

Presenting Linux KVM

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What is Linux KVM?

- Linux KVM (Kernel-based Virtual Machine).
- Hardware-assisted fully virtualized solution for Linux.
- Virtualization using native Linux kernel.
- Runs multiple major guest operating systems, simultaneously.
- Guests have private virtualized hardware (NIC, storage, mem, video).
- Supports native hardware extensions (Intel VT or AMD-V).

- Supports para-virtualization drivers (VirtIO).
- Runs multiple virtual machines using unmodified Linux or Windows images.
- Excellent hypervisor virtualization and emulation.
- Integrated in new native kernels instead of a separate microkernel.

When did this happen?

- Kernel 2.6.20, April 2007.
- New kid on the block.
- Slow take off.
- Now in stable mature state.
- Gain rapid adoption.

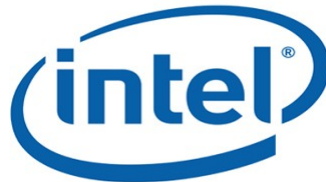
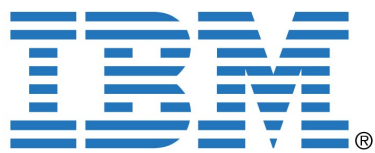
Why is it significant?

- Competes with major proprietary solutions VMWare and Xen.
- Record breaking performance.
- Outperforms competition in many benchmarks.
- Superior scalability above competing solutions.
- Unique advanced application security using SELinux.
- High quality of service; fine grained threshold policies.
- Lower cost with 80% deployment savings.

- Excellent technical documentation.
- Open Source and non-proprietary.
- Many partners provide paid support.
- Integrated in new kernels.
- Simple installation, nothing special.
- Very useful for cloud computing.
- Very good quality, fast, cheap and flexible.
- Likely to play huge role in next-generation data centers.
- May be the hypervisor of choice in the long term.
- No prohibitive license fees.
- Gaining ample recognition.

Who is involved and who supports it?

- Open Virtualization Alliance
(IBM,HP,Intel,RedHat,SuSE)
- Red Hat Enterprise Virtualization (RHEV).
- SuSE Enterprise Linux
- Ubuntu Server



How is it being used?

- Same use as VMWare or Xen.
- Good for small/medium enterprise solution.
- Great for cloud computing.
- Great for ISP hosting.
- Excellent for development testing.

History Timeline of Virtualization:

- 1968: IBM CP-67/CMS for System360 (mainframe).
- 1972: IBM VM/370 (mainframe).
- 1977: IBM openVMS (mainframe).
- 1980: PC, Client-server, Distributed computing.
- 1997: Apple Virtual PC for (Macintosh).
- 1998: VMWare Technical Patent.
- 1999: VMWare Virtual Platform (IA-32, x86).
- 2000: FreeBSD jails.
- 2000: IBM z/VM (mainframe).
- 2001: VMWare ESX, VMWare Workstation.
- 2003: Xen.

- 2004: Solaris Containers.
- 2004: Microsoft VirtualPC (aquired from Apple), MS VirtualServer.
- 2005: VMWare Player.
- 2005: Solaris Zones.
- 2005: HP Integrity Virtual Machines.
- 2006: VMWare Server.
- 2006: QEMU.
- 2007: Sun Virtualbox (qemu-based).
- 2007: Linux KVM.
- 2007: Citrix XenSource (xen-based).
- 2008: Microsoft Hyper-V (xen-based).

Installation

- Lots of google examples.
- I use Debian Squeeze x86_64.
- Any major distro is fine.
- Enable Virtualization in BIOS.
- Verify host CPU Hardware Extensions: Intel-VT or AMD-V

```
~$ grep -E 'vmx|svm' /proc/cpuinfo
```

- Verify Host 64bit OS:

```
~$ uname -m  
x86_64
```

- Stop and disable NetworkManager:

```
~$ sudo /etc/init.d/network-manager stop  
~$ sudo /update-rc.d network-manager disable 2
```

- Configure Host Static Network Settings

Default network is NAT. To network guest in the same sub-net use a host bridge:
NOTE: Do not use wifi.

```
~$ sudo apt-get install bridge-utils
```

```
~$ sudo cat > /etc/network/interface << EOF
iface eth0 inet manual
auto br0
iface br0 inet static
    address 192.168.0.2
    network 192.168.0.0
    netmask 255.255.255.0
    broadcast 192.168.0.255
    gateway 192.168.0.1
    bridge_ports eth0
    bridge_fd 9
    bridge_hello 2
    bridge_maxage 12
    bridge_stp off
    dns-nameservers 192.168.0.1
    dns-search mydomain.com
EOF
```

```

~$ sudo cat > /etc/resolv.conf << EOF
nameserver 192.168.0.1
search mydomain.com
EOF

~$ sudo /etc/init.d/networking restart

~$ /sbin/ifconfig

br0      Link encap:Ethernet  HWaddr 00:30:1b:bc:d5:48
         inet addr:192.168.0.2  Bcast:192.168.0.255  Mask:255.255.255.0
         inet6 addr: fe80::230:1bff:febc:d548/64  Scope:Link

eth0     Link encap:Ethernet  HWaddr 00:30:1b:bc:d5:48
         inet6 addr: fe80::230:1bff:febc:d548/64  Scope:Link

```

Disable Netfilter processing in the bridged traffic:

```

~$ sudo cat >> /etc/sysctl.conf << EOF
net.bridge.bridge-nf-call-ip6tables = 0
net.bridge.bridge-nf-call-iptables = 0
net.bridge.bridge-nf-call-arptables = 0
EOF

~$ sudo sysctl -p

~$ sudo brctl show

```

bridge name	bridge id	STP enabled	interfaces
br0	8000.00301bbcd548	no	eth0

- Install the KVM software

```
~$ sudo apt-get install kvm virt-manager
```

Configure KVM module to load upon reboot:

```
~$ sudo modprobe kvm kvm-intel (or kvm-amd)
```

```
~$ sudo update-rc.d libvirt-bin enable 2
```

```
~$ sudo /etc/init.d/libvirt-bin start
```

```
~$ sudo /etc/init.d/libvirtd status
```

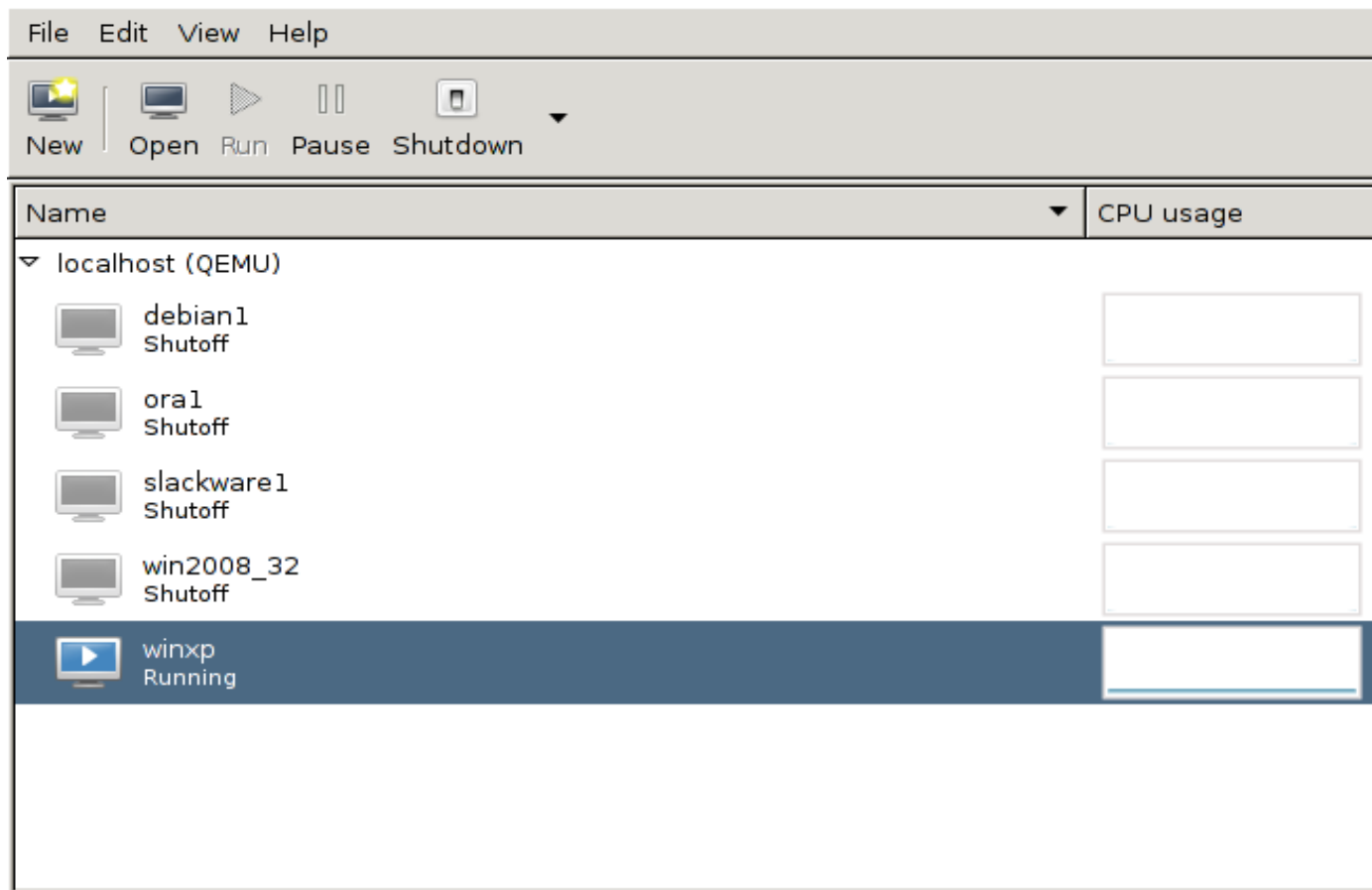
Add your user account to the libvirt local group:

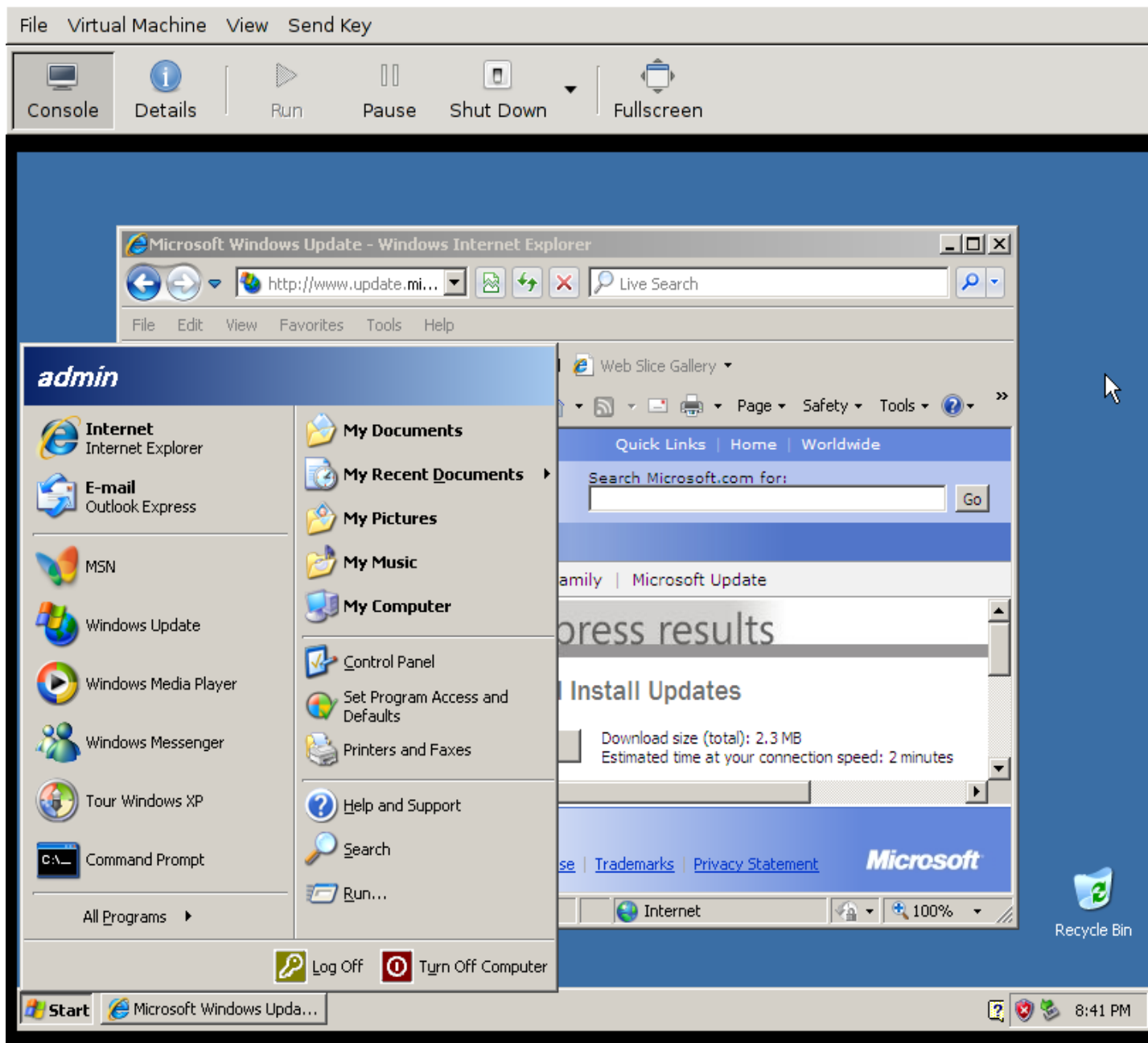
```
usermod -G libvirt johndoe
```

- Create Guest Using Virtual Machine Manager

Using the virt-manager GUI:

```
~$ virt-manager &
```





Using the virsh CLI:

```
~$ virsh --connect qemu:///system
Welcome to virsh, the virtualization interactive terminal.

Type:  'help' for help with commands
       'quit' to quit

virsh # list --all
  Id Name                                     State
-----
  10 winxp                                   running
    - debian1                               shut off

virsh # shutdown winxp
Domain winxp is being shutdown

virsh # list --all
  Id Name                                     State
-----
    - debian1                               shut off
    - oral                                   shut off

virsh # start winxp
Domain winxp started

virsh # exit
```

References:

KVM Home Page and FAQ:

<http://www.linux-kvm.org>

<http://www.linux-kvm.org/page/FAQ>

Open Virtualization Alliance:

<http://www.openvirtualizationalliance.org>

Red Hat Enterprise Virtualization (RHEV):

<http://www.redhat.com/products/virtualization>

SUSE Linux Enterprise Server 11 Virtualization /w KVM:

http://suse.com/documentation/sles11/singlehtml/book_kvm/book_kvm.html

Ubuntu Server Virtualization:

<http://www.ubuntu.com/business/server/virtualisation>

IBM Open Virtualization

<http://www.ibm.com/systems/virtualization>