

System Administration

Week 04, Segment 2 Operating System Installation

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**NAME**

hier — layout of file systems

DESCRIPTION

An outline of the file system hierarchy.

Naming is very important. The UNIX System relies on filename conventions for much of its power as a system. The following file system layout describes generally where things are and what they are, with references to other man pages for more detailed documentation.

Not all files will be in every system.

/ Root directory of the system.

/COPYRIGHT

System copyright notice, most often put on CD-ROM distributions.

/[a-z]/ User file systems.

Variable vs. Static & Shareable vs. Non-Shareable Data

- Variable: data expected to be modified during routine operations
- Static: data not expected to change during runtime
- Shareable: data that remains the same across multiple (instances of) hosts
- Non-shareable: data that is unique to a specific (instance of a) system

	shareable	non-shareable
static	/usr /opt	/boot /etc
variable	/var/data /home	/var/run /var/log



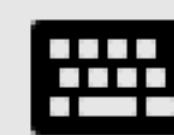
INSTALLATION SUMMARY

CENTOS LINUX 8 INSTALLATION

us

Help!

LOCALIZATION



Keyboard
English (US)



Language Support
English (United States)



Time & Date
Americas/New York timezone

USER SETTINGS



Root Password
Root account is disabled.

SOFTWARE



Installation Source
Error setting up base repository



Software Selection
Installation source not set up

SYSTEM



Installation Destination
Automatic partitioning selected



KDUMP
Kdump is enabled



Network & Host Network
Not connected



Security Policy
No content found

Quit

Begin Installation

We won't touch your disks until you click 'Begin Installation'.



Please complete items marked with this icon before continuing to the next step.

>> NetBSD/x86 NOS Boot, Revision 5.11 (Sun Oct 18 19:24:30 UTC 2020) (from NetBSD 9.1)
>> Memory: 639/1047552 k

- 1. Boot normally
- 2. Boot single user
- 3. Drop to boot prompt

Choose an option: RETURN for default: SPACE to stop countdown.
Option 1 will be chosen in 5 seconds.

This menu-driven tool is designed to help you install NetBSD to a hard disk, or upgrade an existing NetBSD system, with a minimum of work.
In the following menus type the reference letter (a, b, c, ...) to select an item, or type CTRL+N/CTRL+P to select the next/previous item.
The arrow keys and Page-up/Page-down may also work.
Activate the current selection from the menu by typing the enter key.

Thank you for using NetBSD!

NetBSD-9.1 Install System

- a: Install NetBSD to hard disk
- b: Upgrade NetBSD on a hard disk
- c: Re-install sets or install additional sets
- d: Reboot the computer
- e: Utility menu
- f: Config menu
- >x: Exit Install System

To return to the installer, quit this shell by typing 'exit' or '^D.'

█

```
cylinders: 33288
total sectors: 33554432
rpm: 3600
interleave: 1
trackskew: 0
cylinderskew: 0
headswitch: 0          # microseconds
track-to-track seek: 0 # microseconds
drivedata: 0

5 partitions:
#      size    offset   fstype [fsize bsize cpg/sgs]
a: 33554369        63    4.2BSD     0      0      0 # (Cyl. 0*- 33288*)
c: 33554369        63    unused     0      0      0 # (Cyl. 0*- 33288*)
d: 33554432         0    unused     0      0      0 # (Cyl. 0 - 33288*)

w
629
q
# /sbin/newfs -O 2 /dev/rwd0a
/dev/rwd0a: 16384.0MB (33554368 sectors) block size 16384, fragment size 2048
           using 89 cylinder groups of 184.09MB, 11782 blks, 22912 inodes.
super-block backups (for fsck_ffs -b #) at:
160, 377184, 754208, 1131232, 1508256, 1885280, 2262304, 2639328, 3016352,
...
#
#
```

>> NetBSD/x86 BIOS Boot, Revision 5.11 (Sun Oct 18 19:24:30 UTC 2020) (from NetBSD 9.1)
>> Memory: 639/1047552 k

- 1. Boot normally
- 2. Boot single user
- 3. Drop to boot prompt

Choose an option: RETURN for default: SPACE to stop countdown.
Option 1 will be chosen in 5 seconds.

OS Installation

- power up
- PXE or iPXE boot
 - network configuration / BOOTP/DHCP
 - boot from network via e.g., tftp miniroot
- identify root device and optional additional disks
- create partition table / disklabel
- create filesystem(s)
- install MBR, bootblocks etc.
- fetch OS software (e.g., via HTTPS, iSCSI, ...)
- install / copy / extract OS
- optionally add application software
- perform basic system configuration
- reboot

OS Installation

Most of the difficult parts happen outside of the building system:

- hardware identification, provisioning, and registration
- identification of suitable base OS installation
- installation of add-on applications
- initial minimum system configuration [*]
- system registration
- system restart

[*] system *deployment* ∩ system *configuration* => configuration management

OS Installation

A more modern approach.

Summary and Exercises

- Conceptually, the OS installation process is simple.
- Thinking about static/variable / shareable/unshareable data helps you define not only partitioning schemas, but also improve scalability of your processes.
- A lot of work and difficulty automating lies in configuring and customizing the installation.
- As you scale up, OS installation quickly leaks into *Configuration Management* and *Service Orchestration*.
- Compare the installation of NetBSD, FreeBSD, OmniOS, Ubuntu, and CentOS in a virtual machine. How would you automate the process? Research tools that would help.
- How does this compare to the process of creating e.g., an AWS AMI. What are the implications of creating an image suitable for use in such an environment? What are the requirements of the infrastructure?

Links

Software Installation and Package Management:

<https://www.netmeister.org/book/05-software-installation-and-package-management.pdf>

CentOS Install Guide:

<https://docs.centos.org/en-US/centos/install-guide/>

OmniOS Fresh Installation Walk-through:

<https://omnios.org/setup/freshinstall>

Create an Amazon EBS-backed Linux AMI:

<https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/creating-an-ami-ebs.html>