ESTR 3102

Gentoo Installation and Kernel Compilation

Helen Chan SHB 118

hwchan@cse.cuhk.edu.hk

Office Hours: Fri 10am-12pm, or by appointment

Thanks to Dr. Q. Huang and Dr. T.Y. Wong for their slides:)

Outline

- Pre-installation
- Installation
 - 1. Boot from Gentoo installation CD
 - 2. Prepare the disk partitions
 - 3. Prepare the base system
- Kernel Compilation
 - 1. Get kernel source and configure kernel options
 - 2. Compile kernel
 - 3. Set up the new system
- Reference

Outline

Pre-installation

- Installation
 - 1. Boot from Gentoo installation CD
 - 2. Prepare the disk partitions
 - 3. Prepare the base system
- Kernel Compilation
 - 1. Get kernel source and configure kernel options
 - 2. Compile kernel
 - 3. Set up the new system
- Reference

Pre-installation

- Tools to host a virtual machine (VM)
 - e.g. VirtualBox, VMware Player
- Gentoo installation image (iso)
 - [HK Mirror] http://goo.gl/bfyQpU
 - [CSE] http://goo.gl/w83eT6
- Enable VT-x for Intel CPU
 - An option available in BIOS (if CPU supports VT-x)
 - Disabled by default (as far as I know ...)
 - Required for running 64-bit VMs

Pre-installation

1. Create a new VM

- For VMware, choose "I will install the operating system later" at the first step
- Size of Hard Disk : no less than 12GB

2. Edit VM setting

Select the Gentoo CD image for CD-drive

Outline

- Pre-installation
- Installation
 - 1. Boot from Gentoo installation CD
 - 2. Prepare the disk partitions
 - 3. Prepare the base system
- Kernel Compilation
 - 1. Get kernel source and configure kernel options
 - 2. Compile kernel
 - 3. Set up the new system
- Reference

Step 1. Boot from Gentoo CD

- Boot VM from CD
 - Press "Enter" when the VM boots up

```
ISOLINUX 4.04 2011-04-18 ETCD Copyright (C) 1994-2011 H. Peter Anvin et al Gentoo Linux Installation LiveCD http://www.gentoo.org/Enter to boot; F1 for kernels F2 for options.

Press any key in the next 15 seconds or we'll try to boot from disk.
```

Press "Enter" to use default keyboard setting

Step 1. Boot from Gentoo CD

Boot VM from CD

After pressing "Enter" twice,

Welcome to the Gentoo Linux Minimal Installation CD!

The root password on this system has been auto-scrambled for security.

If any ethernet adapters were detected at boot, they should be auto-configured if DHCP is available on your network. Type "net-setup eth0" to specify eth0 IP address settings by hand.

Check /etc/kernels/kernel-config-* for kernel configuration(s).
The latest version of the Handbook is always available from the Gentoo web
site by typing "links http://www.gentoo.org/doc/en/handbook/handbook.xml".

To start an ssh server on this system, type "/etc/init.d/sshd start". If you need to log in remotely as root, type "passwd root" to reset root's password to a known value.

Please report any bugs you find to http://bugs.gentoo.org. Be sure to include detailed information about how to reproduce the bug you are reporting. Thank you for using Gentoo Linux!

livecd ~ #

Show hard disk information

```
livecd # fdisk -1 /dev/sda

Disk /dev/sda: 12 GiB, 12884901888 bytes, 25165824 sectors

Units: sectors of 1 * 512 = 512 bytes

Sector size (logical/physical): 512 bytes / 512 bytes

I/O size (minimum/optimal): 512 bytes / 512 bytes

livecd # _
```

Disk partition plan

Partition	File System	Size	Usage
/dev/sda1	(boot loader)	2MB	BIOS boot
/dev/sda2	ext2	128MB	Gentoo boot
/dev/sda3	(swap)	1024MB	Swap partition
/dev/sd4	ext4	All the rest	Root

1. Create the partitions (first two partitions)

```
# fdisk /dev/sda
                               fdisk /dev/sda
Welcome to fdisk (util-linux 2.25.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.
Device does not contain a recognized partition table.
Created a new DOS disklabel<u>with d</u>isk identifier 0x350651ef.
Command (m for help) n
Partition type
      primary (O primary
                                 nded. 4 free)
      extended (containe
                                 gical partitions)
Select (default p): p
Partition number (L-4, default 1): (Press "Enter" to use default value, twice)
First sector (2048-25165823, default 2048):
Last sector, +sectors or +size{K,M,G,T,P} (2048-25165823, default 25165823): +2M
Created a new partition 1 of <u>tupe '</u>Linux' and of size 2 MiB.
                                                                     +2M
Command (m for help): n
Partition type
       primary (1 primary
                                 mded. 3 free)
                                 gical partitions)
       extended (containe
Select (default p) p
                                                                        +128M
                                        (Press "Enter" twice)
Partition number (2-4,
First sector (6144-25165823, default 6144):
Last sector, +sectors or +size{K,M,G,T,P} (6144-25165823, default 25165823): +128M
Created a new partition 2 of type 'Linux' and of size 128 MiB.
```

1. Create the partitions (last two partitions)

```
Command (m for help) n
Partition type
       primary (2 primary, 0 extended, 2 free)
       extended (containe logical partitions)
Select (default p) p P
Partition number (3.4, default 3)
                                                       (Press "Enter")
First sector (268288-25165823, default 268288):
Last sector, +sectors or +size{K,M,G,T,P} (268288-25165823, default 25165823):
                                                                                +1024M
Created a new partition 3 of type 'Linux' and of size 1 GiB.
                                                                           +1024M
Command (m for help): n
Partition type
       primary (3 primary, 0 extended, 1 free)
       extended (container for logical partitions)
Select (default e): p
                                                                          (Press "Enter")
Selected partition 4
                                                    (Press "Enter")
First sector (2365440-25165823, default 2365440)
Last sector, +sectors or +size{K,M,G,T,P} (2365440-25165823, default 25165823):
Created a new partition 4 of type 'Linux' and of size 10.9 GiB.
                              w (Confirm and write the partition table to disk!!)
Command (m for help) w
The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.
```

2. Mark the partitions



3. Outcome

```
livecd " # fdisk -l /dev/sda
Disk /dev/sda: 12 GiB, 12884901888 bytes, 25165824 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x350651ef
                              (it is alright to be different)
Device
          Boot
                 Start
                            End
                                 Sectors Size Id Type
/dev/sda1
                  2048
                                    4096
                                            2M ef EFI (FAT-12/16/32)
                           6143
/deu/sda2 *
                                  262144 128M 83 Linux
                  6144
                         268287
zdeuzsda3.
                268288
                       2365439 2097152
                                            16 82 Linux swap / Solaris
/deu/sda4
               2365440 25165823 22800384 10.9G 83 Linux
```

4. Create file systems

- " # mkfs.ext2 /dev/sda2
- " # mkfs.ext4 /dev/sda4
- mkswap /dev/sda3

5. Enable swap

- # swapon /dev/sda3
- 6. Mount file systems
 - mount /dev/sda4 /mnt/gentoo
 - mkdir /mnt/gentoo/boot
 - # mount /dev/sda2 /mnt/gentoo/boot

1. Get the stage tarball

- # cd /mnt/gentoo
- # wget -0 stage3.tar.bz2 goo.gl/YxTj8P
- # tar xjpf stage3.tar.bz2

2. Configure compile options

- " # nano /mnt/gentoo/etc/portage/make.conf
- Navigate using the "arrow keys"
- Find "CFLAGS=-O2 -pipe", and change it to
 CFLAGS="-march=native -O2 -pipe"
- Save and exit by pressing "Ctrl+x", "y" and "Enter"

3. Select mirrors

- # mirrorselect -i -o >> /mnt/gentoo/etc/portage/make.conf
 - Select "Hong Kong: aditsu.net"
- # mirrorselect -i -r -o >> /mnt/gentoo/etc/portage/make.conf
 - Select "Japan" or "Taiwan"

4. Set up DNS

```
# cp -L /etc/resolv.conf /mnt/gentoo/etc/
```

5. Mount the (special) file systems

- # mount -t proc proc /mnt/gentoo/proc
- mount --rbind /sys /mnt/gentoo/sys
- mount --rbind /dev /mnt/gentoo/dev

6. Enter the new environment

- # chroot /mnt/gentoo /bin/bash
- # source /etc/profile
- # export PS1="(chroot) \$PS1"

```
(chroot) livecd / #
```

- 7. Install portage snapshot
 - # wget -0 portage.tar.bz2 goo.gl/dDMGVk
 - # tar xjf portage.tar.bz2 -C /usr

Outline

- Pre-installation
- Installation
 - 1. Boot from Gentoo installation CD
 - 2. Prepare the disk partitions
 - 3. Prepare the base system
- Kernel Compilation
 - 1. Get kernel source and configure kernel options
 - 2. Compile kernel
 - 3. Set up the new system
- Reference

Step 1. Get Src. and Config. Kernel

- 1. Get kernel source code
 - # emerge gentoo-sources
- 2. Configure kernel options
 - # cd /usr/src/linux
 - EITHER manually configure the options
 - # make menuconfig
 - (press "Enter" to jump to menu, press "Space" to change an option)
 - Configure based on <u>Reference</u>
 - OR download the configure file
 - For VMware, # wget -0 .config goo.gl/DYqCpy
 - For VirtualBox, # wget -0 .config goo.gl/NoHIHN

Step 2. Compile Kernel

1. Compile and install

```
# make
```

- # make install
- " # make modules_install

Step 3. Set up the New System

- 1. Set up grub bootloader
 - # emerge sys-boot/grub
 - # grub2-install /dev/sda
 - # grub2-mkconfig -o /boot/grub/grub.cfg
- 2. Set up root password
 - # passwd

Step 3. Set up the New System

- 3. Set up /etc/fstab
 - " # nano /etc/fstab

```
# <fs>
                          <mountpoint>
                                                            <opts>
                                                                              <dump/pass>
                                           <tupe>
# NOTE: If your BOOT partition is ReiserFS, add the notail option to opts.
/dev/sda2
                                                            defaults.noatime
                          ∕boot
                                           ext2
                                                                                      0 2
/dev/sda4
                                           ext4
                                                            noatime
                                                                              0 1
/dev/sda3
                                                                              0 \quad 0
                                           swap
                                                            SW
                          none
/dev/cdrom
                          /mnt/cdrom
                                                                              0 \quad 0
                                           auto
                                                            noauto,ro
/deu/fd0
                          /mnt/floppy
                                           auto
                                                            noauto
                                                                              0 \ 0
```

Press "Ctrl + x", "y" and "Enter" to save and exit

Step 3. Set up the New System

4. Set up the network

- # cd /etc/init.d/
- For VirtualBox,
 - # 1n -s net.lo net.enp0s3
 - # rc-update add net.enp0s3
- For VMware,
 - # 1n -s net.lo net.eno16777736
 - # rc-update add net.eno16777736
- Reboot!
 - # reboot
- Login as "root"

Outline

- Pre-installation
- Installation
 - 1. Boot from Gentoo installation CD
 - 2. Prepare the disk partitions
 - 3. Prepare the base system
- Kernel Compilation
 - 1. Get kernel source and configure kernel options
 - 2. Compile kernel
 - 3. Set up the new system
- Reference

Reference

- Gentoo Handbook
 - https://wiki.gentoo.org/wiki/Handbook:Main_Page
- Gentoo HK Mirror
 - http://gentoo.aditsu.net:8000/
 - "release": CD images and stage tarballs
 - "snapshots": portage tarballs
- Kernel Options
 - [VirtualBox]http://gentoo-en.vfose.ru/wiki/Virtualbox_Guest
 - [VMware]
 https://forums.gentoo.org/viewtopic-t-961502.html

Appendix

- If you power off the machine before compiling the kernel, do the following steps before resuming the compilation
 - Installation: Enable swap and mount file systems:
 Step 2.5-2.6
 - Installation: Set up DNS, mount (special) file systems and enter the new environment:
 Step 3.4-3.6

Appendix

For VMware,

- To get more time at boot to enter BIOS, add the following option to the end of ".vmx" file after poweroff
 - bios.bootDelay = "5000"
- This option tells the player to delay for 5 seconds before booting from the default device.
- This will be useful when hard disk is bootable but you want to boot from other devices, e.g. CD, removable drives