Homework #7

Due Time: 2016/6/15 (Wed.) 17:00
Contact TAs: `vegetable@csie.ntu.edu.tw`

Submission

- Compress all your files into a file named **HW7_<studentID>_<version>.tar.gz**, which contains two folders named **<studentID>_SA1** and **<studentID>_SA2** respectively.

- **Folder <studentID>_SA1** should contain a pdf file of all your answers and the command(s) you wrote in *System Administration 1 Part*.

- **Folder <studentID>_SA2** should contain a pdf file of all your answers in *System Administration 2 Part*.

- Submit your tar file to **sftp://intern.csie.ntu.edu.tw:7000** with your workstation account and password.

Instructions and Announcements

- Discussions with others are encouraged. However, you should write down your solutions `in your own words`. In addition, for each problem you have to specify the references (the Internet URL you consulted with or the people you discussed with) on the first page of your solution to that problem.

- Problems below would be related to the material taught in the class and might be far beyond that. Try to search for additional information on the Internet and give a reasonable answer.

- Some problem below might not have standard solutions. We would give you the point if your answer is followed by reasonable explanations.

- **NO LATE SUBMISSION IS ALLOWED.**

System Administration 1

1. Suppose that you have an NFS server with NFSv3, and you wrote the following configuration in */etc/exports*:
   /share 192.168.123.0/24(rw,no_subtree_check,no_root_squash)
   Please explain what this configuration means.

2. Suppose that the NFS server in the previuos problem is 192.168.123.100, and you have another machine in subnet 192.168.123.0/24 as the NFS client. You want to mount /share on the NFS server to the directory /mnt/share on the NFS client.

   (a) Describe how to manually mount the directory using the command **mount**.

   (b) Describe how to automatically mount the directory using **autofs**.

   (c) Describe how to automatically mount the directory by modifying **/etc/fstab**.

System Administration 2

1   VM Installation and Management

Running services in virtual machines is a common way to reduce hardware cost, provide isolation between services and ease management and migration. In this homework, you will run two virtual machines to serve the same static web pages.

The reason to run two virtual machines for the same service here is to have a backup server when the original server stop working. You are encouraged to automate the process of installing and configuring virtual machines by writing scripts. Once you find the way to build your system automatically, testing and reinstalling can become much easier.

You have to run all virtual machines on a free and open-source hypervisor and manage them with tools provided by libvirt or based on libvirt. Hypervisors allowed to use in this homework are Xen, bhyve and KVM. The following table shows operating system requirements of these hypervisors:

Xen dom0	NetBSD, Linux (>= 3.0), FreeBSD (>= 11.0)
bhyve host	FreeBSD (>= 10.0)
KVM host	Linux (>= 2.6.17)

If you want to use a hypervisor that is not listed above, or you are unable to manage your virtual machines with libvirt-based tools because of incomplete support, existing bugs or known difficulties, please contact TAs to know whether it is allowed to use other hypervisors or tools.

Start the hypervisor and install a free and open-source Unix-like operating system in the first virtual machine, and run a web server to serve some static web pages on it. After you understand the steps you use, install the same system with the same service in the second virtual machine in a more automated way. Both virtual machines are required to support the following things:

1. Text consoles are usually easier to use than graphical consoles in server environments. You can access your VM without GUI even if the SSH server is not installed or become unusable in the guest OS. The text console can be accessed with command `virsh console` or the menu item View > Text Consoles in `virt-manager`.

   a. You should be able to see the boot menu provided by your bootloader and use bootloader commands on the text console.

   b. You should be able to enter single user mode and access the root shell on the text console.

   c. You should be able to login to the system using the text console when the system runs normally.

   d. You should be able to see colored output on the text console. This can be checked by running `vim` or `htop`.

   e. You should be able to access the text console with a terminal that is larger than 80×24. Programs like `vim` or `htop` should be able to use the full size of the terminal.

2. Connect your VM to a network bridge that has a physical interface added to it, so your VM is accessible from other hosts on the same network without NAT or manual port forwarding.

3. Your guest OS should have needed balloon driver installed and loaded, so you can resize the memory allocated to your VM without rebooting the VM using `virsh setmem` command.

4. Setup SSH public key authentication for at least one user in your VM.

5. Your web server should provide access to at least one static web page. The page should be accessible by any hosts.

Please submit a report that describes how you complete these requirements. The report should include the name and the version of your guest OS and distribution, output of `virsh dumpxml` and `virsh domxml-to-native`, commands and methods you use to make things work, scripts you use to automate the process. You can also include a few screenshots.

If you find something just works without any configuration, a screenshot with explanation is sufficient.

Note

Some questions and answers that you may find to be useful.

1. Q: How can I do this homework if my CPU does not support any virtualization extension?
   A: You can use Xen in paravirtualization mode. If you don't want to use Xen, contact TAs and we will find a computer with virtualization support for you.

2. Q: How can I do this homework if my computer runs Windows or Mac OS X?
   A: You can install multiple operating systems on single computer as long as you have enough disk space and your computer is not locked down by the vendor. If your primary hard drive doesn't have unallocated space, you can install them on an external USB hard drive.

3. Q: Why can't I add the wireless network interface to a bridge?
   A: This is usually not supported. Use a wired network interface instead.

4. Q: Can I use a preinstalled VM image to do this homework?
   A: Yes, using a preinstalled image to create VM is a common practice in cloud environments.

5. Q: Can I run more than two VMs on the hypervisor?
   A: Yes, it may be useful to run addtional services to automate the process of preparing VMs.

6. Q: Is it acceptable to install the second VM without any automation?
   A: Yes, you are encouraged to automate the process, but this is not a requirement.