Chapter 06
Finding Files

Filesystem Hierarchy Standard

- The Filesystem Hierarchy Standard (FHS) is standard that specifies standard directories and their content for use with a filesystem.

- Learning FHS helps you know what directories to expect to find and what to find in them.

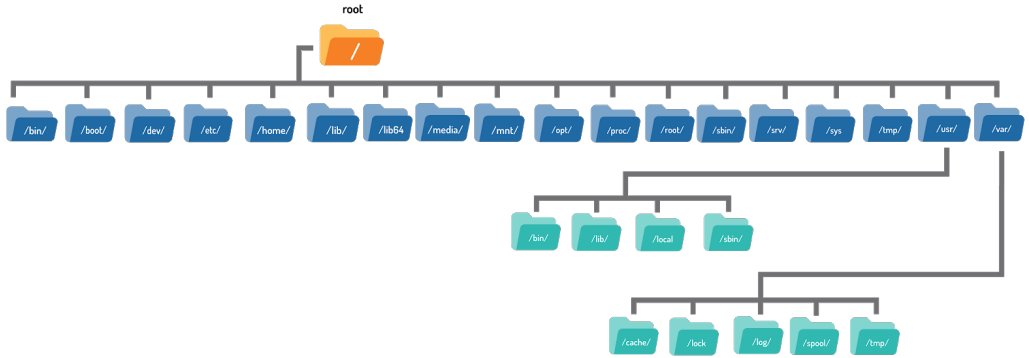
- FHS allows programmers to write programs that will be able to work across a wide variety of systems that conform to this standard.

History of FHS

- First known as known as the Filesystem Standard (FSSTND)
- Renamed FHS in 1997 with series 2.
- The final 2.3 version of this second series of this FHS standard was published in 2004.
- In 2011, a *draft version* of the third series of this standard was published.
- The Linux file structure is best visualized as an upside-down tree, with directories and files branching out from the top-level root `/` directory.

Filesystem Hierarchy Standard

- The FHS details many important directories.
- Administrators should know the directories on the next slides.



Important Directories

Directory	Purpose
`/`	The root of the primary filesystem hierarchy
`/bin`	Contain essential user executables
`/boot`	Contain the kernel and bootloader files
`/dev`	Populated with files representing attached devices
`/etc`	Configuration files specific to the host
`/home`	Common location for user home directories
`/lib`	Essential libraries to support /bin and /sbin executables
`/mnt`	Mount point for temporarily mounting a filesystem

Important Directories

Directory	Purpose
/opt	Optional third party add-on software
/root	Home directory for the root user
/sbin	Contains system or administrative executables
/usr/share/doc	Documentation for software packages
/usr/share/info	Information pages for software packages
/usr/share/locale	Locale information
/usr/share/man	Location for man pages
/usr/share/nls	Native language support files

Filesystem Hierarchy Standard

- A *shareable* directory, typically does not contain anything that would be unique to a particular system like a configuration file.
- A *static* directory usually doesn't change and may suggest that it might be mounted read-only.
- A *variable* directory is likely to change and would have to be available for both read and writes.

Finding Files and Commands

- A GUI typically provides a search tool that makes it possible to find files and applications.
- The CLI provides the `locate` and `find` commands which are useful for searching for a file within the filesystem.

locate Command

```
locate [OPTION]... PATTERN...
```

- The `locate` command searches a database that contains the location of the files on the filesystem.
- The `locate` command accepts a search string as an argument.

```
sysadmin@localhost:~$ locate passwd
/etc/passwd
/etc/passwd-
/etc/pam.d/chpasswd
/etc/pam.d/passwd
/etc/security/opasswd
```

- The `locate` command depends on a database which is updated using the `updatedb` command.

locate Command

- Advantages:
  - Fast because it searches a database of all files on the computer.
- Disadvantages:
  - New files are not in the database if it hasn't been updated.
  - You can only search for files by name versus other search criteria.

find Command

```
find [OPTIONS]... [starting-point...] [expression]
```

- The `find` command searches a live filesystem for specified files.
- The `find` command supports different search criteria options. The following table illustrates some examples of criteria:

`-iname FILE`	Case insensitive search by name.
`-mtime -3`	Files modified less than three days ago.
`-size +1M`	Files larger than 1 megabyte.
`-user jane`	Files owned by the user `jane`.

find Command

- Advantages:
  - Searches directories in real time so it doesn't suffer from problems associated with an outdated database.
  - Supports searching by various criteria.
- Disadvantages:
  - Slower than the `locate` command.

whereis Command

```
whereis [OPTION]... NAME...
```

- The `whereis` command displays the directory location and man page for the specified command.
- Searches only the directories defined by the `$PATH` variable.

```
sysadmin@localhost:~$ whereis grep
grep: /bin/grep /usr/share/man/man1/grep.1.gz /usr/share/info/grep.info.gz
```

- The `-s` option can be used to find source code that has been installed for a given command.
- The `-u` option can be used to identify commands that do not have an entry for a requested attribute.

which Command

```
which [OPTION]…. FILENAME…
```

- The `which` command displays the directory location(s) of a specified command or script.

```
sysadmin@localhost:~$ which bash
/bin/bash
```

- The `which` command returns the location of the real command.
- The `which` command searches only the directories defined by the `$PATH` variable.

type Command

```
type [OPTION]... NAME...
```

- The `type` command displays information about various commands.

```
sysadmin@localhost:~$ type echo
echo is a shell builtin
```

- Using the `-a` option can reveal the path of a command.

```
sysadmin@localhost:~$ type -a echo
echo is a shell builtin
echo is /bin/echo
```

- The `type` command supports other options and can lookup multiple commands simultaneously.