Homework #4 Solution

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System Administration

1. Create a Virtual Machine Automatically (3.5% per blank)

1.1 Install Required Packages

First, install required packages with command:
`yum install` (1) `  virt-install  ` (2) `  qemu-kvm  ` (3) `  libvirt  `
*hint: (1), (2), (3) are starting with **v**, **q**, **l** respectively.*

and start the daemon with command:
`systemctl` (4) `  start libvirtd  `

for machine with Intel CPU, you can verify hardware virtualization support with command:
`grep` (5) `  vmx  ` (6) `  /proc/cpuinfo  `
hint: (6) is a path starting with `/proc/`

for machine with AMD CPU, you can verify hardware virtualization support with command:
`grep` (7) `  svm  ` (8) `  /proc/cpuinfo  `
hint: (8) is a path starting with `/proc/`

To enable a user, say `admin`, to create virtual machine without root permission, we can simply add the user to a special group with command:
(9) `  usermod -aG libvirt  ` `admin`

1.2 Prepare the Bridge

(Note that here the host interface name `em1` is assumed.)

Though you can set up bridge with command `nmtui`, but for simplicity, we use `nmcli` here.

First, create the bridge named `nm-bridge1` with command:
`nmcli connect` (10) `  add type bridge ifname nm-bridge1  ` `con-name bridge1`

Then we need to add interface `em1` to the bridge:
`nmcli connect` (11) `  add type bridge-slave  ` `ifname em1` (12) `  master nm-bridge1  `

Make the bridge to get an IP address with DHCP:
`nmcli connect modify` (13) `  bridge1 ipv4.method auto  `

Now we need to remove `em1`'s original profile:
`nmcli connect` (14) `  del em1  `

Set the bridge up:
`nmcli connect` (15) `  up bridge1  `

1.3 Prepare Storage for the Virtual Machine

Before we can create a virtual machine, we need to create its virtual disk first. We can create a format virtual disk whose

- format is `qcow2`

- path is `/var/lib/libvirt/images/hw4.qcow2`

- size is 16G

with command:
(16) `qemu-img` `create` (17) `-f qcow2` `/var/lib/libvirt/images/hw4.qcow2 16G`

1.4 Prepare Anaconda Kickstart Script

We can simply use the script `/root/anaconda-ks.cfg` to create a virtual machine. However, in general, we need to modify a few places. Please check the reference script (`sa-hw4-anaconda.cfg`) and find `{{_A_}}` and `{{_B_}}` in the `Network information` section and `System services` section.

Here we want the interface to get IP via DHCP. Therefore, `{{_A_}}` should be replaced with (18) `--bootproto=dhcp` .

Also, we would like to access the virtual machine's console with command `virsh console`. Therefore, we can enable a daemon by replacing `{{_B_}}` with (19) `serial-getty@ttyS0` .

Sometimes, we also need to replace `sda` with `vda`. But here we the reference script has done for you.

Now, save the modified script to `/root/hw4-anaconda.cfg`.

1.5 Prepare Installation ISO File

We are going to download the ISO file to `/var/lib/libvirt/images`:
`curl "http://centos.cs.nctu.edu.tw/7.4.1708/isos/x86_64/CentOS-7-x86_64-Minimal-1708.iso"`
`> /var/lib/libvirt/images/CentOS-7-x86_64-Minimal-1708.iso`

1.6 Create the Virtual Machine

Now, create a virtual machine is quite easy. We can use command `virt-install` with a few arguments:

- `--name=vm-hw4`: Specify the virtual machine's name.

- `--vcpus=2`: Specify the number of CPU the virtual machine has.

- `--ram=512`: Specify the size of RAM the virtual machine has.

- (20) `--disk path=/var/lib/libvirt/images/hw4.qcow2` : Use `/var/lib/libvirt/images/hw4.qcow2` as its disk.

- (21) `--graphics spice,password=pwd` : Specify how clients can access the graphic console of the VM. Here spice is specified, which means that clients can access the graphic console with spice protocol and the password is `pwd`.

- (22) `--location=/var/lib/libvirt/images/CentOS-7-x86_64-Minimal-1708.iso` : Use `/var/lib/libvirt/images/CentOS-7-x86_64-Minimal-1708.iso` as installation media.

- (23) `--network bridge=nm-bridge1` : Use `nm-bridge1` as network.

- (24) `--initrd-inject=/root/hw4-anaconda.cfg` : Add `/root/hw4-anaconda.cfg` to the virtual machine's root when booting.

- (25) `--extra-args "ks=file:/hw4-anaconda.cfg"` : Pass additional kernel command line arguments to the installer when performing a guest install to tell kernel to follow kickstart script `/hw4-anaconda.cfg`.

2. `virsh` Commands (2% per blank)

- (26) <u>`list`</u> : List virtual machines on the host.

- (27) <u>`destroy`</u> : Forcefully stop a virtual machine.

- (28) <u>`shutdown`</u> : Stop a virtual machine by sending shutdown signal.

- (29) <u>`undefine`</u> : Remove a virtual machine.

- (30) <u>`domiflist`</u> : List network interfaces of a virtual machine.

- (31) <u>`detach-interface`</u> : Remove an network interface from a virtual machine.

- (32) <u>`edit`</u> : "Edit" configuration of a virtual machine directly.

- (33) <u>`console`</u> : Access serial console of a virtual machine.

3. Connect to Graphic Console Somehow (bonus, 10%)

Solution: Install `virt-manager`, and add connection to the VM-host. Then one can see the graphic console by clicking virtual machine in the list.