Lab 2: OS Installation & Practice on Basic Networking Commands

Theory

Linux

Linux is an open-source, Unix-like operating system kernel that serves as the foundation for a wide range of operating systems, collectively known as Linux distributions (e.g., Ubuntu, Fedora, Debian). It is renowned for its stability, security, and flexibility, making it a popular choice for servers, desktops, and embedded systems. It's open-source nature allows users to freely modify and distribute the software.

Fig: Linux

VirtualBox

VirtualBox is an open-source virtualization software developed by Oracle, allowing users to run multiple operating systems simultaneously on a single physical machine. It supports a wide range of guest OS types and is available on various host platforms, making it a versatile tool for testing, development, and learning environments.

Fig: VirtualBox

VMware

VMware is a leading provider of virtualization solutions, offering products like VMware Workstation and VMware vSphere that enable users to create and manage virtual machines on a single physical host. Known for its robust performance and enterprise-grade features, VMware is widely used in professional IT environments for server consolidation, application testing, and cloud computing.

Fig: VMware

Installing the Virtual Box

Oracle VM Virtual Box is cross-platform virtualization software that allows users to extend their existing computer to run multiple operating systems including Microsoft Windows, Mac OS X, Linux, and Oracle Solaris, at the same time.

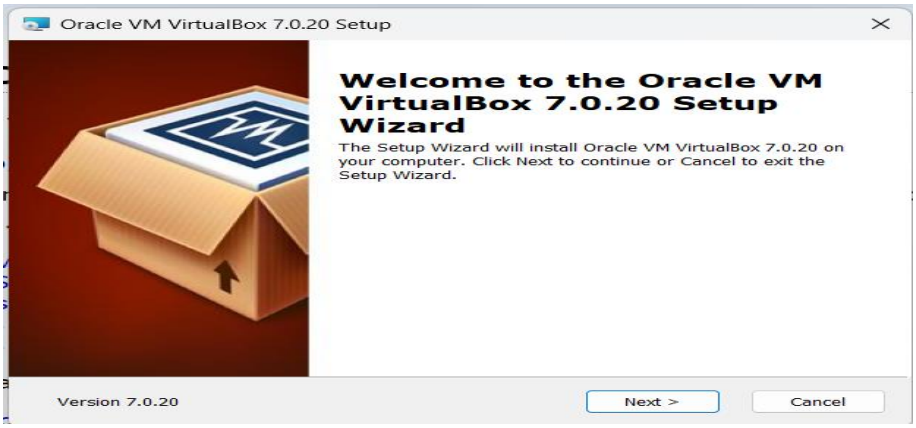

Fig: VirtualBox Setup

Here Click on Next and proceed.
Once Virtual Box is installed then we can create, add or import new VMs using toolbar buttons.

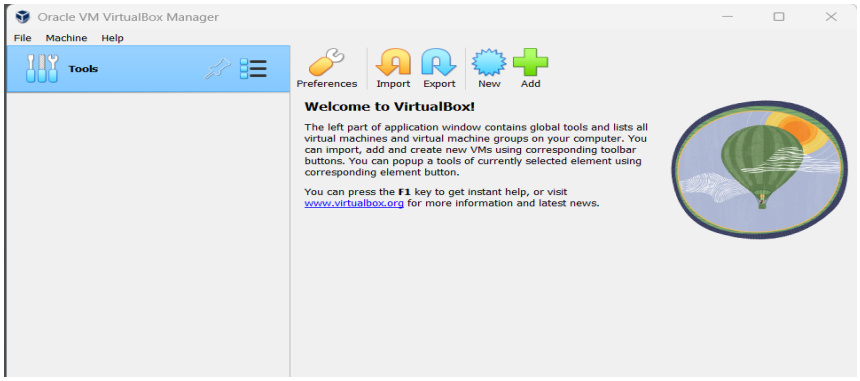

Fig: VirtualBox Manager

Installing Linux (Ubuntu) Desktop OS

Step 1: Click New on Virtual Machine toolbar and add details about the new VM and required OS.

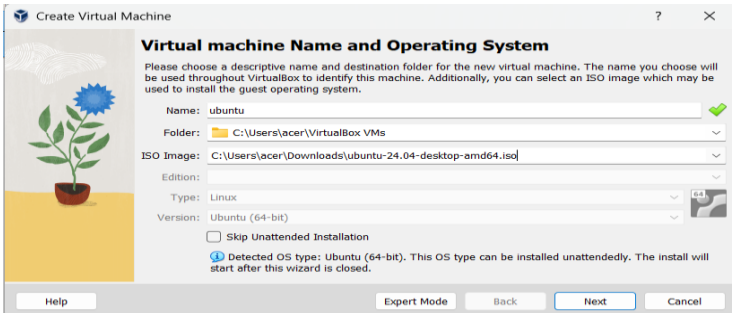

Fig: Virtual Machine Toolbar

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Step 2: Select the Base Memory and Processors to be allocated to the Virtual Machine.

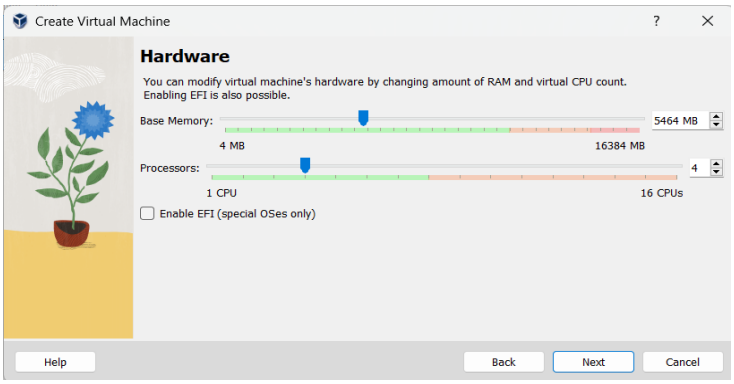

Fig: Base Memory and Processor

Step 3: Select the size of memory to be allocated for Virtual Hard Disk.

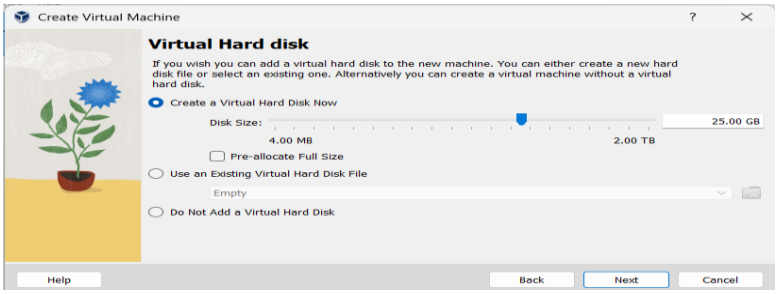

Fig: Allocation of Memory for Virtual Hard Disk

Step 4: This is the interface for the newly created Virtual Machine for Ubuntu Desktop OS. Select Server and Press on **Start** to run the Virtual Machine.

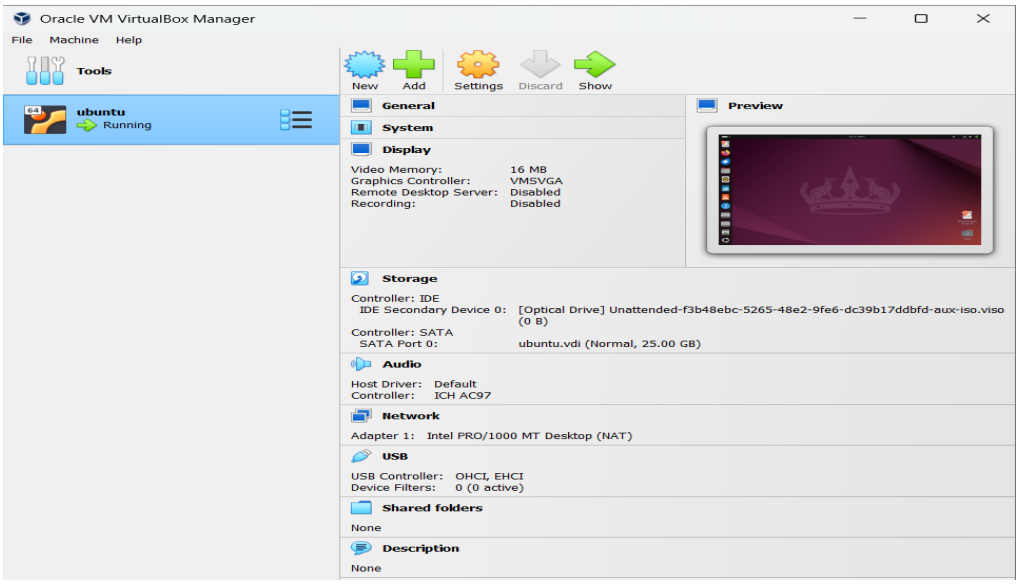

Fig: Ubuntu VM Startup

Step 5: Select the preferred language and click next.

Fig: Selection of language

Step 6: Select the preferred keyboard layout and its variant, click on next once finished.

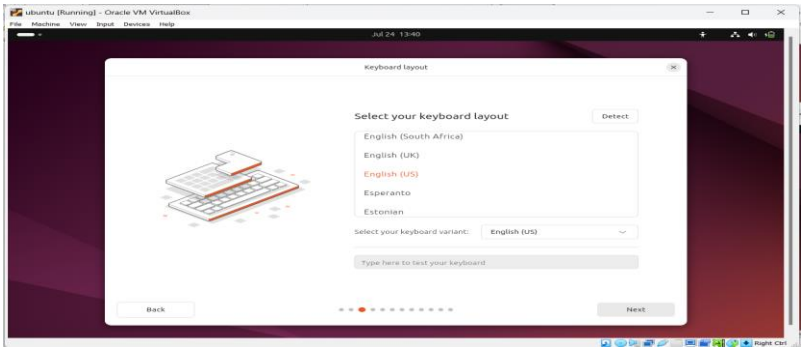

Fig: Selection of keyboard layout

Step 7: Press on install Ubuntu server and click next.

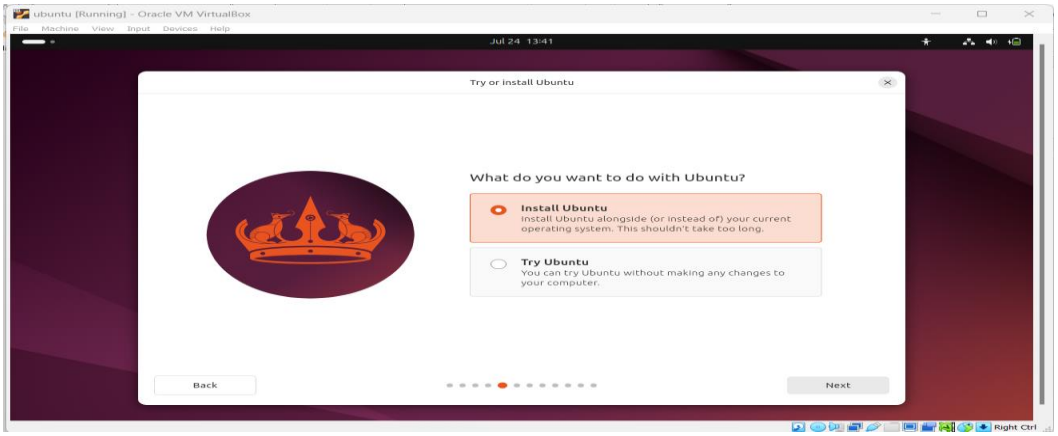

Fig: Ubuntu Installation

Step 8: We will be asked to choose the installation type. Once selected we can click next.

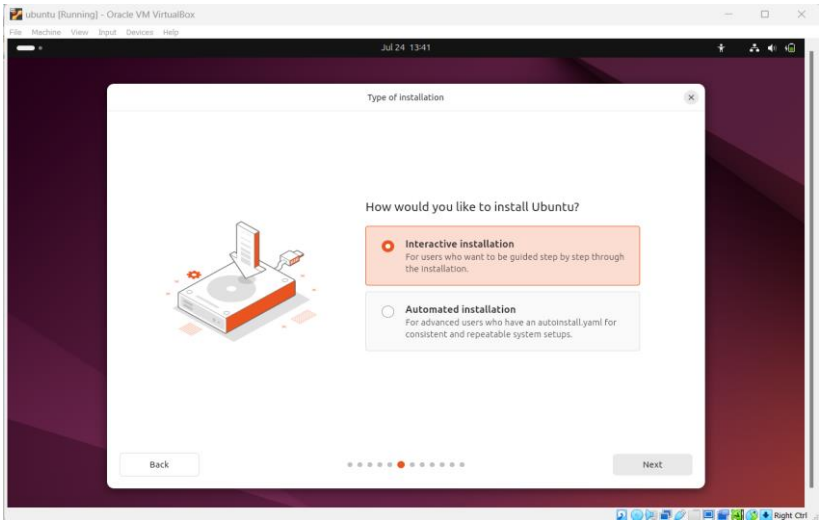

Fig: Selection of Installation type

Step 9: We will be ask to choose apps to install with start. Once selected we can click on next.

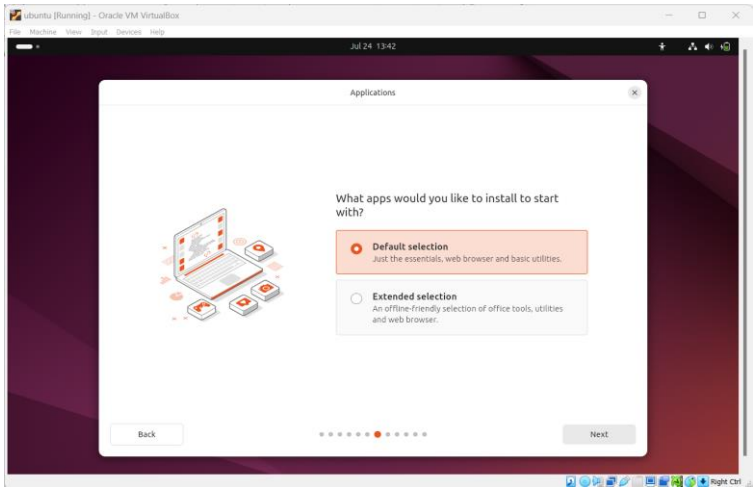

Fig: Choosing Other Software

Step 10: It will prompt us to choose updates for latest version. We can choose or skip the options and click on next.

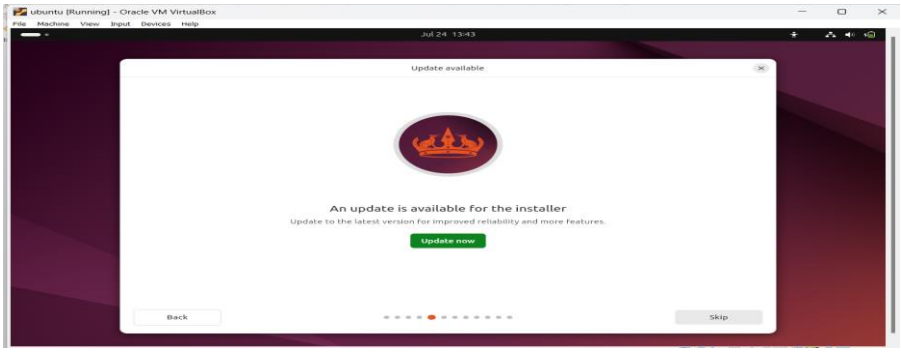

Fig: Update of latest version

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Step 11: We will be ask to install recommended proprietary software. Once selected we can click on next.

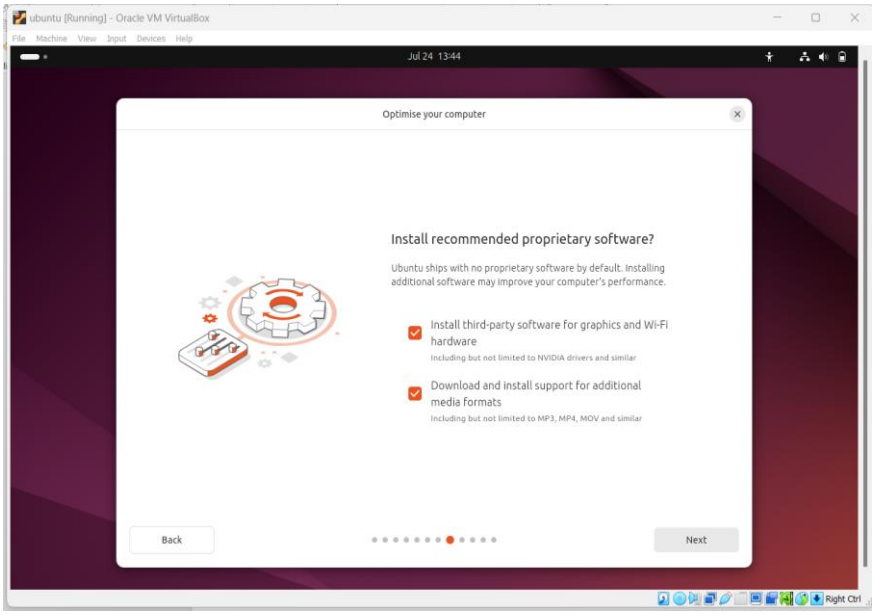

Fig: Installation of recommended proprietary software

Step 12: It will prompts 'How do you want to install Ubuntu'. .Once selected we can click on next.

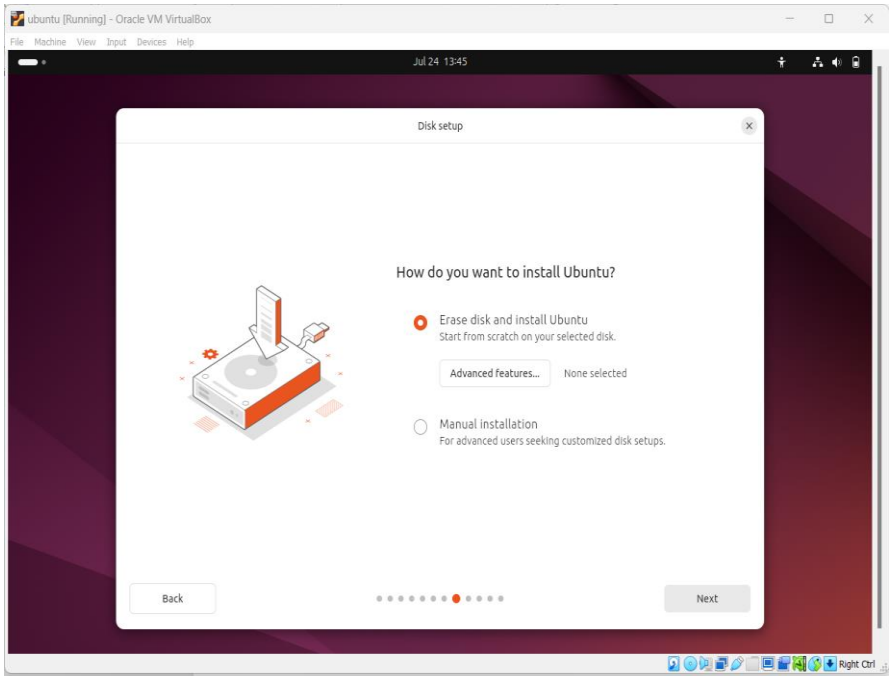

Fig: Choose installation type

Step 13: Setup the profile for the user that includes username, password, computer's name etc. Once finished click on next.

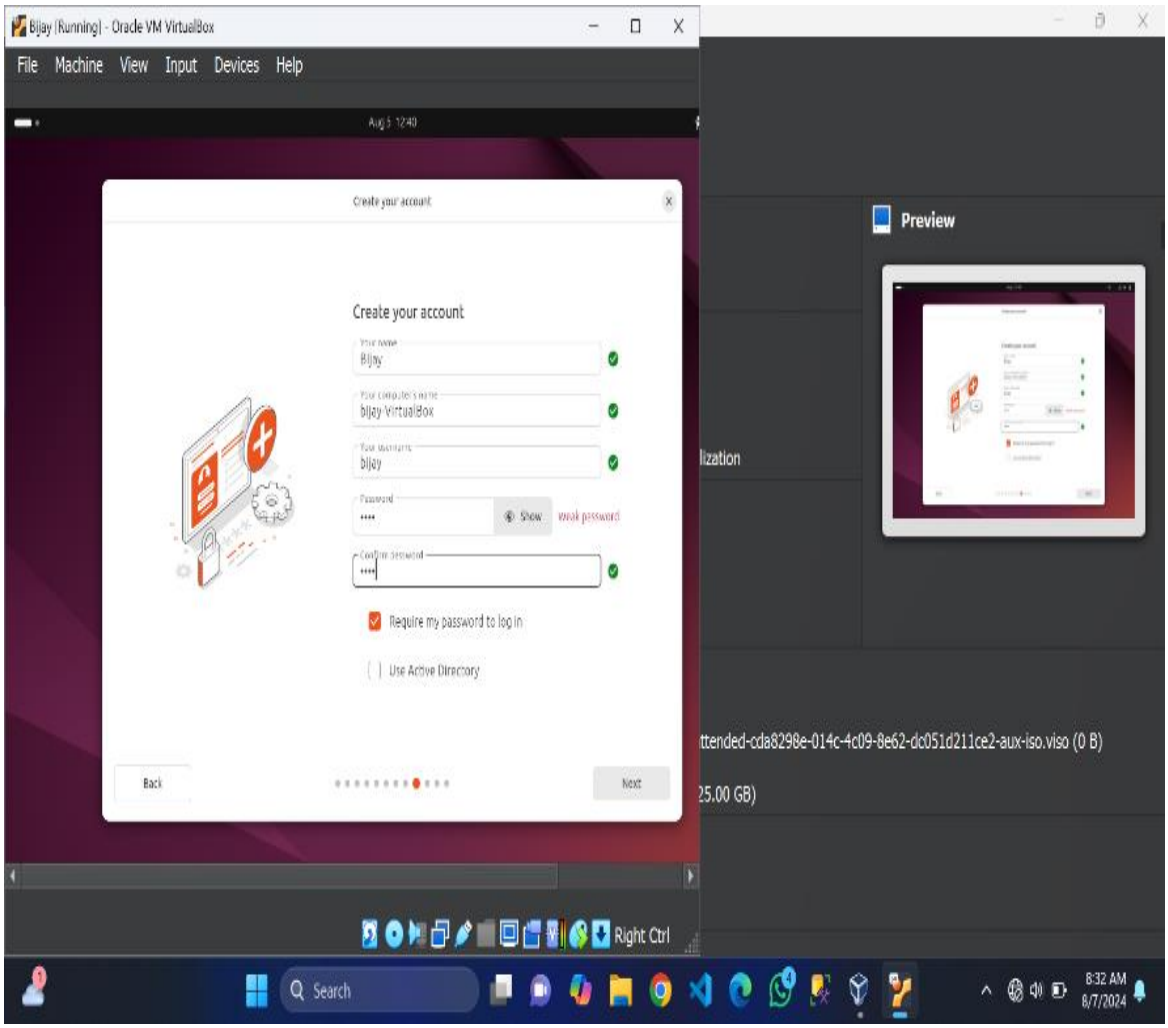

Fig: User profile setup

Step 14: Select the location and press next.

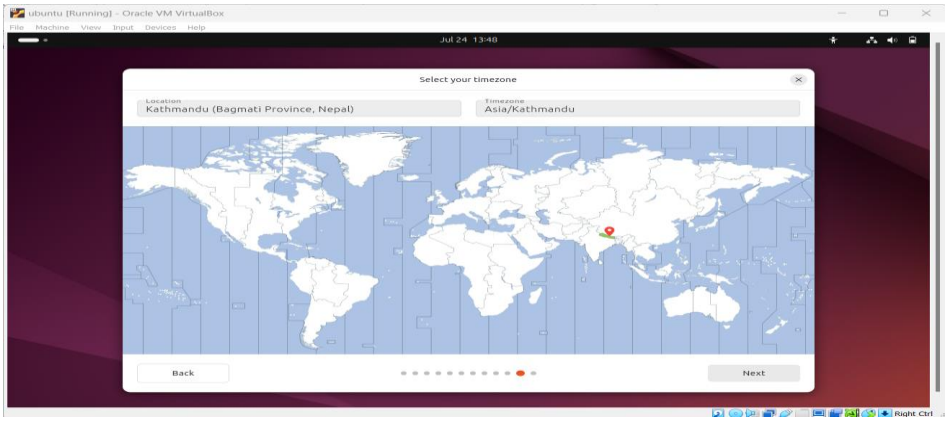

Fig: Selection of location

Step 15: Review all setup choices and click on install.

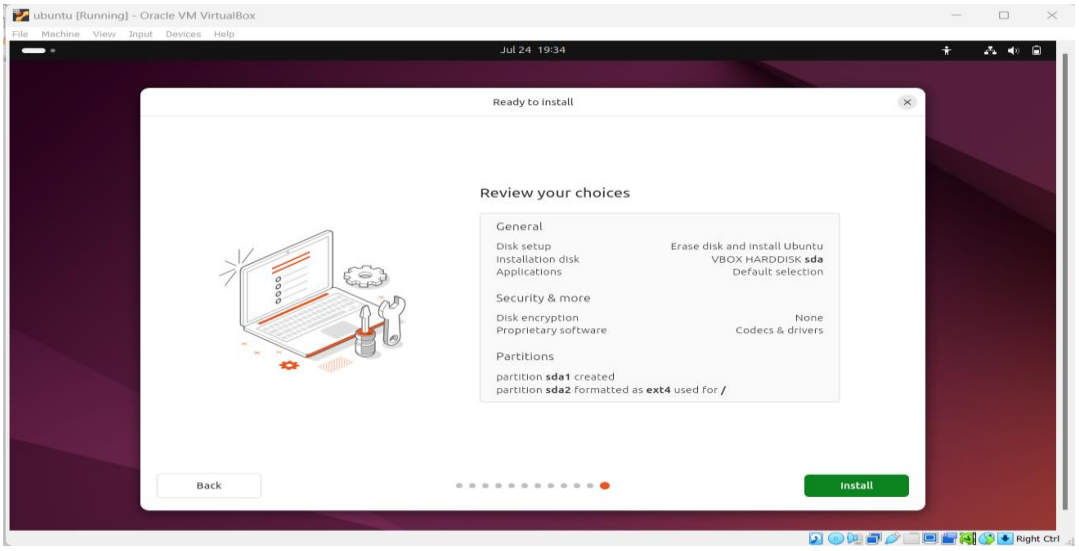

Fig: Review Choices

Step 16: Upon the completion of the installation process, the window on the right will prompt Restart now. Click on restart now for restarting Ubuntu server.

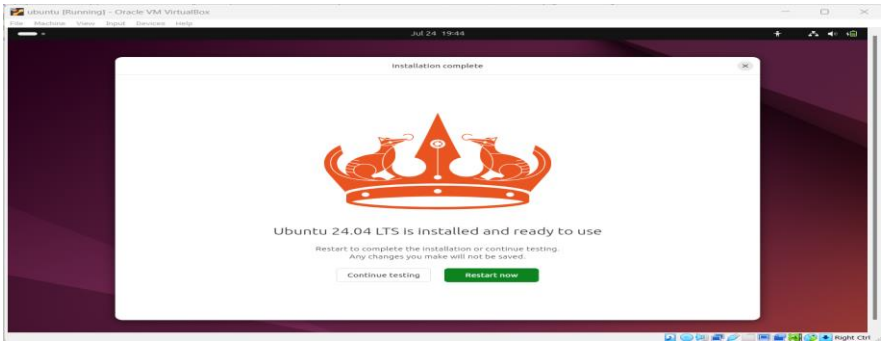

Fig: Completion of installation and ready to restart

Step 17: Now enter the Login details on the screen and press Enter to login into the system.

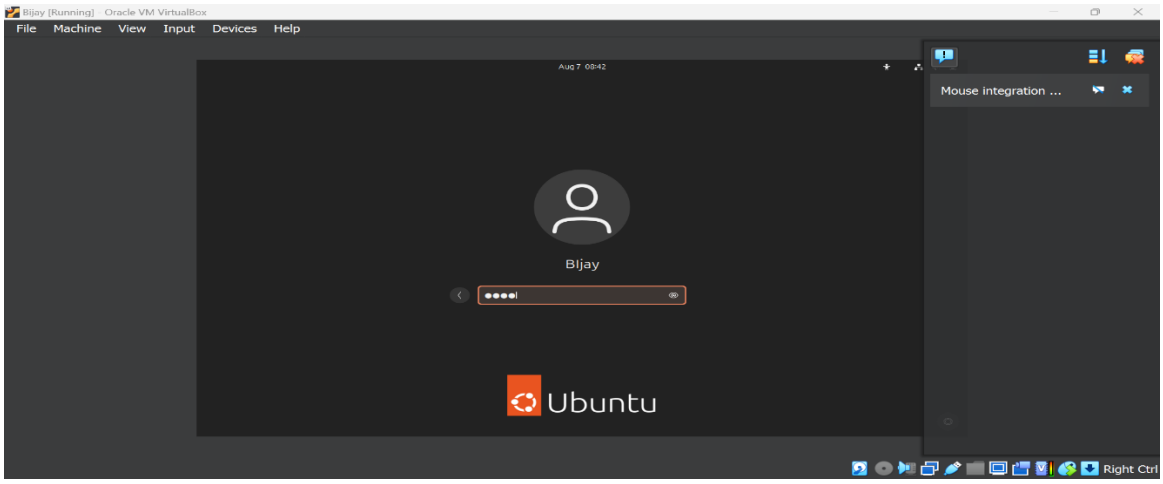

Fig: Login Process

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Step 18: Now our system is ready and Ubuntu is installed completely.

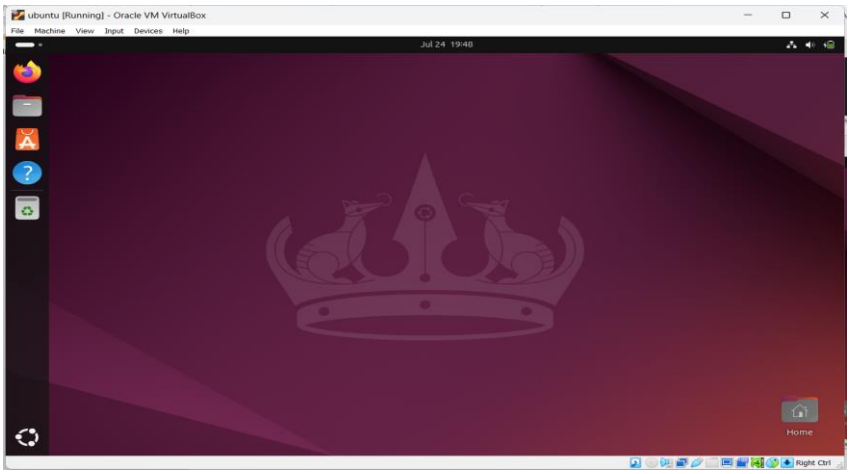


Fig: Ubuntu Home Screen

Basic Networking Commands

1.PING

Ping (Packet Internet Groper) is a command-line utility used to test network connectivity between two hosts by sending ICMP echo request packets and waiting for ICMP echo reply packets.

Syntax: ping [options] hostname or IP address

Uses: Used for checking whether any network is present and if a host is attainable.

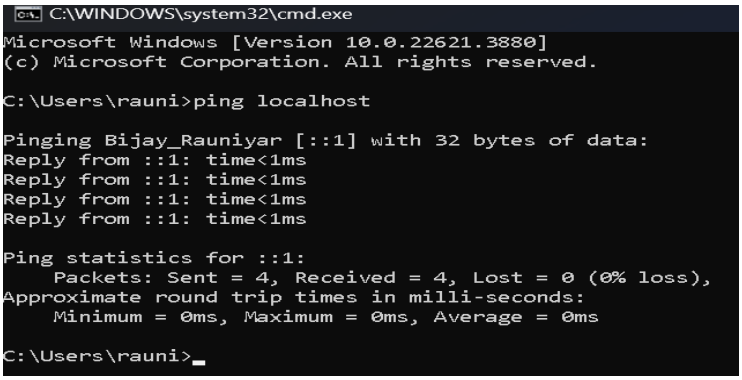


Fig: Packet Internet Groper (PING)

2.IPCONFIG

Ipconfig stands for "Internet Protocol Configuration". It is a program of console application of a few computer OSes that shows every current value of TCP/IP network configuration and refreshes DNS and DHCP settings.

Syntax: ipconfig

Uses: Used to view and manage network configuration settings, renew DHC Pleases, flush DNS cache, and configure network interfaces.

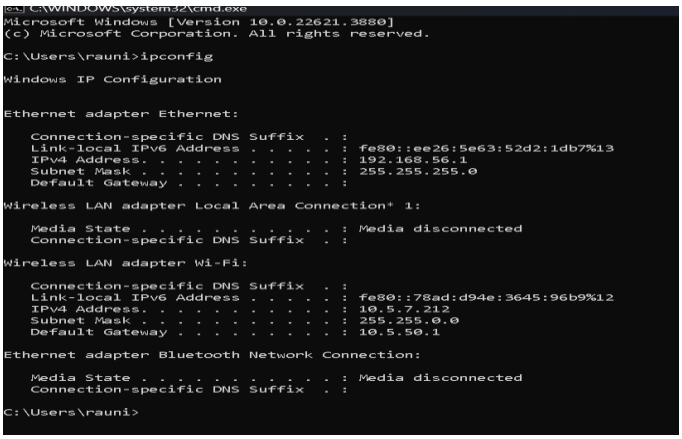


Fig: IPCONFIG

3.GETMAC

MAC address is the physical address, which uniquely identifies each device on a given network. To make communication between two networked devices, we need two addresses: **IP address and MAC address.** It is assigned to the NIC (Network Interface card) of each device that can be connected to the internet.

Syntax:- getmac

Uses: Commonly used in troubleshooting network issues and for network security purposes.

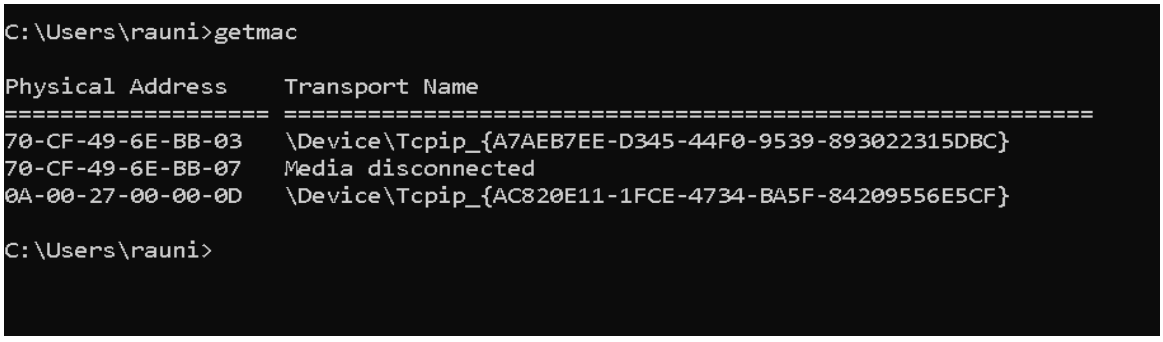


Fig: GETMAC

4.HOSTNAME

Hostname is a command-line utility used to display or set the name of the computer or device within a network. It can be accessed without using a particular IP address.

Syntax: hostname

Uses: Used to display the system name.

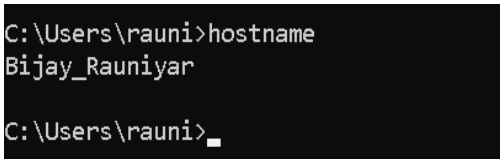


Fig: HOSTNAME

5.NSLOOKUP

The nslookup (Name Server Lookup) command is a network administration tool used for querying the Domain Name System (DNS) to obtain domain name or IP address mapping or other DNS records.

Syntax: nslookup <domainName**>**

Uses: Used for troubleshooting DNS issues, verifying DNS records, testing DNS configurations, and performing reverse DNS lookups.

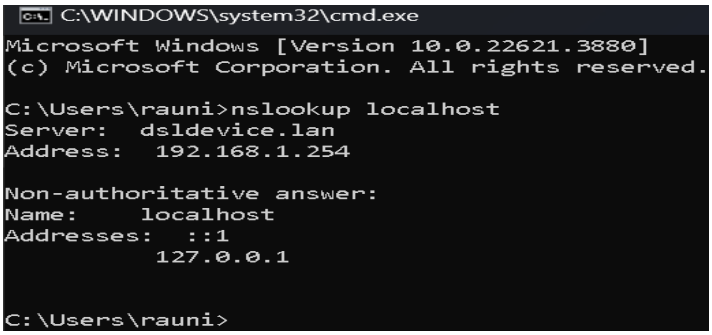


Fig: NSLOOKUP

6.TRACERT

Traceroute (Unix/Linux) or tracert (Windows) is a command-line utility used to trace the route that packets take across an IP network to a specified destination, showing each hop and round-trip time (RTT).

Syntax: traceroute [OPTION...] HOST

Uses: Used to track the pathway taken by packets across an IP network.

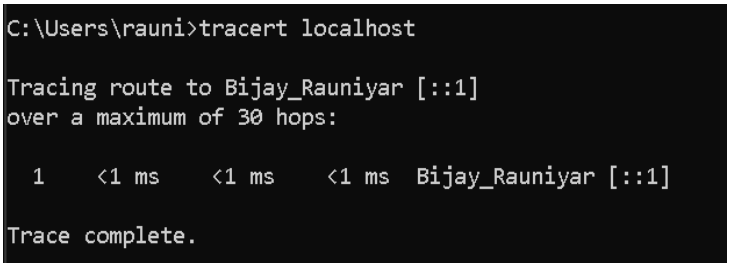


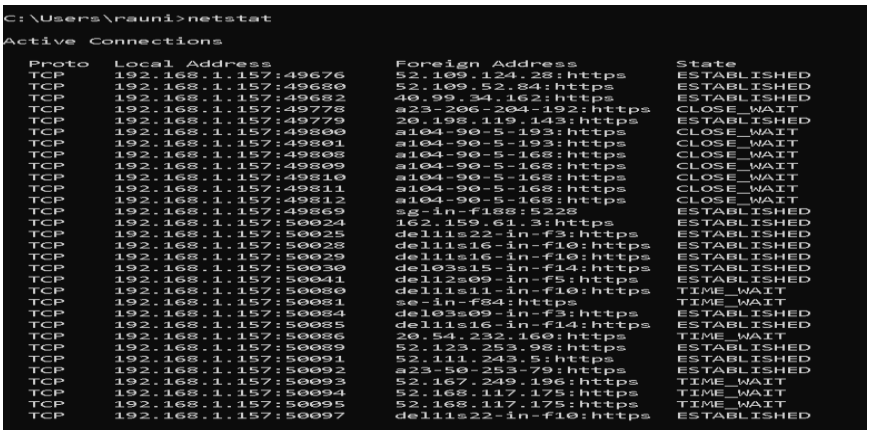
Fig: TRACERT

7.NETSTAT

The netstat command is a command-line network utility that shows network connections for TCP (both outgoing and incoming), several network interfaces (software-defined network interface or network interface controller), network protocol statistics, and routing tables.

Syntax: netstat

Uses: Used for diagnosing network issues and understanding network activity on a system.



```
C:\Users\rauni>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    192.168.1.157:49676    52.109.124.28:https    ESTABLISHED
  TCP    192.168.1.157:49680    52.109.52.84:https     ESTABLISHED
  TCP    192.168.1.157:49682    40.99.34.162:https     ESTABLISHED
  TCP    192.168.1.157:49778    a23-206-204-192:https  CLOSE_WAIT
  TCP    192.168.1.157:49779    20.198.119.143:https   ESTABLISHED
  TCP    192.168.1.157:49800    a104-90-5-193:https    CLOSE_WAIT
  TCP    192.168.1.157:49801    a104-90-5-193:https    CLOSE_WAIT
  TCP    192.168.1.157:49808    a104-90-5-168:https    CLOSE_WAIT
  TCP    192.168.1.157:49809    a104-90-5-168:https    CLOSE_WAIT
  TCP    192.168.1.157:49810    a104-90-5-168:https    CLOSE_WAIT
  TCP    192.168.1.157:49811    a104-90-5-168:https    CLOSE_WAIT
  TCP    192.168.1.157:49812    a104-90-5-168:https    CLOSE_WAIT
  TCP    192.168.1.157:49869    sg-in-f188:5228        ESTABLISHED
  TCP    192.168.1.157:50024    162.159.61.3:https     ESTABLISHED
  TCP    192.168.1.157:50025    del11s22-in-f3:https   ESTABLISHED
  TCP    192.168.1.157:50028    del11s16-in-f10:https  ESTABLISHED
  TCP    192.168.1.157:50029    del11s16-in-f10:https  ESTABLISHED
  TCP    192.168.1.157:50030    del03s15-in-f14:https  ESTABLISHED
  TCP    192.168.1.157:50041    del12s09-in-f5:https   ESTABLISHED
  TCP    192.168.1.157:50080    del11s11-in-f10:https  TIME_WAIT
  TCP    192.168.1.157:50081    se-in-f84:https        TIME_WAIT
  TCP    192.168.1.157:50084    del03s09-in-f3:https   ESTABLISHED
  TCP    192.168.1.157:50085    del11s16-in-f14:https  ESTABLISHED
  TCP    192.168.1.157:50086    20.54.232.160:https    TIME_WAIT
  TCP    192.168.1.157:50089    52.123.253.98:https    ESTABLISHED
  TCP    192.168.1.157:50091    52.111.243.5:https     ESTABLISHED
  TCP    192.168.1.157:50092    a23-50-253-79:https    ESTABLISHED
  TCP    192.168.1.157:50093    52.167.249.196:https   TIME_WAIT
  TCP    192.168.1.157:50094    52.168.117.175:https   TIME_WAIT
  TCP    192.168.1.157:50095    52.168.117.175:https   TIME_WAIT
  TCP    192.168.1.157:50097    del11s22-in-f10:https  ESTABLISHED
```

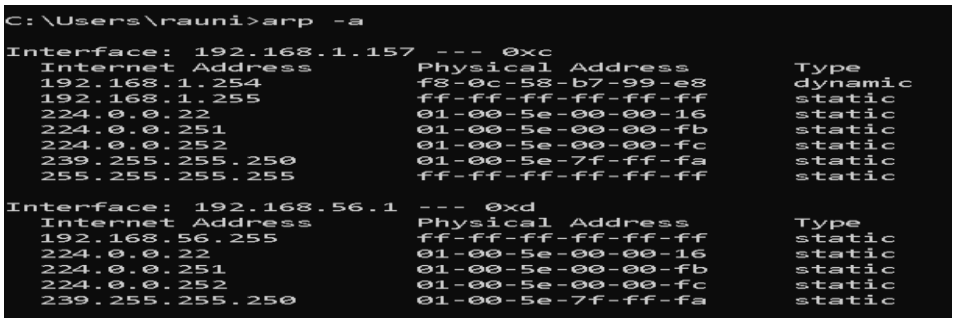
Fig: NETSTAT

8.ARP

The ARP commands allows to view, display, or modify the details/information in an ARP table/cache. The ARP cache or table has the dynamic list of IP and MAC addresses of those devices to which our computer has communicated recently in a local network.

Syntax: arp

Uses: Used to view and manipulate the ARP cache, which maps IP addresses to MAC addresses



```
C:\Users\rauni>arp -a

Interface: 192.168.1.157 --- 0xc
  Internet Address      Physical Address      Type
  192.168.1.254         f8-0c-58-b7-99-e8     dynamic
  192.168.1.255         ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

Interface: 192.168.56.1 --- 0xd
  Internet Address      Physical Address      Type
  192.168.56.255        ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
```

Fig: ARP

9.SYSTEMINFO

The Systeminfo command in Windows is a command-line utility that provides detailed information about the system's configuration, including the operating system, hardware, and network settings.

Syntax: systeminfo

Uses: Used to display detailed configuration information about a computer and its operating system.

```
C:\Users\rauni>systeminfo

Host Name:                 BIJAY_RAUNIYAR
OS Name:                   Microsoft Windows 11 Pro
OS Version:                10.0.22621 N/A Build 22621
OS Manufacturer:           Microsoft Corporation
OS Configuration:          Standalone Workstation
OS Build Type:             Multiprocessor Free
Registered Owner:          rauniyarbizzay@gmail.com
Registered Organization:   N/A
Product ID:                00330-80000-00000-AA514
Original Install Date:     2/2/2023, 7:50:50 PM
System Boot Time:          8/10/2024, 7:51:07 AM
System Manufacturer:       LENOVO
System Model:              81WD
System Type:               x64-based PC
Processor(s):              1 Processor(s) Installed.
                           [01]: Intel64 Family 6 Model 126 Stepping 5 GenuineIntel ~991 Mhz
BIOS Version:              LENOVO EMCN52WW, 1/28/2022
Windows Directory:         C:\WINDOWS
System Directory:          C:\WINDOWS\system32
Boot Device:               \Device\HarddiskVolume1
System Locale:             en-us;English (United States)
Input Locale:              en-us;English (United States)
Time Zone:                 (UTC+05:45) Kathmandu
Total Physical Memory:     7,934 MB
Available Physical Memory: 1,605 MB
Virtual Memory: Max Size:  11,774 MB
Virtual Memory: Available: 4,186 MB
Virtual Memory: In Use:    7,588 MB
Page File Location(s):     C:\pagefile.sys
Domain:                    WORKGROUP
Logon Server:              \\BIJAY_RAUNIYAR
Hotfix(s):                 4 Hotfix(s) Installed.
                           [01]: KB5039895
                           [02]: KB5012170
                           [03]: KB5040442
                           [04]: KB5039338
```

Fig: SYSTEMINFO

10.PATHPING

The PATHPING command is a network utility that combines the features of PING and TRACERT. It traces the path to a destination and provides information about packet loss at each hop.

Syntax: pathping <destination>

Uses: It combines PING and TRACERT to show path and packet loss information.

```
C:\Users\rauni>pathping localhost

Tracing route to Bijay_Rauniyar [::1]
over a maximum of 30 hops:
  0  Bijay_Rauniyar [::1]
  1  Bijay_Rauniyar [::1]

Computing statistics for 25 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           Bijay_Rauniyar [::1]
                                 0/ 100 =  0%   |
  1    0ms     0/ 100 =  0%     0/ 100 =  0%  Bijay_Rauniyar [::1]

Trace complete.

C:\Users\rauni>
```

Fig: PATHPING

Conclusion:

During the OS installation and practice with basic networking commands, we successfully set up the operating system, ensuring all hardware components were correctly configured and optimized for performance. The process involved using essential commands such as nslookup, tracert, netstat, arp, systeminfo and pathping to troubleshoot and verify network connectivity and system configuration. The outcome was a well-configured system with a clear understanding of network paths, connections, and system details. Through this practice, we learned the importance of these commands in diagnosing and resolving network issues, as well as how to effectively gather detailed system information for maintenance and troubleshooting purposes.