KVM and libvirt

NSRC

Server virtualization

- Scenario: running VMs remotely on a server in a data centre
- We are more interested in:
  - Reliability
  - Performance / low overhead
  - Ability to grow to large clusters (without being tied into huge license fees!)
  - Remote management, scripted management
  - Features like machine migration

Choosing a hypervisor

- There are many hypervisor options out there
- Market has forced them all to be "free" - at least to begin with
- Commercial products: you pay later (heavily!) when you need to run clusters of machines

Our choice: KVM

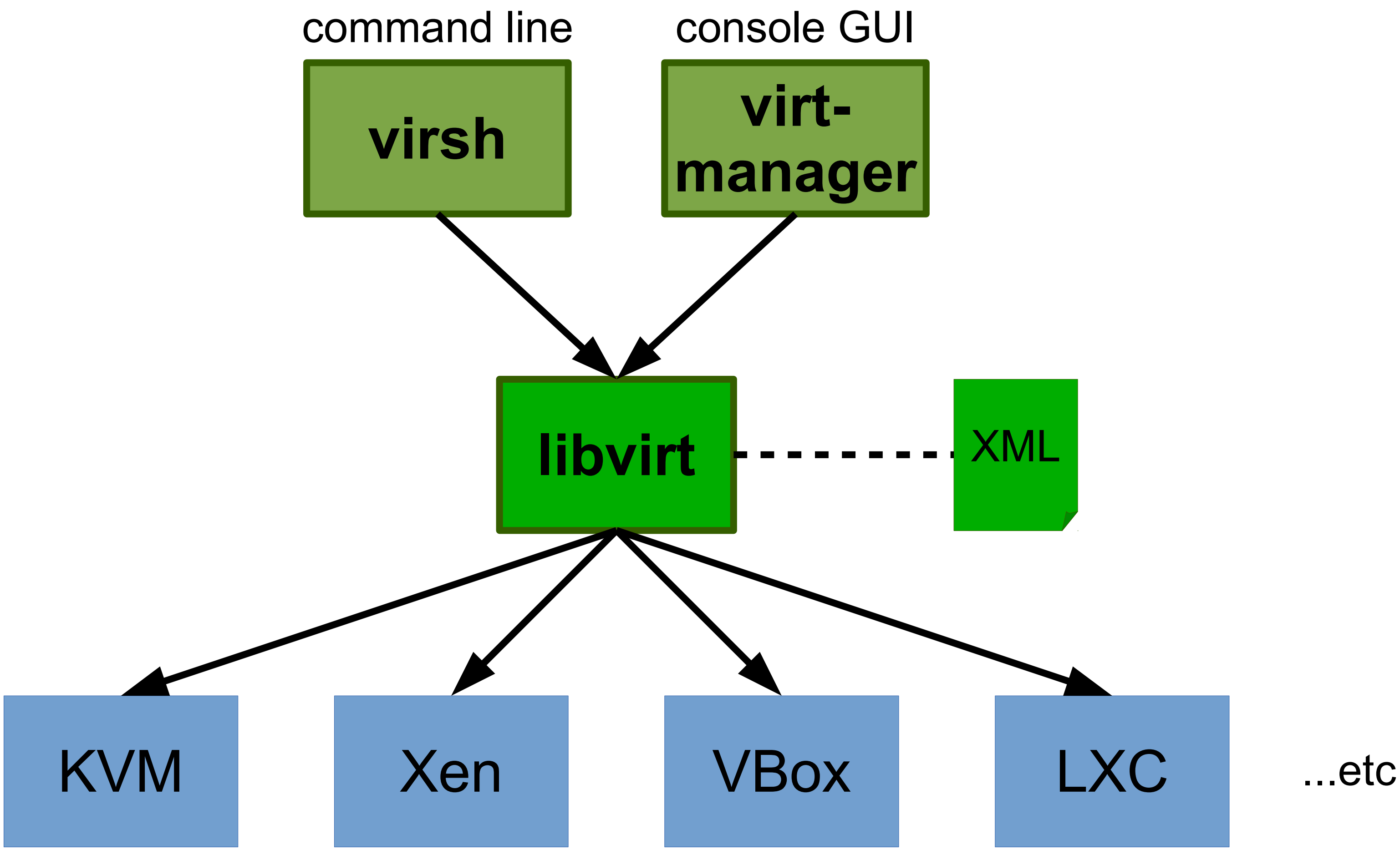
- KVM = Kernel Virtual Machine
- A hypervisor built into the Linux Kernel, based on QEMU
- It's where it's all happening!
  - Many, many projects using KVM
  - KVM gets all the development attention
- It *requires* VT-x or AMD-V to run
- The host must be Linux
  - but not necessarily the guests, of course

KVM is very simple

- Each VM is just a userland process
- Can run it directly from the command line
  - ***kvm –cdrom /path/to/image.iso***
    - starts a VM, ISO image attached
- Painful to track all the command line options for RAM, disk drives, network interfaces, etc etc
- So you need something to remember all your VMs and how to start them

libvirt

- Red Hat's framework for managing hypervisors



libvirt

- API to create, modify, and control VMs
  - Terminology: VM is called "guest domain"
- Each VM has an XML file with all settings
  - Easy to read, backup and duplicate
  - Relatively easy to modify
- Two front-ends
  - virsh: command-line
  - virt-manager: X11 GUI
- Various other projects interface with libvirt API

libvirt limitations

- No simple web interface included
- virt-manager *can* talk to remote hypervisors, but virt-manager itself only runs under Linux
  - so you may end up running a VNC desktop into the Linux box, just to run virt-manager there
- XML format is unique to libvirt
  - different to OVF, VMX etc
  - too hard to write from scratch!
- libvirt's storage management is difficult

virsh commands (1)

- ***`virsh list [--all]`***
  - list running (or all) VMs
- ***`virsh start VM`***
  - start the VM named *VM*
- ***`virsh shutdown VM`***
  - shutdown VM (properly)
- ***`virsh destroy VM`***
  - kill a VM (power off)
- ***`virsh console VM`***
  - connect to the serial console of a VM
- ***`virsh define FILE`***
  - create VM definition from this XML file
- ***`virsh undefine VM`***
  - erase the machine definition (danger!)

Easily scriptable - e.g. easy to write a shell loop to start or stop a bunch of VMs

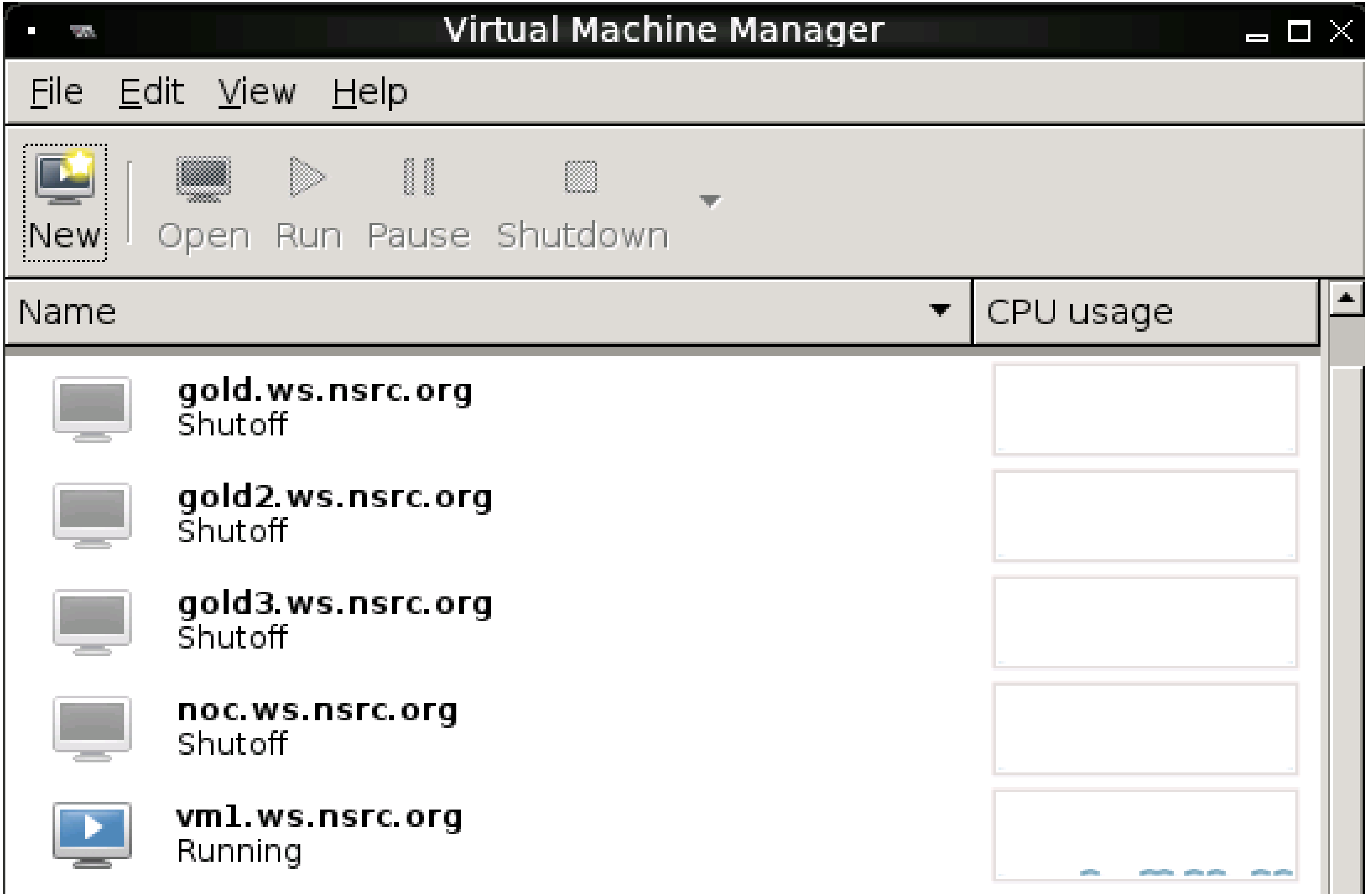
virsh commands (2)

- ***virsh dumpxml VM***
  - show the XML

- ***virsh edit VM***
  - open XML in editor

```
<domain type=’kvm’>
  <name>noc.ws.nsrc.org</name>
  <uuid>4641a945-abab-1c0b-0fb0-2db681c28130</uuid>
  <memory>1048576</memory>
  <currentMemory>1048576</currentMemory>
  <vcpu>1</vcpu>
  <os>
    <type arch=’x86_64’ machine=’pc-1.0’>hvm</type>
    <boot dev=’hd’/>
  </os>
...
```

virt-manager - main view



gold.ws.nsrc.org
Shutoff

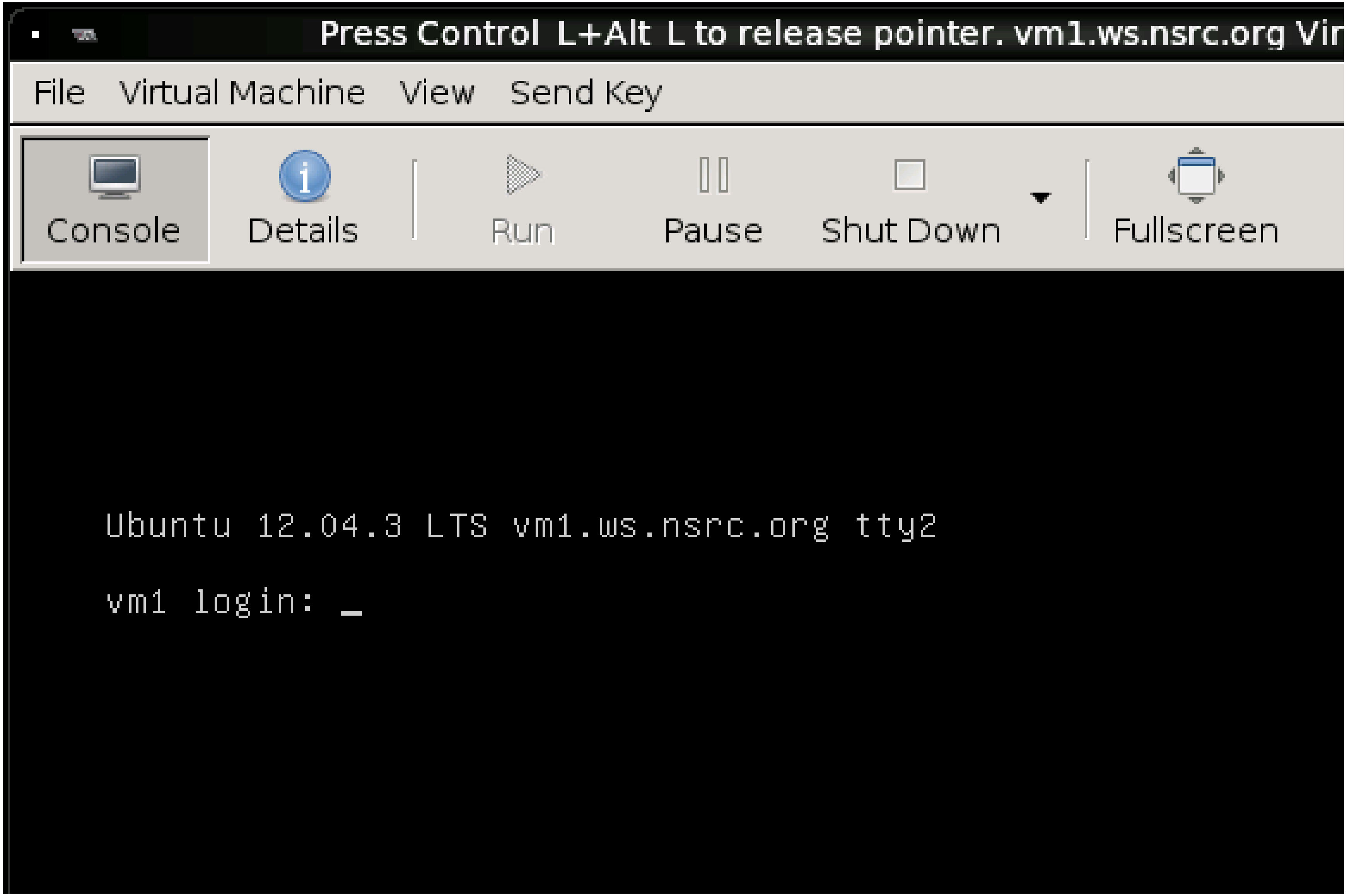
gold2.ws.nsrc.org
Shutoff

gold3.ws.nsrc.org
Shutoff

noc.ws.nsrc.org
Shutoff

vm1.ws.nsrc.org
Running

virt-manager - console view

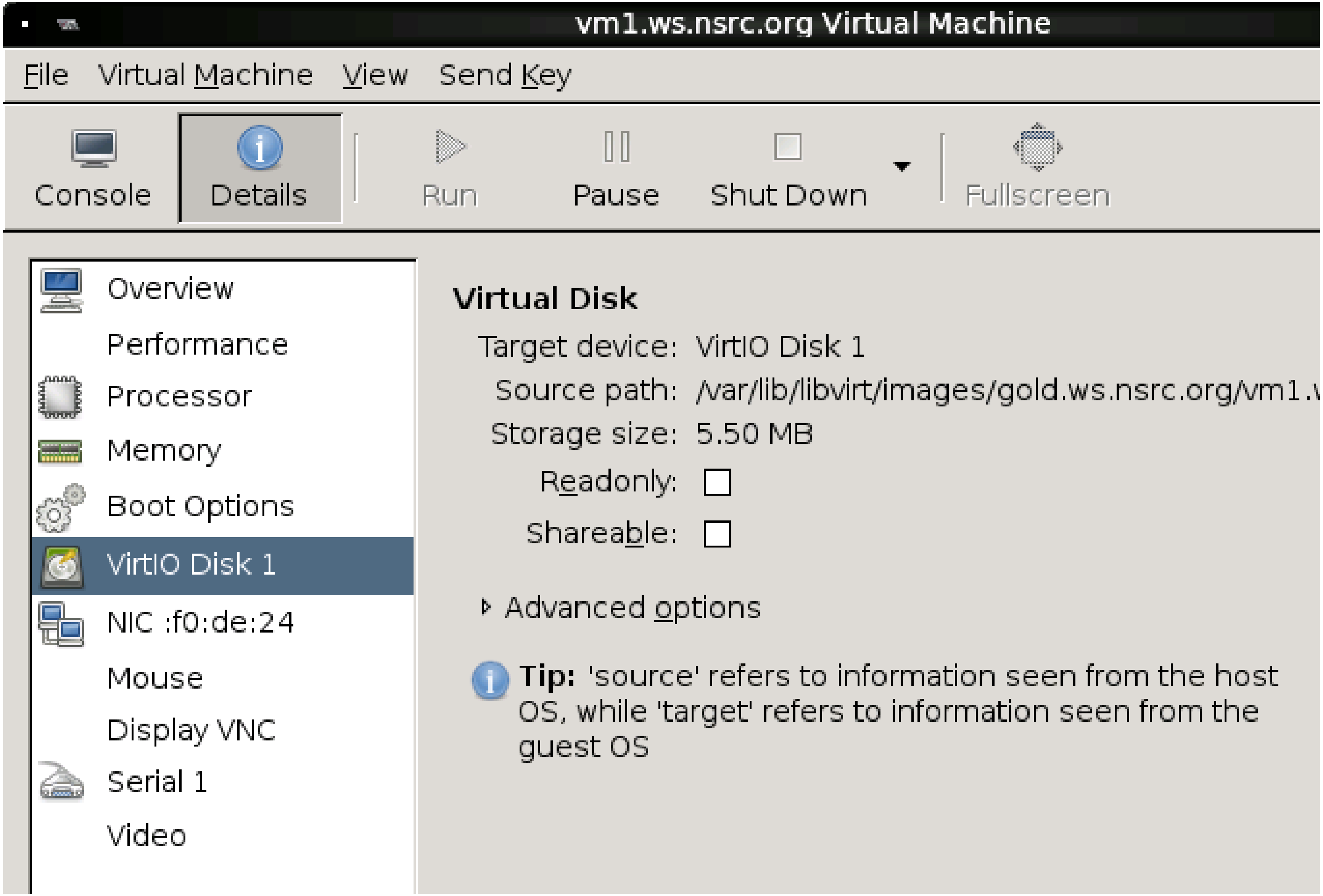


```
Ubuntu 12.04.3 LTS vm1.ws.nsrc.org tty2

vm1 login: _
```

NOTE: Press Left-CTRL and Left-ALT together to release the keyboard and mouse

virt-manager - VM details/settings



Virtual Disk

Target device: VirtIO Disk 1

Source path: /var/lib/libvirt/images/gold.ws.nsrc.org/vm1.v

Storage size: 5.50 MB

Readonly: □

Shareable: □

▸ Advanced options

Tip: 'source' refers to information seen from the host OS, while 'target' refers to information seen from the guest OS

Summary

- KVM is a free, open-source hypervisor for Linux
- All major Linux distros support KVM
- libvirt is a simple admin interface
  - starts and stops the hypervisor
  - stores hypervisor settings in XML file
  - virsh: command line
  - virt-manager: GUI comparable to VirtualBox (albeit not as polished)