

MIT WORLD PEACE UNIVERSITY

Cloud Infrastructure and Security  
Third Year B. Tech, Semester 6

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INSTALLATION OF UBUNTU SERVER ON VMWARE  
WORKSTATION

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ASSIGNMENT 1

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# Contents

<b>1 Aim</b>	<b>1</b>
<b>2 Objectives</b>	<b>1</b>
<b>3 Theory</b>	<b>1</b>
3.1 Introduction to VMware and Virtualization . . . . .	1
3.1.1 VMware . . . . .	1
3.1.2 Virtualization . . . . .	1
3.1.3 Benefits of Virtualization . . . . .	2
3.2 Drawbacks of Virtualization . . . . .	2
3.3 Steps or Procedure to follow for Installation . . . . .	2
3.4 Features of Ubuntu Server . . . . .	13
<b>4 Platform</b>	<b>13</b>
<b>5 FAQs</b>	<b>14</b>
<b>6 Conclusion</b>	<b>15</b>
<b>References</b>	<b>16</b>

## 1 Aim

Install VM-Ware Workstation on a windows platform and deploy an Ubuntu server VM as per requirement.

## 2 Objectives

1. To get familiar with virtualization.
2. Understand the use of VM ware workstation.
3. Learn how to deploy Ubuntu on VM-Ware workstation.

## 3 Theory

### 3.1 Introduction to VMware and Virtualization

#### 3.1.1 VMware

VMware is a virtualization and cloud computing software provider based in Palo Alto, California. Founded in 1998, VMware is a subsidiary of Dell Technologies. The company's core product is a hypervisor that enables multiple operating systems to run on a single physical machine. VMware also offers a range of cloud services and software-defined data center solutions.

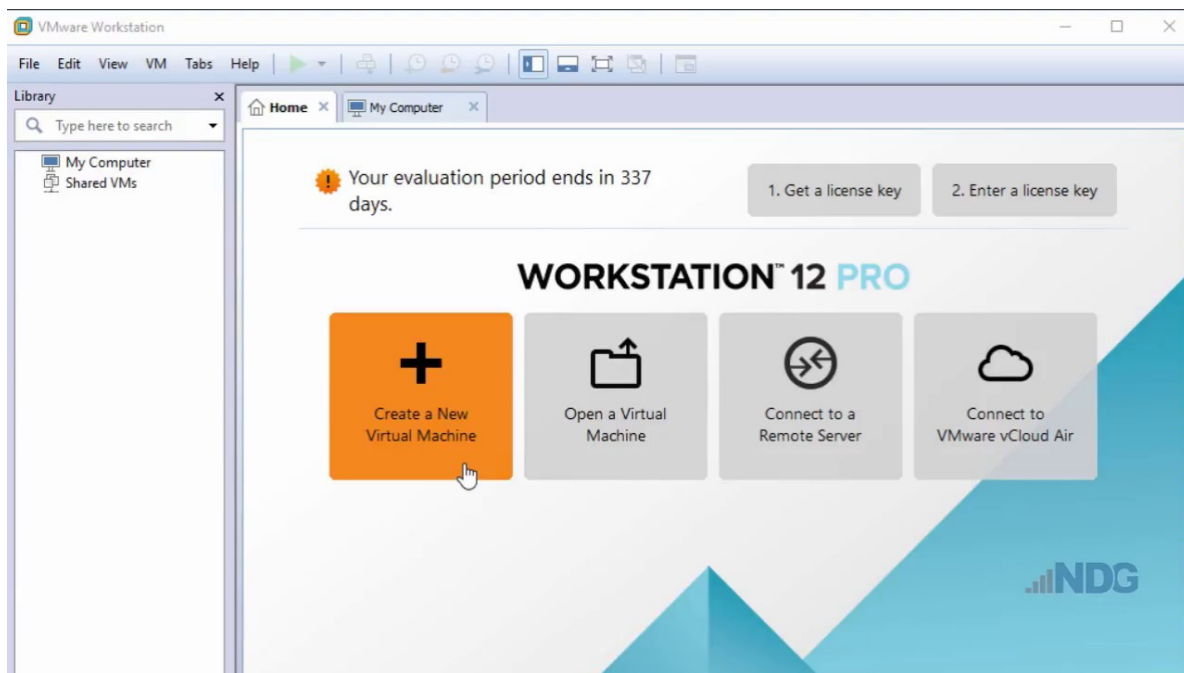


Figure 1: VMWare Workstation 12 Pro

#### 3.1.2 Virtualization

Virtualization is the process of creating a virtual version of a physical resource, such as a server, storage device, or network. It allows multiple virtual instances of the same resource to run on a

single physical machine, enabling greater efficiency and flexibility in managing computing resources. Virtualization is a key technology in cloud computing, enabling the dynamic allocation of computing resources and the efficient use of hardware.

### 3.1.3 Benefits of Virtualization

1. *Resource Optimization*: Virtualization optimizes hardware utilization, leading to cost savings.
2. *Isolation*: It enhances security by isolating applications and workloads.
3. *Flexibility*: Virtualization provides flexibility in scaling resources up or down based on demand.
4. *Energy Efficiency*: Running multiple virtual machines on a single server reduces energy consumption.
5. *Snapshot and Cloning*: Virtualization allows for easy creation of snapshots and cloning for testing and backup purposes.

### 3.2 Drawbacks of Virtualization

1. *Overhead*: Virtualization introduces some overhead due to the virtualization layer.
2. *Complexity*: Managing virtualized environments can be complex, requiring specialized skills.
3. *Dependency on Host*: Virtual machines are dependent on the stability and security of the host system.
4. *Licensing Costs*: Some virtualization solutions may involve licensing costs.
5. *Performance*: In certain high-performance scenarios, there may be a slight performance impact.

### 3.3 Steps or Procedure to follow for Installation

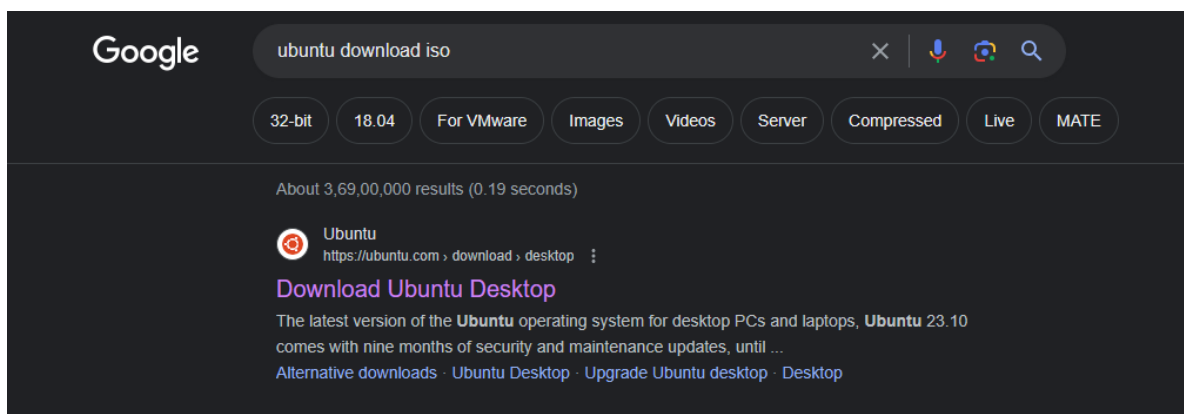


Figure 2:

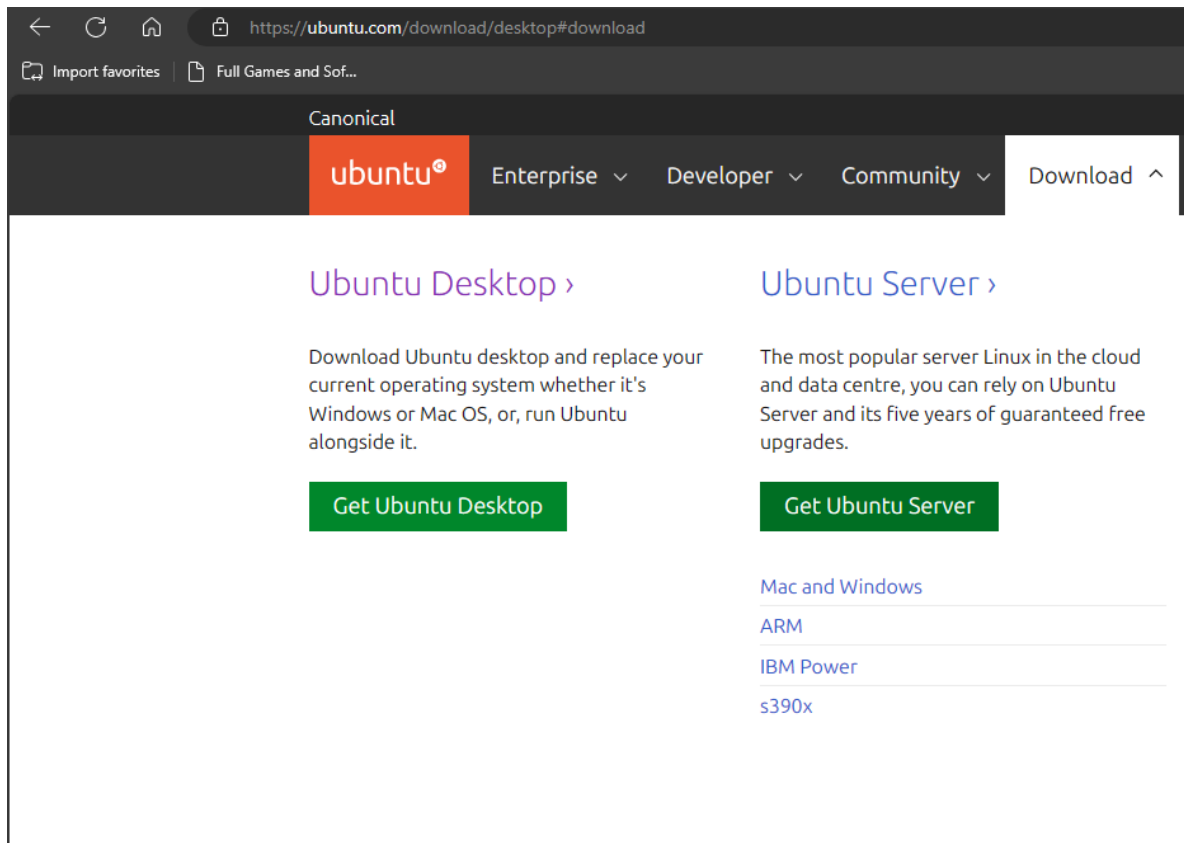


Figure 3:



Figure 4:

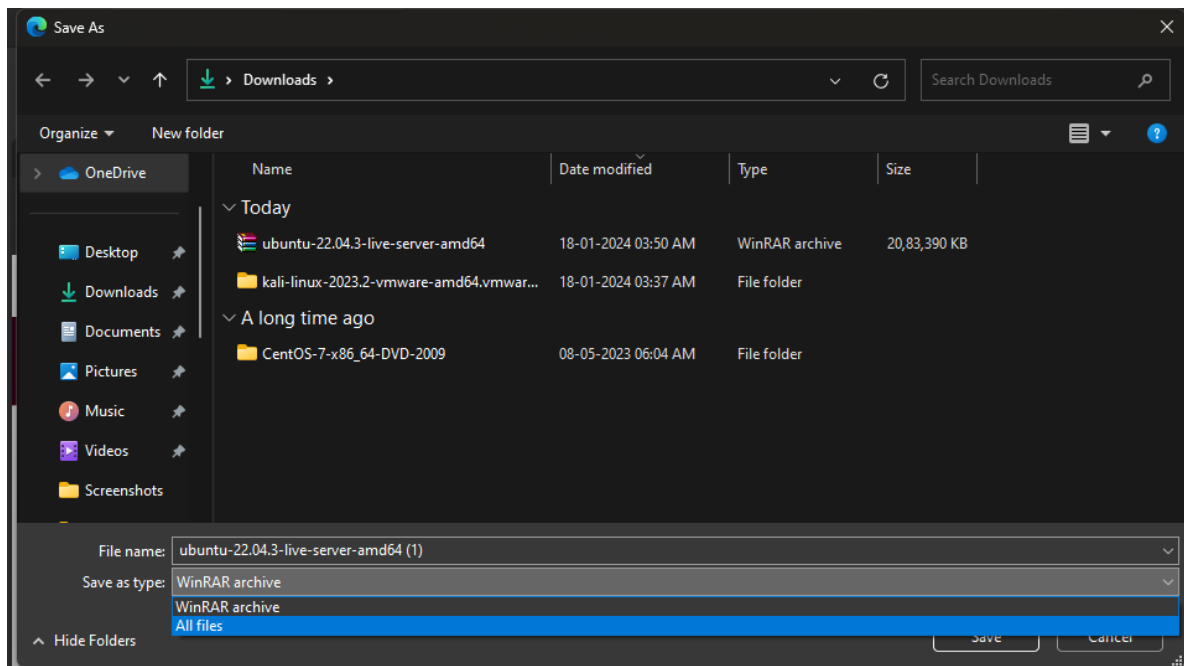


Figure 5:

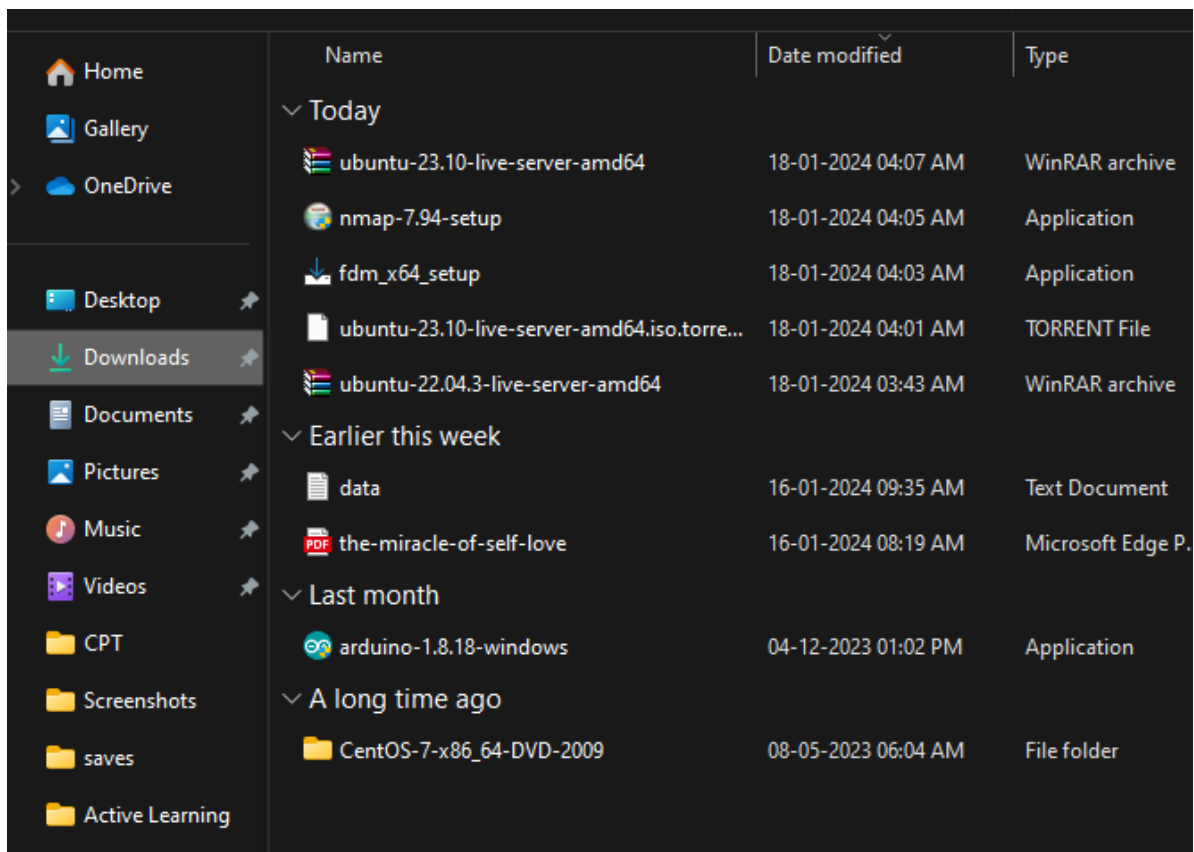
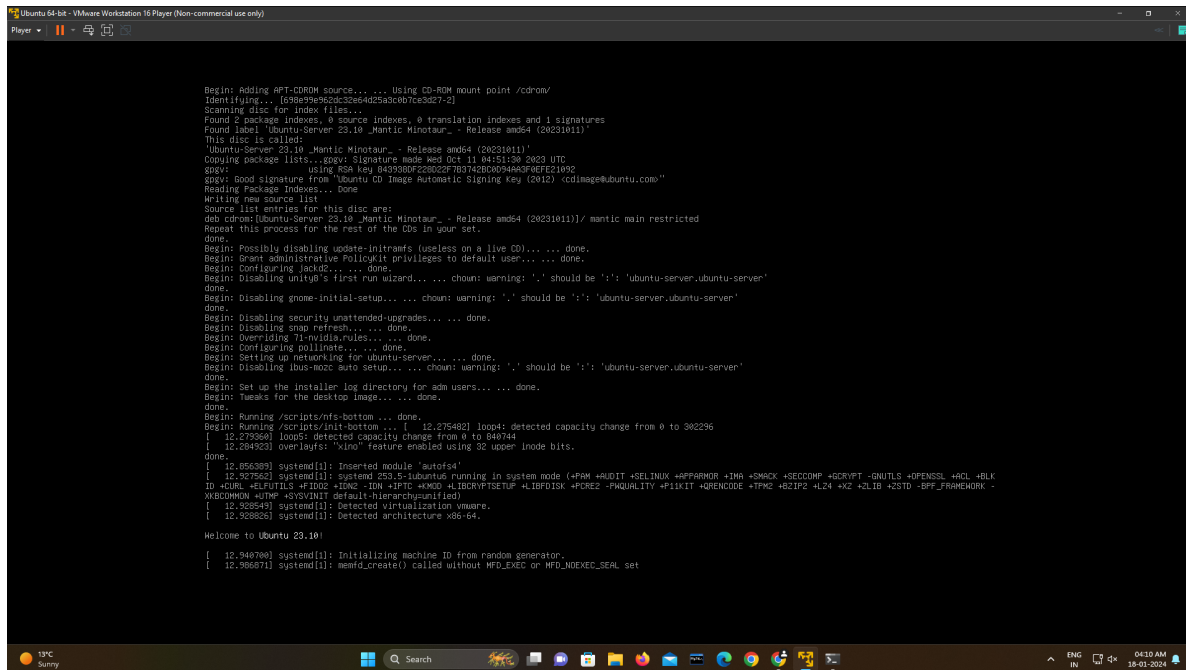


Figure 6:



```

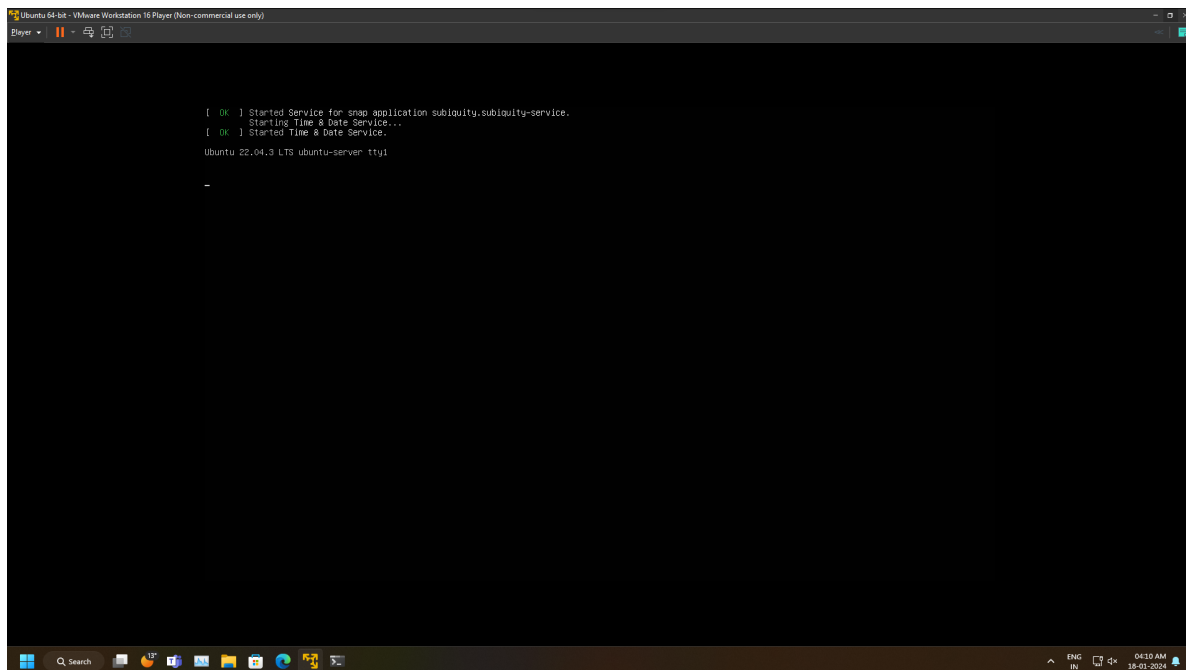
Begin: Adding APT-CDROM source... Using CD-ROM mount point /cdrom/
Identifying... (sha256)cdcd5b5d5a5d07ce58d721
Scanning disc for index files...
Found 2 package indexes, 0 source indexes, 0 translation indexes and 1 signatures
Found label 'Ubuntu-Server 23.10_Mantic Minotaur' - Release amd64 (20231011)
This disc is called:
'Ubuntu-Server 23.10_Mantic Minotaur' - Release amd64 (20231011)'
Copying package lists...gpgv: Signature made Wed Oct 11 04:15:38 2023 UTC
gpgv: using RSA key 0439800F228022F703742BC0D948394C7C21092
gpgv: Good signature from 'Ubuntu CD Image Automatic Signing Key (2012)' <cdimage@ubuntu.com>
Reading Package Indexes... Done
Writing new source list
Source list entries for this disc are:
deb cdrom:[Ubuntu-Server 23.10_Mantic Minotaur - Release amd64 (20231011)] / mantic main restricted
Repeat this process for the rest of the CDs in your set.
done.
Begin: Possibly disabling update-initramfs (unless on a live CD)... done.
Begin: Grant administrative Policykit privileges to default user... done.
Begin: Configuring Jack2... done.
Begin: Disabling unity's first run wizard... chown: warning: '.' should be '/': 'ubuntu-server.ubuntu-server'
done.
Begin: Disabling gnome-initial-setup... chown: warning: '.' should be '/': 'ubuntu-server.ubuntu-server'
done.
Begin: Disabling security unattended-upgrades... done.
Begin: Disabling snap refresh... done.
Begin: Overriding 71-mvidia.rules... done.
Begin: Configuring polinate... done.
Begin: Setting up networking for Ubuntu-server... done.
Begin: Disabling libus-mozc auto setup... chown: warning: '.' should be '/': 'ubuntu-server.ubuntu-server'
done.
Begin: Set up the installer log directory for admin users... done.
Begin: Tweaks for the desktop image... done.
done.
Begin: Running /scripts/nfs-bottom ... done.
Begin: Running /scripts/init-bottom ... [ 12.275483] loop4: detected capacity change from 0 to 302296
[ 12.279268] loop6: detected capacity change from 0 to 840144
[ 12.284923] overlays: "xino" feature enabled using 32 upper inode bits.
done.
[ 12.856389] systemd[1]: Inserted module 'autofs4'
[ 12.327562] systemd[1]: systemd 255.5-ubuntu6 running in system mode (+PAM +AUDIT +SELINUX +APPARMOR +IMA +SMACK +SECCOMP +GCRYPT -GNUTLS -OPENSSL +ACL +BLK
IO +CURL +RTUTILS +FIDO2 +HID +IO +IPTO +KMOD +LIBCRYPTSETUP +LIBFIDIC +PURE2 +FHAQUALITY +PIKIT +GRENOUE +TPM2 +BZIP2 +LZ4 +XZ +ZLIB +ZSTD -BFF_FRAHCAHRI
+XKBCOMMON +HUPM +SYSVINIT default-hierarchy=unified)
[ 12.928549] systemd[1]: Detected virtualization vmware.
[ 12.928823] systemd[1]: Detected architecture x86_64.

Welcome to Ubuntu 23.10!

[ 12.940780] systemd[1]: Initializing machine ID from random generator.
[ 12.940871] systemd[1]: mntfs_create() called without MFD_EXEC or MFD_EXEC_SEAL set

```

Figure 7:



```

[ OK ] Started Service for snap application subiquity.subiquity-service.
Starting Time & Date Service...
[ OK ] Started Time & Date Service.

Ubuntu 22.04.3 LTS ubuntu-server tty1

-

```

Figure 8:

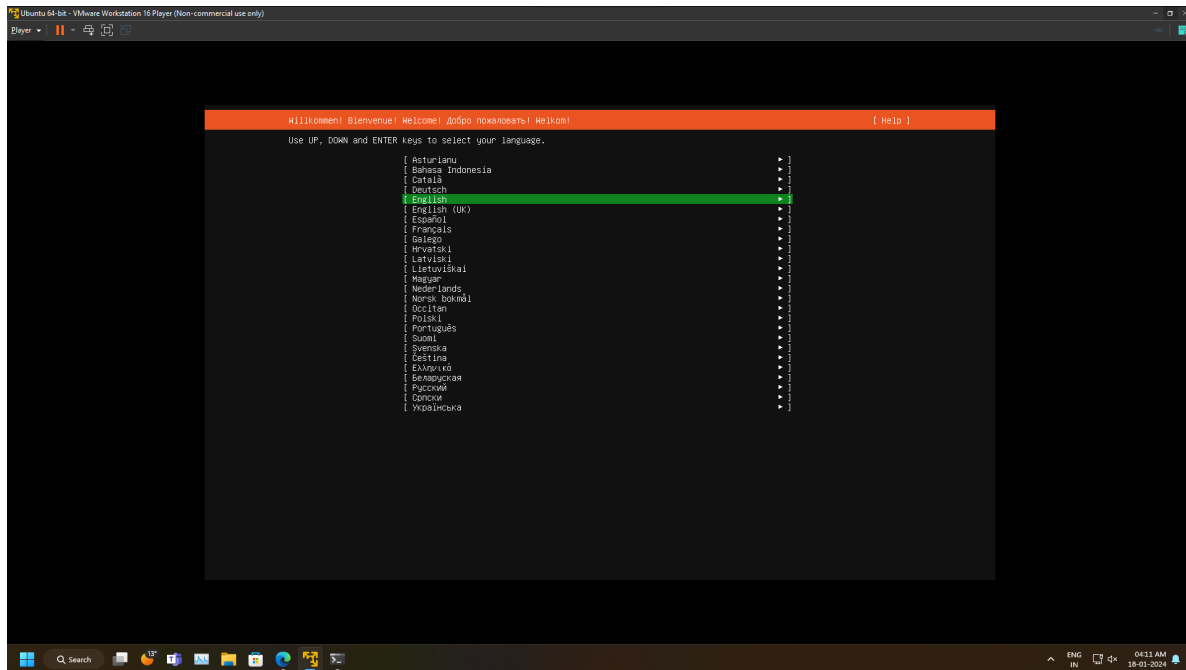


Figure 9:

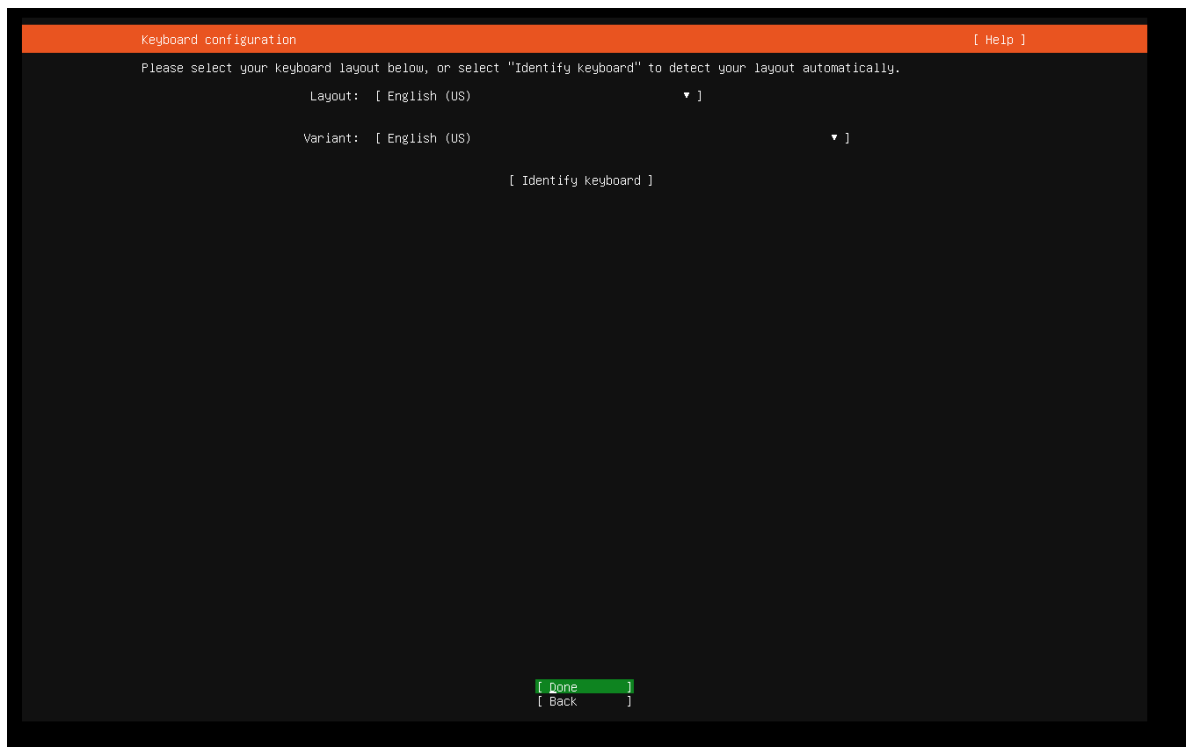


Figure 10:



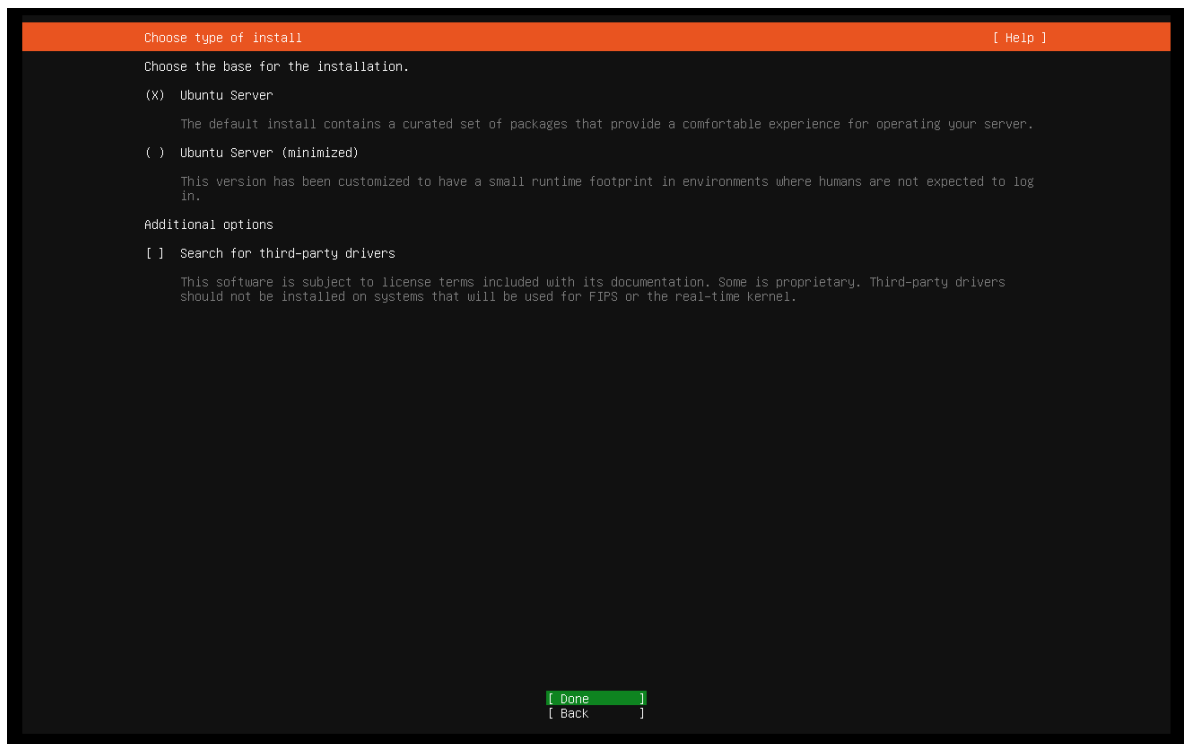


Figure 11:

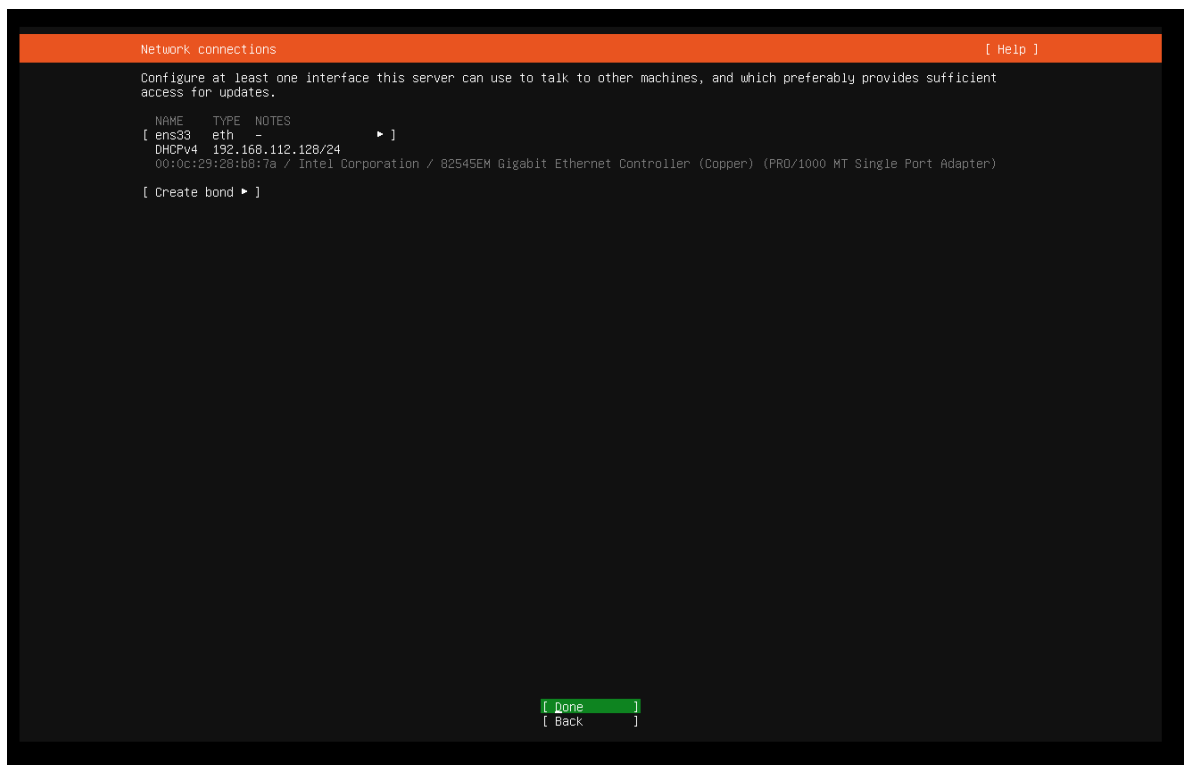


Figure 12:

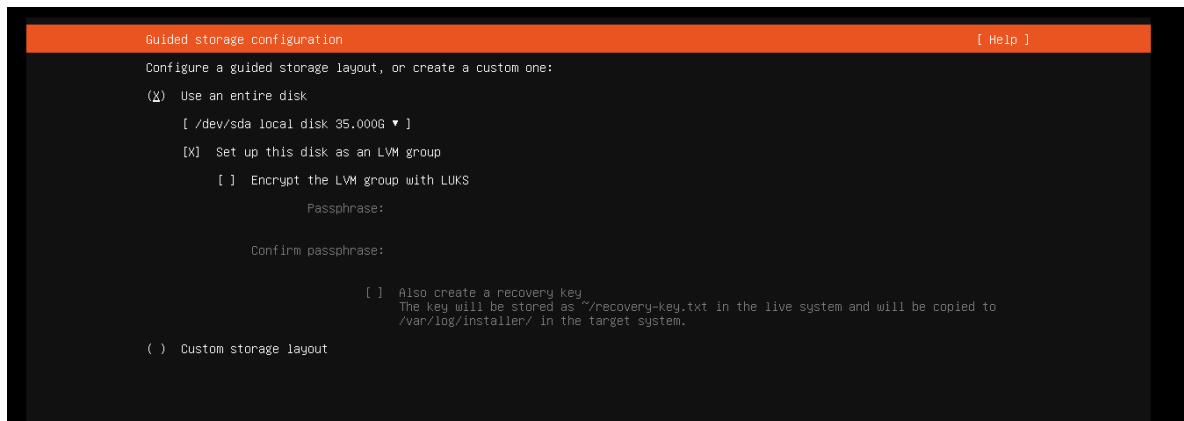


Figure 13:

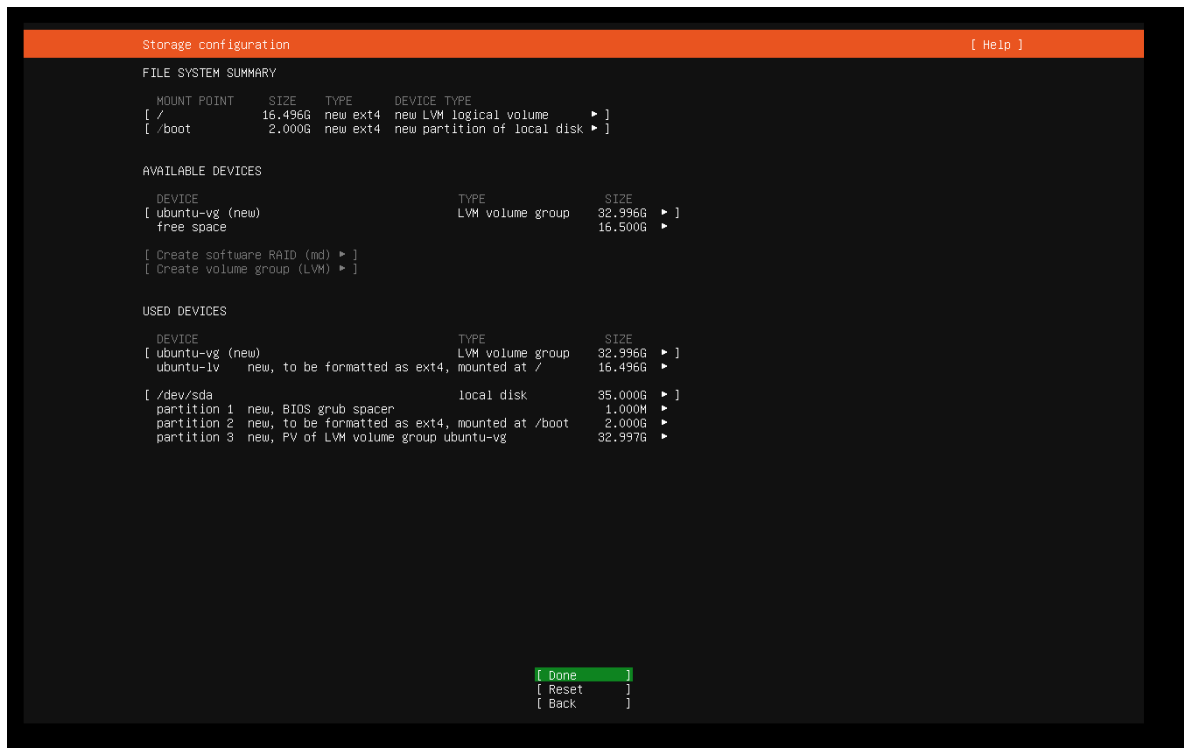


Figure 14:

Profile setup [ Help ]

Enter the username and password you will use to log in to the system. You can configure SSH access on the next screen but a password is still needed for sudo.

Your name:

Your servers name:   
The name it uses when it talks to other computers.

Pick a username:

Choose a password:

Confirm your password:

Figure 15:

Featured Server Snaps [ Help ]

These are popular snaps in server environments. Select or deselect with SPACE, press ENTER to see more details of the package, publisher and versions available.

<input type="checkbox"/>	microk8s	canonical✓	Kubernetes for workstations and appliances	▶
<input type="checkbox"/>	nextcloud	nextcloud✓	Nextcloud Server - A safe home for all your data	▶
<input type="checkbox"/>	wekan	xet7	Open-Source Kanban	▶
<input type="checkbox"/>	kata-containers	katacontainers✓	Build lightweight VMs that seamlessly plug into the containers ecosystem	▶
<input checked="" type="checkbox"/>	docker	canonical✓	Docker container runtime	▶
<input checked="" type="checkbox"/>	canonical-livepatch	canonical✓	Canonical Livepatch Client	▶
<input checked="" type="checkbox"/>	rocketchat-server	rocketchat✓	Rocket.Chat server	▶
<input type="checkbox"/>	mosquitto	mosquitto✓	Eclipse Mosquitto MQTT broker	▶
<input type="checkbox"/>	etcd	canonical✓	Resilient key-value store by CoreOS	▶
<input type="checkbox"/>	powershell	microsoft-powershell✓	PowerShell for every system!	▶
<input type="checkbox"/>	sabnzbd	safihre	SABnzbd	▶
<input checked="" type="checkbox"/>	wormhole	snappcrafters✓	get things from one computer to another, safely	▶
<input checked="" type="checkbox"/>	aws-cli	aws✓	Universal Command Line Interface for Amazon Web Services	▶
<input checked="" type="checkbox"/>	google-cloud-sdk	google-cloud-sdk✓	Google Cloud SDK	▶
<input checked="" type="checkbox"/>	sicli	softlayer	Python based SoftLayer API Tool.	▶
<input checked="" type="checkbox"/>	doctl	digitalocean✓	The official DigitalOcean command line interface	▶
<input checked="" type="checkbox"/>	conjure-up	canonical✓	Package runtime for conjure-up spells	▶
<input checked="" type="checkbox"/>	postgresql10	cnd✓	PostgreSQL is a powerful, open source object-relational database system.	▶
<input checked="" type="checkbox"/>	heroku	heroku✓	CLI client for Heroku	▶
<input type="checkbox"/>	keepalived	keepalived-project✓	High availability VRRP/BFD and load-balancing for Linux	▶
<input type="checkbox"/>	prometheus	canonical✓	The Prometheus monitoring system and time series database	▶
<input type="checkbox"/>	juju	canonical✓	Juju - a model-driven operator lifecycle manager for K8s and machines	▶

Figure 16:

```

Installing system [ Help ]

subiquity/Zdev/apply_autoinstall_config
subiquity/Ad/apply_autoinstall_config
subiquity/Late/apply_autoinstall_config
configuring apt
  curtin command in-target
installing system
  executing curtin install initial step
  executing curtin install partitioning step
  curtin command install
    configuring storage
      running 'curtin block-meta simple'
    curtin command block-meta
      removing previous storage devices
      configuring disk: disk-sda
      configuring partition: partition-0
      configuring partition: partition-1
      configuring format: format-0
      configuring partition: partition-2
      configuring lvm_voigroup: lvm_voigroup-0
      configuring lvm_partition: lvm_partition-0
      configuring format: format-1
      configuring mount: mount-1
      configuring mount: mount-0
  executing curtin install extract step
  curtin command install
    writing install sources to disk
    running 'curtin extract'
    curtin command extract
      acquiring and extracting image from cp:///tmp/tpb1epi7_h/mount
configuring keyboard
  curtin command in-target
executing curtin install curthooks step
  curtin command install
    configuring installed system
      running 'curtin curthooks'
    curtin command curthooks
      configuring apt configuring apt
      installing missing packages
      installing packages on target system: ['grub-pc']
      configuring lscsi service
      configuring raid (mdadm) service
      installing kernel |

[ View full log ]

```

Figure 17:

```

Install complete! [ Help ]

executing curtin install extract step
  curtin command install
    writing install sources to disk
    running 'curtin extract'
    curtin command extract
      acquiring and extracting image from cp:///tmp/tpb1epi7_h/mount
configuring keyboard
  curtin command in-target
executing curtin install curthooks step
  curtin command install
    configuring installed system
      running 'curtin curthooks'
    curtin command curthooks
      configuring apt configuring apt
      installing missing packages
      installing packages on target system: ['grub-pc']
      configuring lscsi service
      configuring raid (mdadm) service
      installing kernel
      setting up swap
      apply networking config
      writing etc/fstab
      configuring multipath
      updating packages on target system
      configuring pollinate user-agent on target
      updating initramfs configuration
      configuring target system bootloader
      installing grub to target devices
final system configuration
  calculating extra packages to install
  installing openssh-server
    retrieving openssh-server
    curtin command system-install
    unpacking openssh-server
    curtin command system-install
  configuring cloud-init
  downloading and installing security updates
  curtin command in-target
  restoring apt configuration
  curtin command in-target
subiquity/Late/run

[ View full log ]
[ Reboot Now ]

```

Figure 18:

```

[ OK ] Started systemd-udev.service - Rule-based Manager for Device Events and Files.
[ OK ] Finished systemd-udev-trigger.service - Coldplug All udev Devices.
[ OK ] Started systemd-ask-password-console.path - Dispatch Password Requests to Console Directory Watch.
[ OK ] Reached target cryptsetup.target - Local Encrypted Volumes.
[ OK ] Found device dev-disk-by\x2duuid-3a48e22b\x2da84f\x2d4897\x2d777303d0cc6e.device - VMware.Virtual.S.2.
[ OK ] Starting systemd-fsck@dev-disk-by\x2duuid-3a48e22b\x2da84f\x2d4897... System Check on /dev/disk/by-uuid/3a48e22b-a84f-4897-ac35-777303d0cc6e...
[ OK ] Started systemd-fsckd.service - File System Check Daemon to report status.
[ OK ] Finished systemd-fsck@dev-disk-by\x2duuid-3a48e22b\x2da84f\x2d4897...le System Check on /dev/disk/by-uuid/3a48e22b-a84f-4897-ac35-777303d0cc6e.
Mounting boot.mount - /boot...
Mounting snap-core22-864.mount - Mount unit for core22, revision 864...
Mounting snap-lxd-25846.mount - Mount unit for lxd, revision 25846...
Mounting snap-snapd-20290.mount - Mount unit for snapd, revision 20290...
[ OK ] Mounted boot.mount - /boot.
[ OK ] Mounted snap-core22-864.mount - Mount unit for core22, revision 864.
[ OK ] Mounted snap-lxd-25846.mount - Mount unit for lxd, revision 25846.
[ OK ] Mounted snap-snapd-20290.mount - Mount unit for snapd, revision 20290.
[ OK ] Reached target snapd.mounts.target - Mounted snaps.
[ OK ] Reached target local-fs.target - Local File Systems.
Starting apparmor.service - Load AppArmor profiles...
Starting console-setup.service - Set console font and keymap...
Starting finalrd.service - Create final runtime dir for shutdown pivot root...
Starting plymouth-read-write.service - Tell Plymouth To Write Out Runtime Data...
Starting systemd-binfmt.service - Set Up Additional Binary Formats...
Starting systemd-tmpfiles-setup.service - Create Volatile Files and Directories...
Starting ufw.service - Uncomplicated firewall...
[ OK ] Finished console-setup.service - Set console font and keymap.
[ OK ] Finished finalrd.service - Create final runtime dir for shutdown pivot root.
[ OK ] Finished plymouth-read-write.service - Tell Plymouth To Write Out Runtime Data.
[ OK ] Finished ufw.service - Uncomplicated firewall.
Mounting proc-sys-fs-binfmt_misc.mount - Arbitrary Executable File Formats File System...
[ OK ] Finished systemd-tmpfiles-setup.service - Create Volatile Files and Directories.
Starting systemd-resolved.service - Network Name Resolution...
[ 7.285379] piix4.smbus 0000:00:07:3: SMBus Host Controller not enabled!
Starting systemd-timesyncd.service - Network Time Synchronization...
Starting systemd-update-utmp.service - Record System Boot/Shutdown in UTMP...
[ OK ] Mounted proc-sys-fs-binfmt_misc.mount - Arbitrary Executable File Formats File System.
[ OK ] Finished systemd-binfmt.service - Set Up Additional Binary Formats.
[ OK ] Finished systemd-update-utmp.service - Record System Boot/Shutdown in UTMP.
[ OK ] Finished apparmor.service - Load AppArmor profiles.
Starting snapd.apparmor.service - Load AppArmor profiles managed internally by snapd...
[ OK ] Started vgauth.service - Authentication service for virtual machines hosted on VMware.
[ OK ] Started open-vm-tools.service - Service for virtual machines hosted on VMware.
Starting cloud-init-local.service - Initial cloud-init job (pre-networking)...
[ OK ] Started systemd-timesyncd.service - Network Time Synchronization.
[ OK ] Reached target time-set.target - System Time Set.
[ OK ] Started systemd-resolved.service - Network Name Resolution.
[ OK ] Reached target nss-lookup.target - Host and Network Name Lookups.
[ OK ] Finished snapd.apparmor.service - Load AppArmor profiles managed internally by snapd.
[ OK ] Listening on systemd-rfkill.socket - Load/Save RF Kill Switch Status /dev/rfkill Match.

```

Figure 19:

```
Ubuntu 23.10 krishnarajcislab1 tty1

krishnarajcislab1 login: Krishnaraj
Password:

Login incorrect
krishnarajcislab1 login: krishnarajcislab1
Password:
Welcome to Ubuntu 23.10 (GNU/Linux 6.5.0-14-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Thu Jan 18 04:47:04 AM UTC 2024

System load:  0.88               Processes:            271
Usage of /:   23.5% of 16.07GB   Users logged in:     0
Memory usage: 15%               IPv4 address for ens33: 192.168.112.128
Swap usage:   0%

42 updates can be applied immediately.
To see these additional updates run: apt list --upgradable


The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

krishnarajcislab1@krishnarajcislab1:~$ _
```

Figure 20:



## 5 FAQs

### 1. Explain the concept of Virtual Machine and How it differs from Physical Machine:

- **Virtual Machine (VM):** A virtual machine is a software-based emulation of a physical computer that runs an operating system and applications. It operates in an isolated environment from the host system and can be configured with specific hardware resources.
- **Differences from Physical Machine:**
  - **Hardware Independence:** VMs are not tied to specific physical hardware and can be easily moved or replicated across different host systems.
  - **Isolation:** Each VM operates independently from other VMs and the host system, providing a secure and isolated environment for running applications.
  - **Resource Allocation:** VMs can be allocated specific amounts of CPU, memory, storage, and network resources, allowing for efficient utilization and optimization of hardware resources.
  - **Snapshots and Cloning:** VMs support features like snapshots and cloning, allowing users to capture the state of a VM at a particular point in time and create identical copies for testing or backup purposes.

### 2. Software or Packages for Ubuntu Server VM Experimentation:

- **Apache Web Server:** For hosting websites or web applications.
- **MySQL or PostgreSQL:** Relational database management systems for storing and managing data.
- **Node.js or Python:** Programming languages and runtime environments for developing and running server-side applications.
- **Docker:** Containerization platform for packaging and deploying applications.
- **Git:** Version control system for managing project code.
- **OpenSSH:** Secure shell protocol for remote access and administration of the server.
- **Nginx:** Web server and reverse proxy for serving static content or load balancing.

### 3. Configuration Options for Ubuntu Server VM in VMware Workstation:

- **Hardware Resources:** Allocate CPU cores, RAM, disk space, and network adapters to the VM.
- **Operating System Installation:** Select the Ubuntu Server ISO image for installation.
- **Network Settings:** Choose between bridged, NAT, or host-only networking modes.
- **Storage Options:** Create virtual disks and configure storage settings such as disk type (e.g., SATA, SCSI), size, and location.
- **VM Hardware Compatibility:** Choose the hardware compatibility level for the VM, which determines the virtual hardware features available.
- **Integration Features:** Enable or disable features like VMware Tools, which enhance VM performance and integration with the host system.



#### 4. Utilization of Hardware Virtualization Technologies by VMware Workstation:

- **Processor Virtualization:** VMware Workstation leverages hardware-assisted virtualization technologies such as Intel VT-x and AMD-V to offload virtualization tasks to the CPU, improving performance and efficiency.
- **Memory Management:** Hardware virtualization assists in efficiently managing memory resources, allowing VMs to access physical memory directly and reducing overhead associated with memory management.
- **I/O Virtualization:** Virtualization technologies optimize I/O operations by providing direct access to physical devices from within the VM, enhancing disk and network performance.
- **Virtualization Extensions:** VMware Workstation supports hardware virtualization extensions such as Intel VT-d and AMD-Vi for improved security and isolation of VMs.

#### 5. Handling Installation of Ubuntu Server OS in VMware Workstation:

- **Create New Virtual Machine:** Use the New Virtual Machine Wizard to set up a new VM.
- **Select Guest Operating System:** Choose Ubuntu Server as the guest OS.
- **Allocate Resources:** Assign CPU cores, memory, and storage for the VM.
- **Configure Network:** Select network settings such as bridged, NAT, or host-only.
- **Install Ubuntu Server:** Mount the Ubuntu Server ISO image and boot the VM to begin the installation process.
- **Follow Installation Steps:** Proceed with the installation by following the on-screen prompts, including disk partitioning, user account setup, and package selection.
- **Install VMware Tools:** After installation, install VMware Tools to enhance VM performance and integration with the host system.

## 6 Conclusion

In this assignment, we have learnt about VMWare and how to use it. We have also learnt how to install Ubuntu Server on VMWare Workstation. This will help us in understanding virtualization and cloud computing concepts better.

## **References**

- [1] Cloud Computing Concepts Overview. Accessed from: <https://www.ibm.com/cloud/learn/cloud-computing-concepts>
- [2] Benefits of Virtualization. Accessed from: <https://www.vmware.com/topics/glossary/content/virtualization>