ESTR 3102

Gentoo Installation and Kernel Compilation

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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

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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

Pre-installation

3. Prepare the resource USB

- Download and place the following files into the top-most directory of your USB

  - Stage tarball: http://goo.gl/YxTj8P

  - Portage tarball: http://goo.gl/FPma4v

  - Kernel configuration file (VMware): http://www.cse.cuhk.edu.hk/~hwchan/estr/config-vmware

  - Kernel configuration file (VirtualBox): http://www.cse.cuhk.edu.hk/~hwchan/estr/config-vbox

- Around 375 MB in total

  - (File size in Bytes)

```
    94293 Sep 16 15:07 config-vbox
    99264 Sep 16 15:07 config-vmware
171430444 Sep 16 15:07 portage.tar.bz2
221347440 Sep 16 15:08 stage3.tar.bz2
```

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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 ~ #
```

Step 2. Prepare Disk Partitions

- Show hard disk information

```
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
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

Step 2. Prepare Disk Partitions

1. Create the partitions (first two partitions)

Step 2. Prepare Disk Partitions

1. Create the partitions (last two partitions)

Step 2. Prepare Disk Partitions

2. Mark the partitions

Step 2. Prepare Disk 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      6143      4096     2M ef EFI (FAT-12/16/32)
/dev/sda2  *        6144    268287    262144   128M 83 Linux
/dev/sda3         268288   2365439   2097152     1G 82 Linux swap / Solaris
/dev/sda4        2365440  25165823  22800384  10.9G 83 Linux
```

Step 2. Prepare Disk Partitions

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`

Step 3. Prepare the Base System

1. Mount the resource USB
   - Connect USB
     - For VMware, at the top right-hand corner

     - For VirtualBox, at the bottom right-hand corner

     - <u>Make sure the resource usb is the ONLY usb connected to the VM</u>
   - `# mkdir /mnt/usb`
   - `# mount /dev/sdb1 /mnt/usb`
   - `# ls /mnt/usb`

Step 3. Prepare the Base System

2. Extract the stage tarball
   - `# cd /mnt/gentoo`
   - `# tar xjpf /mnt/usb/stage3.tar.bz2`

3. Mount (special) file systems
   - `# mount -t proc proc /mnt/gentoo/proc`
   - `# mount --rbind /sys /mnt/gentoo/sys`
   - `# mount --rbind /dev /mnt/gentoo/dev`

4. Enter the new environment
   - `# chroot /mnt/gentoo /bin/bash`
   - `# source /etc/profile`
   - `# export PS1="(chroot) $PS1"`

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

Step 3. Prepare the Base System

5. Mount the resource USB (again)
   - `# mkdir /mnt/usb`
   - `# mount /dev/sdb1 /mnt/usb`

6. Extract portage tarball
   - `# tar xjf /mnt/usb/portage.tar.bz2 -C /usr`

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Step 1. Get Src. and Config. Kernel

1. Get kernel source code
   - `# emerge gentoo-sources`

2. Configure kernel options
   - `# cd /usr/src/linux`
   - <u>EITHER</u> manually configure the options
     - `# make menuconfig`
     - (press "Enter" to jump to menu, press "Space" to change an option)
     - Configure based on Reference
   - <u>OR</u> copy the configure file
     - For VMware,   `# cp /mnt/usb/config-vmware .config`
     - For VirtualBox, `# cp /mnt/usb/config-vbox .config`

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>    <type>        <opts>             <dump/pass>

# NOTE: If your BOOT partition is ReiserFS, add the notail option to opts.
/dev/sda2                 /boot           ext2          defaults,noatime      0 2
/dev/sda4                 /               ext4          noatime            0 1
/dev/sda3                 none            swap          sw                 0 0
/dev/cdrom                /mnt/cdrom      auto          noauto,ro          0 0
/dev/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,
     - `# ln -s net.lo net.enp0s3`
     - `# rc-update add net.enp0s3`
   - For VMware,
     - `# ln -s net.lo net.eno16777736`
     - `# rc-update add net.eno16777736`

- Reboot !
  - `# reboot`

- Login as "root"

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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 just before kernel compilation, do the following steps before resuming the compilation
  - Installation: Enable swap and mount file systems: Step 2.5-2.6
  - Installation: Mount (special) file systems and enter the new environment: Step 3.3-3.4

Appendix

- ## For VMware,
  - To get more time for entering BIOS or boot menu, add the following option to the end of **".vmx"** file **after power off**
    - 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