

Aim - Implementation of host based virtualization using KVM. (Test NAT to NAT)

Theory -

- Host based virtualization allows multiple VMs to share the resources on a single centralized host.
- Access and control is provided to the user by a client device connected over a network
- Host based virtualization can be implemented using VMware, Virtual Box and linux kernel based virtual machine

Kernel-based Virtual Machine (KVM)

- KVM ~~lets~~ is an open source virtualization technology to built into linux.
- This hypervisor allows the host machine to run multiple, isolated virtual environments called guests or virtual machines (VMs).
- KVM converts linux kernel into a type-1 bare metal hypervisor.
- All hypervisors require components like
 

* Memory manager	* Device drivers
* scheduler	* security manager
* I/O stack	* Network stack etc.

Teacher's Sign.:

- Every VM is implemented as a regular linux process, scheduled by standard linux scheduler ~~at~~ with dedicated virtual h/w like network, gpu, cpu, memory etc.

### Features of KVM

- Security : KVM uses Security-Enhanced-Linux and Secure-Virtualization (Svirt).
- storage : All storage formats and devices supported by linux are ~~sp~~ supported by KVM.
- Memory Management : KVM inherits the memory features of linux including non-uniform access and kernel same-page merging.
- live migration - KVM supports live migration which is the ability to move a running (VM) between hosts without service interruption.
- low latency, higher prioritization : The linux kernel features real-time extensions that ensure low latency for VM-based apps with better prioritization.

### Implementation:

- A software "virtual Machine Manager" is used to manage VMs more conveniently via a ~~GUI~~ GUI.

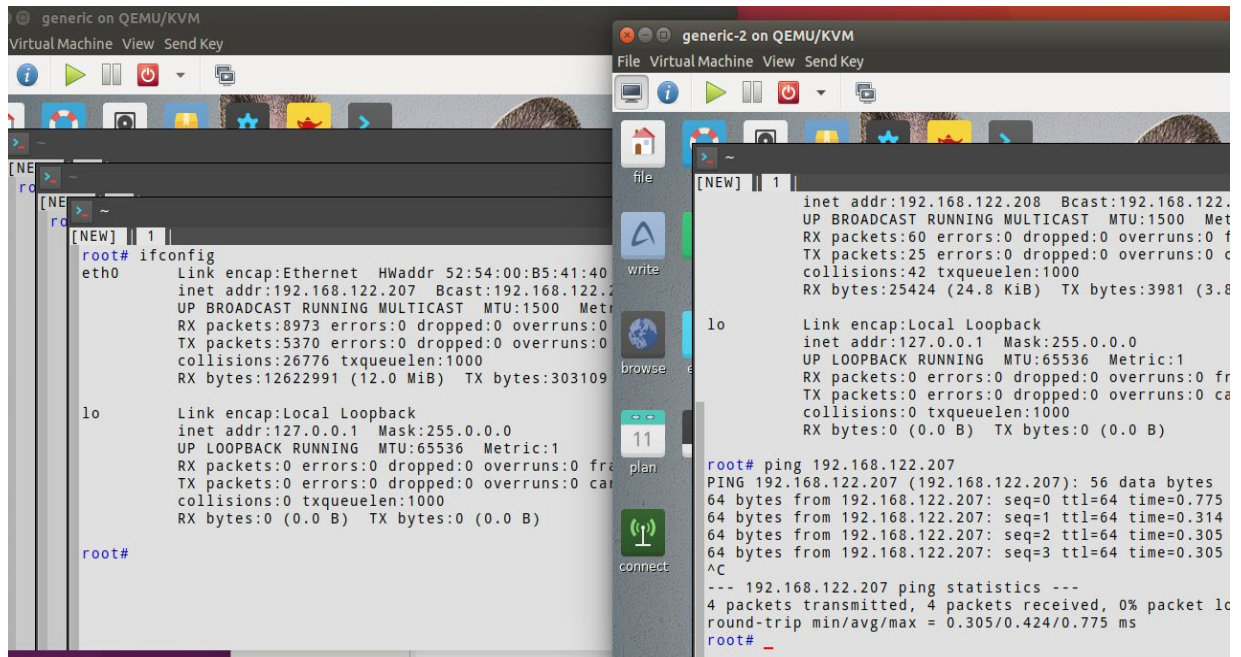
Teacher's Sign.: \_\_\_\_\_



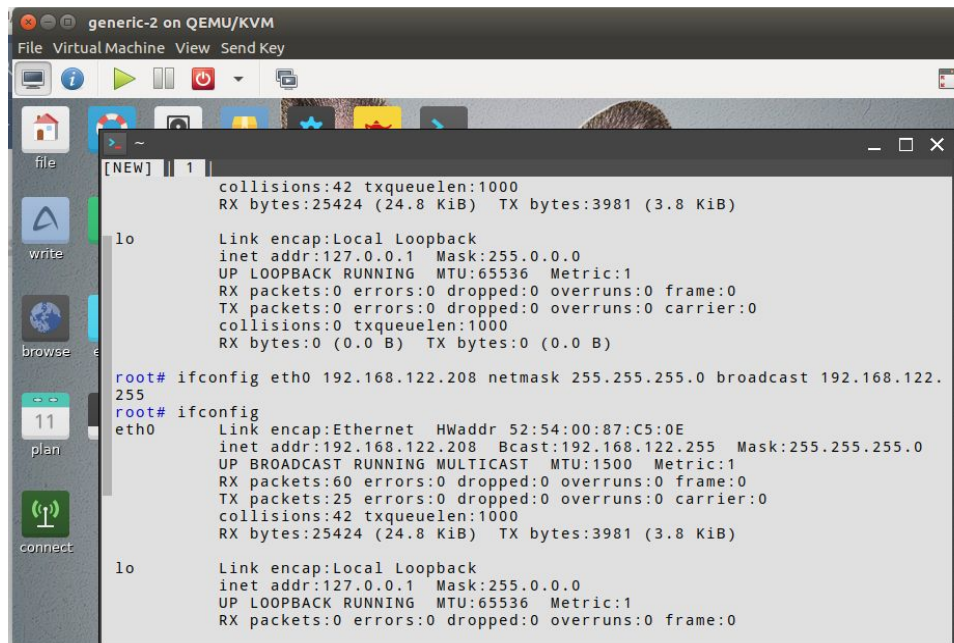
Steps to install KVM & VM :

```
# sudo apt-get install qemu-kvm  
# sudo adduser <username>  
# vmtoolsd -c qemu :// system
```

Conclusion - Hence we have successfully installed implemented hostbased virtualization



## Changing the ip address





## Installation Steps:

```
admin-2@admin2-OptiPlex-3020: ~
admin-2@admin2-OptiPlex-3020:~$ egrep -c '(vmx|svm)' /proc/cpuinfo
4
admin-2@admin2-OptiPlex-3020:~$ kvm-ok
The program 'kvm-ok' is currently not installed. You can install it by typing:
sudo apt install cpu-checker
admin-2@admin2-OptiPlex-3020:~$ sudo apt install cpu-checker
[sudo] password for admin-2:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  msr-tools
The following NEW packages will be installed:
  cpu-checker msr-tools
0 upgraded, 2 newly installed, 0 to remove and 666 not upgraded.
Need to get 17.5 kB of archives.
After this operation, 87.0 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu xenial/main amd64 msr-tools amd64 1.3-2 [10.6 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu xenial/main amd64 cpu-checker amd64 0.7-0ubuntu7 [6,862 B]
Fetched 17.5 kB in 0s (112 kB/s)
Selecting previously unselected package msr-tools.
```

```
admin-2@admin2-OptiPlex-3020: ~
Setting up msr-tools (1.3-2) ...
Setting up cpu-checker (0.7-0ubuntu7) ...
admin-2@admin2-OptiPlex-3020:~$ kvm-ok
INFO: /dev/kvm exists
KVM acceleration can be used
admin-2@admin2-OptiPlex-3020:~$ egrep -c 'lm' /proc/cpuinfo
4
admin-2@admin2-OptiPlex-3020:~$ uname -m
x86_64
admin-2@admin2-OptiPlex-3020:~$ sudo apt-get install qemu-kvm libvirt-bin ubuntu-vm-builder bridge-utils
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  at atauges-lenses cgmanager dctrl-tools debootstrap devscripts dmsetup dput ebtabs file gawk i
pxe-qemu kpartx libaio1 libaugeas0
  libboost-random1.58.0 libboost-thread1.58.0 libcacard0 libdistro-info-perl libfdt1 libiscsi2 li
bmagic1 libnetcf1 libnl-3-200
  libnl-genl-3-200 libnl-route-3-200 librados2 librbd1 libsd1.2debian libsigsegv2 libspice-serve
r1 libusbredirparser1 libvirt0 libxen-4.6
  libxenstore3.0 libxml2-utils python-cheetah python-libvirt python-vm-builder python3-magic qemu
-block-extra qemu-system-common
  qemu-system-x86 qemu-utils seabios sharutils wdiff
Suggested packages:
  default-mta | mail-transport-agent atauges-doc debtags bsd-mailx | mailx cvs-buildpackage diffos
cope devscripts-el dose-extra gnuplot
  libterm-size-perl libyaml-syck-perl mozilla-devscripts mutt svn-buildpackage w3m debian-keyring
equivs libsoap-lite-perl mini-dinstall
```

```
admin-2@admin2-OptiPlex-3020: ~
Setting up wdiff (1.2.2-1build1) ...
Setting up debootstrap (1.0.78+nmu1ubuntu1.10) ...
Setting up kpartx (0.5.0+git1.656f8865-5ubuntu2.5) ...
Setting up python-vm-builder (0.12.4+bzr494-0ubuntu1) ...
Setting up python3-magic (1:5.25-2ubuntu1.3) ...
Setting up ubuntu-vm-builder (0.12.4+bzr494-0ubuntu1) ...
Processing triggers for libc-bin (2.23-0ubuntu10) ...
Processing triggers for systemd (229-4ubuntu21.23) ...
Processing triggers for ureadahead (0.100.0-19) ...
Processing triggers for initramfs-tools (0.122ubuntu8) ...
update-initramfs: Generating /boot/initrd.img-4.4.0-21-generic
admin-2@admin2-OptiPlex-3020:~$ sudo adduser --id -un libvirt
adduser: The group 'libvirt' does not exist.
admin-2@admin2-OptiPlex-3020:~$ sudo adduser --id -un libvirt
The user 'admin-2' is already a member of 'libvirt'.
admin-2@admin2-OptiPlex-3020:~$ sudo adduser --id -un kvm
Adding user 'admin-2' to group 'kvm' ...
Adding user admin-2 to group kvm
Done.
admin-2@admin2-OptiPlex-3020:~$ id -un
admin-2
admin-2@admin2-OptiPlex-3020:~$ groups
admin-2 adm cdrom sudo dip plugdev lpadmin sambashare
admin-2@admin2-OptiPlex-3020:~$ virsh list --all
error: failed to connect to the hypervisor
error: no valid connection
error: Failed to connect socket to '/var/run/libvirt/libvirt-sock': Permission denied
admin-2@admin2-OptiPlex-3020:~$
```

```
admin-2@admin2-OptiPlex-3020: ~
admin-2@admin2-OptiPlex-3020:~$ virsh list --all
Id      Name                               State
-----
admin-2@admin2-OptiPlex-3020:~$
```

```
admin-2@admin2-OptiPlex-3020: ~
admin-2@admin2-OptiPlex-3020:~$ virsh list --all
Id      Name                               State
-----
admin-2@admin2-OptiPlex-3020:~$ sudo ls -la /var/run/libvirt/libvirt-sock
[sudo] password for admin-2:
srwxrwx--- 1 root libvirtd 0 Jan 20 11:16 /var/run/libvirt/libvirt-sock
admin-2@admin2-OptiPlex-3020:~$ ls -l /dev/kvm
crw-rw----+ 1 root kvm 10, 232 Jan 20 11:16 /dev/kvm
admin-2@admin2-OptiPlex-3020:~$ sudo chown root:libvirtd /dev/kvm
admin-2@admin2-OptiPlex-3020:~$ rmmod kvm
rmmod: ERROR: Module kvm is in use by: kvm_intel
admin-2@admin2-OptiPlex-3020:~$
```

```
admin-2@admin2-OptiPlex-3020: ~
admin-2@admin2-OptiPlex-3020:~$ rmmod kvm
rmmod: ERROR: Module kvm is in use by: kvm_intel
admin-2@admin2-OptiPlex-3020:~$ modprobe -a kvm
admin-2@admin2-OptiPlex-3020:~$ sudo apt-get install virt-manager
[sudo] password for admin-2:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  gir1.2-gtk-vnc-2.0 gir1.2-libosinfo-1.0 gir1.2-libvirt-glib-1.0
  gir1.2-spice-client-glib-2.0 gir1.2-spice-client-gtk-3.0 gnome-icon-theme
  libgtk-vnc-2.0-0 libgvnc-1.0-0 libosinfo-1.0-0 libspice-client-glib-2.0-8
  libspice-client-gtk-3.0-4 libusbredirhost1 libvirt-glib-1.0-0 python-cairo
  python-cffi-backend python-chardet python-cryptography python-dbus
  python-enum34 python-gi python-gi-cairo python-idna python-ipaddr
  python-ipaddress python-libxml2 python-ndg-httpsclient python-openssl
  python-pkg-resources python-pyasn1 python-requests python-six python-urllib3
  spice-client-glib-usb-acl-helper virt-viewer virtinst
Suggested packages:
  python-cryptography-doc python-cryptography-vectors python-dbus-doc
  python-dbus-dbg python-enum34-doc python-openssl-doc python-openssl-dbg
  python-setuptools python-ntlm ssh-askpass python-gnomekeyring python-guestfs
The following NEW packages will be installed:
  gir1.2-gtk-vnc-2.0 gir1.2-libosinfo-1.0 gir1.2-libvirt-glib-1.0
```