduction :

Module : Separate a set of code into a self-contained entity.

A module is also referred as called a library , code that is in an already-compiled form.

Make File :

The make utility automatically determines which pieces of a large program need to be recompiled, and issues commands to recompile them.

You need a file called a *makefile* to tell make what to do. The makefile tells make how to compile and link a program.

Save in the same directory as the source file.

Use "tab" to indent the command (NOT spaces).

Syntax :

```
target: pre-requisites -1 pre-requisites -2 ...
        command
```

Note :

- The *target* and *pre-requisites* are separated by a colon (:). The *command* must be preceded by a tab (NOT spaces).
- A *target* is usually the name of a file that is generated by a program.
- A target can also be the name of an action to carry out
- A *prerequisite* is a file that is used as input to create the target.
- *command* is an action that make carries out.
- **you need to put a tab character at the beginning of every *command* line!**

Automatic Variables

Automatic variables are set by make after a rule is matched. There include:

- $@: the target filename.

- $*: the target filename without the file extension.
- $<: the first prerequisite filename.
- $^: the filenames of all the prerequisites, separated by spaces, discard duplicates.
- $+: similar to $^, but includes duplicates.
- $?: the names of all prerequisites that are newer than the target, separated by spaces.

A target that does not represent a file is called a **phony target.**

You can use **VPATH (uppercase**) to specify the directory to search for dependencies and target files.

Procedure :

To create a C module for the grade functions

1. We need to create 2 new source code files: **grades.h** file and **grades.c** file
2. **Grades.h** file contain details about the *interface (i.e.Functional prototypes)* to the module.
3. **Grades.c** file contain details about the *implementation* of the module which is already declared in .h file
4. **Adjust.c** file consist of main program and *user* of the grades module
5. The PrintGrades(float grades[], int howmany) module is used for Grades are all printed on one line separated by spaces and terminated by a newline.
6. The AdjustGrades(float grades[], float adjustments[], int howmany) module is Adjusts each grade in the `grades' array using the corresponding change in the `adjustments' array.
7. The AdjustedGrade(float grade, float adjustment) module is Adjusts one grade and returns the new grade.
8. Create the Make file named as "Makefile " to run the grade application in c program.
9. Draw the dependency chart for know exactly what commands are needed to generate the pieces that make up the executable.
10. Stop the process

Program :

grades228.h

```
/************************ Function Prototypes **********************/
void PrintGrades(float grades[], int howmany);
void AdjustGrades(float grades[],   float adjustments[],  int howmany);
float AdjustedGrade(float grade, float adjustment);
```

grades228.c

```
#include <stdio.h>
```

```
#include "grades228.h"


void PrintGrade(float grades[], int howmany)
{
      int  i;
      for (i = 0; i <howmany; i++)
       {
      printf(" %.2f", grades[i]);
       }
      printf("\n");
}
void AdjustGrades(float grades[], float adjustments[], inthowmany)
{
    floatnewGrade;
    int i;
    for (i = 0; i <howmany; i++)
    {
    /* This two-step assignment can be done in one step. */
          newGrade = AdjustedGrade(grades[i], adjustments[i]);
          grades[i] = newGrade;
     }
}
float AdjustedGrade(float grade, float adjustment)
{
    grade += adjustment;
    return grade;
}
```

adjust228.c

```
#include <stdio.h>
#include "grades228.h"
 #define MAX_GRADES  10
int main()
{
```

```
float adjustments[MAX_GRADES];          /* Grade adjustments for all students. */
float grades[MAX_GRADES];                /* Grades for current student.        */
int numGrades;                           /* Number of adjustments.             */
int numStudents;                         /* Number of students.                */
int studentNum;                          /* Index of current student.          */
int i;
printf("How many grades per student? ");
scanf("%d", &numGrades);
if (numGrades< 1 || numGrades> MAX_GRADES) {
printf("I can only handle ..%d grades!", MAX_GRADES);
exit(1);  /* Terminate program, return error status. */
  }
for (i = 0; i <numGrades; i++) {
printf("\nEnter adjustment for %d> ", i+1);
scanf("%f", &adjustments[i]);
  }
printf("\nHow many students? ");
scanf("%d", &numStudents);
for (studentNum = 1; studentNum<= numStudents; studentNum++) {
printf("\n");
    /* Get each grade for the current student. */
printf("Student #%d\n", studentNum);
for (i = 0; i <numGrades; i++) {
printf("\nEnter grade for %d :  ", i+1);
scanf("%f", &grades[i]);
    }
    /* Print grades before and after adjustment. */
printf("\n\nOld Student #%d grades:", studentNum);
PrintGrades(grades, numGrades);
AdjustGrades(grades, adjustments, numGrades);
printf("\nNew Student #%d grades:", studentNum);
PrintGrades(grades, numGrades);
  }
```

return 0;

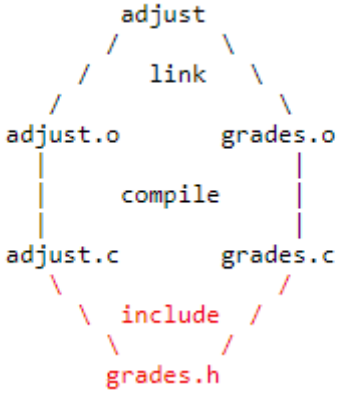
}

Makefile

```
# Makefile for executable adjust
# Parameters to control Makefile operation
CC = gcc
CFLAGS = -ansi -pedantic -Wall -g
# ******************************************************
# Entries to bring the executable up to date

adjust: adjust.ograde s.o
        $(CC) $(CFLAGS) -o adjust adjust.ograde s.o
adjust.o: adjust.cgrade s.h
        $(CC) $(CFLAGS) -c adjust.c
grade s.o: grade s.cgrade s.h
        $(CC) $(CFLAGS) -c grade s.c
```

Dependency Chart :

- The executable **adjust228** is made up of the 2 object files, **adjust228.o** and **grades228.o**. Thus, **adjust** *depends* on those 2 files. To generate **adjust** from those files, we *link* them together.
- Next, **adjust228.o** depends on **adjust228.c** and **grades228.o** depends on **grades228.c**.
- Finally, the 2 source code files depend on **grades228.h** since they both *include* that file.



Sample Input and Output :

How many grades per student? 5

Enter adjustment for 1> 1

Enter adjustment for 2> 2

Enter adjustment for 3> 3

Enter adjustment for 4> 2

Enter adjustment for 5> 1

How many students? 2

Student #1

Enter grade for 1 : 67

Enter grade for 2 : 85

Enter grade for 3 : 95

Enter grade for 4 : 65

Enter grade for 5 : 79

Old Student #1 grades: 67.00 85.00 95.00 65.00 79.00

New Student #1 grades: 68.00 87.00 98.00 67.00 80.00

Student #2

Enter grade for 1 : 95

Enter grade for 2 : 84

Enter grade for 3 : 85

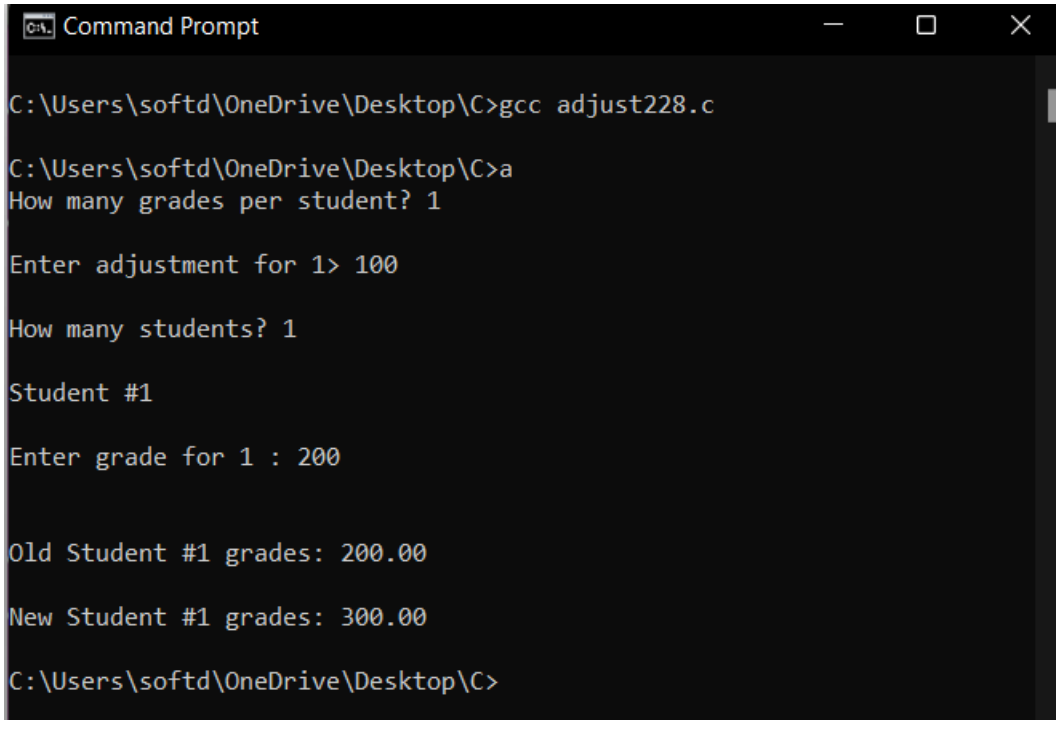
Enter grade for 4 : 95

Enter grade for 5 : 69

Old Student #2 grades: 95.00 84.00 85.00 95.00 69.00

New Student #2 grades: 96.00 86.00 88.00 97.00 70.00

Output:



Result :

The development of grade application by split the programs to different modules using make command and gcc to compile c-programs was successfully written ,executed and verified.

Exp. No. : 1b
Date:29-08-2022

USE GCC TO COMPILE C-PROGRAMS. SPLIT THE PROGRAMS TO DIFFERENT MODULES AND CREATE AN APPLICATION USING MAKE COMMAND.

Aim :

To create an application by split the programs to different modules using make command and gcc to compile c-programs .

Introduction :

Module : Separate a set of code into a self-contained entity. A module is also referred as called a library , code that is in an already-compiled form.

Make File :

The make utility automatically determines which pieces of a large program need to be recompiled, and issues commands to recompile them. You need a file called a makefile to tell make what to do. The makefile tells make how to compile and link a program. Save in the same directory as the source file. Use "tab" to indent the command (NOT spaces).

Syntax :

Note :

- The target and pre-requisites are separated by a colon (:). The command must be preceded by a tab (NOT spaces).
- A target is usually the name of a file that is generated by a program. A target can also be the name of an action to carry out A prerequisite is a file that is used as input to create the target.
- command is an action that make carries out.
- you need to put a tab character at the beginning of every command line!

Automatic Variables:

Automatic variables are set by make after a rule is matched.

- There include: $@: the target filename.
- $*: the target filename without the file extension.
- $<: the first prerequisite filename.
- $^: the filenames of all the prerequisites, separated by spaces, discard duplicates.
- $?: the names of all prerequisites that are newer than the target, separated by spaces.

- A target that does not represent a file is called a phony target. You can use VPATH (uppercase) to specify the directory to search for dependencies and target files.

Procedure :

1. We need to create 2 new source code files: currency228.h file and currency228.c file
2. Currency228.h file contain details about the interface (i.e.Functional prototypes) to the module.
3. Currency228.c file contain details about the implementation of the module which is already declared in .h file
4. Adjust228.c file consist of main program and user of the grades module
5. The PrintGrades(float grades[], int howmany) module is used for Grades are all printed on one line separated by spaces and terminated by a newline.
6. The AdjustGrades(float grades[], float adjustments[], int howmany) module is Adjusts each grade in the `grades' array using the corresponding change in the `adjustments' array.
7. The AdjustedGrade(float grade, float adjustment) module is Adjusts one grade and returns the new grade.
8. Create the Make file named as “Makefile “ to run the grade application in c program.
9. Draw the dependency chart for know exactly what commands are needed to generate the pieces that make up the executable.
10. Stop the process.

Program :

Currency228.h

```
/************************ Function Prototypes **********************/

float Inr To Usd(int inr Value);

float Usd To Inr(int usdValue);
```

currency228.c

```
#include <stdio.h>
#include "currency228.h"

float Inr To Usd(int inr Value)
{
    float newValue;
    if (inrValue)
    {
        newValue = inr Value / 79.35;
        return newValue;
    }
    else
    {
        return 0;
    }
}
float UsdToInr(int usdValue)
{
    float newValue;
    if (usdValue)
```

```
    {
        newValue = usdValue * 79.35;
        return newValue;
    }
    else
    {
        return 0;
    }
}
```

Adjust228.c

```
#include <stdio.h>
#include "currency228.h"
#include "currency228.c"
#include <stdlib.h>
int main()
{
int selectedOption; int moneyValue; printf("This is money converter");
    printf("\n"); printf("\n"); printf("Press 1 to INR to USD, Press 2 to USD to INR");
    scanf("%d", &selectedOption);
    printf("Enter amount value");
    scanf("%d", &moneyValue);
```

```
    if (selectedOption == 1)
    {
        float value = InrToUsd(moneyValue);
        printf("\nThe USD value is %f:", value);
        return 0;
    }else{
        float value = UsdToInr(moneyValue);
        printf("\nThe INR value is %f:", value);
        return 0;
    }
}
```

Makefile

```
  # Makefile for executable adjust
# Parameters to control Makefile operation CC
= gcc,
CFLAGS = -ansi -pedantic -Wall -g
  # ************************************************
  # Entries to bring the executable up to date
adjust: adjust228.ograde s228.o
$(CC) $(CFLAGS) -o adjust adjust228.ograde s228.o
adjust228.o: adjust.cgrades.h
        $(CC) $(CFLAGS) -c adjust.c
```

grades228.o: grades.cgrades.h

$(CC) $(CFLAGS) -c grades.c

Dependency Chart :

The executable **adjust** is made up of the 2 object files, **adjust228.o** and **grades228.o**. Thus, **adjust** *depends* on those 2 files. To generate **adjust** from those files, we *link* them together.

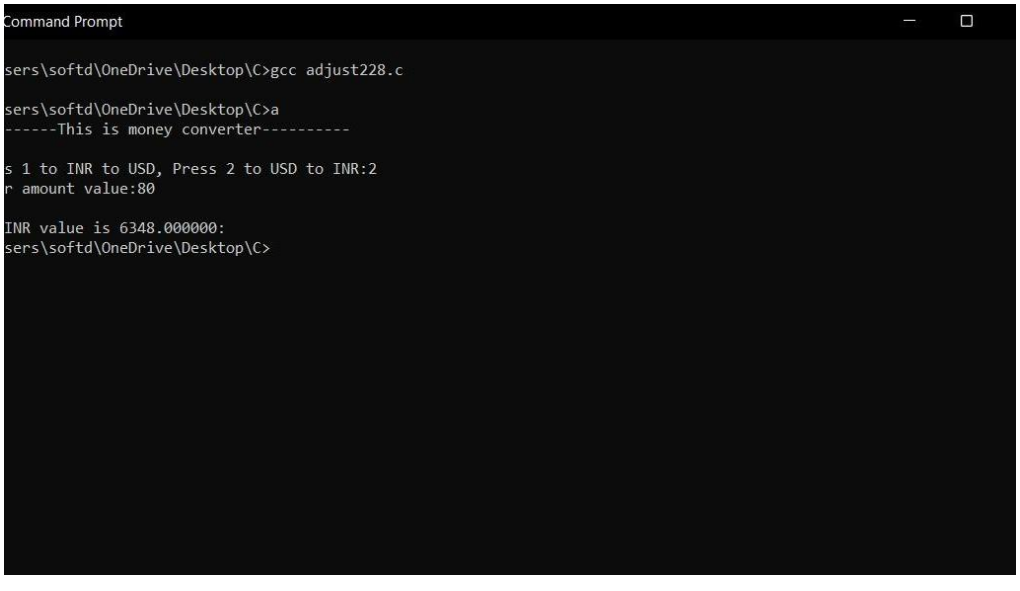
Next, **adjust228.o** depends on **adjust228.c** and **grades228.o** depends on **grades228.c**.

Finally, the 2 source code files depend on **grades228.h** since they both *include* that file.

Sample Input and Output : This is money Converter

Press 1 to INR to USD, Press 2 USD to INR Enter amount value 10

The INR value is 793.5000000



Result :

The development of grade application by split the programs to different modules using make command and gcc to compile c-programs was successfully written ,executed and verified.

Exp. No. : 2
Date:29-08-2022

USE VERSION CONTROL SYSTEMS COMMAND TO CLONE, COMMIT, PUSH, FETCH, PULL, CHECKOUT, RESET, AND DELETE REPOSITORIES.

`

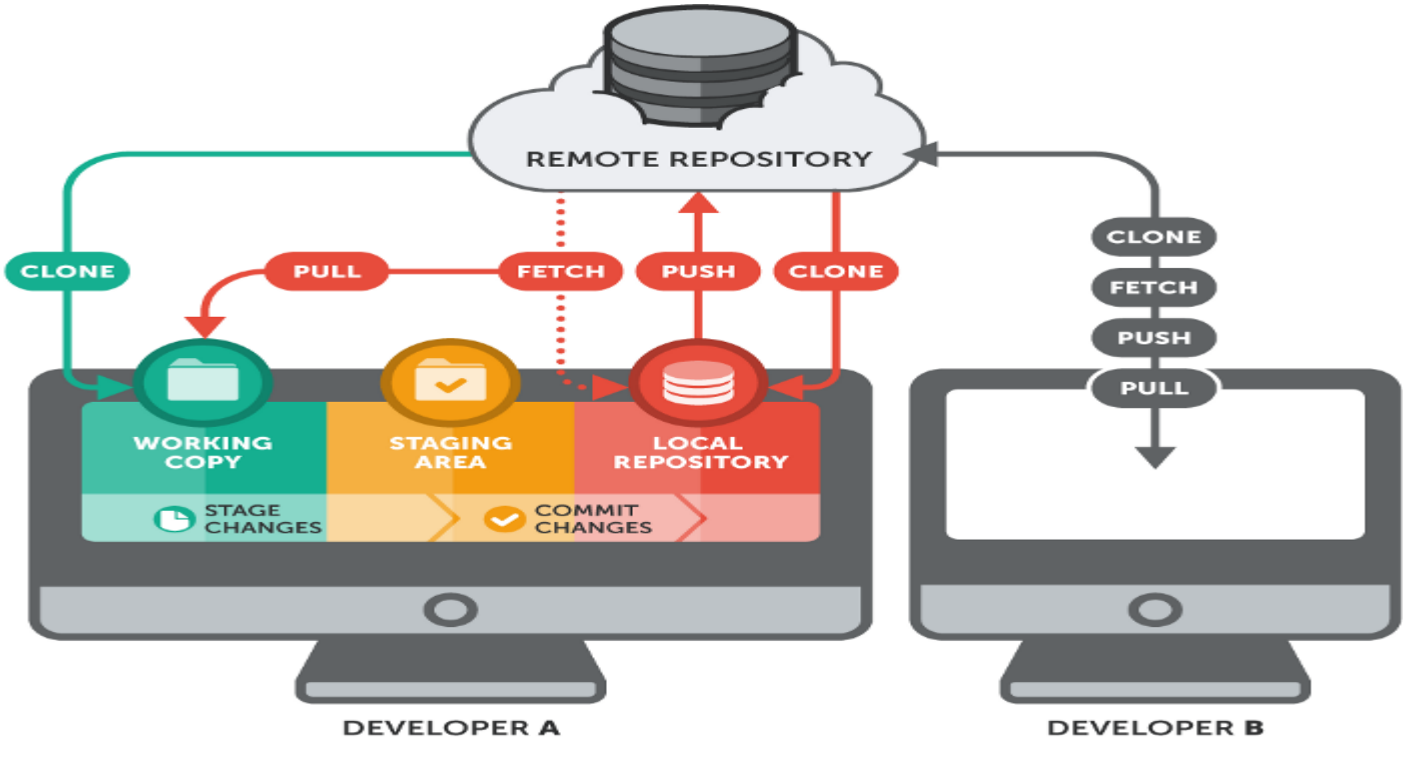
Aim :

To use the version control systems command to clone, commit, push, fetch, pull, checkout, reset, and delete repositories.

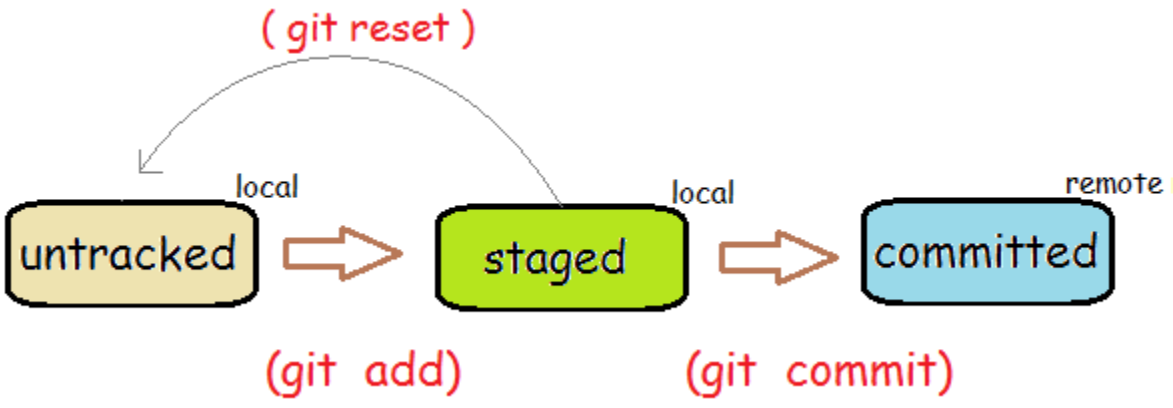
Procedure :

Introduction :

- A **repository** is a place where you will have your codes or you can imagine a foreground server.
- Git is a fast distributed revision control system.
- **Git** is a *version control system (software)* and **GitHub** is a *source code hosting service*. Git is a version control system for tracking changes in computer files and coordinating work on those files among multiple people
- Git is best thought of as a tool for storing the history of a collection of files. It stores the history as a compressed collection of interrelated snapshots of the project's contents. In Git each such version is called a commit.



A file in git goes through the following stages:



Your local repository consists of three "**trees**" maintained by git.

1) The first one is your **Working Directory** which holds the actual files.
2) The second one is the **Index** which acts as a **staging area** and
3) Finally the **HEAD** which points to **the last commit** you've made.

The Working Tree is the area where you are currently working. It is where your files live. This area is also known as the "***untracked***" area of git.

The **StagingArea** is when git starts tracking and saving changes that occur in files. The saved changes reflect in the .git directory. That is about it when it comes to the Staging Area.

- How can you see what is in your Working Tree?
- Run the command ***git status.*** This command will show you **two things**:
  - **The files in your Working Tree** and
  - **the files in your Staging Area.**
- Work may simultaneously proceed along parallel lines of development, called **branches**, which may merge.
- A single Git repository **can track development on multiple branches**. It does this by keeping a list of **heads** which reference the latest commit on each branch
  - **$ git branch**
  - *** master**

Branch :

- "branch" **to mean a line of development**, and "branch head" (or just "head") **to mean a reference to the most recent commit on a branch**

Manipulating branches:

- **git branch**
  - list all branches.
- **git branch <branch>**
  - create a new branch named <branch>, referencing the same point in history as the current branch.
- **git branch <branch><start-point>**
  - create a new branch named <branch>, referencing <start-point>, which may be specified any way you like, including using a branch name or a tag name.
- **git branch -d <branch>**
  - delete the branch <branch>; if the branch is not fully merged in its upstream branch or contained in the current branch, this command will fail with a warning.
- **git branch -D <branch>**
  - delete the branch <branch> irrespective of its merged status.
- **git switch <branch>**
  - make the current branch <branch>, updating the working directory to reflect the version referenced by <branch>.
- **git switch -c <new><start-point>**
  - create a new branch <new> referencing <start-point>, and check it out.
- The special symbol "HEAD" can **always be used to refer to the current branch.** In fact, Git uses a file named HEAD in the .git directory to remember which branch is current:
- **$ cat .git/HEAD**

  ref: refs/heads/master
- **Examining branches from a remote repository**
- **$ git branch -r**
  - **origin/HEAD**
  - **origin/html**
  - **origin/maint**
  - **origin/man**
  - **origin/master**

- **origin/next**
- **origin/seen**
- **origin/todo**

$ git tag -l

v2.6.11

v2.6.11-tree

v2.6.12

v2.6.12-rc2

v2.6.12-rc3

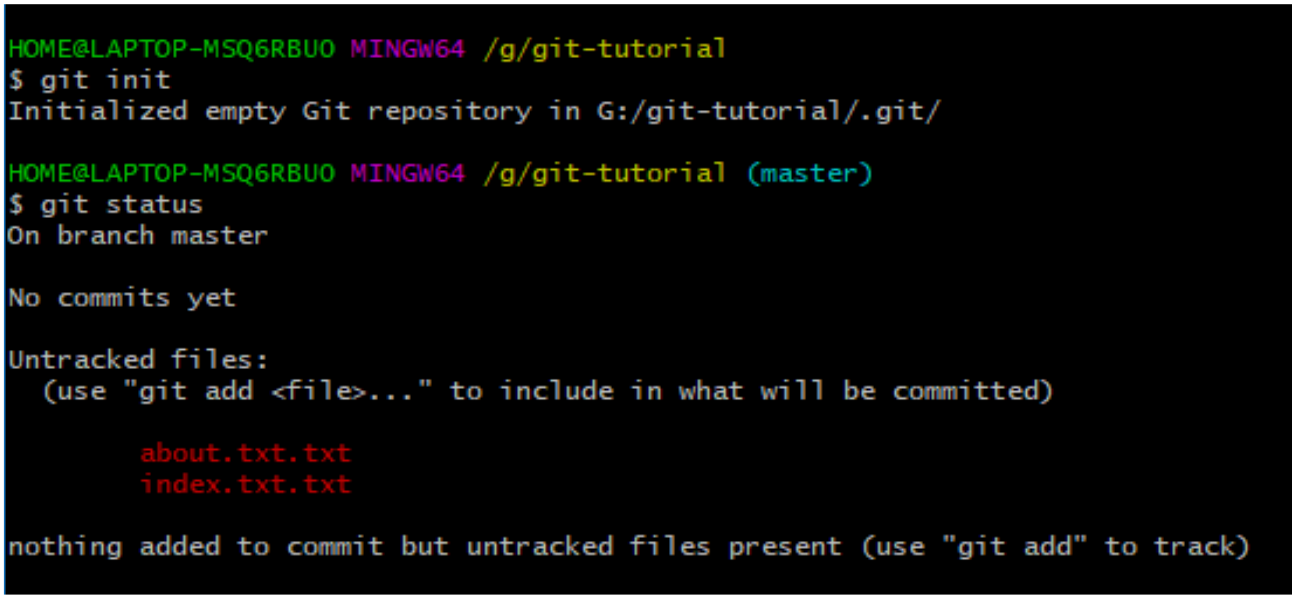
v2.6.12-rc4

v2.6.12-rc5

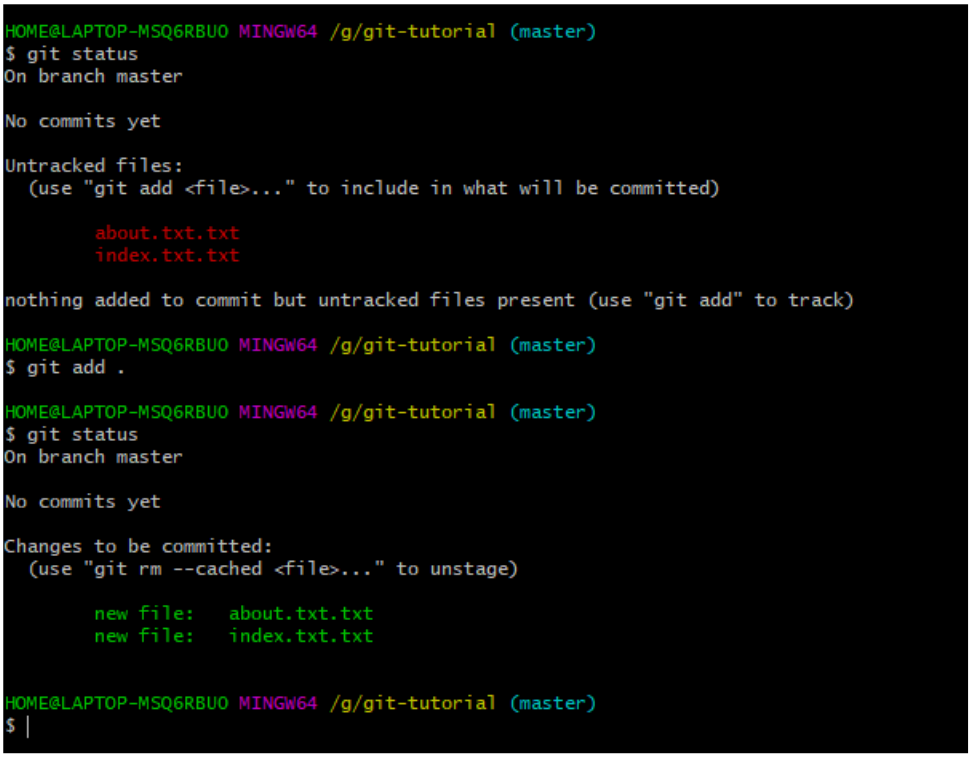
v2.6.12-rc6

v2.6.13

- **Tags** are expected to **always point at the same version of a project**, while **heads** are expected **to advance as development progresses**
- So, First, you need to run ***gitinit*** command, because it will create a new git repository and then after you can perform ***git status the*** command to check to your in Working Tree.
- You can see that the ***untracked files*** are shown **in red color**. If you don't run the gitinit command you will get an error, which looks like something in the image below.



- Running the command ***git add [filename]*** will add a specific file to the Staging Area from your Working Tree. If you want to add everything from the Working Tree, then run the command ***gitadd .*** The dot (.) operator is a wildcard meaning all files



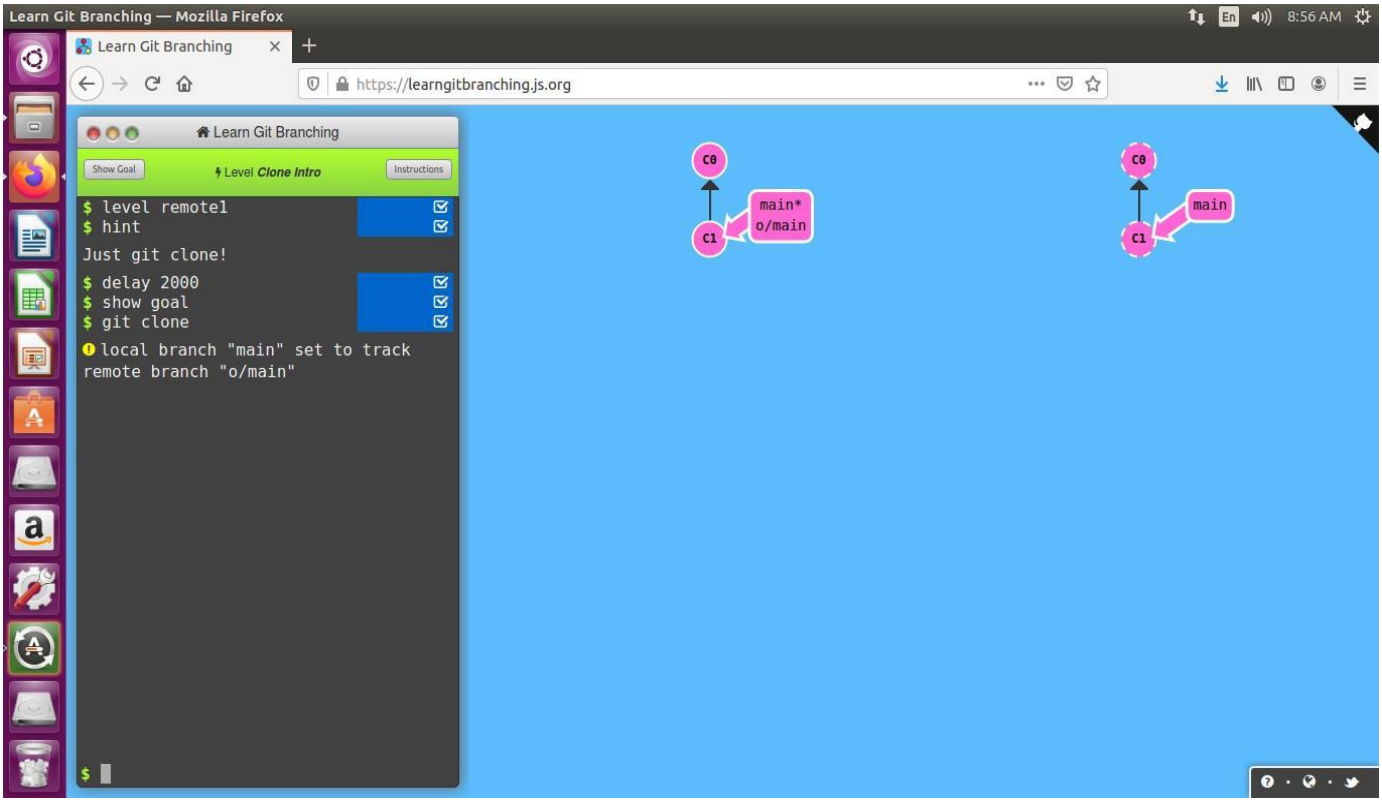
The **clone command :**

The **clone command creates a new directory named after the project** (git or linux in the examples above). After you cd into this directory, you will see that it contains a copy of the project files, called the working tree, together with a special top-level directory named .git

Syntax :git clone [URL]

- # Git itself (approx. 40MB download):
    - **$ git clone git://git.kernel.org/pub/scm/git/git.git**
- # the Linux kernel (approx. 640MB download):
    - **$ git clone git://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git**

A new local respository is automatically created, with the github version configured as a remote. The initial clone may be **time-consuming for a large project**, but you will **only need to clone once.**

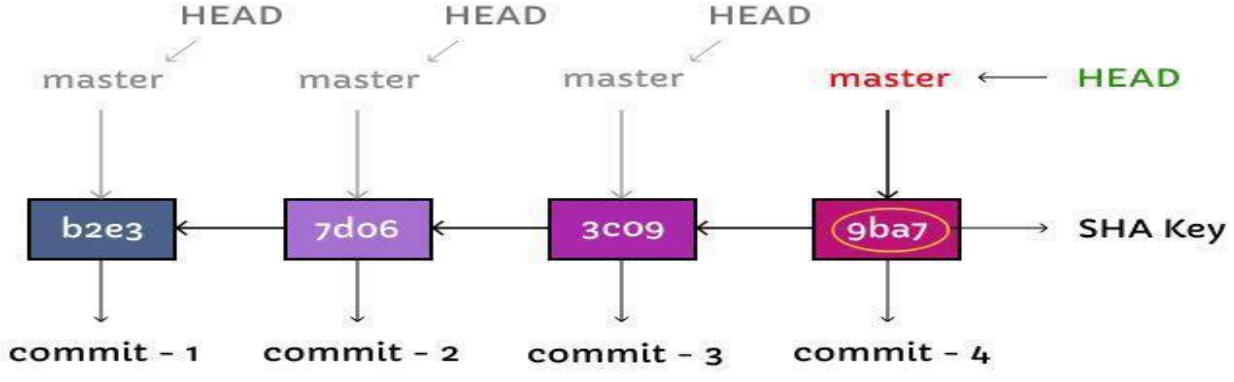


The git commit command :

A commit in a git repository records a snapshot of all the (tracked) files in your directory. It's like a giant copy and paste, but even better.

How is git commit command works internally?

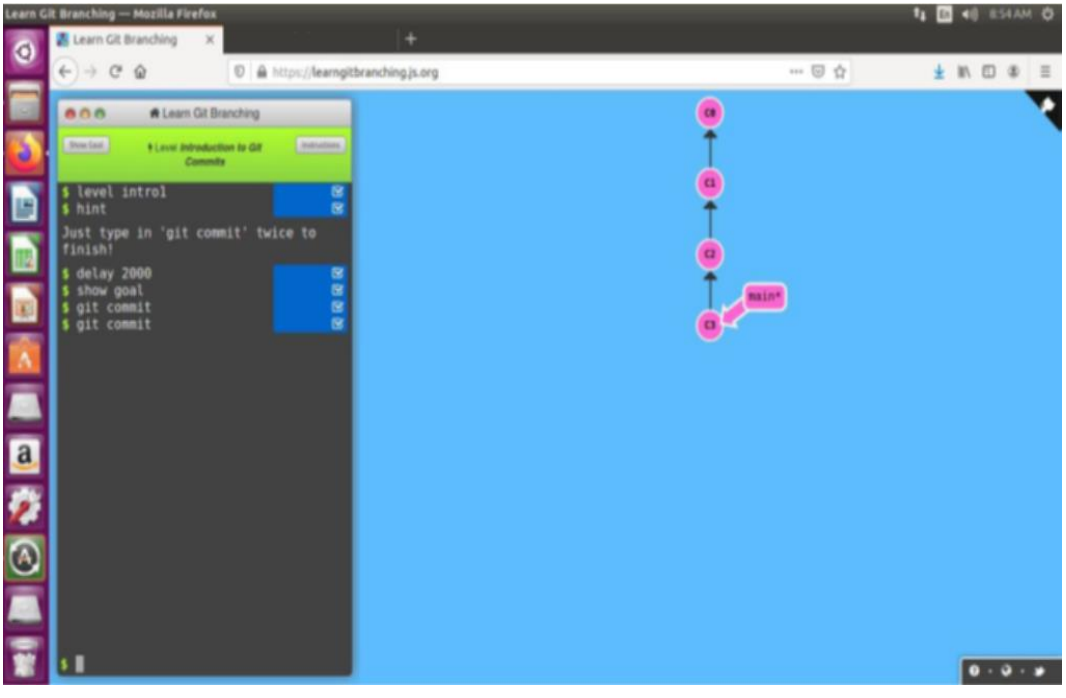
The above image shows the working of git commit command. In which the four blocks represent the commit with the unique **SHA** commit key. Suppose, you are on the **master** branch and you did a commit now git internally will create a block (node) of a commit you did. In git, we have a pointer called **HEAD** (It is the reference to the commit in the current branch in our case i.e master). When you commit something the HEAD will be pointed to our commit in our case the commit hash key is **b2e3 .** If you made another commit now HEAD will move and point to commit having a hash key **7d06** means the parent of the **7d06** commit



is **b2e3** because it holds the reference of the previous commit. As you see our last commit is **9ba7** and the parent of this commit is **3c09** and our HEAD is pointing to **9ba7** commit.

Syntax :git commit -m "[Type in the commit message]"

$ git commit -m " First Commit"



- Every change in the history of a project is represented by a commit.
- **A commit shows who made the latest change, what they did, and why.**
- The git-show command shows the ***most recent commit on the current branch***:
  - **$ git show**

    commit 17cf781661e6d38f737f15f53ab552f1e95960d7

    Author: Abcchand

    Date: Tue Nov 3 14:11:06 2020 -0700

    Remove duplicate getenv(DB_ENVIRONMENT) call

    Noted by Tony Luck.

    diff --git a/init-db.c b/init-db.c

    index 65898fa..b002dc6 100644

    --- a/init-db.c

    +++ b/init-db.c

    @@ -7,7 +7,7 @@

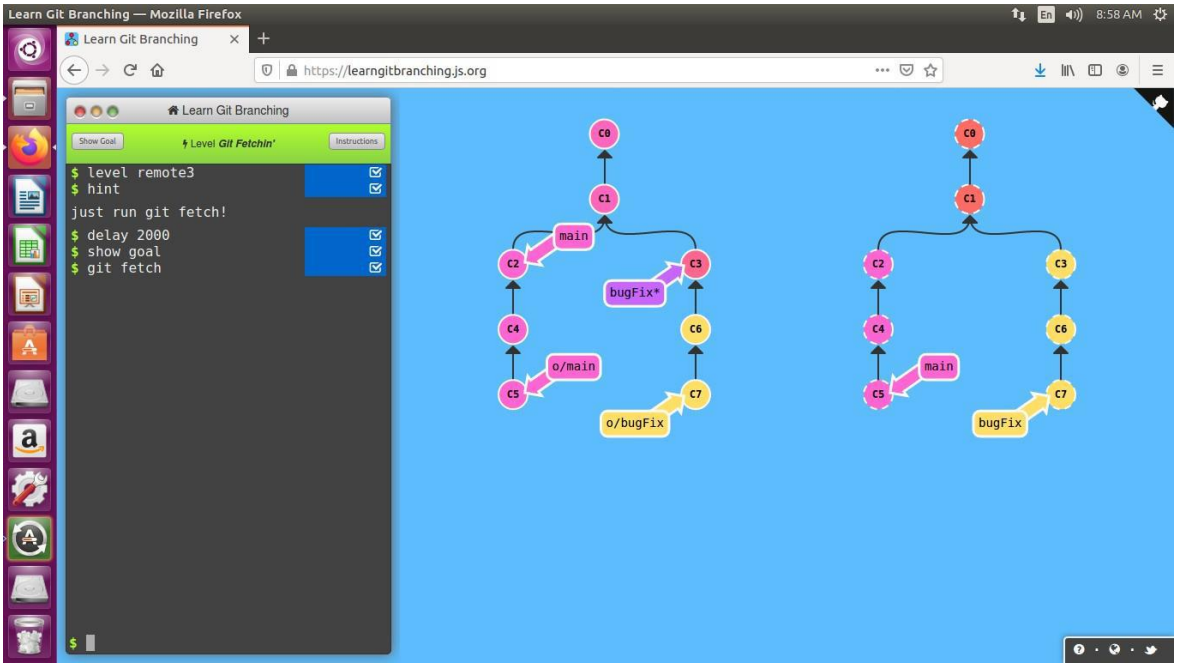
The git fetch command :

- The gitfetch command, with no arguments, will update all of the remote-tracking branches to the latest version found in the original repository.

Update the remote-tracking branches:

$ git fetch origin

When we run this command, a copy of our remote repository (located at “origin”) is downloaded and saved to our local machine. However, the local copy of our code has not yet been changed.



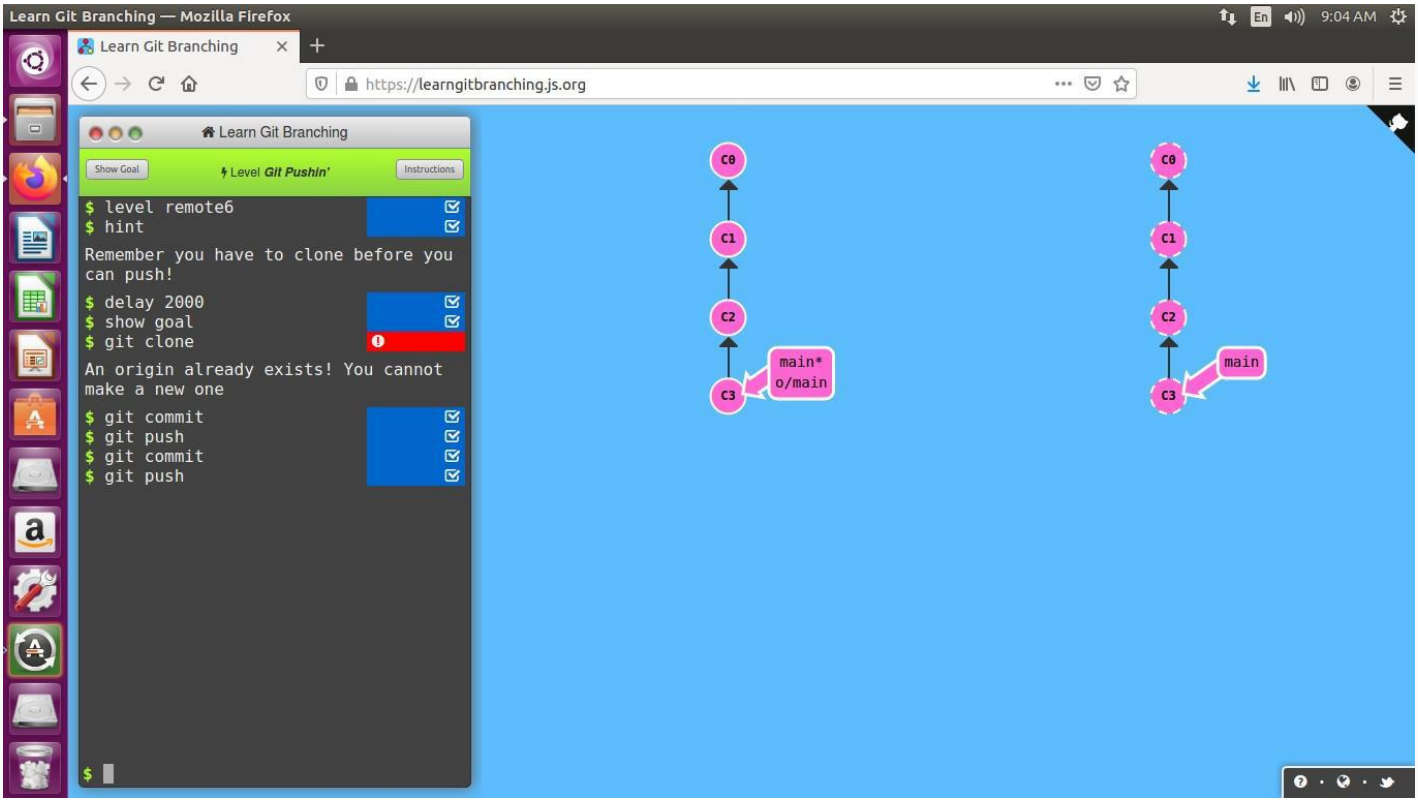
Uploading to a server - git push :

To transfer our local commits to the server. This process is called a **push**, and is done every time we want to update the remote repository.

The Git command to do this is git push and **takes two parameters** - the **name of the remote repo** (we called ours ***origin***) and the **branch to push** to (***master*** is the default branch for every repo).

$ git push origin master

```
Counting objects: 3, done.
Writing objects: 100% (3/3), 212 bytes | 0 bytes/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://github.com/tutorialzine/awesome-project.git
 * [new branch]      master -> master
```

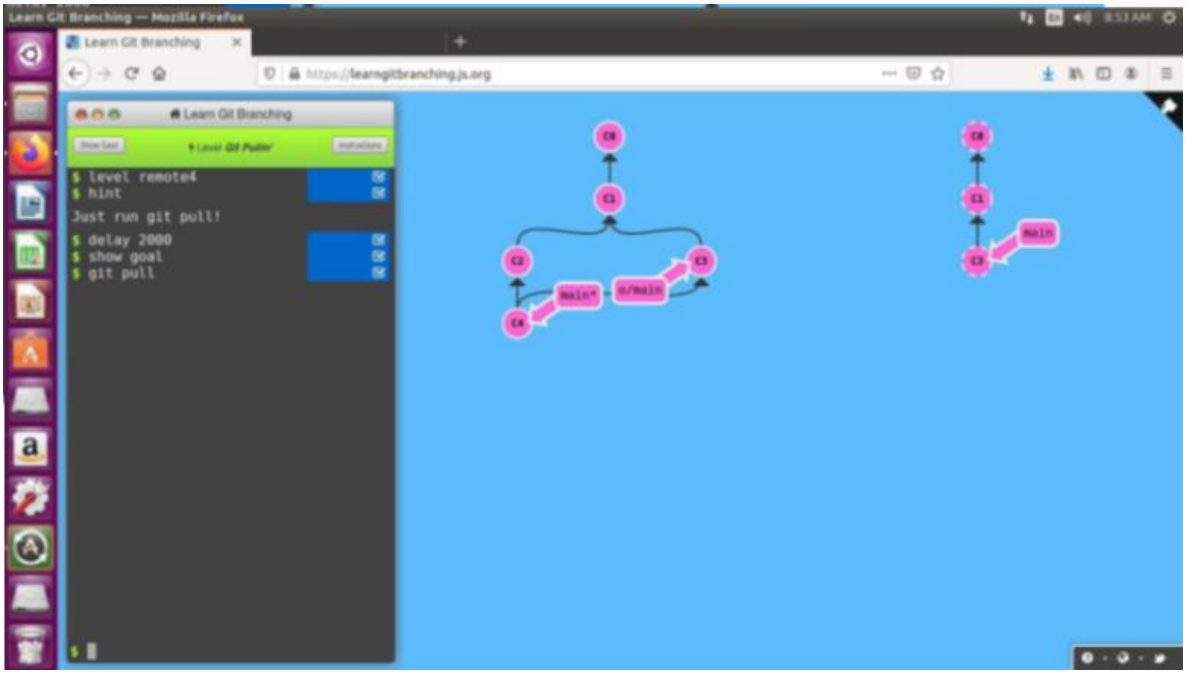


Getting changes from a server – git pull :

If you make updates to your repository, people can download your changes with a single command - **pull**:

$ git pull origin master

From https://github.com/tutorialzine/awesome-project
 * branch master -> FETCH_HEAD
Already up-to-date.



Creating new branches - gitbranch :

The default branch of every repository is called ***master***. To create additional branches use the git branch <name> command:

$ git branch FinalIT

This just creates the new branch, which at this point is exactly the same as our *master*.

Switching branches - gitcheckout :

Now, when we run git branch, we will see there are two options available:

$ git branch

FinalIT

*** master**

Master is the current branch and is marked with an asterisk. However, we want to work on our new FinalIT, so we need to switch to the other branch. This is done with the git checkout command, expecting one parameter - the branch to switch to.

$ git checkout FinalIT

$ git branch

master

*** FinalIT**

Switched to branch '**FinalIT** '

The git reset command :

This command undoes all the commits after the specified commit and preserves the changes locally.

The git reset command allows you to RESET your current head to a specified state. You can reset the state of specific files as well as an entire branch.

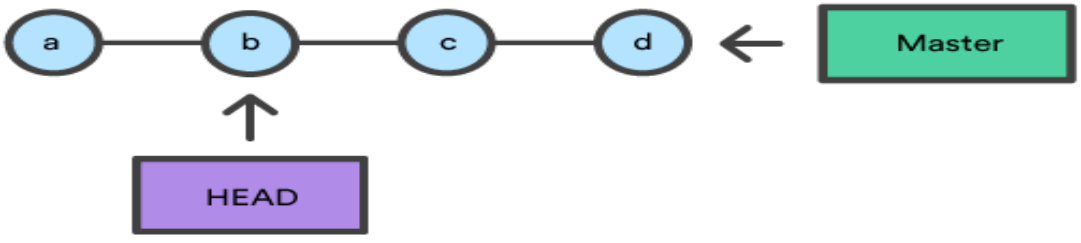
Git reset is similar in behavior to git checkout. Where git checkout solely operates on the HEAD ref pointer, **git reset will move the HEAD ref pointer and the current branch ref pointer**. To better demonstrate this behavior consider the following example:

This example demonstrates a sequence of commits on the master branch. The HEAD ref and master branch ref currently point to commit d. Now let us execute and compare, both

$ git checkout b

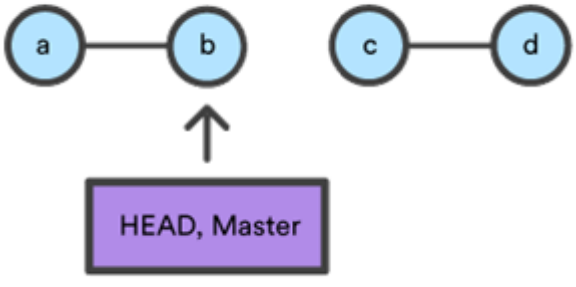
$ git reset b.

$git checkout b



With git checkout, the master ref is still pointing to d. The HEAD ref has been moved, and now points at commit b. The repo is now in a 'detached HEAD' state.

$git reset b



Comparatively, git reset, moves both the HEAD and branch refs to the specified commit.

Git rm :

This command deletes the file from your working directory and stages the deletion.

Syntax :git rm [file]

Example :

$ **git rm sample.txt**

$ git branch -d finalit

This command deletes the finalit branch

Result :

The useof version control systems command to clone, commit, push, fetch, pull, checkout, reset, and delete repositories was learned and verified successfully.

Exp. No. : 3a
Date:5-09-2002

INSTALL VIRTUALBOX/VMWARE WORKSTATION WITH DIFFERENT FLAVOURS OF LINUX OR WINDOWS OS ON TOP OF WINDOWS7 OR 8.

Aim :

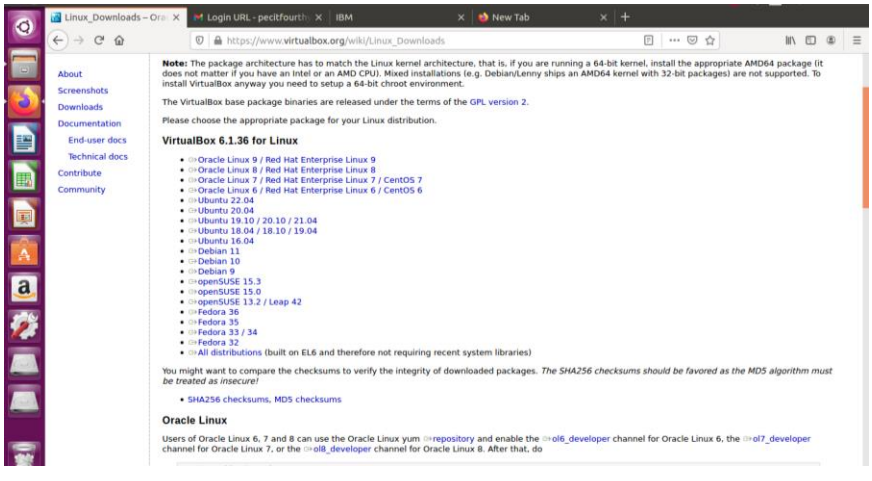
To find and learn the procedure to Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.

Procedure :

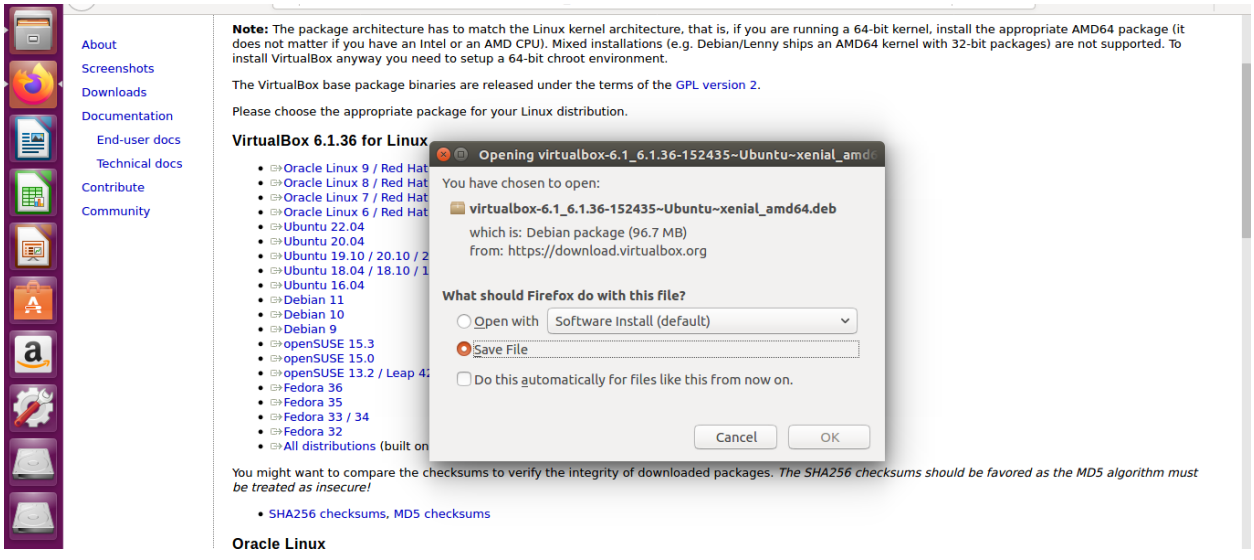
Install Virtualbox :

1. **Open the VirtualBox website.** Go to **https://www.virtualbox.org/** in your computer's Internet browser.

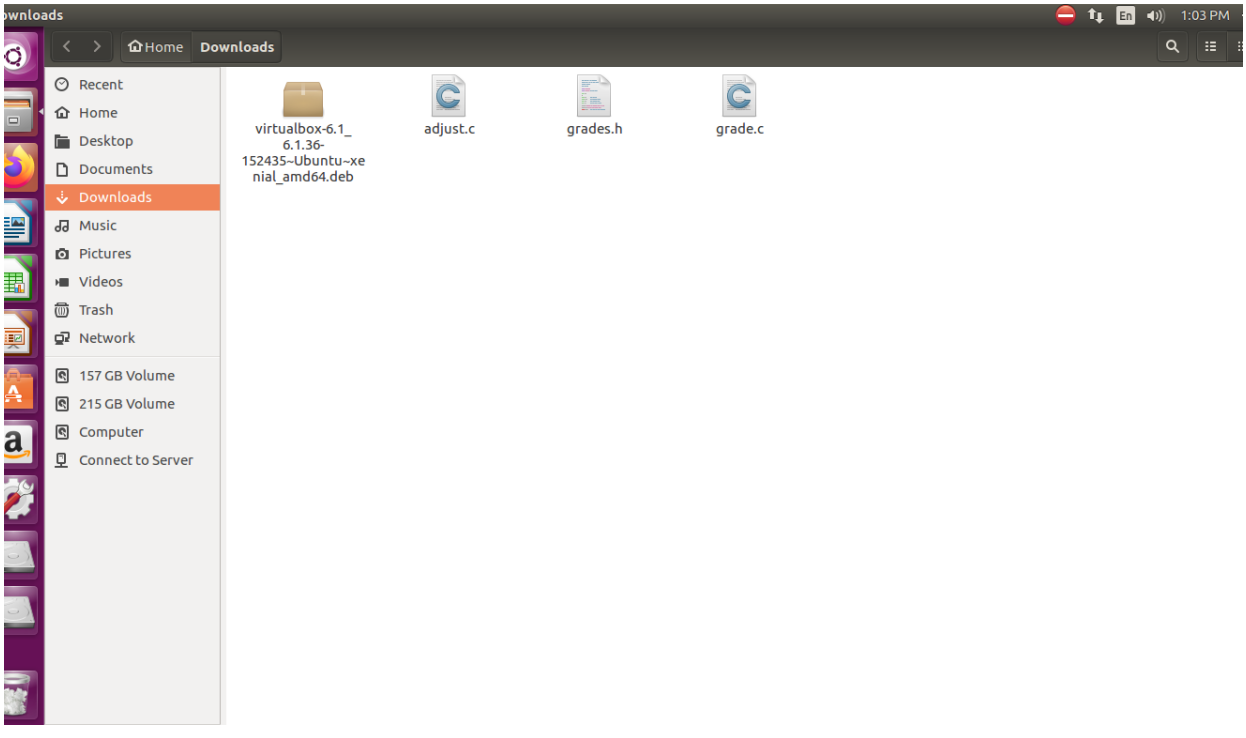
2. **Click Download VirtualBox .**



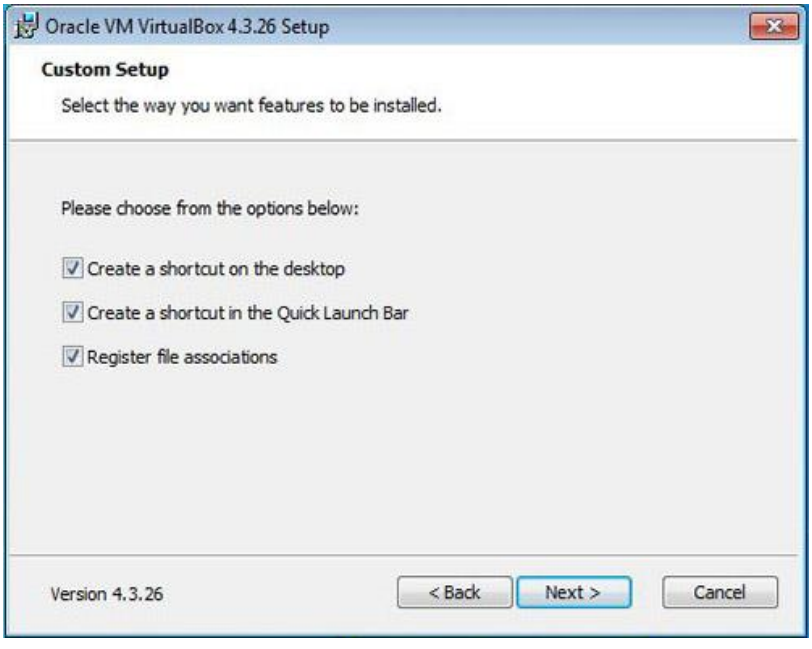
3. **Click Windows hosts.** You'll see this link below the "VirtualBox 6.1.14 platform packages" heading. The VirtualBox EXE file will begin downloading onto your computer and saved in your specified folder.



4. **Open the VirtualBox EXE file.** Go to the location to which the EXE file downloaded and double-click the file.

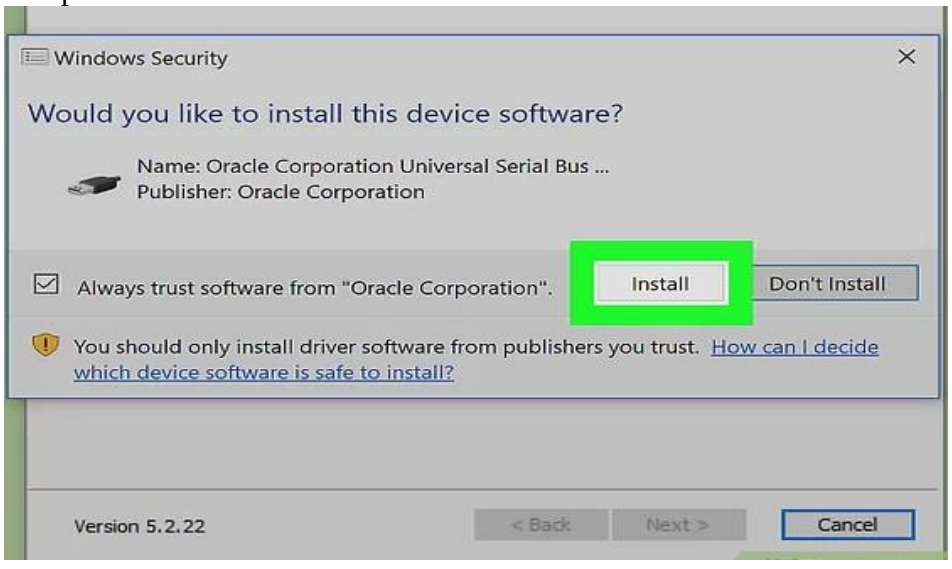


5. Navigate through the installation prompts. Do the following:
   i) Click Next on the first three pages.



   ii) Click Yes when prompted.

6. **Click Install when prompted.** Doing so will allow VirtualBox to begin installing on your computer.

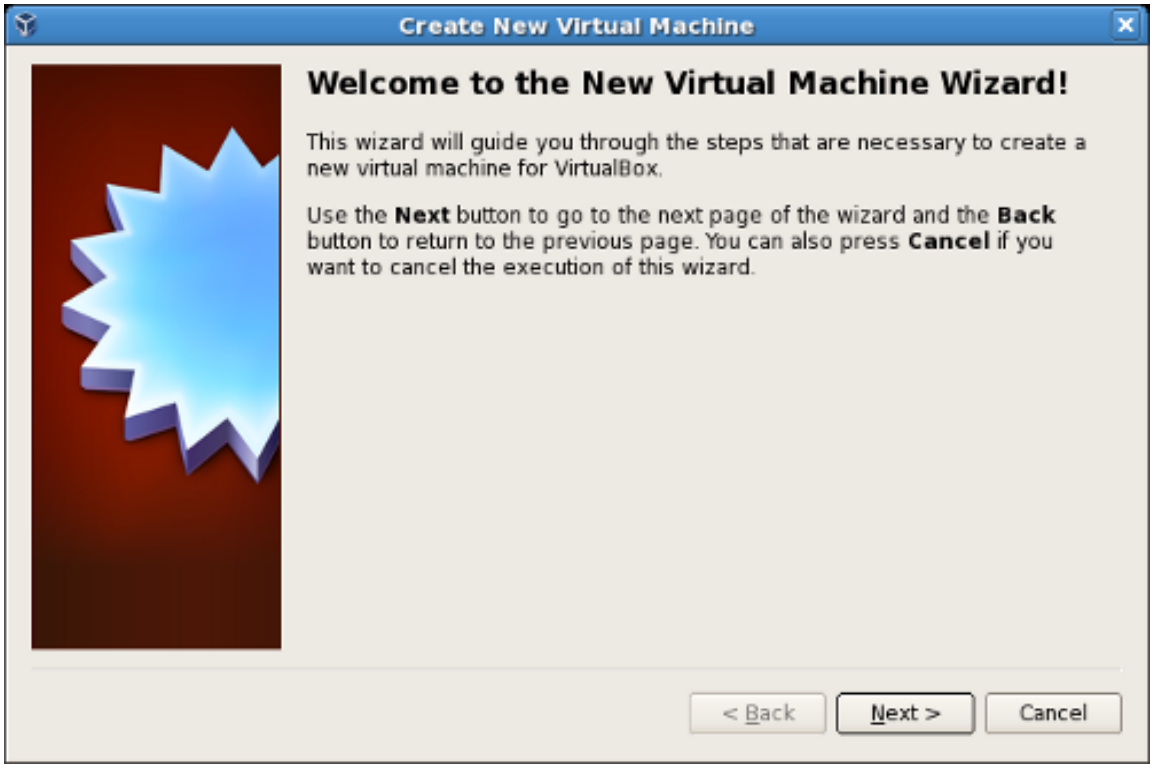


7. **Click Finish when prompted.**

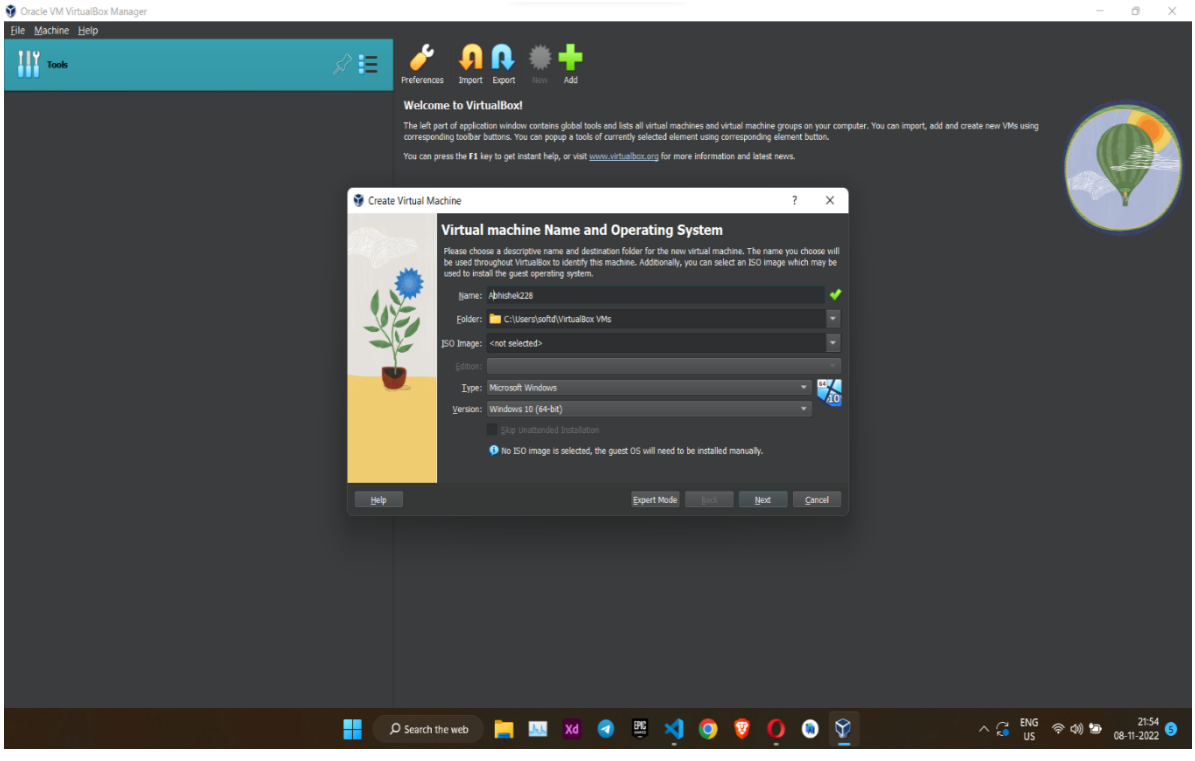
Creating a Virtual Machine :

1. To create a new virtual machine, you need to start VirtualBox. On the host where you installed Oracle VDI and VirtualBox, select the **Applications** menu on the desktop, then the **System Tools** menu, and then **Oracle VM VirtualBox**. Alternatively, you can run the **VirtualBox** command in a terminal. The Oracle VM VirtualBox Manager is displayed

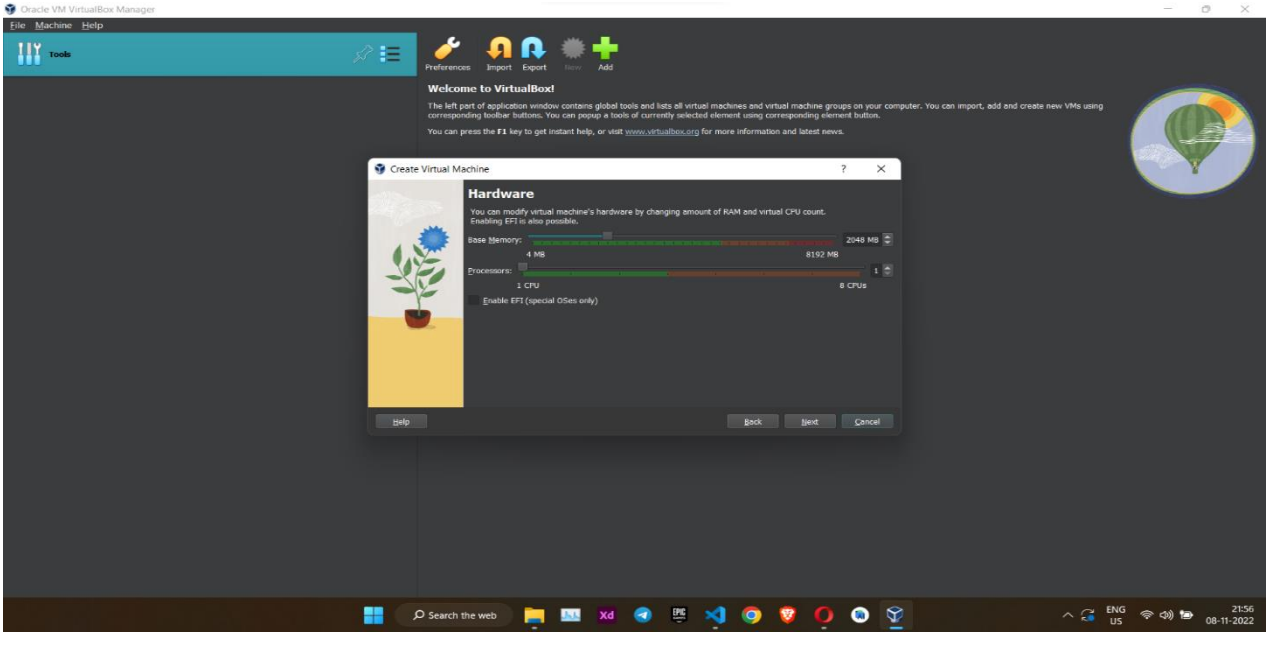
2. Click the **New** button. The New Virtual Machine Wizard is displayed in a new window.



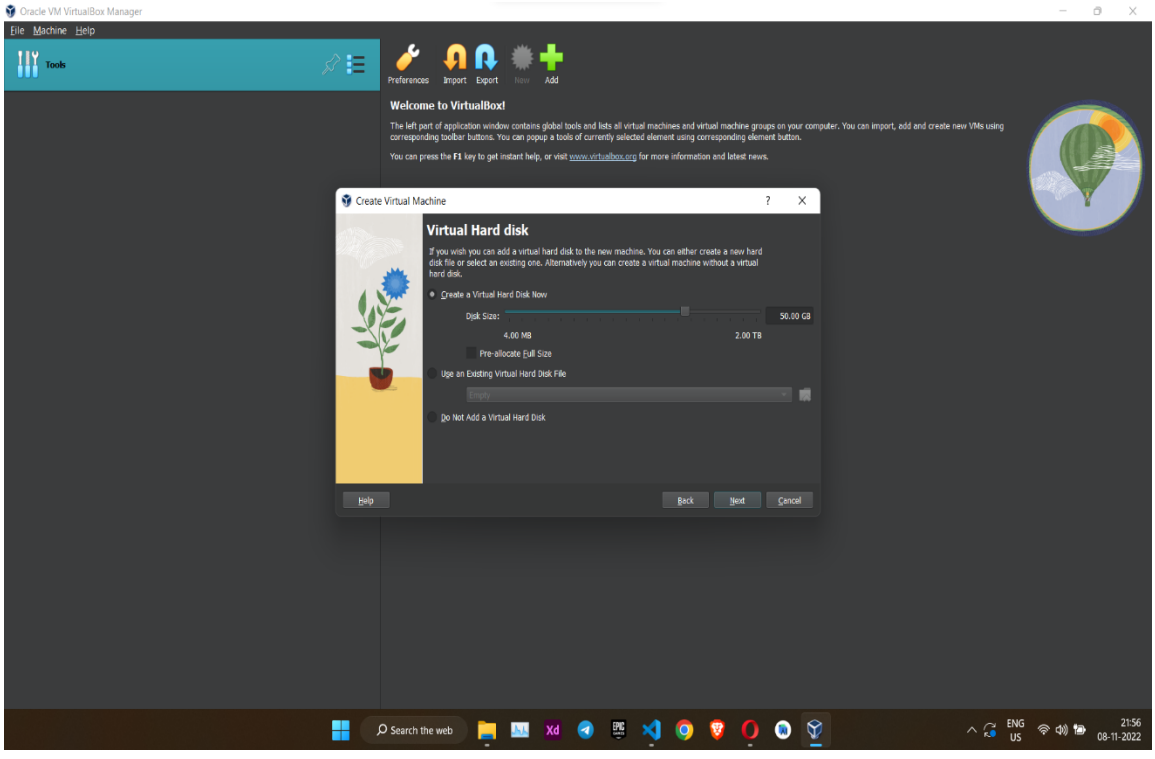
3. Click the **Next** button ,The wizard enables you to configure the basic details of the virtual machine. On the VM Name and OS Type step, enter a descriptive name for the virtual machine in the **Name** field and select the operating system and version that you are going to install from the drop-down lists.



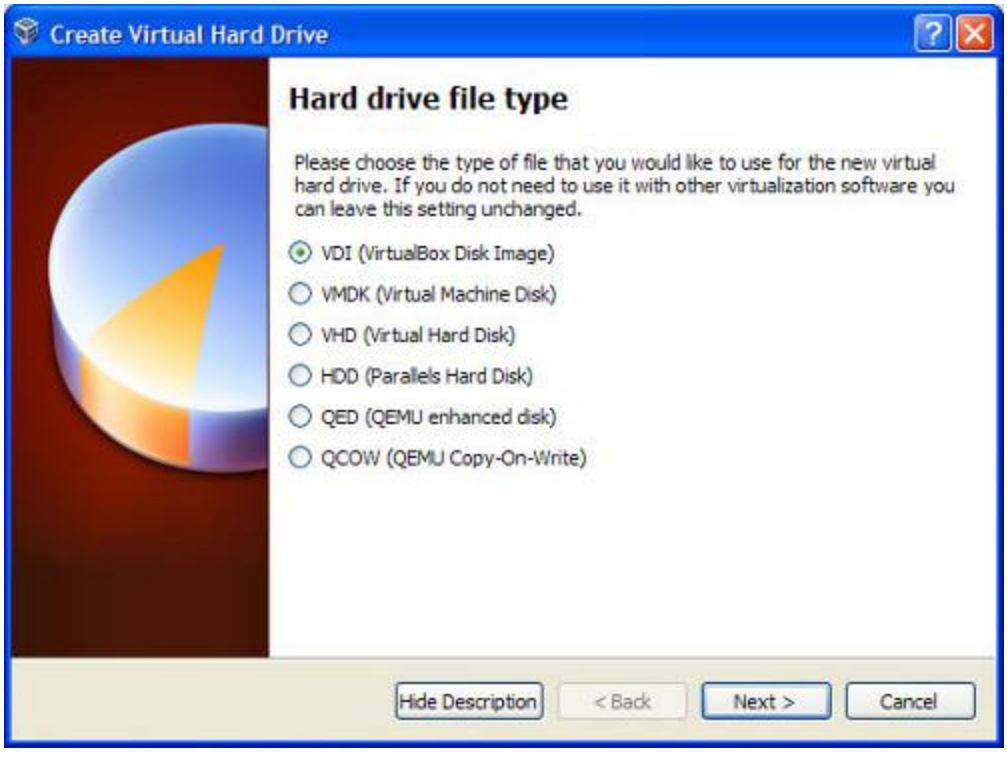
4. On the Memory step, you can simply accept the default.



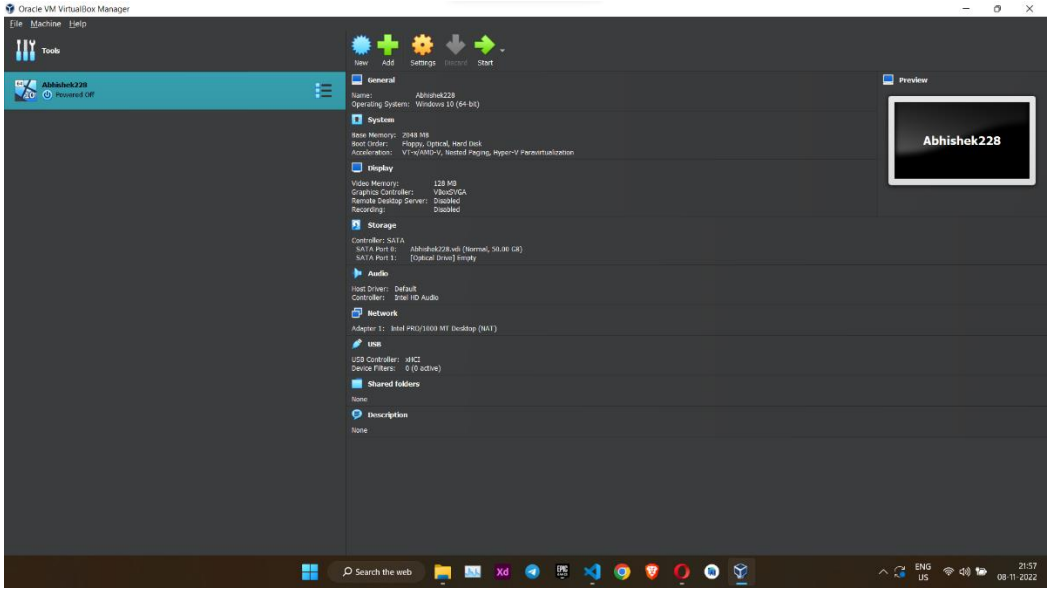
5. On the Virtual Hard Disk step, ensure **Start-up Disk** is selected . select **Create new hard disk** and click **Next**.



6. Select **VDI (VirtualBox Disk Image)** as the file type, **Dynamically allocated** as the storage details, and accept the defaults for the virtual disk file location and size, and then click **Create** to create the virtual disk.



7. When the virtual disk is created, the Virtual Disk Creation Wizard is closed and you are returned to the Summary step of the New Virtual Machine Wizard. Click **Create** to create the virtual machine. The wizard is closed and the newly-created virtual machine is listed in Oracle VM VirtualBox Manager,

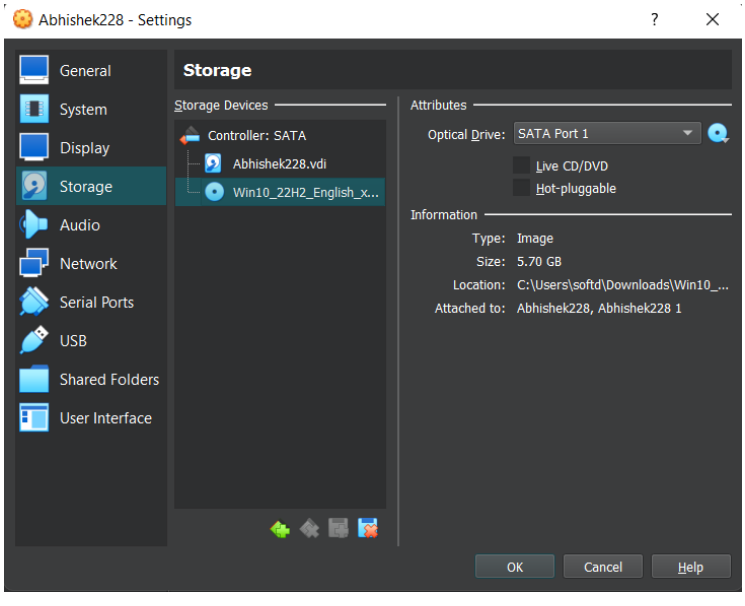


8. Since you want to install an operating system in the virtual machine, you need to make sure the virtual machine can access the installation media. To do this, you edit the virtual machine settings. In Oracle VM VirtualBox Manager, select the virtual machine and then in the toolbar click the **Settings** button. The Settings window is displayed. In the navigation on the left, select **Storage.**

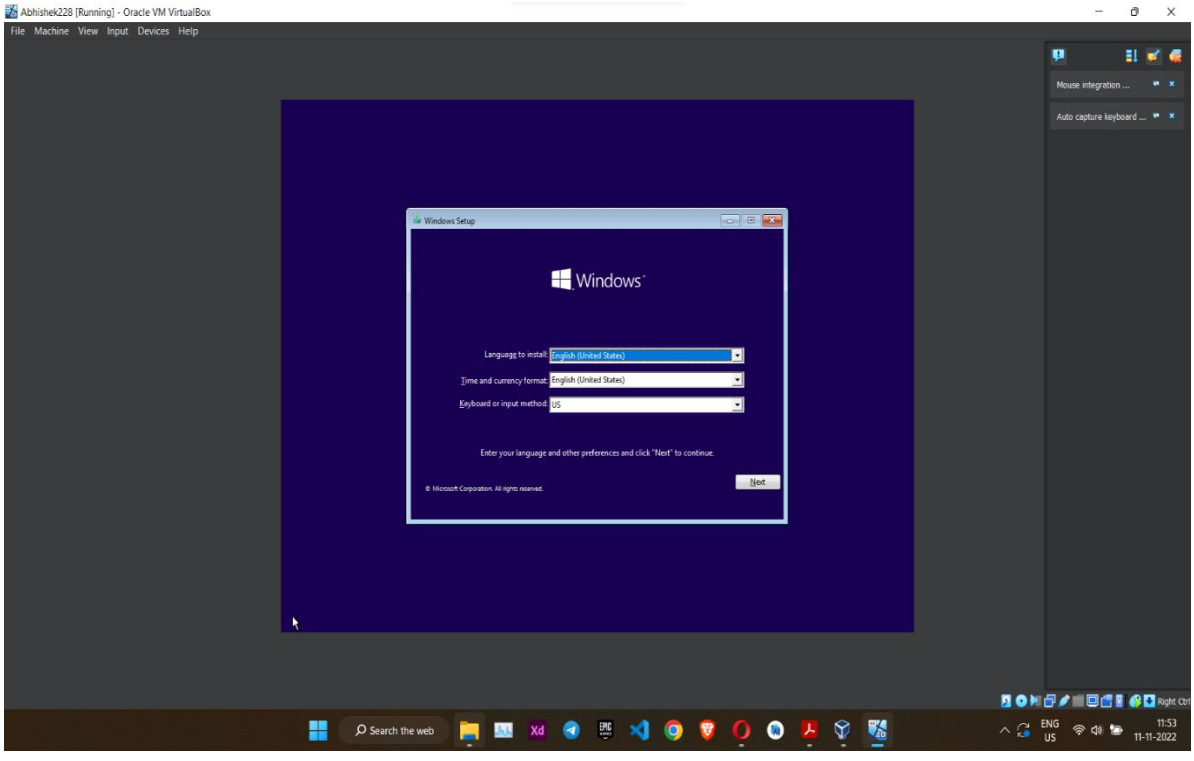
In the Storage Tree section, select **Empty** below the IDE Controller. The CD/DVD Drive attributes are displayed. Click the CD/DVD icon next to the **CD/DVD Drive** drop-down list and select the location of the installation media, as follows:

- To connect the virtual CD/DVD drive to the host's physical CD/DVD drive, select **Host Drive <*drive-name*>**.

  To insert an ISO image in the virtual CD/DVD drive, select **Choose a virtual CD/DVD disk file** and browse for the ISO image.



9. Click **OK** to apply the storage settings. .You are now ready to start the virtual machine and install the operating system. In Oracle VM VirtualBox Manager, select the virtual machine and click the **Start** button in the toolbar. A new window is displayed, which shows the virtual machine booting up.
10. **Start the operating system installation.**



Result :

The procedure to Install Virtualbox/VMware Workstation with different flavors of linux or windows OS on top of windows7 or 8 was learned and verified successfully .

Exp. No. : 3b
Date:5-09-2022

FIND PROCEDURE TO RUN THE VIRTUAL MACHINE OF DIFFERENT CONFIGURATION. CHECK HOW MANY VIRTUAL MACHINES CAN BE UTILIZED AT PARTICULAR TIME.

Aim :

To Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time using Open Nebula and Virtual Machine Manager.

Procedure :

Creating a guest virtual machine with virt-manager

1. Creating a guest virtual machine with virt-manager

i. **Open virt-manager**

Start virt-manager. Launch the **Virtual Machine Manager** application from the **Applications** menu and **System Tools** submenu. Alternatively, run the virt-manager command as root.

ii. **Optional: Open a remote hypervisor**

Select the hypervisor and click the **Connect** button to connect to the remote hypervisor.

iii. **Create a new virtual machine**

The **virt-manager** window allows you to create a new virtual machine. Click the **Create a new virtual machine** button to open the **New VM** wizard.

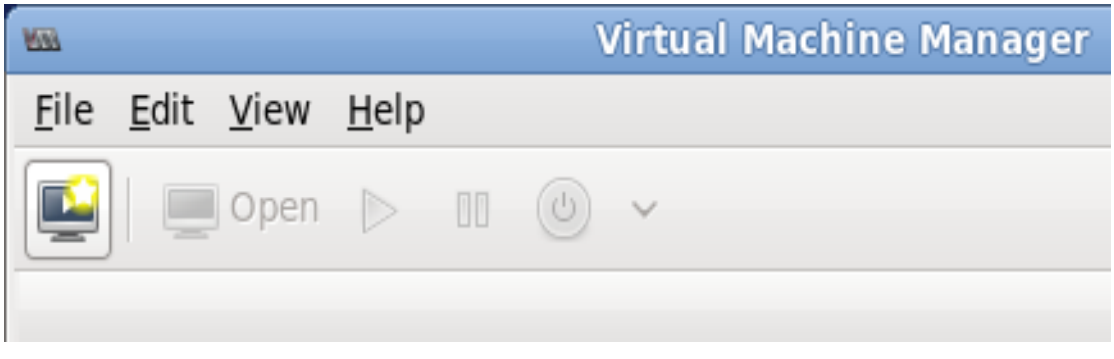


Figure : Virtual Machine Manager window

The **New VM** wizard breaks down the virtual machine creation process into five steps:

1. Naming the guest virtual machine and choosing the installation type
2. Locating and configuring the installation media
3. Configuring memory and CPU options
4. Configuring the virtual machine's storage

5. Configuring networking, architecture, and other hardware settings

Ensure that virt-manager can access the installation media (whether locally or over the network) before you continue.

iv. **Specify name and installation type**

The guest virtual machine creation process starts with the selection of a name and installation type. Virtual machine names can have underscores (_), periods (.), and hyphens (-).

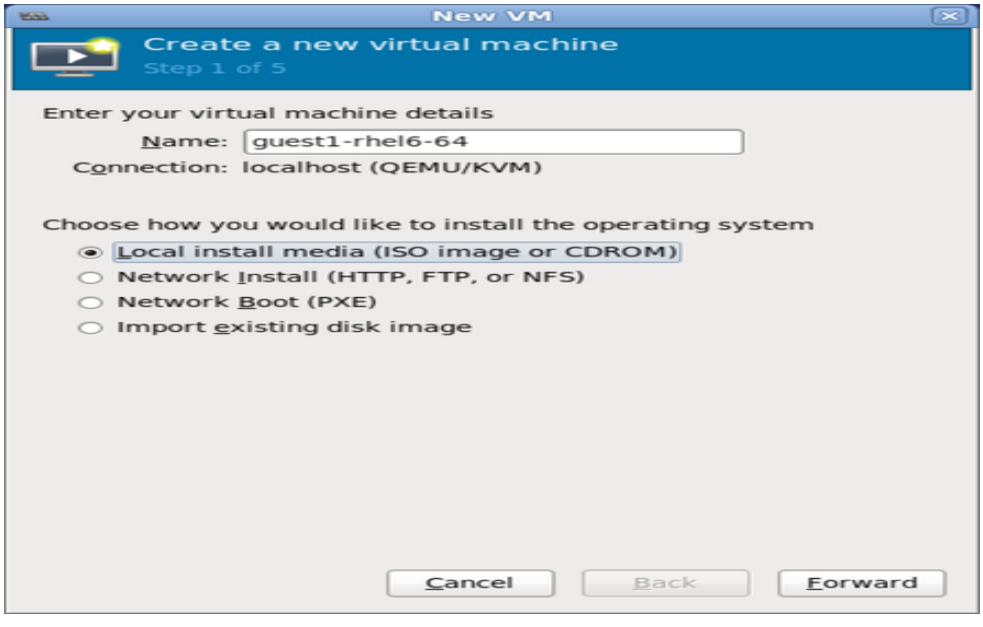


Figure : Name virtual machine and select installation method

Type in a virtual machine name and choose an installation type:

Local install media (ISO image or CDROM)

This method uses a CD-ROM, DVD, or image of an installation disk (for example, .iso).

Network Install (HTTP, FTP, or NFS)

This method involves the use of a mirrored Red Hat Enterprise Linux or Fedora installation tree to install a guest. The installation tree must be accessible through either HTTP, FTP, or NFS.

Import existing disk image

This method allows you to create a new guest virtual machine and import a disk image (containing a pre-installed, bootable operating system) to it.

Click **Forward** to continue.

2. Configure installation

Next, configure the **OS type** and **Version** of the installation. Ensure that you select the appropriate OS type for your virtual machine.

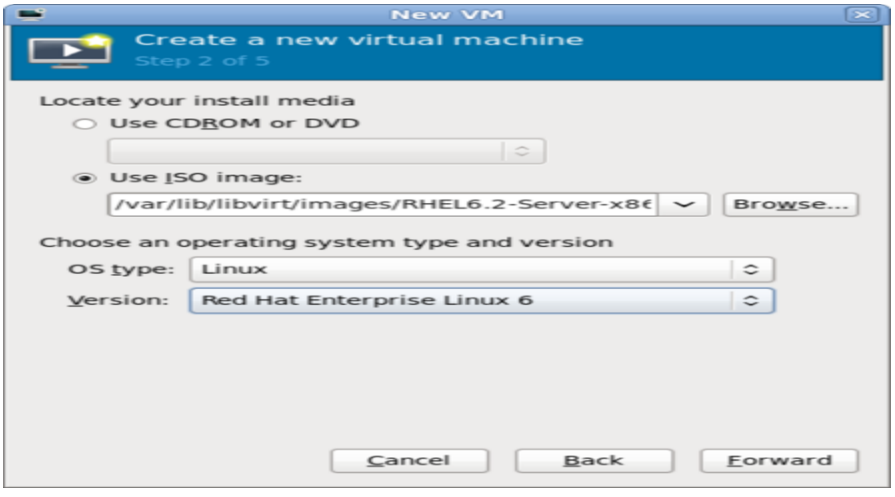


Figure : Local ISO image installation

i. **Configure CPU and memory**

The next step involves configuring the number of CPUs and amount of memory to allocate to the virtual machine. The wizard shows the number of CPUs and amount of memory you can allocate; configure these settings and click **Forward**.

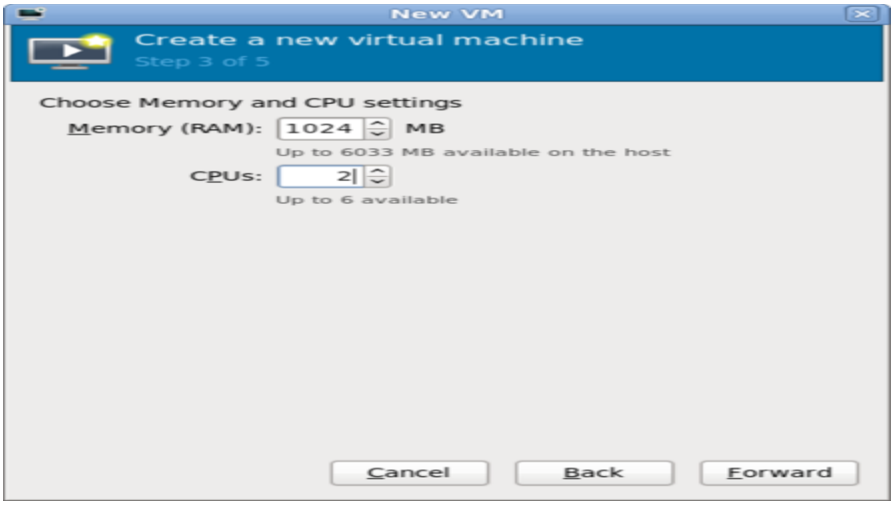


Figure : Configuring CPU and memory

Configure storage

Assign storage to the guest virtual machine.

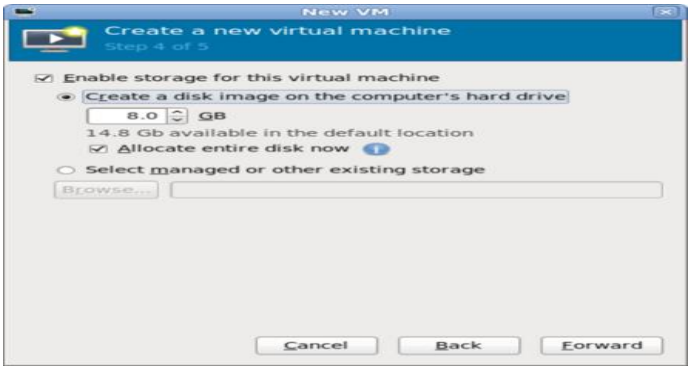


Figure : Configuring virtual storage

If you chose to import an existing disk image during the first step, virt-manager will skip this step. Assign sufficient space for your virtual machine and any applications it requires, then click **Forward** to continue.

7. **Final configuration**

Verify the settings of the virtual machine and click **Finish** when you are satisfied; doing so will create the virtual machine with default networking settings, virtualization type, and architecture.

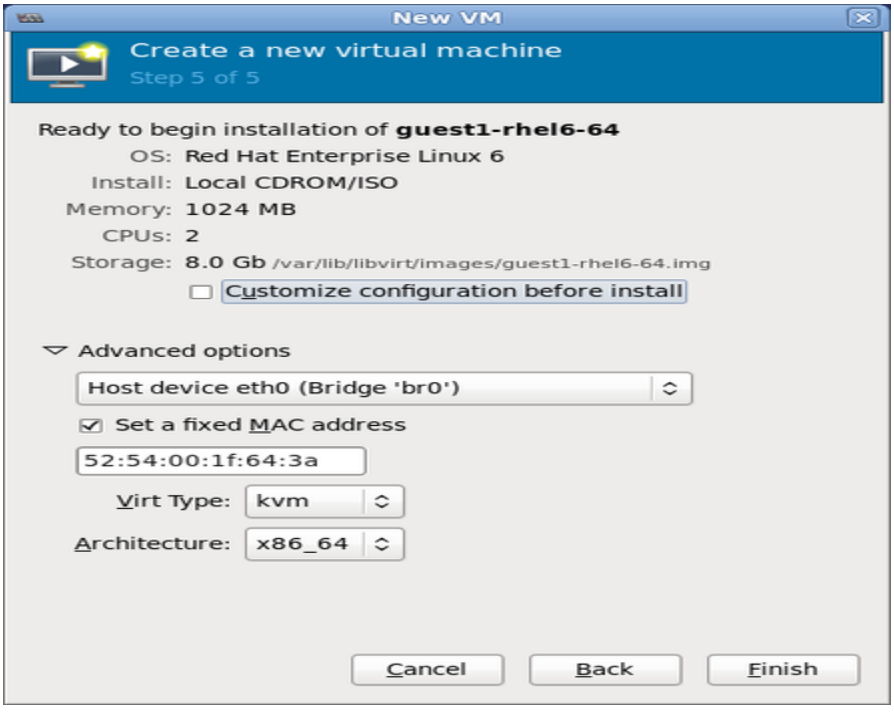


Figure : Verifying the configuration

If you prefer to further configure the virtual machine's hardware first, check the **Customize configuration before install** box first before clicking **Finish**. Doing so will open another wizard that will allow you to add, remove, and configure the virtual machine's hardware settings.

After configuring the virtual machine's hardware, click **Apply**. virt-manager will then create the virtual machine with your specified hardware settings.

Installing KVM

KVM only works if your CPU has hardware virtualization support – either Intel VT-x or AMD-V. To determine whether your CPU includes these features, run the following command:

1 . egrep -c '(svm|vmx)' /proc/cpuinfo

0 indicates that your CPU doesn't support hardware virtualization , **1** enable hardware virtualization support in your computer's BIOS.

Virt-Manager is a graphical application for managing your virtual machines

2. sudo apt-get install qemu-kvm libvirt-bin bridge-utils virt-manager

3. sudo adduser panimalar libvirtd

In root user

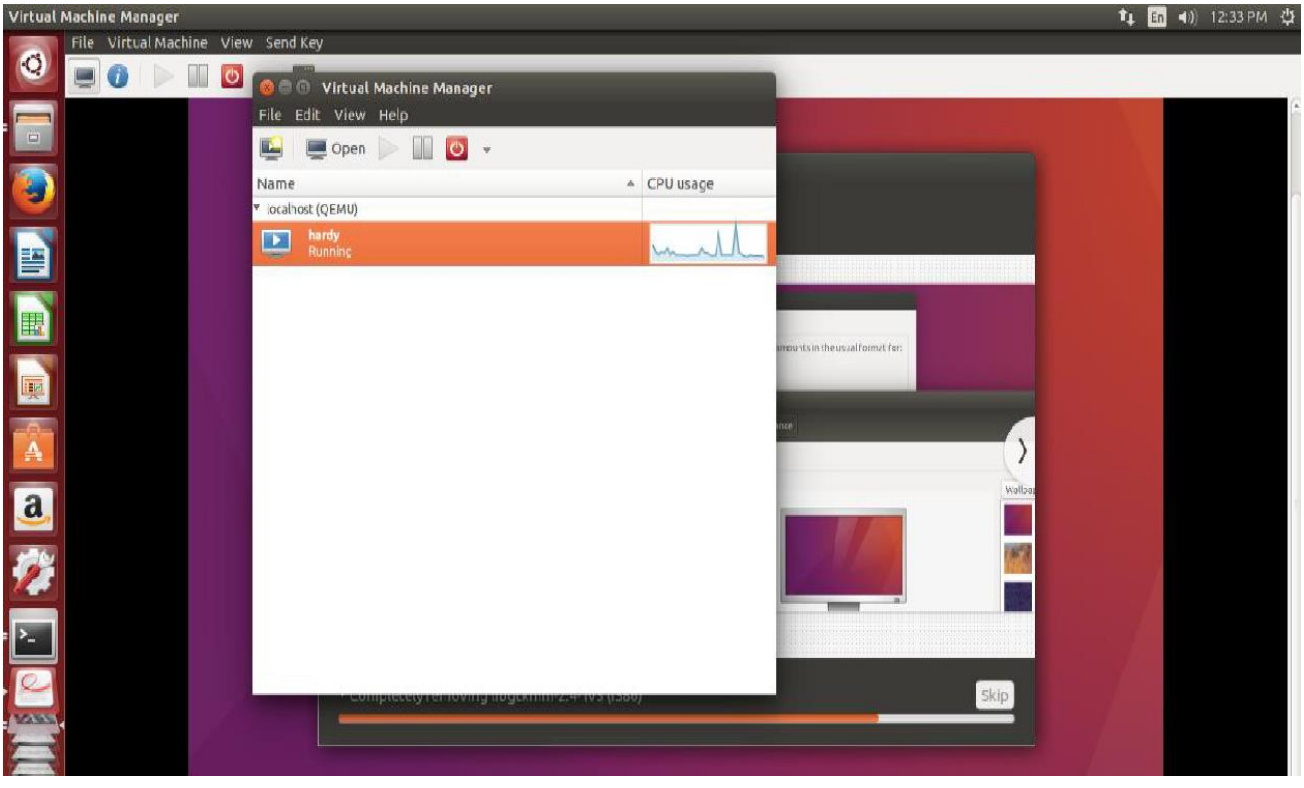
4.virsh -c qemu:///system list

Id Name State

This indicates that everything is working correctly.

5. sudo virt-manager

Sample Output:



Result :

The procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time using Open Nebula and Virtual Machine Manager was successfully created and verified .

Exp. No. : 4
Date:19-09-2022

INSTALL A C COMPILER IN THE VIRTUAL MACHINE CREATED USING VIRTUAL BOX AND EXECUTE SIMPLE PROGRAMS

Aim :

To install a C compiler and execute a sample program in the created virtual machine.

Procedure :

1. Start the process.
2. To login into Guest OS in KVM(Kernel Virtual Machine).
3. The most well-known **C** and **C++** compilers are **gcc** and **g++**
4. Installing C, C++ Compiler and Development Tools (build-essential).
5. To login into root user :

   $ sudo -s

   # **apt-get update && apt-get install build-essential**

   (OR)

   $ sudo get update && apt-get install build-essential

   (OR)

   $ sudo apt-get install gcc
6. Speeding Up C and C++ Compilations

   # **aptitude install ccache**
7. Open your favorite text editor and enter the code for adds two numbers, then save as sum.c
8. To compile the code into an executable named "**sum"** in the current working directory.

   # gcc sum.c -o sum
9. If you want to take advantage of **ccache**, just propend the above command with ccache, as follows:

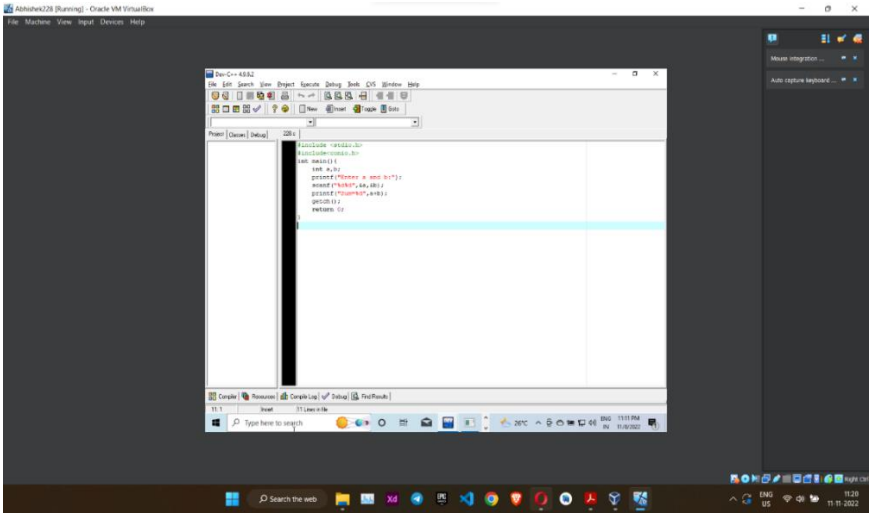
   # ccache gcc sum.c -o sum
10. To run the binary:

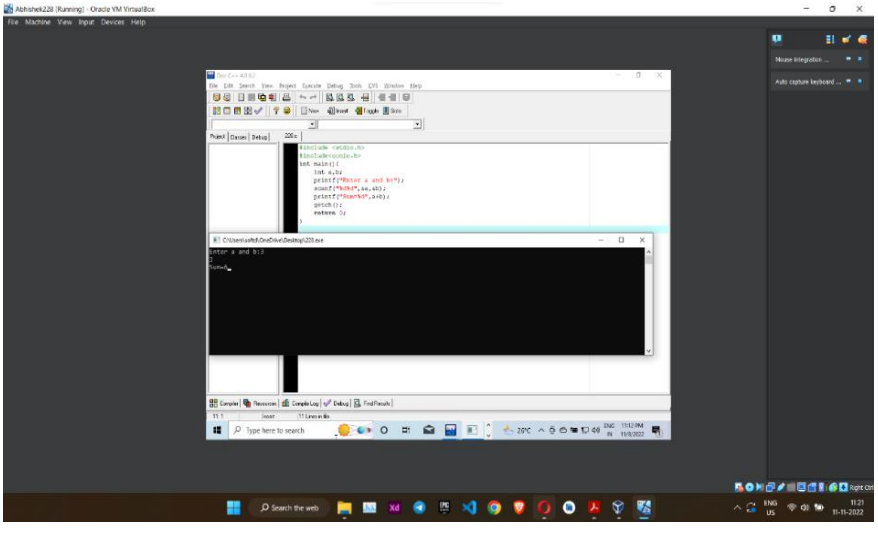
    # ./sum
11. Stop the process .

Program :

```
#include<stdio.h>
int main()
{
        int a, b, c;
        printf("enter first number");
        scanf("%d",&a);
        printf("enter second number");
        scanf("%d",&b);
        c = a + b;
        printf("The sum of equals %d\n",c);
return 0;
}
```

Sample Input and Output :





Result :

Thus the installation of a C compiler and execute a sample program in the created using virtual machine was successfully executed and verified

Exp. No. : 5
Date:10-10-2022

INSTALL GOOGLE APP ENGINE. CREATE HELLO WORLD APP AND OTHER SIMPLE WEB APPLICATIONS USING PYTHON/JAVA.

Aim :

To Install Google App Engine. Create *hello world* app and other simple web applications using python/java.

Procedure :

The App Engine SDK allows you to run Google App Engine Applications on your local computer. It simulates the run---time environment of the Google App Engine infrastructure.

Pre--Requisites: Python 2.5.4

If you don't already have Python 2.5.4 installed in your computer, download and Install Python 2.5.4 from:

http://www.python.org/download/releases/2.5.4/

Download and Install

You can download the Google App Engine SDK by going to:

http://code.google.com/appengine/downloads.html

and download the appropriate install package.

Download the Google App Engine SDK

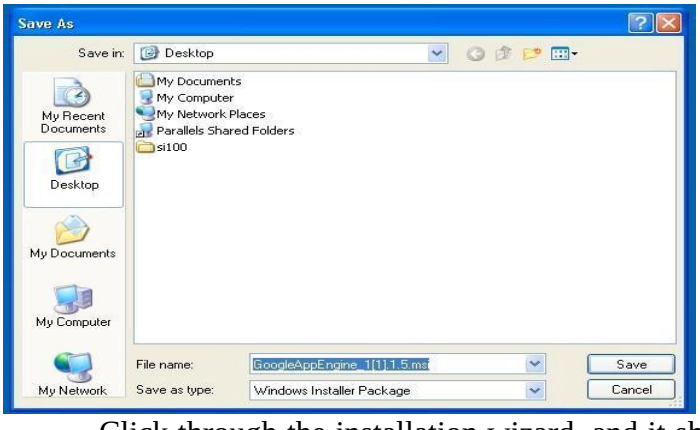
Before downloading, please read the Terms that govern your use of the App Engine SDK.

Please note: The App Engine SDK is under **active development**, please keep this in mind as you explore its capabilities. See the SDK Release Notes for the information on the most recent changes to the App Engine SDK. If you discover any issues, please feel free to notify us via our Issue Tracker.

Platform	Version	Package	Size	SHA1 Checksum
Windows	1.1.5 - 10/03/08	GoogleAppEngine_1.1.5.msi	2.5 MB	e974312b4aefc0b3873ff0d93eb4c525d5e88c30
Mac OS X	1.1.5 - 10/03/08	GoogleAppEngineLauncher-1.1.5.dmg	3.6 MB	f62208ac01c1b3e39796e58100d5f1b2f052d3e7
Linux/Other Platforms	1.1.5 - 10/03/08	google_appengine_1.1.5.zip	2.6 MB	cbb9ce817bdabf1c4f181d9544864e55ee253de1

Download the Windows installer – the simplest thing is to download it to your Desktop or another folder that you remember.

Double Click on the **GoogleApplicationEngine** installer.



Click through the installation wizard, and it should install the App Engine. If you do not have Python 2.5, it will install Python 2.5 as well.

Once the install is complete you can discard the downloaded installer

Making your First Application

- **Create a project**

Projects bundle code, VMs, and other resources together for easier development and monitoring.

- **Build and run your "Hello World!" app**

You will learn how to run your app using Cloud Shell, right in your browser. At the end, you'll deploy your app to the web using the gcloud command.

Step 1 : Project setup

GCP organizes resources into projects, which collect all of the related resources for a single application in one place.

Step 2 : Using Cloud Shell

Cloud Shell is a built-in command-line tool for the console. We're going to use Cloud Shell to deploy our app.

Open Cloud Shell

Open Cloud Shell by clicking the **Activate Cloud Shell** button in the navigation bar in the upper-right corner of the console.

Clone the sample code

Use Cloud Shell to clone and navigate to the "Hello World" code. The sample code is cloned from your project repository to the Cloud Shell.

In Cloud Shell, enter the following:

$ **git clone \ https://github.com/GoogleCloudPlatform/python-docs-samples**

$ **cd \ python-docs-samples/appengine/standard_python3/hello_world**

Step 3 : Configuring your deployment

You are now in the main directory for your code.

Exploring the application :

$ **cat main.py**

```
# [START gae_python38_app]
from flask import Flask
# If `entrypoint` is not defined in app.yaml, App Engine will look for an app called `app` in `main.py`.
app = Flask(__name__)
@app.route('/')
def hello():
    """Return a friendly HTTP greeting."""
    return 'Hello World!'
if __name__ == '__main__':
    # This is used when running locally only. When deploying to Google App
```

```
    # Engine, a webserver process such as Gunicorn will serve the app. This
    # can be configured by adding an `entrypoint` to app.yaml.
    app.run(host='127.0.0.1', port=8080, debug=True)
# [END gae_python38_app]
```

The application is a simple Python application that uses the Flask web framework. This Python app responds to a request with an HTTP header and the message Hello World!.

Exploring your configuration :

$ cat app.yaml

This file contains the minimal amount of configuration required for a Python 3 application. The runtime field specifies the python38 run-time environment.

```
runtime: python38
```

Example :

```
runtime: python38      # or python37 for Python 3.7
instance_class: F2
env_variables:
  BUCKET_NAME: "example-gcs-bucket"
handlers:
# Matches requests to /images/... to files in static/images/...
- url: /images
  static_dir: static/images

- url: /.*
  secure: always
  redirect_http_response_code: 301
  script: auto
```

Step 4 : Testing your app

Cloud Shell lets you test your app before deploying to make sure it's running as intended, just like debugging on your local machine.

To test your app, first create an isolated virtual environment. This ensures that your app does not interfere with other Python applications that may be available on your system.

$ virtualenv --python python3 ~/envs/hello_world

Activate your newly created virtual environment:

$ source ~/envs/hello_world/bin/activate

Use pip to install project dependencies. This "Hello World" app depends on the Flask microframework:

$ pip install -r requirements.txt

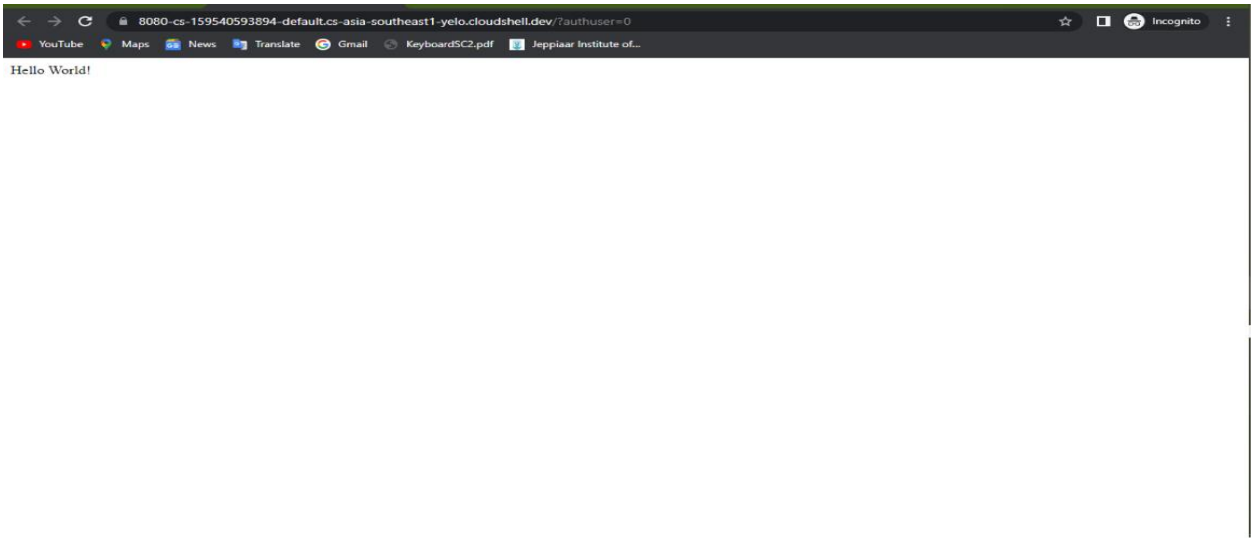
Finally, run your app in Cloud Shell using the Flask development server:

$ python main.py

Preview your app with "Web preview"

Your app is now running on Cloud Shell. You can access the app by clicking the **Web preview** button at the top of the Cloud Shell pane and choosing **Preview on port 8080**.

Sample output :



Terminating the preview instance

Terminate the instance of the application by pressing Ctrl+C in the Cloud Shell.

Step 5 : Deploying to App Engine

Create an application :

In order to deploy your app, you need to create an app in a region:

$ gcloud app create

Note: If you already created an app, you can skip this step.

Deploying with Cloud Shell:

You can use Cloud Shell to deploy your app. To deploy your app enter the following:

$ gcloud app deploy app.yaml --project adept-rock-295007

Visit your app

Congratulations! Your app has been deployed. The default URL of your app is a subdomain on appspot.com that starts with your project's ID: adept-rock-295007.appspot.com

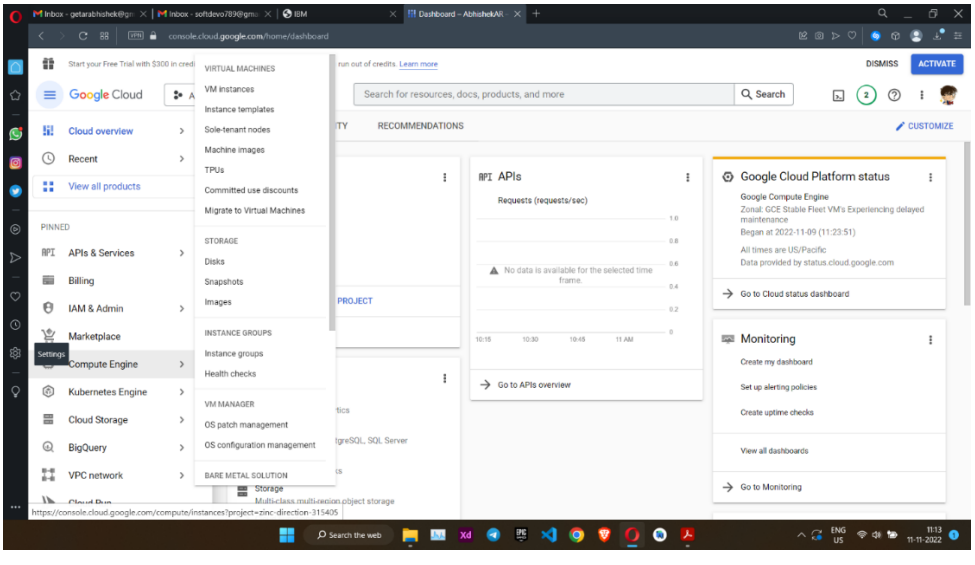
```
target project:  [adept-rock-295007]
target service:  [default]
target version:  [20201108t092724]
target url:      [https://adept-rock-295007.uc.r.appspot.com]


Do you want to continue (Y/n)?  y

Beginning deployment of service [default]...
╔═══ Uploading 1638 files to Google Cloud Storage ═══╗
File upload done.
Updating service [default]...failed.
ERROR: (gcloud.app.deploy) Error Response: [7] Access Not Configured. Cloud Build has notbeen used in project adept-rock-295007
efore or it is disabled. Enable it by visiting https://console.developers.google.com/apis/api/cloudbuild.googleapis.com/overvie
project=adept-rock-295007 then retry. If you enabled this API recently, wait a few minutes for the action to propagate to our s
tems and retry.
```

Step 6 : View your app's status

You can check in on your app by monitoring its status on the App Engine dashboard.

Open the **Navigation menu** in the upper-left corner of the console.

Then, select the **App Engine** section.



Step 7 : Disable your application

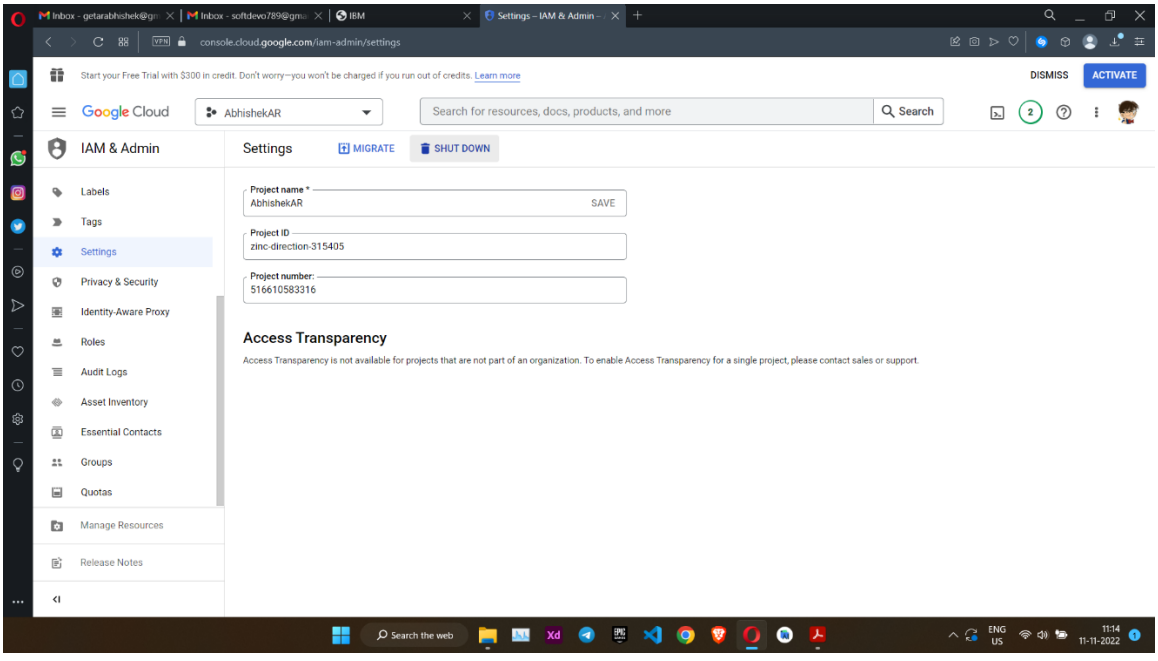
1. Go to the **Settings** page.
2. Click **Disable Application**.

This is sufficient to stop billing from this app. More details on the relationship between apps and projects and how to manage each can be found here.

Delete your project

If you would like to completely delete the app, you must delete the project in the **Manage resources** page. This is not reversible, and any other resources you have in your project will be destroyed:

1. Go to IAM & admin
2. Click **Settings**.
3. Click **Shut down**.



Result :

The procedure for installations of Google App Engine. Create hello world app and other simple web applications using python/java was successfully learned and verified .

Exp. No. : 6
Date:10-10-2022 **USE GAE LAUNCHER TO LAUNCH THE WEB APPLICATIONS.**

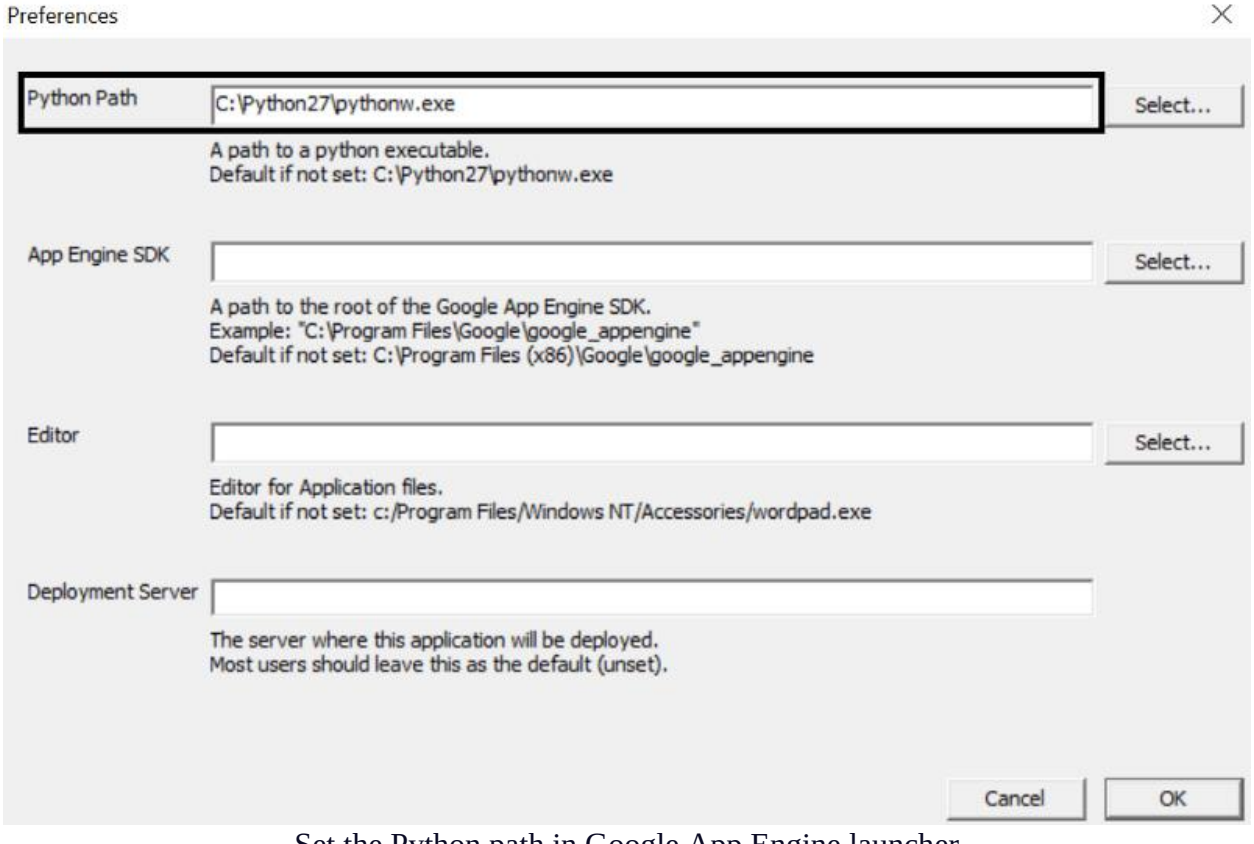
Aim :

To Use GAE launcher to launch the any web application using python.

Procedure :

Step 1. Download the basic housekeeping stuff

1. Download Python 2.7
2. Download Google Cloud SDK
3. Set the Python path in the Google App Engine launcher After downloading the SDK, launch the App Engine launcher, go to Edit -> Preferences and make sure you set the path for where you installed Python in step 1 above.



Set the Python path in Google App Engine launcher

That's all you need. Your local machine should now be ready to build webapps.

Step 2. App Engine sign-up

This is often the most confusing part of the entire setup. Things you should know when you sign-up:

1. Currently, App Engine offers a free trial for one year.
2. The trial includes $300 of credit that can be used during the one year trial period.
3. You will need to add a credit card to sign-up (for verification purposes).
4. You will not be charged during the sign-up process.
5. You will not be charged during the trial period as long as you do not cross the credit limit offered.

Here are the steps you need to follow to sign-up:

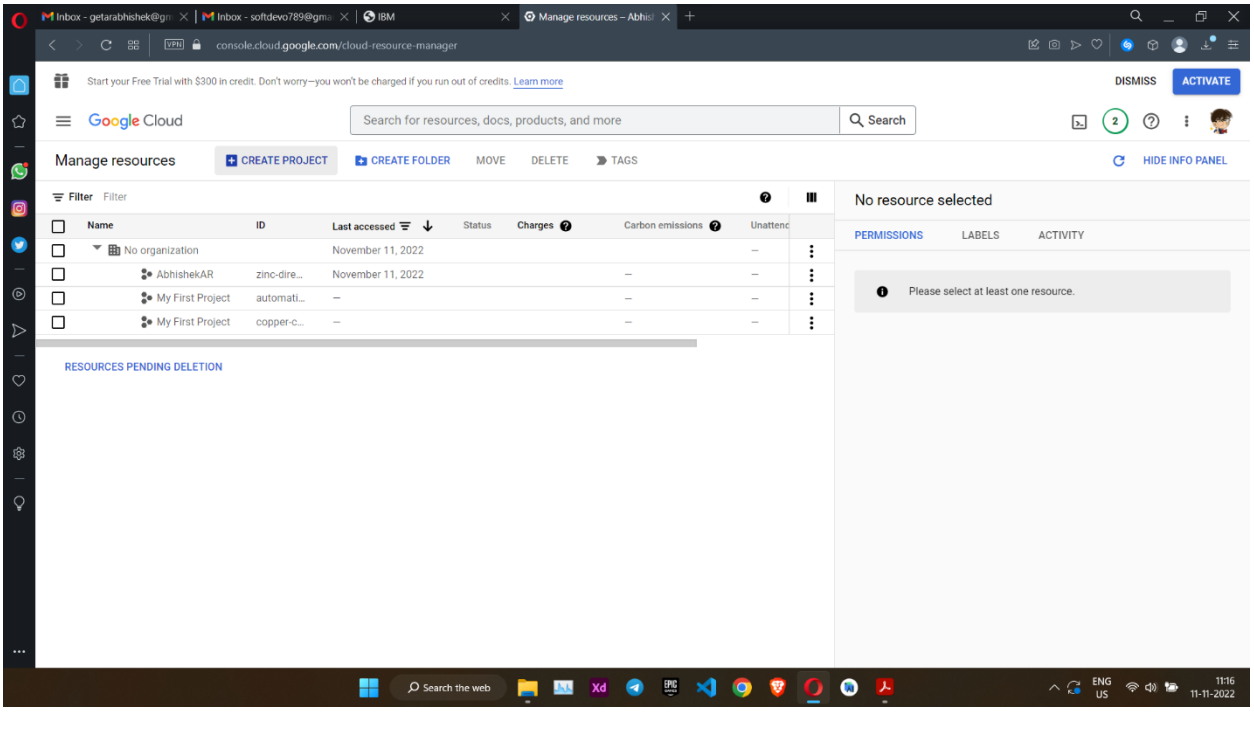
1. Go to the Google Cloud landing page
2. Follow the sign-up process and go to your App Engine dashboard

Most of the hard work is complete after a successful sign-up.

Step 3. Create a new project

The next step is to create a new Python project that you can work on. Follow the screenshots below to create a new project.

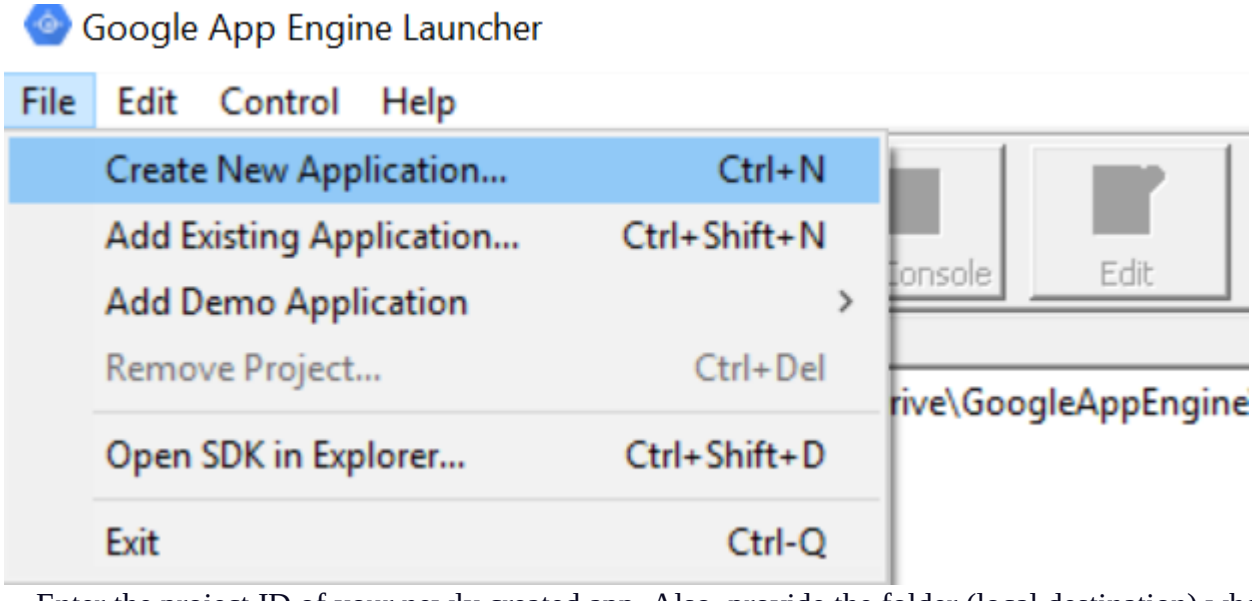
Launch the new project wizard.



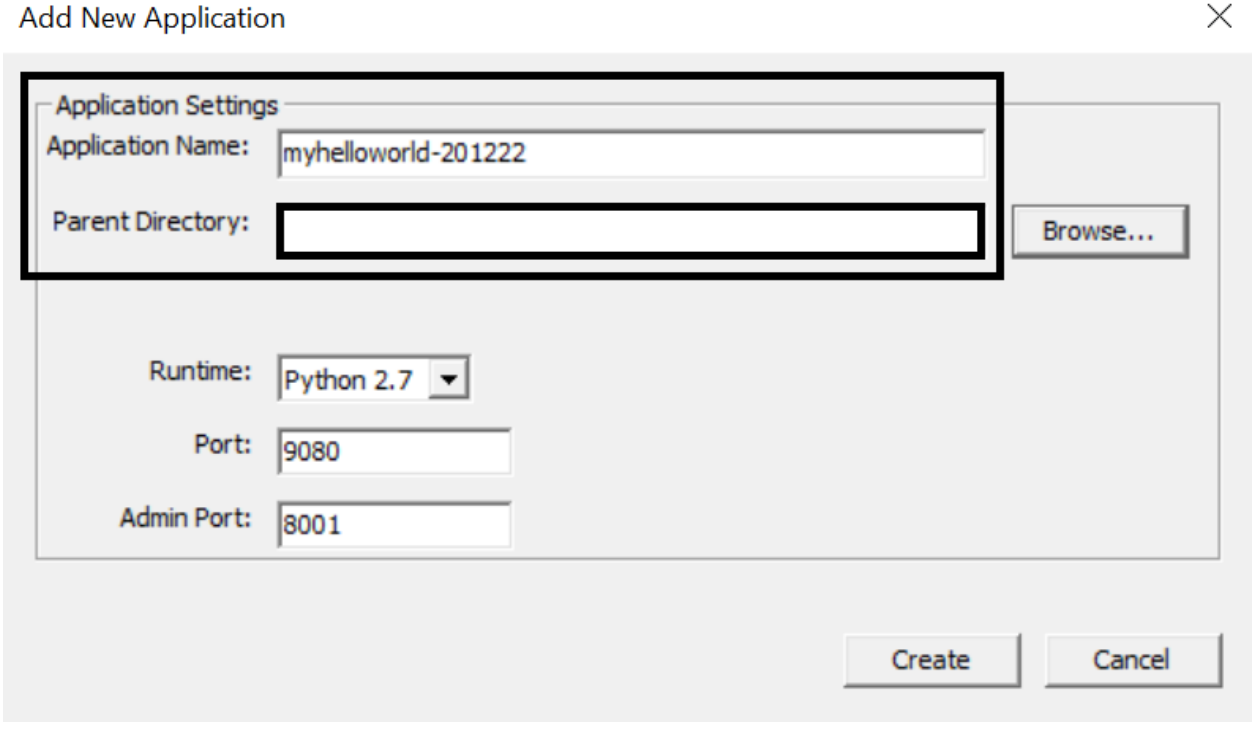
Step 4. Fork the app to develop it locally

The next step in the process is to fork the app on your local machine. This will allow you to make changes to the app locally and deploy it whenever you wish to.

Go to Google App Engine launcher and create a new application.

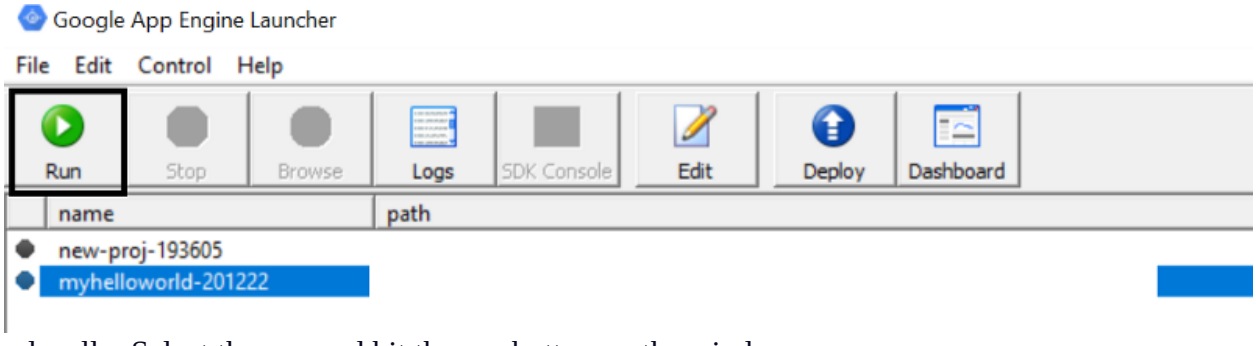


Enter the project ID of your newly created app. Also, provide the folder (local destination) where you wish to store the app locally. Make sure you select the Python 2.7 as your runtime engine.



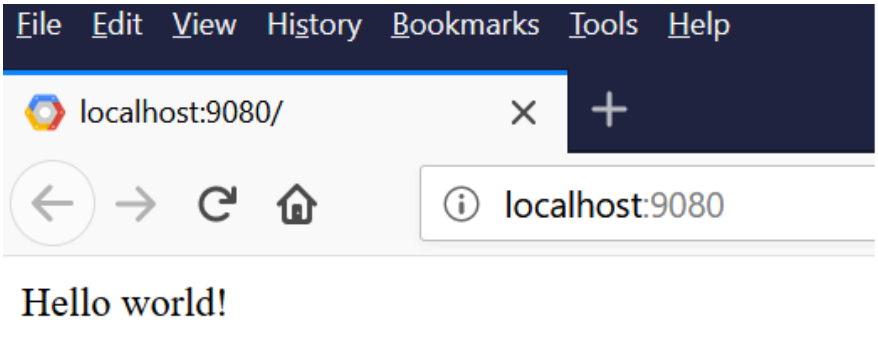
Step 5. Run the app locally

Before you go ahead and make some changes to the app, it is important to check whether or not you have executed all the above steps correctly. This can be done by simply running the app



locally. Select the app and hit the run button on the window.

Wait for a few seconds until you can hit the **Browse** button. Once the **Browse** button becomes clickable, click it. This should take you to the browser, and you should see the hello world text appear in your browser window. Alternatively, you can manually go to the browser and use the port specified to access the app.



Step 6. Understand the app structure

It is finally time to look at the lines of code which are running this webapp. Open your app folder in the text editor of your choice.

Here is a description of the various files.

app.yaml

This file is a basic markup file that stores information (some metadata) about the app. It is important to note the following crucial parts of the file.

1. **application**

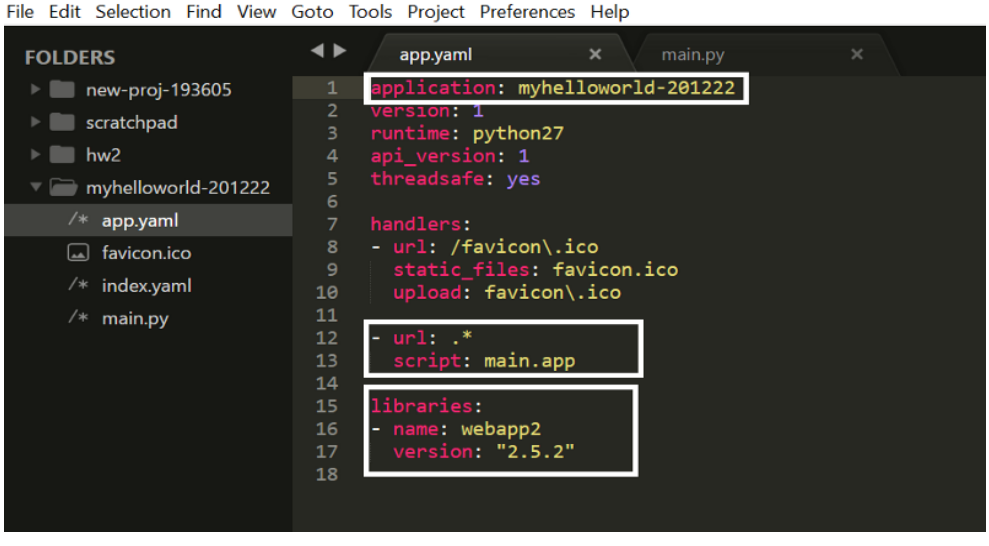
   This is the project ID which you should never change. This is the unique identifier for the app

2. **url -> script**

   This is the homepage for the app. In other words, this file will be rendered in your browser when you launch the app

3. **libraries**

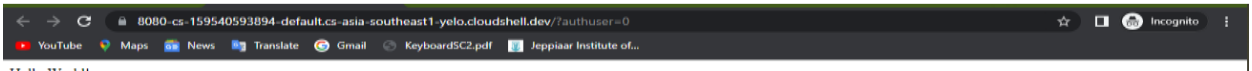
   This is where you can include external libraries to use within the webapp



app.yaml file in the webapp folder

main.py

This is the homepage of the app

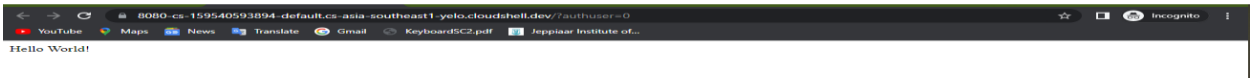


Step 7. Make your changes and deploy the new ap No hello world app is ever complete without the developer changing the hello world text to something else just to make sure that everything happening behind the scenes is working as it should.

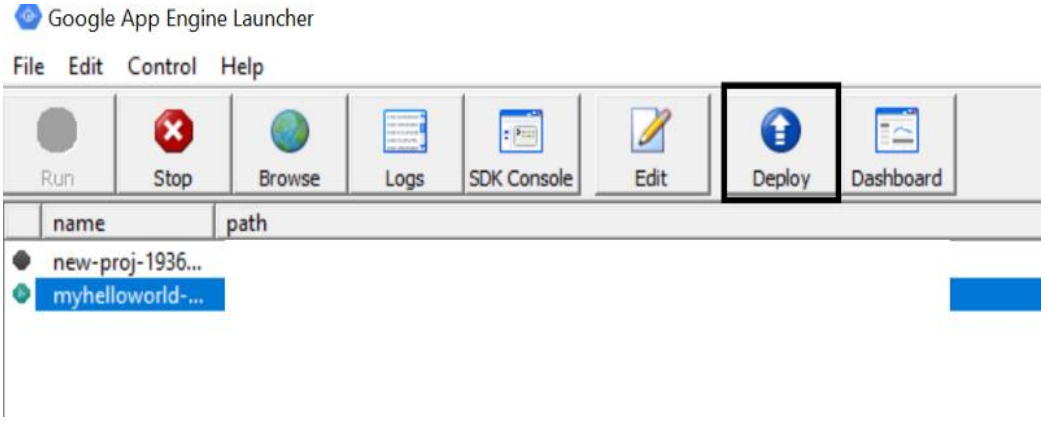
Go ahead and change the text in the above screenshot to something else

```
17  import webapp2
18
19  class MainHandler(webapp2.RequestHandler):
20      def get(self):
21          self.response.write('MEOW')
22
23  app = webapp2.WSGIApplication([
24      ('/', MainHandler)
25  ], debug=True)
26
```

Save the changes, go to the browser and refresh the page. You should see the page with the text “MEOW” displayed.



Finally, it is time to deploy your changes to the cloud to make them globally accessible via a URL. Go to the App Engine launcher, select the app, and hit the **Deploy** button.



go to the URL below:

https://<yourProjectID>.appspot.com/

https://myhelloworld-201222.appspot.com/

Result :

The procedure for GAE launcher to launch the hello world web application using python was successfully learned and verified .

Exp. No. : 7 **FIND A PROCEDURE TO TRANSFER THE FILES FROM ONE VIRTUAL MACHINE TO ANOTHER VIRTUAL MACHINE.**

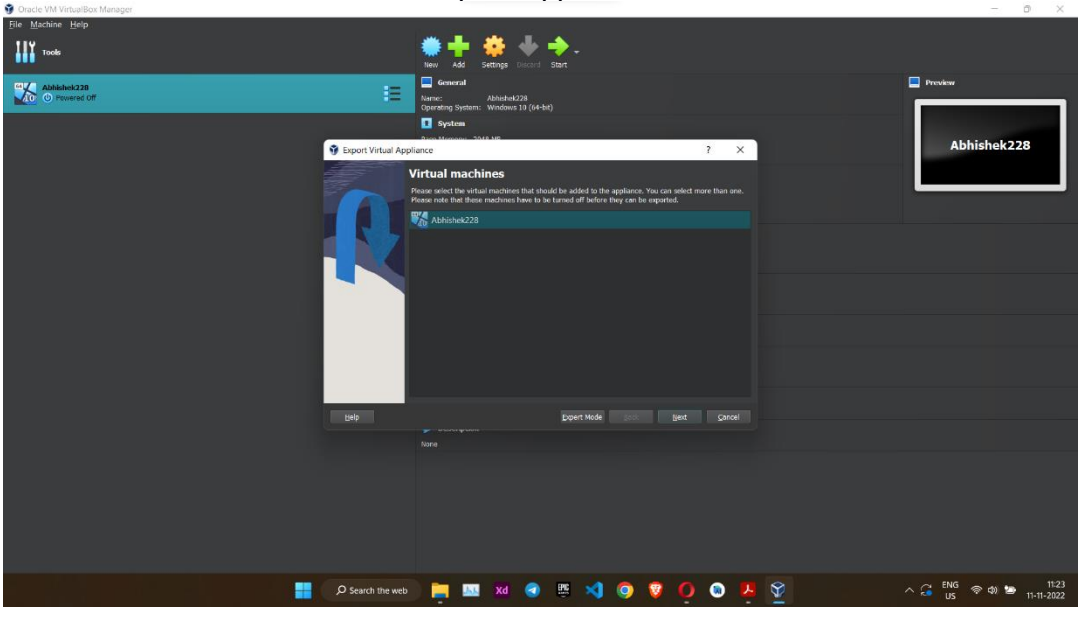
Date:17-10-2022

AIM:

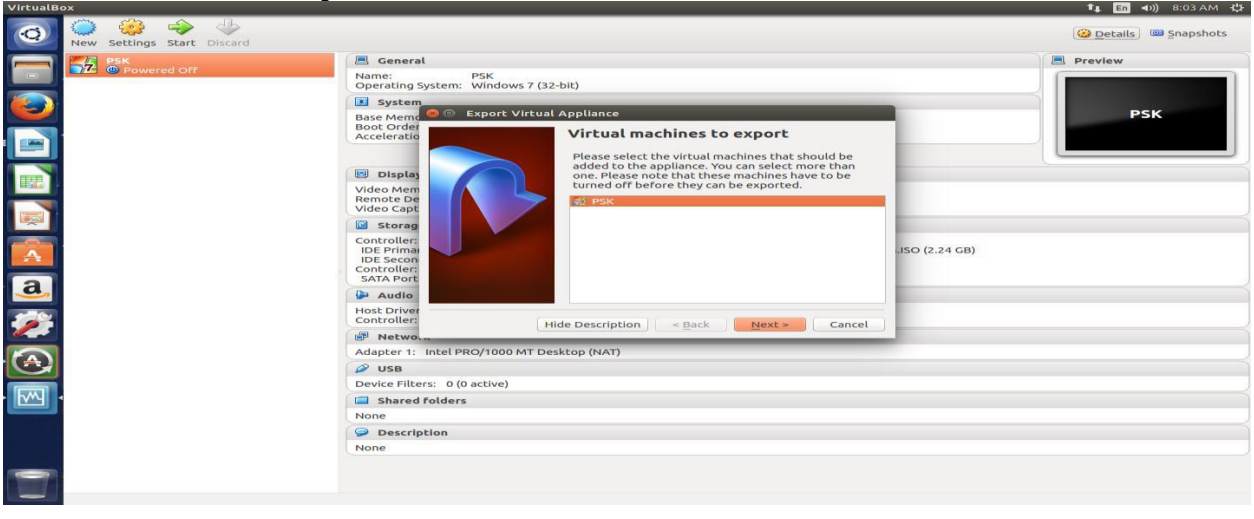
To find a procedure to transfer the files from one virtual machine to another virtual machine by migration based on the certain condition from one node to the other.

PROCEDURE:

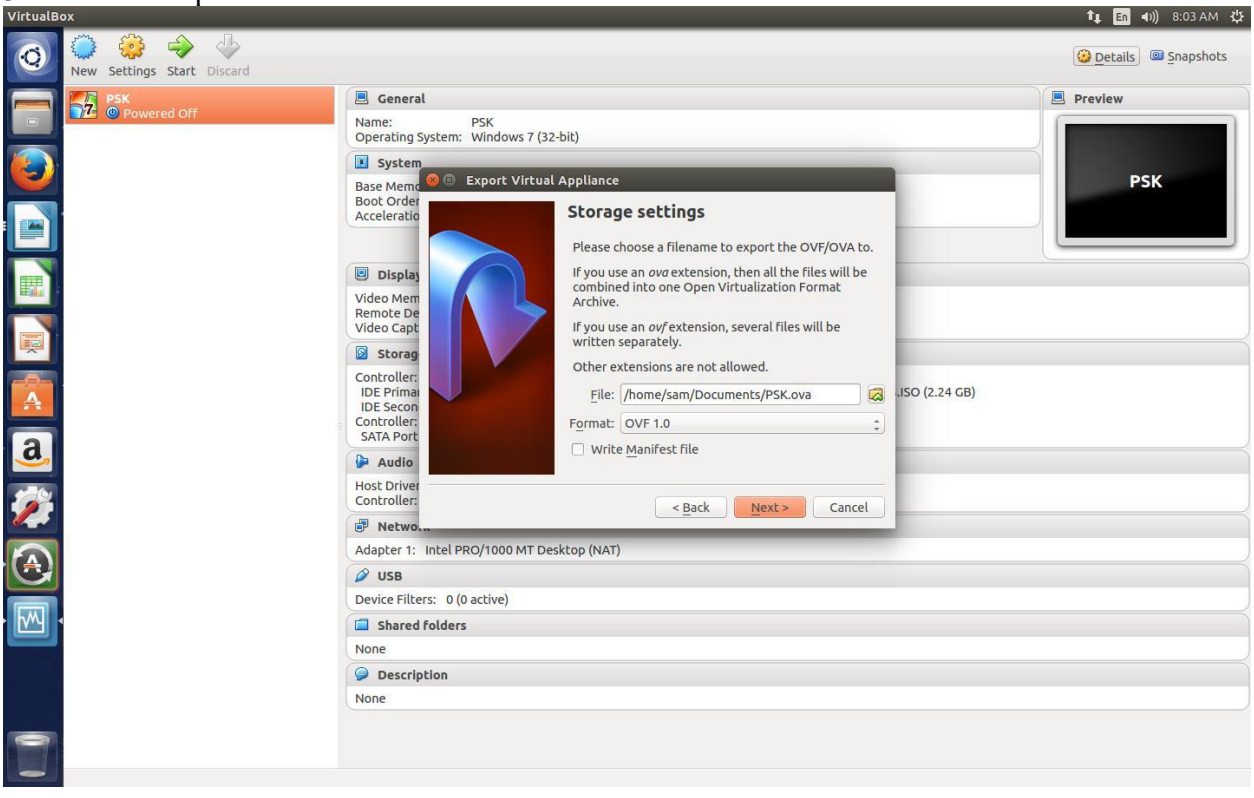
1.Select the VM and click File->Export Appliance



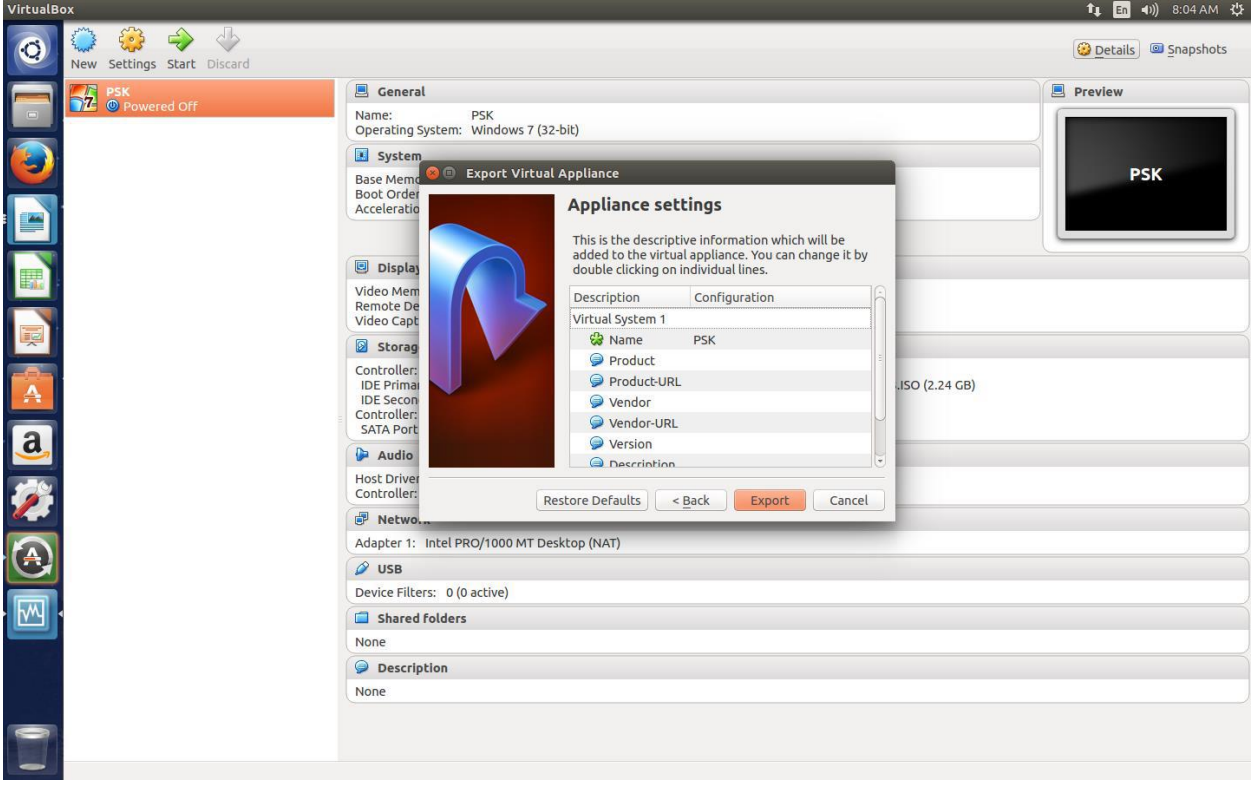
2.Select the VM to be exported and click NEXT.



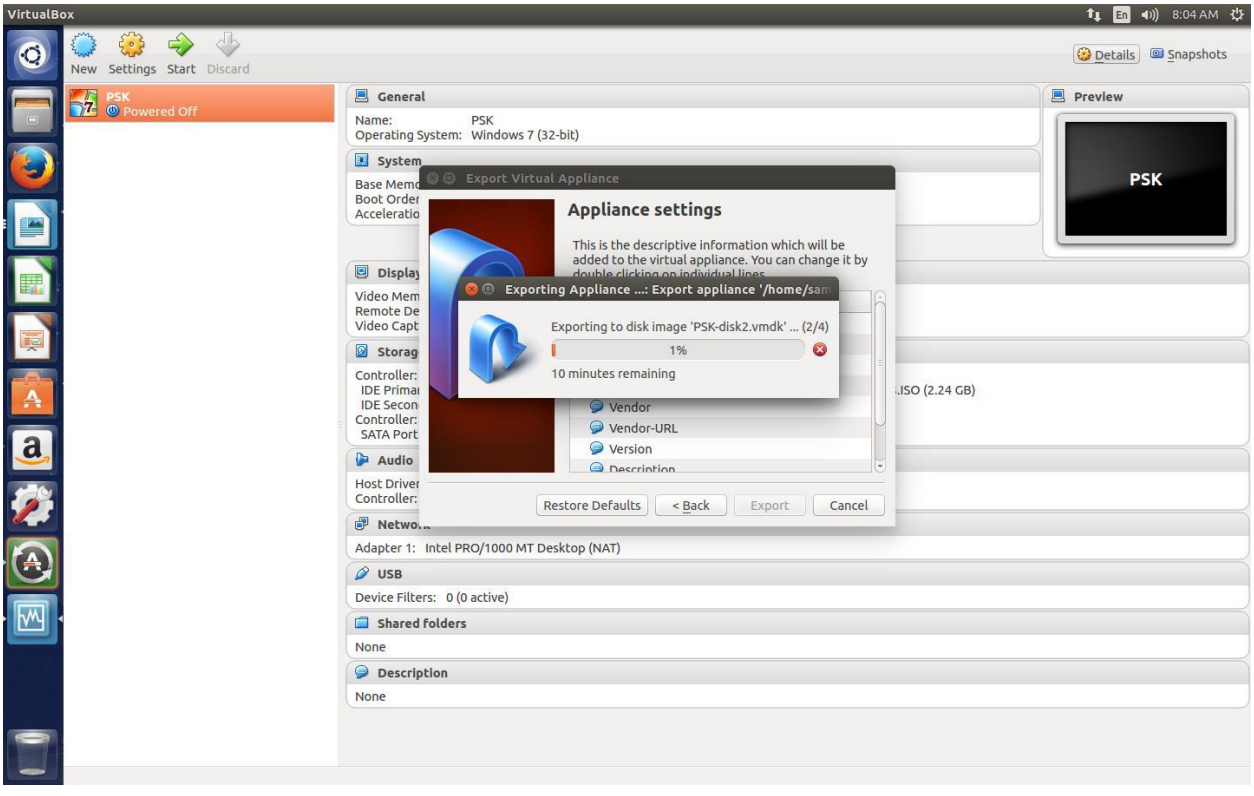
3.Note the file path and click “Next”



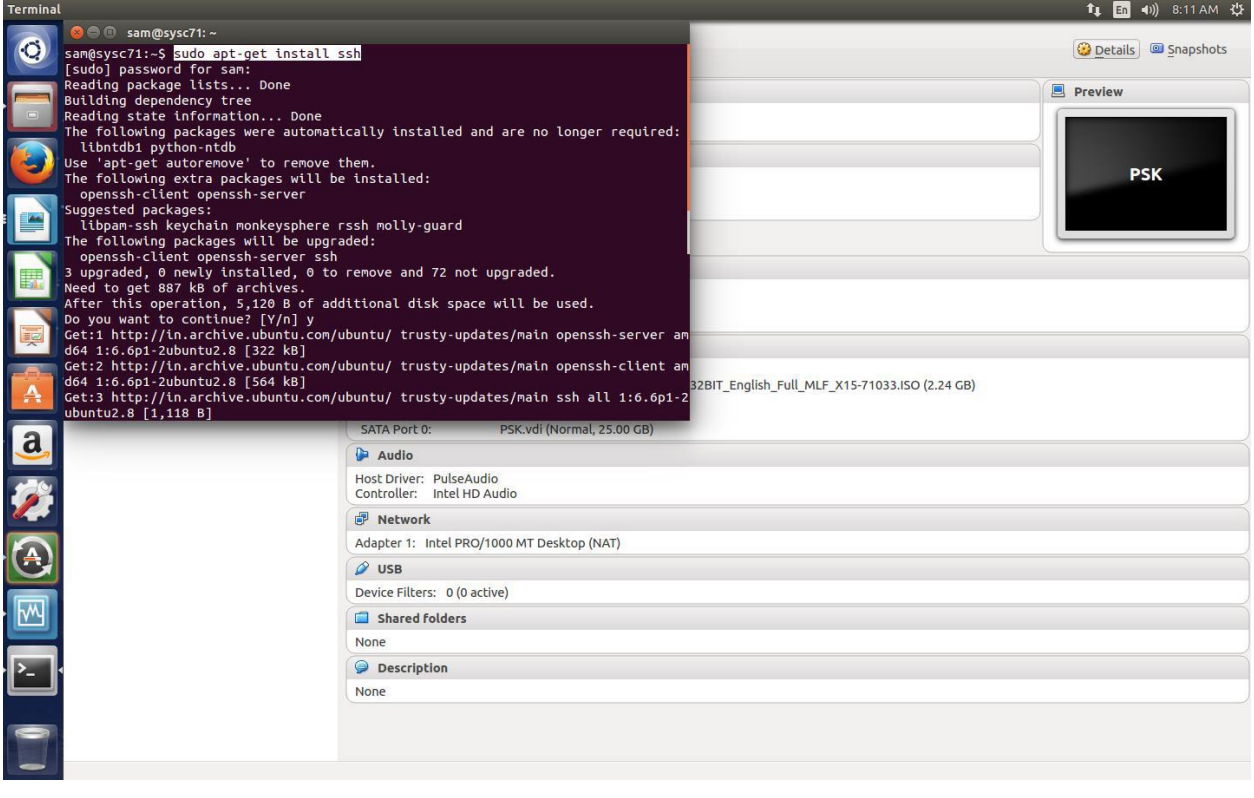
4.Click “Export”



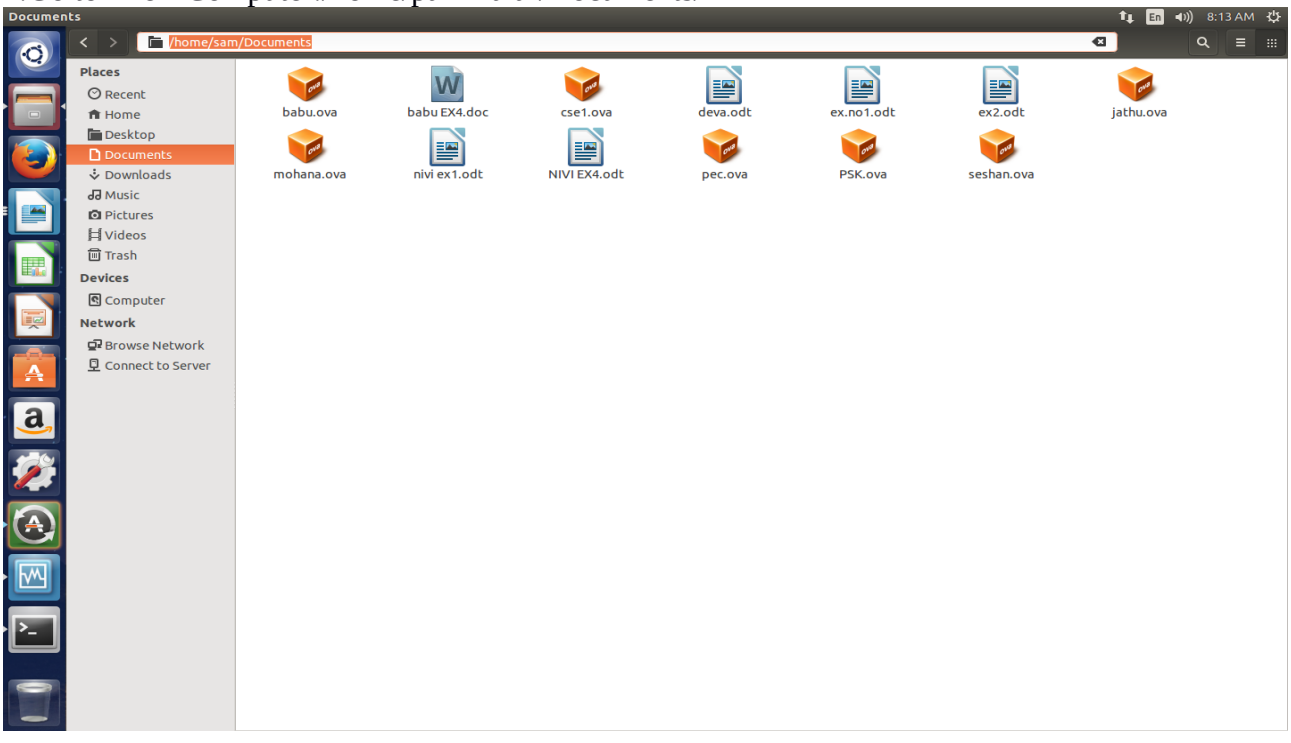
5.The Virtual machine is being exported.



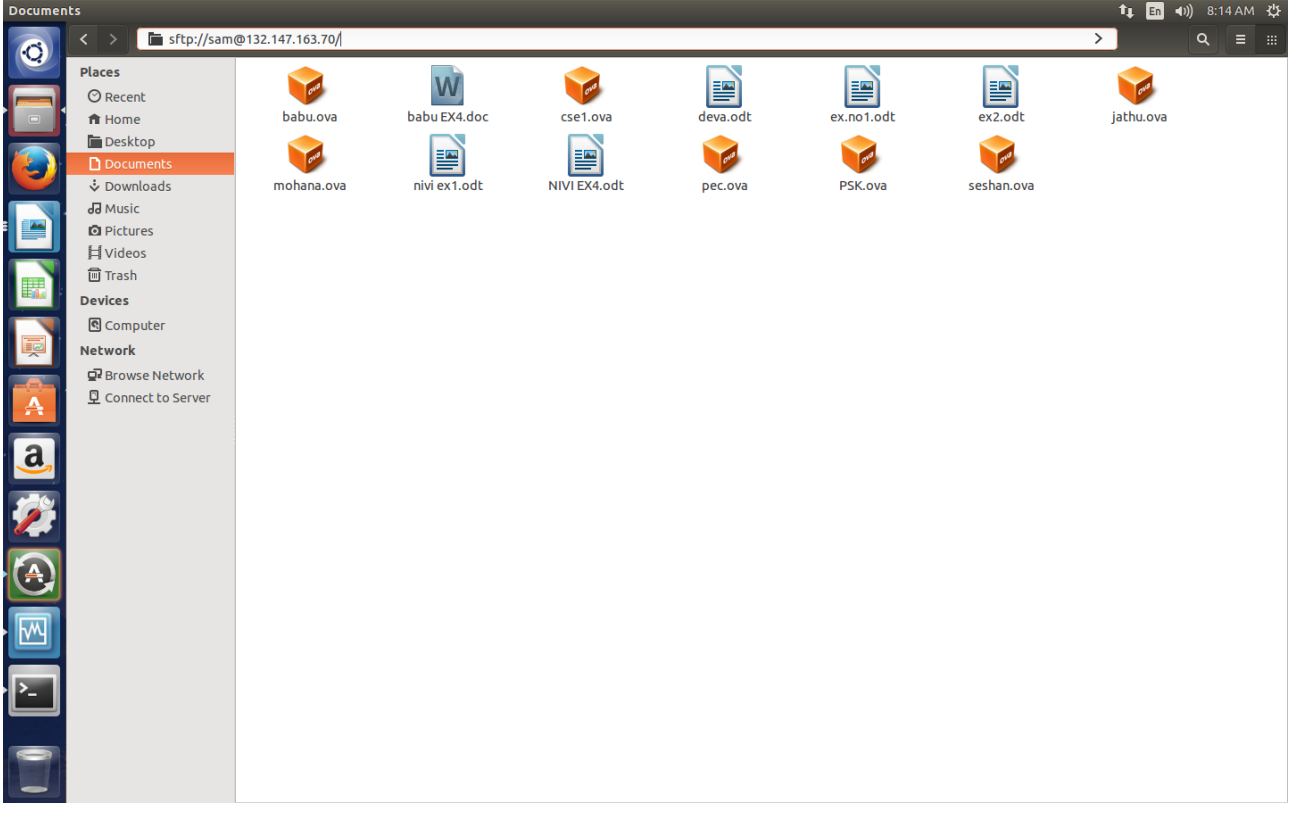
6.Install “ssh” to access the neighbour's VM.



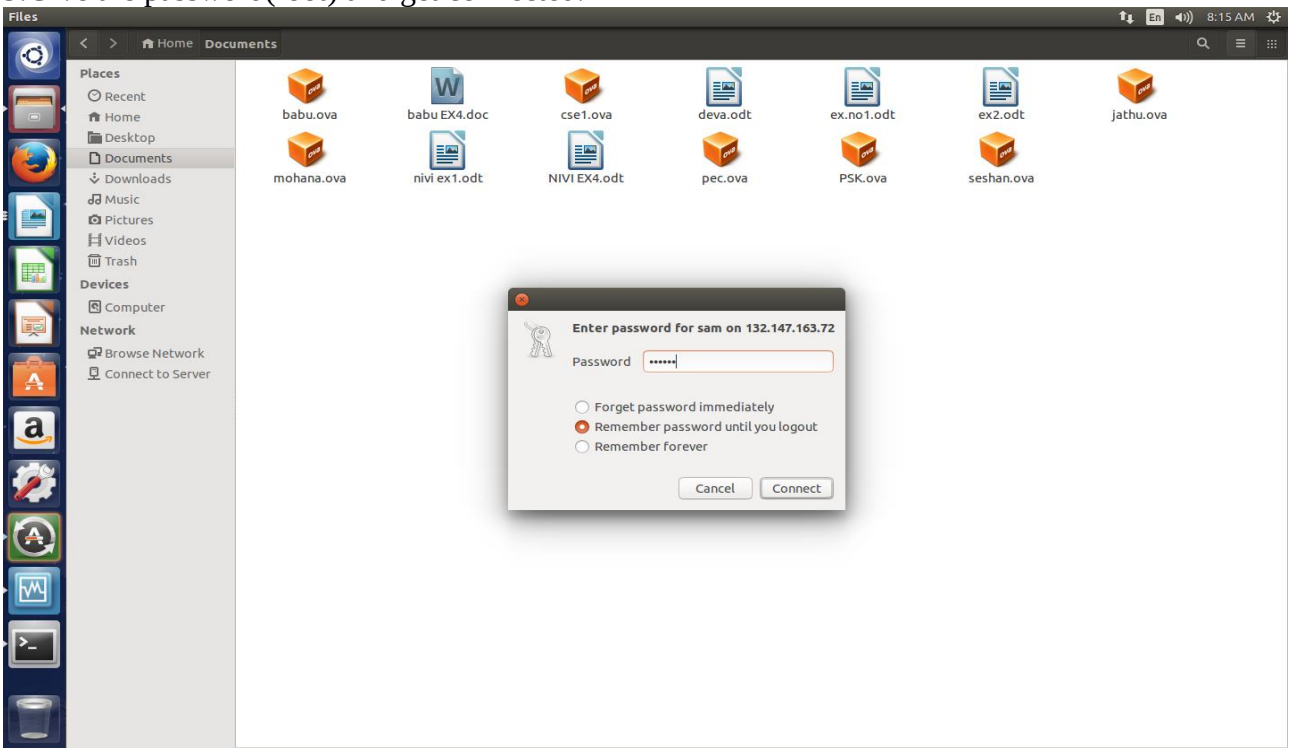
7.Go to File->Computer:/home/panimalar/Documents/



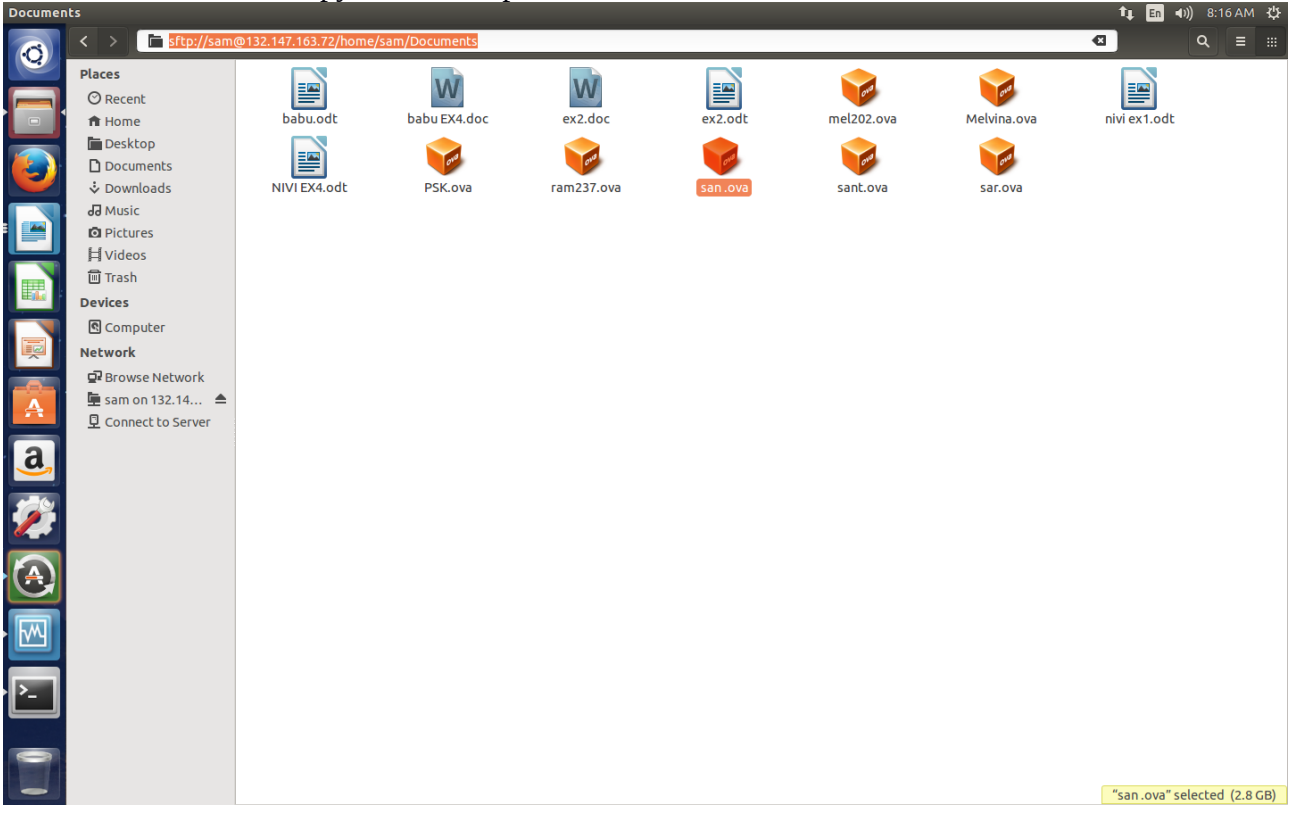
8.Type the neighbour's URL: sftp://panimalar@172.16.20.53/



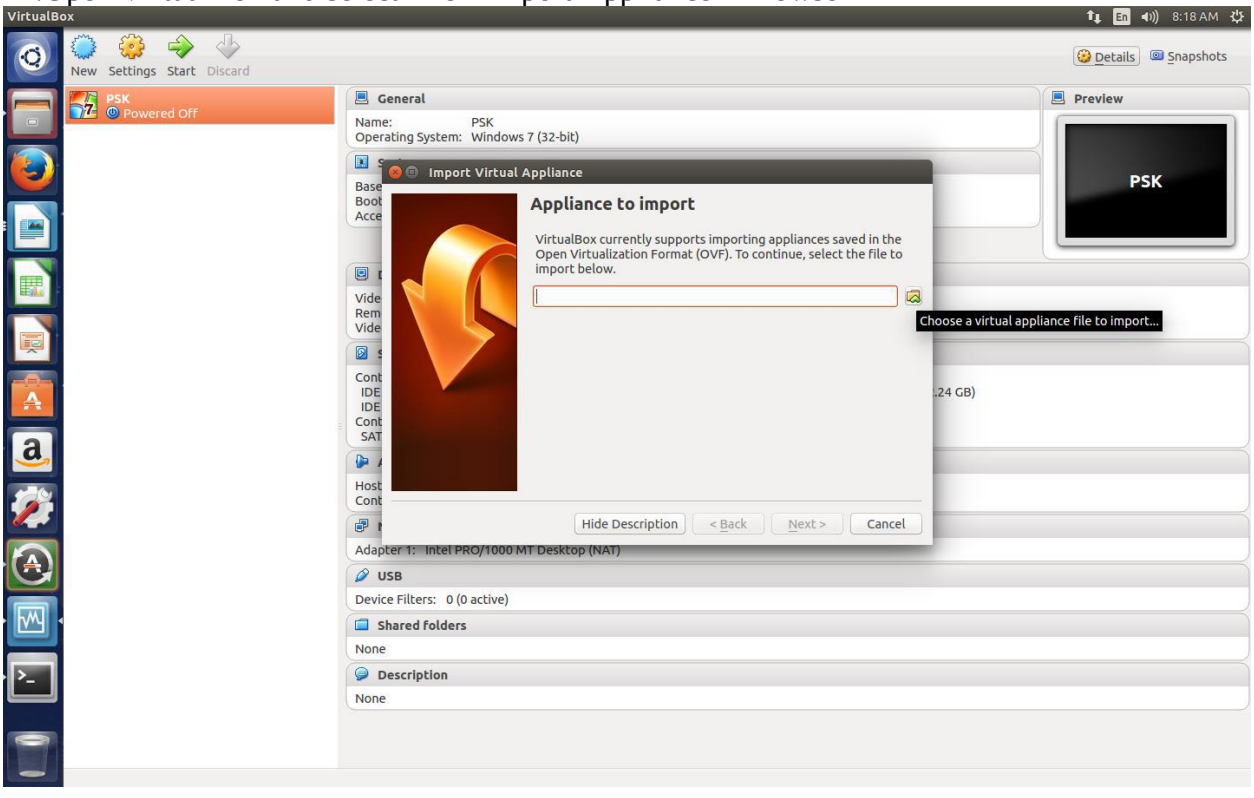
9.Give the password(root) and get connected.



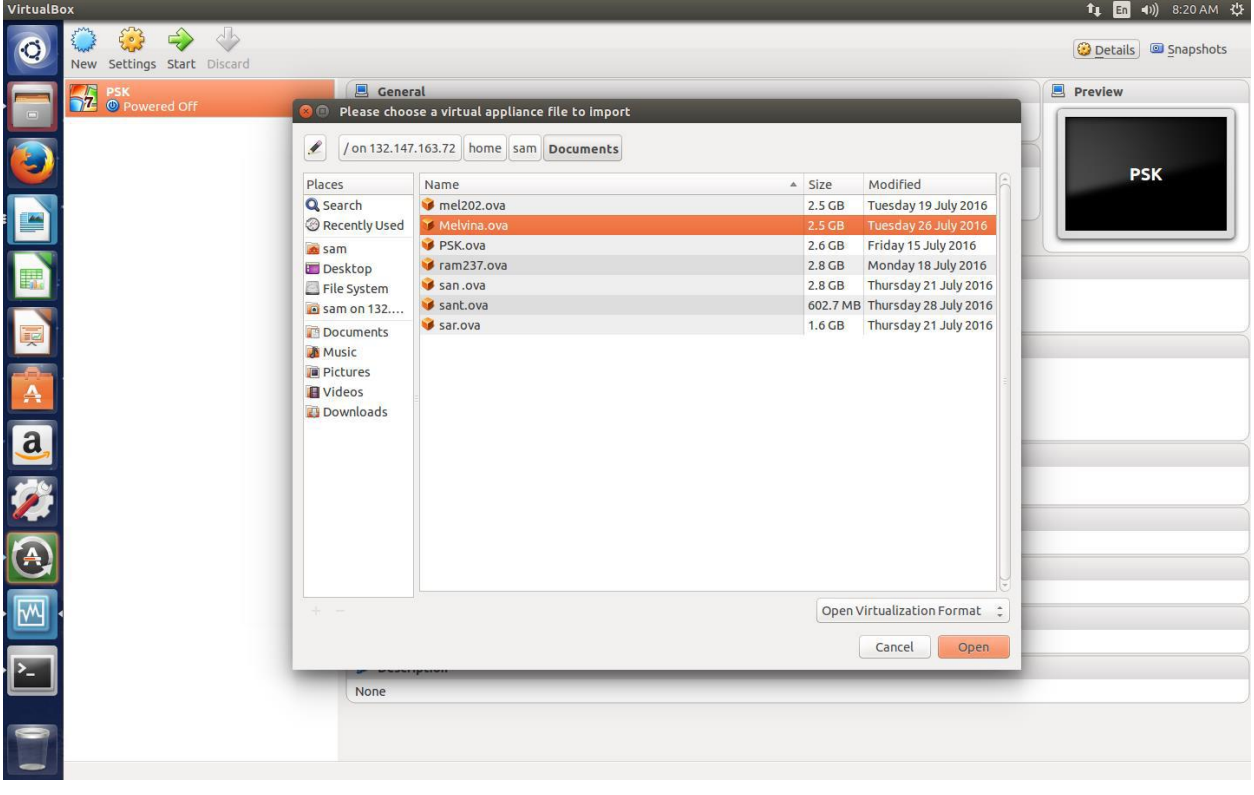
10.Select the VM and copy it in desktop.



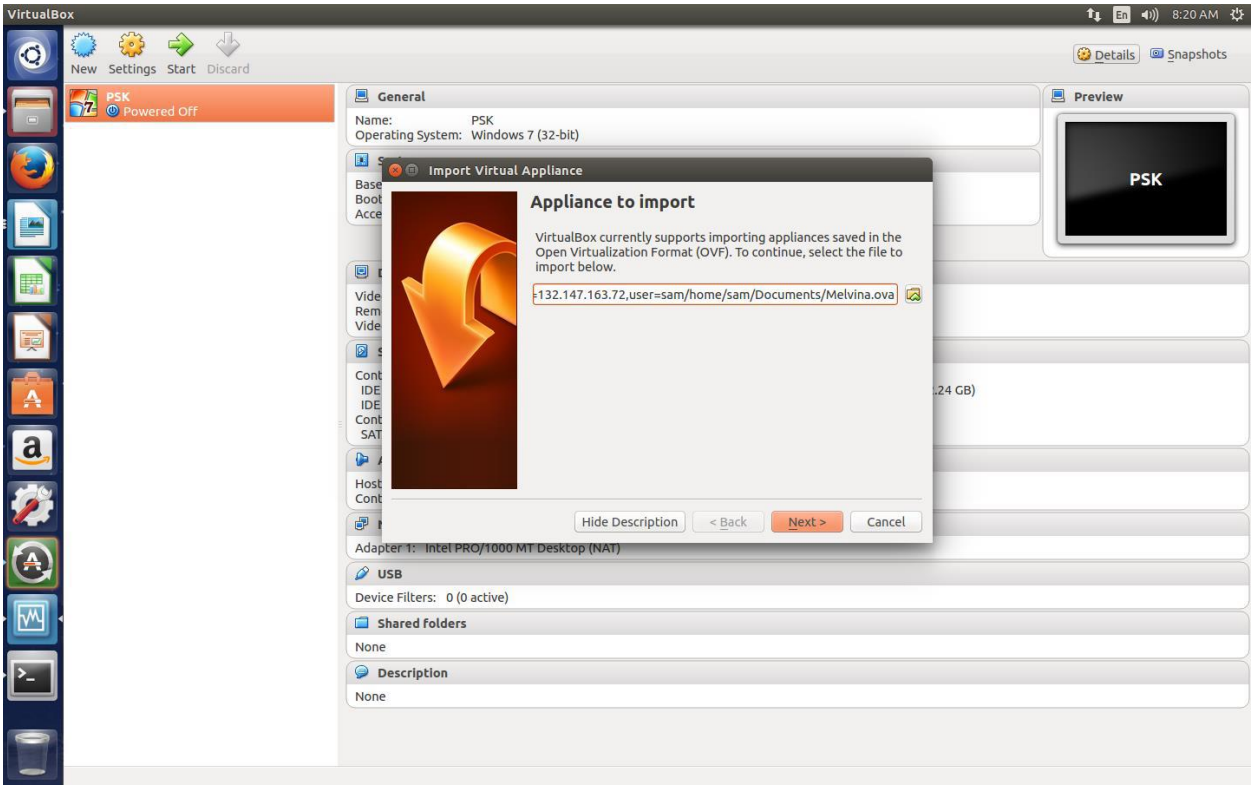
11.Open VirtualBox and select File->Import Appliance->Browse



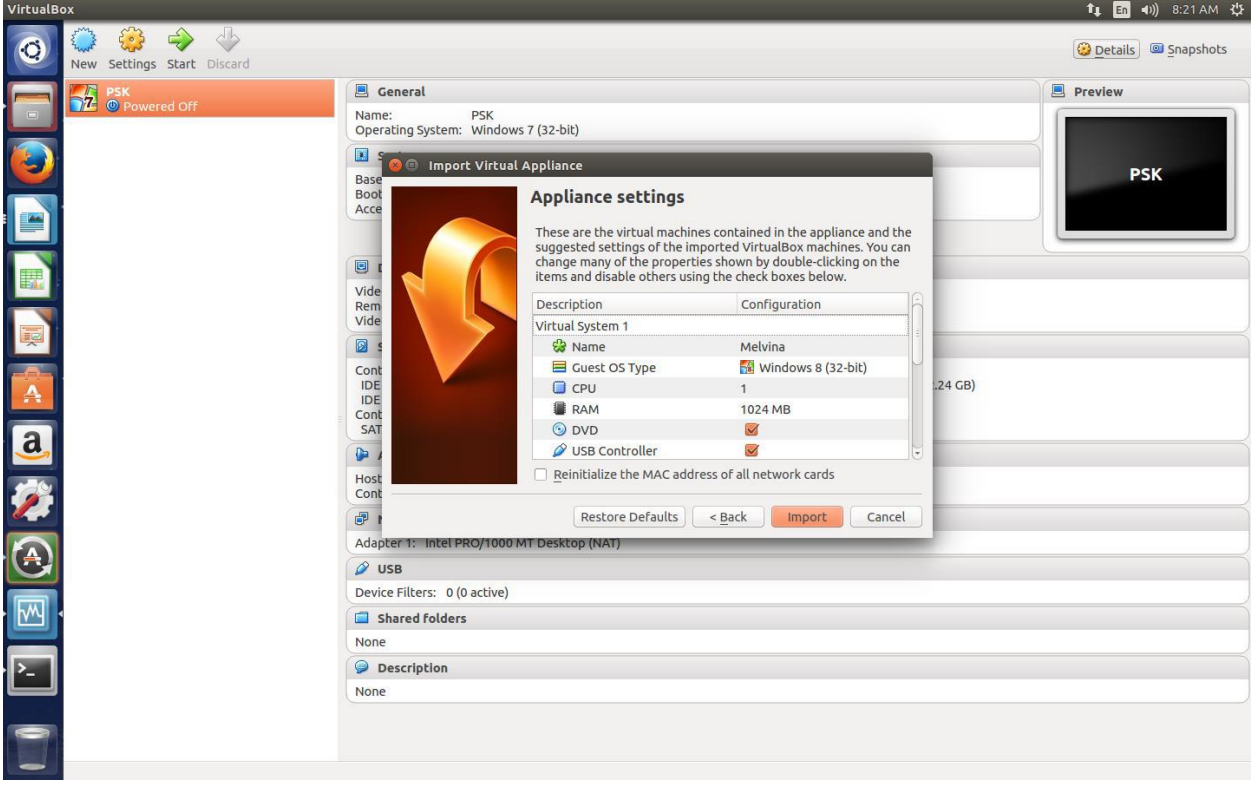
12.Select the VM to be imported and click “Open”.



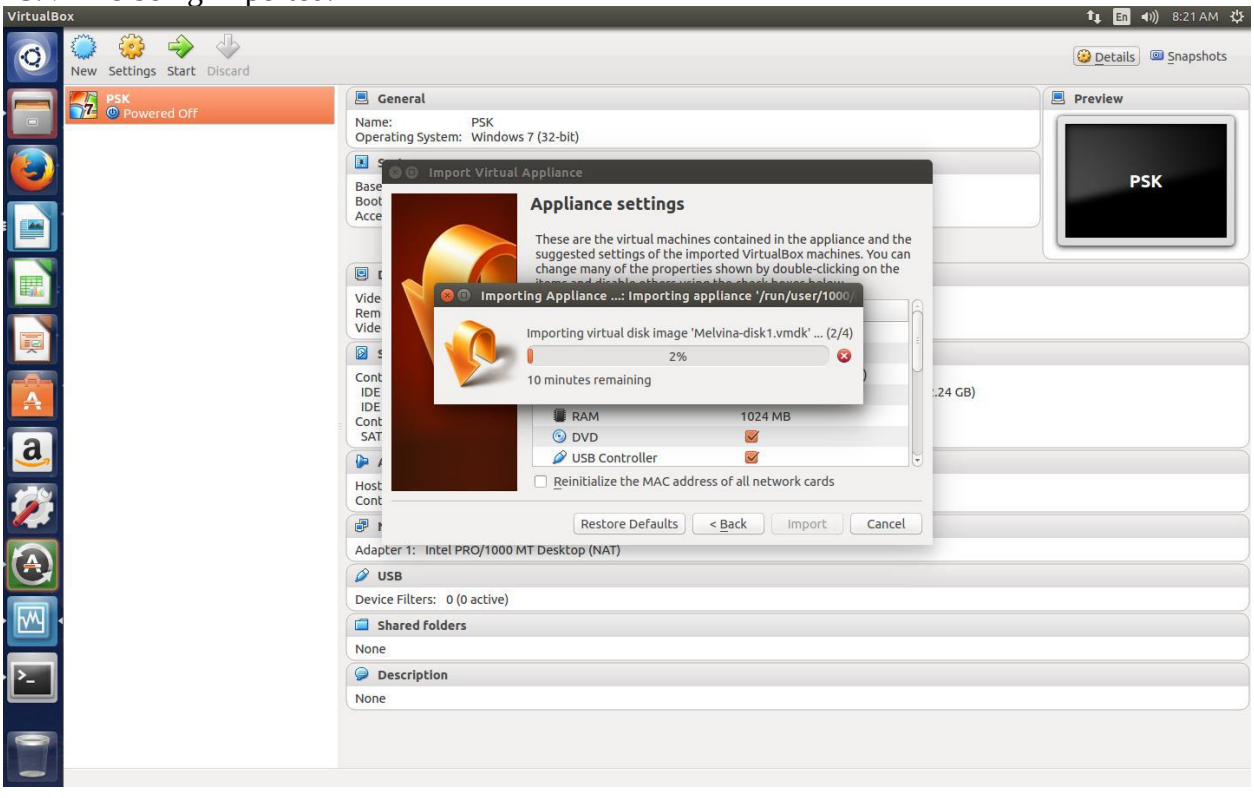
13. Click “Next”



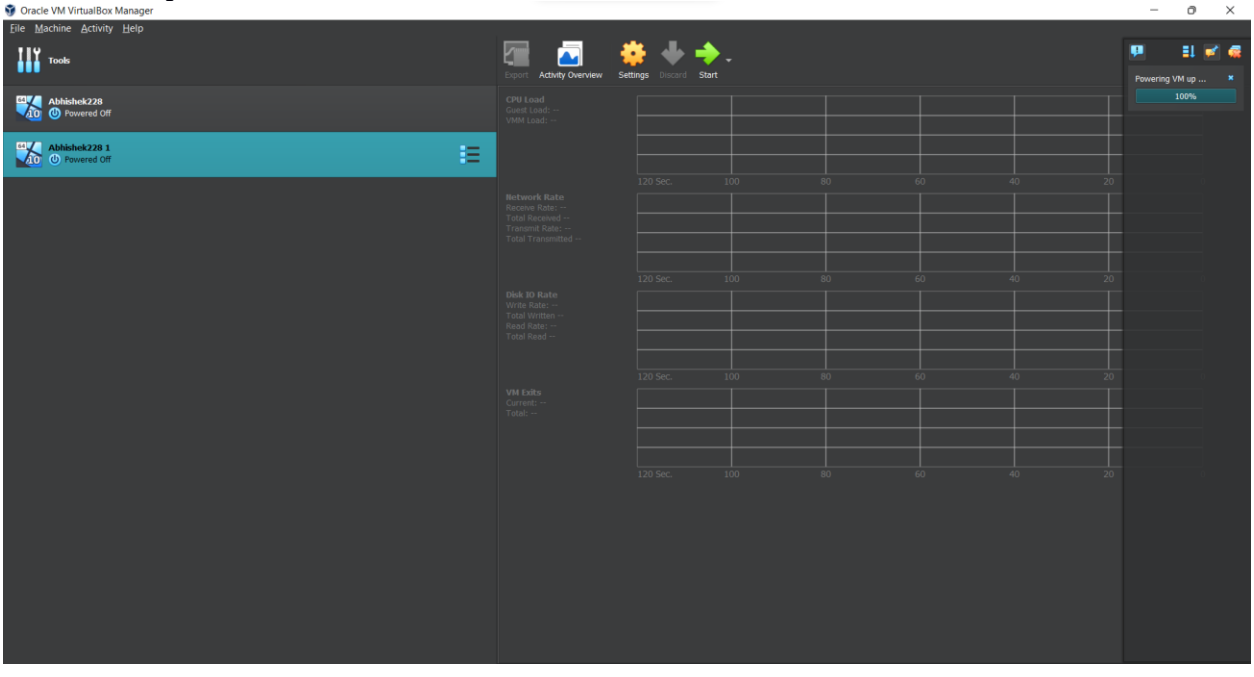
14.Click “Import”.



15.VM is being imported.



16.VM is imported.



RESULT:

The procedure to transfer the files from one virtual machine to another virtual machine by migration based on the certain condition from one node to the other was successfully learned and verified .

Exp. No. : 8
Date:17-10-2022

FIND A PROCEDURE TO LAUNCH VIRTUAL MACHINE USING TRYSTACK (ONLINE OPENSTACK DEMO VERSION)

Aim :

To find a procedure to launch virtual machine using trystack (online openstack demo version).

Procedure :

OpenStack is an open-source software cloud computing platform. OpenStack is primarily used for deploying an infrastructure as a service (IaaS) solution like Amazon Web Service (AWS).

TryStack is the easiest and free way to do it.

Minimum requirements for OpenStack is listed below:

- 4 GB Of Ram.
- 4 CPU Units.
- 30 GB Disk Space.

Step 1: Prepare the environment for installing OpenStack:

Run the following commands and you will be done with it to **bring all your packages to the latest version and install git so that we can clone OpenStack** to our Linux machine.

Commands :

- sudo apt-get update
- sudo apt-get upgrade
- sudo apt-get dist-upgrade
- sudo apt-get install git -y
- sudo reboot

Step 2: Download and Install OpenStack!

Note: If you already have a "stack" user on your virtual machine or laptop (with sudo privileges), then you do not need to create an additional user.

After your virtual machine is done with a reboot, you are now ready to install OpenStack.

Normally **OpenStack runs under non-root user with sudo privileges**. We can easily create one to start with using:

Create the user named as "stack"

sudo useradd -s /bin/bash -d /opt/stack -m stack

Now let us give this user sudo privileges using:

echo "stack ALL=(ALL) NOPASSWD: ALL" | sudo tee /etc/sudoers.d/stack

We now have to log in as user “stack” to proceed with our installation as

sudo su – stack

Start with the installation of openstack by downloading the required material.

git clone https://git.openstack.org/openstack-dev/devstack

 # cd to the cloned directory

cd devstack

Normally during installing it will ask you to set various passwords, you can automate this process by creating a file in your current directory named “**local.conf**”. Save and exit the following file, this will automate the installation process.

 # create the file

$ nano local.conf

 # Now paste following contents in the file

[[local|localrc]]

ADMIN_PASSWORD=secret

DATABASE_PASSWORD=$ADMIN_PASSWORD

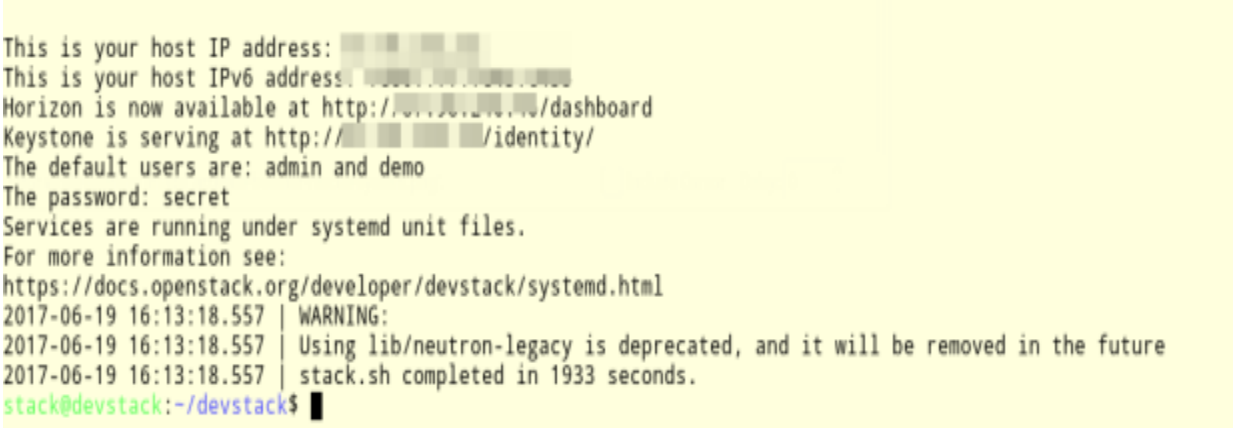
RABBIT_PASSWORD=$ADMIN_PASSWORD

SERVICE_PASSWORD=$ADMIN_PASSWORD

We are now ready to run the installation script. **Installation script can be launched** using the command:

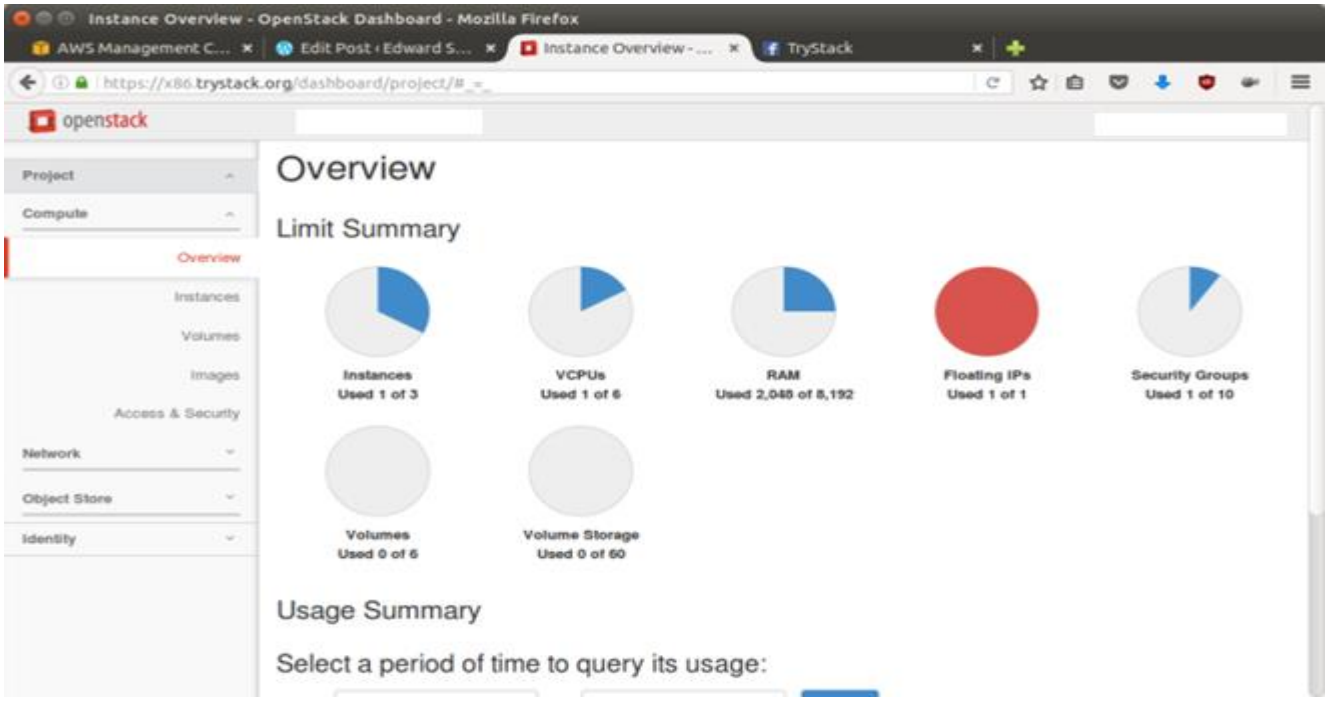
./stack.sh

Once installation is complete your screen should be :



OpenStack dashboard can now be accessed at :

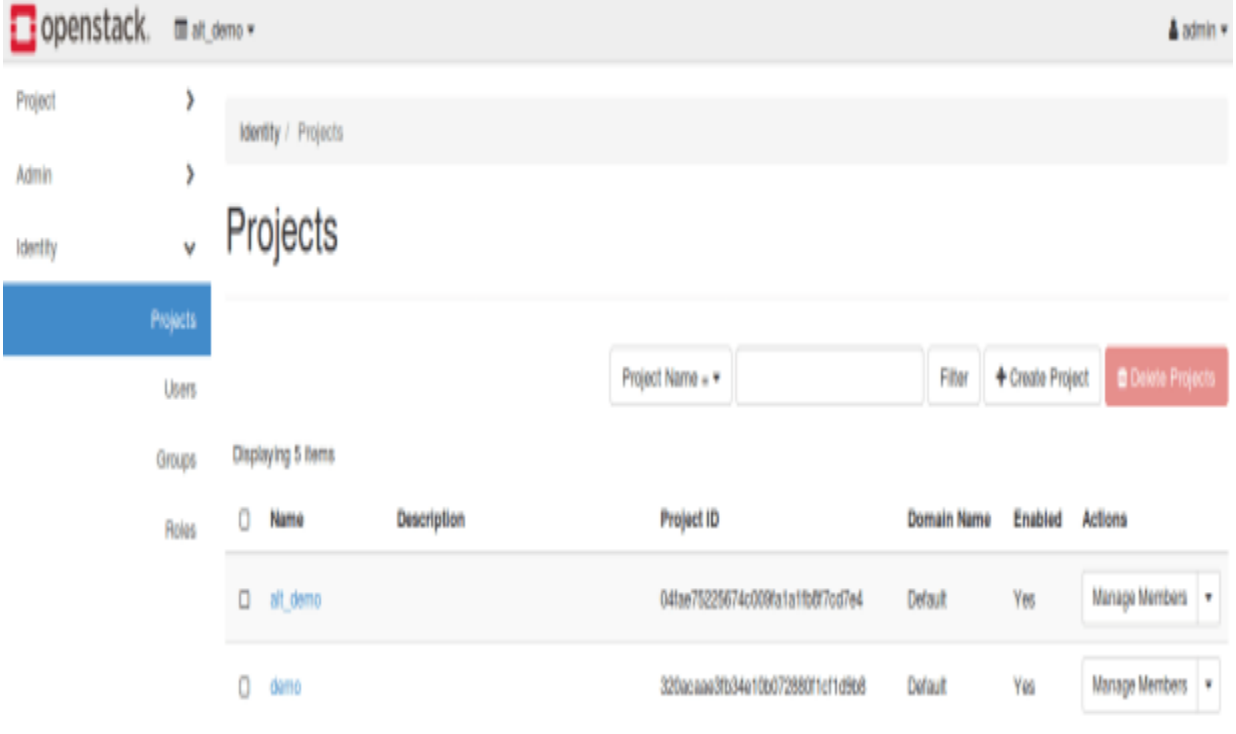
http://<IPAddress>/dashboard/



Step 3: Create Network!

Note: Please remember that without having a network, you can not launch an instance/virtual machine.

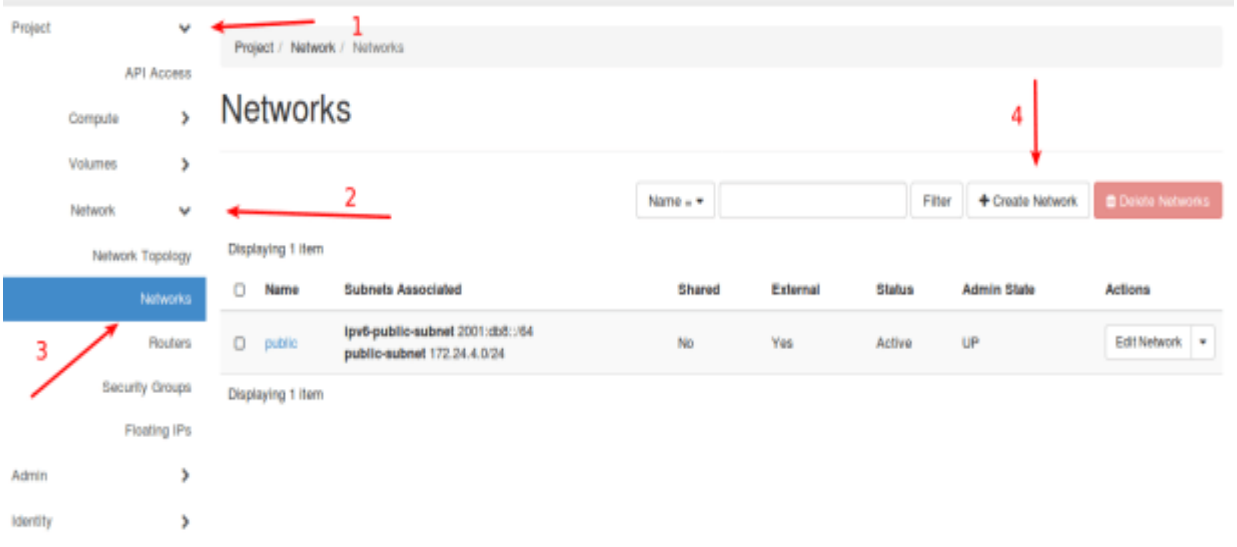
After you are logged into the OpenStack Dashboard it will look something like this:

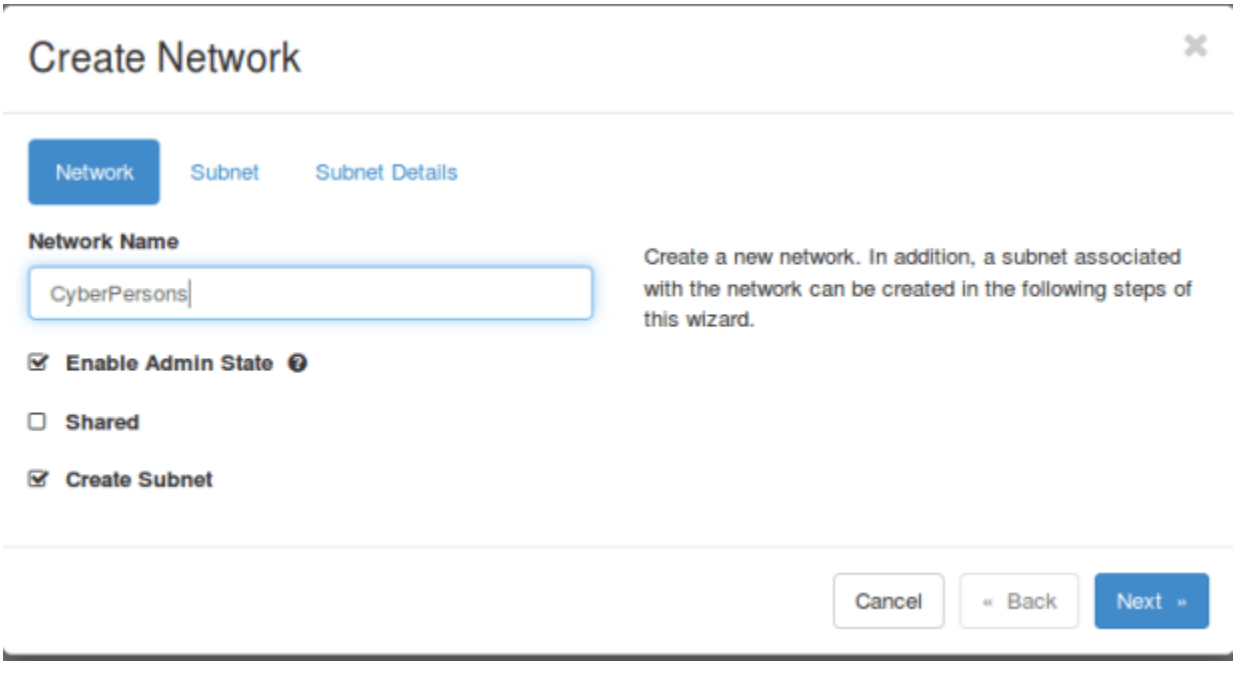


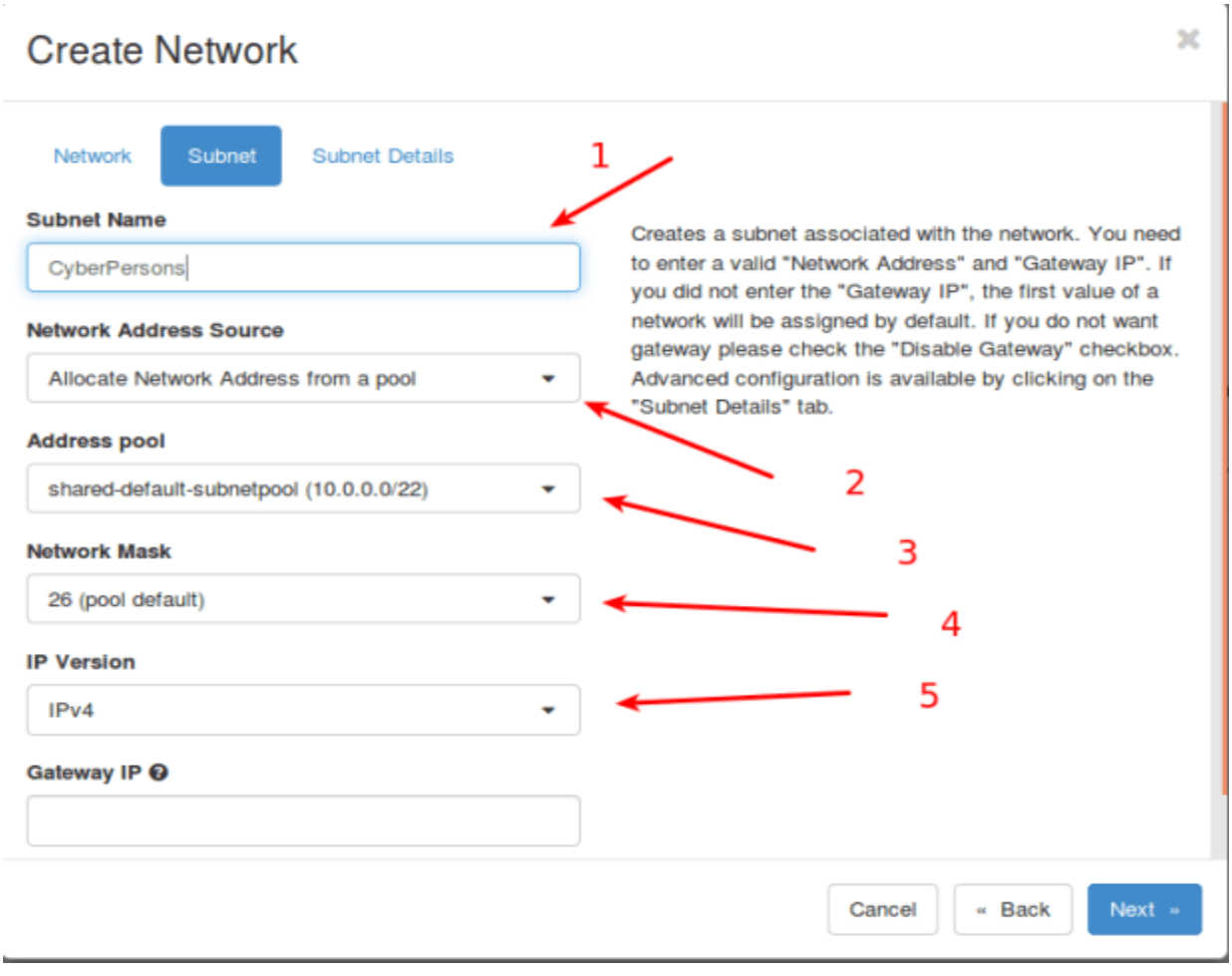
We need to **create a network that virtual machine can use**. For now, it will just be a dummy network:

Steps :

1. Click the Project Drop Down.
2. Click the Network Drop Down.
3. From network Drop Down select Networks, and this window will open that you see on the right side.
4. Finally, click Create Network.

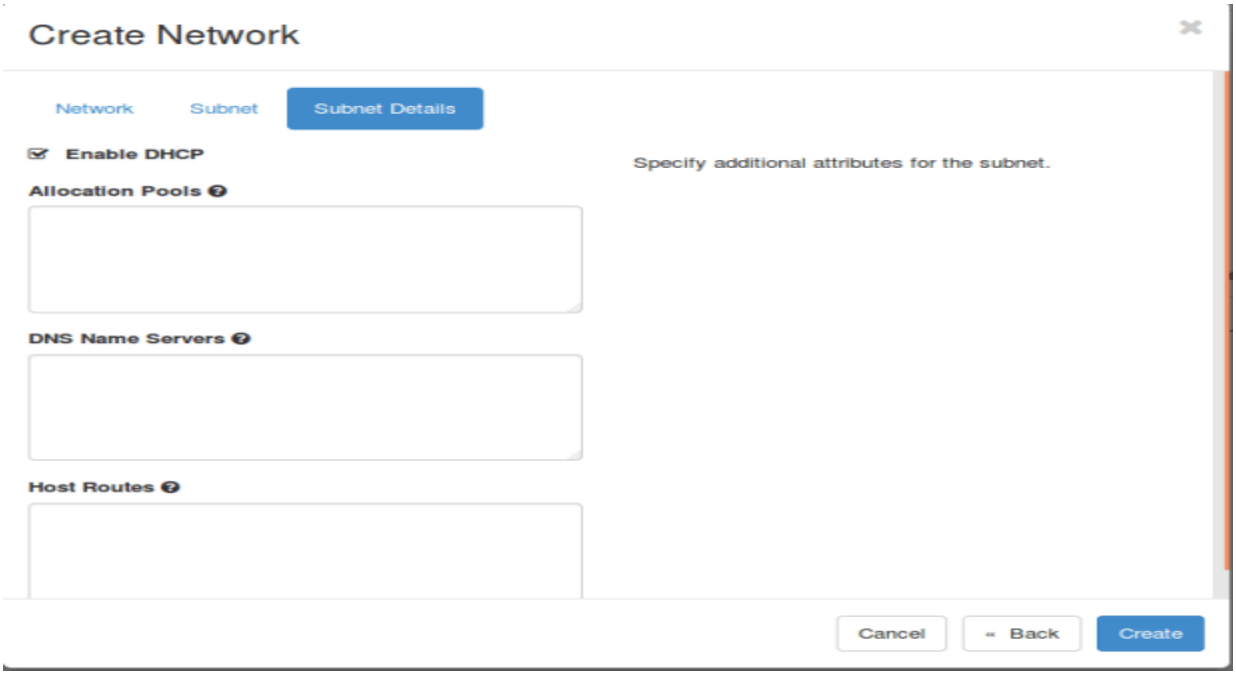






Once all these things are done, click “Next”.

Now everything is optional in this below window if you are interested in filling something up, you can. Otherwise, leave everything as it is and click “Create”. You now have a network that you can use to launch a virtual machine.

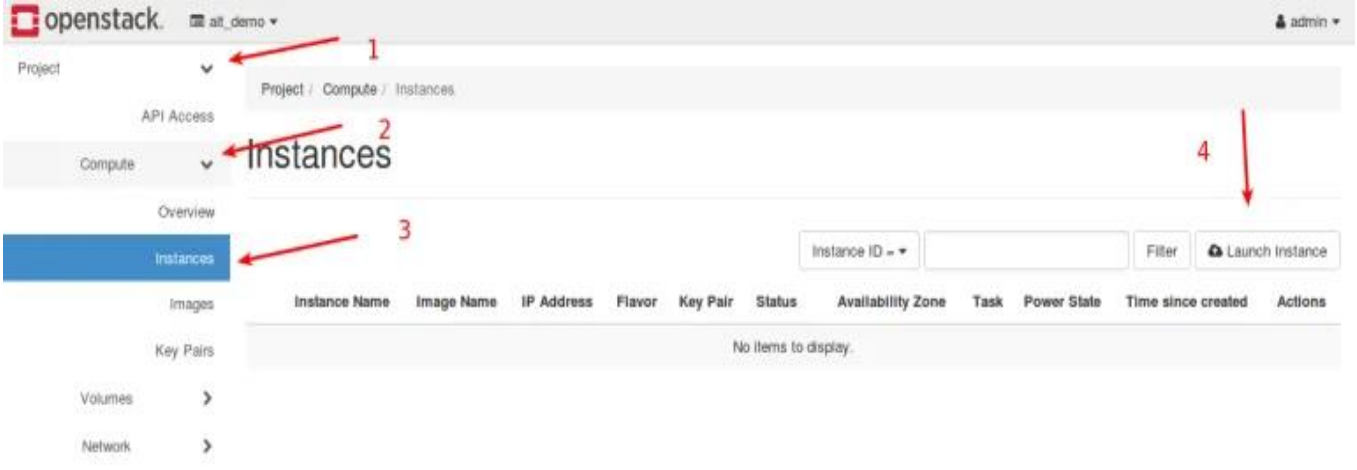


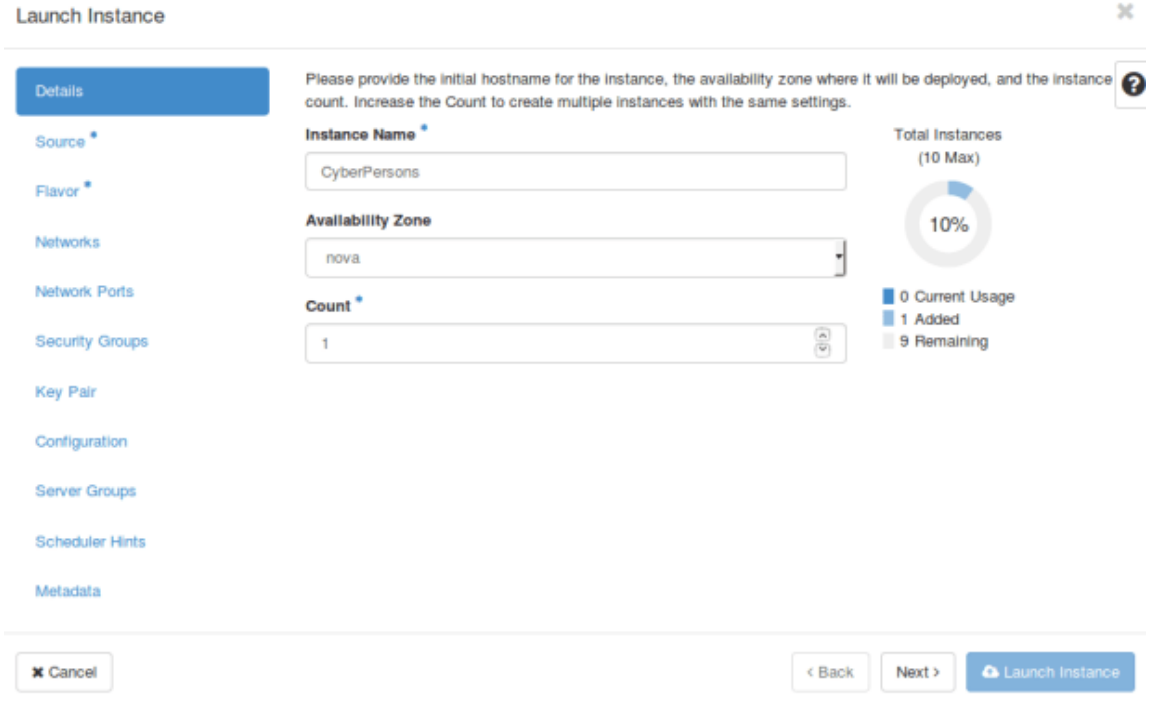
Step 4: Create Virtual Machine/Instance

After the network is created, we are now ready to create our very first virtual machine.

Steps :

1. Click on “Project” drop down.
2. Inside project click “Compute” drop down.
3. Under compute you have four options, since we are interested in creating an instance, you have to click on “Instance”.
4. Finally, click “Lunch Instance”.



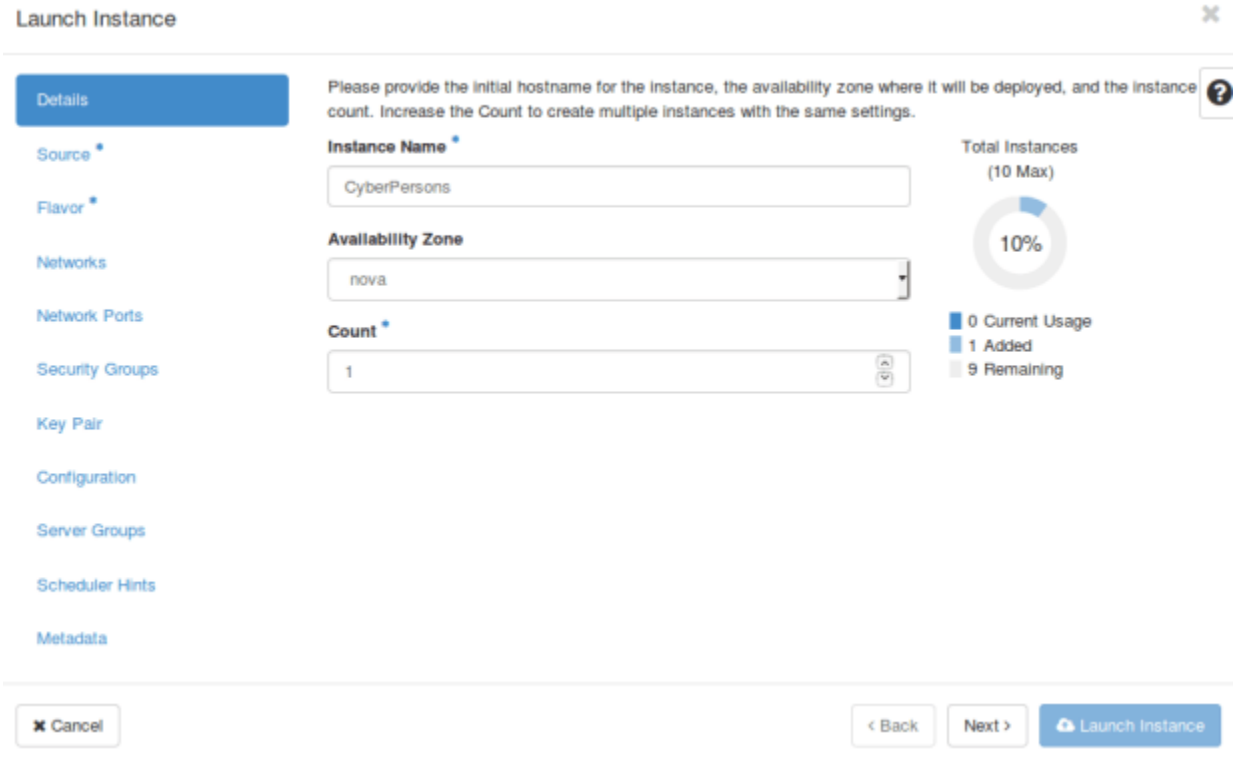


Now, there are 11 tabs to create an instance, we will go through each tab one by one.

Details Tab :

This is a general information tab for creating an instance,

- You will have to **assign a name to your virtual machine** on this tab.
- Select **zone to launch a virtual machine**, and
- Tell **how many copies of virtual machine** you want.



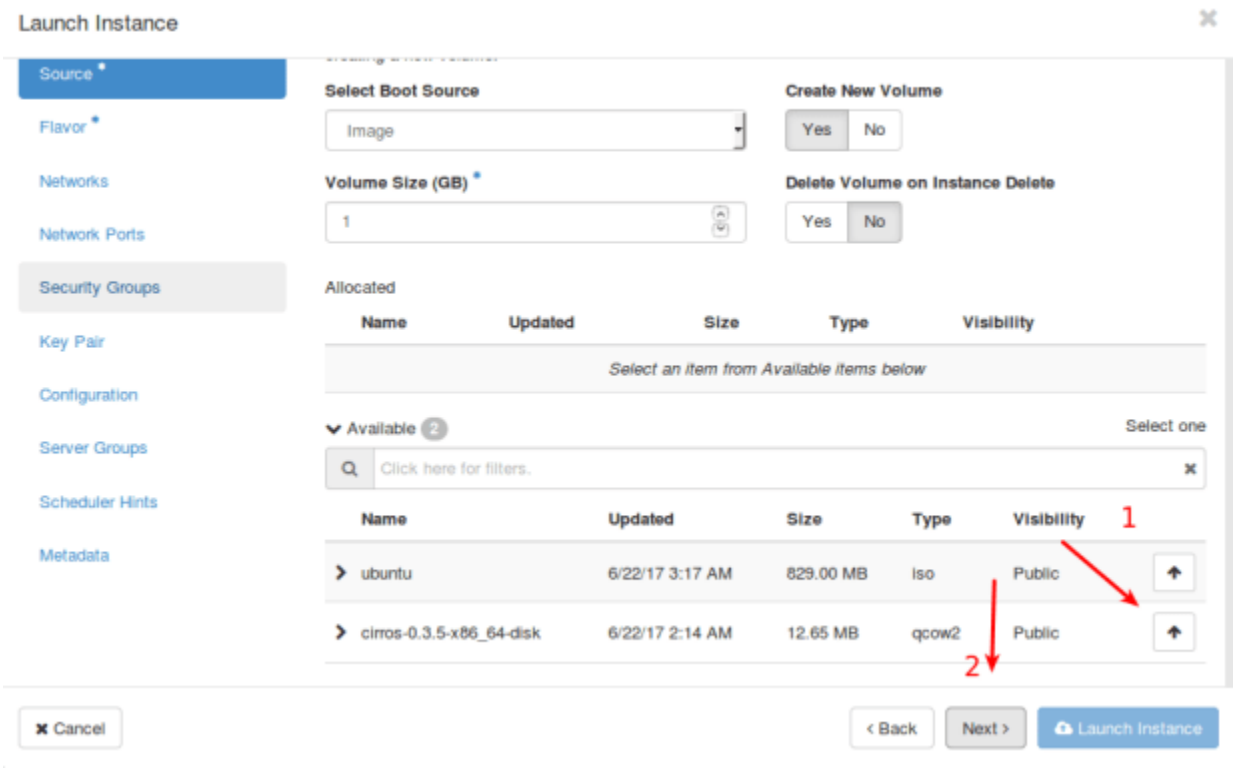
Source Tab

Normally when we create a virtual machine on Proxmox or VMWare we need to insert CD-ROM

In OpenStack this is done by Source Tab, you can use various ways to launch a new virtual machine, OpenStack allows you to choose **following as a source to create your instance.**

- **Image**
- **Snapshot of already created instance**
- **Volume or a volume Snapshot**

We are going to use “Cirros” image to create our instance.



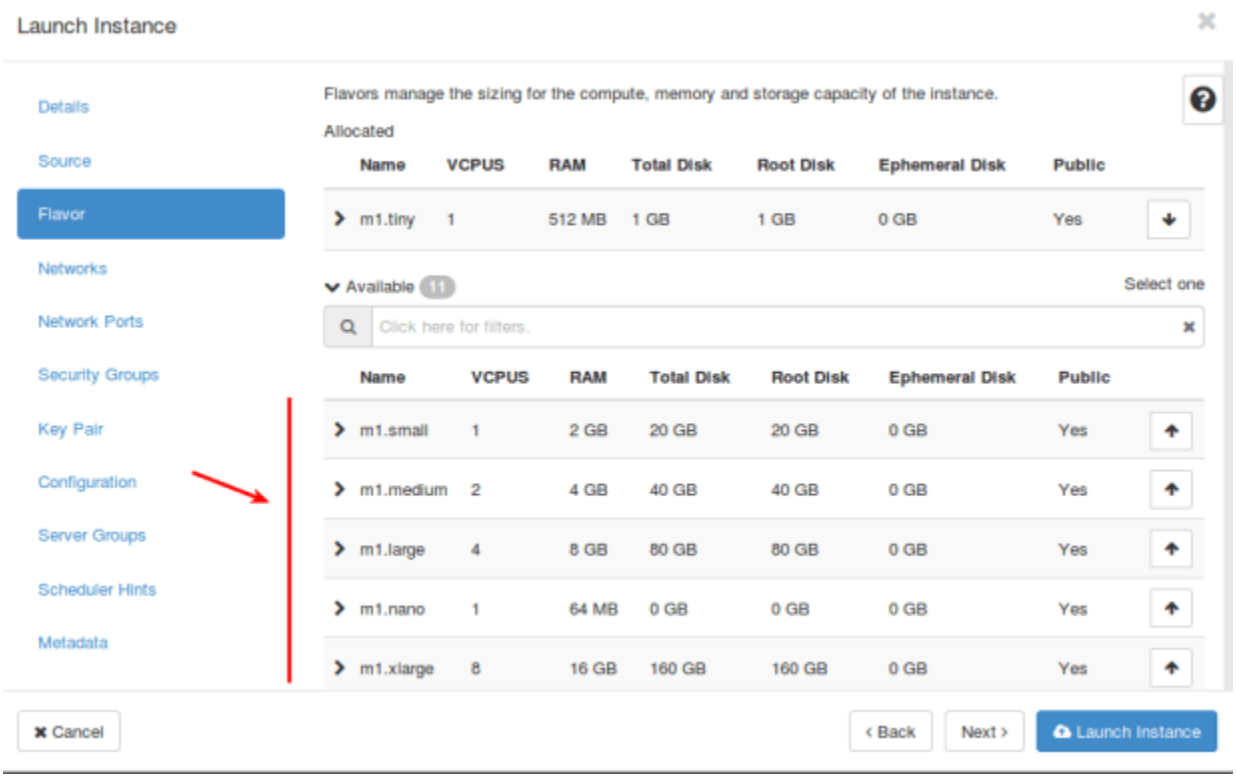
1. Click on the icon where the first arrow is pointing, so that we can use “Cirros” to launch our virtual machine.
2. After the image is selected, just click “Next” so that we can move to “Flavor” tab.

Flavor Tab

Flavor tab will **allow you to allocate resource to your instance**. Like:

- Ram.
- CPU.
- Disk Space.

It is similar to giving virtual resources to the virtual machine, but OpenStack gives fancy names to everything



You can see that there are 11 available pre-configured templates to choose from. The one I choose gave following resources to the instance:

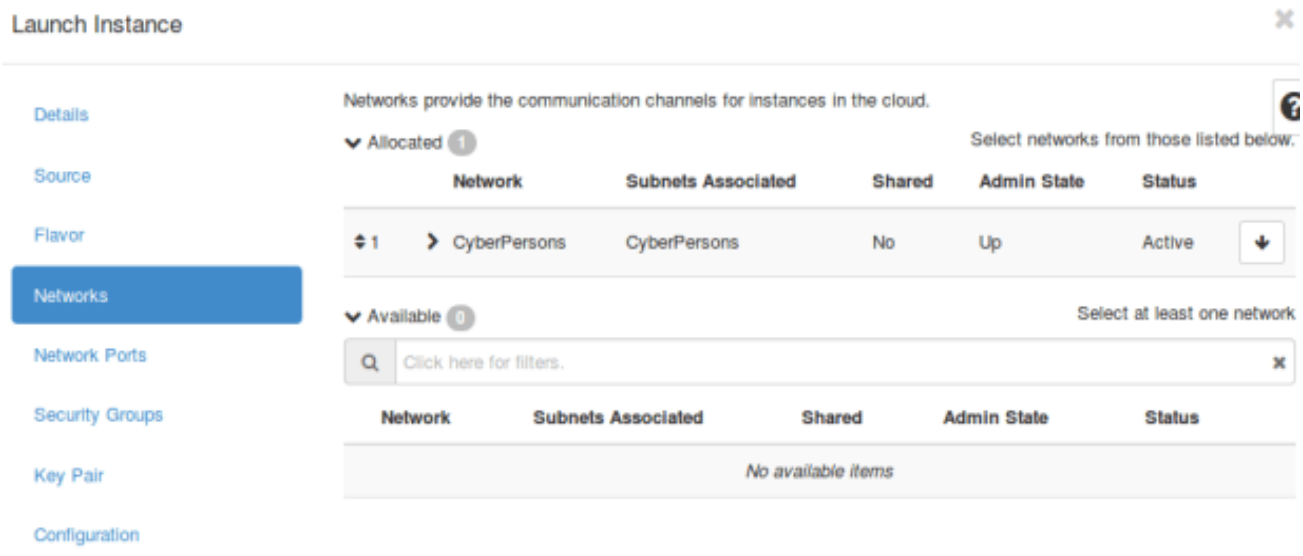
- **1 virtual CPU.**
- **512 MB Ram.**
- **1 GB Disk.**

After flavor is selected, just press “Next”.

Network Tab

Network tab **allows us to define a network for our virtual machine,** you might have remembered that we’ve created a network above for this purpose.

Now by default, the network you have created above will be selected for this machine, as seen in the image below:



Don't change anything just click "Next".

Network Ports Tab

For now, just leave the default settings on "Network Ports" tab and click next.

Security Groups Tab

Security groups define how a specific virtual machine is allowed to talk with the outer world. As for now, we are just trying to create our first virtual machine, you can leave all the defaults.

Key-Pair Tab

Leave defaults and click Next.

Configuration Tab

Leave defaults and click Next.

Server Groups Tab

Leave defaults and click Next.

Scheduler Hints Tab

Leave defaults and click Next.

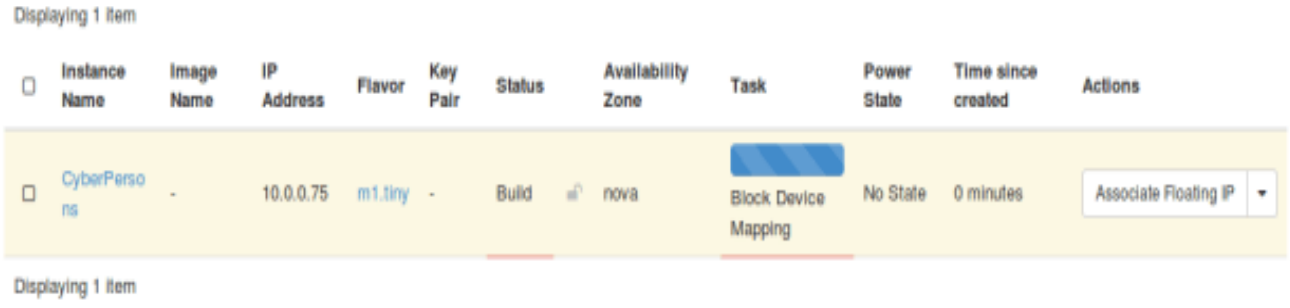
Metadata Tab

Leave defaults and click Next.

Launch Instance

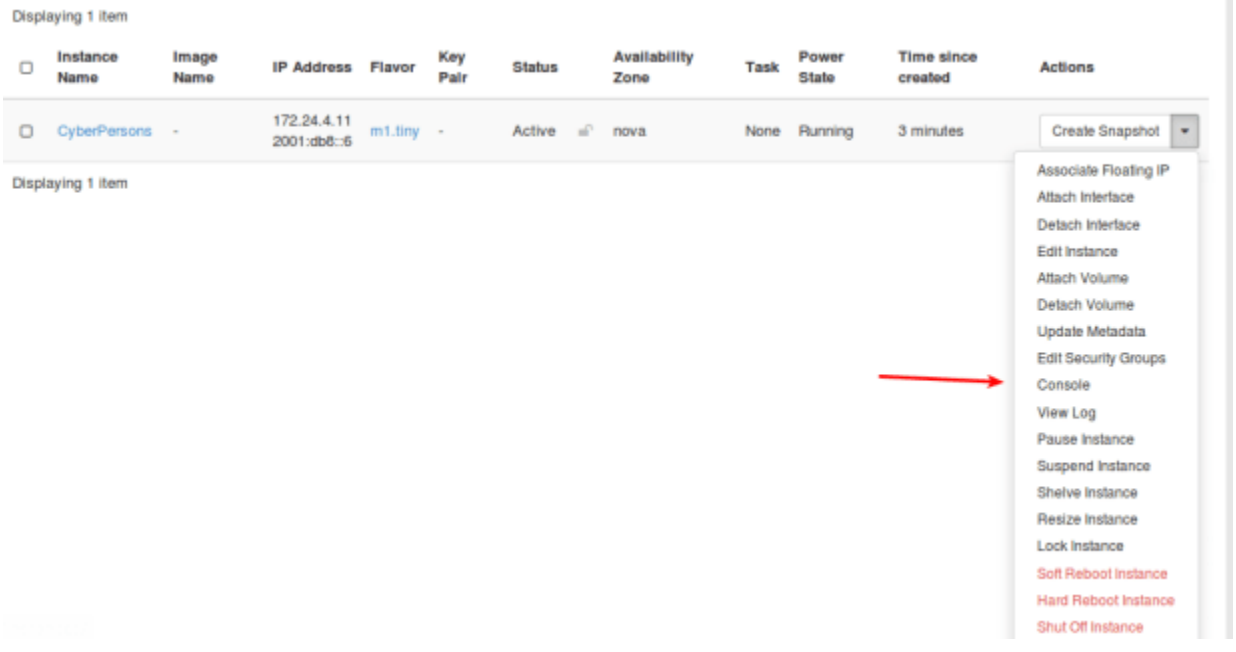
After going through all the tabs, you are now ready to press that magic "Launch Instance" button.

Once you click "Launch Instance" button, OpenStack will start creating our virtual machine, and it is going to look something like this:

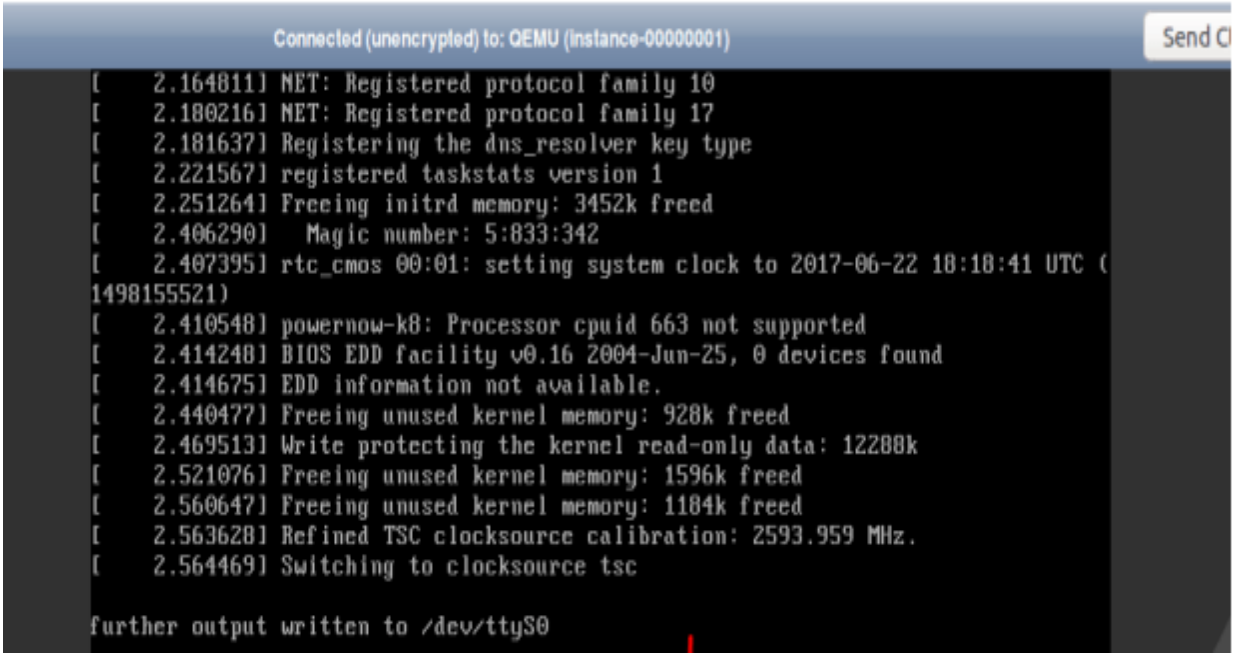


Step 5: Access Virtual Machine Console!

Once you click “Launch Instance” it will take OpenStack few seconds to create your virtual machine. Once ready you can access the console to see how the command line of your first virtual machine looks like.



Click on “Console” and OpenStack will take you to the console of the virtual machine. The console will look something like this:



Result :

The procedure for find a procedure to launch virtual machine using trystack (online openstack demo version) was learned and verified successfully .

Exp. No. : 9a
Date:7-11-2022

FIND PROCEDURE TO SET UP THE ONE NODE HADOOP CLUSTER.

Aim:

To find procedure to set up the one node Hadoop cluster using Hadoop Apache open source framework with simple programming models .

Procedure :

1. Start and complete the perquisite procedure .
2. Creating namenode and datanode and configuring:
    - **a.** hduser@sysk38$ **sudo mkdir -p /usr/local/hadoop_store/hdfs/namenode**
    - **b.** hduser@sysk38$ **sudo mkdir -p /usr/local/hadoop_store/hdfs/datanode**
    - **c.** hduser@sysk38$ **sudo chown -R hduser:hadoop /usr/local/hadoop_store**
    - **d.** hduser@sysk38$ **sudo chown -R hduser /usr/local/hadoop**
3. Formatting namenode as preliminary stage of HDFS:

    hduser@sysk38$ **/usr/local/hadoop/bin/hadoop namenode -format**
4. Starting Hadoop:

    hduser@sysk38**$ /usr/local/hadoop/sbin/start-all.sh**
5. Checking Hadoop:

    hduser@sysk38$ **jps**
6. Checking HDFS installing:

    $ **hadoop version**
7. Creating HDFS Input Directory:

    $**hadoop fs -mkdir /usr/local/hadoop/input**
8. Copying a file into HDFS Input Directory:

    $ **hadoop fs -put /home/4300.txt /usr/local/hadoop/input**
9. Stoping Hadoop:

    hduser@sysk38$ **stop-all.sh**

Commands and Procedure :

I. Installing JAVA JDK

Login as root:

1.sudo –s

Install Jave Runtime :

2.sudo apt-get update

3.sudo apt-get install default-jre

Install Java JDK (OpenJDK v 1.7 or newer)

4.sudo apt-get update

5.sudo apt-get install default-jdk

Checking Java verison :

6.Java -version

Adding a dedicated Hadoop user :

Adding group:

7.$ sudo addgroup hadoop

Adding group `hadoop' (GID 1002) ...

Done.

Creating a user and adding the user to a group:

8. $ **sudo adduser --ingroup hadoop hduser**

Adding user `hduser' ...

Adding new user `hduser' (1001) with group `hadoop' ...

Creating home directory `/home/hduser' ...

Copying files from `/etc/skel' ...

Enter new UNIX password:

Retype new UNIX password:

passwd: password updated successfully

Changing the user information for hduser

Enter the new value, or press ENTER for the default

Full Name []:

Room Number []:

Work Phone []:

Home Phone []:

Other []:

Is the information correct? [Y/n] **Y**

0 Configuring SSH access:

II. Install Secure Shell

Install (SSH and RSYNC)

ssh has two main components:

- **ssh** : The command we use to connect to remote machines - the client.
- **sshd** : The daemon that is running on the server and allows clients to connect to the server.

The **ssh** is pre-enabled on Linux, but in order to start **sshd** daemon, we need to install **ssh** first. Use this command to do that :

9.sudo apt-get install ssh

10.sudo apt-get install rsync

we can think it is setup properly:

11.k@laptop:~$ **which ssh**

/usr/bin/ssh

12.k@laptop:~$ **which sshd**

/usr/sbin/sshd

Create and Setup SSH Certificates (Setup passphraseless ssh)

Hadoop requires SSH access to manage its nodes, i.e. remote machines plus our local machine. For our single-node setup of Hadoop, we therefore need to configure SSH access to localhost. So, we need to have SSH up and running on our machine and configured it to allow SSH public key authentication.

Hadoop uses SSH (to access its nodes) which would normally require the user to enter a password. However, this requirement can be eliminated by creating and setting up SSH certificates using the following commands. If asked for a filename just leave it blank and press the enter key to continue.

Generating an SSH key for the hduser user.

a. Login as hduser with sudo

13.k@laptop:~$ **su hduser**

Password:

b. Run this Key generation command:

14.k@laptop:~$ **ssh-keygen -t rsa -P ""**

Generating public/private rsa key pair.

Enter file in which to save the key (/home/hduser/.ssh/id_rsa):

Created directory '/home/hduser/.ssh'.

Your identification has been saved in /home/hduser/.ssh/id_rsa.

Your public key has been saved in /home/hduser/.ssh/id_rsa.pub.

The key fingerprint is:

50:6b:f3:fc:0f:32:bf:30:79:c2:41:71:26:cc:7d:e3 hduser@laptop

The key's randomart image is:

+--[RSA 2048]----+

| .oo.o |

```
|      . .o=. o  |
|     . + .  o . |
|      o =    E  |
|       S +      |
|        . +     |
|         O +    |
|          O o   |
|           o..  |
+-----------------+
```

Enable SSH access to your local machine with this newly created key.

15.hduser@laptop:/home/k$ cat $HOME/.ssh/id_rsa.pub >> $HOME/.ssh/authorized_keys

The final step is to test the SSH setup by connecting to your local machine with the hduser user. We can check if ssh works:

16.hduser@laptop:/home/k$ **ssh localhost**

The authenticity of host 'localhost (127.0.0.1)' can't be established.

ECDSA key fingerprint is e1:8b:a0:a5:75:ef:f4:b4:5e:a9:ed:be:64:be:5c:2f.

Are you sure you want to continue connecting (yes/no)? **yes**

Warning: Permanently added 'localhost' (ECDSA) to the list of known hosts.

Welcome to Ubuntu 14.04.1 LTS (GNU/Linux 3.13.0-40-generic x86_64)

(OR)

To enable password-less login, generate a new SSH key with an empty passphrase:

Use Hadoop User:

ssh-keygen -t dsa -P '' -f ~/.ssh/id_dsa

cat ~/.ssh/id_dsa.pub >> ~/.ssh/authorized_keys

1 Disabling IPv6.

```
sudo gedit /etc/sysctl.conf
```

Add the following lines to the end of the file and reboot the machine, to update the configurations correctly.

```
#disable ipv6
net.ipv6.conf.all.disable_ipv6 = 1
net.ipv6.conf.default.disable_ipv6 = 1
```

```
net.ipv6.conf.lo.disable_ipv6 = 1
```

III. Fetch and Install Hadoop

Run this following command to download Hadoop version 2.6.0

Fetcth Hadoop (Stable Version)

17.hduser@laptop:~$ **wget http://mirrors.sonic.net/apache/hadoop/common/hadoop-2.6.0/hadoop-2.6.0.tar.gz**

Unpack the compressed hadoop file by using this command:

18.hduser@laptop:~$ **tar xvzf hadoop-2.6.0.tar.gz**

Move hadoop-2.6.0 to hadoop directory by using give command :

19.hduser@laptop:~$mv hadoop-2.6.0 /usr/local/hadoop

mv: cannot move ‘hadoop-2.6.0’ to ‘/usr/local/hadoop’: Permission denied

20.hduser@laptop:~$ **cd hadoop-2.6.0**

Move hadoop package of your choice, I picked **/usr/local** for my convenience :

21.hduser@laptop:~/hadoop-2.6.0$ **sudo mv * /usr/local/hadoop**

[sudo] password for hduser:

hduser is not in the sudoers file. This incident will be reported.

This error can be resolved by logging in as a root user, and then add **hduser** to **sudo**:

22.hduser@sysk81:~/hadoop-2.6.0$ **su panimalar**

Password:

23.panimalar@sysk81:/home/hduser/hadoop-2.6.0$ **sudo adduser hduser sudo**

[sudo] password for k:

Adding user `hduser' to group `sudo' ...

Adding user hduser to group sudo

Done.

Now, the **hduser** has root priviledge, we can move the Hadoop installation to the **/usr/local/hadoop** directory without any problem:

24.panimalar@sysk81:/home/hduser/hadoop-2.6.0$ **sudo su hduser**

hduser@sysk81:~/hadoop-2.6.0$

25.hduser@sysk81:/home/panimalar$ **sudo -s**

26.root@sysk81:/home/panimalar# **mkdir /usr/local/hadoop**

27.root@sysk81:/home/panimalar# **exit**

exit

28.hduser@sysk81:/home/panimalar$ **sudo su hduser**

[sudo] password for hduser:

29.hduser@sysk81:/home/panimalar$ **pwd**

/home/panimalar

30.hduser@sysk81:/home/panimalar$ **cd /home/hduser**

31.hduser@sysk81:~$ **cd hadoop-2.6.0/**

32.hduser@sysk81:~/hadoop-2.6.0$ **sudo mv * /usr/local/hadoop**

Make sure to change the owner of all the files to the hduser user and hadoop group by using this command:

33.hduser@sysk81:~/hadoop-2.6.0$ **sudo chown -R hduser:hadoop /usr/local/hadoop**

IV. Edit Hadoop Configuration Files

Get Java Correct Path

34.hduser@laptop$ **update-alternatives --config java**

There is only one alternative in link group java (providing /usr/bin/java): /usr/lib/jvm/java-7-openjdk-amd64/jre/bin/java

Nothing to configure.

/usr/lib/jvm/java-7-openjdk-i386 /jre/bin/java

Setup Configuration Files

The following files will have to be modified to complete the Hadoop setup:

Modifing The following Files

- ✓ **~/.bashrc**
- ✓ **/usr/local/hadoop/etc/hadoop/hadoop-env.sh**
- ✓ **/usr/local/hadoop/etc/hadoop/core-site.xml**
- ✓ **/usr/local/hadoop/etc/hadoop/yarn-site.xml**
- ✓ **/usr/local/hadoop/etc/hadoop/mapred-site.xml**
- ✓ **/usr/local/hadoop/etc/hadoop/hdfs-site.xml**

(1)~/.bashrc :

35.hduser@sysk81:~$ **nano ~/.bashrc**

Add the following to the end file after modify the java_home and Hadoop_install, Change JAVA_HOME to Correct path you getting above, and HADOOP_INSTALL to your hadoop folder room

```
#HADOOP VARIABLES START
export JAVA_HOME=/usr/lib/jvm/java-7-openjdk-i386
export HADOOP_INSTALL=/usr/local/hadoop
export PATH=$PATH:$HADOOP_INSTALL/bin
export PATH=$PATH:$HADOOP_INSTALL/sbin
export HADOOP_MAPRED_HOME=$HADOOP_INSTALL
```

export HADOOP_COMMON_HOME=$HADOOP_INSTALL

export HADOOP_HDFS_HOME=$HADOOP_INSTALL

export YARN_HOME=$HADOOP_INSTALL

export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_INSTALL/lib/native

export HADOOP_OPTS="-Djava.library.path=$HADOOP_INSTALL/lib"

#HADOOP VARIABLES END

Save file and close then Refresh Source using the following command

36.hduser@sysk81:~$ **source ~/.bashrc**

37.hduser@sysk81:~$ **javac -version**

javac 1.7.0_101

38.hduser@sysk81:~$ **which javac**

/usr/bin/javac

hduser@sysk81:~$

39.(2) hduser@sysk81:~$ **readlink -f /usr/bin/javac**

/usr/lib/jvm/java-7-openjdk-amd64/bin/javac

(2)hadoop-env.sh:

40.hduser@sysk81:~$ **nano /usr/local/hadoop/etc/hadoop/hadoop-env.sh**

Update the JAVA_HOME

export JAVA_HOME=/usr/lib/jvm/java-7-openjdk-amd64

Save and close the file

(3)/usr/local/hadoop/etc/hadoop/core-site.xml

The **/usr/local/hadoop/etc/hadoop/core-site.xml** file contains configuration properties that Hadoop uses when starting up.

This file can be used to override the default settings that Hadoop starts with.

Create a directory tmp in the data folder.

41.hduser@sysk81:~$ **sudo mkdir -p /app/hadoop/tmp**

[sudo] password for hduser:

42.hduser@sysk81:~$ **sudo chown hduser:hadoop /app/hadoop/tmp**

hduser@sysk81:~$

43.hduser@sysk81:~$ **nano /usr/local/hadoop/etc/hadoop/core-site.xml**

Add the following between the configuration Tag

```
<property>
  <name>hadoop.tmp.dir</name>
  <value>/app/hadoop/tmp</value>
  <description>A base for other temporary directories.</description>
 </property>
```

<property>
<name>fs.default.name</name>
<value>hdfs://localhost:54310</value>
</property>

Save and close the file

(4)/usr/local/hadoop/etc/hadoop/yarn-site.xml

44.hduser@sysk81:~$ **nano /usr/local/hadoop/etc/hadoop/yarn-site.xml**

Add the following to the configuration Tag

<property>
<name>yarn.nodemanager.aux-services</name>
<value>mapreduce_shuffle</value>
</property>
<property>
<name>yarn.nodemanager.aux-services.mapreduce.shuffle.class</name>
<value>org.apache.hadoop.mapred.ShuffleHandler</value>
</property>

Save and close the file

(5)/usr/local/hadoop/etc/hadoop/mapred-site.xml

By default, the **/usr/local/hadoop/etc/hadoop/** folder contains **/usr/local/hadoop/etc/hadoop/mapred-site.xml.template** file which has to be renamed/copied with the name **mapred-site.xml**:

Copy template

45.hduser@sysk81:~$ **cp /usr/local/hadoop/etc/hadoop/mapred-site.xml.template /usr/local/hadoop/etc/hadoop/mapred-site.xml**

Modify file

hduser@sysk81:~$ **nano /usr/local/hadoop/etc/hadoop/mapred-site.xml**

Add the following to the configuration Tag

<property>
<name>mapred.job.tracker</name>
<value>localhost:54311</value>
<description>The host and port that the MapReduce job tracker runs at. If "local", then jobs are run in-process as a single map and reduce task.
</description>
</property>

Save and close the file

(6)/usr/local/hadoop/etc/hadoop/hdfs-site.xml

The **/usr/local/hadoop/etc/hadoop/hdfs-site.xml** file needs to be configured for each

host in the cluster that is being used.

It is used to specify the directories which will be used as the **namenode** and the **datanode** on that host.

//Find procedure to set up the one node Hadoop cluster.

Create two directory for hadoop storage

46.hduser@sysk81:~$ **sudo mkdir -p /usr/local/hadoop_store/hdfs/namenode**

47.hduser@sysk81:~$ **sudo mkdir -p /usr/local/hadoop_store/hdfs/datanode**

48.hduser@sysk81:~$ **sudo chown -R hduser:hadoop /usr/local/hadoop_store**

Modify the file hdfs-site.xml:

49.hduser@sysk81:~$ **nano /usr/local/hadoop/etc/hadoop/hdfs-site.xml**

Add the following to the configuration Tag

```
<property>
 <name>dfs.replication</name>
 <value>1</value>
 <description>Default block replication.
 The actual number of replications can be specified when the file is created.
 The default is used if replication is not specified in create time.
 </description>
</property>
<property>
  <name>dfs.namenode.name.dir</name>
  <value>file:/usr/local/hadoop_store/hdfs/namenode</value>
</property>
<property>
  <name>dfs.datanode.data.dir</name>
  <value>file:/usr/local/hadoop_store/hdfs/datanode</value>
</property>
```

Save and close the file

V. Change folder permission

Replace qursaan: with your hadoop users to be the owner of the folder

50.hduser@sysk81:~$ **sudo chown hduser:hadoop -R /usr/local/hadoop**

51.hduser@sysk81:~$ **sudo chown hduser:hadoop -R /usr/local/hadoop_store**

also give the folder the full permission

52.hduser@sysk81:~$ **sudo chmod -R 777 /usr/local/hadoop**

53.hduser@sysk81:~$ **sudo chmod -R 777 /usr/local/hadoop_store**

VI. Format the New Hadoop Filesystem

Now, the Hadoop file system needs to be formatted so that we can start to use it. The format command should be issued with write permission since it creates **current** directory under **/usr/local/hadoop_store/hdfs/namenode** folder:

Using Hadoop user (not superuser)

54.hduser@sysk81:~$ **hadoop namenode -format**

(or)

hduser@sysk81:~$ **hdfs namenode –format**

VII. Start Hadoop by running the following command .

Now it's time to start the newly installed single node cluster.

We can use **start-all.sh** or (**start-dfs.sh** and **start-yarn.sh**)

Using Hadoop user (not superuser)

55.hduser@sysk81:~$ **start-all.sh**

(or)

cd /usr/local/hadoop/sbin

sudo su hduser

56.hduser@sysk81$ **start-all.sh**

Run *jps* coomand to see your all the services up and running:

hduser@sysk81:~$ **jps**

13337 ResourceManager

12869 NameNode

13461 NodeManager

13753 Jps

13191 SecondaryNameNode

13013 DataNode

The output means that we now have a functional instance of Hadoop running on our VPS (Virtual private server).

Run *netstat –plten | grep java* to see list of ports running :

57.hduser@sysk81:~$ **netstat -plten | grep java**

(Not all processes could be identified, non-owned process info

will not be shown, you would have to be root to see it all.)

tcp	0	0	0.0.0.0:50070	0.0.0.0:*	LISTEN	1001	79069	12869/java
tcp	0	0	0.0.0.0:50010	0.0.0.0:*	LISTEN	1001	76599	13013/java
tcp	0	0	0.0.0.0:50075	0.0.0.0:*	LISTEN	1001	76605	13013/java
tcp	0	0	0.0.0.0:50020	0.0.0.0:*	LISTEN	1001	76608	13013/java
tcp	0	0	127.0.0.1:9000	0.0.0.0:*	LISTEN	1001	78066	

12869/java tcp 0 0 0.0.0.0:50090 0.0.0.0:* LISTEN 1001 77637
13191/java tcp6 0 0 :::41168 :::* LISTEN 1001 80980
13461/java
tcp6 0 0 :::8088 :::* LISTEN 1001 80482 13337/java
tcp6 0 0 :::13562 :::* LISTEN 1001 80991 13461/java
tcp6 0 0 :::8030 :::* LISTEN 1001 79343 13337/java
tcp6 0 0 :::8031 :::* LISTEN 1001 80943 13337/java
tcp6 0 0 :::8032 :::* LISTEN 1001 80954 13337/java
tcp6 0 0 :::8033 :::* LISTEN 1001 79570 13337/java
tcp6 0 0 :::8040 :::* LISTEN 1001 80987 13461/java
tcp6 0 0 :::8042 :::* LISTEN 1001 80992 13461/java

- If DataNode or Namenode is not starting, check if other programs are running in ports reserved for hadoop.

sudo netstat -tulpn | grep :8040

sudo netstat -tulpn | grep :8042

sudo netstat -tulpn | grep :50070

sudo netstat -tulpn | grep :50075

Stop Hadoop by running the following command :

We run **stop-all.sh** or (**stop-dfs.sh** and **stop-yarn.sh**) to stop all the daemons running on our machine:

58.hduser@sysk81:~$ **stop-all.sh**

VIII. Hadoop Web Interfaces as Web View

Let's start the Hadoop again and see its Web UI:

59.hduser@sysk81:~$ **start-all.sh**

ResourceManager @- http://localhost:8088/

NameNode @- http://localhost:50070/

SecondaryNameNode @- http://localhost:50090/

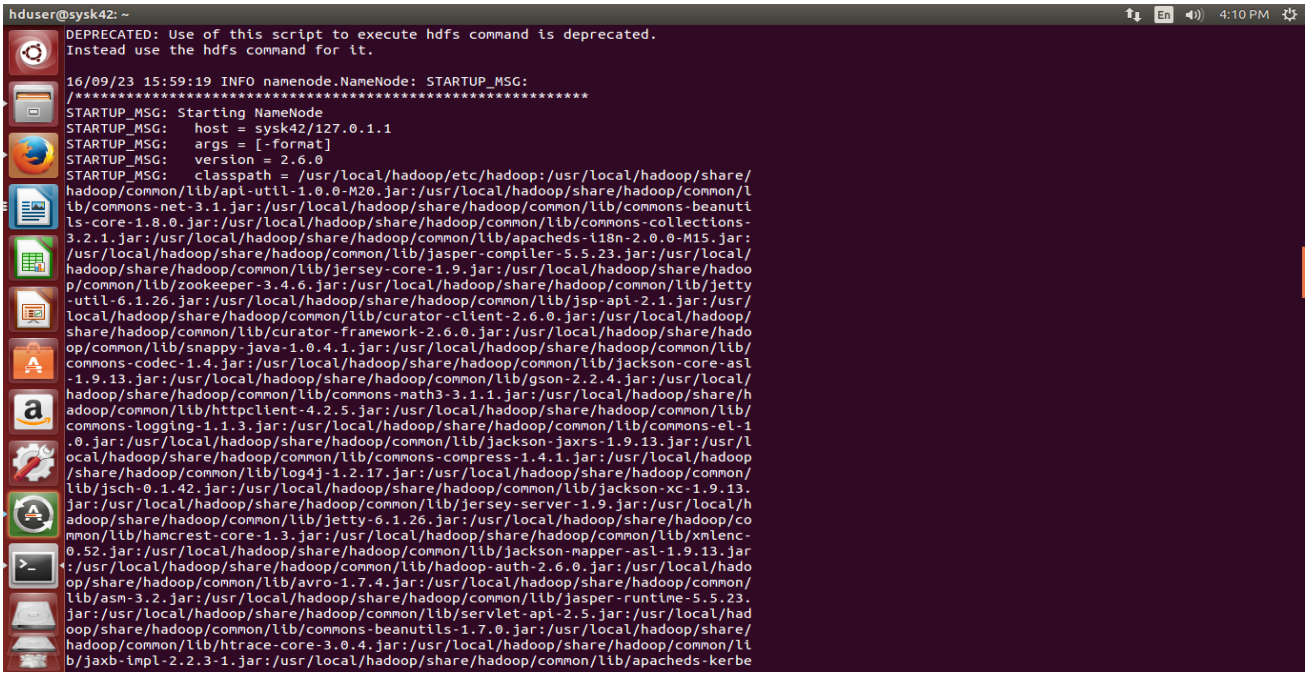
DataNode @- http://localhost:50070/

JobTracker Web Interface (MapReduce layer) http://localhost:50030/

TaskTracker Web Interface (MapReduce layer) http://localhost:50060/.

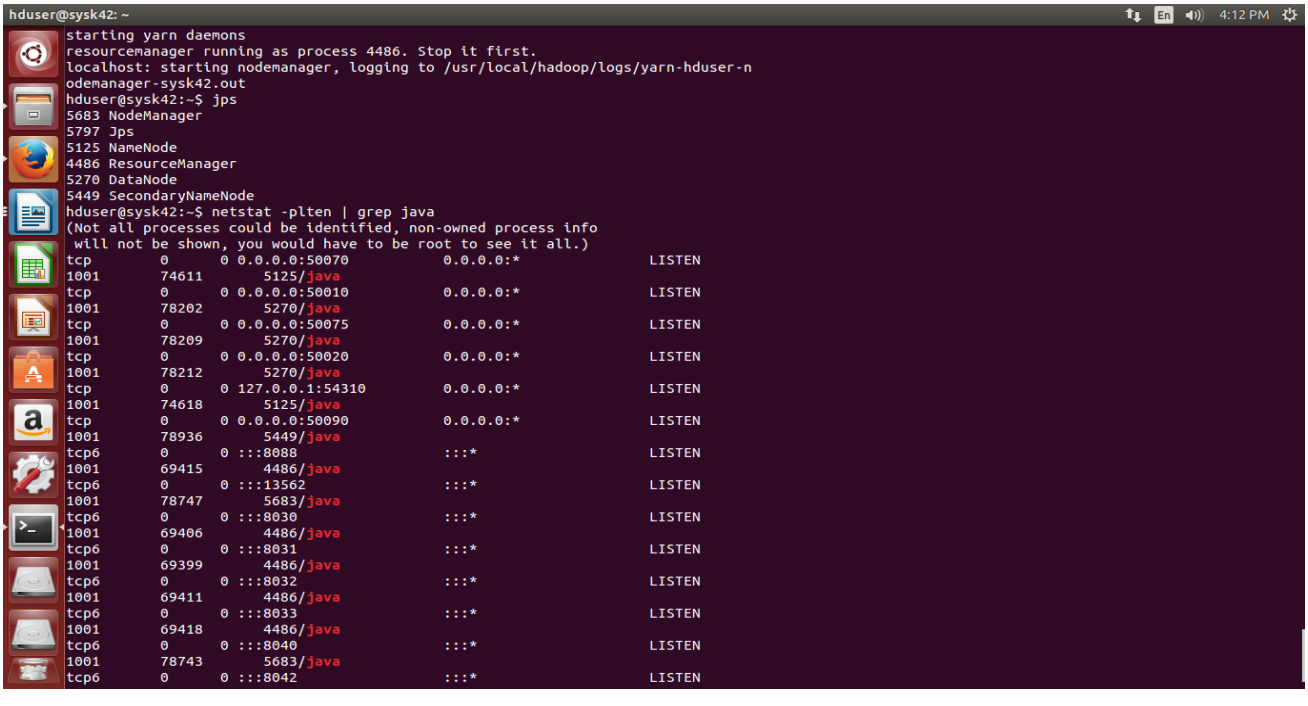
Sample Input and Output :

hduser@sysk42:~$ **/usr/local/hadoop/bin/hadoop namenode -format**

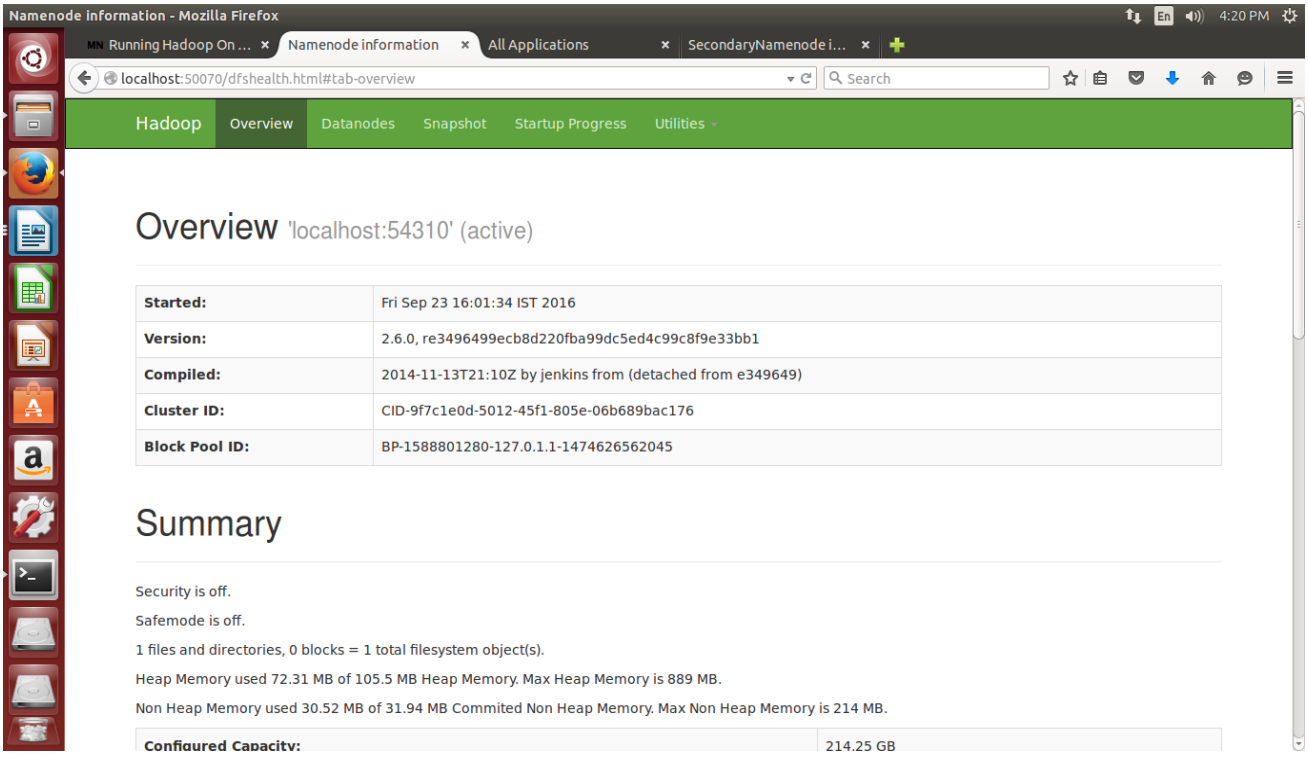


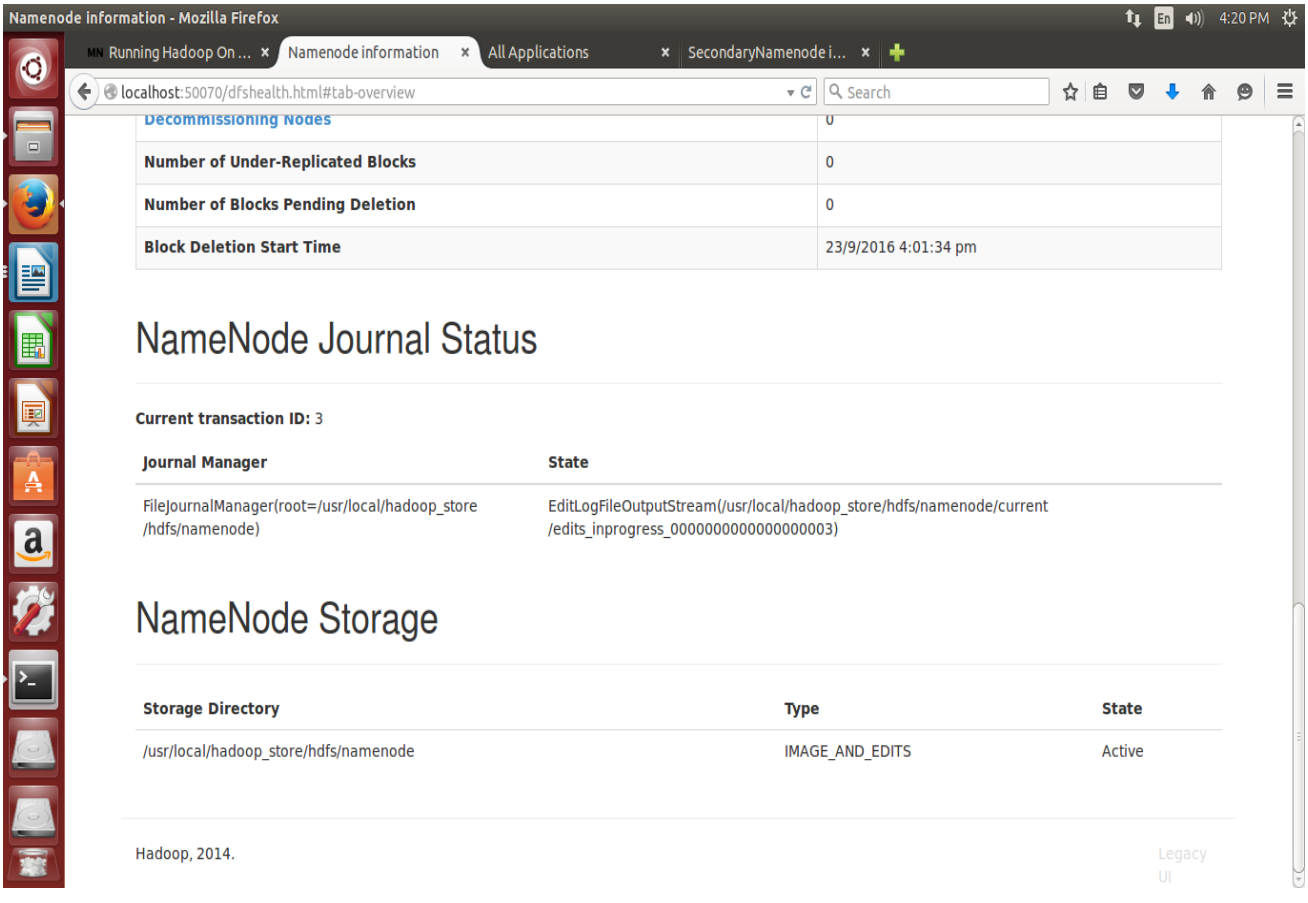
hduser@sysk38**$ jps**

hduser@sysk42:~**$ netstat -plten | grep java**

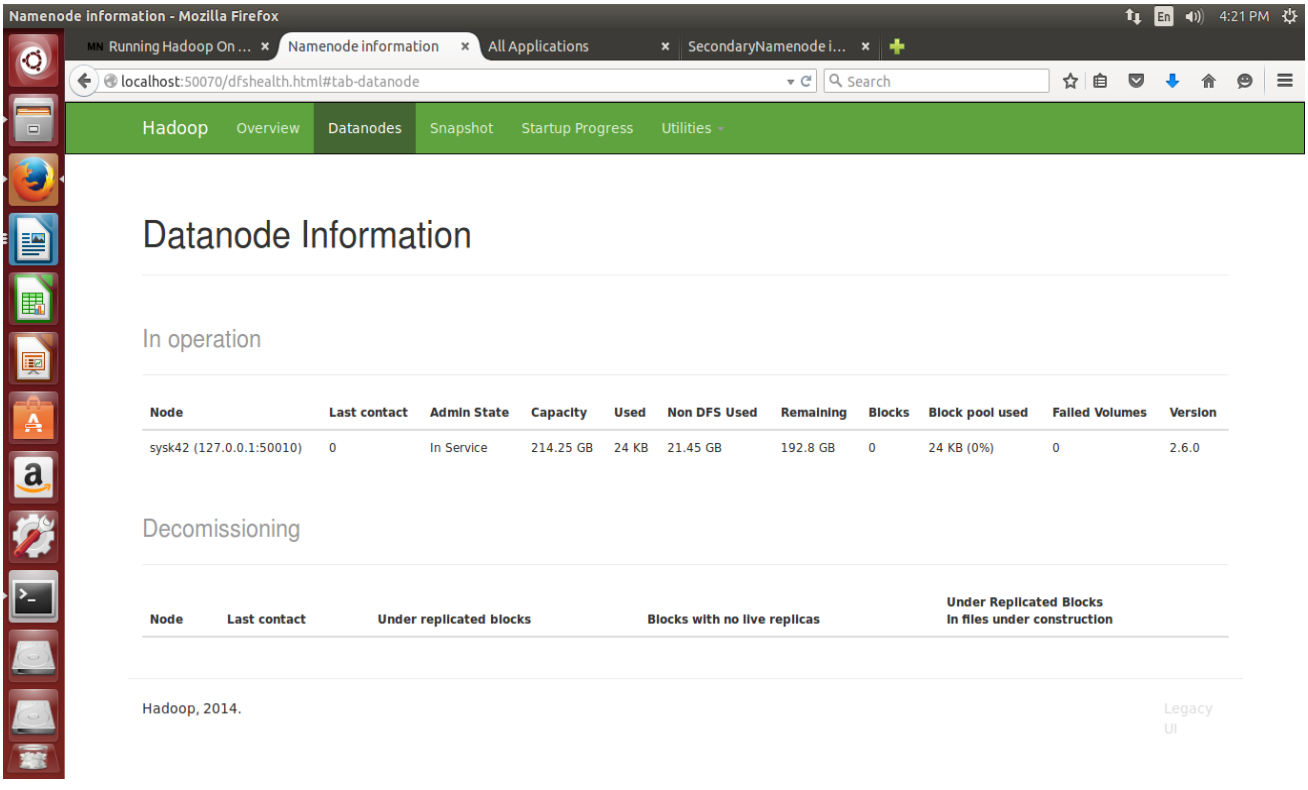


Name Node :

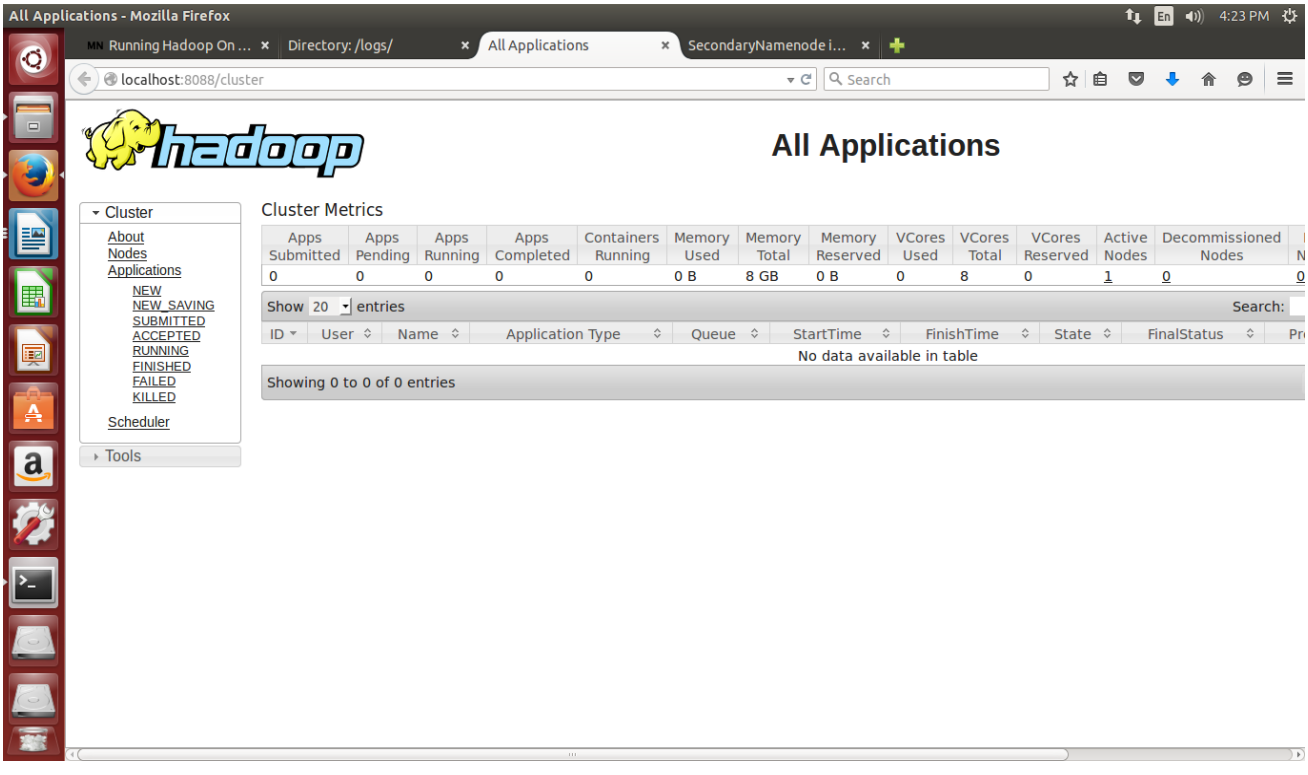

Namenode information - Mozilla Firefox
Running Hadoop On ...
Namenode information
All Applications
SecondaryNamenode i...
localhost:50070/dfshealth.html#tab-overview
Search
Hadoop
Overview
Datanodes
Snapshot
Startup Progress
Utilities
Overview 'localhost:54310' (active)
Started: Fri Sep 23 16:01:34 IST 2016
Version: 2.6.0, re3496499ecb8d220fba99dc5ed4c99c8f9e33bb1
Compiled: 2014-11-13T21:10Z by jenkins from (detached from e349649)
Cluster ID: CID-9f7c1e0d-5012-45f1-805e-06b689bac176
Block Pool ID: BP-1588801280-127.0.1.1-1474626562045
Summary
Security is off.
Safemode is off.
1 files and directories, 0 blocks = 1 total filesystem object(s).
Heap Memory used 72.31 MB of 105.5 MB Heap Memory. Max Heap Memory is 889 MB.
Non Heap Memory used 30.52 MB of 31.94 MB Commited Non Heap Memory. Max Non Heap Memory is 214 MB.
Configured Capacity: 214.25 GB


Namenode information - Mozilla Firefox
Running Hadoop On ...
Namenode information
All Applications
SecondaryNamenode i...
localhost:50070/dfshealth.html#tab-overview
Search
Decommissioning Nodes 0
Number of Under-Replicated Blocks 0
Number of Blocks Pending Deletion 0
Block Deletion Start Time 23/9/2016 4:01:34 pm
NameNode Journal Status
Current transaction ID: 3
Journal Manager
State
FileJournalManager(root=/usr/local/hadoop_store/hdfs/namenode)
EditLogFileOutputStream(/usr/local/hadoop_store/hdfs/namenode/current/edits_inprogress_0000000000000000003)
NameNode Storage
Storage Directory
Type
State
/usr/local/hadoop_store/hdfs/namenode
IMAGE_AND_EDITS
Active
Hadoop, 2014.
Legacy UI

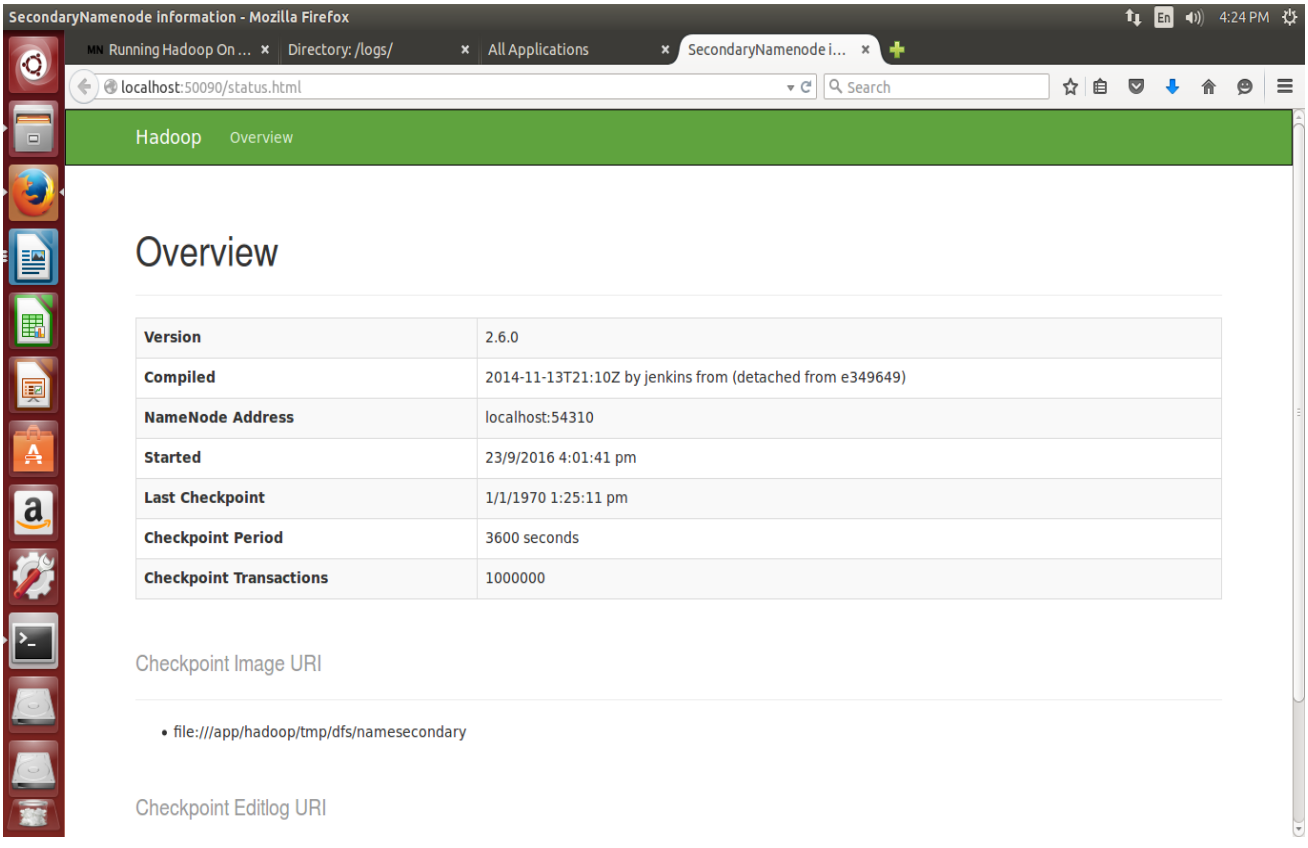
Data Node :

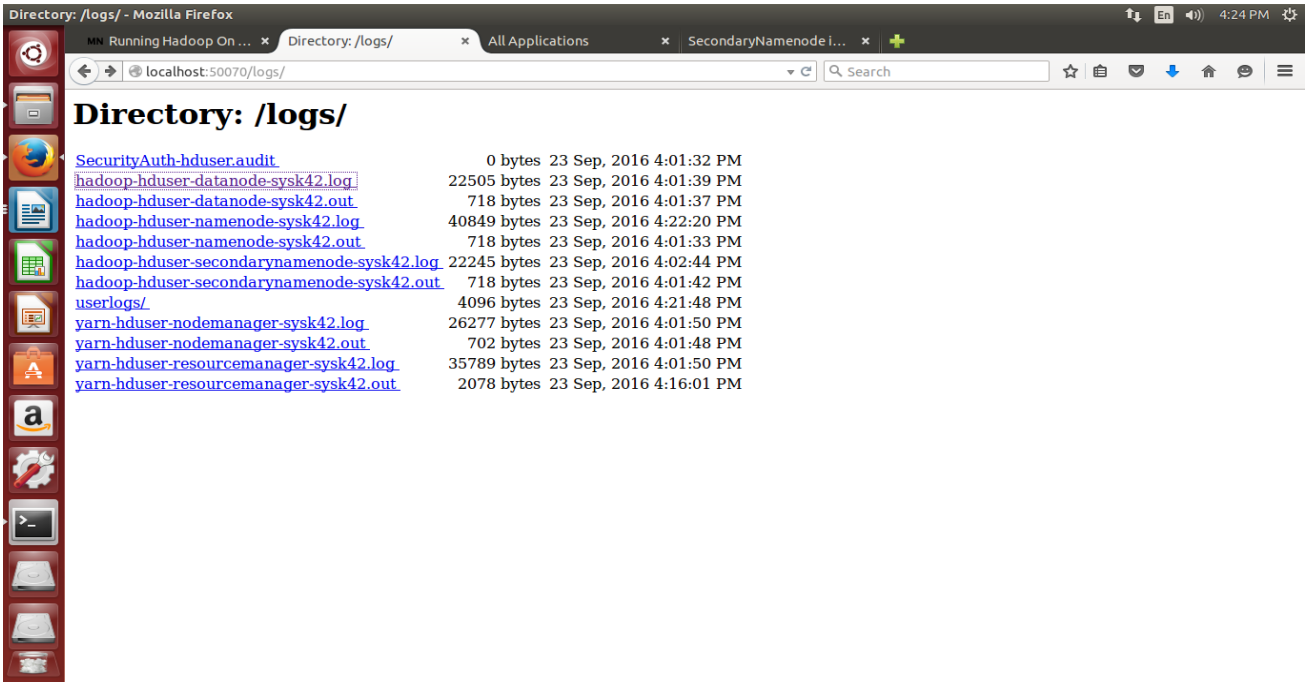


Resource Manager :



Secondary Name node :





Result:

Procedure to set up the one node Hadoop cluster using Hadoop Apache open source framework with simple programming models was successfully created , executed and verified .

Exp. No. : 9b
Date:7-11-2022

WRITE A WORDCOUNT PROGRAM TO DEMONSTRATE THE USE OF MAP AND REDUCE TASKS

Aim:

To write a wordcount program to demonstrate the use of Map and Reduce tasks.

Procedure :

Creating a working directory for your data

1. Create a hdfs directory for input:
   a. hduser@sysk81:/home/panimalar$ **sudo hadoop dfs -mkdir -p /usr/local/hadoop/input**
2. Now paste the jar file into this folder using hadoop command. hduser@sysk81:/home/panimalar$ **sudo hadoop dfs -copyFromLocal /usr/local/hadoop/input/4300.txt /usr/local/hadoop/input**
3. Go to $HADOOP_HOME/share/hadoop/mapreduce folder in terminal. **cd /usr/local/hadoop/share/hadoop/mapreduce**

   (OR)

   a. cd $HADOOP_HOME/share/hadoop/mapreduce

   Here /usr/local/hadoop/output folder will be created. Each time you have to give a new name.

   NOTE: you cannot simply list the folders input and output using ls in terminal.
4. To view the output, use this:

   hduser@sysk81:/home/panimalar$ **hadoop dfs -cat /usr/local/hadoop/output/part-r-00000**

Commands :

// Change the Directory

hduser@sysk81:~$ **cd /usr/local/hadoop**

// Make the input directory in /usr/local/hadoop

hduser@sysk81:~$**mkdir input**

// Change the directory into input directory

hduser@sysk81:~$**cd /usr/local/hadoop/input**

// Download the sample Bigdata input file

hduser@sysk81:~$**wget http://www.gutenberg.org/files/4300/4300.zip**

// Unzip the compressed file

hduser@sysk81:~$**unzip 4300.zip**

// Remove the Downloaded file after unzip it

hduser@sysk81:~$**rm 4300.zip**

// Copy the data file 4300.txt to the **Hadoop File System** (HDFS)

hduser@sysk81:~$ **cp 4300.txt /usr/local/hadoop/input**

// Check the contents of your directory

hduser@sysk81:~$ **sudo hadoop dfs -ls**

// Output :

Found 1 items

-rw-r--r-- 1 hduser hadoop 1573079 2014-12-09 03:08 4300.txt

// Copy any file from the web

hduser@sysk81:/usr/local/hadoop/input$**curl http://hadoop.apache.org/docs/current/hadoop-project-dist/hadoop-common/ClusterSetup.html > setup.html**

//Copy one or more text files into the **input** directory

panimalar@sysk81:/usr/local/hadoop/input$ sudo hadoop fs -copyFromLocal setup.html input

(or)

panimalar@sysk81:~$ **hadoop fs -copyFromLocal setup.html input**

// Change the directory into mapreduce

panimalar@sysk81:~$ **cd /usr/local/hadoop/share/hadoop/mapreduce**

Program :

```
package wc;
import java.io.IOException;
import java.util.*;
import org.apache.hadoop.conf.*;
import org.apache.hadoop.fs.*;
import org.apache.hadoop.conf.*;
import org.apache.hadoop.io.*;
import org.apache.hadoop.mapreduce.*;
import org.apache.hadoop.mapreduce.lib.input.*;
import org.apache.hadoop.mapreduce.lib.output.*;
import org.apache.hadoop.util.*;
public class WordCount extends Configured implements Tool
{
    public static void main(String args[]) throws Exception
```

```
        {
          //this main function will call run method defined above.
                int res = ToolRunner.run(new WordCount(), args);
                System.exit(res);
         }
        public int run(String[] args) throws Exception
        {
                Path inputPath = new Path(args[0]);
                Path outputPath = new Path(args[1]);
//creating a Job and Conf object and assigning a job name for identification purposes
                Configuration conf = getConf();
                Job job = new Job(conf, this.getClass().toString());
//The hdfs input and output directory to be fetched from the command line
                FileInputFormat.setInputPaths(job, inputPath);
                FileOutputFormat.setOutputPath(job, outputPath);
                job.setJobName("WordCount");
                job.setJarByClass(WordCount.class);
                job.setInputFormatClass(TextInputFormat.class);
                job.setOutputFormatClass(TextOutputFormat.class);
                job.setMapOutputKeyClass(Text.class);
                job.setMapOutputValueClass(IntWritable.class);
//Setting configuration object with the Data Type of output Key and Value

                job.setOutputKeyClass(Text.class);
                job.setOutputValueClass(IntWritable.class);
// The map-reduce organization section
                job.setMapperClass(Map.class);
                job.setCombinerClass(Reduce.class);
                job.setReducerClass(Reduce.class);
                return job.waitForCompletion(true) ? 0 : 1;
        }
//The map section
  public static class Map extends Mapper<LongWritable, Text, Text, IntWritable>
{
//hadoop supported data types
        private final static IntWritable one = new IntWritable(1);
```

```
        private Text word = new Text();
//map method that performs the tokenizer job and framing the initial key value pairs
     // after all lines are converted into key-value pairs, reducer is called.
   @Override
        public void map(LongWritable key, Text value,Mapper.Context context) throws IOException, InterruptedException
        {
//taking one line at a time from input file and tokenizing the same
                 String line = value.toString();
                StringTokenizer tokenizer = new StringTokenizer(line);
//iterating through all the words available in that line and forming the key value pair
                while (tokenizer.hasMoreTokens())
                {
                      word.set(tokenizer.nextToken());
                      context.write(word, one);
                }
        }
  }
// The reduce section
  public static class Reduce extends Reducer<Text, IntWritable, Text, IntWritable>
{
//reduce method accepts the Key Value pairs from mappers, do the aggregation based on keys and produce the final out put
   @Override
   public void reduce(Text key, Iterable<IntWritable> values, Context context) throws IOException, InterruptedException
{
            int sum = 0;
 /*iterates through all the values available with a key and add them together and give the
        final result as the key and sum of its values*/
         for (IntWritable value : values)
        {
              sum += value.get();
        }
            context.write(key, new IntWritable(sum));
   }
```

```
 }
}
```

To Run :

// To run the job on data in the input directory, and place results in the output directory.

panimalar@sysk81:/usr/local/hadoop/share/hadoop/mapreduce$ **sudo hadoop jar hadoop-mapreduce-examples-2.6.0.jar wordcount /usr/local/hadoop/input/4300.txt /usr/local/hadoop/output**

// See the Output :

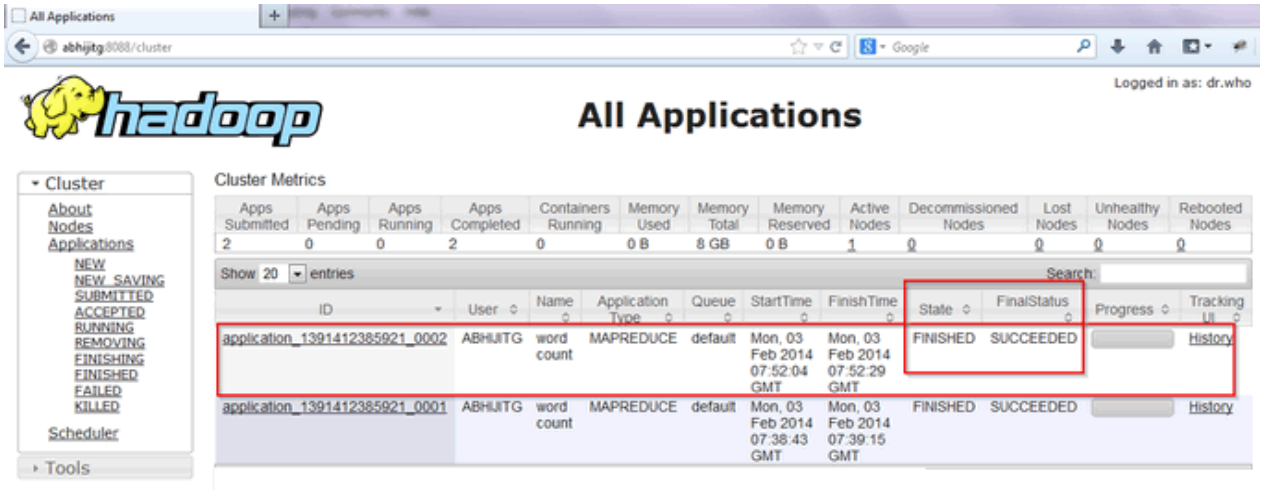
panimalar@sysk81:/usr/local/hadoop/share/hadoop/mapreduce$ **sudo hadoop dfs -cat /usr/local/hadoop/output/part-r-00000**

Sample Input and Output :

```
13:22:30 INFO mapreduce.Job:  map 100% reduce 100%
13:22:30 INFO mapreduce.Job: Job job_1391412385921_0002 completed successfully
13:22:31 INFO mapreduce.Job: Counters: 43
File System Counters
        FILE: Number of bytes read=89
        FILE: Number of bytes written=160142
        FILE: Number of read operations=0
        FILE: Number of large read operations=0
        FILE: Number of write operations=0
        HDFS: Number of bytes read=171
        HDFS: Number of bytes written=59
        HDFS: Number of read operations=6
        HDFS: Number of large read operations=0
        HDFS: Number of write operations=2
Job Counters
        Launched map tasks=1
        Launched reduce tasks=1
        Data-local map tasks=1
        Total time spent by all maps in occupied slots (ms)=5657
        Total time spent by all reduces in occupied slots (ms)=6128
Map-Reduce Framework
        Map input records=2
        Map output records=7
        Map output bytes=82
        Map output materialized bytes=89
        Input split bytes=116
        Combine input records=7
        Combine output records=6
        Reduce input groups=6
        Reduce shuffle bytes=89
        Reduce input records=6
        Reduce output records=6
        Spilled Records=12
        Shuffled Maps =1
        Failed Shuffles=0
        Merged Map outputs=1
        GC time elapsed (ms)=145
        CPU time spent (ms)=1418
        Physical memory (bytes) snapshot=368246784
        Virtual memory (bytes) snapshot=513716224
        Total committed heap usage (bytes)=307757056
Shuffle Errors
        BAD_ID=0
        CONNECTION=0
        IO_ERROR=0
```

$ hdfs dfs -cat output/*

Example 1
Hadoop 2
Install 1
Mapreduce 1
Run 1
Wordcount 1



Exp. No. : 10
Date :7-11-2022

SIMULATE A CLOUD SCENARIO USING CLOUDSIM AND RUN A SCHEDULING ALGORITHM THAT IS NOT PRESENT IN CLOUDSIM

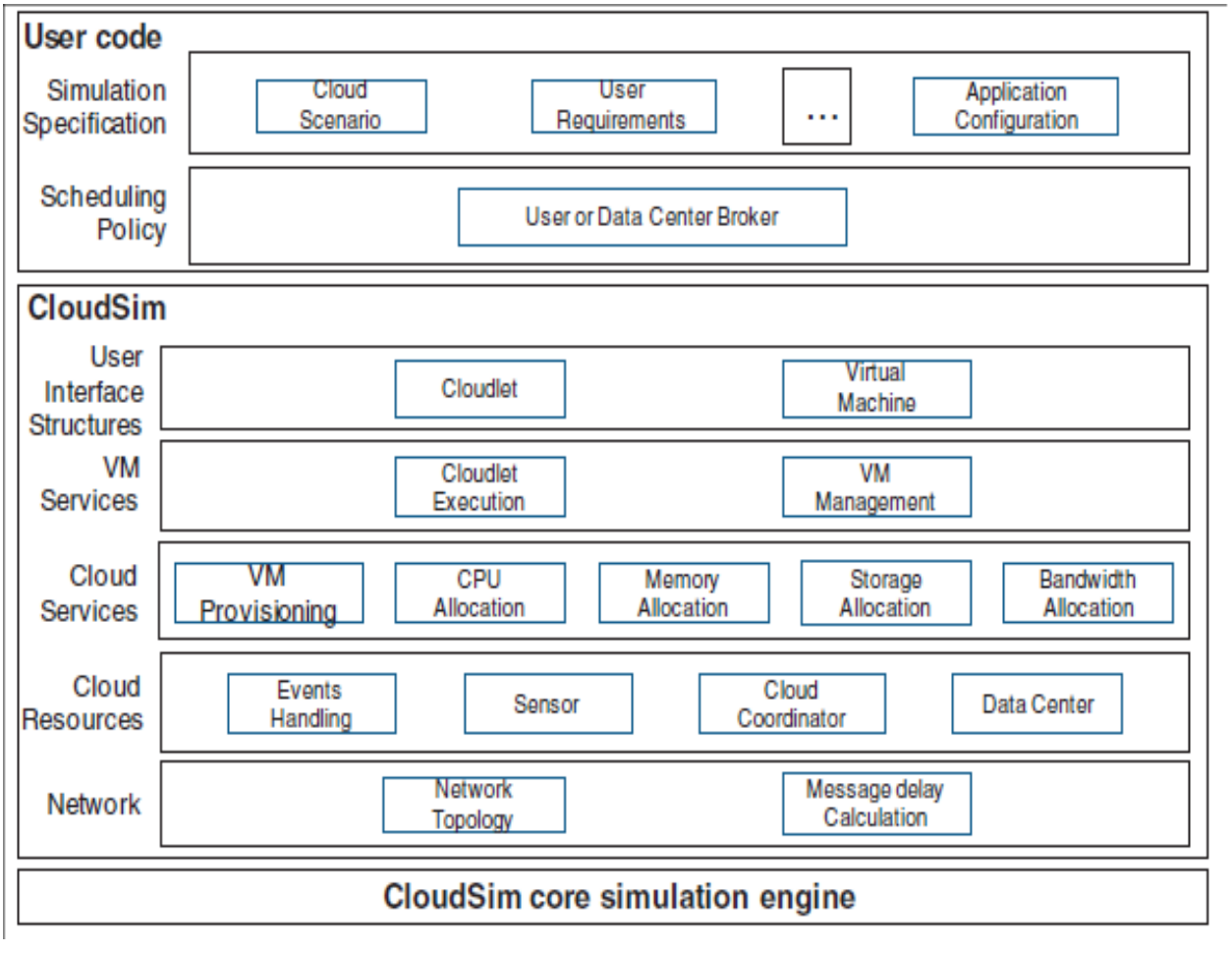
Aim:

To Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim .

Procedure :

CloudSim is a programming language based simulator and even though it does not support a graphical user interface for simulation.

CloudSim is a library for the simulation of cloud scenarios . CloudSim support for modeling and simulation of large scale Cloud computing environments, including data centers, on a single physical computing node.



CloudSim offers architecture inside four uncomplicated entities. these types of entities offer consumer to set-up the basic cloud computing environment as well as measure your effectiveness involving fill up Balancing algorithms.. Datacenters entity features the responsibility of providing Infrastructure level solutions for the Cloud Users. They act as a home to help a lot of Host Entities or maybe a lot of instances hosts' entities aggregate to help application form the solitary Datacenter entity. Hosts with Cloud are usually Physical Servers

Scheduling in Cloud :

- As **cloud computing** is the **virtualized operating environment**, and the **virtual machines** are the **primary computing component** which is **responsible for the execution of the workloads(tasks)**. **The virtual machine(s) are powered by a physical server host machine (i.e.) hardware.**
- Depending on the requirement of the Virtual Machine(VM) there could be **'one to one' or 'many to one' mapping between the VM and host machine. That means in cloud computing the scheduling is done at both the mapping levels that are:**
  - **Virtual Machine to Host Machines**
  - **Tasks to Virtual Machines**

Steps :

1. Setting the number of users for a current simulation
2. Initializing the simulation by instantiating the common variables (current time, trace flag, number of users)
3. Creating CIS instance
4. Creating data center instance and then registering it with CIS
5. Creating physical machines (hosts) with their characteristics
6. Creating data center broker instance
7. Creating VMs with their characteristics
8. Submitting VMs to data center broker
9. Creating cloudlets and specifying their characteristics
10. Submitting cloudlets to data center broker.
11. Sending a call to start the simulation once there is an event to be executed
12. Sending a call to stop the simulation once there is no event to be executed

13. Printing the results of the simulation

Design of Cloudsim :

There are several of classes need to modify if want to implement own algorithms

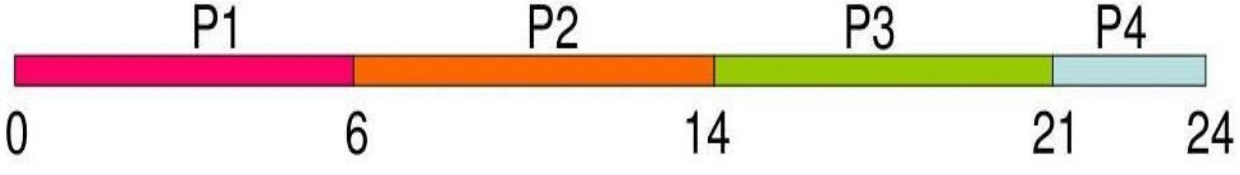
- DatacenterBroker - Modifying the way VM provisioning requests are submitted to data centers and the way cloudlets are submitted and assigned to VMs.
- VmAllocatonPolicy - Need to extend this abstract class to implement your own algorithms for deciding which host a new VM should be placed on
- VmScheduler - Implementing algorithms for resource allocation to VMs within a single host.
- CloudletScheduler - Implementing algorithms for scheduling cloudlets within a single VM

Shortest Job First Scheduling :

In SJF, Process from the ready queue that has shortest finish time will execute first. If two process are having same burst time and arrival time, then FCFS procedure is used to break the tie.

FCFS Example

Process	Duration	Priority	Arrival Time
P1	6	4	0
P2	8	1	0
P3	7	3	0
P4	3	2	0



Program :

Shortest Job First (SJF) Task scheduling algorithm implementation in cloudsim

FCFS.Java

```
package org.cloudbus.cloudsim; import java.text.DecimalFormat; import java.util.Calendar; import
java.util.List;
import org.cloudbus.cloudsim.Cloudlet; import org.cloudbus.cloudsim.Datacenter; import
org.cloudbus.cloudsim.Log; import org.cloudbus.cloudsim.Vm;
import org.cloudbus.cloudsim.core.CloudSim;
/**
* FCFS Task scheduling
*/
public class FCFS {
/** The cloudlet list. */
private static List<Cloudlet> cloudletList;
/** The vmlist. */
private static List<Vm> vmlist;
private static int reqTasks = 10; private static int reqVms = 4;
/**
* Creates main() to run this example
*/
public static void main(String[] args) { Log.printLine("Starting FCFS...");
try {
// First step: Initialize the CloudSim package. It should be called
// before creating any entities.
int num_user = 1; // number of cloud users Calendar calendar = Calendar.getInstance(); boolean
trace_flag = false; // mean trace events
// Initialize the CloudSim library CloudSim.init(num_user, calendar, trace_flag);
// Second step: Create Datacenters
//Datacenters are the resource providers in CloudSim. We need at list one of them to run a CloudSim
simulation
@SuppressWarnings("unused")
Datacenter datacenter0 = createDatacenter("Datacenter_0");
//Third step: Create Broker FcfsBroker broker = createBroker(); int brokerId = broker.getId();
//Fourth step: Create one virtual machine
vmlist = new VmsCreator().createRequiredVms(reqVms, brokerId);
//submit vm list to the broker broker.submitVmList(vmlist);
//Fifth step: Create two Cloudlets
cloudletList = new CloudletCreator3().createUserCloudlet(reqTasks, brokerId);
//submit cloudlet list to the broker broker.submitCloudletList(cloudletList);
//call the scheduling function via the broker broker.scheduleTaskstoVms(); // Sixth step: Starts the
simulation CloudSim.startSimulation();
// Final step: Print results when simulation is over List<Cloudlet> newList =
broker.getCloudletReceivedList();
CloudSim.stopSimulation(); printCloudletList(newList);
Log.printLine("FCFS finished!");
}
catch (Exception e) { e.printStackTrace();
Log.printLine("The simulation has been terminated due to an unexpected error");
}
```

```
}
private static Datacenter createDatacenter(String name){
Datacenter datacenter=new DataCenterCreator().createUserDatacenter(name, reqVms); return
datacenter;
}
//We strongly encourage users to develop their own broker policies, to submit vms and cloudlets
according
//to the specific rules of the simulated scenario private static FcfsBroker createBroker(){
FcfsBroker broker = null; try {
broker = new FcfsBroker("Broker");
} catch (Exception e) { e.printStackTrace(); return null;
}
return broker; }
/**
* Prints the Cloudlet objects
* @param list list of Cloudlets

*/
private static void printCloudletList(List<Cloudlet> list) { int size = list.size();
Cloudlet cloudlet;
String indent = " "; Log.printLine();
Log.printLine("========== OUTPUT ==========");
Log.printLine("Cloudlet ID" + indent + "STATUS" + indent +
"Data center ID" + indent + "VM ID" + indent + "Time" + indent + "Start Time" + indent + "Finish
Time");
DecimalFormat dft = new DecimalFormat("###.##"); for (int i = 0; i < size; i++) {
cloudlet = list.get(i);
Log.print(indent + cloudlet.getCloudletId() + indent + indent);
if (cloudlet.getCloudletStatus() == Cloudlet.SUCCESS){ Log.print("SUCCESS");
Log.printLine( indent + indent + cloudlet.getResourceId() + indent + indent + indent +
cloudlet.getVmId() +
indent + indent + dft.format(cloudlet.getActualCPUTime()) + indent + indent +
dft.format(cloudlet.getExecStartTime())+
indent + indent + dft.format(cloudlet.getFinishTime()));
}
}
}
}
```

Sample Output :

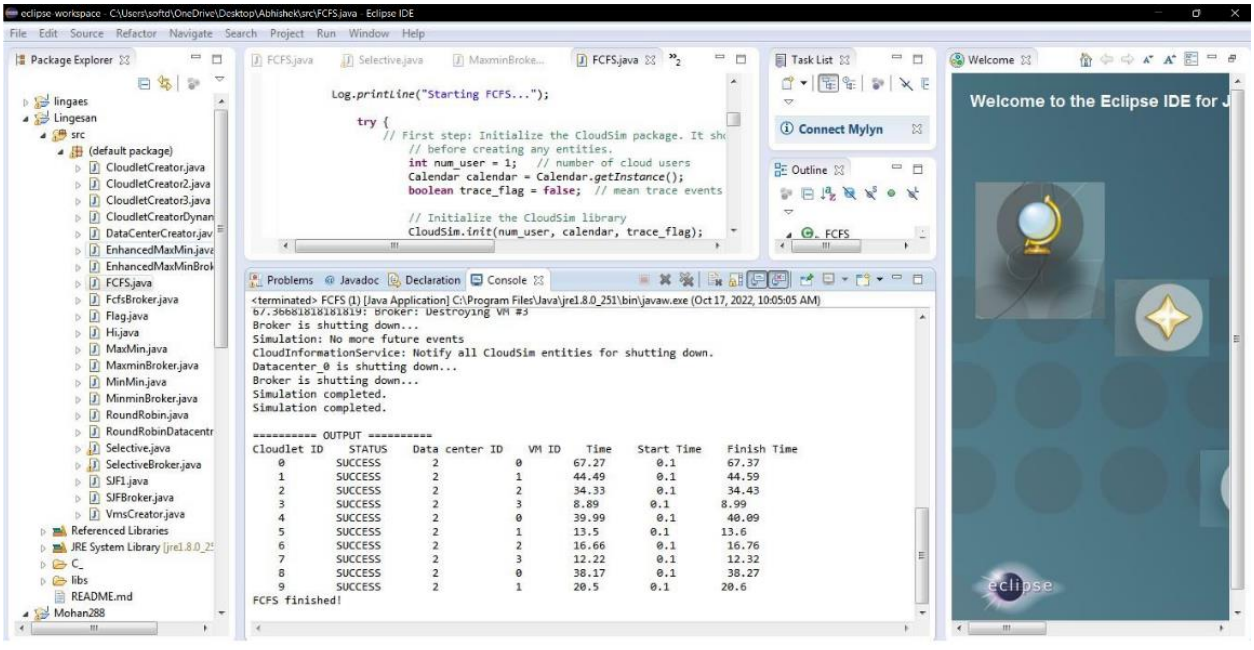


Fig. Configuration details of Cloudsim simulator

Result :

The Simulation of a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim was successfully learned and verified.