Diskless Installation of CentOS 7

PHASEMON.01

Sébastien BLANCHET

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Institut Radio Astronomie Millimétrique
300 rue de la piscine
38406 Saint Martin D'Hères - France

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Chapter 1

Introduction

This document explains how to create a diskless installation of CentOS 7. It is a guide to build a basic read-write installation to host a NFS filesystem for a single computer. However, this document does not explain how to setup neither a NFS server nor a TFTP server.

Prerequesites

- a DHCP server
- a TFTP server
- a recent PXE file tree[1] with `menu.c32`, `pxelinux.0` and the `pxelinux.cfg` directory.
- a NFS server

Tips

The DHCP and TFTP servers can be easily validated with a basic test: boot `memtest86+` over PXE.

[1] these files come from the Syslinux Project: `http://syslinux.org`

Chapter 2

Build the NFS root

2.1 Create the NFS root

2.1.1 Host computer

A CentOS 7 host computer is required to create the NFS root filesystem. The most convenient way to get it, is to create a virtual machine with VirtualBox.

- Download the latest version of CentOS7 iso from `https://centos.org`
- Create a virtual machine with Virtualbox. A single vcpus with 2 GB of RAM and a 15 GB harddrive is enough.
- Install CentOS 7 in the virtual machine.
- At the installation end, login as root to create the filesystem for the diskless computer.

2.1.2 Disable SELinux

Disable SELinux on the virtual machine to allow changing the root password in the *chroot*.

- Edit `/etc/sysconfig/selinux`
- Set `SELINUX=disabled`
- reboot to apply the new SELinux configuration

Note: it disables SELinux only on the virtual machine host to build the diskless filesystem. SELinux is still enabled on the diskless filesystem (except if you decide to disable it too).

2.1.3 Setup a NFSROOT variable

Setup a variable with the hosting directory, to avoid typing it everytime.

```
# export NFSROOT=/home/nfsroot
# mkdir ${NFSROOT}
```

2.1.4 Bootstrap

Run `yum` but with `--installroot` option to create a basic CentOS system.

```
# yum -y groupinstall Base --installroot=${NFSROOT} --releasever=/
# yum -y install kernel nfs-utils --installroot=${NFSROOT} --releasever=/
```

Now customize this basic CentOS system in `$NFSROOT`.

2.1.5 Configure /etc/resolv.conf

Recopy `/etc/resolv.conf` from host to $NFSROOT

```
# cp /etc/resolv.conf ${NFSROOT}/etc/resolv.conf
```

2.1.6 Configure /etc/fstab

$NFSROOT/etc/fstab

Listing 2.1: $NFSROOT/etc/fstab

```
none            /tmp            tmpfs   defaults        0 0
tmpfs           /dev/shm        tmpfs   defaults        0 0
sysfs           /sys            sysfs   defaults        0 0
proc            /proc           proc    defaults        0 0
```

2.1.7 Configure hostname

$NFSROOT/etc/hosts

Remove all IPv6 lines and add IPv4 addresses for the NFS server and the NFS client

Listing 2.2: $NFSROOT/etc/hosts

```
127.0.0.1       localhost
192.168.0.100   nfsserver   # NFS server to host filesystem
192.168.0.186   pc-client1
```

$NFSROOT/bin/whereami

Create a script `/bin/whereami` to setup client hostname from `/etc/hosts`

Listing 2.3: $NFSROOT/bin/whereami

```
#!/bin/bash
# finds node's hostname based on matching IP in /etc/hosts
PATH=/sbin:/bin:/usr/sbin:/usr/bin
IP=`ifconfig | egrep 'inet.*broadcast' \
| sed -e 's/.*inet \(.*\).*netmask.*/\1/'`
grep $IP /etc/hosts | /usr/bin/awk '{print $2}'
```

Add executable bit:

```
# chmod +x ${NFSROOT}/bin/whereami
```

2.1.8 Configure /etc/rc.local

$NFSROOT/etc/rc.local

Even if CentOS 7 uses systemd, `/etc/rc.local` is still very convenient. So create the file `$NFSROOT/etc/rc.local`

```
# touch ${NFSROOT}/etc/rc.local
# chmod +x ${NFSROOT}/etc/rc.local
```

Listing 2.4: $NFSROOT/etc/rc.local

```
#!/bin/bash
PATH=/sbin:/bin:/usr/sbin:/usr/bin
# set hostname
hostname `/bin/whereami`
touch /var/lock/subsys/local
```

2.1.9 Configure the root user

Set the password (if you have forgotten to disable SELinux, `passwd` does not work in the *chroot*).

```
# chroot ${NFSROOT}
# passwd root
# exit
```

Note: After this step, you can enable again SELinux on the host if you really want.

2.1.10 Create initramfs

Create a suitable initramfs file with `dracut`

```
# echo 'add_dracutmodules+="nfs"' >> $NFSROOT/etc/dracut.conf
# chroot $NFSROOT
# dracut --no-hostonly --nolvmconf -m "nfs network  base" \
    --xz /boot/initramfs.pxe-$(uname -r) $(uname -r)
# chmod ugo+r  /boot/initramfs.pxe-$(uname -r)
# exit
```

2.2 Prepare NFS and TFTP server

- Transfer the $NFSROOT directory to the NFS server.

  ```
  # rsync -av ${NFSROOT}/ root@nfsserver:/path/to/exportdir/
  ```

- Transfer kernel and initrd to the TFTP server.

  ```
  # scp ${NFSROOT}/boot/vmlinuz-3.10.0-514.21.2.el7.x86_64 \
        ${NFSROOT}/boot/initramfs.pxe-3.10.0-514.21.2.el7.x86_64  \
     root@tftpserver:/tftpboot/
  ```

Create a pxeconfig file for the PXE server

Listing 2.5: pxeconfig

```
# boot centos7 with tftp/nfs
default menu.c32
prompt 0
menu title CentOS diskless

ontimeout centos7
timeout 50

label centos7
  menu label phasemon centos7 3.10.0-514.21.2.el7.x86_64
  kernel vmlinuz-3.10.0-514.21.2.el7.x86_64
  append root=/dev/nfs initrd=initramfs.pxe-3.10.0-514.21.2.el7.x86_64 \
      nfsroot=192.168.130.11:/path/to/exportdir \
      rw panic=60 ipv6.disable=1

label memtest
  menu label memtest
  kernel memtest86+
```

Note

- the backslash in the `append` line is only for printing purpose, to show that the line continue. But indeed, all the arguments *must* be on the same line.

2.2.1 Final test

Boot the diskless computer to check that it works, and then enjoy your new CentOS 7 diskless computer.