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Roll No: 83

1. Prerequisites

- Ubuntu system
- Sudo/root access

2. Install Required Packages

Open terminal and run:

```
sudo apt update
```

```
sudo apt install -y qemu-kvm libvirt-daemon-system libvirt-clients bridge-utils virt-manager
```

- qemu-kvm: KVM hypervisor
- libvirt-daemon-system & libvirt-clients: For managing VMs with libvirtd
- bridge-utils: To manage network bridges
- virt-manager: GUI to manage VMs

3. Enable and Start libvirtd

```
sudo systemctl enable libvirtd
```

```
sudo systemctl start libvirtd
```

```
sudo systemctl status libvirtd
```

Check libvirt is active.

4. Add User to libvirt and kvm Groups

```
sudo usermod -aG libvirt $(whoami)
```

```
sudo usermod -aG kvm $(whoami)
```

Logout and login again or reboot for group changes to take effect.

5. Create a Network Bridge on the Host

You need to bridge your physical network interface (e.g., eth0 or enp3s0) to a new bridge interface (e.g., br0).

For Ubuntu 18.04/20.04 using netplan:

Check your current interface name:

```
ip link
```

Assuming your interface is enp3s0, create or edit netplan config:

```
sudo nano /etc/netplan/01-netcfg.yaml
```

Replace with:



```
ubuntu@ubuntu-ThinkCentre-M720t: ~
/etc/netplan/01-netcfg.yaml: ~

GNU nano 6.2
network:
  version: 2
  renderer: networkd
  ethernets:
    enot:
      dhcp4: no
      bridges:
        br0:
          interfaces: [en0]
          addresses: [172.25.5.25/24]
          routes:
            - to: 0.0.0.0/0
              via: 172.25.0.1
              name servers:
                addresses: [8.8.8.8, 8.8.4.4]
            parameters:
              stp: false
              forward-delay: 0
```

Save and apply changes:

```
sudo netplan apply
```

Check bridge is up:

```
ip addr show br0
```

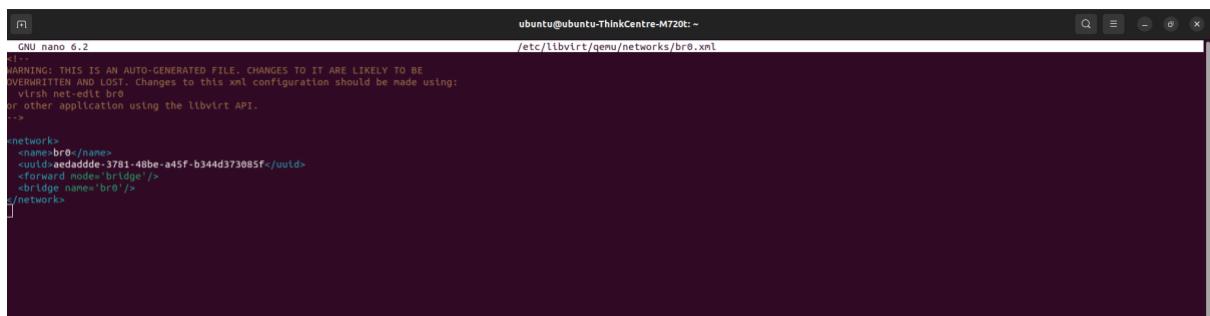
br0 should have your IP address, and enp3s0 should be without IP.

6. Configure libvirt to Use the Bridge

Create a bridge network XML file for libvirt.

```
sudo nano /etc/libvirt/qemu/networks/br0.xml
```

Paste:



```
ubuntu@ubuntu-ThinkCentre-M720t: ~
/etc/libvirt/qemu/networks/br0.xml: ~

GNU nano 6.2
WARNING: THIS IS AN AUTO-GENERATED FILE. CHANGES TO IT ARE LIKELY TO BE
OVERWRITTEN AND LOST. Changes to this xml configuration should be made using:
  virsh net-edit br0
or other application using the libvirt API.
<!--
<network>
  <name>br0</name>
  <uuid>aedaddde-3781-48be-a45f-b344d373085f</uuid>
  <forward mode='bridge' />
  <bridge name='br0' />
</network>
-->
```

Define and start the network:

```
sudo virsh net-define /etc/libvirt/qemu/networks/br0.xml
```

```
sudo virsh net-start br0
```

```
sudo virsh net-autostart br0
```

7. Create Virtual Machine Using virt-manager

1. Run:
virt-manager
 2. Create a new VM with desired OS ISO.
 3. Under "Network selection," choose "Specify shared device name" and enter br0.
 4. For paravirtualization support, set **Firmware** to **UEFI** (optional) and CPU model to **host-passthrough** in VM settings.
 5. Under "Performance" tab, select **VirtIO** for network and disk devices (paravirtualized drivers).
 6. Complete VM installation.

8. Verify VM Network & Internet Access

- Start VM.
 - Check IP inside VM using:
`ip addr show`
 - Ping outside network
 - Open a browser inside VM to verify internet.

```
ubuntu@ubuntu:~$ sudo apt update
[sudo] password for ubuntu:
Get:1 http://archive.ubuntu.com/ubuntu jammy InRelease [129 kB]
Get:2 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]
Get:5 https://in.archive.ubuntu.com/ubuntu jammy-backports/main amd64 DEP-11 Metadata [7,068 B]
Get:6 https://in.archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 DEP-11 Metadata [212 B]
Get:7 https://in.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 DEP-11 Metadata [26,0 kB]
Get:8 https://in.archive.ubuntu.com/ubuntu jammy-backports/multiverse amd64 DEP-11 Metadata [212 B]
Reading package lists... Done
E: Release file for http://security.ubuntu.com/ubuntu/dists/jammy-security/InRelease is not valid yet (invalid for another 4h 20min 25s). Updates for this repository will not be applied.
E: Release file for http://archive.ubuntu.com/ubuntu/dists/jammy-updates/InRelease is not valid yet (invalid for another 4h 23min 24s). Updates for this repository will not be applied.
ubuntu@ubuntu:~$ sudo systemctl enable libvirdt
ubuntu@ubuntu:~$ sudo systemctl start libvirdt
ubuntu@ubuntu:~$ sudo systemctl status libvirdt
● libvirdt.service - Virtualization daemon
   Loaded: loaded (/lib/systemd/system/libvirdt.service; enabled; vendor preset: enabled)
     Active: active (running) since Thu 2025-09-11 09:07:48 IST; 38min ago
TriggeredBy: ● libvirdt-ro.socket
              ● libvirdt-admin.socket
              ● libvirdt-ds.socket
  Docs: man:libvirdt(8)
        https://libvirdt.org
 Main PID: 794 (libvirdt)
   Tasks: 21 (linit: 32768)
    Memory: 52.9M
       CPU: 1.909s
CGroup: /system.slice/libvirdt.service
         └─ 794 /usr/sbin/libvirdt
              ├─ 1132 /usr/sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf --leasefile-ro --dhcp-script=/usr/lib/libvirt/libvirt_leaseshelper
              ├─ 1133 /usr/sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf --leasefile-ro --dhcp-script=/usr/lib/libvirt/libvirt_leaseshelper

Sep 11 09:07:48 ubuntu ThinkCentre-M720t systemd[1]: Started Virtualization daemon.
Sep 11 09:07:49 ubuntu ThinkCentre-M720t dnsmasq[1132]: started, version 2.84, pid 150
Sep 11 09:07:49 ubuntu ThinkCentre-M720t dnsmasq[1132]: compile time options: IPv6 GNU-getopt DBus no-UBUS l18N DNI2 DHCP DHCPv6 no-Lua TFTP conntrack ipset no-nftset auth cryptohash DNSSEC loop-detect
Sep 11 09:07:49 ubuntu ThinkCentre-M720t dnsmasq-dhcp[1132]: DHCP, IP range 192.168.122.2 -- 192.168.122.254, lease time 1h
Sep 11 09:07:49 ubuntu ThinkCentre-M720t dnsmasq[1132]: DHCP, socket bound exclusively to interface virbr0
Sep 11 09:07:49 ubuntu ThinkCentre-M720t dnsmasq[1132]: reading /etc/resolv.conf
Sep 11 09:07:49 ubuntu ThinkCentre-M720t dnsmasq[1132]: using nameserver 127.0.0.5#53#5
Sep 11 09:07:49 ubuntu ThinkCentre-M720t dnsmasq[1132]: using nameserver 127.0.0.5#53#5
Sep 11 09:07:49 ubuntu ThinkCentre-M720t dnsmasq[1132]: using nameserver 127.0.0.5#5
Sep 11 09:07:49 ubuntu ThinkCentre-M720t dnsmasq[1132]: read /var/lib/libvirt/dnsmasq/default.addnhosts - 0 names
Sep 11 09:07:49 ubuntu ThinkCentre-M720t dnsmasq-dhcp[1132]: read /var/lib/libvirt/dnsmasq/default.hostsfile
[2]+  Stopped                  sudo systemctl status libvirdt
```

```
ubuntu@ubuntu:~$ sudo systemctl status libvirtd
● libvirtd.service - Virtualization daemon
   Loaded: loaded (/lib/systemd/system/libvirtd.service; enabled; vendor preset: enabled)
   Active: active (running) since Thu 2025-09-11 09:07:48 IST; 38min ago
TriggeredBy: ● libvirtd-ro.socket
             ● libvirtd-admin.socket
             ● libvirtd-socket
             ● libvirtd-leasehelper
   Docs: man:libvirtd(8)
         https://libvirt.org
 Main PID: 794 (libvirtd)
   Tasks: 21 (limit: 32768)
   Memory: 52.9M
     CPU: 1.900s
    CGroup: /system.slice/libvirtd.service
           ├─ 794 /usr/sbin/libvirtd
           ├─ 1132 /usr/sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf --leasefile-ro --dhcp-script=/usr/lib/libvirt/libvirt_leaseshelper
           └─ 1133 /usr/sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf --leasefile-ro --dhcp-script=/usr/lib/libvirt/libvirt_leaseshelper

Sep 11 09:07:48 ubuntu:libvirtd[1]: Started Virtualization daemon.
Sep 11 09:07:49 ubuntu:libKncentre-M720t systemd[1]: started version 2.98 cachsize 150
Sep 11 09:07:49 ubuntu:libKncentre-M720t dnsmasq[1132]: completed line options via GNU-getopt
Sep 11 09:07:49 ubuntu:libKncentre-M720t dnsmasq[1132]: no-lease 0.0.0.0 0.0.0.0
Sep 11 09:07:49 ubuntu:libKncentre-M720t dnsmasq[1132]: DHCPv4 lease 192.168.122.2 -- 192.168.122.254, lease time 1h
Sep 11 09:07:49 ubuntu:libKncentre-M720t dnsmasq[1132]: DHCPv6, sockets bound exclusively to interface virbr0
Sep 11 09:07:49 ubuntu:libKncentre-M720t dnsmasq[1132]: reading /etc/resolv.conf
Sep 11 09:07:49 ubuntu:libKncentre-M720t dnsmasq[1132]: using nameserver 127.0.0.5#53
Sep 11 09:07:49 ubuntu:libKncentre-M720t dnsmasq[1132]: read /etc/hosts - 8 names
Sep 11 09:07:49 ubuntu:libKncentre-M720t dnsmasq[1132]: read /var/lib/libvirt/dnsmasq/default.addnhosts - 0 names
Sep 11 09:07:49 ubuntu:libKncentre-M720t dnsmasq[1132]: read /var/lib/libvirt/dnsmasq/default.hostsfile
[1] 1133 [DNSE] (pid 1133) Stopped: libvirtd
[1]+ 1133 stopped  sudo systemctl status libvirtd
ubuntu@ubuntu:~$ sudo usermod -aG libvirt S(whoami)
ubuntu@ubuntu:~$ sudo usermod -aG kvm S(whoami)
ubuntu@ubuntu:~$ ip link
1: lo: <LOOPBACK,NOQUEUE,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
  link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc mq state DOWN mode DEFAULT group default qlen 1000
  link/ether 00:0c:61:93:a6:s5 brd ff:ff:ff:ff:ff:ff
  altname enp0s11f6
3: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN mode DEFAULT group default qlen 1000
  link/ether 52:54:09:d7:0c brd ff:ff:ff:ff:ff:ff
4: br0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
  link/ether 0e:ef:8e:46:59:54 brd ff:ff:ff:ff:ff:ff
ubuntu@ubuntu:~$ sudo nano /etc/netplan/01-netcfg.yaml
```

```
ubuntu@ubuntu-ThinkCentre-M720t: ~
CPU: 1.90%
GPU: /system.slice/libvirtd.service
└─[132] /usr/sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf --leasefile-ro --dhcp-script=/usr/lib/libvirt/libvirt_leaseshelper
   └─[133] /usr/sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf --leasefile-ro --dhcp-script=/usr/lib/libvirt/libvirt_leaseshelper

Sep 11 09:07:48 ubuntu-ThinkCentre-M720t systemd[1]: Started Virtualization daemon.
Sep 11 09:07:48 ubuntu-ThinkCentre-M720t dnsmasq[132]: compiled time options: PVi GNU getopt DBus no-UBus t18n IDN2 DHCP DHCPv6 no-Lua TFTP conntrack ipset no-nftset auth cryptohash DNSSEC loop-detect
Sep 11 09:07:49 ubuntu-ThinkCentre-M720t dnsmasq-dhcp[132]: DHCP IP range 192.168.122.2 -- 192.168.122.254, lease time 1h
Sep 11 09:07:49 ubuntu-ThinkCentre-M720t dnsmasq[132]: DHCP, sockets bound exclusively to interface virbr0
Sep 11 09:07:49 ubuntu-ThinkCentre-M720t dnsmasq[132]: reading /etc/resolv.conf
Sep 11 09:07:49 ubuntu-ThinkCentre-M720t dnsmasq[132]: using nameserver 127.0.0.5#53
Sep 11 09:07:49 ubuntu-ThinkCentre-M720t dnsmasq[132]: read /etc/hosts - 8 names
Sep 11 09:07:49 ubuntu-ThinkCentre-M720t dnsmasq[132]: read /var/lib/libvirt/dnsmasq/default.addhosts - 0 names
Sep 11 09:07:49 ubuntu-ThinkCentre-M720t dnsmasq-dhcp[132]: read /var/lib/libvirt/dnsmasq/default.hostsfile
lines: 27/27 (END)

[2]: Stopped           sudo systemctl status libvirtd
ubuntu@ubuntu-ThinkCentre-M720t: $ sudo usermod -aG libvirt (whoami)
ubuntu@ubuntu-ThinkCentre-M720t: $ sudo usermod -aG kvm (whoami)
ubuntu@ubuntu-ThinkCentre-M720t: $ sudo ln -s /lib/modules/`uname -r`/kernel/drivers/net/ethernet/broadcom/bnx2/bnx2.ko /lib/modules/`uname -r`/kernel/drivers/net/ethernet/broadcom/bnx2/bnx2.ko
1: br0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/ether 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eno1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc qdisc master br0 state UP mode DEFAULT group default qlen 1000
    link/ether 00:00:00:93:a5:5b brd ff:ff:ff:ff:ff:ff
    altname enp0s31f6
3: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN mode DEFAULT group default qlen 1000
    link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
4: virbr0n1: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN mode DEFAULT group default qlen 1000
    link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
5: br0: <NO-CARRIER,BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
inet br0:0: brd 0.0.0.0 mask 255.255.255.255 scope global nodstroute br0
    valid_lft forever preferred_lft forever
    inet6 fe80::ddcfe:effff%br0: brd ff:ff:ff:ff:ff:ff scope link
        valid_lft forever preferred_lft forever
ubuntu@ubuntu-ThinkCentre-M720t: $ sudo virsh net-define /etc/libvirt/qemu/networks/br0.xml
ubuntu@ubuntu-ThinkCentre-M720t: $ sudo virsh net-start br0
Network br0 defined from /etc/libvirt/qemu/networks/br0.xml

ubuntu@ubuntu-ThinkCentre-M720t: $ sudo virsh net-start br0
error: Failed to start network br0
error: Requested operation is not valid: network is already active

ubuntu@ubuntu-ThinkCentre-M720t: $ sudo virsh net-stop br0
error: unknown command: 'net-stop'
ubuntu@ubuntu-ThinkCentre-M720t: $ sudo virsh net-autostart br0
Network br0 marked as autostarted

ubuntu@ubuntu-ThinkCentre-M720t: $ virt-manager
```

```
ubuntu@ubuntu:~$ sudo systemctl start libvirtd
ubuntu@ubuntu:~$ sudo systemctl status libvirtd
● libvirtd.service - Virtualization daemon
   Loaded: loaded (/lib/systemd/system/libvirtd.service; enabled; vendor preset: enabled)
     Active: active (running) since Thu 2025-09-11 09:07:48 IST; 38min ago
TriggeredBy: ● libvirtd-ro.socket
● libvirtd-admin.socket
● libvirtd-socket
  Docs: man:libvirtd(8)
        https://libvirt.org
 Main PID: 794 (libvirtd)
    Tasks: 21 (limit: 32768)
   Memory: 52.9M
      CPU: 1.908s
 CGroup: /system.slice/libvirtd.service
          └─ 794 /usr/sbin/libvirtd
           ├─ 1132 /usr/sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf --leasefile-ro --dhcp-script=/usr/lib/libvirt/libvirt_leaseshelper
           ├─ 1133 /usr/sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf --leasefile-ro --dhcp-script=/usr/lib/libvirt/libvirt_leaseshelper

sep 11 09:07:48 ubuntu:ThinkCentre-M720t systemd[1]: Started VLRization daemon.
sep 11 09:07:48 ubuntu:ThinkCentre-M720t dnsmasq[1132]: starting version 2.80.achieve150
sep 11 09:07:48 ubuntu:ThinkCentre-M720t dnsmasq[1132]: using interface eth0
sep 11 09:07:49 ubuntu:ThinkCentre-M720t dnsmasq[1132]: DHCP, IP range 192.168.122.2 - 192.168.122.254, lease time 1h
sep 11 09:07:49 ubuntu:ThinkCentre-M720t dnsmasq[1132]: DHCP, sockets bound exclusively to interface vlr0
sep 11 09:07:49 ubuntu:ThinkCentre-M720t dnsmasq[1132]: reading /etc/resolv.conf
sep 11 09:07:49 ubuntu:ThinkCentre-M720t dnsmasq[1132]: using nameserver 127.0.0.53#53
sep 11 09:07:49 ubuntu:ThinkCentre-M720t dnsmasq[1132]: read /etc/hosts - 8 names
sep 11 09:07:49 ubuntu:ThinkCentre-M720t dnsmasq[1132]: read /var/lib/libvirt/dnsmasq/default.addnhosts - 0 names
sep 11 09:07:49 ubuntu:ThinkCentre-M720t dnsmasq[1132]: read /var/lib/libvirt/dnsmasq/default.hostsfile
lines 1-27/27 (END)

[2]+ Stopped                  sudo systemctl libvirtd
ubuntu@ubuntu:~$ sudo usermod -aG libvirt $whoami
ubuntu@ubuntu:~$ sudo usermod -aG kvm $whoami
ubuntu@ubuntu:~$ ip link
1: ens3:  brd 0x state DOWN group default qlen 1000
link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eno1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
link/ether 00:0d:61:93:a6:a5 brd ff:ff:ff:ff:ff:ff
  altname enp0s1f6
3: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default qlen 1000
link/ether 52:54:00:9f:d7:bc brd ff:ff:ff:ff:ff:ff
4: br0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
link/ether 00:0c:00:46:59:54 brd ff:ff:ff:ff:ff:ff
ubuntu@ubuntu:~$ sudo nano /etc/netplan/01-netcfg.yaml
ubuntu@ubuntu:~$ sudo nano /etc/netplan/01-netcfg.yaml
ubuntu@ubuntu:~$ sudo chmod 060 /etc/netplan/01-netcfg.yaml
ubuntu@ubuntu:~$ sudo netplan apply
ubuntu@ubuntu:~$ ip link show br0
1: br0: <NO-CARRIER,BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
link/ether dc:ef:98:46:59:54 brd ff:ff:ff:ff:ff:ff
  netdev_id:25.25.25.24 brd 172.25.25.25 scope global no_pmtu_rxroute br0
    valid_lft forever preferred_lif forever
  inet fe80::dc:eff:fe40:954/64 scope link
    valid_lft forever preferred_lif forever
ubuntu@ubuntu:~$ sudo nano /etc/libvirt/qemu/networks/br0.xml
```

