Deploy and test oVirt using nested virtualization environments

Mark Wu
wudxw@linux.vnet.ibm.com

Agenda

- Nested KVM
- Kickstart & Cobbler
- Kickstart files for VMs
- Install and clone oVirt VMs
- Integration test with Igor
- Q & A

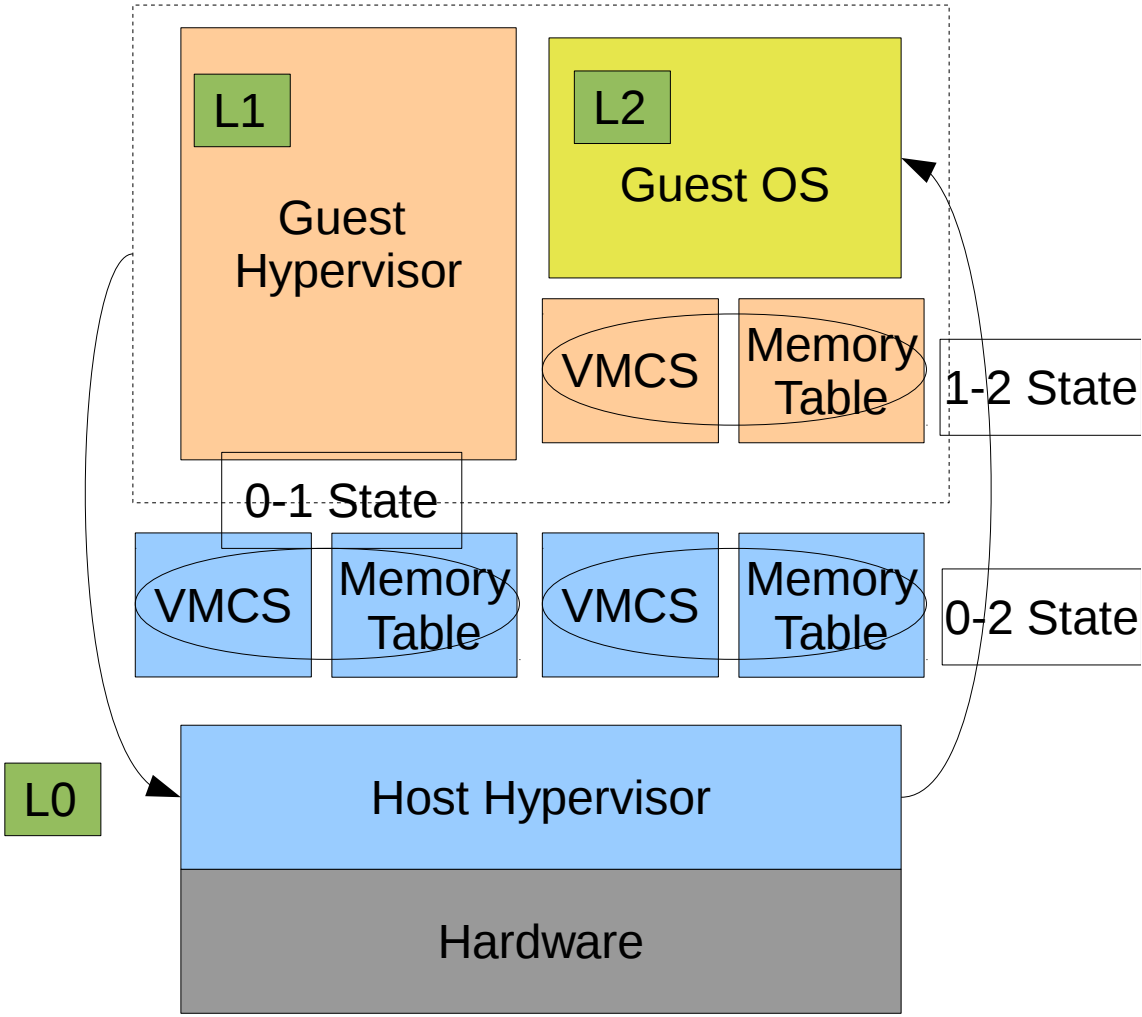
Nested Virtualization

oVirt

- Running multiple unmodified hypervisors with their associated unmodified VM's
- Why?
  - Operating systems are already hypervisors (Windows 7 with XP mode, Linux/KVM)
  - To be able to run other hypervisors in clouds
  - Live migration of hypervisors and their vms
  - Testing, demonstrating, debugging hypervisors and virtualization setups

Nested VMX

- Merged in kernel 3.1
- No hardware support
- Multiplex hardware
- Follows the “trap and emulate” model
- Flow:
  - L0 intercepts the 'vmlaunch' instruction which L1 execute to run L2
  - L0 generates VMCS0-2 by merging VMCS1-2 and VMCS0-1 and then launches L2



How to enable nested KVM? (For VMX)

- Enable the nested switch of kvm_intel.ko
  - enable it at runtime
    - modprobe -r kvm_intel
    - modprobe kvm_intel nested=1
  - Verify
    - $cat /sys/module/kvm_intel/parameters/nested => Y
  - Persist the change
    - echo “options kvm-intel nested=1″>/etc/modprobe.d/kvm-intel.conf
- Qemu command line
  - qemu -cpu host
  - qemu -cpu qemu64,+vmx

How to enable nested KVM? (cont'd)

- Libvirt XML
  - Use host CPU model

```
<cpu mode='host-model'/>
```

  - Specify a CPU model

```
<cpu match='exact'>
  <model>core2duo</model>
  <feature policy='require' name='vmx'/>
</cpu>
```

- Verify in guest
  - cat /proc/cpuinfo |grep vmx
  - qemu-kvm should not complain about no access to KVM kernel module

Kickstart & Cobbler

- Kickstart
  - Using 'answer file' to installer to do fully automatic installations
  - Used with PXE
- Cobbler
  - A provisioning (installation) and update server
  - Supports deployments via:
    - PXE (network booting)
    - Virtualization (Xen, QEMU/KVM, or Vmware) (by koan)
    - Re-installs of existing Linux systems (by koan)
- Update server features
  - yum mirroring
  - Integrate mirrors with kickstart

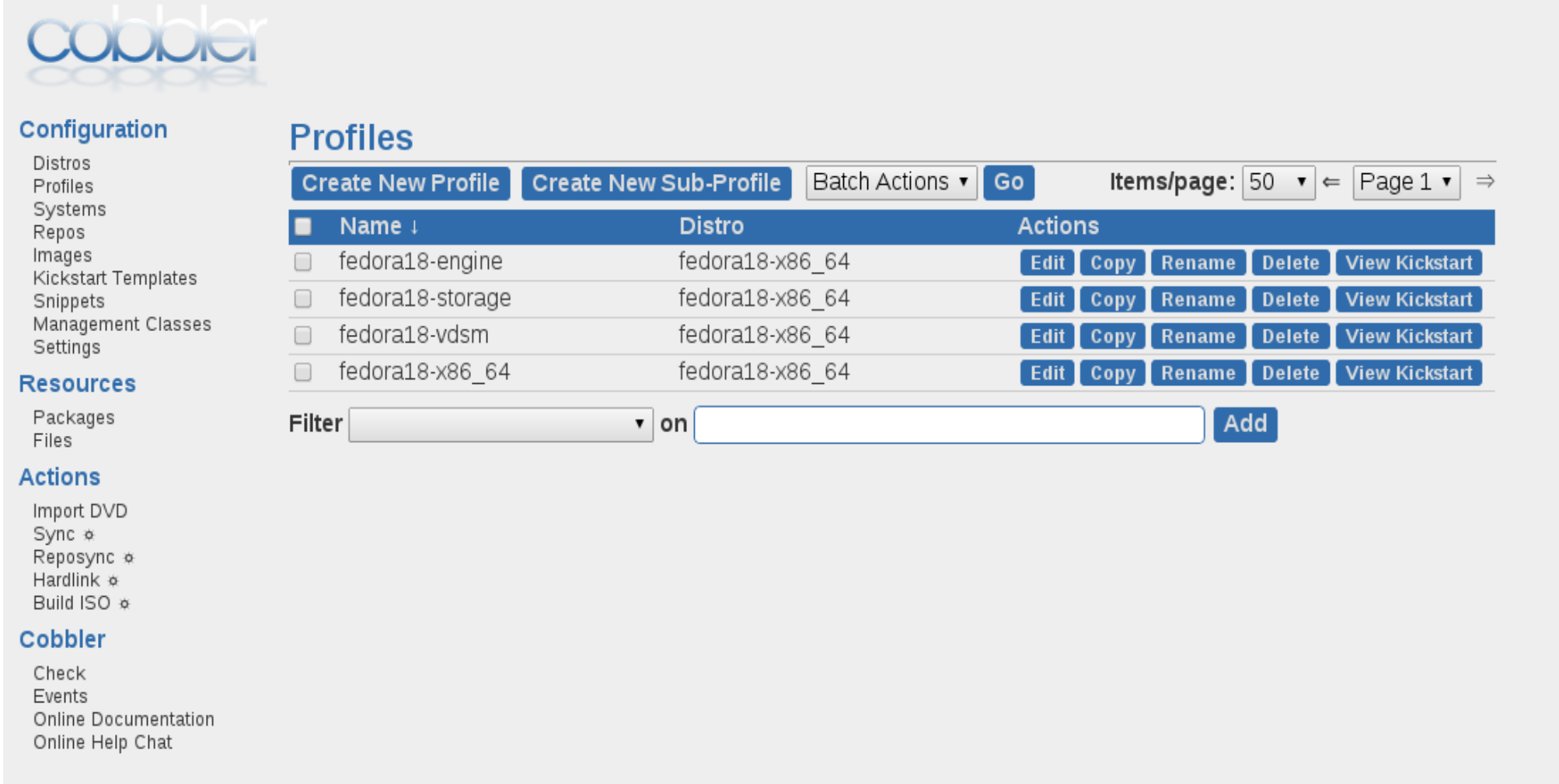
Cobbler concepts

- Distributions
  - contain information about what kernel and initrd are used, plus metadata
- Profiles
  - associate a Distribution with a kickstart file and optionally customize the metadata further.
- Systems
  - associate a MAC, IP, and other networking details with a profile
- Repositories
  - contain yum mirror information

Setup cobbler server for oVirt

```
mount -o loop Fedora-18-x86_64-DVD.iso /mnt
cobbler import --path=/mnt --name=fedora18 –arch=x86_64

cobbler repo add --name=ovirt-3.2
--mirror=http://resources.ovirt.org/releases/3.2/rpm/Fedora/18/

cobbler repo add –name=glustefs
--mirror=http://download.gluster.org/pub/gluster/glusterfs/qa-
releases/3.4.0alpha/Fedora/fedora-18/x86_64/

cobbler repo add --name=fedora18-everything
--mirror=http://mirrors.163.com/fedora/releases/18/Everything/x86_64/os  --mirror-
locally=N

cobbler repo add --name=fedora18-updates
--mirror=http://mirrors.163.com/fedora/updates/18/x86_64/ --mirror-locally=N

cobbler reposync

cobbler profile add --name=fedora18-engine --distro=fedora18-x86_64 --virt-ram=2048
--virt-type=qemu --virt-file-size=20 --virt-cpus=2 --virt-path=/var/lib/libvirt/images/ --virt-
disk-driver=qcow2 –virt-bridge=virbr-ovirt --repos="ovirt-3.2 fedora18-everything
fedora18-updates" –kickstart=/var/lib/cobbler/kickstarts/engine.ks
...
```

Cobbler Web UI



Kickstart file for oVirt engine

- Key packages:
  - ovirt-engine
  - firefox
  - spice-xpi
- Prepare an answer file in %post section

```
cat >/home/ovirtadm/engine/answer <<EOF
[general]
...
HOST_FQDN=ENGINE_FQDN  # Replace with hostname before running engine-setup
AUTH_PASS=ovirt
DC_TYPE=NFS
DB_REMOTE_INSTALL=local
DB_LOCAL_PASS=ovirt
NFS_MP=/var/lib/export/iso
...
EOF
```

Kickstart file for VDSM

- Key packages
  - vdsm
  - vdsm-cli
  - vdsm-gluster
  - -NetworkManager
- Inject ssh public key

```
cat >> .ssh/authorized_keys << END_AUTHORIZED_KEYS
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQDQmD6md
...    (replace it with the  ssh public key on your management host.
END_AUTHORIZED_KEYS
chmod 600 .ssh/authorized_keys

if -x /usr/sbin/selinuxenabled && /usr/sbin/selinuxenabled; then
  chcon -R -h -t home_ssh_t .ssh
fi
```

Kickstart file for storage server

- Key packages
  - nfs-utils
  - targetcli
- Create volume group for NFS

```
part pv.02 --size=83920
volgroup vg_iscsi pv.02
logvol /ovirt-iso --fstype ext4 --vgname=vg_nfs --name=lv1 --size=20480
logvol /ovirt-data --fstype ext4  --vgname=vg_nfs --name=lv2 --size=20480  --grow
```

- Enable NFS service

```
chown 36:36 /ovirt-data /ovirt-iso
echo "/ovirt-data  *(rw)" > /etc/exports
echo "/ovirt-iso *(rw)" >> /etc/exports
systemctl enable targetcli.service
systemctl start targetcli.service
```

Kickstart file for storage server (Cont'd)

- Create volume group for iscsi target
- Setup iscsi target via LIO
  - LIO is the standard and unified SCSI Target in Linux
  - Supports different fabrics as the frontend of the SCSI target by fabric modules:
    - Fibre Channel, FcoE, iSCSI, vHost, etc.
  - Backstores implement methods of accessing data on devices.
    - block, fileio, pscsi, ramdisk, etc
  - Configured by targetcli.

```
targetcli "/backstores/block create name=block01 dev=/dev/iscsi/lv01"
targetcli "/iscsi create wwn=iqn.2013-04.org.ovirt.storage-server:t01"
targetcli "/iscsi/iqn.2013-04.org.ovirt.storage-server:t01/tpg1/luns create
storage_object=/backstores/block/block01"
targetcli "/iscsi/iqn.2013-04.org.ovirt.storage-server:t01/tpg1/portals create"
...
targetcli "/ saveconfig"
```

VM Network

- Make use of libvirt's NATed virtual network.
- Set mac, ip, and hostname mapping for VMs

```
<network>
  <name>ovirt-test</name>
  <forward mode='nat'>
    <nat>
      <port start='1024' end='65535'/>
    </nat>
  </forward>
  <bridge name='virbr-ovirt' stp='on' delay='0' />
  <mac address='52:54:00:BA:19:DF'/>
  <domain name='test.ovirt.org'/>
  <ip address='192.168.247.1' netmask='255.255.255.0'>
    <dhcp>
      <host mac='52:54:00:70:9e:33' name='engine1' ip='192.168.247.2' />
      <host mac='52:54:00:9a:82:be' name='storage1' ip='192.168.247.3' />
      <host mac='52:54:00:e1:dc:f4' name='host1'' ip='192.168.247.4' />
      <host mac='52:54:00:1b:3a:a2' name='host2' ip='192.168.247.5' />
    </dhcp>
  </ip>
</network>
```

Create oVirt VMs

- Using virt-install

```
virt-install --name engine-base --vcpus 2 –ram 2048
 --disk path=/var/lib/libvirt/engine-base.qcow2,format=qcow2,bus=virtio,cache=none
 -w network=ovirt-test  --accelerate  --location $(INSTALL_TREE)
 --os-variant fedora18  --extra-args ks=http://cobbler-server/engine.ks --noreboot
```

- Using koan

```
koan --server 192.168.247.1 --virt --profile=fedora18-engine --virt-type=kvm –qemu-disk-type=virtio –virt-name=engine-base

koan --server 192.168.247.1 --virt --profile=fedora18-vdsm --virt-type=kvm –qemu-disk-type=virtio –virt-name=vdsm-base
```

- Update CPU model to enable nested KVM for VMs running VDSM

Clone oVirt VMs

- Clone images based on the base Vms

```
qemu-img create -f qcow2 -b /var/lib/libvirt/image/engine-base
/var/lib/libvirt/engine-foo.qcow2
```

- Append a new dhcp entry (mac, ip and hostname) to virtual network for the new vm.
- Clone new vm

```
virt-clone --connect qemu:///system -o engine-base -n engine1 -f
/var/lib/libvirt/image/engine-foo.qcow2 --preserve-data --mac MAC
```

- Update configurations inside guests
  - guest-mount
  - Run guest commands via ssh, like engine-setup

Put things together & Demo

- Create VM network and base Vms

```
ovirt-setup.py setup
ovirt-setup.py create-base --type engine --name engine-base
--profile fedora18-engine
ovirt-setup.py create-base --type vdsm --name vdsm-base --profile
fedora18-vdsm
ovirt-setup.py create-base --type storage --name storage-base
--profile fedora18-storage
```

- Clone a new oVirt setup

```
ovirt-setup.py clone-vm --base engine-base --name engine1
ovirt-setup.py clone-vm --base vdsm-base --name vdsm1
ovirt-setup.py clone-vm --base vdsm-base --name vdsm2
ovirt-setup.py clone-vm --base storage-base --name storage1
```

oVirt cluster level tests

- ovirt-engine-sdk
  - an auto-generated python API which uses REST-API to perform operations against ovirt-engine
- Examples
  - Create iSCSI Data Center

```
if api.datacenters.add(params.DataCenter(name=DC_NAME,
storage_type='iscsi', version=VERSION)):
    print 'iSCSI Data Center was created successfully'
```

  - Create Cluster

```
if api.clusters.add(params.Cluster(name=CLUSTER_NAME,
cpu=params.CPU(id=CPU_TYPE),
data_center=api.datacenters.get(DC_NAME), version=VERSION)):
            print 'Cluster was created successfully'
```

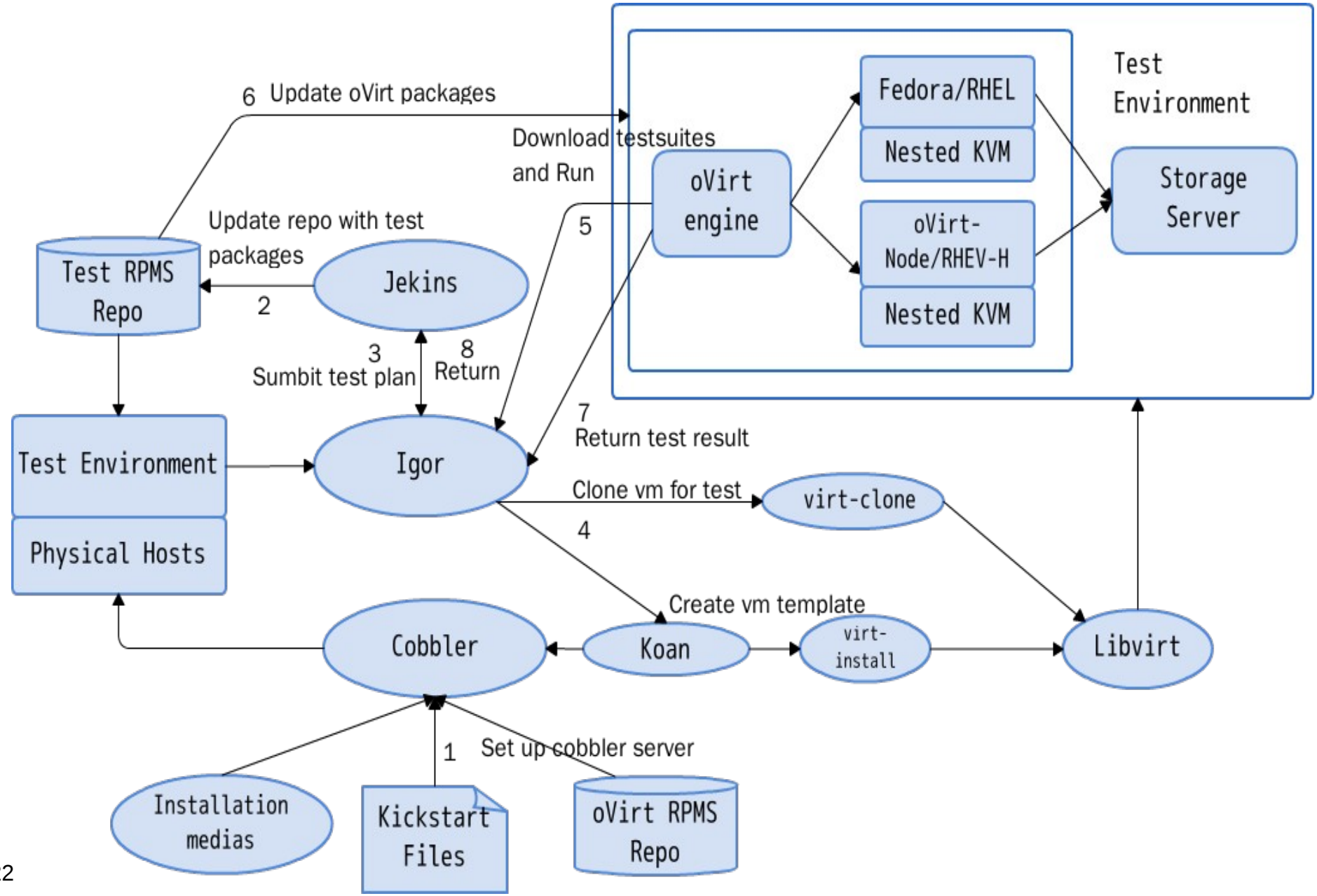
Igor

- Used for auto testing for oVirt Node/REHV-H
- Automate deployment, installation
  - Installation via PXE
  - Import ISO using livecd-to-pxeboot
  - Create profile and system in Cobbler.
  - Run installation or update
- Works for virtual guests and real hardware
  - Libvirt for virtual guests
- Testsuite life-cycle management

Proposed solution for oVirt functional test

- Expand Igor's test plan for oVirt functional tests
  - Allow specify the specs of test environment
  - Allow creating test vm based on a template
  - Allow creating vm template if it doesn't exist
  - Skipped system installation
- Ship igor-client in ovirt-engine VM
  - Associate test cases with host name
- Run test suites based on oVirt engine SDK
  - Run update rpm packages as a 'setup' test

Test flow with Igor using nested KVM



Resources

- The Turtles Project: Design and Implementation of Nested Virtualization
- http://fedoraproject.org/wiki/Anaconda/Kickstart
- http://www.cobblerd.org/
- http://www.ovirt.org/Testing/PythonApi
- Automated Testing of oVirt Node
- https://github.com/wudx05/ovirt-setup

oVirt

Thanks for Listening!
Q & A

http://www.ovirt.org
wudxw@linux.vnet.ibm.com