MEENAKSHI COLLEGE OF ENGINEERING

No 12, Vembuli Amman Koil Street, West K.K. Nagar,
Chennai – 600 078

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CCS372 VIRTUALIZATION LABORATORY

VISION STATEMENT

To become a centre of excellence in computer science with strong research and teaching environment that adapts swiftly to the real world challenges of the current era.

MISSION STATEMENT

- To provide quality education and generate new knowledge by engaging in research and by offering undergraduate, postgraduate programmes leading to professionals in diversified domain of industries, government and academia.
- To promote teaching and learning process resulting in the integration of research results and innovations by applying new technologies that leads to useful product.
- To provide ethical and value based global education by promoting activities addressing the societal needs.
- To provide placement opportunities and to motivate for higher studies.

COURSE OBJECTIVES:

- To Learn the basics and types of Virtualization
- To understand the Hypervisors and its types
- To Explore the Virtualization Solutions
- To Experiment the virtualization platforms

UNIVERSITY SYLLABUS:

LIST OF EXPERIMENTS:

1.Create type 2 virtualization in VMWARE or any equivalent Open Source Tool. Allocate memory and storage space as per requirement. Install Guest OS on that VMWARE.

2. a.Shrink and extend virtual disk

b. Create, Manage, Configure and schedule snapshots

c. Create Spanned, Mirrored and Striped volume

d. Create RAID 5 volume

3. a.Desktop Virtualization using VNC

b.Desktop Virtualization using Chrome Remote Desktop

4.Create type 2 virtualization on ESXI 6.5 server

5.Create a VLAN in CISCO packet tracer 6.Install KVM in Linux

7.Create Nested Virtual Machine(VM under another VM)

COURSE OUTCOMES:

On completion of this course, the students will be able to

CO1: Analyse the virtualization concepts and Hypervisor

CO2: Apply the Virtualization for real-world applications

CO3: Install & Configure the different VM platforms

CO4: Experiment with the VM with various software

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8. Enabling and Using Hyper-V in Windows

9. Creating and Configuring a Virtual Switch in Virtual Box

Ex.No: 1 **Date:**

Creating Type 2 Virtualization using VMware Workstation.

Aim: To create Type 2 virtualization using VMware Workstation, allocate memory andstorage space as per requirements, and install a Guest OS on the VMware.

Materials Needed:

- A host computer with VMware Workstation installed
- ISO image of the Guest OS you want to install
- Adequate system memory and storage space

Procedure:

1. Install VMware Workstation on your host computer. If not installed, download it fromthe official VMware website and follow the installation instructions.
2. Launch VMware Workstation from your system's applications or the Start menu.
3. In the VMware Workstation main interface, go to "File" and select "New Virtual Machine."
4. Choose the "Typical (recommended)" option and click "Next."
5. Select the Guest OS you want to install in the virtual machine, along with the appropriate version (e.g., Windows, Linux). Click "Next."
6. Name your virtual machine and specify the location where you want to store thevirtual machine files. Click "Next."
7. Determine the amount of storage space you want to allocate for the virtual machine.You can either choose the default or customize it. Select "Store virtual disk as a single file" for simplicity and click "Next."
8. Review your selections in the summary window and click "Finish."
9. Adjust your virtual machine's settings by right-clicking on the virtual machine in the VMware Workstation interface and selecting "Settings." Allocate memory, adjust the number of processors, and configure other hardware settings as needed. Click "OK"to save the settings.
10. In the VMware Workstation interface, select your virtual machine and click "Power onthis virtual machine."
11. Mount the ISO image of your chosen Guest OS to the virtual machine and follow the installation instructions for your OS.
12. Complete the installation of your Guest OS, including setting up user accounts andsystem preferences.
13. You can now manage your virtual machine within VMware Workstation, including starting, stopping, and configuring it as needed.

Ex.No: 2a **Date:**

Managing VMware Virtual Disks and Snapshots.

a. Shrinking and Extending VMware Virtual Disk.

Aim:

To learn how to shrink and extend a virtual disk in VMware.

Procedure:

- Launch VMware Workstation and open the virtual machine for which you want toshrink or extend the virtual disk.
- Go to the "VM" menu and select "Settings."
- In the Virtual Machine Settings window, select the virtual hard disk you want to workwith. It's listed under the "Hardware" tab.

1. **Shrinking a Virtual Disk:**

    - To shrink the virtual disk, click the "Shrink" button. VMware will analyze thedisk to determine how much space can be reclaimed.
    - Follow the prompts to confirm the shrinking process. The virtual disk will be resized to its minimum required size based on the data stored within.

2. **Extending a Virtual Disk:**

    - To extend the virtual disk, click the "Expand" button.
    - Enter the new size for the virtual disk. You can choose to allocate unusedspace or specify a custom size.
    - Follow the prompts to complete the disk extension process. The virtual diskwill be resized with the additional space.

Ex.No: 2b **Date:**

Creating, Managing, Configuring, and Scheduling Snapshots in VMware.

Aim:

To learn how to create, manage, configure, and schedule snapshots in VMware.

Procedure:

- Launch VMware Workstation and open the virtual machine for which you want tocreate snapshots.
- In the VMware Workstation interface, go to "VM" and select "Snapshot."
- Click "Take Snapshot." You can provide a name and description for the snapshot.
- The snapshot will be created, capturing the current state of the virtual machine.

1. Managing and Configuring Snapshots:

- To manage snapshots, go to "Snapshot Manager" in the "Snapshot" menu. Here, you can see all existing snapshots and perform actions like reverting toa snapshot or deleting them.
- Configure snapshot settings by right-clicking on a snapshot and choosing "Settings." You can specify options like memory, timeout, and quiesce.

2. Scheduling Snapshots:

- You can schedule snapshots to be taken automatically at specified intervals.To do this, open the "Snapshot Manager," select a snapshot, and click "Schedule."
- Configure the snapshot schedule settings, including frequency and retentionpolicy.

Ex.No: 2c **Date:**

Creating Spanned, Mirrored, and Striped Volumes in Windows.

Aim:

To create spanned, mirrored, and striped volumes in a Windows operating system.

Procedure:

- Open the "Disk Management" tool in Windows. You can do this by right-clicking on"This PC" (or "My Computer") and selecting "Manage." Then, go to "Disk Management" under "Storage."

Creating Spanned, Mirrored, and Striped Volumes:

- To create a spanned volume, select two or more dynamic disks, right-click, and choose "New Spanned Volume." Follow the wizard to create the spannedvolume.
- To create a mirrored volume, select two dynamic disks, right-click, and choose "New Mirrored Volume." Follow the wizard to create the mirroredvolume.
- To create a striped volume, select two or more dynamic disks, right-click, and choose "New Striped Volume." Follow the wizard to create the striped volume.

Ex.No: 2d **Date:**

Creating a RAID 5 Volume.

Aim:

To create a RAID 5 volume using a hardware RAID controller or motherboard BIOS.

Procedure:

1. Ensure that your computer has a RAID controller card installed or that your motherboard supports RAID.
2. Access the RAID configuration utility during the computer's boot process. This is typically done by pressing a specific key (e.g., Ctrl+I, Ctrl+M) when prompted.
3. In the RAID configuration utility, create a new RAID 5 array.
4. Add the hard drives you want to include in the RAID 5 volume to the array.
5. Configure the RAID 5 settings, which may include specifying the strip size and parity settings.
6. Save the configuration and exit the RAID utility.

Ex.No: 3a **Date:**

Desktop Virtualization using VNC

Aim:

To set up desktop virtualization using VNC (Virtual Network Computing) to remotely access and control a desktop.

Procedure:

1. **On the Host Computer (Server):**

- Ensure that the host computer is running a graphical desktop environmentand is connected to the network.
- Install a VNC server software on the host computer. Popular options include TightVNC, RealVNC, or TigerVNC. Follow the installation instructions for your chosen software.
- Configure the VNC server by setting a password and defining access permissions, such as which desktop or screen to share.
- Start the VNC server on the host computer.

2. **On the Client Computer (Viewer):**

- Install a VNC client software on the client computer or device. Examples include RealVNC Viewer, TightVNC Viewer, or Remmina (for Linux).
- Launch the VNC client and enter the IP address or hostname of the host computer, along with the port number (default is 5900).
- When prompted, enter the password you set for the VNC server on the host computer.
- The client computer will connect to the host's desktop, and you can now remotely control and interact with the host desktop.

Ex.No: 3b **Date:**

Desktop Virtualization using Chrome Remote Desktop

Aim:

To set up desktop virtualization using Chrome Remote Desktop to remotely access and control a desktop.

Procedure:

1. **On the Host Computer (Server):**

- Ensure that the host computer is running a graphical desktop environmentand is connected to the internet.
- Open Google Chrome on the host computer.
- Sign in to your Google account or create one if you don't have an account.
- Go to the Chrome Web Store and install the "Chrome Remote Desktop" extension.
- Launch the Chrome Remote Desktop extension.
- Under "My Computers," click "Get Started." Follow the instructions to enable remote connections.
- Set a PIN (personal identification number) for secure access.
- The host computer is now configured for remote access using ChromeRemote Desktop.

2. **On the Client Computer (Viewer):**

- Install Google Chrome on the client computer or device if not already installed.
- Sign in to the same Google account used on the host computer.
- Install the "Chrome Remote Desktop" extension from the Chrome Web Storeon the client.
- Launch the Chrome Remote Desktop extension and select the host computeryou want to connect to.
- Enter the PIN you set on the host computer.
- The client computer will connect to the host's desktop, allowing you to remotely control and interact with the host desktop.

Ex.No: 4 **Date:**

Creating Type 2 Virtualization on ESXi 6.5 Server

Aim:

To set up Type 2 virtualization on an ESXi 6.5 server, enabling the creation of virtual machines within the ESXi environment.

Procedure:

1. Ensure that you have an ESXi 6.5 server up and running. This server should beinstalled and configured with hardware virtualization support.
2. Open the VMware vSphere Client on a computer that is connected to the samenetwork as your ESXi server.
3. Connect to the ESXi server using the IP address or hostname of the server. Enteryour credentials to log in.
4. In the vSphere Client, select the ESXi host under "Hosts and Clusters" in the leftpane.
5. In the "Actions" menu, click "New Virtual Machine."
6. The New Virtual Machine Wizard will open. Follow the wizard's steps to create a newvirtual machine. You'll need to specify the following information:
    1. Virtual machine name and location.
    2. Guest OS type and version.
    3. Datastore where the virtual machine files will be stored.
    4. Disk provisioning (e.g., Thin provision, Thick provision).
    5. Network adapter settings.
    6. Assign virtual CPUs and memory.
7. After configuring the virtual machine settings, finish the wizard. The new virtual machine will be created and displayed in the vSphere Client interface.
8. Power on the virtual machine by right-clicking it and selecting "Power" > "Power On."
9. Open a console to the virtual machine to install the Guest OS. Right-click the virtual machine and select "Open Console."
10. Mount the ISO image of the Guest OS to the virtual machine's CD/DVD drive.
11. Install the Guest OS by following the installation instructions specific to the OS youare installing.
12. Once the Guest OS is installed, you can manage, configure, and use the virtualmachine as needed.

Ex.No: 5 **Date:**

Creating a VLAN in Cisco Packet Tracer.

Aim:

To create a Virtual Local Area Network (VLAN) in Cisco Packet Tracer.

Procedure:

1. Launch Cisco Packet Tracer on your computer.
2. Create a network topology by dragging and dropping routers, switches, and enddevices onto the workspace.
3. Connect the devices by using appropriate cables and configuring interfaces. Makesure you have at least one switch in your topology that supports VLANs. Cisco Catalyst switches are commonly used for this purpose.
4. Select the switch in your topology that you want to configure for VLANs, and click onit to open its configuration panel.
5. Go to the "CLI" tab to access the Command Line Interface of the switch.
6. Enter privileged EXEC mode by typing **enable**and then enter global configurationmode by typing **configure terminal**.
7. Create a VLAN by using the **vlan <vlan_id>**command. Replace **<vlan_id>**withthe desired VLAN number. For example, to create VLAN 10, you would enter **vlan10**.
8. To assign a name to the VLAN, use the **name <vlan_name>**command. Replace **<vlan_name>**with the desired name. For example, **name Marketing**.
9. Exit global configuration mode by typing **exit**.
10. Assign ports to the VLAN by entering interface configuration mode for each port. Usethe **interface <interface>** command to select the port, and then use the **switchport access vlan <vlan_id>** command to assign the port to the VLAN. For example, to assign interface FastEthernet0/1 to VLAN 10, you would enter:

    interface FastEthernet0/1
    switchport access vlan 10

11. Repeat step 10 for each port you want to assign to the VLAN.
12. Exit interface configuration mode by typing **exit**.
13. Save your configuration by typing write memory or **copy running-config startup-config**.

Ex.No: 6 **Date:**

Installing KVM in Linux.

Aim:

To install Kernel-based Virtual Machine (KVM) on a Linux system.

Procedure:

Before you begin the installation, make sure your CPU supports hardware virtualization by running the following command:

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

If the output is a number other than 0, it means your CPU supports virtualization, andyou can proceed. If it's 0, your CPU may not support virtualization.

Step 1: Install KVM Packages

1.First, update your package repositories:

sudo apt update

2.Install essential KVM packages by running:

sudo apt install qemu-kvm libvirt-daemon-systemlibvirt-clients bridge-util

This will install the necessary KVM packages.

Step 2: Authorize Users

1. To allow users to run virtual machines, add them to the libvirt and kvm user groups:

   sudo adduser 'username' libvirt

   Replace 'username' with the actual username.

2.Similarly, add the user to the kvm group:

sudo adduser 'username' kvm

Step 3: Verify the Installation

1. Confirm the successful installation by running:

   virsh list --all

   You should see a list of virtual machines, indicating that the installation wassuccessful.

2.Alternatively, you can check the status of the libvirtd service with:

sudo systemctl status libvirtd

If everything is working correctly, you'll see an "active" or "running" status.

3.To exit the status screen, press 'Q.'

4.If the libvirtd service is not active, enable it with:

sudo systemctl enable --now libvirtd

Creating a Virtual Machine:

1. Before creating a virtual machine, install virt-manager, a tool for creating and managing VMs:

   sudo apt install virt-manager

2. Once the installation is complete, start virt-manager:

   sudo virt-manager

3. In the first window, click the computer icon in the upper-left corner.

4. In the dialogue box that opens, select the option to install the VM using an ISOimage, and then click "Forward."

5. Browse your local storage to select the ISO file for the OS you want to install,and click "Forward."

6. Configure the amount of RAM and the number of CPUs for the VM, and click "Forward."

7. Allocate hard disk space to the VM, and click "Forward."

8. Specify the name for your VM and click "Finish" to complete the setup. 9.The VM

will start automatically, and you can proceed with the OS installation from the ISO file.

Ex.No: 7 **Date:**

Creating Nested Virtual Machines (VM under another VM).

Aim:

To set up and run a virtual machine (VM) within another VM, also known as nested virtualization.

Procedure:

1. On the Physical Host:

- Ensure that your physical host computer has virtualization support enabled inthe BIOS. This is typically referred to as VT-x (Intel) or AMD-V (AMD) virtualization technology.
- Install a hypervisor software on the physical host (e.g., VMware Workstation, VirtualBox, VMware Player). Ensure that the hypervisor software is compatible with nested virtualization.
- Configure the hypervisor software to use hardware virtualization support. In VMware, this is done in the VM settings under the "Processor" section.

2. Create a Virtual Machine (VM1):

- Using your chosen hypervisor software, create a virtual machine (VM1) on the physical host. This VM will serve as the host for the nested VM.
- Allocate sufficient system resources to VM1, including memory and CPU cores.
- Install a Guest OS in VM1 (e.g., Windows, Linux) if you haven't already.

3. On VM1 (Nested VM Host):

- Install a Guest OS on VM1. This will be the operating system that runs the nested virtual machine. Ensure that the VM software inside VM1 supports nested virtualization. Some hypervisor software like VMware Workstation support nested virtualization out of the box.
- Set up VM1 as you would for any other VM. Install any necessary drivers, applications, and configuration required for your specific use case.

4. Create a Virtual Machine within VM1 (Nested VM):

- Using the nested virtualization support within VM1 (if available), create another virtual machine (Nested VM) within VM1.
- Allocate system resources to the Nested VM, including memory, CPU cores, and storage.
- Install a Guest OS on the Nested VM, just as you would for any standard VM

Ex.No: 8 **Date:**

Enabling and Using Hyper-V in Windows

Aim: To enable and use the Hyper-V feature in Windows to create a basic virtual machine.

Procedure:

1. **Enable Hyper-V**:
    - Go to Control Panel and open Programs and Features.
    - Click on Turn Windows features on or off.
    - Scroll down and select Hyper-V. Click OK and restart your computer to apply changes.
2. **Launch Hyper-V Manager**:
    - After reboot, type Hyper-V Manager in the Start menu search bar and open it.
3. **Create a New Virtual Machine**:
    - Click Action in the top menu, select New, and choose Virtual Machine.
    - In the New Virtual Machine Wizard, provide a name (e.g., "TestVM"), select Generation 1 as the VM generation, and click Next.
4. **Assign Memory**:
    - Allocate at least 1024 MB of memory to the VM and click Next.
5. **Configure Network**:
    - Choose Default Switch for network connectivity and click Next.
6. **Create a Virtual Hard Disk**:
    - Use the default settings to create a new virtual hard disk (e.g., 20 GB).
7. **Install an Operating System**:
    - Select Install an operating system from a bootable image file and browse to the downloaded ISO file (e.g., Ubuntu Server).
8. **Finish and Start the Virtual Machine**:
    - Complete the wizard and click Finish.
    - Right-click the new VM in the Hyper-V Manager and select Start.
9. **Connect and Set Up the OS**:
    - Right-click the VM and select Connect.
    - Follow the installation instructions for the chosen OS.

Ex.No: 9 **Date:**

Creating and Configuring a Virtual Switch in VirtualBox

Aim: To create and configure a virtual switch in Virtual Box for networking between virtual machines.

Procedure:

1. **Open VirtualBox**: Launch Oracle Virtual Box on your host machine.
2. **Create a New Internal Network**:
    - Go to File > Preferences.
    - Click on the Network tab and then click on the Host-only Networks tab.
    - Click the Add Host-Only Network button to create a new virtual network.
    - Optionally, configure IP ranges and DHCP if needed.
3. **Configure the Virtual Machines**:
    - Select the first VM in the Virtual Box interface, click Settings.
    - Go to the Network tab.
    - Under Adapter 1, select Attached to and choose Internal Network.
    - Repeat this process for the second VM, ensuring both are connected to the same internal network.
4. **Test Connectivity**:
    - Start both VMs.
    - Open the terminal in each VM.
    - Assign IP addresses manually if needed using the following command:
      sudo if config eth0 192.168.56.101 up
    - On the other VM, use:
      sudo if config eth0 192.168.56.102 up
    - Test the connection using the ping command:
      ping 192.168.56.102