Virtual Server Management

with KVM for IBM z Systems

Viktor Mihajlovski <mihajlov@de.ibm.com>

Agenda

- KVM virtualization components
- Managing virtual servers
- Managing virtual resources
- Migrating running virtual servers
- Setting up virtual servers

KVM Virtualization Components

Host resource management
Virtual server life cycle

libvirt

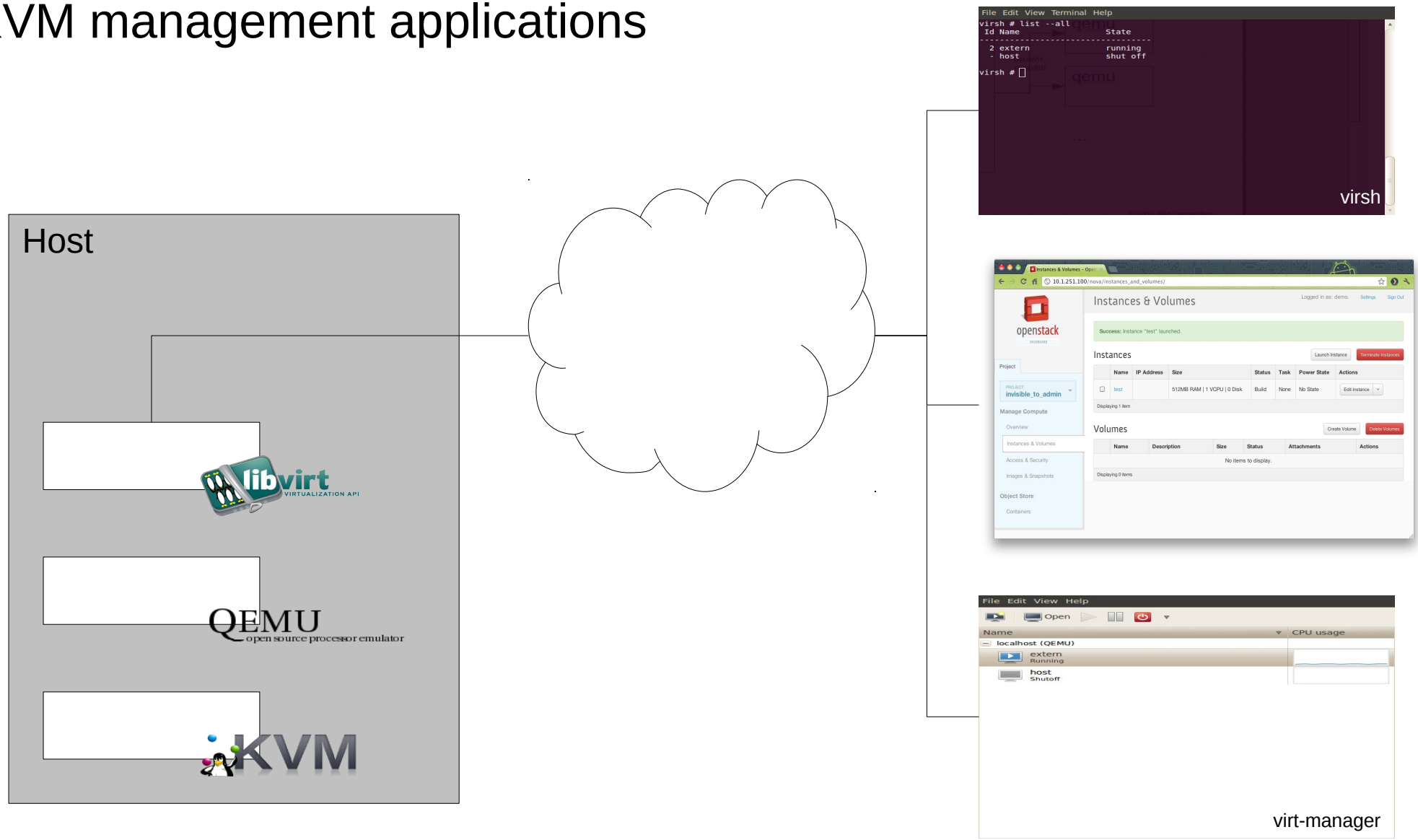
I/O virtualization
CPU and memory support

QEMU

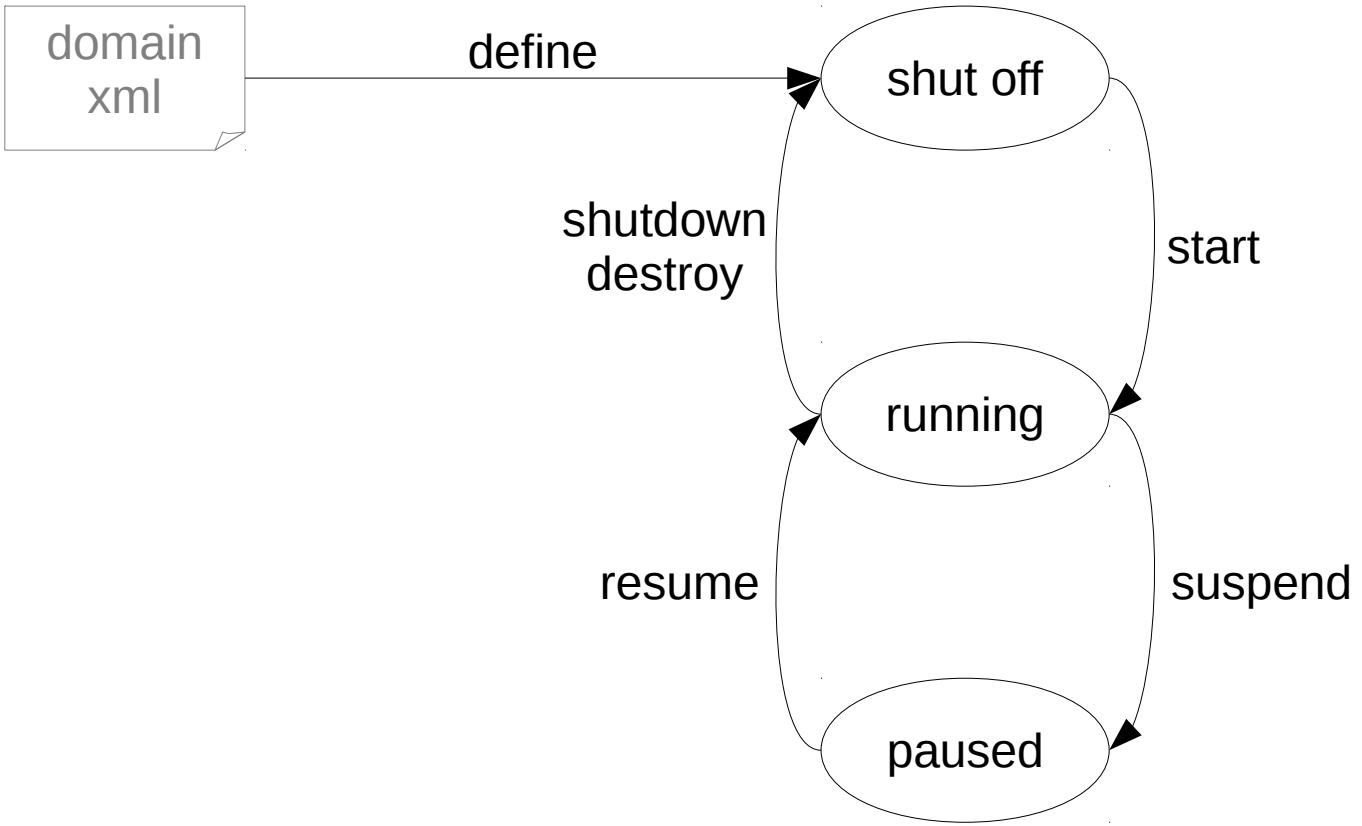
CPU and memory

kvm kernel module

KVM management applications

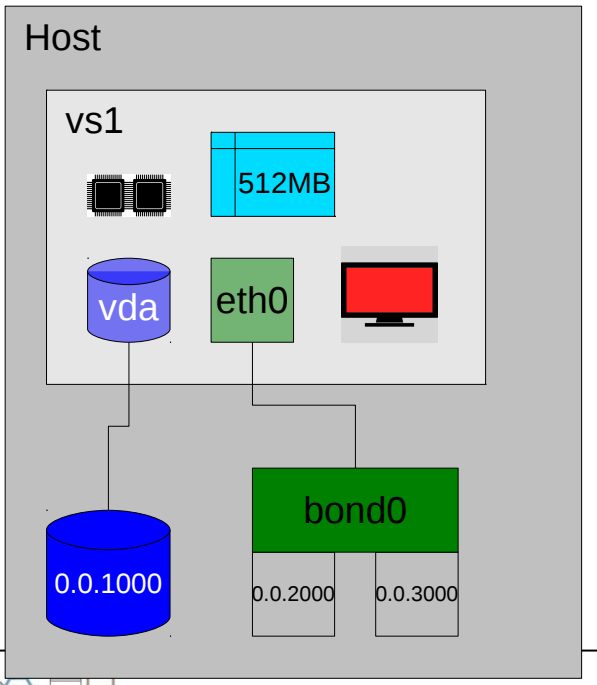


Virtual server states (simplified)



Defining a virtual server: the domain XML

```
<domain type='kvm'>
  <name>vs1</name>
  <memory>524288</memory>
  <vcpu>2</vcpu>
  <os>
    <type arch='s390x' machine='s390-ccw-virtio'>hvm</type>
  </os>
  <iothreads>1</iothreads>
  <devices>
    <disk type='block' device='disk'>
      <driver name='qemu' type='raw' cache='none' iothread='1' io='native'/>
      <source dev='/dev/disk/by-path/ccw-0.0.1000'/>
      <target dev='vda' bus='virtio'/>
    </disk>
    <interface type='direct'>
      <source dev='bond0' mode='bridge'/>
      <model type='virtio'/>
    </interface>
    <console type='pty'>
       <target type='sclp'/>
    </console>
  </devices>
</domain>
```



Defining a virtual server with virsh

Step 1: Make sure the libvirt daemon is running

```
# systemctl status libvirtd
libvirtd.service - Virtualization daemon
   Loaded: loaded (/usr/lib/systemd/system/libvirtd.service; enabled)
   Active: active (running) since Thu 2015-04-16 10:55:29 CEST; 2 months 3 days ago
     Docs: man:libvirtd(8)
           http://libvirt.org
 Main PID: 5615 (libvirtd)
   CGroup: /system.slice/libvirtd.service
           ├─5615 /usr/sbin/libvirtd
           ├─6750 /sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf  ...
           └─6751 /sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf  ...
```

Step 2: Define a virtual server

```
# virsh define vs1.xml
Domain vs1 defined from vs1.xml
```

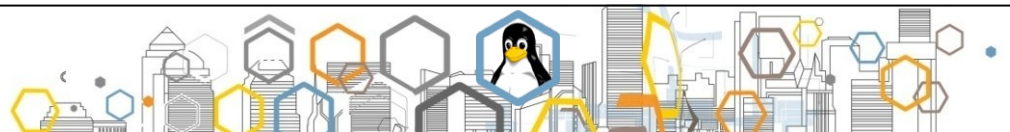
Starting and stopping a virtual server with virsh

Start a virtual server

```
# virsh start vs1
Domain vs1 started
```

Shut down a virtual server

```
# virsh shutdown vs1
Domain vs1 is being shut down
```



Monitoring a virtual server with virsh

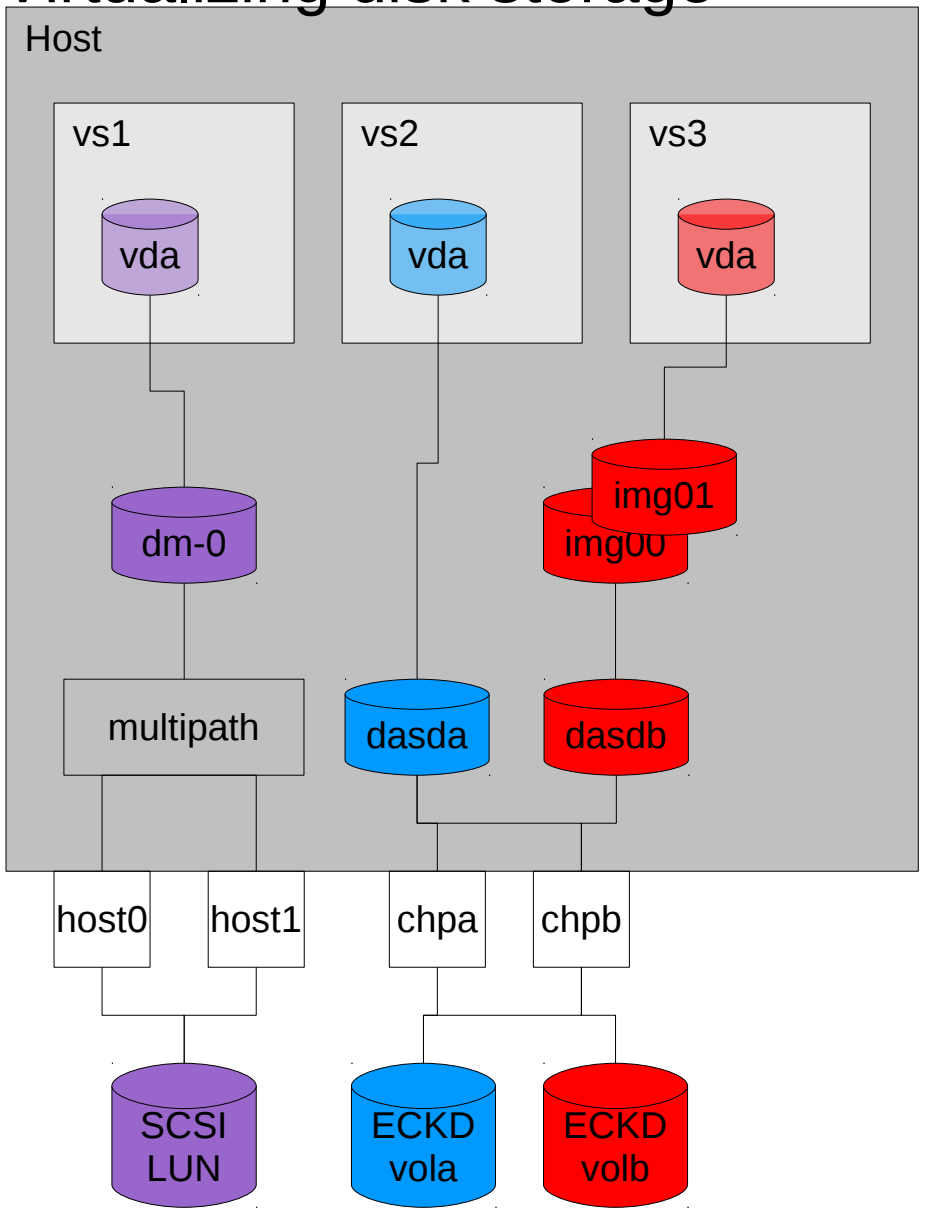
List running virtual servers

```
# virsh list
 Id    Name                           State
----------------------------------------------------
 11    vs1                            running
```

Display virtual server details

```
# virsh dominfo vs1
Id:             11
Name:           vs1
UUID:           ea6de929-a4df-487d-8054-d50b4af20708
OS Type:        hvm
State:          running
CPU(s):         2
CPU time:       266.6s
Max memory:     524288 KiB
Used memory:    524288 KiB
Persistent:     yes
Autostart:      disable
Managed save:   no
Security model: selinux
Security DOI:   0
Security label: system_u:system_r:svirt_t:s0:c24,c532 (enforcing)
```


Virtualizing disk storage

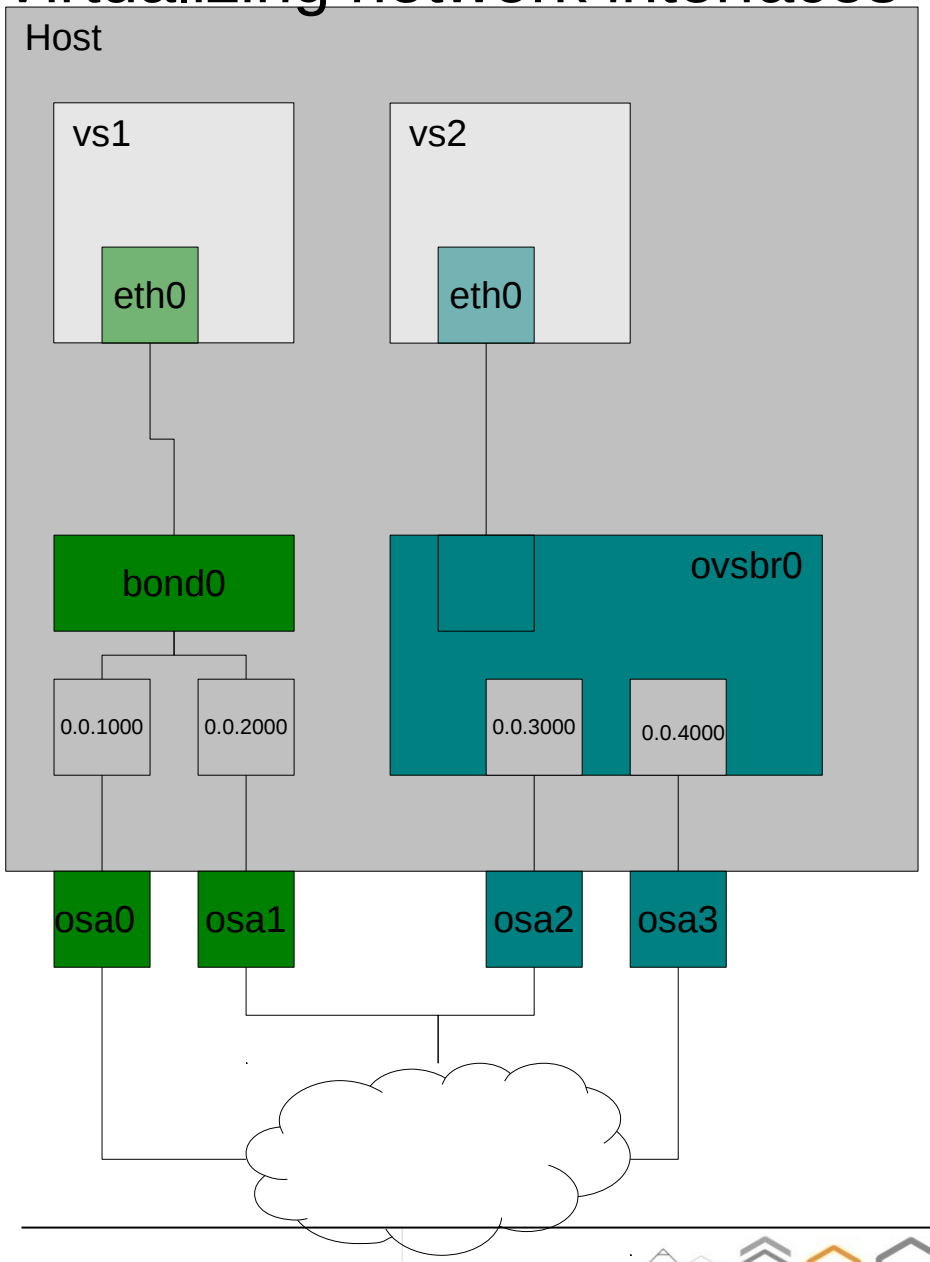



```
<disk type='file' device='disk'>
      <source file='/var/libvirt/images/img01'/>
      <driver name='qemu' type='raw' io='native'
          cache='none' iothread='1'/>
      <target dev='vda' bus='virtio'/>
</disk>
```

```
<disk type='block' device='disk'>
      <source dev='/dev/dasda'/>
      <driver name='qemu' type='raw' io='native'
          cache='none' iothread='1'/>
      <target dev='vda' bus='virtio'/>
</disk>
```

```
<disk type='block' device='disk'>
      <source dev='/dev/dm-0'/>
      <driver name='qemu' type='raw' io='native'
          cache='none' iothread='1'/>
      <target dev='vda' bus='virtio'/>
</disk>
```

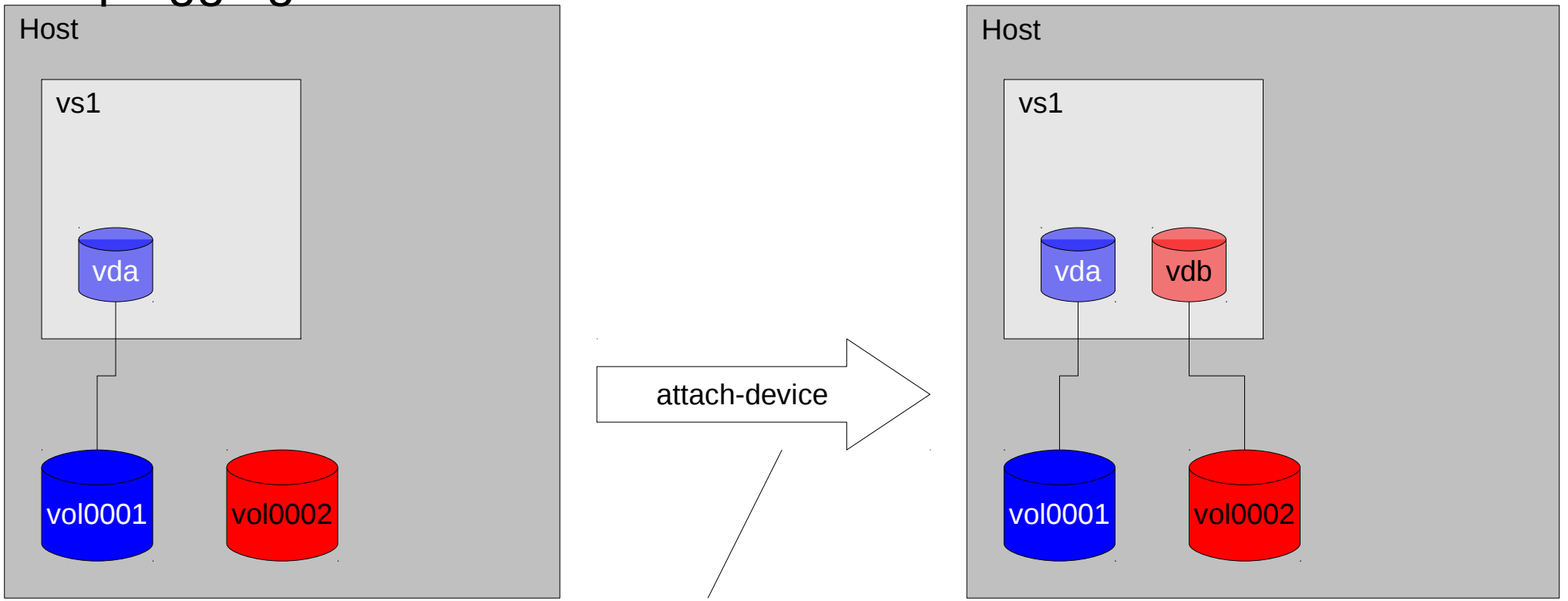
Virtualizing network interfaces




```
  <interface type='direct'>
        <source dev='bond0'/>
        <model type='virtio'/>
        <mac address='47:11:af:fe:08:15'/>
  </interface>
```

```
<interface type='bridge'>
      <source bridge='ovsbr0'/>
      <model type='virtio'/>
      <virtualport type='openvswitch'/>
      <mac address='be:ef:ca:fe:fe:ed'/>
</interface>
```

Hotplugging devices




```
<disk type='file' device='disk'>
       <source file='/var/libvirt/images/vol0002'/>
       <driver name='qemu' type='raw' io='native'
            cache='none' iothread='1'/>
       <target dev='vdb' bus='virtio'/>
</disk>
```

Attaching a second disk with virsh

Before attach

```
# virsh domblklist vs1
Target     Source
------------------------------------------------
vda        /dev/disk/by-path/ccw-0.0.1000
```

Attach

```
# cat vdb.xml
<disk type='block' device='disk'>
      <driver name='qemu' type='raw' cache='none' iothread='1' io='native'/>
      <source dev='/dev/disk/by-path/ccw-0.0.2000'/>
      <target dev='vdb' bus='virtio'/>
</disk>
# virsh attach-device –live vs1 vdb.xml
Device attached successfully
```

After attach

```
# virsh domblklist vs1
Target     Source
------------------------------------------------
vda        /dev/disk/by-path/ccw-0.0.1000
vdb        /dev/disk/by-path/ccw-0.0.2000
```

Virtual Server Trouble Shooting

- <on_crash>
  - restart: potential reboot loops
  - destroy: default, allows simple external automation
  - preserve: allows detailed analysis

Observing a crash

Before crash

```
# virsh domstate --reason vs1
running (booted)
```

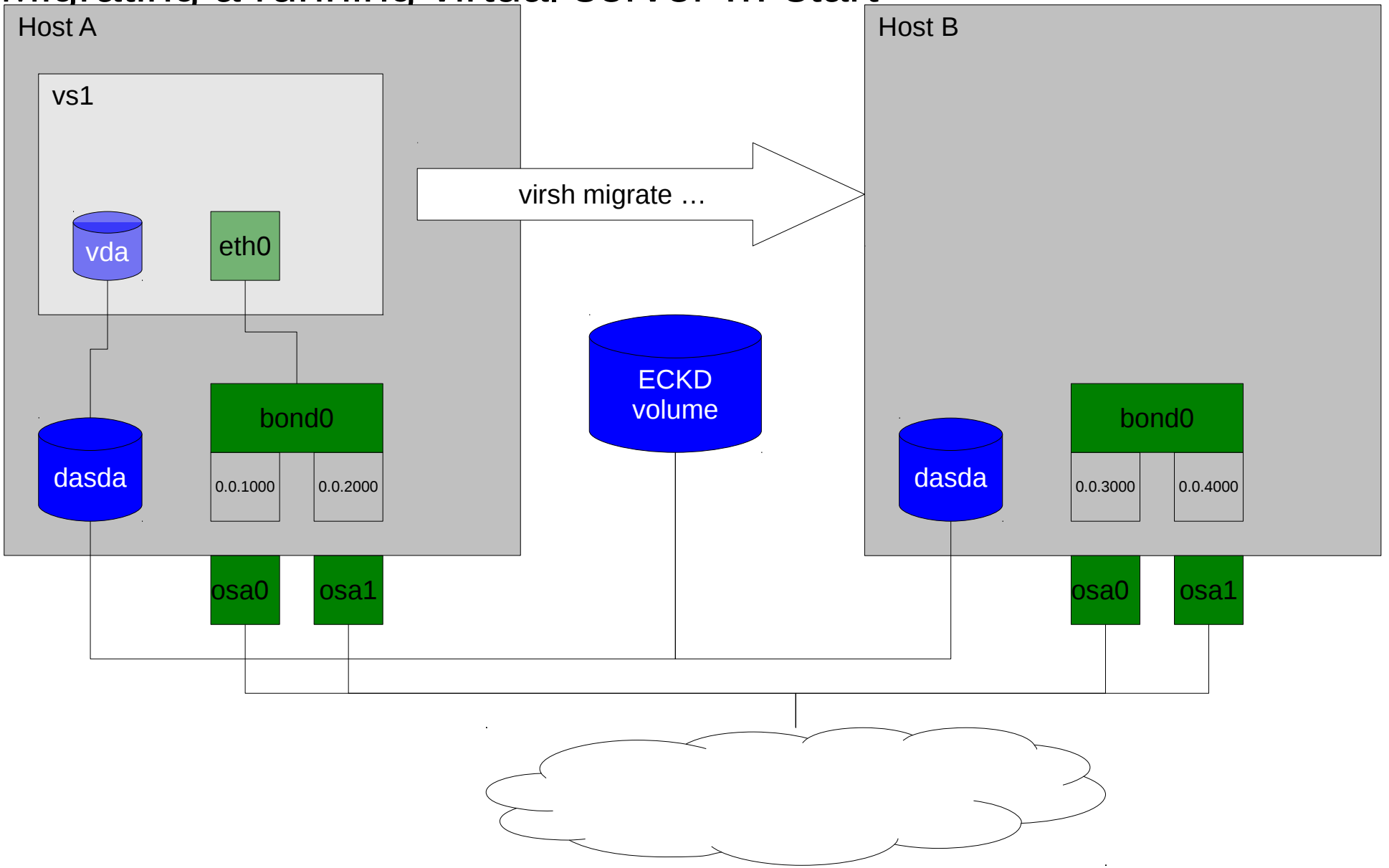
Provoke crash in virtual server

```
# virsh console vs1
~ # echo c > /proc/sysrq-trigger
[ 7056.393138] sysrq: SysRq : Trigger a crash
…
…
[ 7056.393302] Kernel panic - not syncing: Fatal exception: panic_on_oops
```

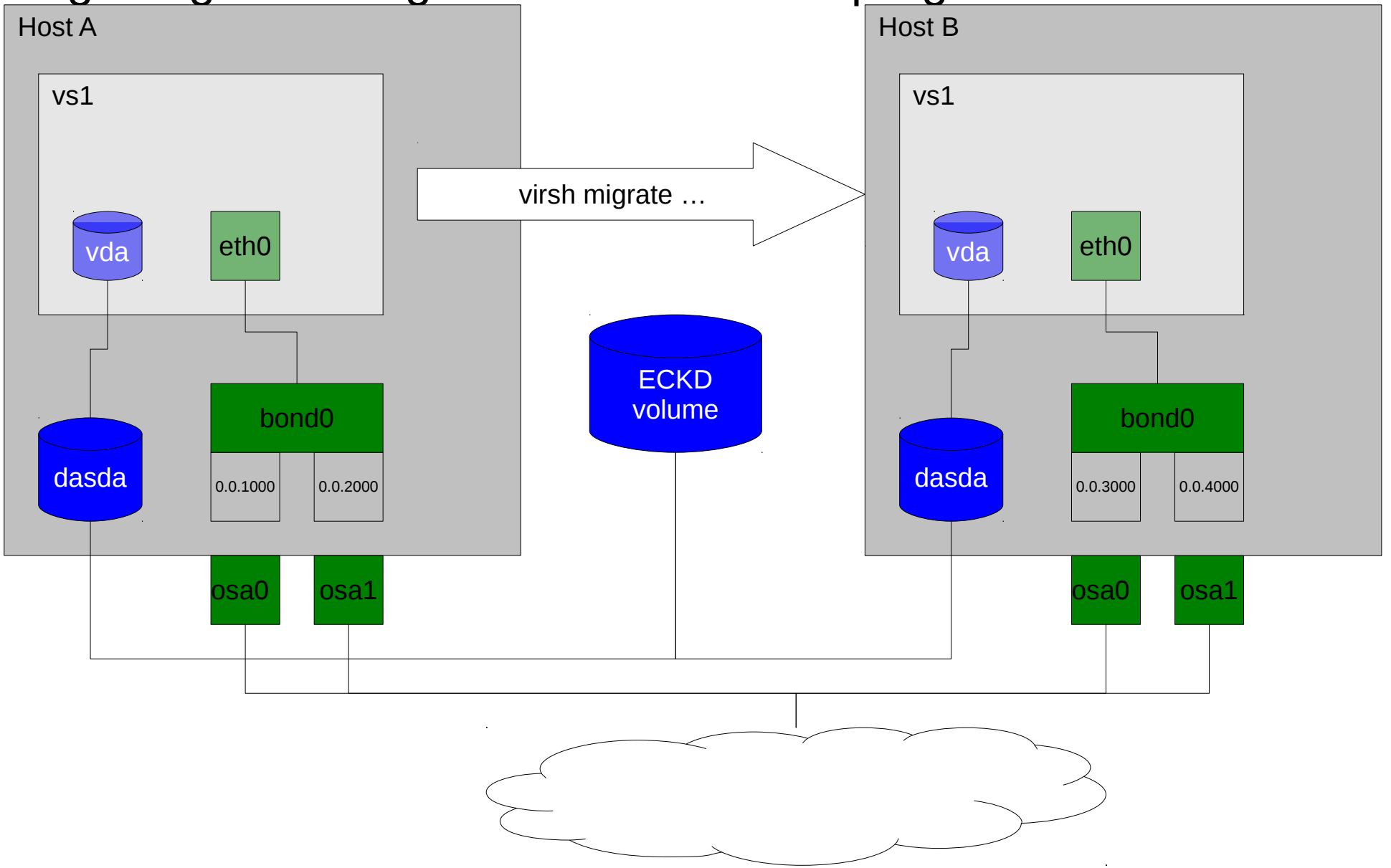
After crash

```
# virsh domstate --reason vs1
crashed (panicked)
```

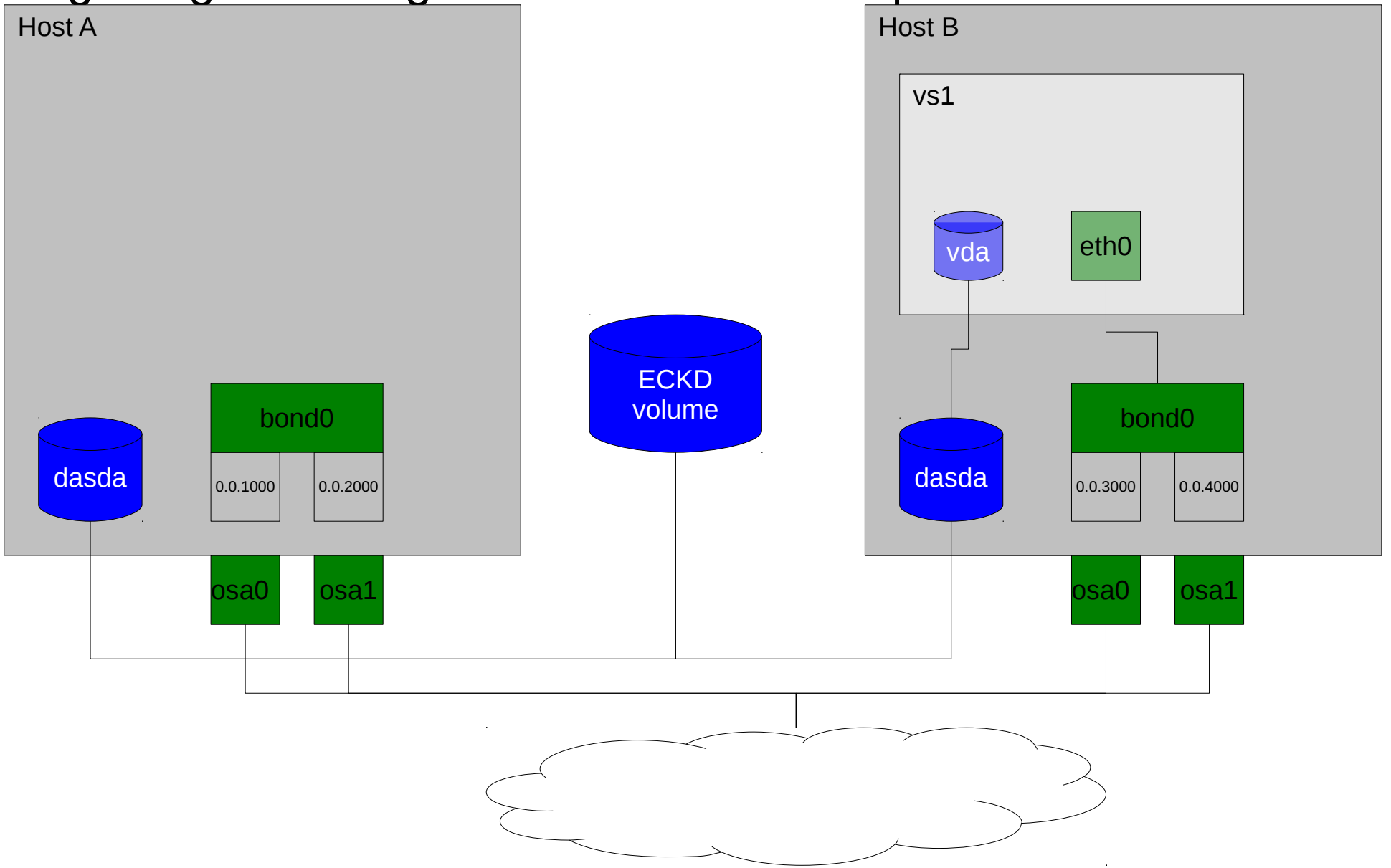
Migrating a running virtual server … start



Migrating a running virtual server … in progress



Migrating a running virtual server … completed



Converting an existing Linux installation

- Starting point: Linux installed on SCSI disk
- Perform a backup FIRST
- Modification needed:
  - Mount filesystems by id or label NOT by block device name
  - Same for boot configuration (root=...)

```
# fstab
. . .
/dev/mapper/mpath0  /    ext3 defaults  0 0
. . .
```

```
# fstab
. . .
LABEL=/   /    ext3 defaults  0 0
. . .
```

Converting an existing installation ...

- Modify boot configuration
  - Use LABEL=/ in zipl.conf or grub.conf
  - Re-run *zipl* if necessary
- Set up hypervisor resources for virtual servers
  - Ensure root disk is accessible from hypervisor
  - Provide network connectivity
- Define a virtual server
  - Write domain XML and run *virsh define ...*
- Start the virtual server
  - Run *virsh –console start …*
- Log in to the console and perform the necessary customizations
  - Network interface configuration
  - Additional file systems
  - ...

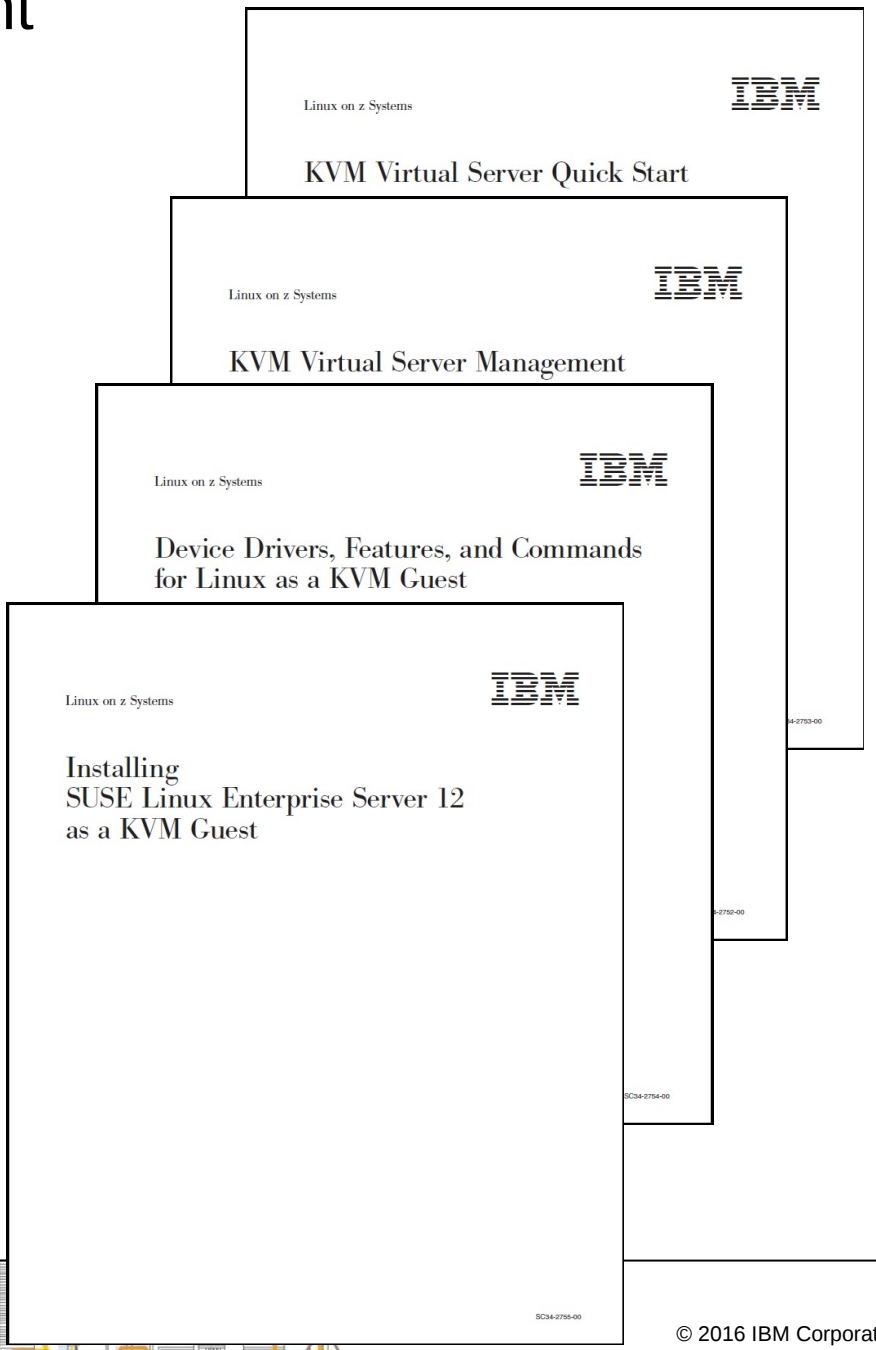
Installing a new guest

- Similar to z Systems LPAR installation
  - FTP Server with installation media
  - Boot from installaton kernel and RAM disk
- Steps
  - Copy kernel and initial RAMdisks to hypervisor (e.g. /var/lib/libvirt/images)
  - Define virtual server using direct kernel boot
    - For possible command line options, see the Linux distributor's documentation
  - After completing the installation, update the virtual server definition to boot from disk

```
<domain type='kvm'>
  <name>zguest</name>
  <memory>524288</memory>
  <vcpu>2</vcpu>
  <os>
    <type arch='s390x' machine='s390-ccw-virtio'>hvm</type>
    <kernel>/var/lib/libvirt/kernel</kernel>
    <initrd>/var/lib/libvirt/image</initrd>
    <cmdline>Install=ftp://user:password@server/directory/DVD1/ ...</cmdline>
  </os>
 ...
 ...
</domain>
```

Publications for KVM base component

- KVM Virtual Server Quick Start, SC34-2753
- KVM Virtual Server Management, SC34-2752
- Device Drivers, Features, and Commands for Linux as a KVM Guest, SC34-2754
- Installing SUSE Linux Enterprise Server 12 as a KVM Guest, SC34-2755



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Backup

Terminology used in this presentation

- KVM virtual server, virtual server

  virtualized z Systems resources that comprise processor, memory, and I/O capabilities as provided and managed by KVM. A virtual server can include an operating system.

- KVM guest, guest

  an operating system of a virtual server.

- KVM host, host

  the Linux instance that runs the KVM virtual servers and manages their resources.

  - In libvirt context also
    - node (host)
    - domain (virtual server)