

RAJALAKSHMI ENGINEERING COLLEGE
AN AUTONOMOUS INSTITUTION
Affiliated to ANNA UNIVERSITY
Rajalakshmi Nagar, Thandalam,
Chennai-602105



RAJALAKSHMI
ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

**DEPARTMENT OF COMPUTER SCIENCE
AND ENGINEERING**

CS19741 CLOUD COMPUTING LABORATORY
ACADEMIC YEAR:2024-2025 (ODD)

INDEX

Reg. No : 210701275

Name : R.Sweatha

Branch : CSE

Year/Section : IV-E

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2	Virtualize a machine and check how many virtual machines can be utilized at a particular time		
3	Create a VM clone and attach a virtual block to the cloned VM		
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11	Implement the MaxTemperature MapReduce program to identify the year wise maximum temperature from sensor data		

Exp No: 1

Date:

VIRTUALIZATION

CONFIGURATION AND CREATION OF VIRTUAL MACHINE

AIM:

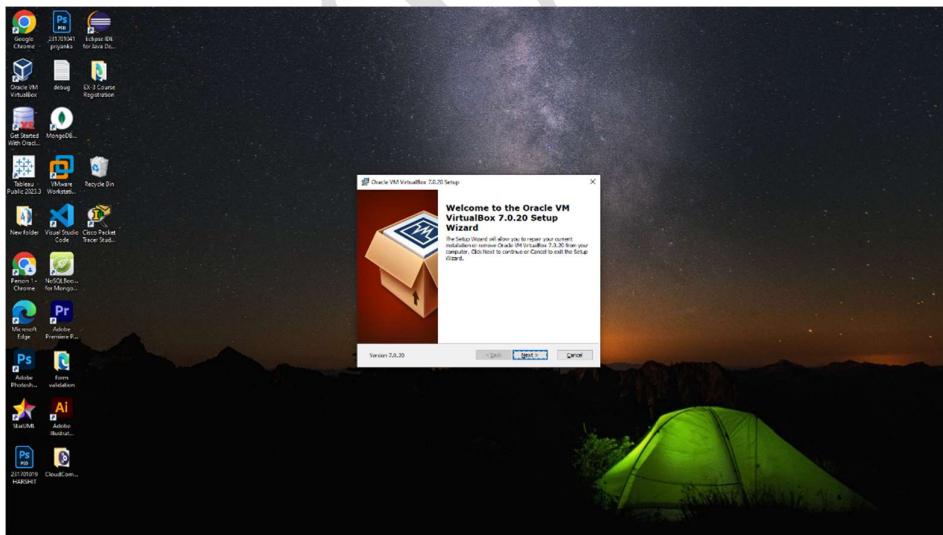
To configure a Virtual Machine using VM ware and Launch the VM and execute a simple program using C/PYTHON/JAVA.

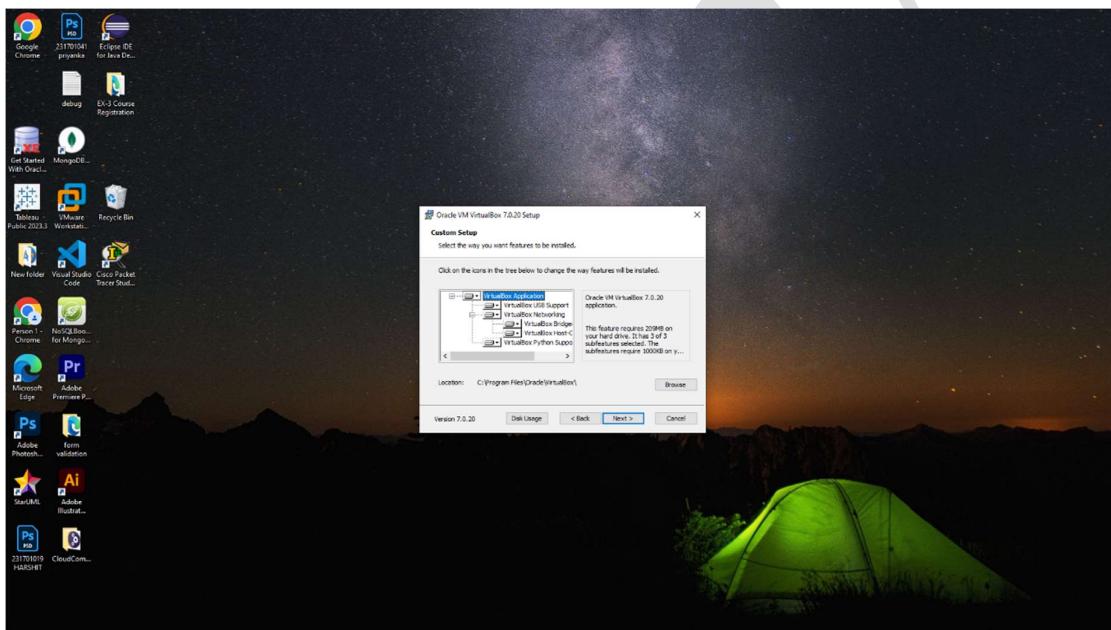
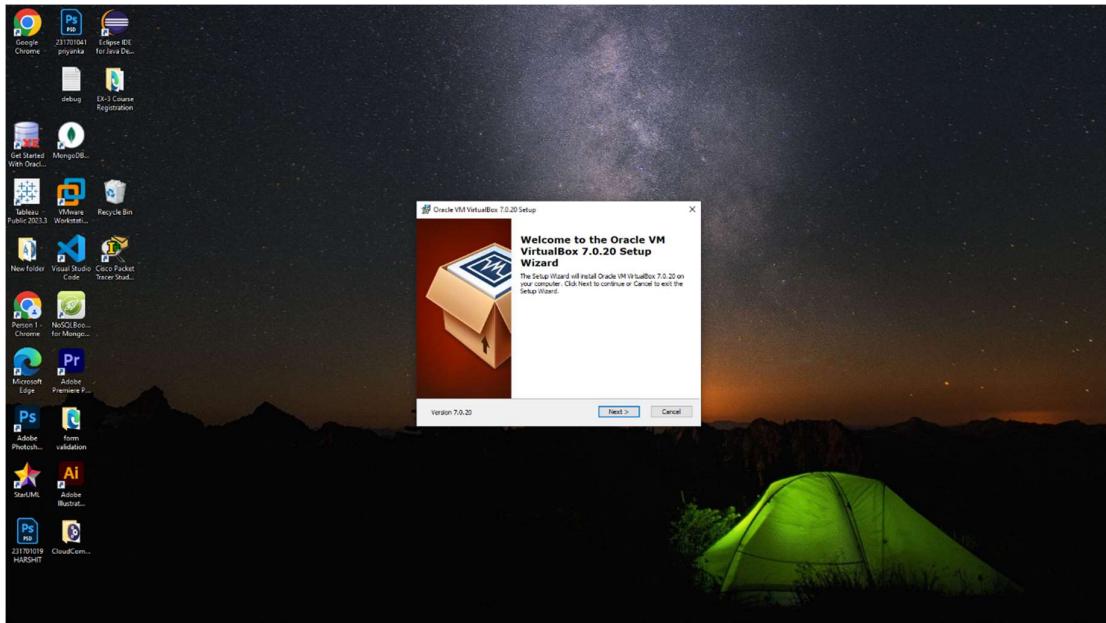
PROCEDURE:

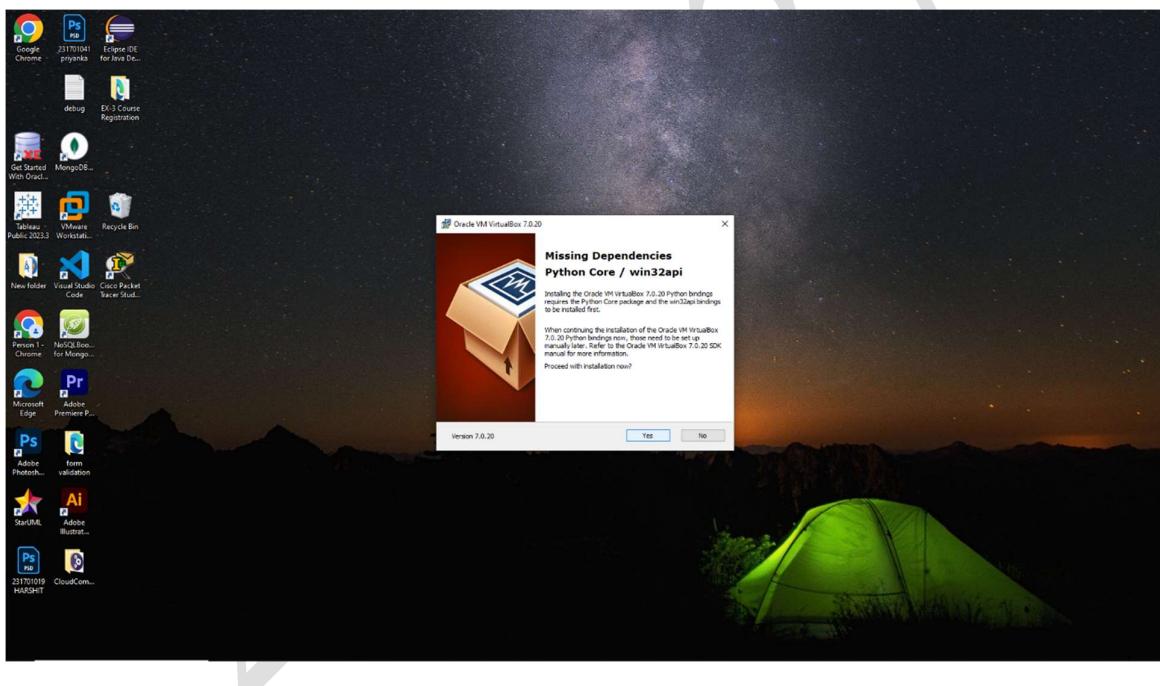
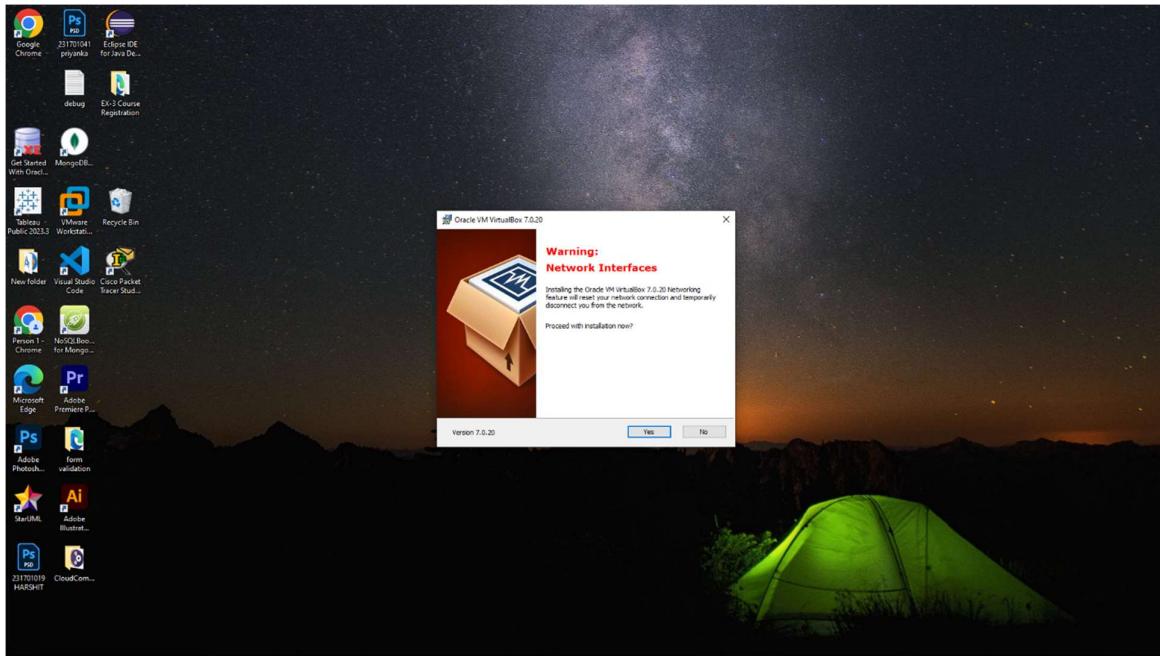
1. Launch a VM ware
2. Create new virtual machine
3. Customize the set-up
4. Set username and password
5. Browse for .iso file of an operating system
6. Configure the hardware capacity
7. Finish and power on the VM
8. Install C or PYTHON OR JAVA Compiler and execute a simple program

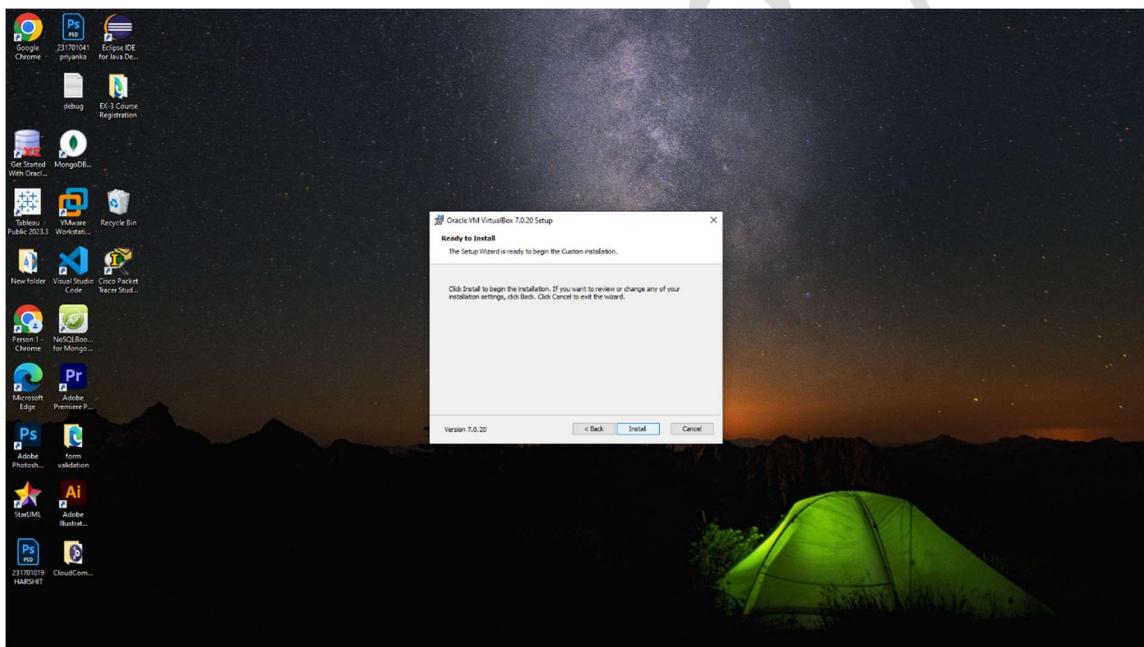
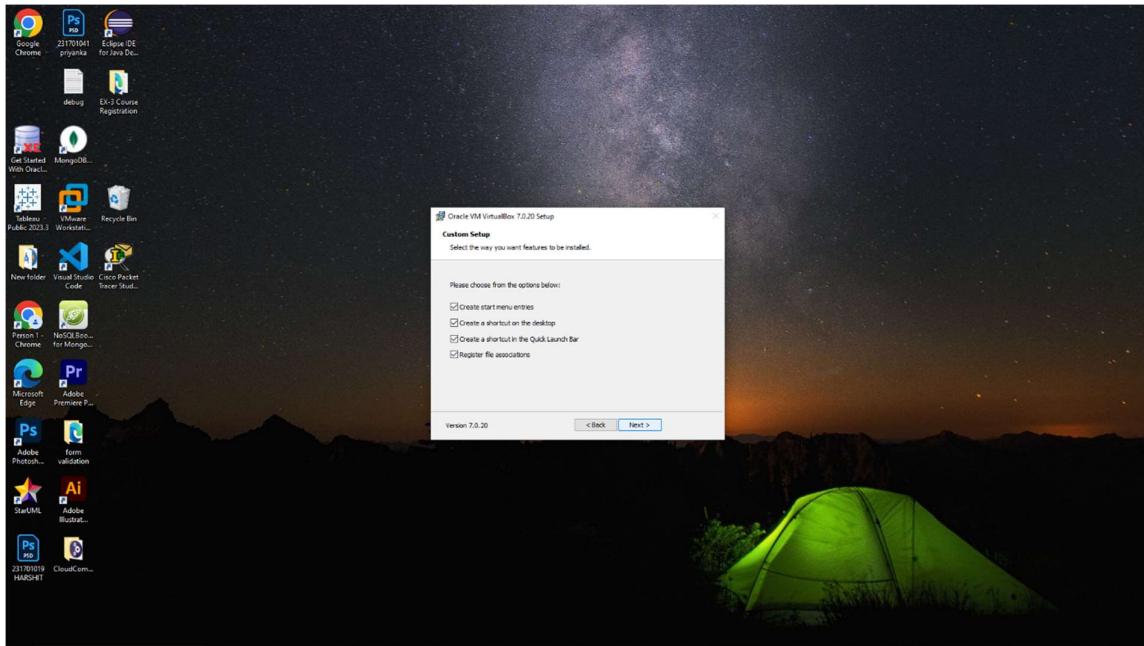
OUTPUT:

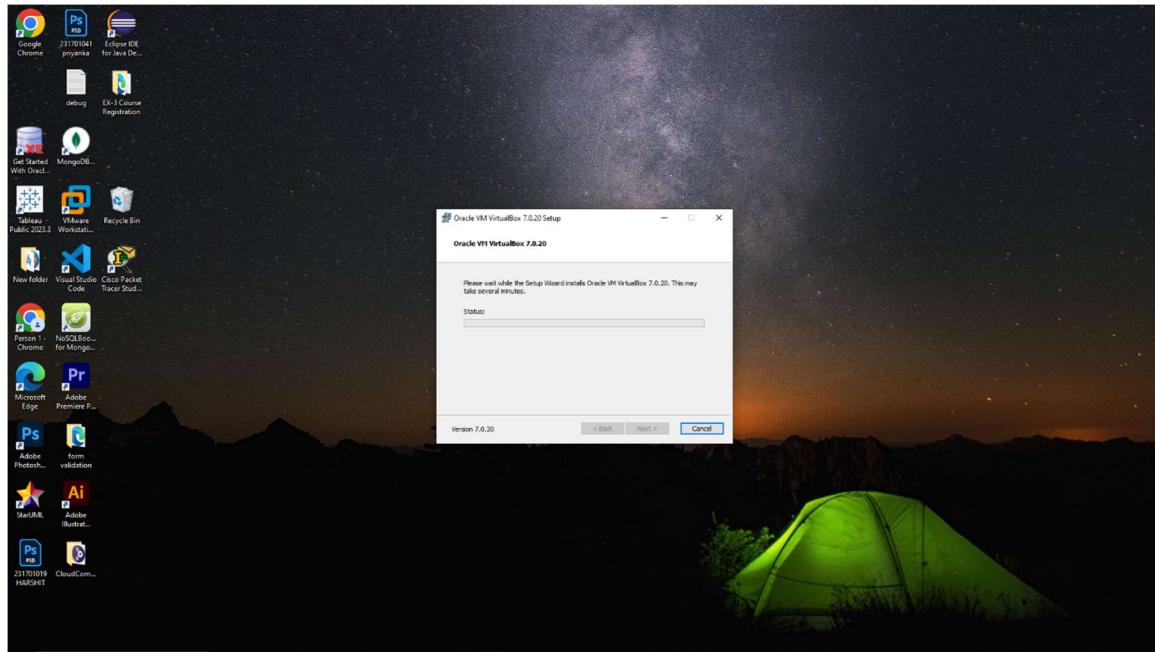
Typical Configuration



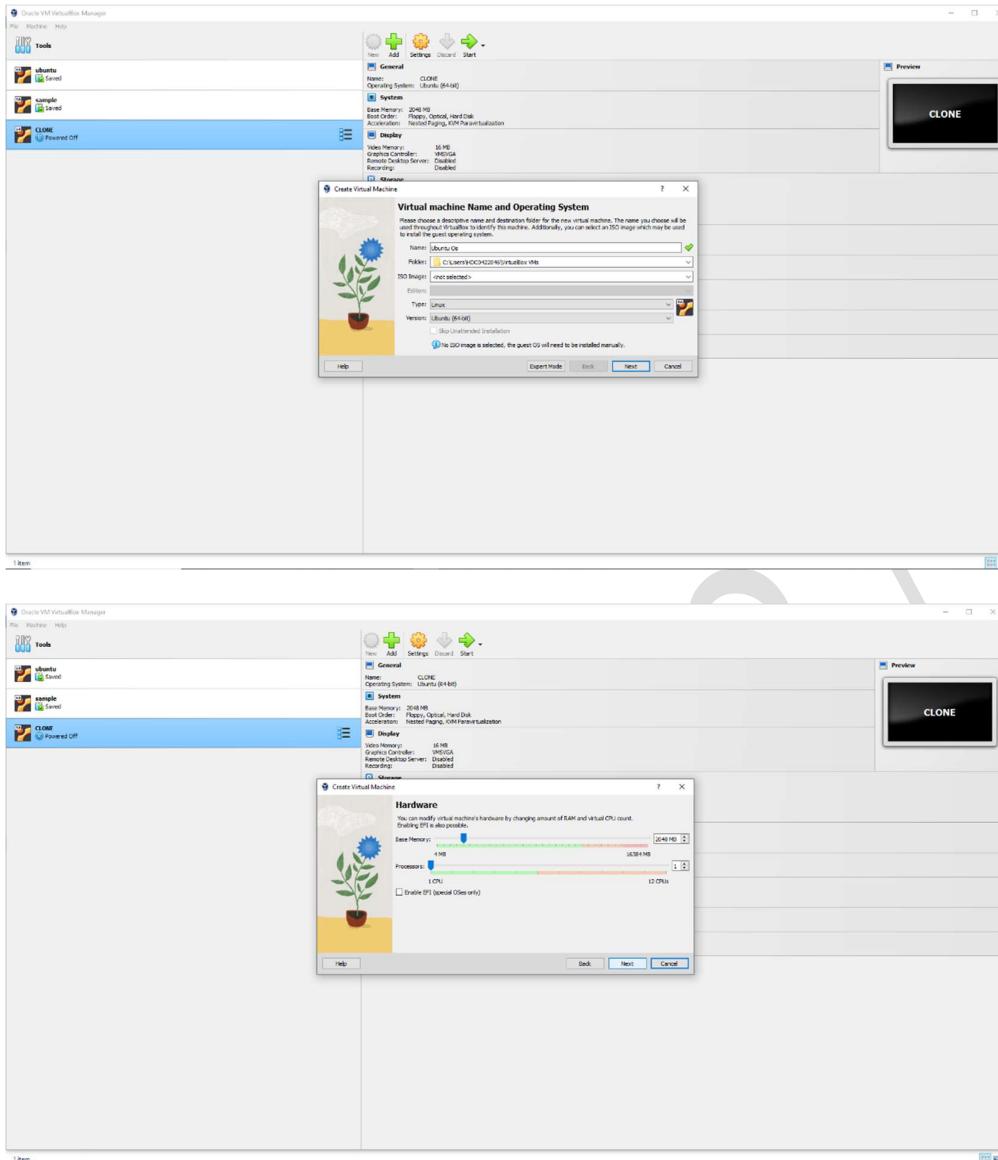


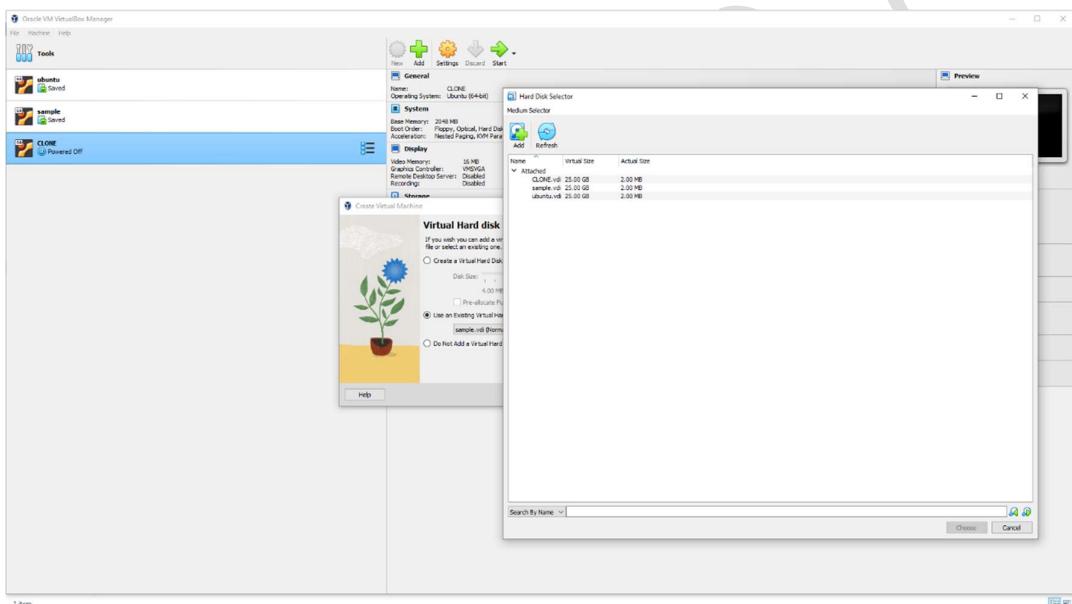
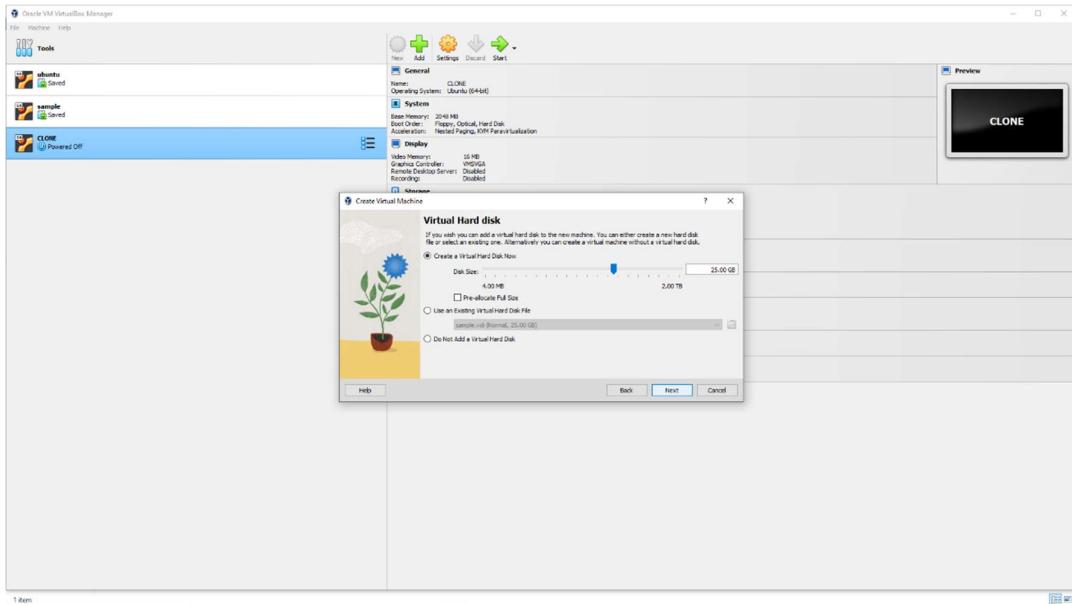


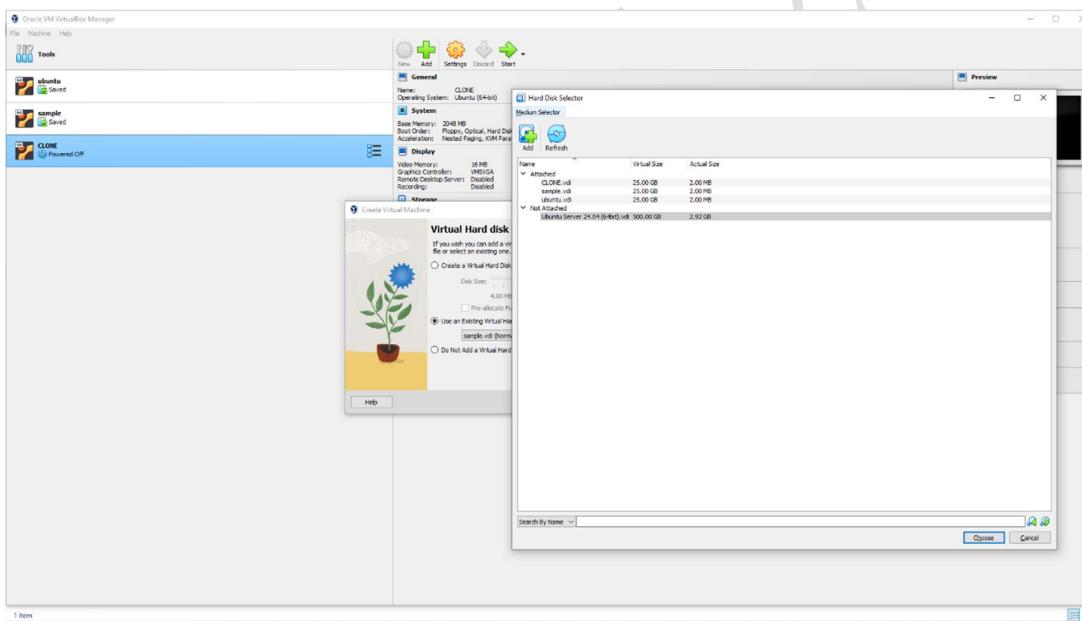
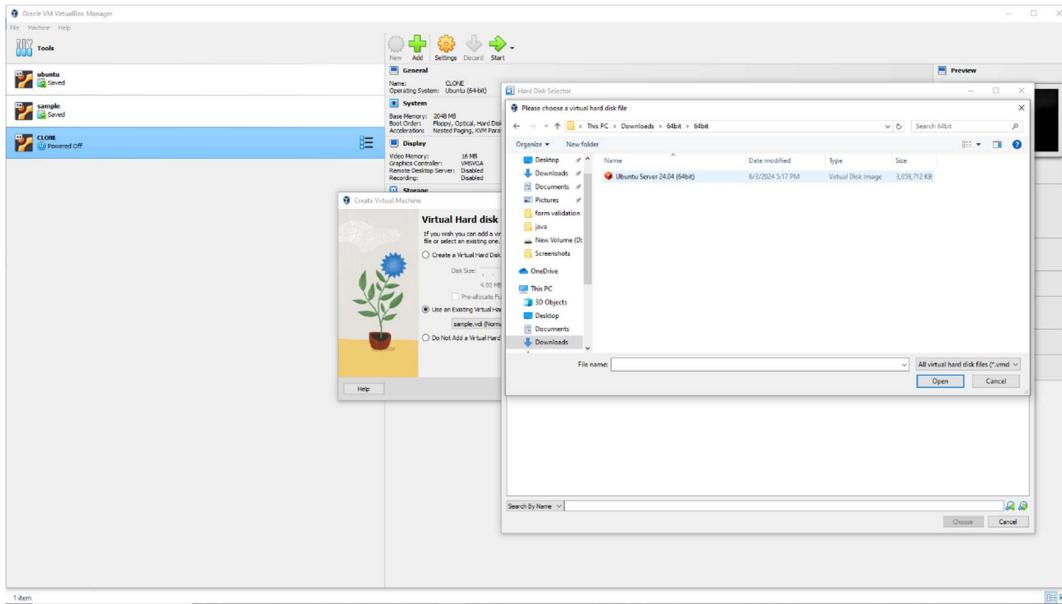


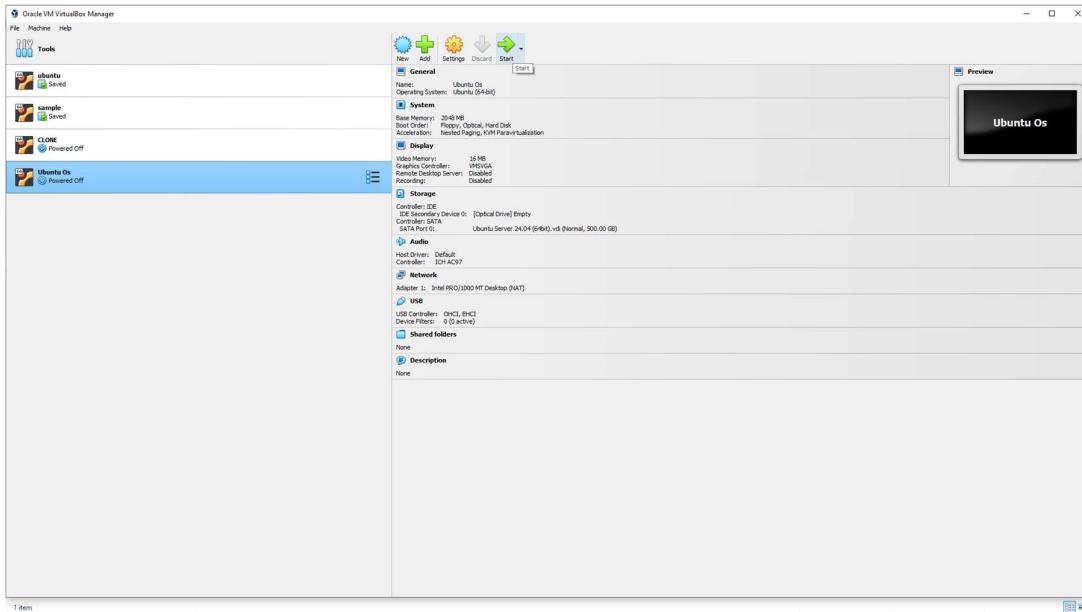


Custom configuration:









21070121

RESULT:

Thus, a Virtual Machine using VM ware and Launch the VM is configured.

Exp No: 2

Date:

VIRTUALIZATION

VIRTUAL BLOCK, VM CLONE & VM SNAPSHOT

AIM:

To configure a Virtual Block for a VM and then create a copy of VM through Cloning and perform a snapshot of VM.

PROCEDURE FOR VIRTUAL DISK:

1. Open the virtual machine settings editor (VM > Settings) and click Add
2. Click Hard Disk, then click Next.
3. Select Create a new virtual disk, then click Next.
4. Choose whether you want the virtual disk to be an IDE disk or a SCSI disk.
5. Set the capacity for the new virtual disk.
6. Accept the default filename and location for the virtual disk file
7. The wizard creates the new virtual disk. It appears to your guest operating system as a new, blank hard disk. Use the guest operating system's tools to partition and format the new drive for use.

PROCEDURE FOR VM CLONE:

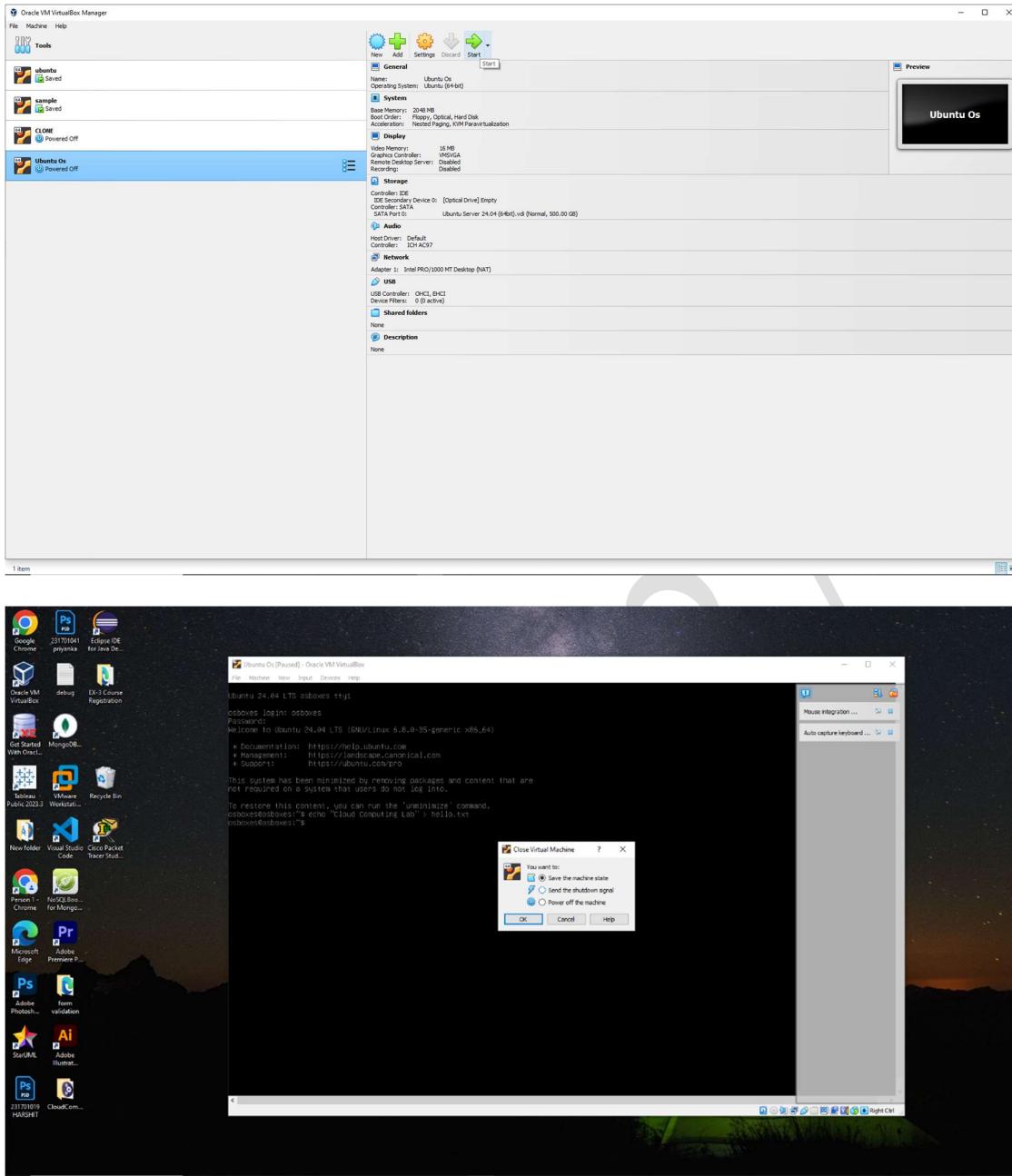
1. Select the virtual machine you want to clone.
2. Open the Clone Virtual Machine Wizard (VM > Manage > Clone) and click Next.
3. Select the state of the parent from which you want to create a clone, and click Next.
4. Select the type of clone you want to create and click Next.
5. Type a name and a path for the cloned virtual machine, and click Finish.

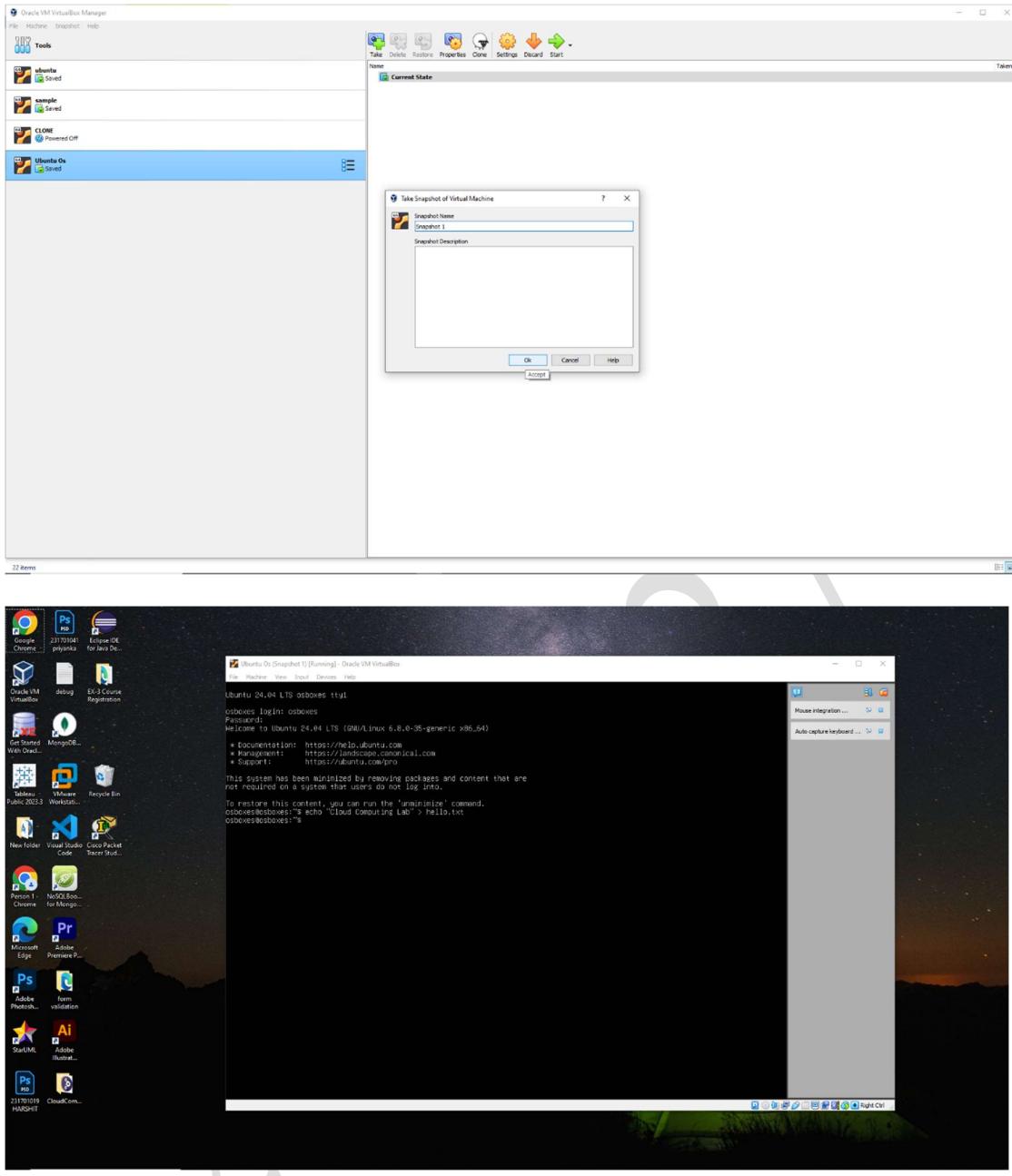
NOTE: You must power off a virtual machine before you can make a clone.

PROCEDURE FOR VM SNAPSHOT:

1. Choose VM > Snapshot > Take Snapshot

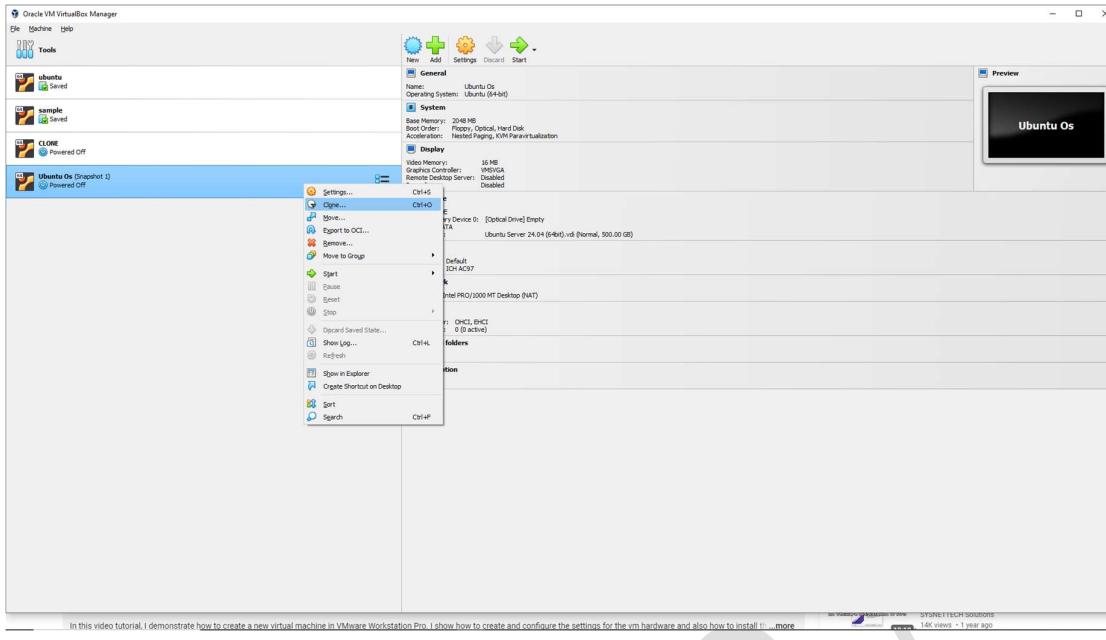
OUTPUT:



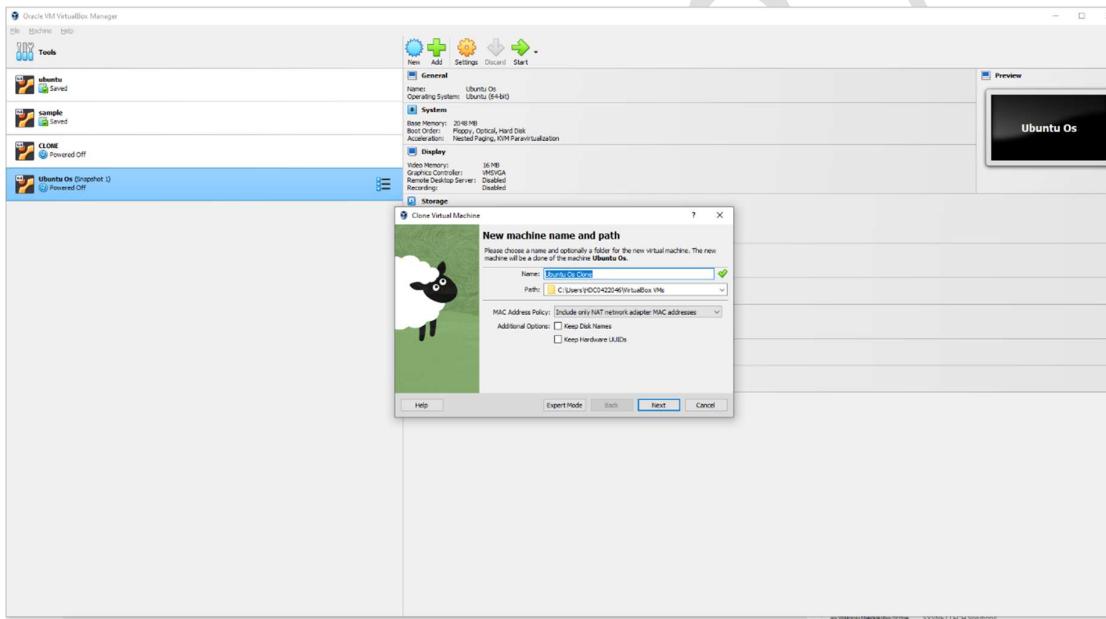


A Virtual block, Clone and Snapshot are created.

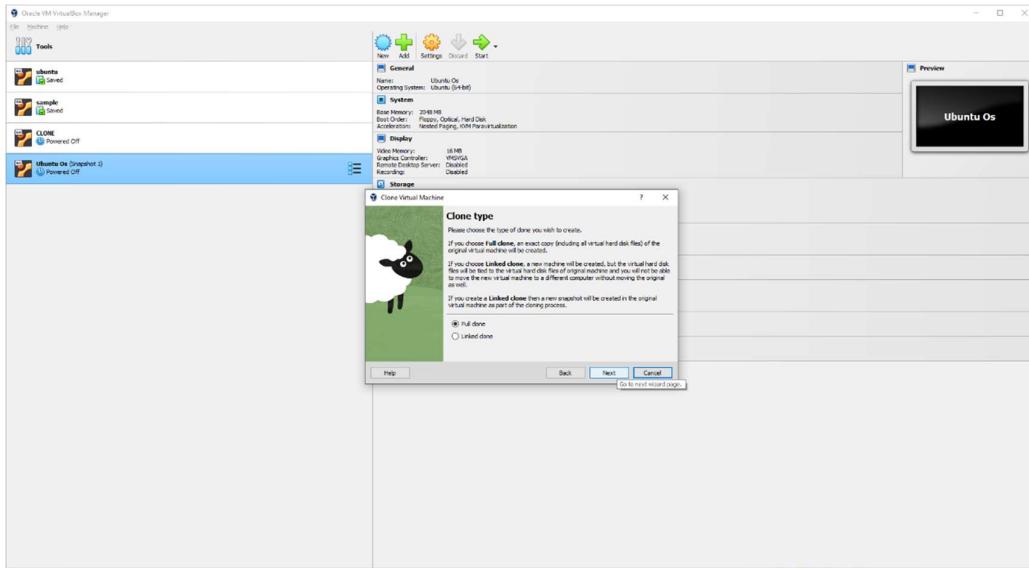
Cloning:



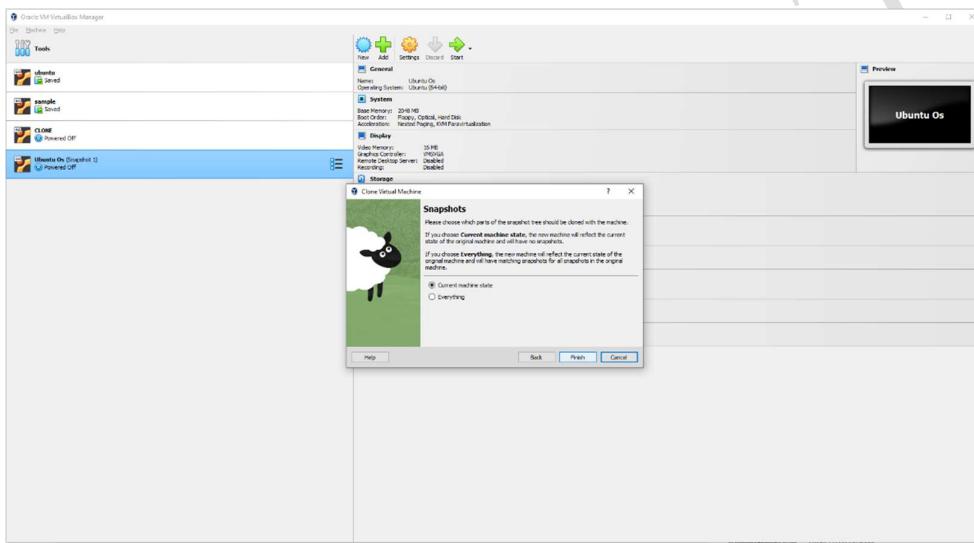
In this video tutorial, I demonstrate how to create a new virtual machine in VMware Workstation Pro. I show how to create and configure the settings for the vm hardware and also how to install it! ... more



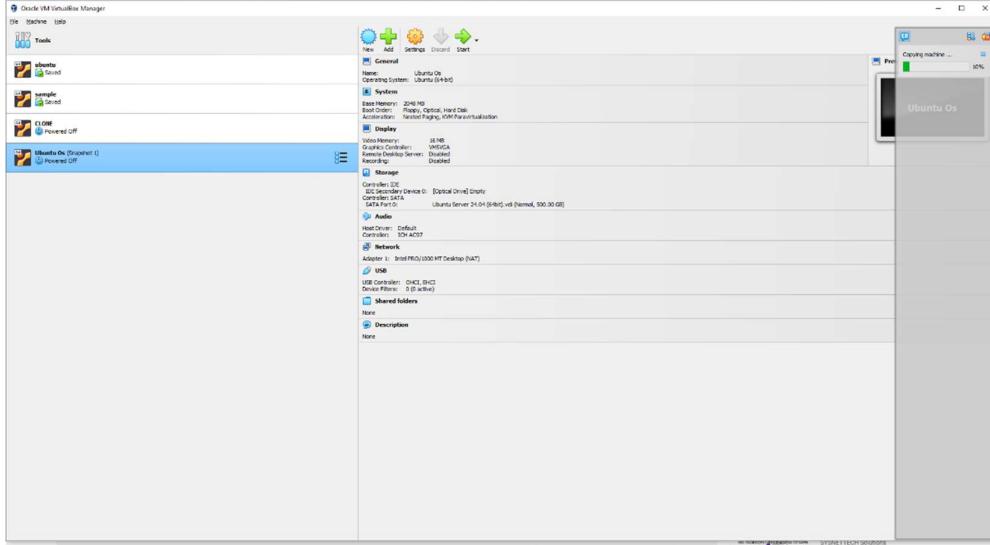
In this video tutorial, I demonstrate how to create a new virtual machine in VMware Workstation Pro. I show how to create and configure the settings for the vm hardware and also how to install it! ... more

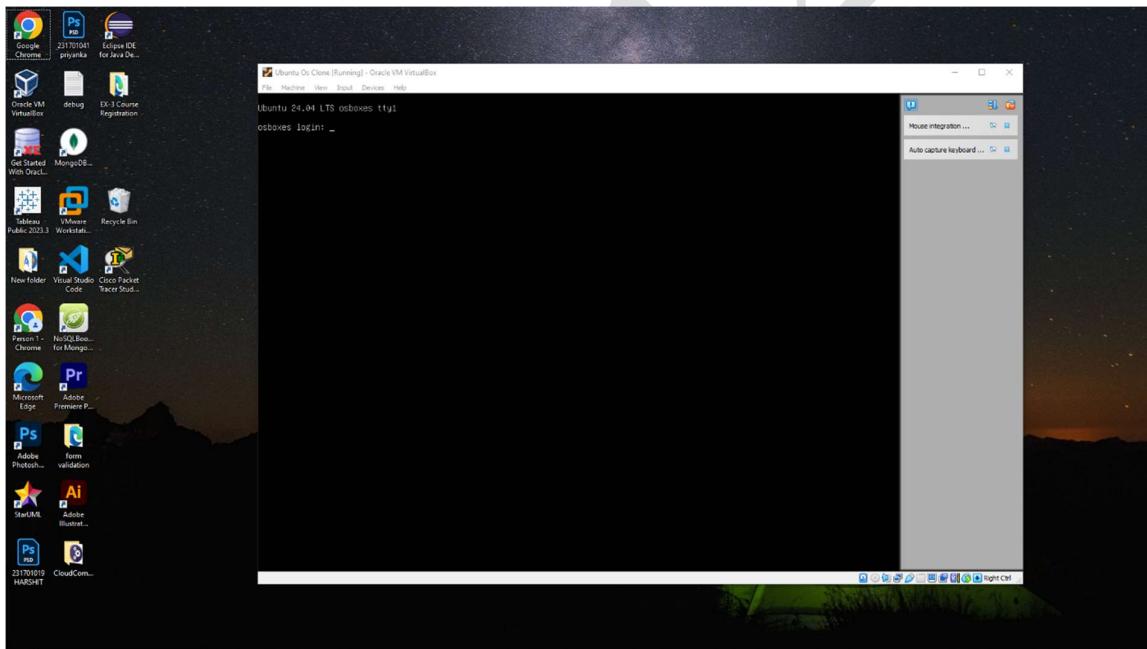
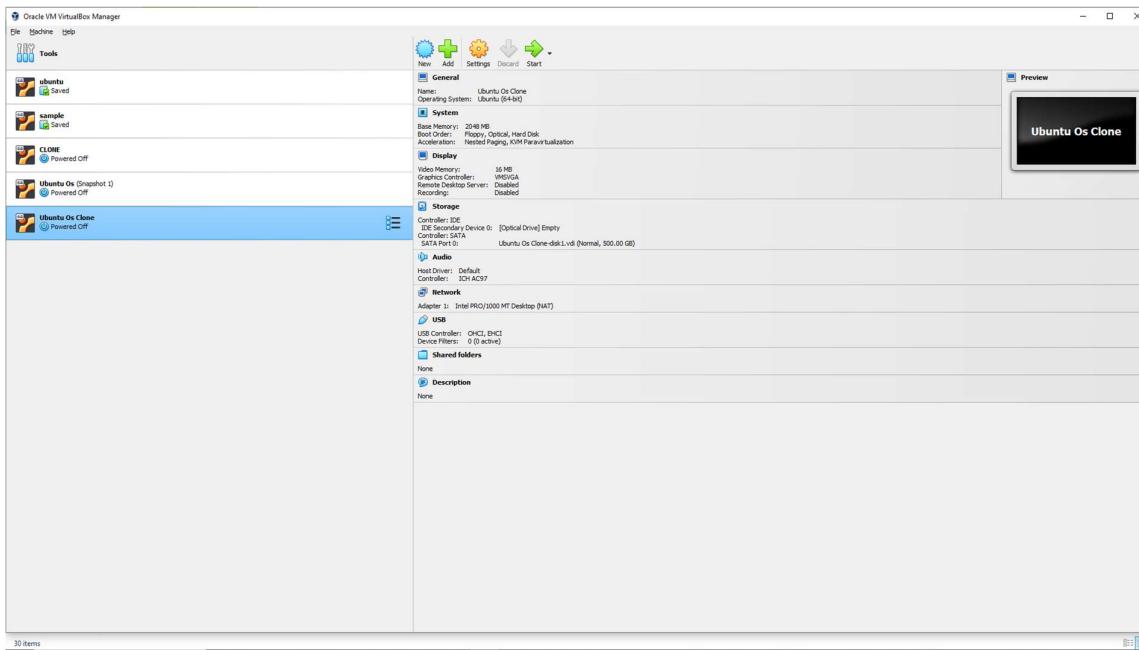


In this video tutorial, I demonstrate how to create a new virtual machine in VMware Workstation Pro. I show how to create and configure the settings for the vm hardware and also how to install ... more



In this video tutorial, I demonstrate how to create a new virtual machine in VMware Workstation Pro. I show how to create and configure the settings for the vm hardware and also how to install ... more





RESULT:

Thus a Virtual Block for a VM is configured, a copy of VM through Cloning is created and a snapshot of VM is performed.

Exp No: 3

Date:

VIRTUALIZATION

INSTALLATION OF VIRTUAL MACHINE IN VIRTUAL BOX

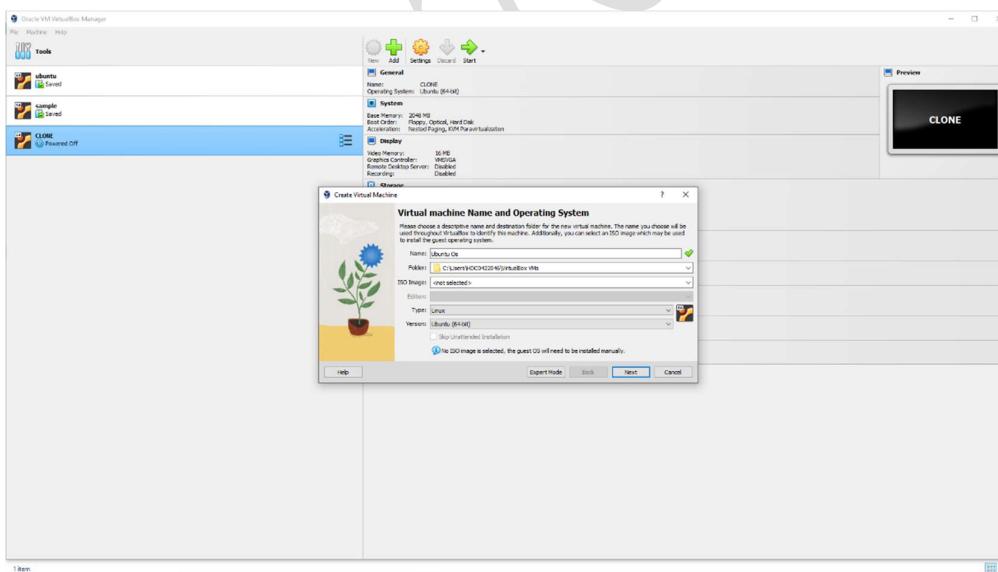
AIM:

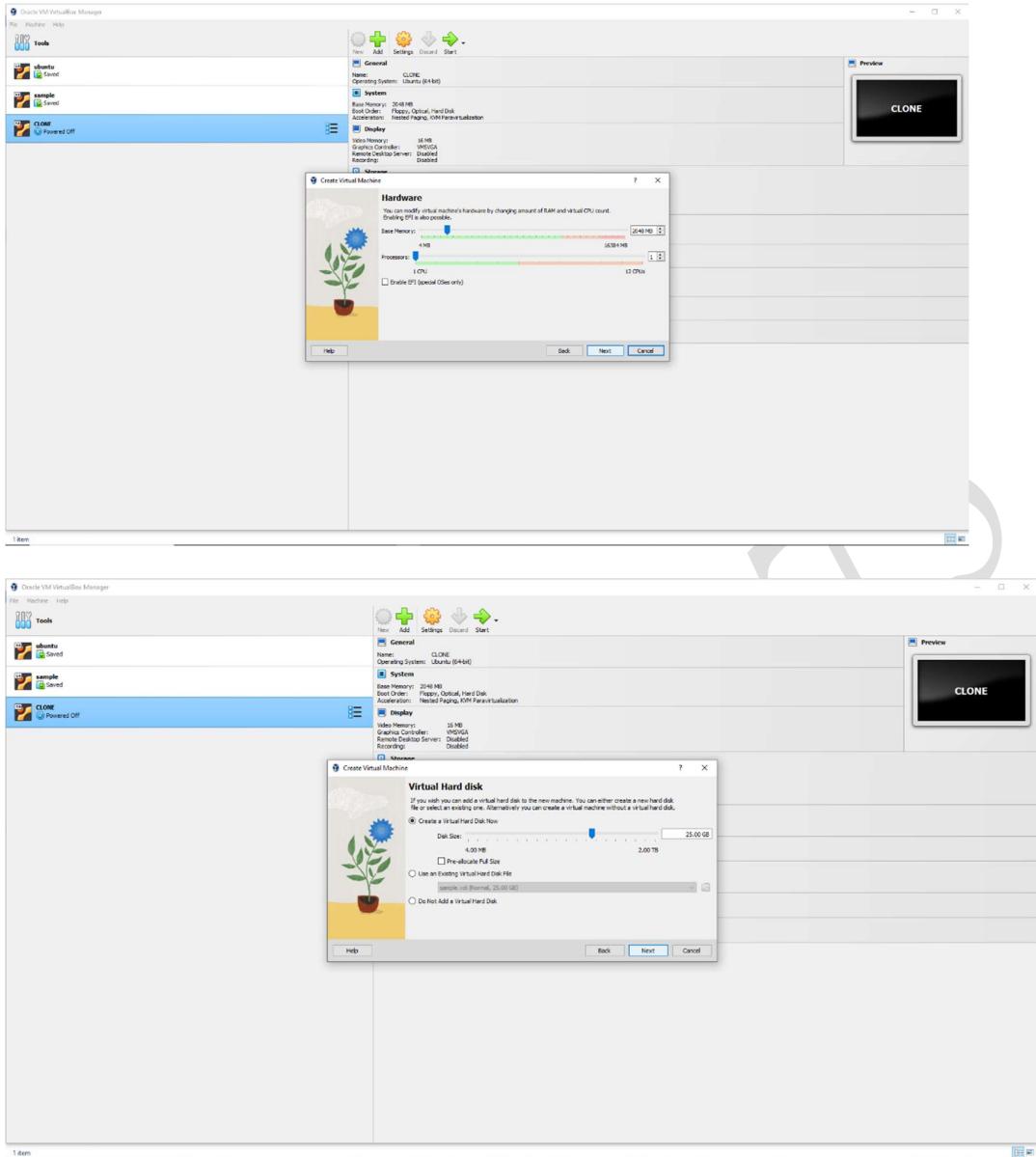
To configure a Virtual Machine using Virtual Box and Launch to execute a simple program using PYTHON.

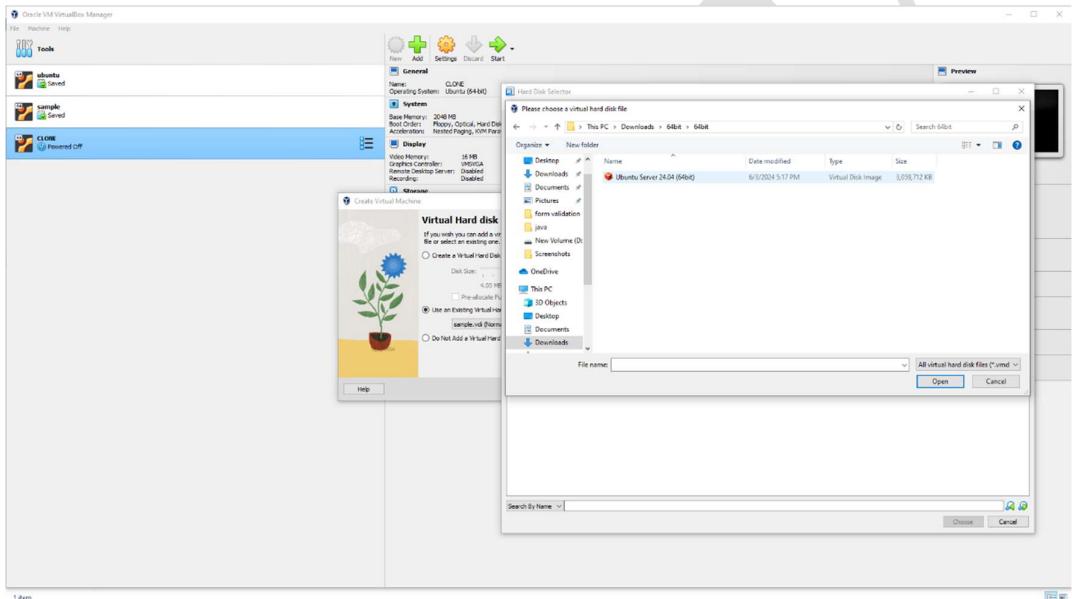
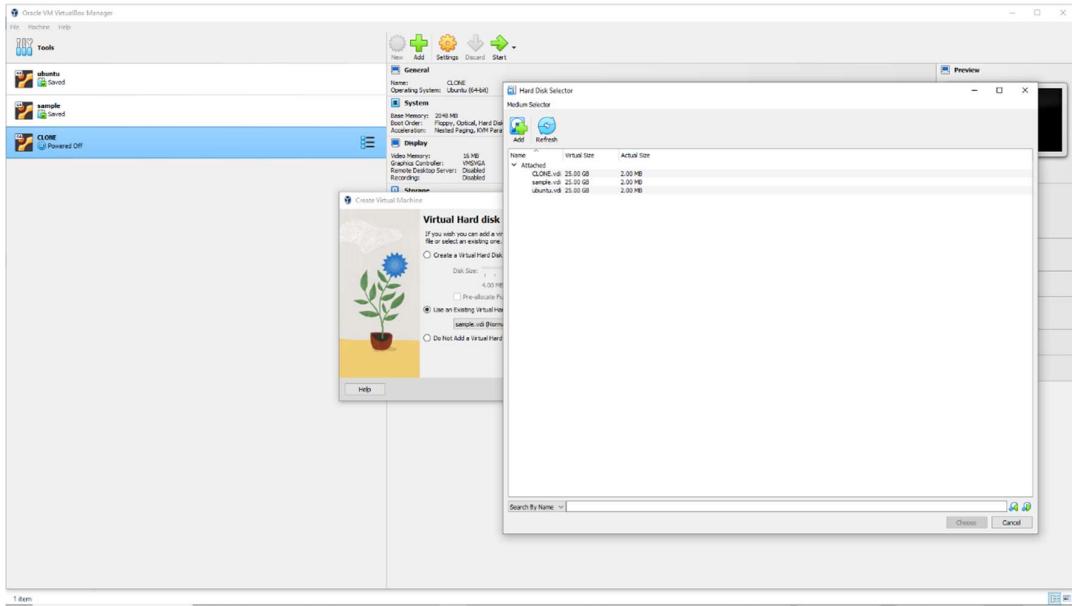
PROCEDURE:

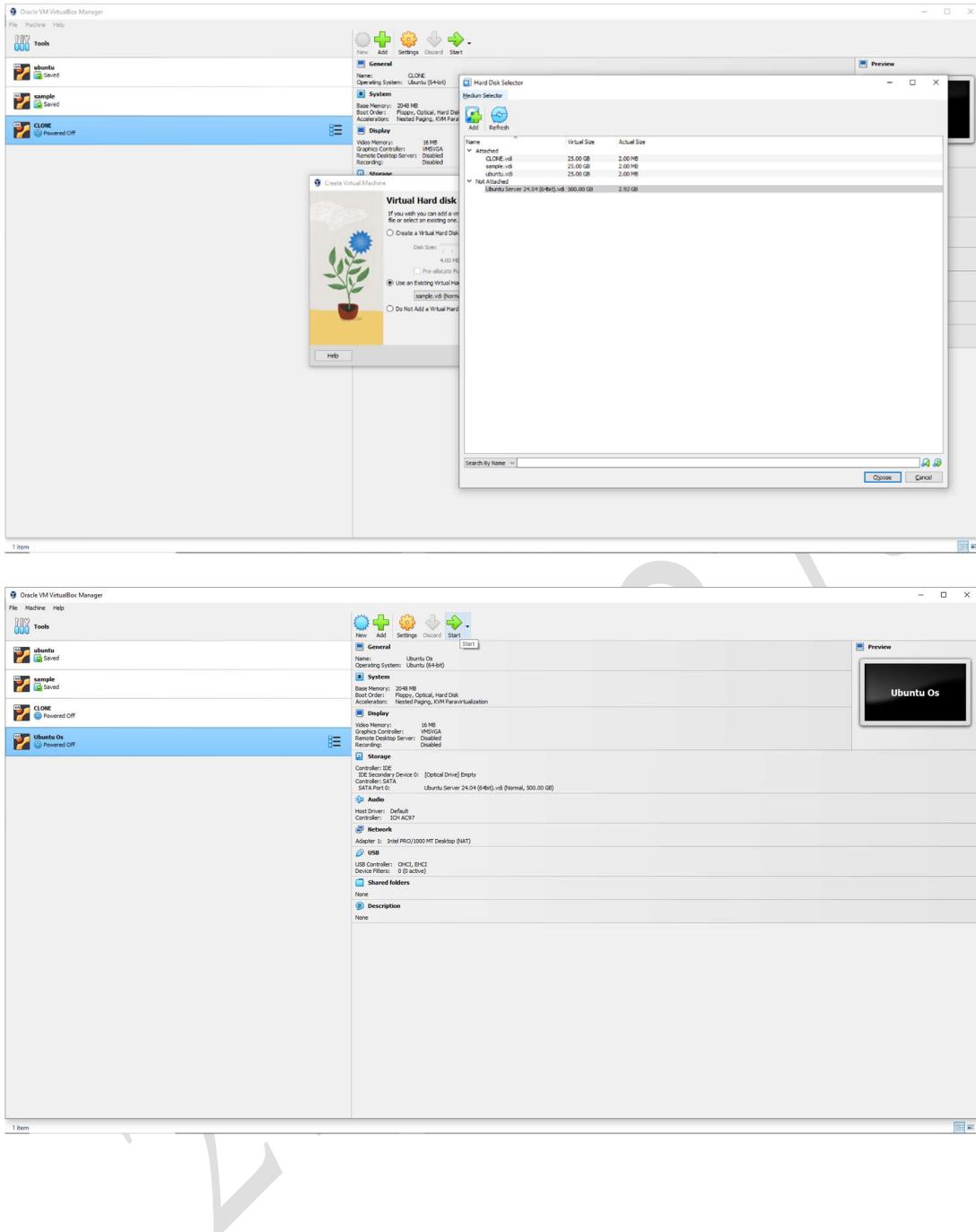
1. Launch a Virtual Box
2. Create new virtual machine
3. Customize the set-up
4. Set username and password
5. Browse for .iso file of an operating system
6. Configure the hardware capacity
7. Finish and power on the VM
8. Install C or PYTHON OR JAVA Compiler and execute a simple program

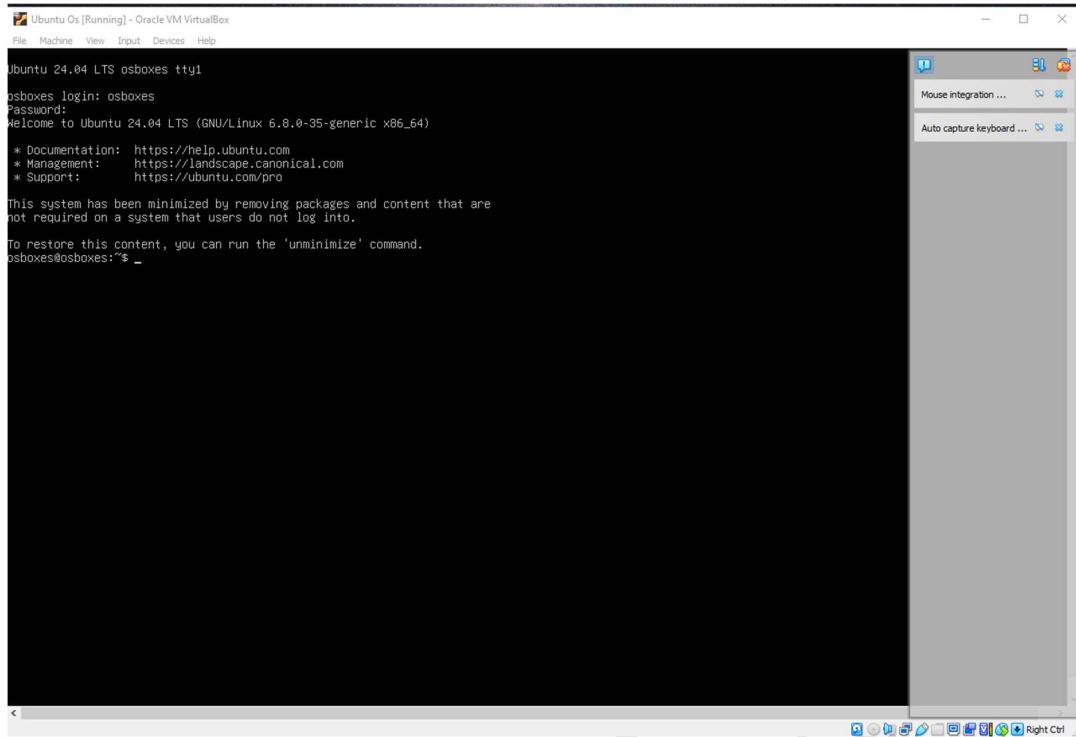
OUTPUT:











RESULT:

Thus a Virtual Machine using Virtual Box is configured.

EX. NO: 4

DATE:

PUBLIC CLOUD

CREATING AN INSTANCE IN SALESFORCE

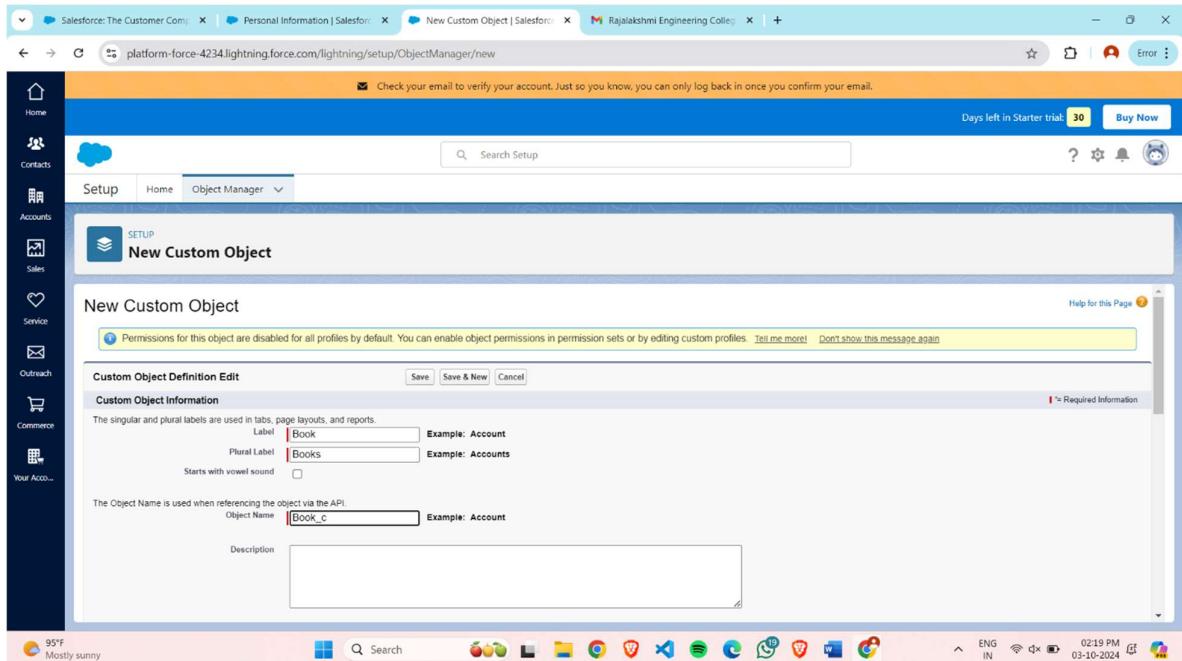
AIM:

Develop a simple application to understand the concept of PAAS using Sales force

PROCEDURE:

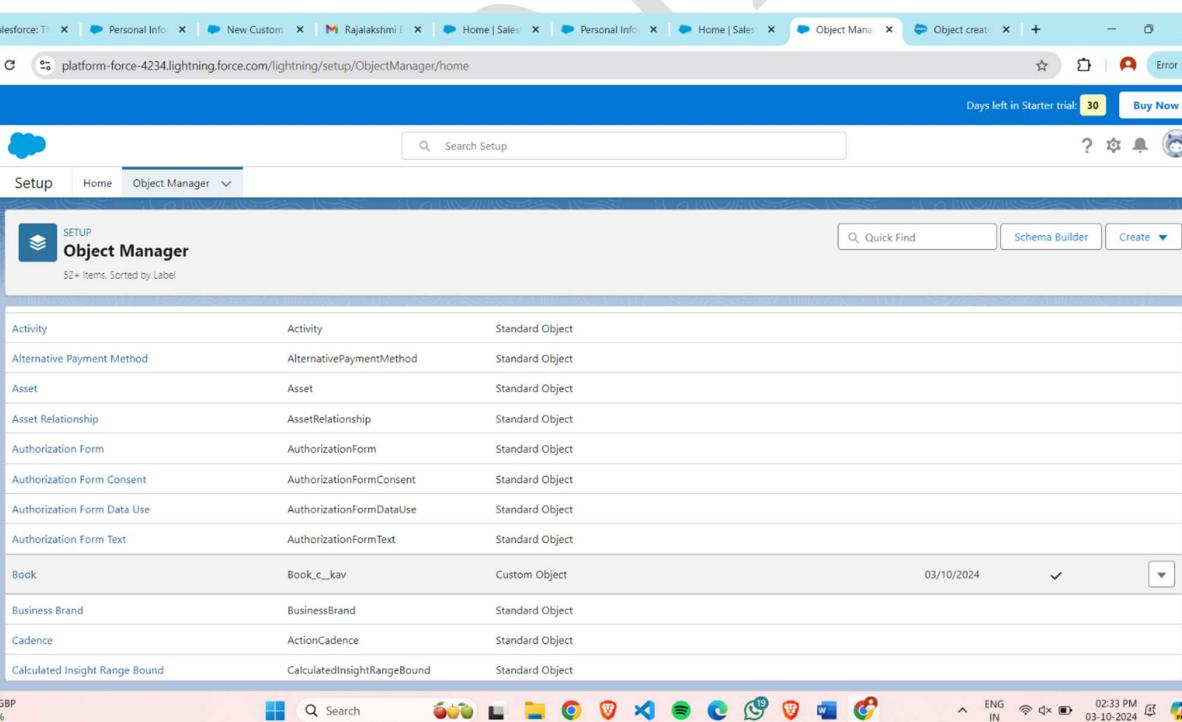
1. Log in to your Salesforce account.
2. Click Setup at the upper-right corner.
3. Under the Build section, click Create and select Objects.
4. To create a custom object, click New Custom Object.
5. Enter the name of the Custom Object in Label, Plural Label, and Object Name.
6. Choose the custom apps for which the new Custom tab is required and click Save.
7. Select whether you want to define a custom app or a Salesforce console.
8. Give the app a name and description. An app name can have a maximum of 40 characters, including spaces. Click Save.

OUTPUT:



The screenshot shows the Salesforce Setup interface with the 'Object Manager' tab selected. A message at the top indicates that permissions for the 'Book' object are disabled by default and can be enabled via permission sets or custom profiles. The 'Custom Object Definition Edit' screen is displayed, showing the 'Label' as 'Book' and 'Plural Label' as 'Books'. The 'Object Name' field contains 'Book_c'. A 'Description' field is present but empty. The status bar at the bottom shows it's 95°F and mostly sunny.

Activity	Activity	Standard Object
Alternative Payment Method	AlternativePaymentMethod	Standard Object
Asset	Asset	Standard Object
Asset Relationship	AssetRelationship	Standard Object
Authorization Form	AuthorizationForm	Standard Object
Authorization Form Consent	AuthorizationFormConsent	Standard Object
Authorization Form Data Use	AuthorizationFormDataUse	Standard Object
Authorization Form Text	AuthorizationFormText	Standard Object
Book	Book_c_kav	Custom Object
Business Brand	BusinessBrand	Standard Object
Cadence	ActionCadence	Standard Object
Calculated Insight Range Bound	CalculatedInsightRangeBound	Standard Object



The screenshot shows the 'Object Manager' page with a list of 52+ items. The 'Book' object is highlighted, showing its details: Label 'Book', Plural Label 'Books', Object Name 'Book_c', and Type 'Custom Object'. The status bar at the bottom shows it's 02:33 PM on 03-10-2024.

The screenshot shows the Salesforce Setup interface with the 'Tabs' tab selected. The left sidebar includes links for Home, Contacts, Accounts, Sales, Service, Outreach, Commerce, and Your Account. The main content area displays sections for Custom Object Tabs, Web Tabs, Visualforce Tabs, and Lightning Component Tabs. A single entry for a 'Books' tab is listed under Custom Object Tabs. The top right corner shows a 'Days left in Starter trial: 30' message and a 'Buy Now' button.

The screenshot shows the Salesforce Setup interface with the 'Navigation Menus' tab selected. The left sidebar includes links for Home, Contacts, Accounts, Sales, Service, Outreach, Commerce, and Your Account. The main content area displays the 'App Details & Branding' section for a new Lightning App. It includes fields for App Name, Developer Name, Description, Primary Color Hex (set to #0070D2), and Org Theme Options. A 'Next' button is visible at the bottom right. The top right corner shows a 'Days left in Starter trial: 30' message and a 'Buy Now' button.

Salesforce | Personal Info | New Cust... | Rajalakshmi | App Manager | Home | Sales | Object creation | Home | Sales | Personal Info | Home | Sales | + Days left in Starter trial: 30 Buy Now

platform-force-4234.lightning.force.com/lightning/setup/NavigationMenus/home

New Lightning App

Available Profiles

- Contract Manager
- Marketing User
- Minimum Access - Salesforce
- Sales Insights Integration User
- SalesforceIQ Integration User
- Solution Manager

Selected Profiles

- System Administrator
- External Apps Login User
- Standard User

Save & Finish

Back

User Engagement Platform Sales

10 Outreach 11 Platform 12 Sales

For Starter Orgs, zero implemented emails to lists of prospective customers 03/10/2024, 12:59 pm Lightning

03/10/2024, 12:59 pm Classic 03/10/2024, 12:59 pm Classic

Upcoming Earnings Search ENG IN 02:40 PM 03-10-2024

Home | Salesforce | Object Manager | Salesforce

Check your email to verify your account. Just so you know, you can only log back in once you confirm your email.

Your Recommended Tours ▾

Leave Feedback | 30 Days left in trial | Buy Now

SETUP Object Manager

48 items. Sorted by Label

Search Setup

Quick Find Schema Builder Create

Custom Object
Custom Object from Spreadsheet

LABEL	API NAME	TYPE	DESCRIPTION	LAST MODIFIED
Account	Account	Standard Object		
Account Contact Relationship	AccountContactRelation	Standard Object		
Activity	Activity	Standard Object		
Asset	Asset	Standard Object		
Asset Relationship	AssetRelationship	Standard Object		
Campaign	Campaign	Standard Object		
Campaign Influence	CampaignInfluence	Standard Object		
Campaign Member	CampaignMember	Standard Object		
Case	Case	Standard Object		
Contact	Contact	Standard Object		
Contact Request	ContactRequest	Standard Object		

https://ruby-computing-1407.lightning.force.com/lightning/setup/ObjectManager/new

89°F Partly sunny

The screenshot shows the Salesforce Object Manager interface. The top navigation bar has tabs for 'Home | Salesforce' and 'Cup | Salesforce'. The URL is <https://ruby-computing-1407.lightning.force.com/lightning/setup/ObjectManager/01IdN0000014WqL/Details/view>. A banner at the top says 'Check your email to verify your account. Just so you know, you can only log back in once you confirm your email.' The main area shows the 'Cup' object details. On the left, a sidebar lists various configuration tabs: Fields & Relationships, Page Layouts, Lightning Record Pages, Buttons, Links, and Actions, Compact Layouts, Field Sets, Object Limits, Record Types, Related Lookup Filters, Triggers, and Flow Triggers. The 'Details' tab is selected. The right side displays the object's API name ('Cup_O__c'), custom status ('Custom'), singular label ('Cup'), and plural label ('Cups'). Other settings like Enable Reports, Track Activities, and Deployment Status are also visible.

The screenshot shows the Salesforce Setup interface under the 'Custom Tabs' section. The top navigation bar has tabs for 'Home | Salesforce' and 'Tabs | Salesforce'. The URL is <https://ruby-computing-1407.lightning.force.com/lightning/setup/CustomTabs/home>. A banner at the top says 'Check your email to verify your account. Just so you know, you can only log back in once you confirm your email.' The main area shows the 'Custom Tabs' page. On the left, a sidebar shows 'User Interface' with 'Rename Tabs and Labels' and 'Tabs' selected. The main content area is titled 'Custom Tabs' and explains how to create new custom tabs. It lists four categories: 'Custom Object Tabs', 'Web Tabs', 'Visualforce Tabs', and 'Lightning Component Tabs', each with a 'New' button and 'What Is This?' link. The bottom of the page shows the URL <https://ruby-computing-1407.lightning.force.com/lightning/setup/CustomTabs/home>.

Screenshot 1: New Custom Object Tab - Step 2, Add to Profiles

The screenshot shows the Salesforce Setup interface for creating a new custom object tab. The page title is "New Custom Object Tab" and the sub-section is "Step 2, Add to Profiles". It asks to choose user profiles for visibility. A radio button is selected for "Apply one tab visibility to all profiles [Default On]". Below this, there is a table mapping profiles to tab visibility settings. The profiles listed include Analytics Cloud Integration User, Analytics Cloud Security User, Contract Manager, CPQ Integration User, End User, Executive Sponsor, Identity User, and Marketing User. All profiles have "Default On" selected for tab visibility.

Profile	Tab Visibility
Analytics Cloud Integration User	Default On
Analytics Cloud Security User	Default On
Contract Manager	Default On
CPQ Integration User	Default On
End User	Default On
Executive Sponsor	Default On
Identity User	Default On
Marketing User	Default On

Screenshot 2: Lightning Experience App Manager

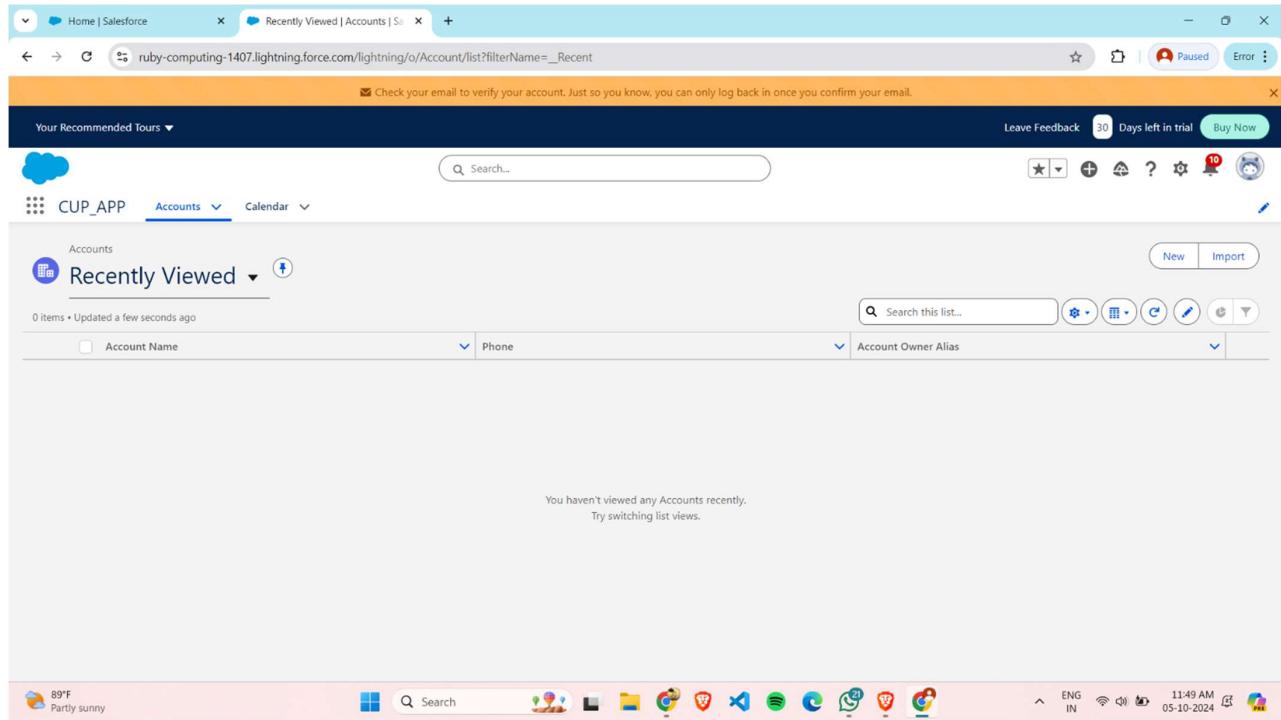
The screenshot shows the Salesforce Setup interface for managing apps. The page title is "Lightning Experience App Manager". It lists 18 items sorted by app name. The table includes columns for App Name, Developer Name, Description, Last Modified, App Type, and Vi... (View). The "App Type" column shows various categories like Classic, Lightning, Connected, and others. The "Vi..." column contains small icons for each item.

App Name	Developer Name	Description	Last Modified	App Type	Vi...
All Tabs	AllTabSet		05/10/2024, 10:28 am	Classic	
Automation	FlowsApp	Automate business processes and repetitive tasks.	05/10/2024, 10:29 am	Lightning	
Community	Community	Salesforce CRM Communities	05/10/2024, 10:28 am	Classic	
CPQ Integration User Connected A...	CPQIntegrationUserApp		05/10/2024, 10:28 am	Connected	
Digital Experiences	SalesforceCMS	Manage content and media for all of your sites.	05/10/2024, 10:28 am	Lightning	
Inside Sales	Inside_Sales	Generate leads faster, and qualify and nurture prospects using best practices.	05/10/2024, 10:28 am	Lightning	
Marketing CRM Classic	Marketing	Track sales and marketing efforts with CRM objects.	05/10/2024, 10:28 am	Classic	
Platform	Platform	The fundamental Lightning Platform	05/10/2024, 10:28 am	Classic	
Sales	Sales	The world's most popular sales force automation (SFA) solution	05/10/2024, 10:28 am	Classic	
Sales Console	LightningSalesConsole	Sell smarter and faster with the world's #1 CRM solution.	05/10/2024, 10:30 am	Lightning	
Sales Leader	Sales_Leader	(Lightning Experience) Lets sales reps work with multiple records on one screen.	05/10/2024, 10:28 am	Lightning	

The screenshot shows the Salesforce App Manager interface. A modal window titled "New Lightning App" is open, listing various user profiles: Analytics Cloud Integration User, Analytics Cloud Security User, Contract Manager, CPQ Integration User, Executive Sponsor, Identity User, Minimum Access - Salesforce, Solution Manager, and Standard User. On the right side of the modal, there are buttons for "End User", "System Administrator", "Marketing User", and "Read Only". Below the modal is a progress bar with several steps completed. At the bottom right of the screen, there is a "Save & Finish" button.

The screenshot shows the "App Manager" section of the Salesforce Setup page. The left sidebar includes "App Launcher", "Setup", "Home", and "Object Manager". The main area is titled "Lightning Experience App Manager" and displays a list of available apps. The table has columns for "App Name", "Developer Name", "Description", "Last Modified", "App Type", and "Visible". The list includes standard Salesforce apps like Tabs, Automation, Community, and Sales, along with custom apps like "CUP_APP" and "Digital Experiences".

App Name	Developer Name	Description	Last Modified	App Type	Visible
AllTabs	AllTabSet		05/10/2024, 10:28 am	Classic	✓
Automation	FlowsApp	Automate business processes and repetitive tasks.	05/10/2024, 10:29 am	Lightning	✓
Community	Community	Salesforce CRM Communities	05/10/2024, 10:28 am	Classic	✓
CPQ Integration User Connected A...	CPQIntegrationUserApp		05/10/2024, 10:28 am	Connected	✓
CUP_APP	CUP_APP		05/10/2024, 11:48 am	Lightning	✓
Digital Experiences	SalesforceCMS	Manage content and media for all of your sites.	05/10/2024, 10:28 am	Lightning	✓
Inside_Sales		Generate leads faster, and qualify and nurture prospects using best practices.	05/10/2024, 10:28 am	Lightning	✓
Marketing CRM Classic	Marketing	Track sales and marketing efforts with CRM objects.	05/10/2024, 10:28 am	Classic	✓
Platform	Platform	The fundamental Lightning Platform	05/10/2024, 10:28 am	Classic	✓
Sales	Sales	The world's most popular sales force automation (SFA) solution	05/10/2024, 10:28 am	Classic	✓
LightningSales	LightningSales	Sell smarter and faster with the world's #1 CRM solution.	05/10/2024, 10:30 am	Lightning	✓
Sales Console	LightningSalesConsole	(Lightning Experience) Lets sales reps work with multiple records on one screen.	05/10/2024, 10:28 am	Lightning	✓



RESULT:

Thus a simple application to understand concept of PAAS using Salesforce is implemented.

PUBLIC CLOUD

CREATING AN INSTANCE IN IBM CLOUD

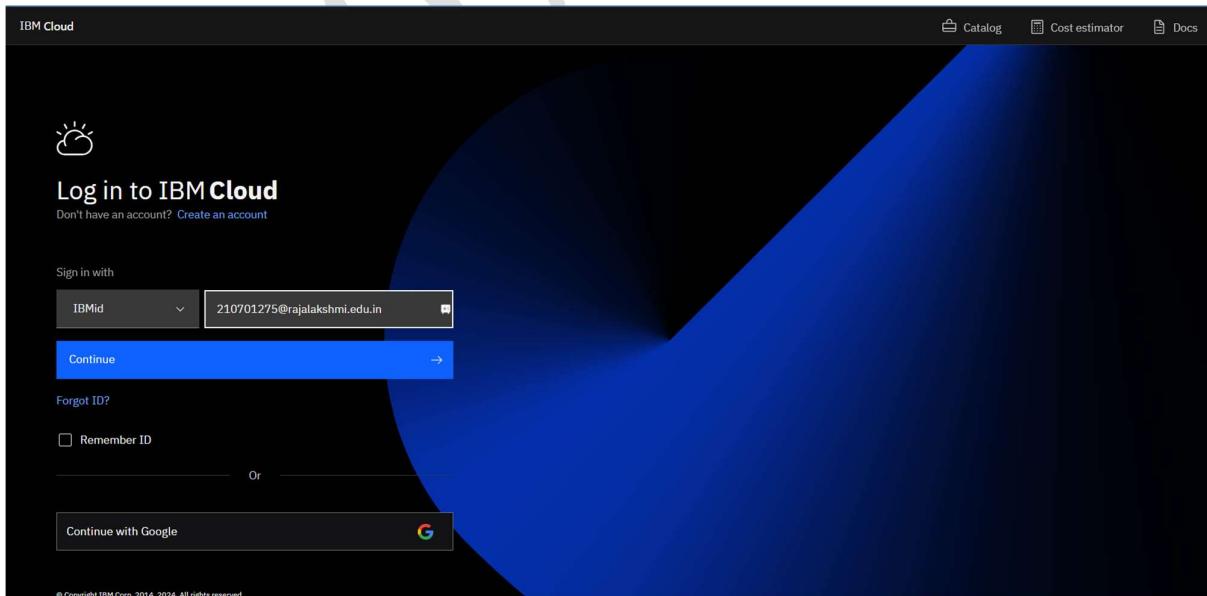
AIM:

Develop a simple application to understand the concept of PAAS using IBM CLOUD

PROCEDURE:

1. In the IBM Cloud console, go to Menu icon > VPC Infrastructure > Compute > Virtual server instances.
2. Click Create and enter the information required.
3. Click Create virtual server instance when you are ready to provision

OUTPUT:



The screenshot displays two main interfaces related to IBM Cloud services.

Top Interface (IBM Catalog):

- Header:** Sell on IBM Cloud, Catalog settings.
- Title:** Catalog.
- Search Bar:** Search the catalog.
- Filter Bar:** All products, Deployable architectures, Cloud essentials, IBM products, Partner products, Professional services.
- Sort Order:** Relevance.
- Category Filter:** Category (Compute, Containers, Networking, Storage, Converged infrastructure, Enterprise applications).
- Product Listings:**
 - Cloud Object Storage on VPC for SAP HANA Backup:** By IBM. Description: Deploy the capability to backup an SAP HANA database to IBM Cloud Object Storage in a single step. Tags: Deployable architecture, SAP Certified.
 - DevSecOps Application Lifecycle Management:** By IBM. Description: DevSecOps provides a set of predefined continuous integration, continuous deployment and continuous compliance toolchain templates. Tags: Deployable architecture, Terraform IBM Modules (TIM).
 - IBM Cloud Essential Security and Observability Services:** By IBM. Description: Deploy core security and other supporting services to get set up to manage the security compliance of the resources in your account. Tags: Deployable architecture, Terraform IBM Modules (TIM).
- Total Products:** Viewing 248 products.

Bottom Interface (IBM Db2 on Cloud):

- Left Sidebar:** Data objects, Saved objects, SQL, Tables, Functions, Views.
- SQL Editor:** * Untitled - 1
 - Text input: SELECT * FROM USER;
 - Buttons: Syntax assistant, Run all.
- Results Tab:**
 - History tab.
 - Results tab: Result set 1, Details.

NAME	EMAIL	PASSWORD	GI
Varun	fdhjdf@gmail.com	1234	M
Sujan	sujan.g.2019.cse@rajalakshmi.edu.in	\$2b\$12\$Tm9rhwJ.oV8tHXVMamhkqeoGPg7XXjVNgl7TqwAFkMAR.ON3DNHu	M
thuhin@gmail.com	thuhin@gmail.com	\$2b\$12\$Ja6EnNS21k646qZBduh5VulBpEqlqsAaJ4xt8kl5w3xKkBjvUj6	M
admin	admin@gmail.com	\$2b\$12\$HS9zQHsfmbVJHI.dWs9FeO3QlfqHFFmL7L1lO/bolq/Xa5I1AF6	M
guest	sujanraju4000@gmail.com	\$2b\$12\$2/AcCVS25w.Gc0ep4JWcJOzylGpSSUgnf.thqOqUr3aMPjtYAOcy	M

RESULT:

Thus, a simple application to understand the concept of PAAS using IBM CLOUD is implemented.

EX. NO: 6

DATE:

PUBLIC CLOUD

CREATING AN INSTANCE IN MICROSOFT AZURE

AIM:

Develop a simple application to understand the concept of PaaS using Microsoft Azure

PROCEDURE:

1. Sign in to the Azure portal
2. Select Azure SQL on the left menu of the Azure portal.
3. Select +Add to open the Select SQL deployment option page.
4. Select Create.

OUTPUT:

The screenshot shows the Microsoft Azure portal homepage. At the top, there's a search bar and a navigation bar with icons for mail, notifications, settings, and a user profile. The main header says "Welcome to Azure!" Below it, there are three promotional cards: "Start with an Azure free trial" (Get \$200 free credit), "Manage Microsoft Entra ID" (Manage access, set smart policies, and enhance security), and "Access student benefits" (Get free software, Azure credit, or access Azure Dev Tools for Teaching). Below these are sections for "Azure services" and "Resources". The "Azure services" section lists various services with icons: Create a resource, Quickstart Center, Azure AI services, Kubernetes services, Virtual machines, App Services, Storage accounts, SQL databases, Azure Cosmos DB, and More services. The "Resources" section is partially visible at the bottom.

Welcome to Azure!

Don't have a subscription? Check out the following options.

SQL databases

Description: Utilize a fully managed relational database service, perfect for accelerating application development and simplifying management tasks.

Free training from Microsoft:

- Provision an Azure SQL database to store ... 5 units - 50 min
- Secure your Azure SQL Database 8 units - 1 hr 7 min
- Scale multiple Azure SQL Databases with SQ... 7 units - 39 min

Useful links:

- Overview
- Get started

Manage Microsoft Entra ID

Manage access, set smart policies, and enhance security with Microsoft Entra ID.

Access student benefits

Get free software, Azure credit, or access Azure Dev Tools for Teaching after you verify your academic status.

Kubernetes services **Virtual machines** **App Services** **Storage accounts** **SQL databases** **Azure Cosmos DB** **More services**

<https://portal.azure.com/#blade/HubsExtension/BrowseResourceBlade/resourceType/Microsoft.Sql%2fServers%2fdatabases>

Microsoft Azure

All services > **Free services** [...](#)

Give feedback

Services that include monthly free amounts for 12 months

For 12 months after signup, new customers can use up to the specified monthly free amount of each of these services without getting charged. **Service usage is billed at the pay-as-you-go rate after you reach the monthly limit.** To learn more, see the [Azure free account FAQ](#).

Windows Virtual Machine COMPUTE 750 hours each of B1s and B2s v2 (AMD-based) burstable VMs. Create Windows virtual machines (VMs) in seconds to meet your workload and budget needs. Learn more	Linux Virtual Machine COMPUTE 750 hours each of B1s and B2s v2 (AMD-based) burstable VMs. Create Linux virtual machines (VMs) in seconds to meet your workload and budget needs. Learn more	Azure Managed Disks STORAGE 64 GB x 2 (P6) solid state drives SSD storage, plus 1 GB snapshot and 2 million I/O operations Get high performance, durable block storage for Azure Virtual Machines with simplified management. Learn more	Azure Blob Storage STORAGE 5 GB locally redundant storage (LRS) hot block with 20,000 read and 10,000 write operations Use massively-scalable object storage for any type of unstructured data. Learn more
Azure Files STORAGE 100GB of LRS transaction optimized, hot, and cool files, 2 million read, list, and other file operations	Key Vault SECURITY 10,000 transactions RSA 2048-bit keys or secret operations, Standard tier. Safeguard and maintain control of keys	Azure Media Services Encoding MEDIA 20 output minutes Standard encoder video or audio source file encoding. Index, package, protect, and stream video	Azure Database for MySQL DATABASES 750 hours of Flexible Server—Burstable B1MS Instance, 32 GB storage, and 32 GB backup storage Host a fully managed, scalable MySQL

Microsoft Azure

All services > Free services >

Select Azure Database for MySQL deployment option

Azure Database for MySQL - Single Server is scheduled for retirement by September 16, 2024. [Learn More](#)

Feedback

How do you plan to use the service?

Flexible server

Best for production workloads that require zone resiliency, predictable performance, maximum control with IOPS scaling, custom maintenance window, cost optimization controls and simplified developer experience.

[Quick Create](#) [Advanced Create](#)

Wordpress + MySQL Flexible server

Wordpress is state of the art publishing platform with a focus on aesthetics, web standards and usability. Use this template to create Wordpress on APP Service and Azure Database for MySQL Flexible Server in a Virtual network.

[Create](#) [Learn More](#)

<https://go.microsoft.com/fwlink/?linkid=2220695>

Microsoft Azure

All services > Free services >

Flexible server

Subscription * Resource group * [Create new](#)

Server details

Enter required settings for this server, including picking a location and configuring the compute and storage resources.

Server name * ✓

Region * ✓

Availability zone * ✓

Authentication

Admin username * ✓

Password * ✓

Confirm password * ✓

Workload details [\(Compare workload type\)](#)

Workload type * Dev/Test Standard Enterprise

Choose one of these workload types to quickly configure the server based on your needs. You can modify the configuration after creation.

[Review + create](#) [Next : Tags >](#)

Storage INR 217.97/month
Storage selected 20 GiB (INR 20 x 10.898503 per GiB) **10.898503**

Auto scale IOPS
Auto scale IOPS is billed on usage in per million request increments. [Learn more](#)

Backup Retention
Backup retention is billed based on additional storage used for retaining backups. [Learn more](#)

Bandwidth
For outbound data transfer across services in different regions will incur additional charges. Any inbound data transfer is free. [Learn more](#)

Estimated total INR 1705.91/month

Prices reflects an estimates only. [View Azure pricing calculator](#). Final charges will appear in your local currency in cost analysis and billing views.

The screenshot shows the Microsoft Azure portal interface for creating a new MySQL database instance. The configuration details are as follows:

- Storage:** INR 217.97/month. Storage selected: 20 GiB (INR 10.898503 per GiB).
- Auto scale IOPS:** Auto scale IOPS is billed on usage in per million request increments.
- Backup Retention:** Backup retention is billed based on additional storage used for retaining backups.
- Bandwidth:** For outbound data transfer across services in different regions will incur additional charges. Any inbound data transfer is free.

Estimated total: INR 1705.91/month. Prices reflect estimates only. [View Azure pricing calculator](#).

Basics Configuration:

Subscription	Azure for Students
Resource group	cc
Server name	cclab
Server admin login name	admin
Location	South India
Availability zone	No preference
High availability	Disabled
MySQL version	8.0
Workload type	Dev/Test
Compute + storage	Burstable, B1ms, 1 vCores, 2 GiB RAM, 20 GiB storage, Auto scale IOPS
Backup redundancy	Locally redundant

Tags: A note says: "If you need to modify the default settings, please click on [Advanced Create](#)".

Buttons at the bottom: **Create**, < Previous : Tags, Download a template for automation.

RESULT:

Thus a simple application to understand the concept of PAAS using Microsoft Azure is developed.

Exp No: 7

Date :

CLOUD SIMULATION **MODEL CLOUD ENVIRONMENT USING CLOUD SIM**

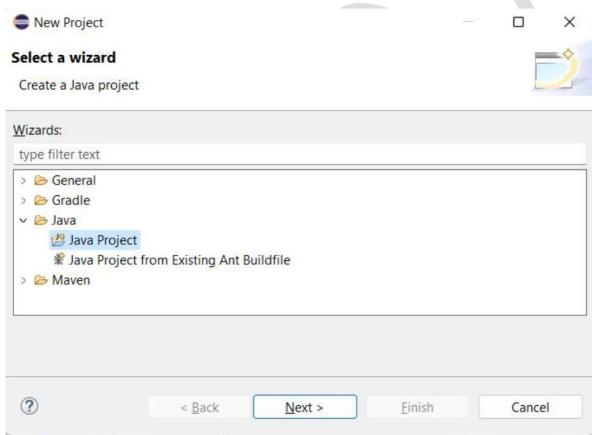
AIM:

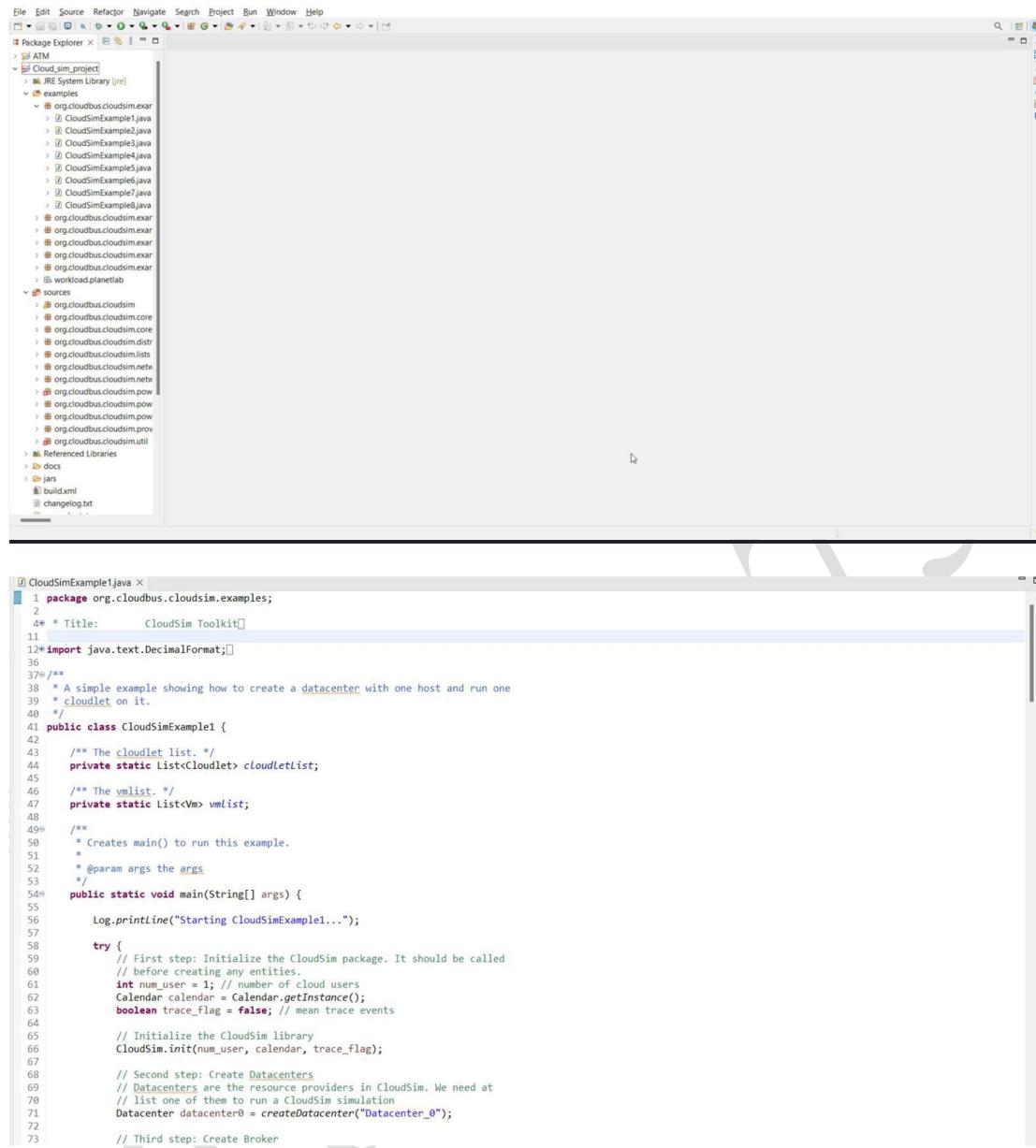
To model the cloud environment using cloud sim tools.

PROCEDURE:

1. Now within the Eclipse window navigate the menu: File -> New -> Project, to open the new project wizard.
2. Select the ‘Java Project’ from the window popup and click Next.
3. Unselect the ‘Use default location’ option and then click on ‘Browse’ to open the path where you have unzipped the Cloudsim project and finally click Next to set project settings.
4. Now select the example program from folder examples from the unzipped folder.
5. Run the sample program

OUTPUT:







```

CloudSimExample1.java X Problems Javadoc Declaration Console X
1 package org.cloudbus.cloudsim.examples;
2
3 * Title: CloudSim Toolkit
4
5 import java.text.DecimalFormat;
6
7 /**
8 * A simple example showing how to create a da
9 * cloudlet on it.
10 */
11 public class CloudSimExample1 {
12
13     /** The cloudlet list. */
14     private static List<Cloudlet> cloudletList;
15
16     /** The vmlist. */
17     private static List<Vm> vmlist;
18
19     /**
20      * Creates main() to run this example.
21      *
22      * @param args the args
23      */
24     public static void main(String[] args) {
25
26         Log.println("Starting CloudSimExample1...");
27
28         try {
29             // First step: Initialize the CloudSim package. It should be called
30             // before creating any entities.
31             int numUser = 1; // number of cloud users
32             Calendar calendar = Calendar.getInstance();
33             boolean trace_flag = false; // mean trace events
34
35             // Initialize the CloudSim library
36             CloudSim.init(numUser, calendar, trace_flag);
37
38             // Second step: Create Datacenters
39             // Datacenters are the resource providers in CloudSim. We need at
40             // least one of them to run a CloudSim simulation
41             Datacenter datacenter0 = createDatacenter("Datacenter_0");
42
43             // Third step: Create Broker

```

Simulation: No more future events
CloudInformationService: Notify all CloudSim entities for shutting down.
Datacenter_0 is shutting down...
Broker is shutting down...
Simulation completed.
Simulation completed.

===== OUTPUT =====

Cloudlet ID	STATUS	Data center ID	VM ID	Time	Start Time	Finish Time
0	SUCCESS	2	0	400	0.1	400.1
****Datacenter: Datacenter_0****						
User id	Debt	3	35.6			

CloudSimExample1 finished!

RESULT:

Thus, the cloud environment using cloud sim tools has been modelled.

CLOUD SIMULATION

IMPLEMENT ROUND ROBIN TASK SCHEDULING IN BOTH TIME SHARED AND SPACE SHARED CPU ASSIGNMENT

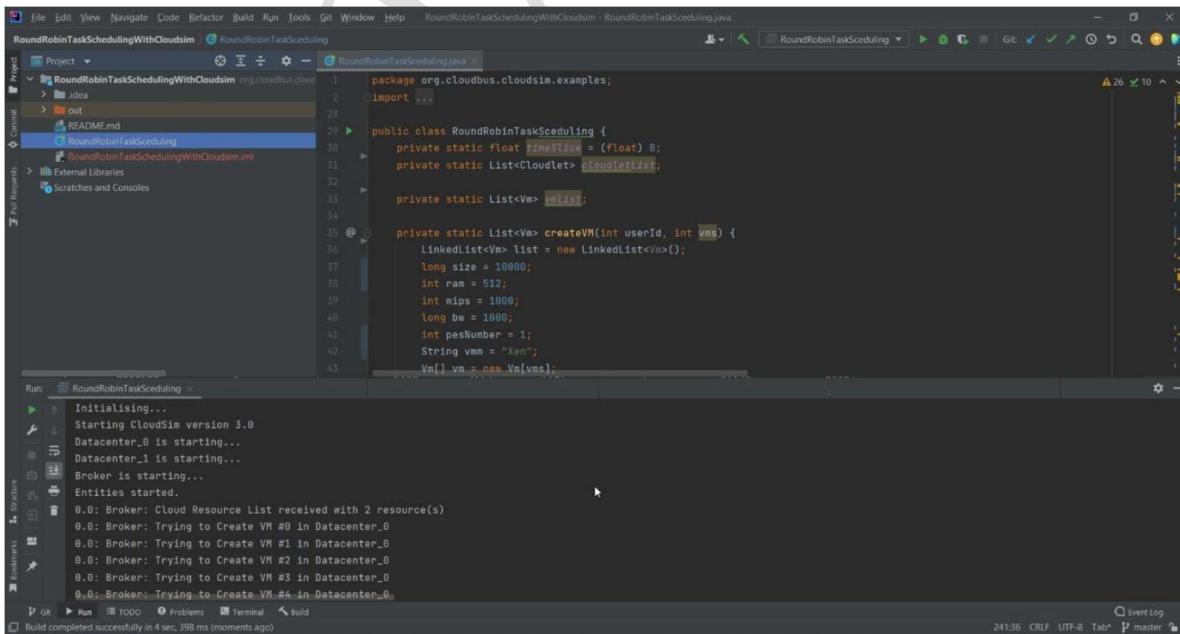
AIM:

Implement RoundRobin task scheduling in both TimeShared and SpaceShared CPU assignments.

PROCEDURE:

1. Create a new project by selecting java console line application template and JDK 18.
2. Open project settings from the file menu of the options window.
3. Navigate to project dependencies and select on add external jars and then click on 'Browse' to open the path where you have unzipped the Cloudsim Jars and click on apply.
4. Create a java file with the cloudsim code to implement the Round robin scheduling algorithm.
5. Run the application as a java file to see the output in the console below.

OUTPUT:



The screenshot shows an IDE interface with the following details:

- Project Structure:** The project is named "RoundRobinTaskSchedulingWithCloudsim". It contains a package named "org.cloudbus.cloudsim.examples" and a class named "RoundRobinTaskScheduling".
- Code Editor:** The "RoundRobinTaskScheduling.java" file is open, displaying Java code for implementing Round Robin scheduling. The code includes imports, class definition, and a static method "createVM" which creates VMs with specific configurations like memory size, RAM, and bandwidth.
- Terminal Output:** The "Run" tab shows the execution of the application. The output in the terminal pane includes messages such as "Initialising...", "Starting CloudSim version 3.0", and logs from the Broker entity indicating attempts to create VMs in Datacenter_0 and Datacenter_1.
- Status Bar:** The bottom status bar shows the build status: "Build completed successfully in 4 sec, 398 ms (moments ago)".

RESULT:

Thus Round Robin take scheduling is implemented using cloud simulator.

Exp No: 9

Date:

HADOOP

SET UP A SINGLE HADOOP CLUSTER AND SHOW THE PROCESS USING WEB UI

AIM:

To set-up one node Hadoop cluster.

PROCEDURE:

1. System Update
2. Install Java
3. Add a dedicated Hadoop user
4. Install SSH and setup SSH certificates
5. Check if SSH works
6. Install Hadoop
7. Modify Hadoop config files
8. Format Hadoop filesystem
9. Start Hadoop
10. Check Hadoop through web UI
11. Stop Hadoop

THEORY

Hadoop is an Apache open source framework written in java that allows distributed processing of large datasets across clusters of computers using simple programming models. A Hadoop frame-worked application works in an environment that provides distributed storage and computation across clusters of computers. Hadoop is designed to scale up from a single server to thousands of machines, each offering local computation and storage.

HADOOP ARCHITECTURE

Hadoop framework includes following four modules:

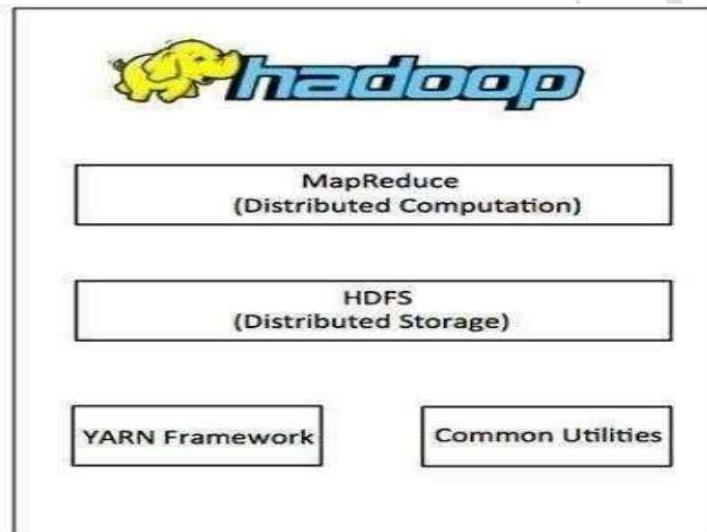
Hadoop Common: These are Java libraries and utilities required by other Hadoop modules. These libraries provide filesystem and OS level abstractions and contain the necessary Java files and scripts required to start Hadoop.

Hadoop YARN: This is a framework for job scheduling and cluster resource management.

Hadoop Distributed File System (HDFS): A distributed file system that provides high-throughput access to application data.

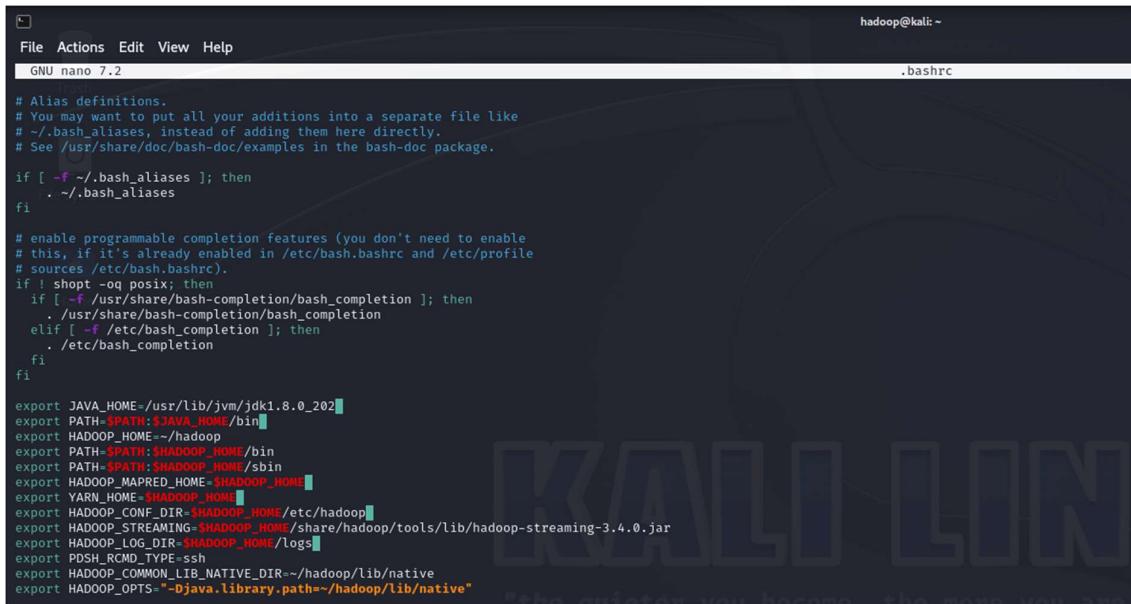
Hadoop MapReduce: This is a YARN-based system for parallel processing of large data sets.

We can use following diagram to depict these four components available in Hadoop framework.



PROCEDURE

\$ nano ~/.bashrc



```
hadoop@kali: ~
File Actions Edit View Help
GNU nano 7.2
.bashrc

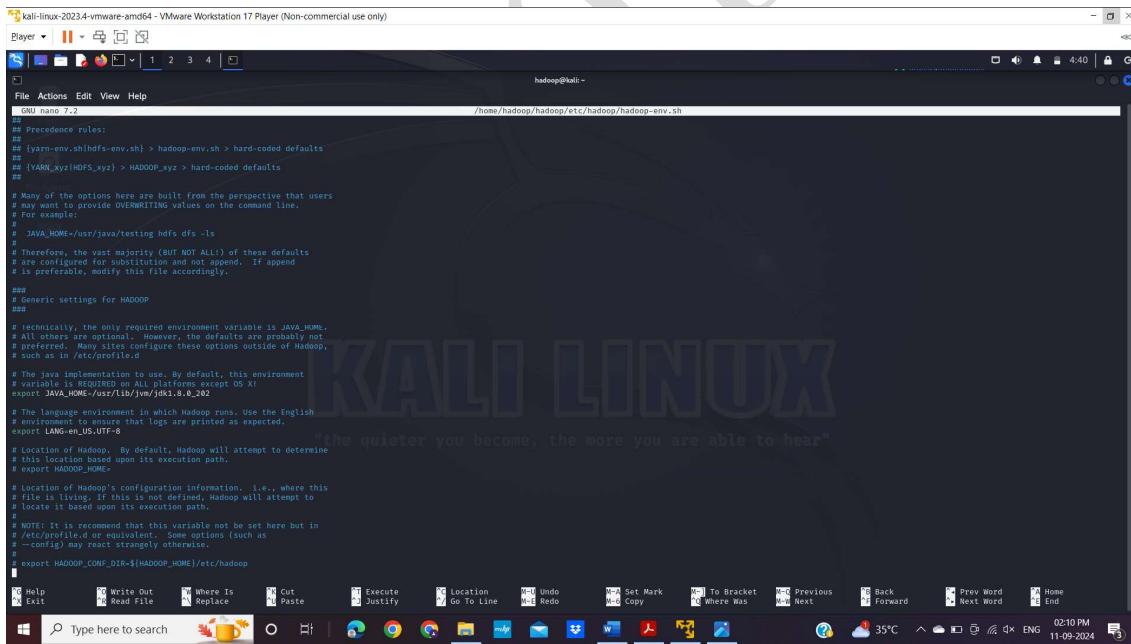
# Alias definitions.
# You may want to put all your additions into a separate file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.

if [ -f ~/.bash_aliases ]; then
  . ~/.bash_aliases
fi

# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc.
if ! shopt -q posix; then
  if [ -f /usr/share/bash-completion/bash_completion ]; then
    . /usr/share/bash-completion/bash_completion
  elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
  fi
fi

export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_202
export PATH=$JAVA_HOME/bin
export HADOOP_HOME=/hadoop
export PATH=$PATH:$HADOOP_HOME/bin
export PATH=$PATH:$HADOOP_HOME/sbin
export HADOOP_MAPRED_HOME=$HADOOP_HOME
export YARN_HOME=$HADOOP_HOME
export HADOOP_CONF_DIR=$HADOOP_HOME/etc/hadoop
export HADOOP_STREAMING=$HADOOP_HOME/share/hadoop/tools/lib/hadoop-streaming-3.4.0.jar
export HADOOP_LOG_DIR=$HADOOP_HOME/logs
export PDSH_RCMD_TYPE=ssh
export HADOOP_COMMON_LIB_NATIVE_DIR=/hadoop/lib/native
export HADOOP_OPTS="-Djava.library.path=~/.hadoop/lib/native"
```

\$ nano \$HADOOP_HOME/etc/hadoop/hadoop-env.sh



```
kali-linux-2023.4-vmware-amd64 - VMware Workstation 17 Player (Non-commercial use only)
File Actions Edit View Help
GNU nano 7.2
/home/hadoop/hadoop/etc/hadoop/hadoop-env.sh

## Precedence rules:
## (yarn-env.sh|hdfs-env.sh) > hadoop-env.sh > hard-coded defaults
## {YARN_XY|HDFS_XY} > HADOOP_XY > hard-coded defaults
## 

## Many of the options here are built from the perspective that users
## may want to provide OVERRIDING values on the command line,
## For example:
## 
## JAVA_HOME=/usr/java/testing/hdfs dfs -ls
## 
## Therefore, the vast majority (BUT NOT ALL!) of these defaults
## are configured for substitution and not append. If append
## is preferable, modify this file accordingly.

## Generic settings for HADOOP
## 
## Technically, the only required environment variable is JAVA_HOME.
## All others are optional. However, the defaults are probably not
## preferred. Many sites configure these options outside of Hadoop,
## such as in /etc/profile.d

## The Java implementation to use. By default, this environment
## variable is REQUIRED on ALL platforms except OS X!
## export JAVA_HOME=/usr/lib/jvm/jdk1.8.0_202
## 
## The language environment used by Hadoop runs. Use the English
## language environment so that logs are printed as expected.
## export LANG=en_US.UTF-8

## Location of Hadoop. By default, Hadoop will attempt to determine
## this location based upon its execution path.
## export HADOOP_HOME=

## Location of Hadoop's configuration information. i.e., where this
## file is living. If this is not defined, Hadoop will attempt to
## locate it based upon its execution path.
## 
## NOTE: It is recommended that this variable not be set here but in
## $HADOOP_HOME/conf or equivalent. Configuration options (such as
## -config) may react strangely otherwise.
## export HADOOP_CONF_DIR=${HADOOP_HOME}/etc/hadoop
```

\$nano \$HADOOP_HOME/etc/hadoop/core-site.xml



```
File Actions Edit View Help
GNU nano 7.2 /home/hadoop
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>
<!--
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you may not use this file except in compliance with the License.
You may obtain a copy of the License at
http://www.apache.org/licenses/LICENSE-2.0

Unless required by applicable law or agreed to in writing, software
distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the License for the specific language governing permissions and
limitations under the License. See accompanying LICENSE file.
--> Home
<!-- Put site-specific property overrides in this file. -->

<configuration>
<property>
<name>fs.defaultFS</name>
<value>hdfs://localhost:9000</value> </property>
<property>
<name>hadoop.proxyuser.dataflair.groups</name> <value>*</value>
</property>
<property>
<name>hadoop.proxyuser.dataflair.hosts</name> <value>*</value>
</property>
<property>
<name>hadoop.proxyuser.server.hosts</name> <value>*</value>
</property>
<property>
<name>hadoop.proxyuser.server.groups</name> <value>*</value>
</property>
</configuration>
```

\$nano \$HADOOP_HOME/etc/hadoop/hdfs-site.xml

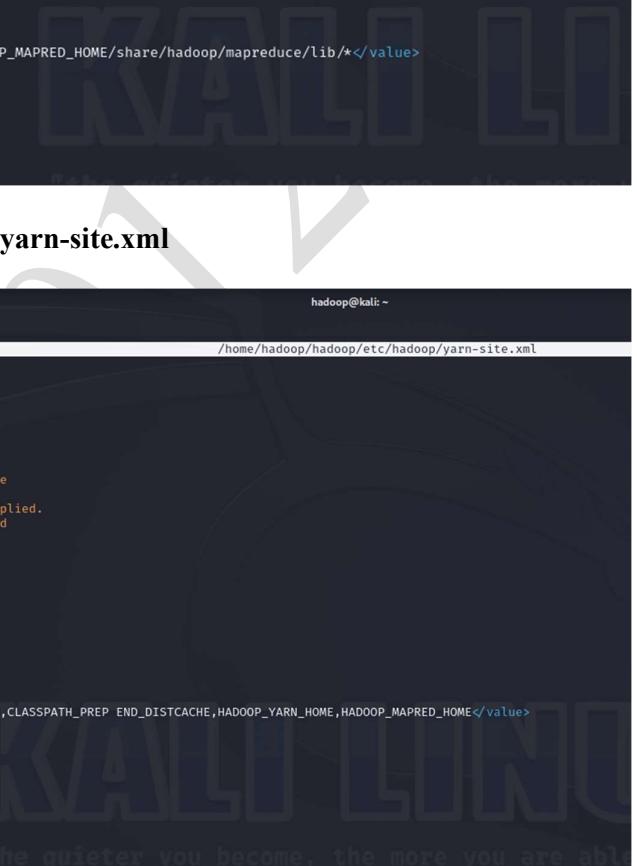


```
File Actions Edit View Help
hadoop@kali: ~
GNU nano 7.2 /home/hadoop/hadoop/etc/hadoop
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>
<!--
Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at
http://www.apache.org/licenses/LICENSE-2.0

Unless required by applicable law or agreed to in writing, software
distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the License for the specific language governing permissions and
limitations under the License. See accompanying LICENSE file.
--> Home
<!-- Put site-specific property overrides in this file. -->

<configuration>
<property>
<name>dfs.replication</name>
<value>1</value>
</property>
<property>
<name>dfs.name.dir</name>
<value>file:///home/hadoop/hadoopdata/hdfs/namenode</value>
</property>
<property>
<name>dfs.datanode.data.dir</name>
<value>file:///home/hadoop/hadoopdata/hdfs/datanode</value>
</property>
</configuration>
```

\$nano \$HADOOP_HOME/etc/hadoop/mapred-site.xml



```

hadoop@kali: ~
File Actions Edit View Help
GNU nano 7.2
/home/hadoop/hadoop/etc/hadoop/mapred-site.xml
<?xml version="1.0"?>
<xm...l-stylesheet type="text/xsl" href="configuration.xsl"?>
<!--
Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at
  File System
    http://www.apache.org/licenses/LICENSE-2.0

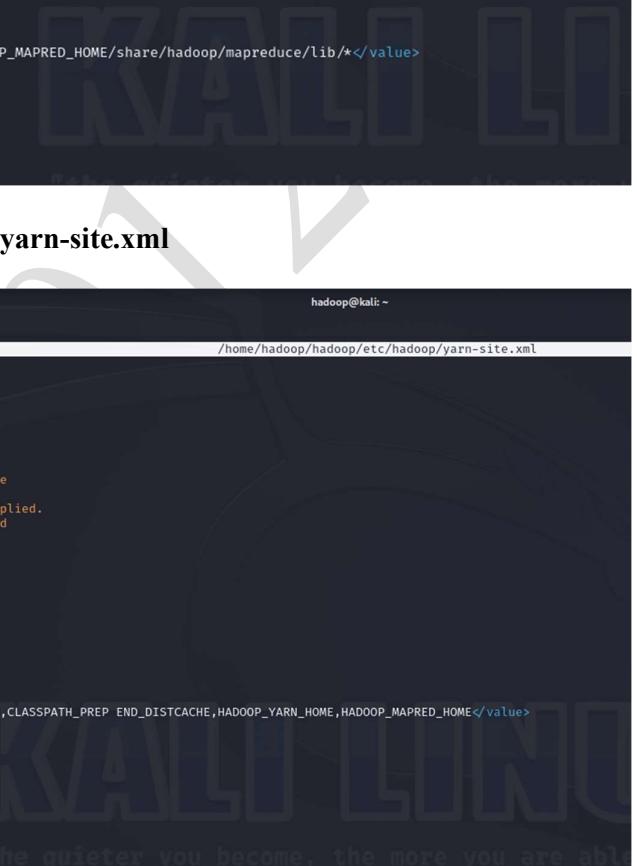
Unless required by applicable law or agreed to in writing, software
distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the License for the specific language governing permissions and
limitations under the License. See accompanying LICENSE file.
-->

<!-- Put site-specific property overrides in this file. -->

<configuration>
<property>
<name>mapreduce.framework.name</name> <value>yarn</value>
</property>
<property>
<name>mapreduce.application.classpath</name>
<value>$HADOOP_MAPRED_HOME/share/hadoop/mapreduce/*:$HADOOP_MAPRED_HOME/share/hadoop/mapreduce/lib/*</value>
</property>
</configuration>

```

\$nano \$HADOOP_HOME/etc/hadoop/yarn-site.xml



```

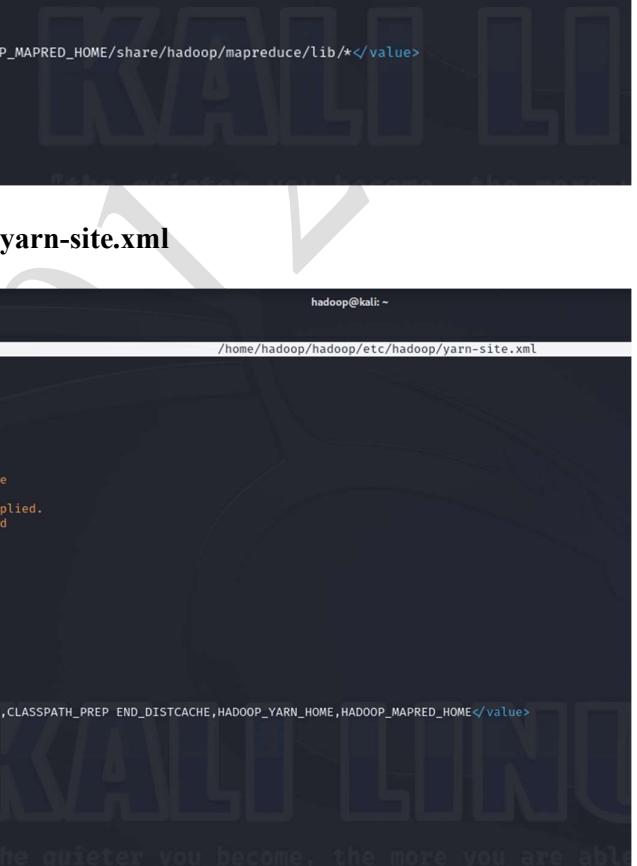
hadoop@kali: ~
File Actions Edit View Help
GNU nano 7.2
/home/hadoop/hadoop/etc/hadoop/yarn-site.xml
<?xml version="1.0"?>
<!--
Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at
  File System
    http://www.apache.org/licenses/LICENSE-2.0

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distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the License for the specific language governing permissions and
limitations under the License. See accompanying LICENSE file.
-->

<configuration>
<!-- Site specific YARN configuration properties -->
<property>
<name>yarn.nodemanager.aux-services</name>
<value>mapreduce_shuffle</value>
</property>
<property>
<name>yarn.nodemanager.env-whitelist</name>
<value>JAVA_HOME,HADOOP_COMMON_HOME,HADOOP_HDFS_HOME,HADOOP_CONF_DIR,CLASSPATH_PREP_END_DISTCACHE,HADOOP_YARN_HOME,HADOOP_MAPRED_HOME</value>
</property>
</configuration>

```

\$ start-all.sh



```

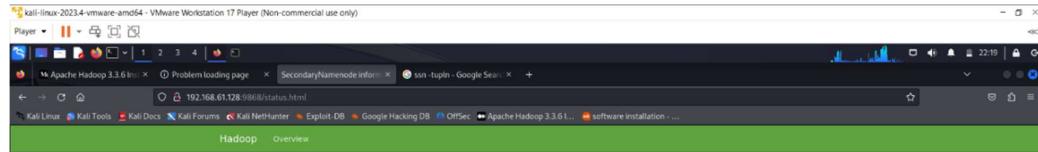
hadoop@kali: ~
File Actions Edit View Help
(hadoop@kali) [~]
└─$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [kali]
Picked up JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
2024-09-11 04:59:16,429 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Starting resourcemanager
Starting nodemanagers

```

```
$ jps
```

```
[hadoop@kali) ~]$ jps
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
14436 NodeManager
16772 Jps
13830 SecondaryNameNode
14311 ResourceManager
13597 DataNode
13471 NameNode
```

localhost:9870



Overview

Version	3.3.6
Compiled	2023-06-18T08:22Z by ubuntu from (HEAD detached at release-3.3.6-RC1)
NameNode Address	localhost:9000
Started	Wed Aug 14 21:51:32 -0400 2024
Last Checkpoint	Never
Checkpoint Period	3600 seconds
Checkpoint Transactions	1000000

Checkpoint Image URI

- file:///tmp/hadoop-kali/dfs/namesecondary

Checkpoint Editlog URI

- file:///tmp/hadoop-kali/dfs/namesecondary

Hadoop, 2023.



localhost:8088

The screenshot shows a browser window with the URL `192.168.61.128:8088/cluster`. The page title is "All Applications". It contains several tables and sections:

- Cluster Metrics**: Shows 0 Apps Submitted, 0 Apps Pending, 0 Apps Running, 0 Apps Completed, 0 Containers Running, <memory:0 B, vCores:0>, <memory:8 GB, vCores:8>.
- Scheduler Metrics**: Shows Scheduler Type, Scheduling Resource Type, Minimum Allocation, Maximum Allocation.
- Tools**: Options for About, Node Labels, Capacity Scheduler, and YARN.

RESULT:

Thus, Hadoop has been successfully installed.

Exp No: 10

Date:

HADOOP

DEMONSTRATE THE MAP REDUCE PROGRAMMING MODEL BY COUNTING THE NUMBER OF WORDS IN A FILE

AIM:

To demonstrate the MAP REDUCE programming model for counting the number of words in a file.

PROCEDURE

Step 1 - Open Terminal

```
$ su hduser
```

Password:

Step 2 - Start dfs and mapreduce services

```
$ cd /usr/local/hadoop/hadoop-2.7.2/sbin
```

```
$ start-dfs.sh
```

```
$ start-yarn.sh
```

```
$ jps
```

Step 3 - Check Hadoop through web UI

// Go to browser type <http://localhost:8088> – All Applications Hadoop Cluster

// Go to browser type <http://localhost:50070> – Hadoop Namenode

Step 4 – Open New Terminal

```
$ cd Desktop/
```

```
$ mkdir inputdata
```

```
$ cd inputdata/  
$ echo "Hai, Hello, How are you? How is your health?" >> hello.txt  
$ cat>> hello.txt
```

Step 5 – Go back to old Terminal

```
$ hadoop fs –copyFromLocal /home/hduser/Desktop/inputdata/hello.txt  
/folder/hduser // Check in hello.txt in Namenode using Web UI
```

Step 6 – Download and open eclipse by creating workspace

Create a new java project.

Step 7 – Add jar to the project

You need to remove dependencies by adding jar files in the hadoop source folder. Now Click on Project tab and go to Properties.Under Libraries tab, click Add External JARs and select all the jars in the folder (click on 1st jar, and Press Shift and Click on last jar to select all jars in between and click ok)

/usr/local/hadoop/hadoop-2.7.2/share/hadoop/commonand

/usr/local/hadoop/hadoop-2.7.2/share/hadoop/mapreduce folders.

Step -8 – WordCount Program

Create 3 java files named

- WordCount.java
- WordCountMapper.java
- WordCountReducer.java

WordCount.java

```
import org.apache.hadoop.conf.Configured;  
import org.apache.hadoop.fs.Path;  
import org.apache.hadoop.io.IntWritable;  
import org.apache.hadoop.mapred.FileInputFormat;
```

```
import org.apache.hadoop.mapred.FileOutputFormat;  
  
import org.apache.hadoop.mapred.JobClient; import  
org.apache.hadoop.mapred.JobConf;  
  
import org.apache.hadoop.util.Tool;  
  
import org.apache.hadoop.util.ToolRunner;  
  
import org.apache.hadoop.io.Text;  
  
public class WordCount extends Configured implements Tool {  
  
    @Override  
    public int run(String[] arg0) throws Exception {  
        // TODO Auto-generated method  
        stub if(arg0.length<2)  
        {  
            System.out.println("check the command line arguments");  
        }  
        JobConf conf=new JobConf(WordCount.class);  
        FileInputFormat.setInputPaths(conf, new Path(arg0[0]));  
        FileOutputFormat.setOutputPath(conf, new  
Path(arg0[1]));  
        conf.setMapperClass(WordMapper.class);  
        conf.setReducerClass(WordReducer.class);  
  
        conf.setOutputKeyClass(Text.class);  
        conf.setOutputValueClass(IntWritable.class);  
        conf.setOutputKeyClass(Text.class);
```

```

        conf.setOutputValueClass(IntWritable.class);

        JobClient.runJob(conf);

    }

    return 0;
}

public static void main(String args[]) throws Exception
{
    int exitcode=ToolRunner.run(new WordCount(),
        args); System.exit(exitcode);

}
}

```

WordCountMapper.java

```

import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.mapred.MapReduceBase;
import org.apache.hadoop.mapred.OutputCollector;
import org.apache.hadoop.mapred.Reporter;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapred.Mapper;

public class WordCountMapper extends MapReduceBase implements

```

```
Mapper<LongWritable,Text,Text,IntWritable>

{
    @Override

    public void map(LongWritable arg0, Text arg1, OutputCollector<Text,
IntWritable> arg2, Reporter arg3)

        throws IOException {

        // TODO Auto-generated method stub


        String s=arg1.toString();

        for(String word:s.split(" "))

        {

            arg2.collect(new Text(word),new IntWritable(1));

        }

    }

}
```

WordCountReducer.java

```
import java.io.IOException;

import java.util.Iterator;

import org.apache.hadoop.io.IntWritable;

import org.apache.hadoop.mapred.JobConf;

import org.apache.hadoop.mapred.OutputCollector;

import org.apache.hadoop.mapred.Reducer;

import org.apache.hadoop.mapred.Reporter;

import org.apache.hadoop.io.Text;
```

```

public class WordCountReducer implements
    Reducer<Text,IntWritable,Text,IntWritable> { @Override

    public void configure(JobConf arg0) {

        // TODO Auto-generated method stub

    }

    @Override

    public void close() throws IOException {

        // TODO Auto-generated method stub

    }

    @Override
    public void reduce(Text arg0, Iterator<IntWritable> arg1,
                      OutputCollector<Text, IntWritable> arg2, Reporter arg3)

        throws IOException {

        // TODO Auto-generated method

        stub int count=0;

        while(arg1.hasNext())

        {

            IntWritable i=arg1.next();

            count+=i.get();

        }

        arg2.collect(arg0,new IntWritable(count));

    }

}

```

Step 9 - Create JAR file

Now Click on the Run tab and click Run-Configurations. Click on New Configuration button on the left top side and Apply after filling the following properties.

Step 10 - Export JAR file

Now click on File tab and select Export. under Java, select Runnable Jar.

In Launch Config – select the config fie you created in Step 9 (WordCountConfig).

- Select an export destination (let's say desktop.)
- Under Library handling, select Extract Required Libraries into generated JAR and click Finish.
- Right-Click the jar file, go to Properties and under Permissions tab, Check Allow executing file as a program. and give Read and Write access to all the users

Step 11 – Go back to old Terminal for Execution of WordCount Program \$hadoop jar wordcount.jar/usr/local/hadoop/input/usr/local/hadoop/output

Step 12 – To view results in old Terminal

```
$hdfs dfs -cat /usr/local/hadoop/output/part-r-00000
```

Step 13 - To Remove folders created using hdfs

```
$ hdfs dfs -rm -R /usr/local/hadoop/output
```

OUTPUT:

```
harithaah@fedora:~/CC/exp2$ ls
Mapper1.java Reducer1.java Runner1.java s.txt
harithaah@fedora:~/CC/exp2$ hdfs dfs -ls /
Found 7 items
drwxr-xr-x  - harithaah supergroup          0 2024-10-23 19:57 /cc
drwxr-xr-x  - harithaah supergroup          0 2024-10-10 20:38 /exp1
drwxr-xr-x  - harithaah supergroup          0 2024-10-10 20:47 /exp2
drwxr-xr-x  - harithaah supergroup          0 2024-10-10 21:02 /exp4
drwxr-xr-x  - harithaah supergroup          0 2024-10-10 21:13 /exp6
drwxr-xr-x  - harithaah supergroup          0 2024-10-10 21:13 /home
drwxr-xr-x  - harithaah supergroup          0 2024-10-10 21:08 /tmp
harithaah@fedora:~/CC/exp2$ hdfs dfs -mkdir /cc
harithaah@fedora:~/CC/exp2$ hdfs dfs -put s.txt /CC
```

```

harithaa@fedora:~/CC/exp$ javac -classpath SHADOOP_HOME/share/hadoop/common/*:$SHADOOP_HOME/share/hadoop/mapreduce/*:. -d . Mapper1.java Reducer1.java
harithaa@fedora:~/CC/exp$ jar -cvf wordcount.jar -C .
added manifest
adding: Mapper1.java(in = 1036) (out= 369)(deflated 64%)
adding: Reducer1.java(in = 871) (out= 368)(deflated 57%)
adding: Runner1.java(in = 1433) (out= 487)(deflated 66%)
adding: s.txt(in = 158) (out= 114)(deflated 27%)
adding: Mapper1.class(in = 1858) (out= 759)(deflated 59%)
adding: Reducer1.class(in = 1527) (out= 604)(deflated 66%)
adding: Runner1.class(in = 1432) (out= 789)(deflated 50%)
harithaa@fedora:~/CC/exp$ hadoop jar wordcount.jar Runner1 /CC/s.txt /CC/output
2024-10-26 14:00:08,752 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2024-10-26 14:00:09,469 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2024-10-26 14:00:11,224 WARN mapreduce.JobResourceUploader: Hadoop command-line option parsing not performed. Implement the Tool interface and execute your application with ToolRunner to remedy this.
2024-10-26 14:00:11,493 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/harithaa/.staging/job_1729930878688_0001
2024-10-26 14:00:13,797 INFO mapred.FileInputFormat: Total input files to process : 1
2024-10-26 14:00:15,965 INFO mapreduce.JobSubmitter: number of splits:2
2024-10-26 14:00:18,774 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1729930878688_0001
2024-10-26 14:00:18,875 INFO mapreduce.JobSubmitter: Executing with tokens: []
2024-10-26 14:00:19,495 INFO conf.Configuration: resource-types.xml not found
2024-10-26 14:00:19,495 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2024-10-26 14:00:21,066 INFO impl.YarnClientImpl: Submitted application application_1729930878688_0001
2024-10-26 14:00:21,385 INFO mapreduce.Job: The url to track the job: http://fedora:8088/proxy/application_1729930878688_0001/
2024-10-26 14:00:21,396 INFO mapreduce.Job: Running job: job_1729930878688_0001
2024-10-26 14:00:59,125 INFO mapreduce.Job: Job job_1729930878688_0001 running in uber mode : false
2024-10-26 14:00:59,138 INFO mapreduce.Job: map 0% reduce 0%
2024-10-26 14:01:26,297 INFO mapreduce.Job: map 100% reduce 0%
2024-10-26 14:01:46,586 INFO mapreduce.Job: map 100% reduce 100%
2024-10-26 14:01:48,821 INFO mapreduce.Job: Job job_1729930878688_0001 completed successfully
2024-10-26 14:01:49,756 INFO mapreduce.Job: Counters: 54

```

```

harithaa@fedora:~/CC/exp2$ hdfs dfs -cat /CC/output/part-00000
B      1
CSE    1
From   1
Hello  1
Hey    1
We    1
a     1
an    1
are   1
awesome 1
be    1
ever   1
found  1
get    1
girl   2
happy  1
have   2
her    2
here   1
i     3
if    1
is    1
like   1
never  1

```

RESULT

Thus a word count program in java is implemented using Map Reduce.

Exp No: 11

Date:

HADOOP

IMPLEMENT THE MAX TEMPERATURE MAPREDUCE PROGRAM TO IDENTIFY THE YEAR WISE MAXIMUM TEMPERATURE FROM SENSOR DATA

AIM

To implement the Max temperature MapReduce program to identify the year-wise maximum temperature from the sensor data.

Description

Sensors sense weather data in big text format containing station ID, year, date, time, temperature, quality etc. from each sensor and store it in a single line. Suppose thousands of data sensors are there, then we have thousands of records with no particular order. We require only a year and maximum temperature of particular quality in that year.

For example:

Input string from sensor:

002902907099999 1902010720004+64333+023450

FM-12+

000599999V0202501N027819999999N0000001N9-*00331*+

99999098351ADDGF10299199999999999999999999999

Here: 1902 is year

0033 is temperature

1 is measurement quality (Range between 0 or 1 or 4 or 5 or 9)

Here each mapper takes the input **key** as "byte offset of line" and **value** as "one weather sensor read i.e one line". and parse each line and produce an intermediate **key** "year" and **intermediate value** as "temperature of certain measurement qualities" for that year.

The combiner will form set values of temperature. Year and set of values of temperatures is given as input \langle key, value \rangle to reducer and Reducer will produce year and maximum temperature for that year from the set of temperature values.

PROGRAM

* /

```

import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;
import java.io.IOException;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.LongWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;

//Mapper class

class MaxTemperatureMapper
extends Mapper<LongWritable, Text, Text, IntWritable> { private static final int MISSING
= 9999;

@Override
public void map(LongWritable key, Text value, Context context) throws IOException,
InterruptedException {

String line = value.toString(); String year = line.substring(15, 19); int airTemperature;
if (line.charAt(87) == '+') { // parseInt doesn't like leading plus signs airTemperature =
Integer.parseInt(line.substring(88, 92));
} else {
airTemperature = Integer.parseInt(line.substring(87, 92));
}
String quality = line.substring(92, 93);
if (airTemperature != MISSING && quality.matches("[01459]")) { context.write(new
Text(year), new IntWritable(airTemperature));
}
}
}

//Reducer class
class MaxTemperatureReducer
extends Reducer<Text, IntWritable, Text, IntWritable> {

@Override
public void reduce(Text key, Iterable<IntWritable> values, Context context)
throws IOException, InterruptedException {

```

```

int maxValue = Integer.MIN_VALUE; for (IntWritable value : values) {
maxValue = Math.max(maxValue, value.get());
}
context.write(key, new IntWritable(maxValue));
}
}
//Driver Class

public class MaxTemperature {

public static void main(String[] args) throws Exception { if (args.length != 2) {
System.err.println("Usage: MaxTemperature <input path> <output path>"); System.exit(-1);
}

Job job = Job.getInstance(new Configuration()); job.setJarByClass(MaxTemperature.class);
job.setJobName("Max temperature");

FileInputFormat.addInputPath(job, new Path(args[0])); FileOutputFormat.setOutputPath(job,
new Path(args[1]));

job.setMapperClass(MaxTemperatureMapper.class);
job.setReducerClass(MaxTemperatureReducer.class);

job.setOutputKeyClass(Text.class); job.setOutputValueClass(IntWritable.class);

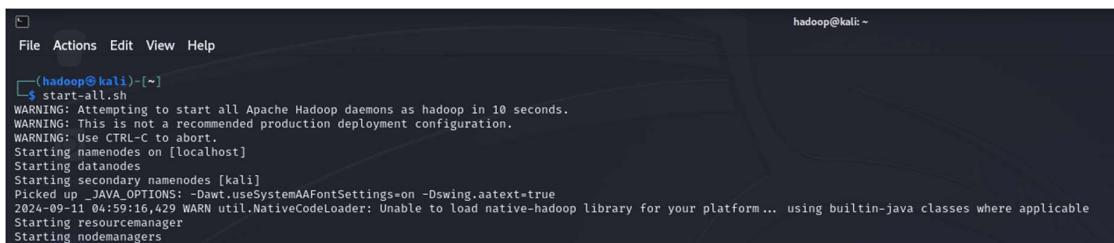
job.submit();
}
}

```

OUTPUT:

Input for String :

002902907099999 1902010720004+64333+023450FM-12+
 000599999V0202501N027819999999N0000001N9- 00331+
 99999098351ADDGF102991999999999999999'



```

File Actions Edit View Help
(hadoop@kali)-[~]
$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [kali]
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
2024-09-11 04:59:16,429 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Starting resourcemanager
Starting nodemanagers

```

```
(hadoop@kali)-[~]
└─$ jps
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
14436 NodeManager
16772 Jps
13830 SecondaryNameNode
14311 ResourceManager
13597 DataNode
13471 NameNode
```

```
(hadoop@kali)-[~/hadoop/bin]
└─$ ./hdfs dfs -ls /exp3
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
2024-09-21 00:11:13,818 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform ...
Found 3 items
-rw-r--r-- 1 hadoop supergroup 79205 2024-08-29 10:50 /exp3/dataset.txt
drwxr-xr-x - hadoop supergroup 0 2024-08-29 10:52 /exp3/new_output
drwxr-xr-x - hadoop supergroup 0 2024-09-13 01:00 /exp3/output
```

```
(hadoop@kali)-[~/hadoop/bin]
└─$ hadoop jar $HADOOP_STREAMING -input /exp3/dataset.txt -output /exp3/output -mapper ~/DA-Lab/exp3/mapper.py -reducer ~/DA-Lab/exp3/reducer.py
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
2024-09-21 00:13:19,993 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
packageJobJar: [/tmp/hadoop-unjar3830594044787382099/] []
/tmp/streamjob2158010624070613243.jar tmpDir=null
2024-09-21 00:13:20,918 INFO client.DefaultNoharmFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2024-09-21 00:13:21,223 INFO client.DefaultNoharmFailoverProxyProvider: Connecting to ResourceManager at /0.0.0.0:8032
2024-09-21 00:13:27,216 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/hadoop/.staging/job_1726891437845_0001
2024-09-21 00:13:28,262 INFO mapred.FileInputFormat: Total input files to process : 1
2024-09-21 00:13:28,365 INFO mapreduce.JobSubmitter: number of splits:2
2024-09-21 00:13:28,370 INFO mapreduce.JobSubmitter: Submitting application for job: job_1726891437845_0001
2024-09-21 00:13:28,613 INFO mapreduce.JobSubmitter: Number of的心子任务: []
2024-09-21 00:13:29,230 INFO conf.Configuration: resource-types.xml not found
2024-09-21 00:13:29,230 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2024-09-21 00:13:29,895 INFO impl.YarnClientImpl: Submitted application application_1726891437845_0001
2024-09-21 00:13:29,993 INFO mapreduce.Job: The url to track the job: http://kali:8088/proxy/application_1726891437845_0001/
2024-09-21 00:13:29,998 INFO mapreduce.Job: Running job: job_1726891437845_0001
2024-09-21 00:13:43,554 INFO mapreduce.Job: Job job_1726891437845_0001 running in uber mode : false
2024-09-21 00:13:43,560 INFO mapreduce.Job: map 0% reduce 0%
2024-09-21 00:13:43,918 INFO mapreduce.Job: map 100% reduce 0%
2024-09-21 00:14:00,992 INFO mapreduce.Job: map 100% reduce 100%
2024-09-21 00:14:01,012 INFO mapreduce.Job: Job job_1726891437845_0001 completed successfully
2024-09-21 00:14:01,189 INFO mapreduce.Job: Counters: 54
  File System Counters
    FILE: Number of bytes read=102094
    FILE: Number of bytes written=1138411
    FILE: Number of read operations=0
    FILE: Number of large read operations=0
    FILE: Number of write operations=0
    HDFS: Number of bytes read=83481
    HDFS: Number of bytes written=96
    HDFS: Number of read operations=11
    HDFS: Number of large read operations=0
    HDFS: Number of write operations=2
    HDFS: Number of bytes read erasure-coded=0
  Job Counters
    Launched map tasks=2
    Launched reduce tasks=1
    Data-local map tasks=2
    Total time spent by all maps in occupied slots (ms)=14691
    Total time spent by all reduces in occupied slots (ms)=4696
    Total time spent by all map tasks (ms)=14691
    Total time spent by all reduce tasks (ms)=4696
    Total vcore-milliseconds taken by all map tasks=14691
    Total vcore-milliseconds taken by all reduce tasks=4696
    Total megabyte-milliseconds taken by all map tasks=15043584
    Total megabyte-milliseconds taken by all reduce tasks=4808704
  Map-Reduce Framework
    Map input records=365
    Map output records=10220
    Map output bytes=81648
    Map output materialized bytes=102100
    Input split bytes=180
```

```
(hadoop@kali)-[~/hadoop/bin]
└─$ ./hdfs dfs -cat /exp3/output/*
Picked up _JAVA_OPTIONS: -Dawt.useSystemAAFontSettings=on -Dswing.aatext=true
2024-09-21 00:15:38,966 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform...
01      26.5
02      26.6
03      29.1
04      30.8
05      31.1
06      33.6
07      38.5
08      40.2
09      36.5
10      36.9
11      27.6
12      25.9
```

RESULT

Thus a java program has been implemented to identify the year-wise maximum temperature from the sensor data.

Sample Questions

BASIC UNDERSTANDING: Exp 1

1. What is virtualization?

Ans. Virtualization is an abstraction layer that decouples physical hardware from operating system to deliver greater IT resource utilization and flexibility.

2. What is the Difference between Full Virtualization and Para Virtualization?

Ans. Full virtualization & Para virtualization both comes under the Hardware virtualization. Some of the differences between them are listed below:

Full Virtualization: In full virtualization guest VMs (Virtual Machines) are not aware that they are in virtualized environment there-fore the guest os issues command to what it thinks as actual hardware but actually are just simulated devices created by the hosts.

Para Virtualization : In para virtualization the guest vm is aware that it is in a virtualized environment . If guest vm requires resources , it issues commands to host operating system instead of directly communicating with simulated hardware.

3. What is Hyper-vvisor ?

A **hypervisor** or virtual machine monitor (VMM) is computer software, firmware or hardware that creates and runs virtual machines. A computer on which a **hypervisor** runs one or more virtual machines is called a host machine, and each virtual machine is called a guest machine.

4. What are the difference between Type 1 and Type 2 Hypervisor ?

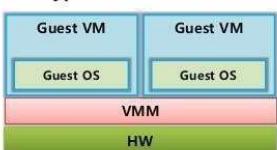
Ans. Type 1: When the Hypervisor is installed on bare metal / Physical hardware it is known as Type 1 Hypervisor . Examples are VM ware ESXi, Oracle VM, Microsoft Hyper V.

Type 2: When the Hypervisor is installed on top of an operating system it is known as Type 2 Hypervisor . Examples are Microsoft Virtual Server, VM Ware Server and workstation.

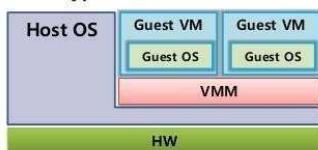
Type-1 vs. Type-2

- Depending on what sits right on HW

Type-1: VMM on HW



Type-2: Host OS on HW



- Xen, VMware ESX server, Hyper-V
- Mostly for server, but not limited
- VMM by default
- OS-independent VMM

- KVM, VMware Workstation, VirtualBox
- Mostly for client devices, but not limited
- VMM on demand
- OS-dependent VMM

BASIC UNDERSTANDING: Exp 2

1. What is a virtual block?

A virtual block device is an interface with applications that appears to the applications as a memory device, such as a standard block device.

2. What is a virtual disk?

Virtual disks are stored as files on the host computer or on a network file server. It does not matter whether the physical disk that holds the files is IDE or SCSI.

IDE (Integrated Drive Electronics) SCSI(Small Computer System Interface) SATA(Serial Advanced Technology Attachment)

3. What is a VM clone?

A clone is a copy of an existing virtual machine.

4. What is a Snapshot and a Template?

A snapshot is a copy of the virtual machine's disk file at a given point in time.

Snapshots provide a change log for the virtual disk and are used to restore a VM to a particular point in time when a failure or system error occurs.

A **template** is a master copy of a virtual machine that can be used to create many clones.