Homework #4

Due Time: 2018/4/29 (Sun.) 22:00
Contact TAs: `vegetable@csie.ntu.edu.tw`

Submission

- Compress all your files into a file named **HW4_[studentID].zip** (e.g. `HW4_bxx902xxx.zip`), which contains a folder named **[studentID]_SA** respectively.
- **Folder [studentID]_SA** should contain a csv file named **sa.csv** of all your answers in *System Administration Part*. As for the screenshot `graphic-console.png` from the bonus question, please also include it in this folder.
- Please submit your answer in `CSV` format with header `id,answer`. Following is an example:

```
id,answer
1,some commands
2,"some ""commands"""
```

- The simplest way to generate a CSV file is editing your answer in Google Spreadsheet, and download it with menu `File` > `Download as` > `Comma-separated values`.
- You can check if your CSV file is not broken by running print_csv.py with the command `python3 print_csv.py ans.csv`.
- Submit your zip file to Ceiba.

Instructions and Announcements

- Discussions with others are encouraged. However, you should write down your solutions **in your own words**. In addition, for **each and every** problem you have to specify the references (the URL of the web page you consulted or the people you discussed with) on the first page of your solution to that problem.
- Problems below will be related to the materials taught in the class and may be far beyond that. Try to search for additional information on the Internet and give a reasonable answer.
- Some problems below may not have standard solutions. We will give you the points if your answer is followed by reasonable explanations.
- **NO LATE SUBMISSION OR PLAGIARISM IS ALLOWED.**

System Administration

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

Following the instructions bellow, you are going to create a virtual machine

- installed with Anaconda kickstart script.
- with one network interface connected a bridge of host.

so your virtual machine will have IP in the same subnet as your host, and you will be able to ssh into your virtual machine outside your host.

Note:

- You can refer to the slide last year, which must be *very* helpful.
- Here we assume that your virtual machine host has one network interface named `em1`.
- And the interface gets IP address with DHCP.

1.1 Install Required Packages

First, install required packages with command:

`yum install` (1) (2) (3)

hint: (1), (2), (3) are starting with ***v****,* ***q****,* ***l*** *respectively.*

And start the daemon with command:

`systemctl` (4)

For machine with Intel CPU, you can verify hardware virtualization support with command:

`grep` (5) (6)

hint: (6) is a path starting with `/proc/`

For machine with AMD CPU, you can verify hardware virtualization support with command:

`grep` (7) (8)

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) `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) `con-name bridge1`

Then we need to add interface `em1` to the bridge:

`nmcli connect` (11) `ifname em1` (12)

Make the bridge to get an IP address with DHCP:

`nmcli connect modify` (13)

Now we need to remove `em1`'s original profile:

`nmcli connect` (14)

Set the bridge up:

`nmcli connect` (15)

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) `create` (17) `/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).

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).

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) : Use `/var/lib/libvirt/images/hw4.qcow2` as its disk.
- (21) : 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) : Use `/var/lib/libvirt/images/CentOS-7-x86_64-Minimal-1708.iso` as installation media.
- (23) : Use `nm-bridge1` as network.
- (24) : Add `/root/hw4-anaconda.cfg` to the virtual machine's root when booting.
- (25) : 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) : List virtual machines on the host.
- (27) : Forcefully stop a virtual machine.
- (28) : Stop a virtual machine by sending shutdown signal.
- (29) : Remove a virtual machine.
- (30) : List network interfaces of a virtual machine.
- (31) : Remove an network interface from a virtual machine.
- (32) : "Edit" configuration of a virtual machine directly.
- (33) : Access serial console of a virtual machine.

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

Please attach the screenshot as file `graphic-console.png`.