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Class: BSE- VA

Roll No: 2023-BSE-031

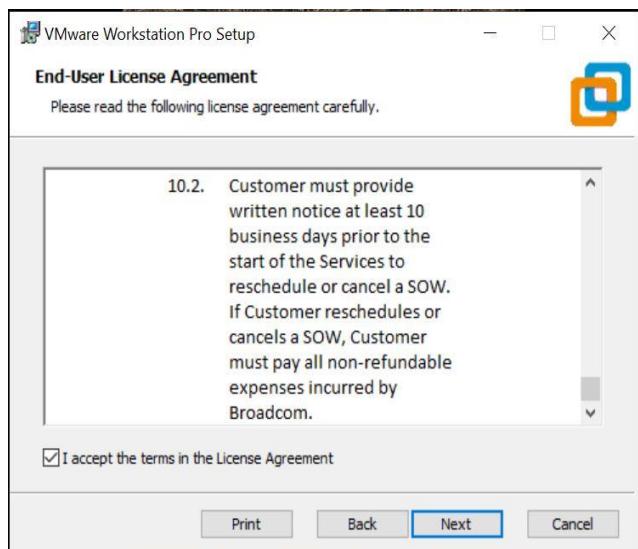
CLOUD COMPUTING

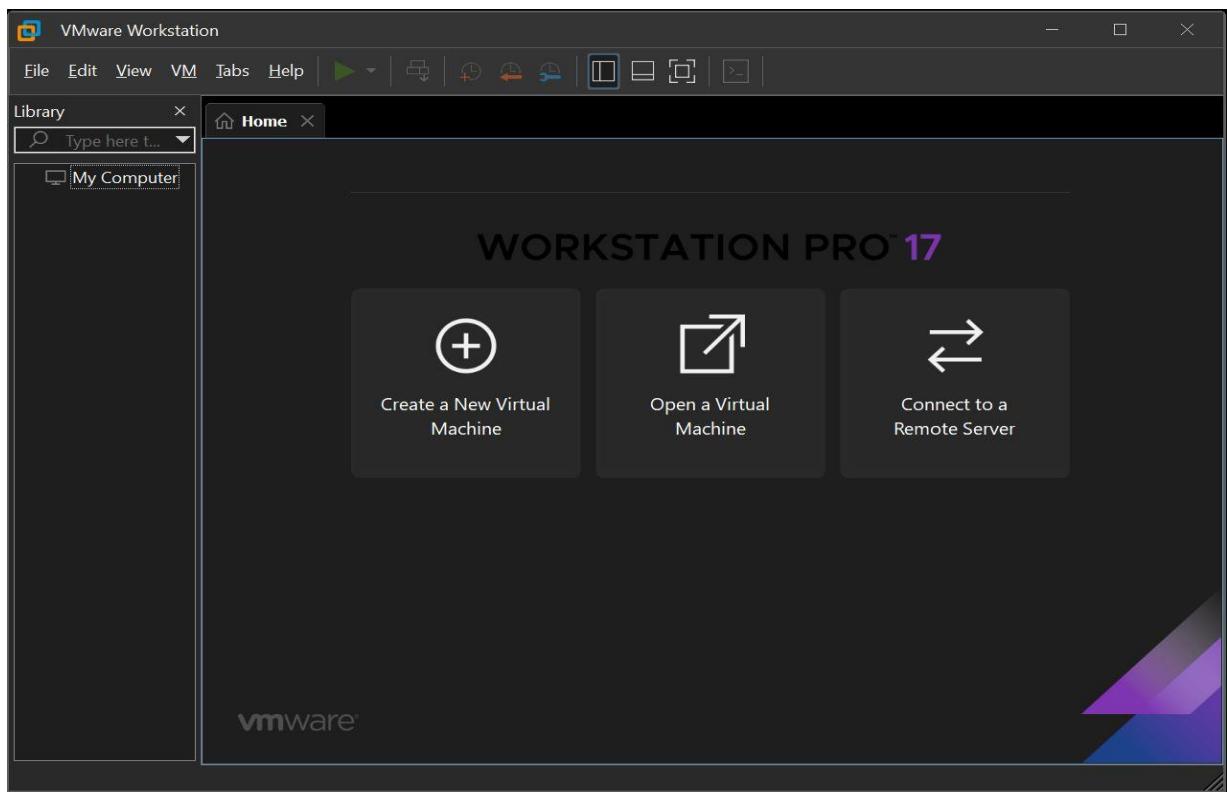
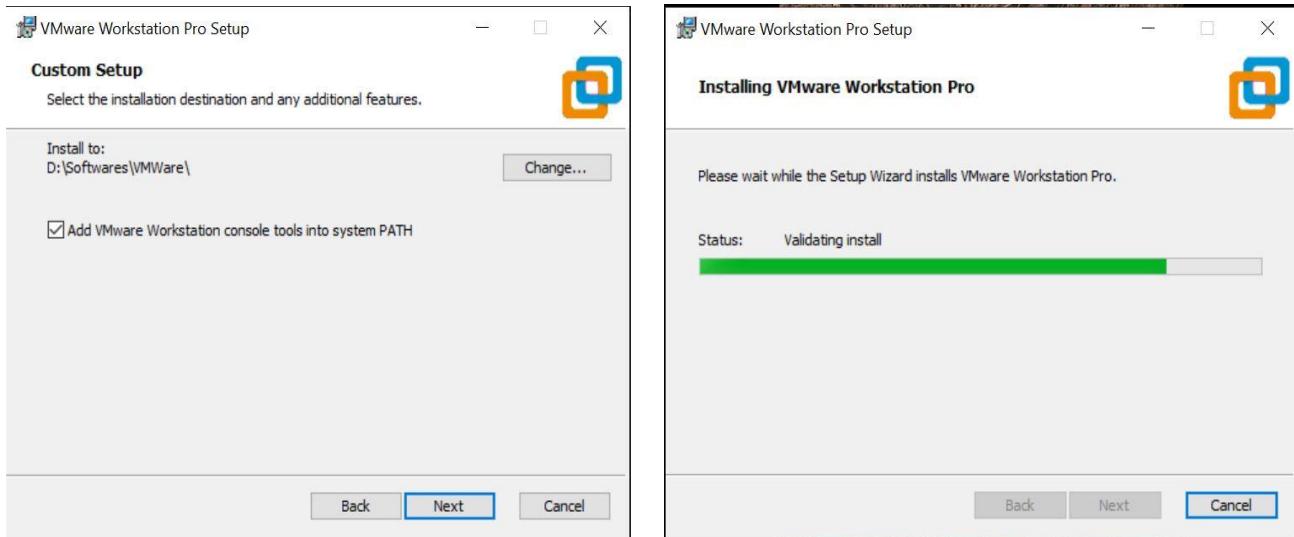
LAB 01



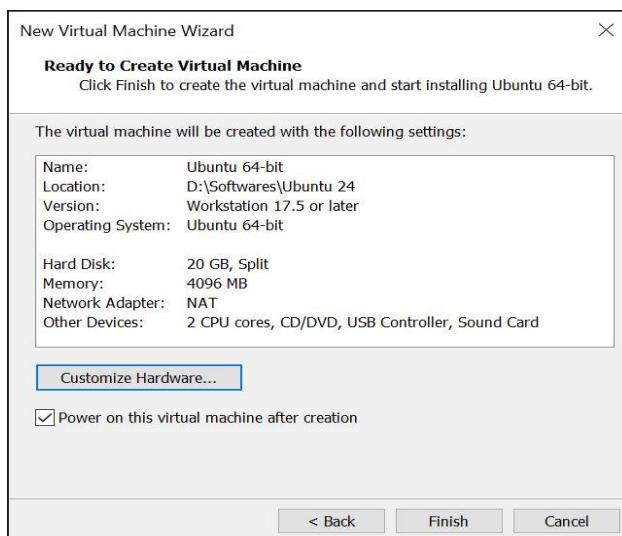
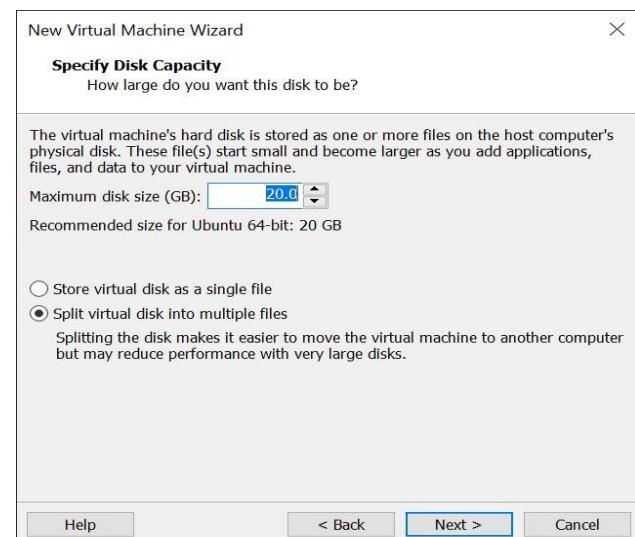
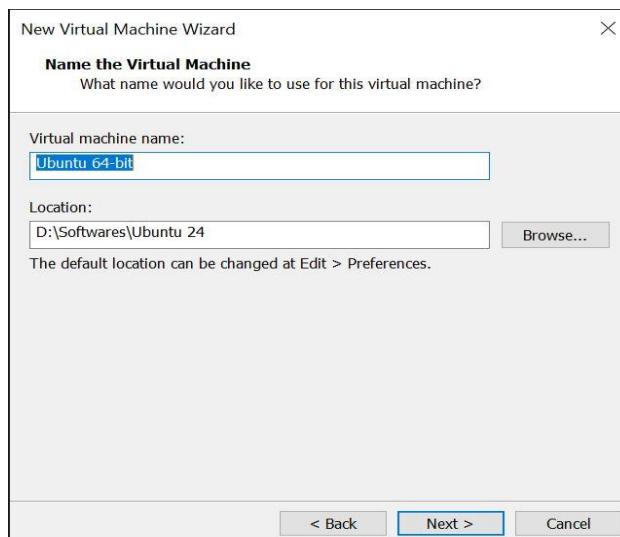
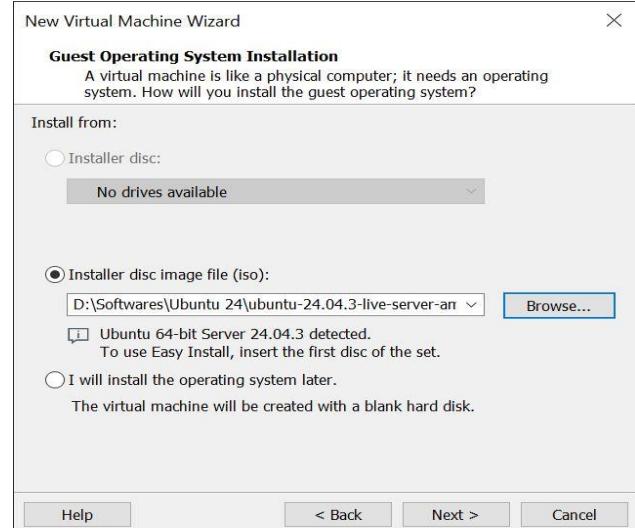
INSTALL UBUNTU SERVER:

First of all, we'll download VMware Workstation Pro,





We'll click on 'Create a new machine',

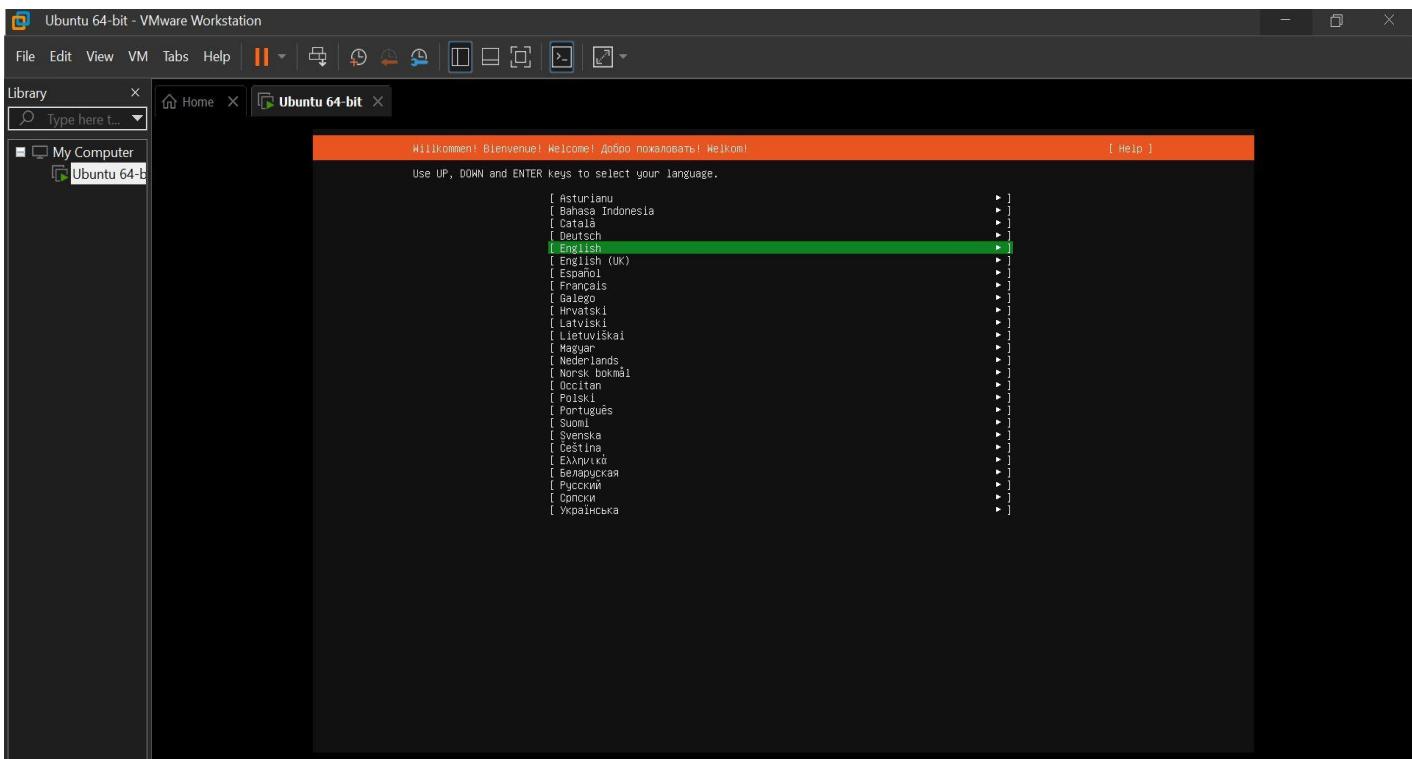


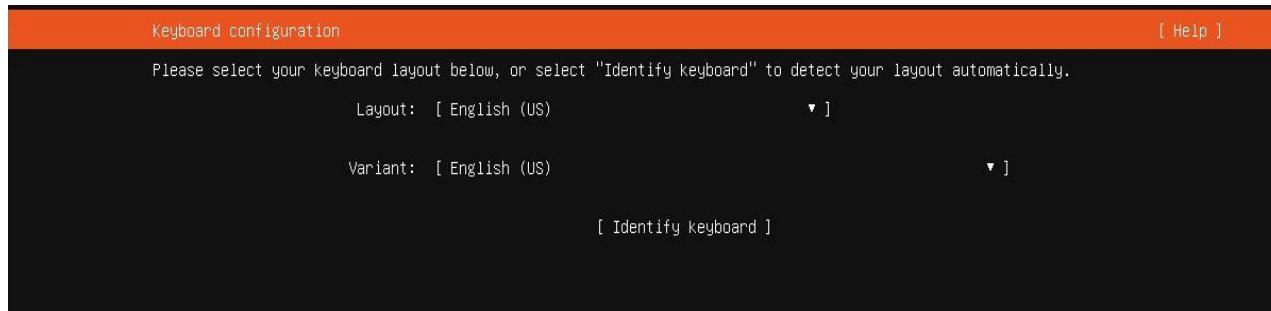
Clicking Finish will create a Virtual Machine.

```
Ubuntu 64-bit - VMware Workstation
File Edit View VM Tabs Help ||| Library Home Ubuntu 64-bit

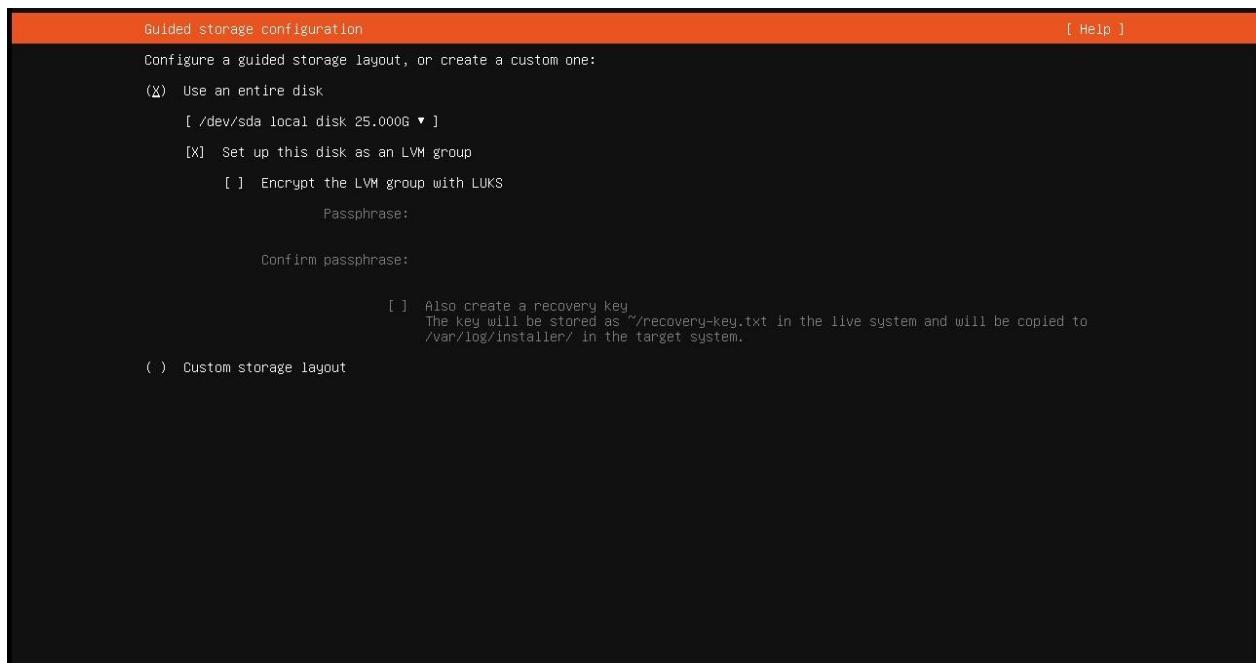
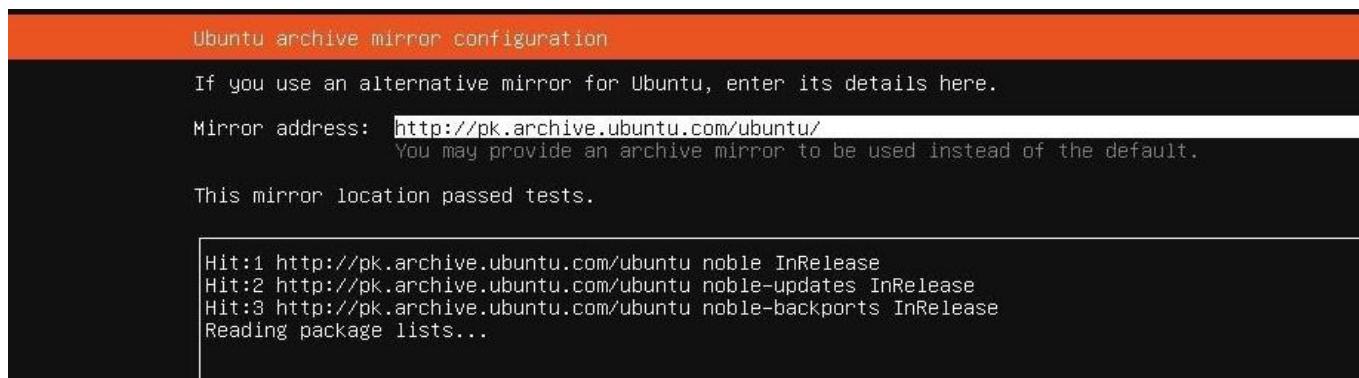
[ OK ] Starting systemd-tmpfiles-setup-se-volatile Files and Directories...
[ OK ] Finished systemd-bootfs-service - Set Up Additional Binary Formats.
[ OK ] Finished systemd-tmpfiles-setup-se-volatile Files and Directories.
Starting systemd-journal-catalog-u-service - Rebuild Journal Catalog...
Starting systemd-journald - Network Journal...
Starting systemd-timesyncd.service - Network Time Synchronization...
Starting Systemd-Update-Unit@.service System Boot/Shutdown in UTM...
[ OK ] Started vsauth.service - Authentic virtual machine hosted on VMware.
[ OK ] Started open-iscsi.service - Set up iSCSI Initiator on VMware.
Starting Cloud-init-local.service - Local Stage (pre-network)...
[ OK ] Finished systemd-journal-catalog-u.service - Rebuild Journal Catalog.
[ OK ] Finished Systemd-Update-Unit@.service System Boot/Shutdown in UTM...
[ OK ] Reached target local-block-devices - Local Block Devices.
[ OK ] Started system-timesyncd.service - Network Time Synchronization...
[ OK ] Reached target time-set.target - System Time Set.
[ OK ] Started systemd-ask-password-console.service - Ask Password to Console Directory Watch.
[ OK ] Reached target userangers.target - Userangers...
[ OK ] Started systemd-resolved.service - Network Name Resolution...
[ OK ] Reached target nss-lookup.target - Host and Network Name Lookups...
[ OK ] Finished snapd-upmon.service - Online manager internally by snapd...
[ OK ] Finished apt-daily-upgrade.service - Daily apt download activities...
Starting systemd-update-done.service - Update is Completed...
[ OK ] Finished systemd-update-done.service - Update is Completed.
[ 20.09.2021 11:47:11] [OK] 20.09.2021 11:47:11] [OK]
[ OK ] Reached target sound-target - Sound Card...
[ OK ] Listening on systemd-rfkill.socket - Load/Save RF Kill Switch Status /dev/rfkill Watch.
[ OK ] Finished cloud-init-local.service - Cloud-init: Local Stage (pre-network)...
[ OK ] Reached target network-pre.target - Prepare Network...
Starting systemd-networkd-wait-online.service - Network Configuration...
[ OK ] Started systemd-networkd.service - Network Configuration...
[ OK ] Reached target network.target - Network...
[ OK ] Reached target network-online.target - Network is Online...
Starting cloud-init.service - Cloud-init: Network Stage...
[ OK ] Finished cloud-init.service - Cloud-init: Network Stage...
[ OK ] Reached target network-online.target - Network is Online...
[ OK ] Reached target sysinit.target - System Initialization...
[ OK ] Started apt-daily.timer - Daily apt download activities...
[ OK ] Started apt-daily-upgrade.timer - Daily apt download activities...
[ OK ] Started dkg-db-backup.timer - daily dpg database backup timer...
[ OK ] Started e2scrub_all.timer - Periodic ext4 Online Metadata Check for All Filesystems...
[ OK ] Started fsckfs.timer - Run fsck on unused filesystem blocks once a week...
[ OK ] Started sound-refresh.timer - Refresh sound configuration regularly...
[ OK ] Started logrotate.timer - Daily rotation of log files...
[ OK ] Started man-db.timer - Daily man-db regeneration...
[ OK ] Started monitstat-collect.timer - Run monitstat activity accounting tool every 10 minutes...
[ OK ] Started sysstat-summary.timer - Generate summary of yesterday's process accounting.
```

Now, selecting Language and Keyboard:





The installation continues as follows,



```
Storage configuration [ Help ]  
FILE SYSTEM SUMMARY  
MOUNT POINT SIZE TYPE DEVICE TYPE  
[ / 11.496G new ext4 new LVM Logical Volume ► ]  
[ /boot 2.000G new ext4 new partition of local disk ► ]  
  
AVAILABLE DEVICES  
DEVICE TYPE SIZE  
[ ubuntu-vg (new) LVM volume group 22.996G ► ]  
free space 11.500G ►  
[ Create software RAID (md) ► ]  
[ Create volume group (LVM) ► ]  
  
USED DEVICES  
DEVICE TYPE SIZE  
[ ubuntu-vg (new) LVM volume group 22.996G ► ]  
ubuntu-lv new, to be formatted as ext4, mounted at / 11.496G ►  
[ /dev/sda local disk 25.000G ► ]  
partition 1 new, BIOS grub spacer 1.000M ►  
partition 2 new, to be formatted as ext4, mounted at /boot 2.000G ►  
partition 3 new, PV of LVM volume group ubuntu-vg 22.997G ►
```

— Confirm destructive action —
Selecting Continue below will begin the installation process and result in the loss of data on the disks selected to be formatted.
You will not be able to return to this or a previous screen once the installation has started.
Are you sure you want to continue?
[No] [Continue]

```
Installing system [ Help ]  
subiquity/load_cloud_config/extract_autoinstall:  
subiquity/Early/apply_autoinstall_config:  
subiquity/Reporting/apply_autoinstall_config:  
subiquity/Error/apply_autoinstall_config:  
subiquity/Userdata/apply_autoinstall_config:  
subiquity/Package/apply_autoinstall_config:  
subiquity/Debconf/apply_autoinstall_config:  
subiquity/Kernel/apply_autoinstall_config:  
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_volvgroup: lvm_volvgroup-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
```

Installation complete! [Help]

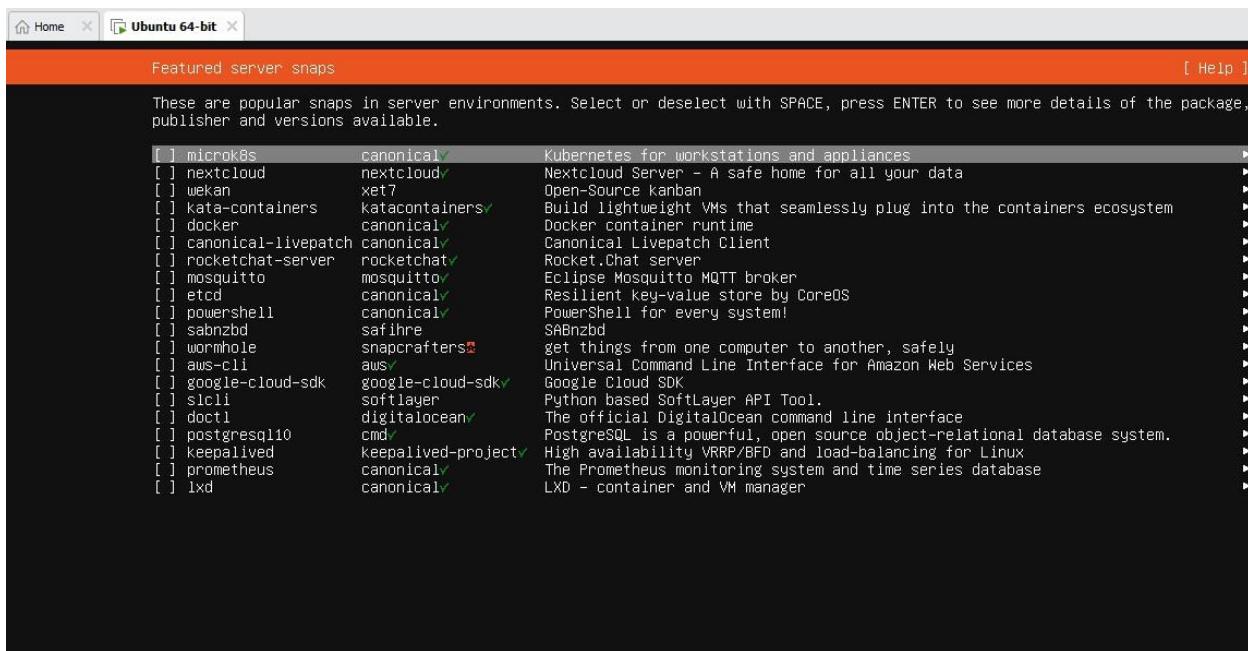
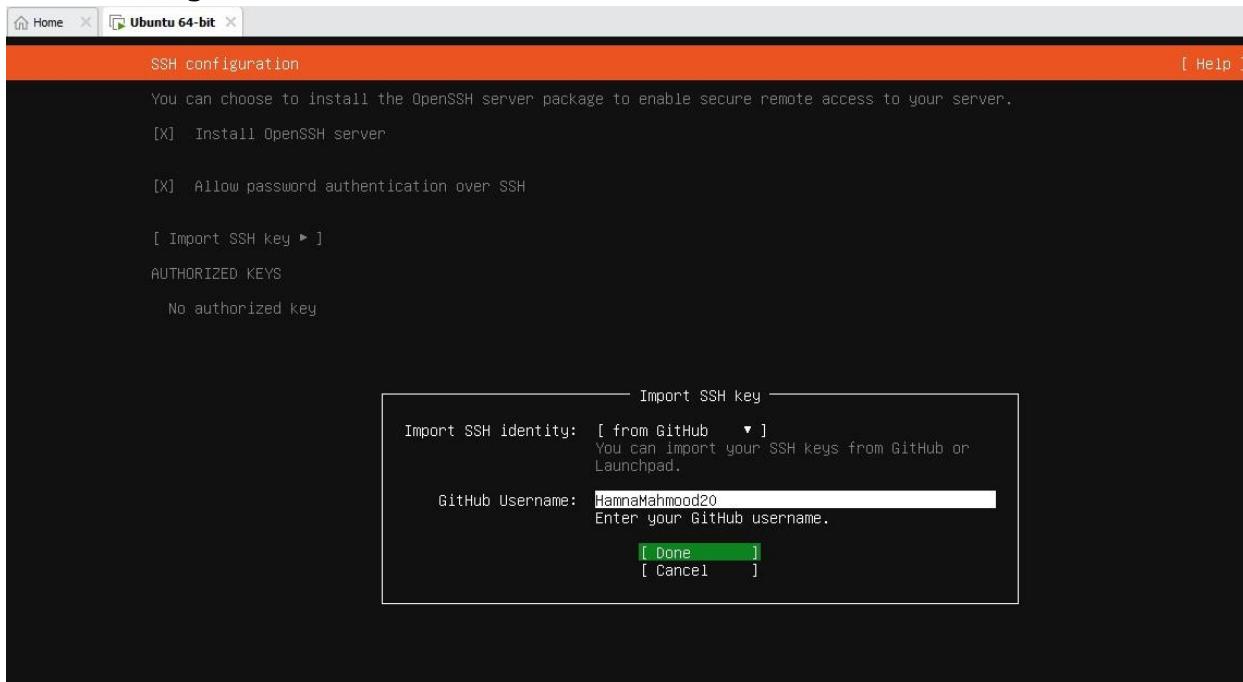
```
configuring mount: mount-0
executing curtin install extract step
curtin command install
writing install sources to disk
running 'curtin extract'
curtin command extract
acquiring and extracting image from cp:///tmp/tmp_mquxeip/mount
configuring keyboard
curtin command in-target
executing curtin install 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 iscsi service
configuring raid (mdadm) service
configuring NVMe over TCP
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
copying metadata from /cdrom
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
restoring apt configuration
subiquity/Late/run:
```

[View full log]
[Reboot Now]

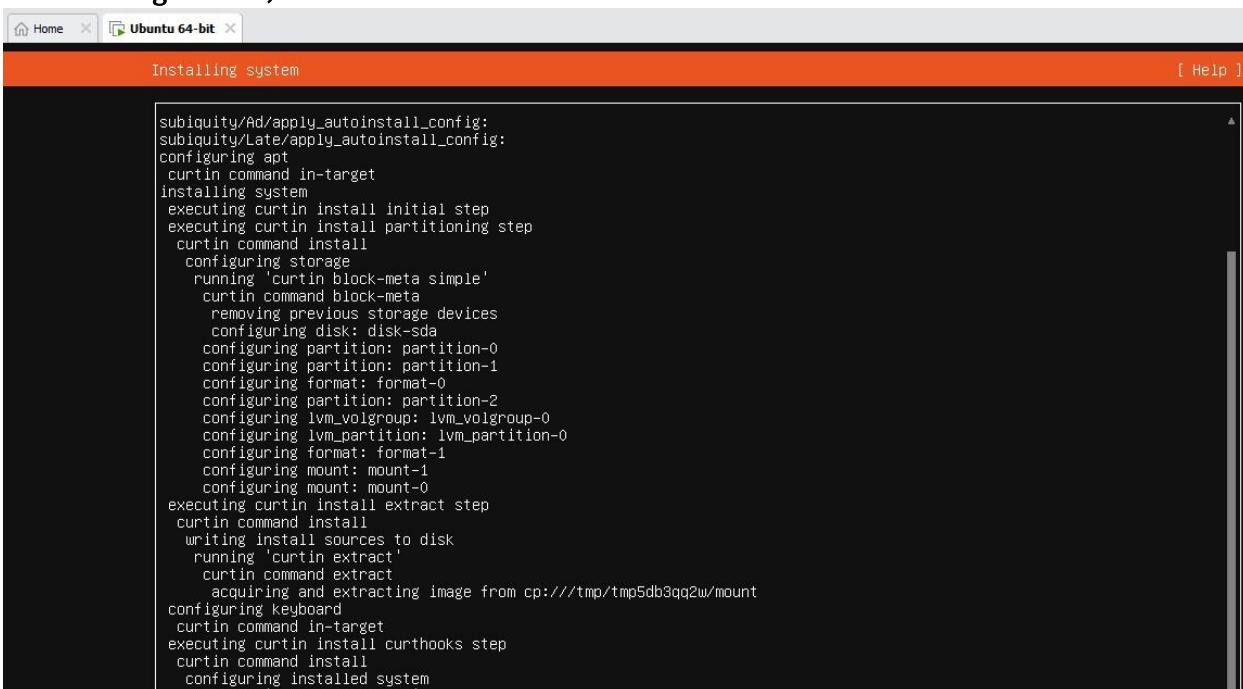
Setting up username and password:



SSH Configuration

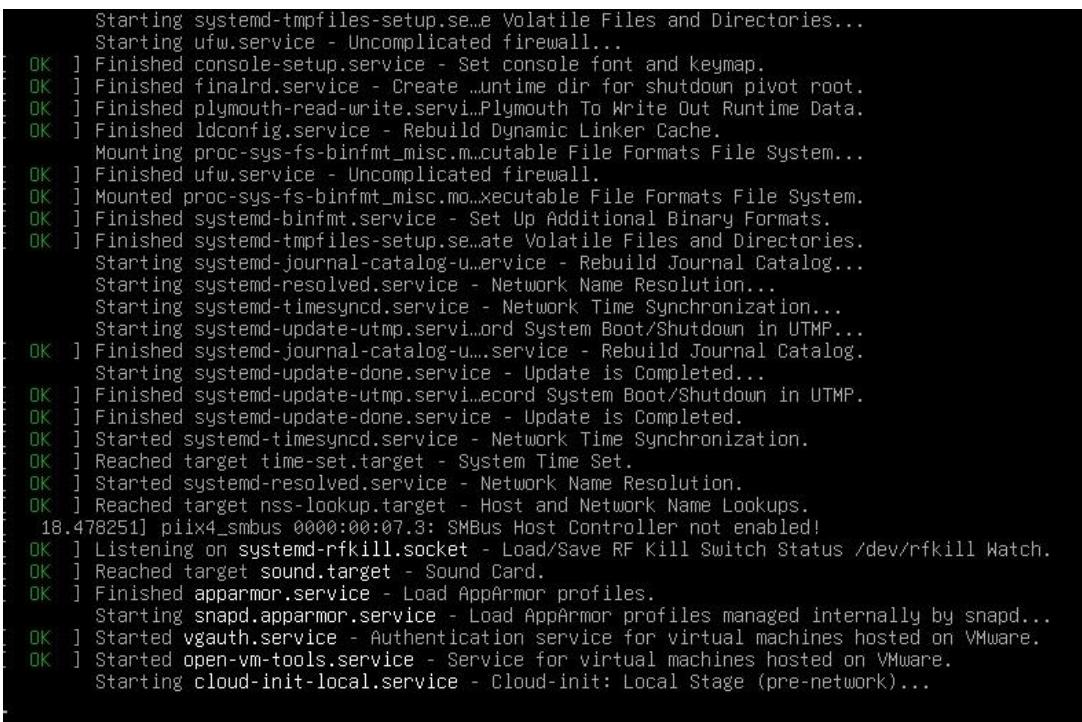


Installing Ubuntu,



The screenshot shows the Ubuntu 64-bit desktop environment. A terminal window titled "Ubuntu 64-bit" is open, displaying the output of the installation process. The title bar also shows "Home" and "[Help]". The terminal window has a black background with white text. The text is a log of the installation steps, starting with "subiquity/Ad/apply_autoinstall_config:" and ending with "configuring installed system".

```
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_volumegroup: lvm_volumegroup-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/tmp5db3qq2w/mount  
configuring keyboard  
    curtin command in-target  
executing curtin install curthooks step  
    curtin command install  
        configuring installed system
```



The screenshot shows a terminal window displaying the final boot logs of the Ubuntu system. The logs show various services starting up, including ufw.service, ldconfig.service, proc-sys-fs-binfmt_misc.service, and systemd-tmpfiles-setup.service. It also shows the start of the journal service and various system time synchronization and update services. The logs end with the start of the cloud-init-local.service.

```
Starting systemd-tmpfiles-setup.se..e Volatile Files and Directories...  
Starting ufw.service - Uncomplicated firewall...  
OK [ ] Finished console-setup.service - Set console font and keymap.  
OK [ ] Finished finalrd.service - Create ..untime dir for shutdown pivot root.  
OK [ ] Finished plymouth-read-write.servi.Plymouth To Write Out Runtime Data.  
OK [ ] Finished ldconfig.service - Rebuild Dynamic Linker Cache.  
Mounting proc-sys-fs-binfmt_misc.m.cutable File Formats File System...  
OK [ ] Finished ufw.service - Uncomplicated firewall.  
OK [ ] Mounted proc-sys-fs-binfmt_misc.mo.xecutable File Formats File System.  
OK [ ] Finished systemd-binfmt.service - Set Up Additional Binary Formats.  
OK [ ] Finished systemd-tmpfiles-setup.se..ate Volatile Files and Directories.  
Starting systemd-journal-catalog-u..ervice - Rebuild Journal Catalog...  
Starting systemd-resolved.service - Network Name Resolution...  
Starting systemd-timesyncd.service - Network Time Synchronization...  
Starting systemd-update-utmp.servi..ord System Boot/Shutdown in UTMP...  
OK [ ] Finished systemd-journal-catalog-u...service - Rebuild Journal Catalog.  
Starting systemd-update-done.service - Update is Completed...  
OK [ ] Finished systemd-update-utmp.servi..ecord System Boot/Shutdown in UTMP.  
OK [ ] Finished systemd-update-done.service - Update is Completed.  
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.  
18.478251] piix4_smbus 0000:00:07.3: SMBus Host Controller not enabled!  
OK [ ] Listening on systemd-rfkill.socket - Load/Save RF Kill Switch Status /dev/rfkill Watch.  
OK [ ] Reached target sound.target - Sound Card.  
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 - Cloud-init: Local Stage (pre-network)...
```

After a few minutes of installation, we are prompted to enter login and password which we set during installation,

```

Ubuntu 24.04.3 LTS ubuntu tty1

ubuntu login: komal_31
Password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-71-generic x86_64)

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

System information as of Thu Oct 2 07:27:30 AM UTC 2025

System load: 0.17           Memory usage: 7%   Processes: 244
Usage of /: 45.7% of 9.75GB Swap usage: 0%   Users logged in: 0

Expanded Security Maintenance for Applications is not enabled.

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

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

```

So Ubuntu is installed on VMWare.

Checking IP address:

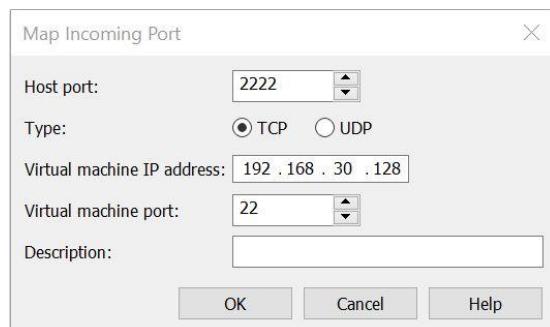
```

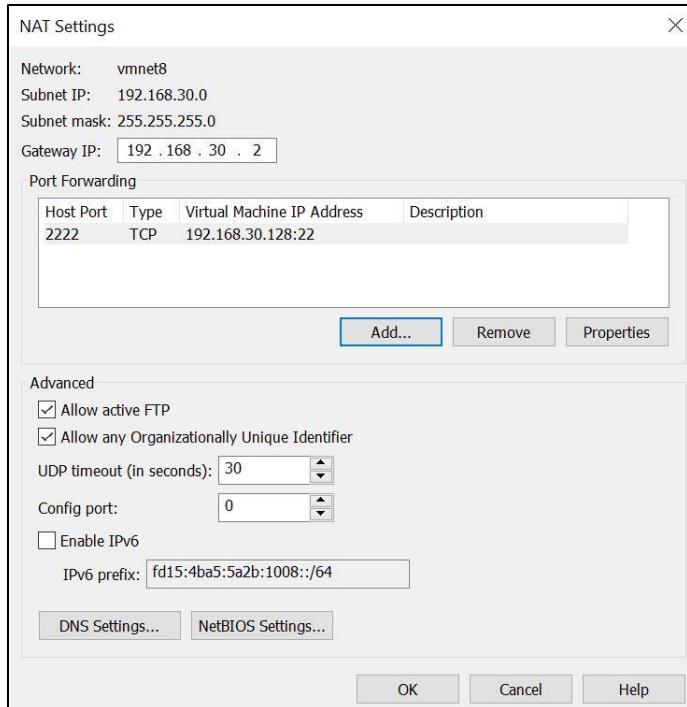
komal_31@ubuntu:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
        inet 127.0.0.1/8 scope host lo
            valid_lft forever preferred_lft forever
            inet6 ::1/128 scope host noprefixroute
                valid_lft forever preferred_lft forever
2: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:f6:a3:8d brd ff:ff:ff:ff:ff:ff
        altname enp2s1
        inet 192.168.30.128/24 metric 100 brd 192.168.30.255 scope global dynamic ens3
            valid_lft 1290sec preferred_lft 1290sec
            inet6 fe80::20c:29ff:fef6:a38d/64 scope link
                valid_lft forever preferred_lft forever

```

Setting up SSH:

Since my PC couldn't connect through ssh <username>@<ip>, I connected it through port forwarding. In Virtual Network Editor, open NAT settings and:





Then on Control Panel:

```
C:\Windows\system32>ssh -p 2222 komal_31@127.0.0.1
The authenticity of host '[127.0.0.1]:2222 ([127.0.0.1]:2222)' can't be established.
ED25519 key fingerprint is SHA256:auOSHasHuCI6xuB/2gJFqsQp2oO13QYPAxD3w74fDDY.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '[127.0.0.1]:2222' (ED25519) to the list of known hosts.
komal_31@127.0.0.1's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-87-generic x86_64)

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

System information as of Tue Aug  5 17:06:09 UTC 2025

System load:  0.88      Processes:          29
Usage of /home: unknown   Users logged in:     0
Memory usage:  5%        IPv4 address for eth0: 10.10.10.2
Swap usage:   0%

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
just raised the bar for easy, resilient and secure K8s cluster deployment.

https://ubuntu.com/engage/secure-kubernetes-at-the-edge

Expanded Security Maintenance for Applications is not enabled.

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

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

koma1_31@ubuntu:~$
```

Now, we are remotely logged into our Virtual Machine using SSH from Control Panel successfully.