

Experiment No : 3

Aim : To study and implement Bare-metal Virtualization with Xen.

Theory :

- Functions performed by Bare-metal hypervisors
⇒ Bare-metal hypervisor, also known as Type-2 hypervisors, operate directly on the hardware without the need for an underlying operating system.

- Their main functions include:

1) Resource Management

- ⇒ Bare-metal hypervisors allocate hardware resources such as CPU, memory, and storage to multiple virtual machines running on the same physical host.

2) Isolation

- ⇒ They ensure strong isolation between VMs, preventing interference and providing security by separating the execution environments.

3) Performance Optimization

- ⇒ Bare-metal hypervisors optimize performance by directly interacting with hardware, reducing the overhead associated with a host operating system.

4) Hardware Virtualization

→ They enable multiple operating systems to run on a single physical machine by creating virtual instances of the hardware components.

• Compare Hosted and Bare-metal hypervisors:

Hosted Hypervisors	Bare-Metal Hypervisors
1) Operates on the conventional operating system.	1) Runs directly on the system where VMs function.
2) OS virtualization.	2) Hardware virtualization.
3) Functions as the application on the host.	3) Guest OS and applications runs on the hypervisor.
4) It is less scalable than the bare-metal hypervisor.	4) It is more scalable than the hosted hypervisor.
5) Easier than a type 1 setup because of the existing OS.	5) Simpler, if your hardware supports the application.
6) Speed is slower than bare-metal.	6) Speed is faster than hosted hypervisors.
7) For e.g., VMware ESXi, Microsoft Hyper V	7) For e.g., VMware ESXi, Microsoft Hyper V, Citrix XenServer.
Player Microsoft Virtual PC	
Sun's VirtualBox	

- Horizontal and Vertical Scaling:

- In horizontal scaling, increasing the number of instances of an application or services across multiple machines or nodes.
- For e.g., Adding more servers to a web application to handle increased user traffic.
- Vertical scaling can be defined as increasing the capacity of a single machine by adding more resources. (CPU, RAM)
- For e.g., Upgrading a server's RAM or CPU to handle a growing database.

- Auto Scaling

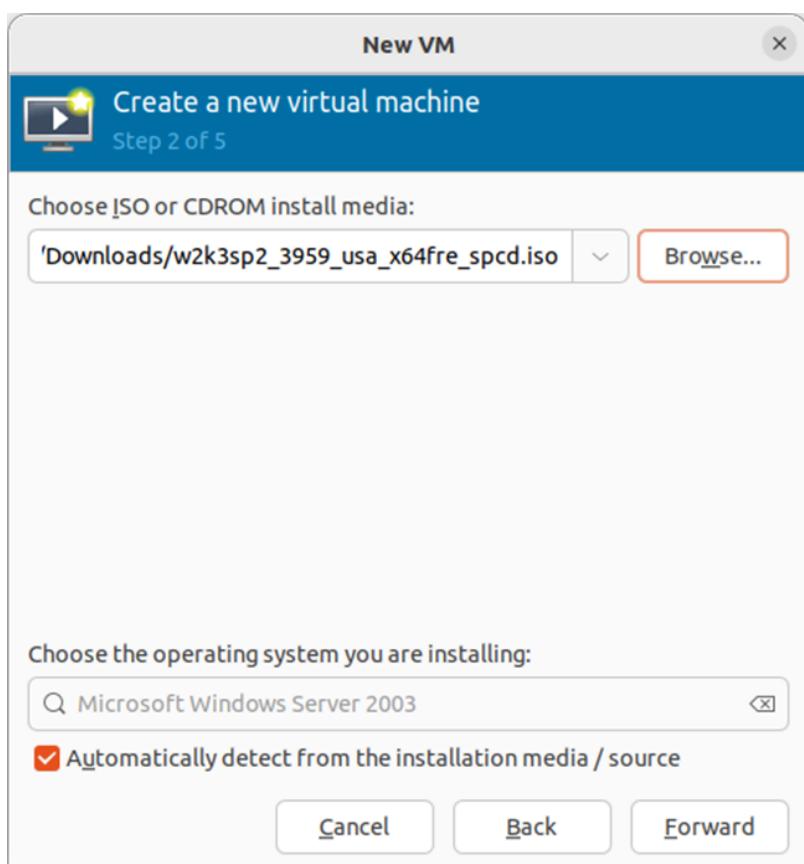
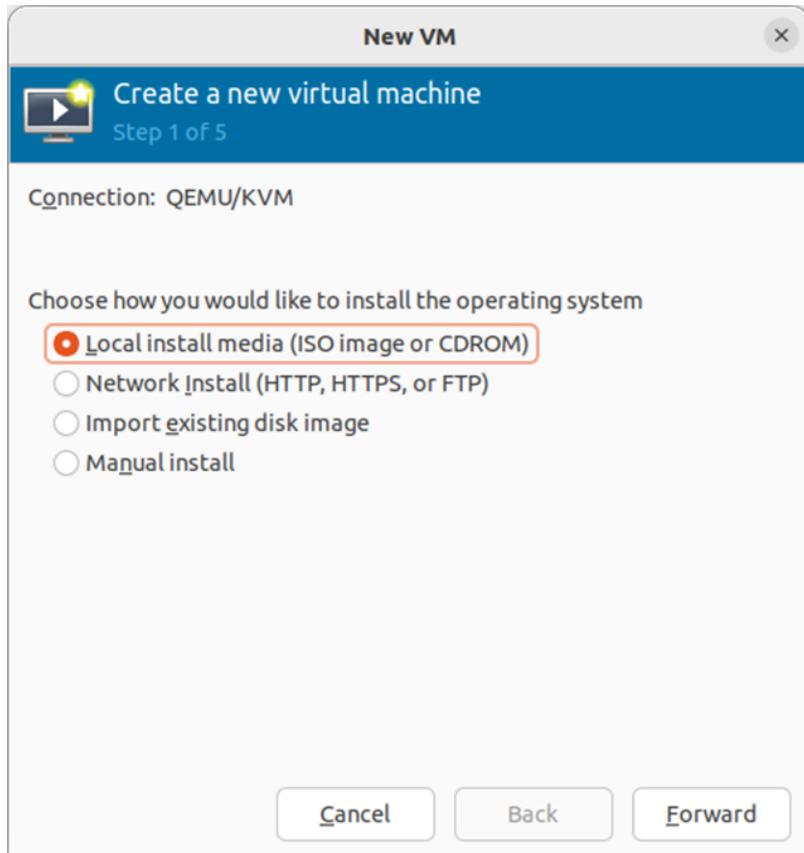
- Automatically adjusting the number of compute resources based on the demand, ensuring optimal performance and cost efficiency.
- For e.g., scaling up instances during peak hours and scaling down during low traffic.

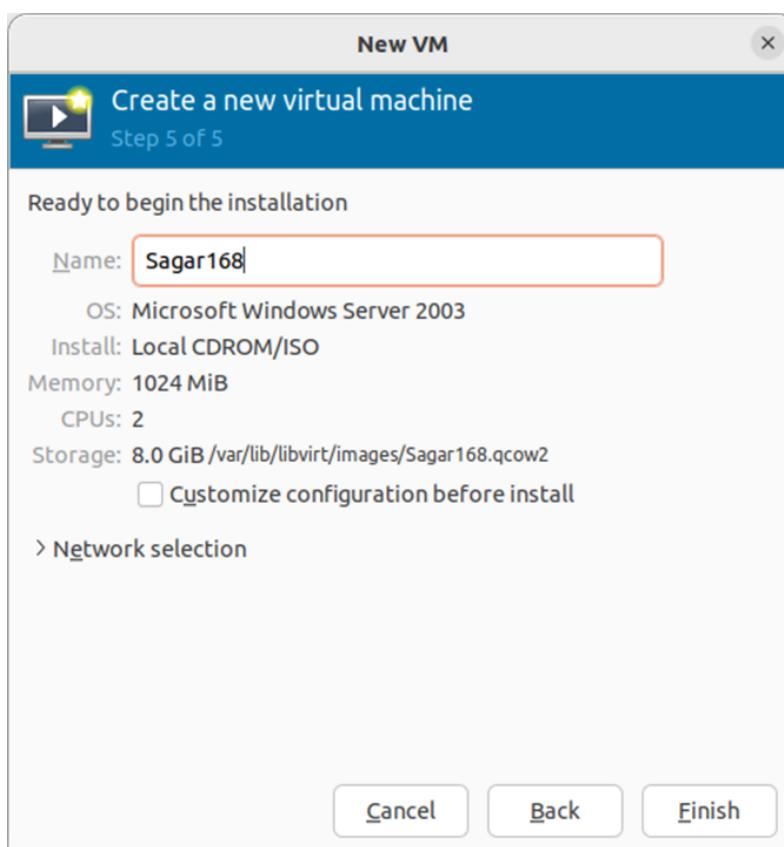
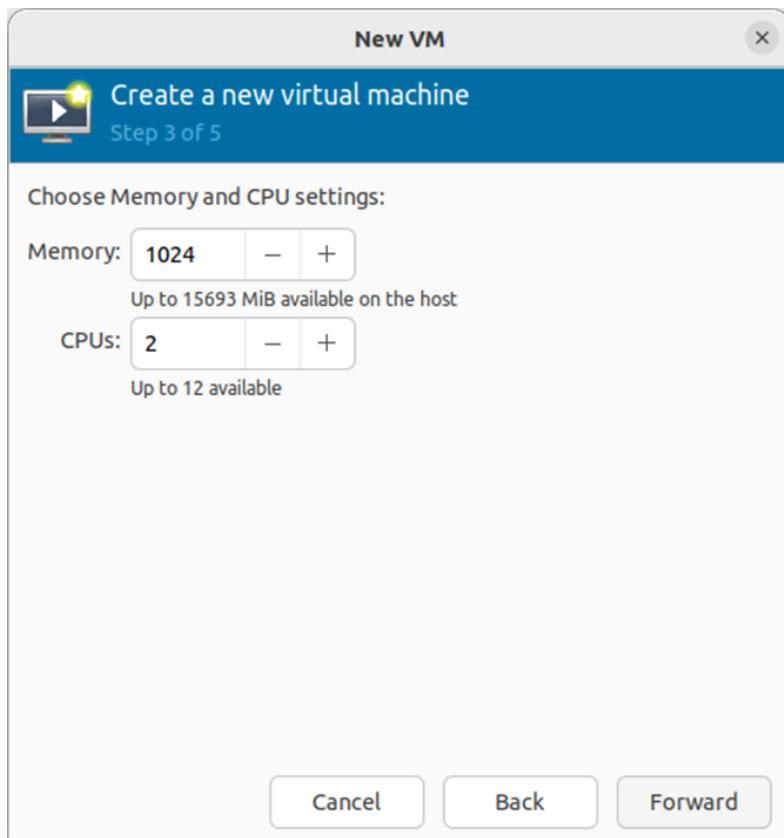
- Load Balancing

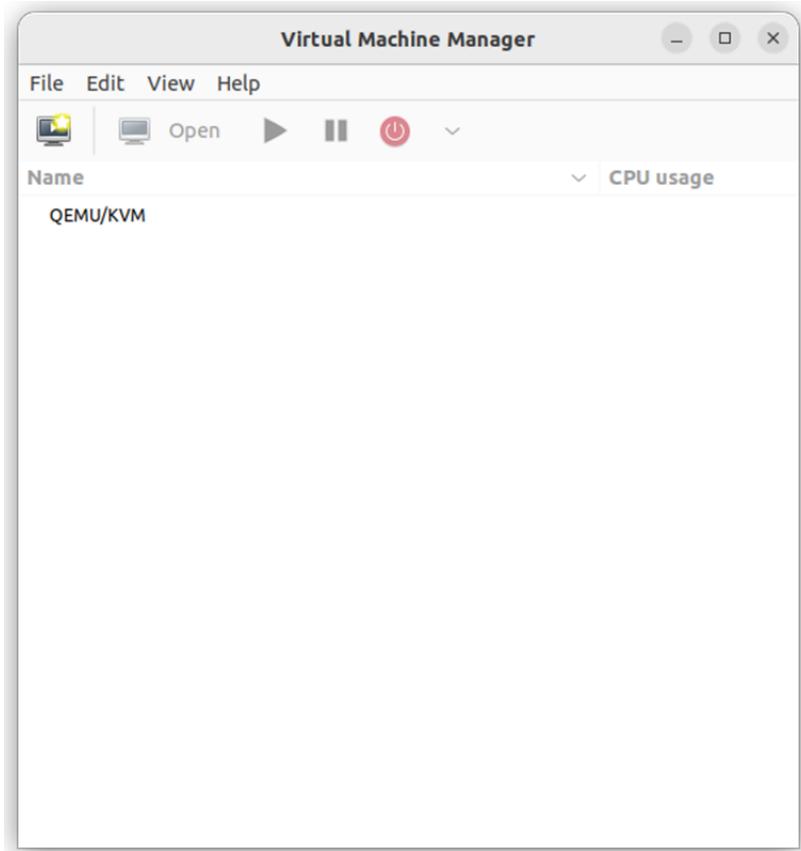
- Distributing incoming network traffic across multiple servers to ensure no single server is overwhelmed, optimizing resource utilization and improve reliability.
- For e.g., Distributing web traffic among multiple servers to prevent overloading any single server.

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Output:







```
root@LAB301PC07: /home/student
Note, selecting 'qemu-system-x86' instead of 'qemu-kvm'
bridge-utils is already the newest version (1.7-1ubuntu3).
libvirt-clients is already the newest version (8.0.0-1ubuntu7.8).
libvirt-daemon-system is already the newest version (8.0.0-1ubuntu7.8).
qemu-system-x86 is already the newest version (1:6.2+dfsg-2ubuntu6.16).
The following packages were automatically installed and are no longer required:
  libqt5help5 libqt5sql5 libqt5sql5-sqlite libqt5xml5 libsdl-ttf2.0-0
  linux-image-6.2.0-39-generic linux-modules-6.2.0-39-generic
  linux-modules-extra-6.2.0-39-generic
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 57 not upgraded.
root@LAB301PC07:/home/student# virsh -c qemu:///system list
  Id  Name      State
  --
root@LAB301PC07:/home/student# virt-manager
root@LAB301PC07:/home/student# virsh -c qemu:///system list
virsh-c: command not found
root@LAB301PC07:/home/student# virsh -c qemu:///system list
  Id  Name      State
  --
  1  Sagar168   running
root@LAB301PC07:/home/student#
```