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**Department of Information Technology**

A.Y. 2025-2026
Class: BE-IT A/B, Semester: VIII
Subject: Cloud Computing Lab

Student Name: Durva Kadam Student Roll No: 23

# Experiment – 2: Bare-metal Virtualization

**Aim:** To study and Implement Bare-metal Virtualization using Xen (Open Source tool), HyperV or VMware Esxi.

**Objective:** After performing the experiment, the students will be able to learn –
- Understand functionalities of OS and Hypervisor
- Working of Hypervisor
- Getting familiar with key concepts of virtualization
- Types of virtualization
- Usefulness of virtualization

**Lab objective mapped : ITDO8024.1**: To get familiar and implement different types of virtualization techniques.

**Prerequisite:** An AWS account

**Requirements:**
- XenServer ISO

**Pre-Experiment Theory:**
1. **Hypervisor** (description-To be written in hand))
2. **Bare-metal hypervisor Architecture-**(To be drawn in hand)
3. **Xen Architecture-**(To be drawn in hand)

**Procedure** (Soft Copy form)
- **Install Xen Server**
  1. Download the Citrix Hypervisor (XenServer) .iso file Download
  2. Create an account to complete the download
  3. Launch Virtualbox
  4. Create a New VM by selecting Machine > New
     i. Name: XenServer
     ii. Machine Folder: C:\VMs
     iii. Type: Linux
     iv. Version: Other (64-bit)
     v. Memory Size: 8192 MB

vi. Hard disk: Create a virtual hard disk now

5. Click Create
6. On the Create Virtual Hard Disk dialog
   i. Name the virtual disk image XenServer.vdi
   ii. File size: 500 GB
   iii. Hard disk file type: VDI
   iv. Storage on physical hard disk: Dynamically Allocated
7. Click Create
8. Select the VM and Click Settings
9. Select System > Processor
10. Give the VM at least 2 processors
11. Check the Enable Nested VT-x/AMD-V
12. Select Display
13. Slide the Video Memory to 128 MB
14. Select Network
15. Set the attached to dropdown to Bridged Adapter
16. Select Storage
17. Click on the CD-ROM drive
18. Select the disc dropdown to the right > Choose a virtual optical disc file...
19. Browse to and select the downloaded Citrix Hypervisor (XenServer) .iso file
20. Click OK
21. Select the hard disk dropdown to the right
22. Click the Create button at the top
23. Change the size to 500 GB > Click Create
24. Click OK to accept the settings
25. Make sure the XenServer VM is selected and click Start > Normal
26. Select a keyboard mapping > Ok
27. Select Ok to begin the installation
28. Select Accept EULA
29. Press Spacebar to select the 500GB VBOX HARDDISK
30. Arrow down and check the Enable thin provisioning box
31. Select Ok
32. Select Local Media > Ok
33. Enter and confirm a root password
34. Configure the network > Ok
35. Specify a hostname > Ok
36. Set the time zone > Ok
37. Select Using NTP > Ok
38. Select Ok at the NTP server setup
39. Select Install Citrix Hypervisor
40. Select No at the supplemental packs installation screen
41. After the installation completes, select Devices > Optical Drives > Remove disk from virtual drive
42. Select Ok to reboot
43. Welcome to Citrix Hypervisor (XenServer) inside VirtualBox

- **Installing Citrix XenCenter**
  1. Go back to the download page and download XenCenter Download
  2. Install the downloaded .msi
  3. Launch Citrix XenCenter
  4. Click the Add a Server option in the main window
  5. Enter the IP address and root password to the Citrix Hypervisor VM

- **To connect XenCenter to the Citrix Hypervisor server:**
  a. Launch XenCenter. The program opens to the Home tab.
  b. Click the Add New Server icon.
  c. Enter the IP address of the Citrix Hypervisor server in the Server field. Type the root user name and password that you set during Citrix Hypervisor installation. Click Add.
  d. The first time you add a host, the Save and Restore Connection State dialog box appears.
  e. This dialog enables setting preferences for storing host connection information and automatically restoring host connections.

**Post-Experiments Exercise**

Attach Following Screen Shots-

1. Creation of VM inside Oracle Box
2. Any two screen shots of Xen hypervisor installation
3. final working screen of xen hypervisor
4. Enter the IP address and root password to the Citrix Hypervisor VM from xen center

**Extended Theory:**

1. Difference between bare-metal and hosted hypervisors?(to be written in hand)
2. Bare-metal hypervisor use cases(to be written in hand)
3. Benefits and drawbacks of bare-metal hypervisors(soft copy)
4. Top bare-metal hypervisor vendors and products(soft copy)

**Conclusion:**

1. Write what was performed in the experiment
2. Mention a few applications of what was studied.
3. Write the significance of the studied topic

**References:**

[1]Linux foundation: ”Xen tools”. Information available at: http://wiki.xen.org/wiki/Xen_tools
Last review: 16-03-2014: 13.51

[2] Bill HILL “Intro to Virtualization: Hardware, Software, Memory, Storage, Data and Network Virtualization Defined”. Information available at: http://www.petri.co.il/intro-tovirtualization.htm
Last review: 16-03-2014: 12.55

[3] [Online]https://docs.citrix.com/en-us/citrix-hypervisor/install.html

[4] [Online]https://i12bretro.github.io/tutorials/0372. Html

**Extended Theory:**

1. **Benefits and drawbacks of bare-metal hypervisors(soft copy)**

**ANS**: **Benefits of Bare-Metal Hypervisors**

1. Bare-metal hypervisors are installed directly on physical hardware, which results in better performance compared to hosted hypervisors.
2. They provide efficient utilization of system resources such as CPU, memory, and storage.
3. High security is achieved because virtual machines are isolated at the hardware level.
4. They offer high stability and reliability, making them suitable for enterprise and data-center environments.
5. Advanced features like live migration, high availability, and fault tolerance are supported.

**Drawbacks of Bare-Metal Hypervisors**

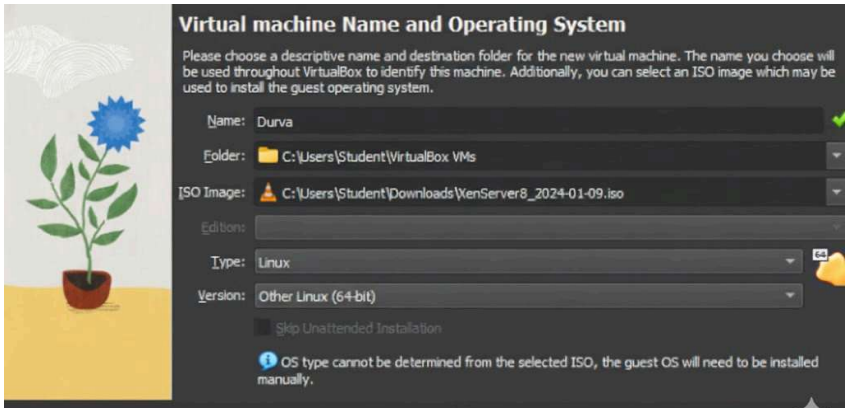
1. Installation and configuration of bare-metal hypervisors are complex and require skilled administrators.
2. Hardware compatibility is limited to supported devices and drivers.
3. Licensing and maintenance costs are high for enterprise-level solutions.
4. They are not suitable for personal or desktop use due to their complexity.
5. Management often requires additional tools and centralized control software.

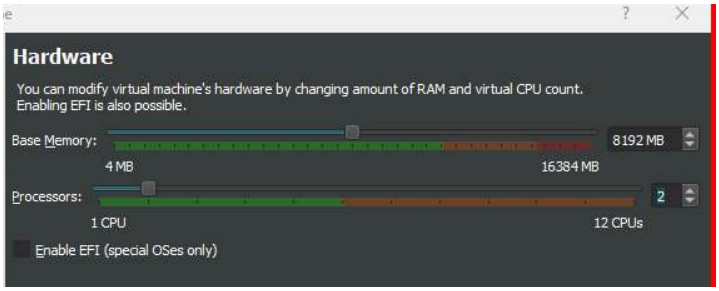
2. **Top bare-metal hypervisor vendors and products(soft copy)**

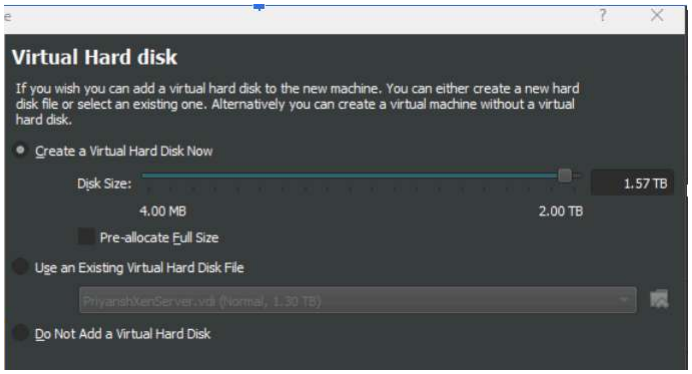
**ANS:**

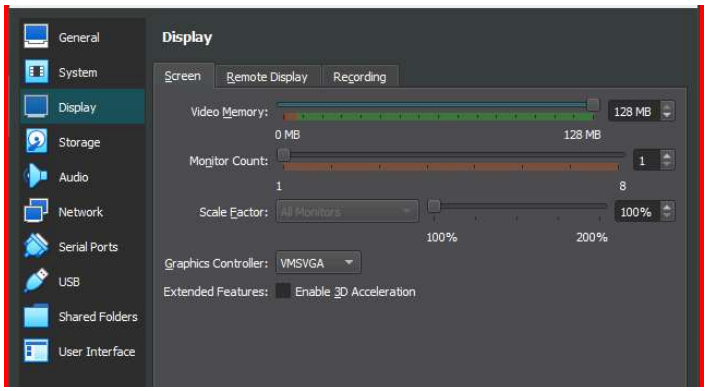
1. VMware provides VMware ESXi, a widely used enterprise-level bare-metal hypervisor known for high performance and reliability.
2. Microsoft offers Hyper-V, which is integrated with Windows Server and supports virtualization in enterprise environments.
3. Citrix provides Citrix Hypervisor (XenServer), an open-source based hypervisor commonly used in cloud infrastructures.
4. Red Hat offers KVM (Kernel-based Virtual Machine), a Linux-based open-source bare-metal hypervisor used in enterprise and cloud platforms.
5. Oracle provides Oracle VM Server, which is used for running Oracle applications and databases efficiently.

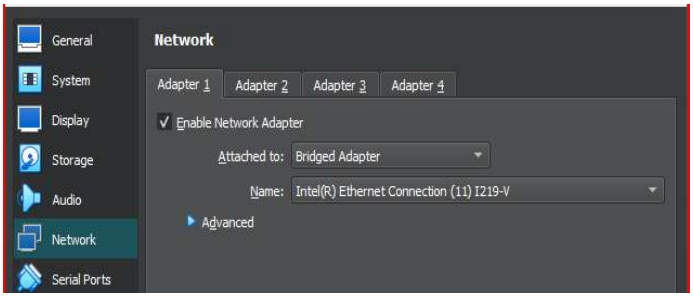
**Screenshots:**



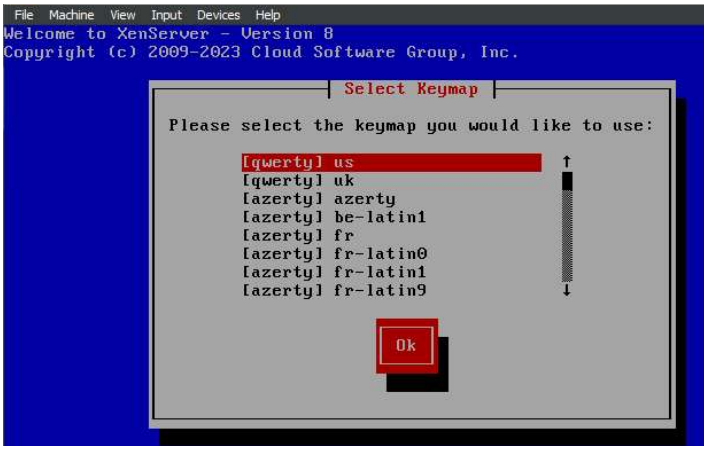

Hardware
You can modify virtual machine's hardware by changing amount of RAM and virtual CPU count.
Enabling EFI is also possible.
Base Memory:
8192 MB
4 MB
16384 MB
Processors:
2
1 CPU
12 CPUs
Enable EFI (special OSes only)

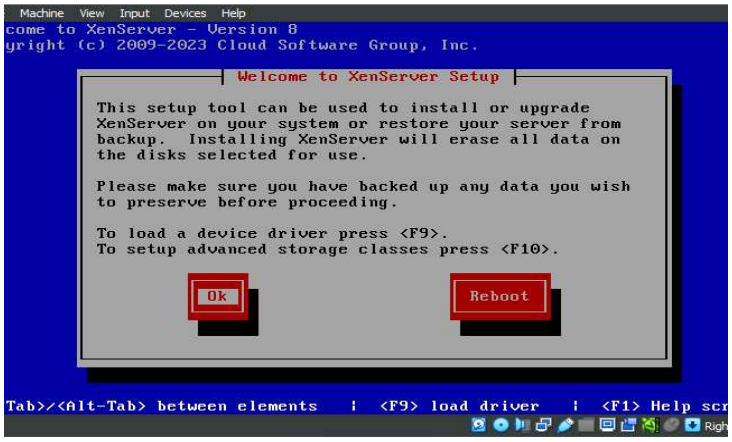

Virtual Hard disk
If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select an existing one. Alternatively you can create a virtual machine without a virtual hard disk.
Create a Virtual Hard Disk Now
Disk Size:
1.57 TB
4.00 MB
2.00 TB
Pre-allocate Full Size
Use an Existing Virtual Hard Disk File
Do Not Add a Virtual Hard Disk

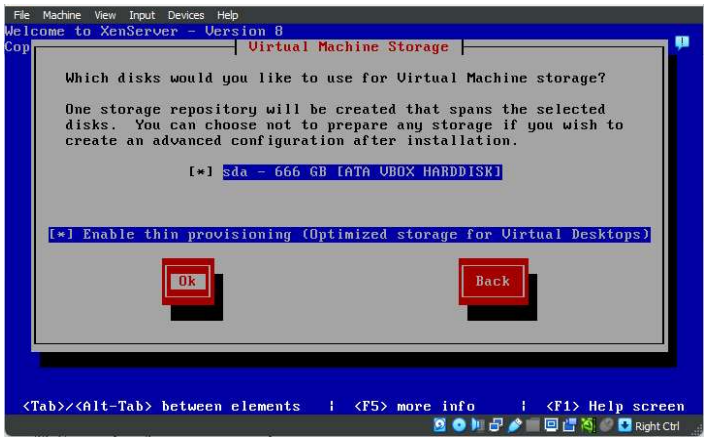

General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
User Interface
Display
Screen
Remote Display
Recording
Video Memory:
128 MB
0 MB
128 MB
Monitor Count:
1
1
8
Scale Factor:
100%
100%
200%
Graphics Controller:
VMSVGA
Extended Features:
Enable 3D Acceleration

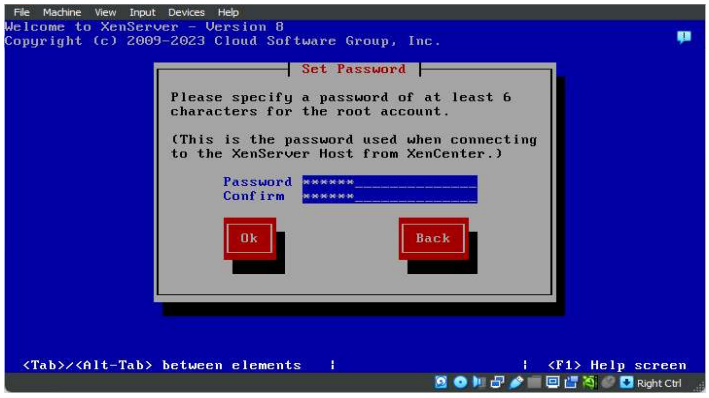

General
System
Display
Storage
Audio
Network
Serial Ports
Network
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
Bridged Adapter
Name:
Intel(R) Ethernet Connection (11) I219-V
Advanced

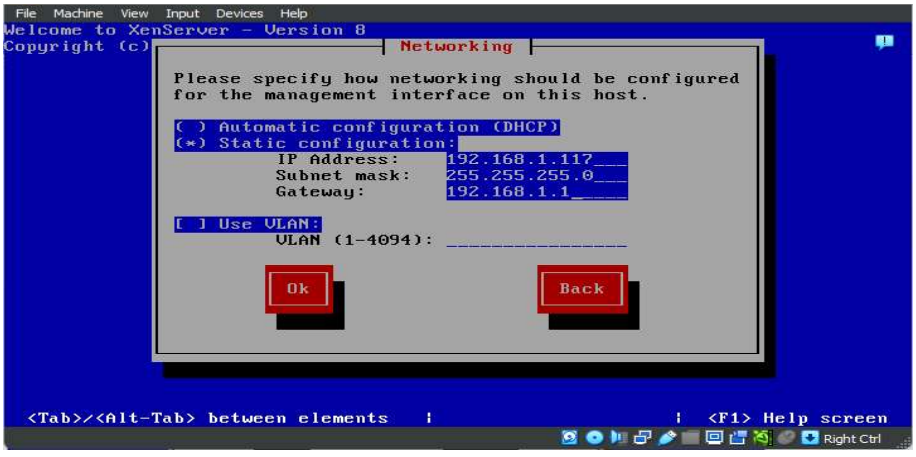
## POST- EXPERIMENT EXERCISE:

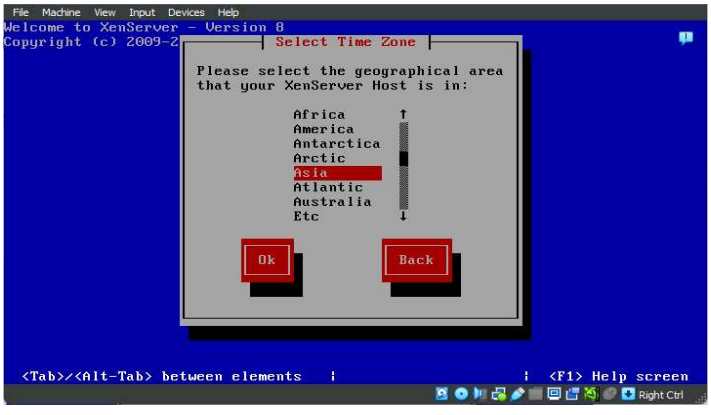


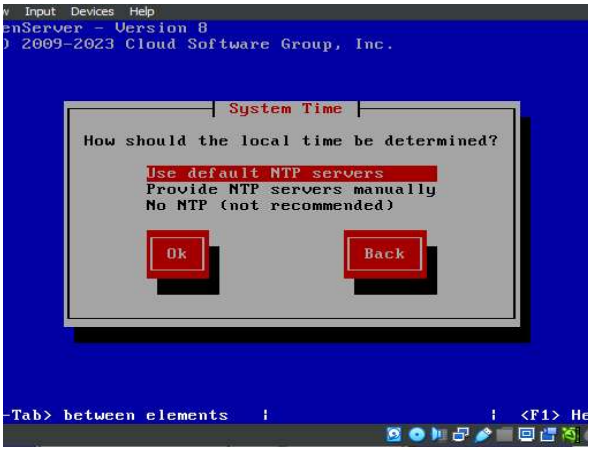



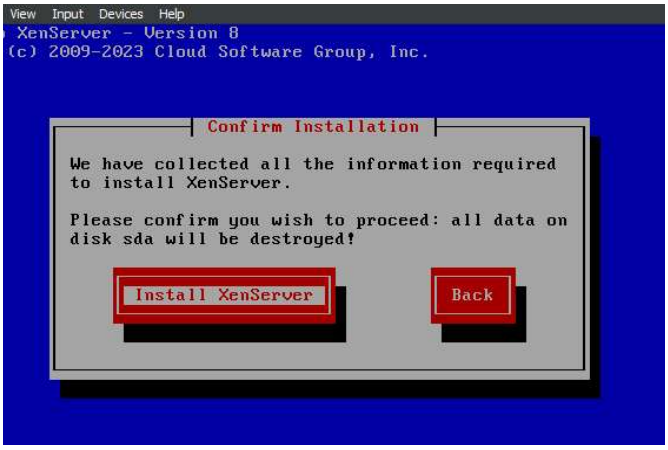



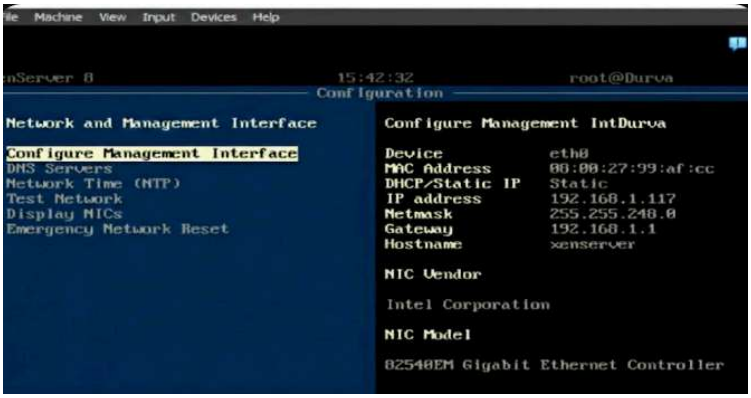



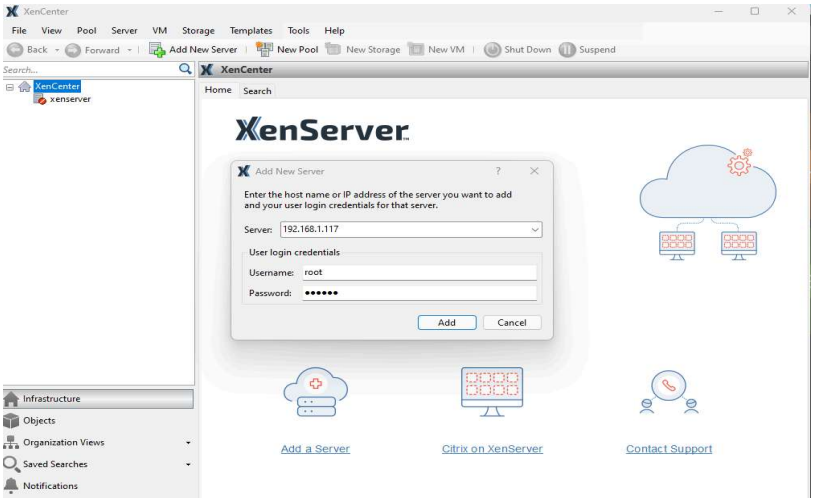



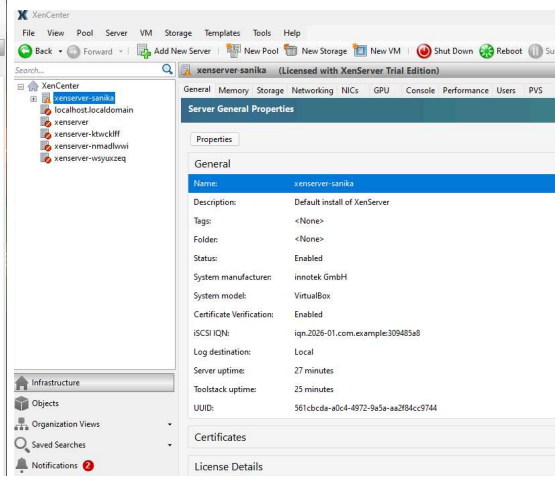


Input Devices Help
enServer - Version 8
) 2009-2023 Cloud Software Group, Inc.
System Time
How should the local time be determined?
Use default NTP servers
Provide NTP servers manually
No NTP (not recommended)
Ok
Back
-Tab> between elements
<F1> He

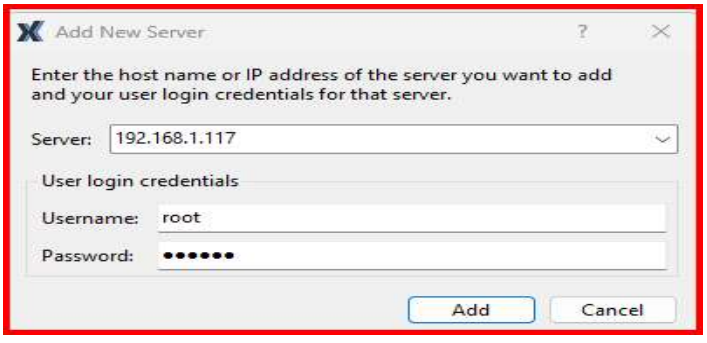

View Input Devices Help
XenServer - Version 8
(c) 2009-2023 Cloud Software Group, Inc.
Confirm Installation
We have collected all the information required to install XenServer.
Please confirm you wish to proceed: all data on disk sda will be destroyed!
Install XenServer
Back


File Machine View Input Devices Help
Welcome to XenServer - Version 8
Copyright (c) 2009-2023 Cloud Software Group, Inc.
Installation Complete
The XenServer installation has completed.
Please remove any local media from the drive, and press Enter to reboot.
Ok


Machine View Input Devices Help
15:42:32
root@Durva
Configuration
Network and Management Interface
Configure Management Interface
DNS Servers
Network Time (NTP)
Test Network
Display NICs
Emergency Network Reset
Configure Management IntDurva
Device eth0
MAC Address 00:00:27:99:af:cc
DHCP/Static IP Static
IP address 192.168.1.117
Netmask 255.255.248.0
Gateway 192.168.1.1
Hostname xenserver
NIC Vendor
Intel Corporation
NIC Model
82540EM Gigabit Ethernet Controller


XenCenter
File View Pool Server VM Storage Templates Tools Help
Back Forward Add New Server New Pool New Storage New VM Shut Down Suspend
XenCenter
xenserver
Home Search
XenServer
Add New Server
Enter the host name or IP address of the server you want to add and your user login credentials for that server.
Server: 192.168.1.117
User login credentials
Username: root
Password: ••••••
Add
Cancel
Infrastructure
Objects
Organization Views
Saved Searches
Notifications
Add a Server
Citrix on XenServer
Contact Support


XenCenter
File View Pool Server VM Storage Templates Tools Help
Back Forward Add New Server New Pool New Storage New VM Shut Down Reboot
xenserver-sanika (Licensed with XenServer Trial Edition)
General Memory Storage Networking NICs GPU Console Performance Users PVS
Server General Properties
Properties
General
Name: xenserver-sanika
Description: Default install of XenServer
Tags: <None>
Folder: <None>
Status: Enabled
System manufacturer: innotek GmbH
System model: VirtualBox
Certificate Verification: Enabled
iSCSI IQN: iqn.2026-01.com.example:309485a8
Log destination: Local
Server uptime: 27 minutes
Toolstack uptime: 25 minutes
UUID: 561cbcda-a0c4-4972-9a5a-aa2f84cc9744
Certificates
License Details
Infrastructure
Objects
Organization Views
Saved Searches
Notifications


Add New Server
Enter the host name or IP address of the server you want to add and your user login credentials for that server.
Server: 192.168.1.117
User login credentials
Username: root
Password: ••••••
Add
Cancel