Lab Explore Linux Part I - Navigate Linux Directories

Overview

In this lab, you will be introduced to the Linux shell. This lab only scratches the surface regarding what there is to know about Linux. The intent is to give you a good foundation of the basics.

Requirements

- Logon as root to a virtual install of Linux, workstation, or server.

Introduction to the Bash Shell

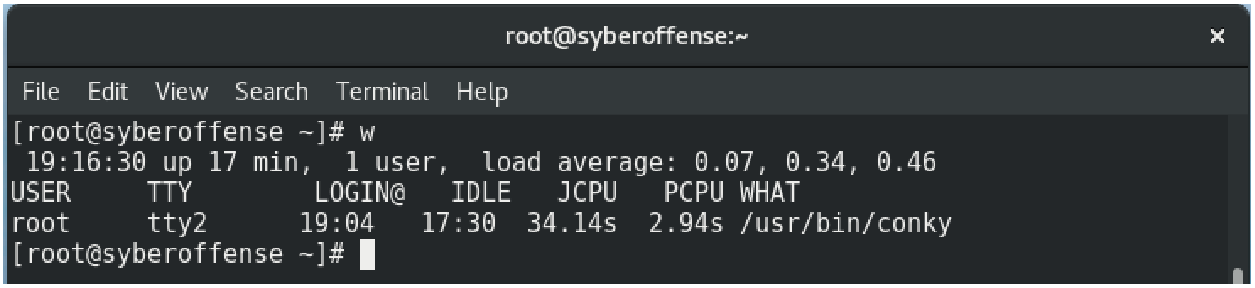
Bash stands for Bourne again shell, so the term "bash shell" is redundant. The bash shell replaced the Bourne shell. Hence the name is a bit of a pun. In Linux terminology, a shell is a command processor. If you log into a Linux system and are presented with a text-based CLI, or you open a terminal window from a desktop GUI to interact with a text-based CLI, you are working within a shell. Bash is the default shell in most Linux distributions and OS-X. But other shells exist. The original Bourne shell (sh) is kept available for backward compatibility. The C shell (csh) and the Korn shell (ksh) are two other alternatives.

The shell provides the user a working environment. It provides fundamental commands to interact with the computer system. It provides a standard input/output mechanism, generally a keyboard, and a terminal display. It provides redirection of I/O, such as using the contents of a file as input to a program and capturing the output of a program in a file. It provides piping the output of one command to the input of a second command. It allows for the creation and execution of shell scripts that can be very simple combinations of commands to very complex programs.

In this section of the lab exercise, login and get a quick introduction to some bash features.

Step 1
Access your Fedora desktop. Log into Fedora as "root."

Step 2
Open a terminal window. You've logged into Fedora a second time, simply by opening this terminal window. Execute the `w` command to list the currently logged in users.



```
[root@syberoffense ~]# w
 19:16:30 up 17 min,  1 user,  load average: 0.07, 0.34, 0.46
USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
root     tty2       19:04   17:30  34.14s  2.94s /usr/bin/conky
[root@syberoffense ~]# 
```

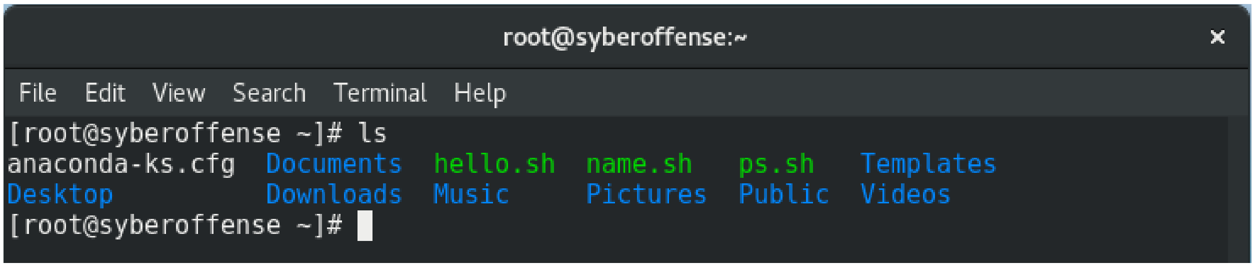
Note the following:

- The user is in the user list.
- User is running the Gnome Desktop Manager.
- Root is running the `w` command (which produced this output).
- Other hints that you are logged in as **root** are that root@syberoffense is used in the shell prompt and is in the title bar of this terminal window.

Step 3

Display the contents of your current directory using the `ls` command.

Answer



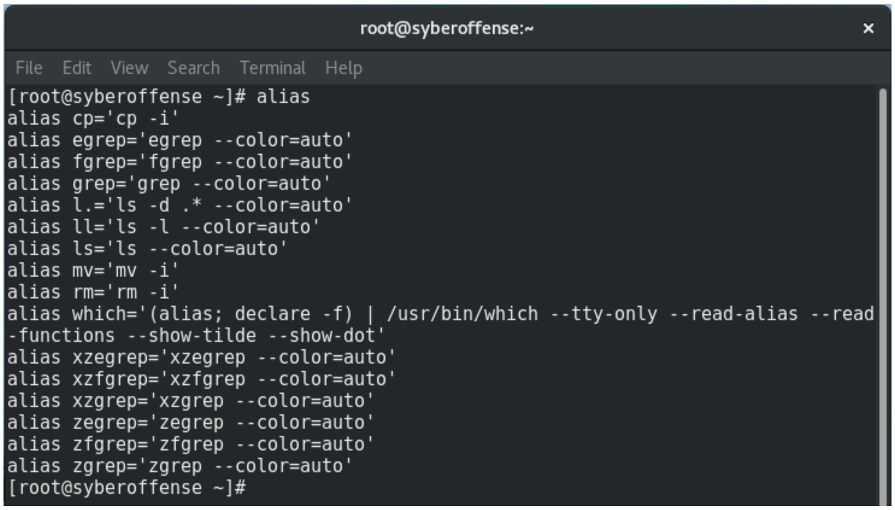
```
[root@syberoffense ~]# ls
anaconda-ks.cfg  Documents  hello.sh  name.sh   ps.sh   Templates
Desktop          Downloads  Music     Pictures  Public  Videos
[root@syberoffense ~]# 
```

Note the following:

- The `ls` command is the traditional command for displaying the contents of a directory. Most Linux distributions also support the `dir` command, which behaves very similarly.
- The output is color-coded: directories are blue, executable files are green, and non-executable files are white.

Step 4

You entered the `ls` command, but the system ran the command `ls --color=auto` which is why the entries were color-coded by entry type. To see the current alias definitions, enter the command `alias`.

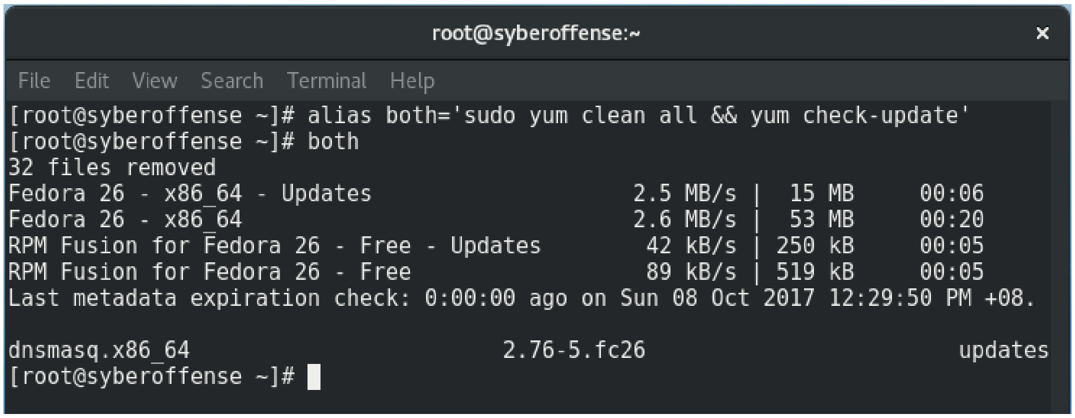


```
[root@syberoffense ~]# alias
alias cp='cp -i'
alias egrep='egrep --color=auto'
alias fgrep='fgrep --color=auto'
alias grep='grep --color=auto'
alias l.='ls -d .* --color=auto'
alias ll='ls -l --color=auto'
alias ls='ls --color=auto'
alias mv='mv -i'
alias rm='rm -i'
alias which='(alias; declare -f) | /usr/bin/which --tty-only --read-alias --read
-functions --show-tilde --show-dot'
alias xzegrep='xzegrep --color=auto'
alias xzfgrep='xzfgrep --color=auto'
alias xzgrep='xzgrep --color=auto'
alias zegrep='zegrep --color=auto'
alias zfgrep='zfgrep --color=auto'
alias zgrep='zgrep --color=auto'
[root@syberoffense ~]#
```

We can create an alias for any long command string. In this example, I've taken the long command string to clean and check for Fedora updates and reduced it to just a single word, `both`

So now when I type in the word `both`, the system knows I want to clean and check for updates. This alias is not permanent. To make the alias permanent, we have to add the alias to the .bashrc file located in our home directory.

Answer



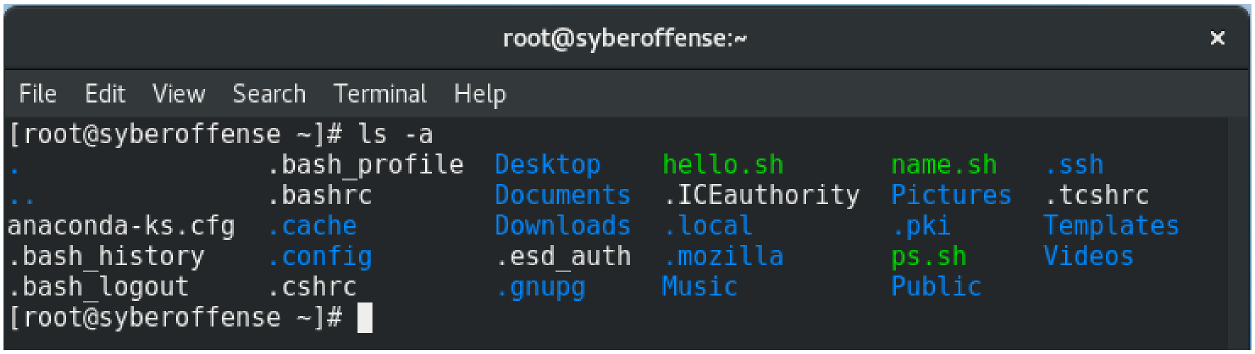
```
[root@syberoffense ~]# alias both='sudo yum clean all && yum check-update'
[root@syberoffense ~]# both
32 files removed
Fedora 26 - x86_64 - Updates                    2.5 MB/s |  15 MB     00:06
Fedora 26 - x86_64                              2.6 MB/s |  53 MB     00:20
RPM Fusion for Fedora 26 - Free - Updates        42 kB/s | 250 kB     00:05
RPM Fusion for Fedora 26 - Free                  89 kB/s | 519 kB     00:05
Last metadata expiration check: 0:00:00 ago on Sun 08 Oct 2017 12:29:50 PM +08.

dnsmasq.x86_64                        2.76-5.fc26                        updates
[root@syberoffense ~]# 
```

Step 5

What defined this alias? For a hint, enter the command `ls -a`.

Answer



```
[root@syberoffense ~]# ls -a
.                .bash_profile  Desktop    hello.sh       name.sh   .ssh
..               .bashrc        Documents  .ICEauthority  Pictures  .tcshrc
anaconda-ks.cfg  .cache         Downloads  .local         .pki      Templates
.bash_history    .config        .esd_auth  .mozilla       ps.sh     Videos
.bash_logout     .cshrc         .gnupg     Music          Public
[root@syberoffense ~]# 
```

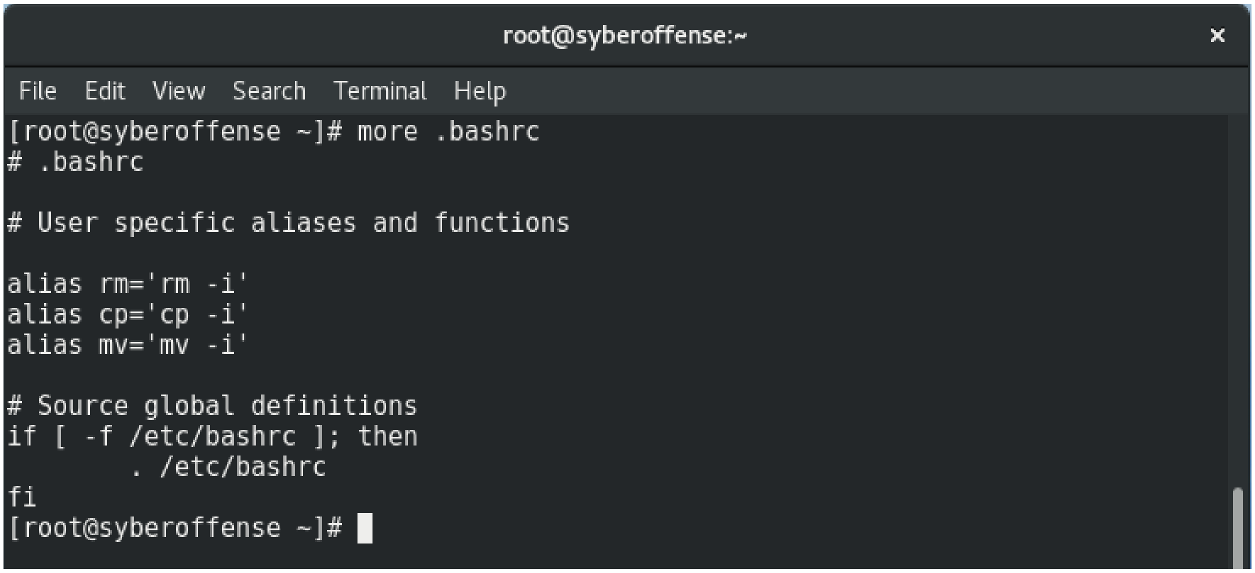
Note the following:

- The `-a` argument tells `ls` to display the hidden files and folders.
- By default, files with names that start with a period character (**.**) are hidden in the directory.

Step 6

There is a file in the directory called, **.bashrc,** which is a shell script that is run when you log in. View its contents using the **`more`** command. Use the spacebar to page through the file. Look for mentions of the **`alias`** command.

Answer



```
[root@syberoffense ~]# more .bashrc
# .bashrc

# User specific aliases and functions

alias rm='rm -i'
alias cp='cp -i'
alias mv='mv -i'

# Source global definitions
if [ -f /etc/bashrc ]; then
        . /etc/bashrc
fi
[root@syberoffense ~]# 
```

Note the following:

- Any line that starts with a # character is ignored by the parse and is a comment.
- The one non-commented `alias` command is `alias rm='rm -i'` which is consistent with it being one of the aliases that showed up with the alias command.

- Optionally, you could edit this document and add your preferred aliases. You will see how to edit files later in this lab exercise.

Navigate Linux Directories

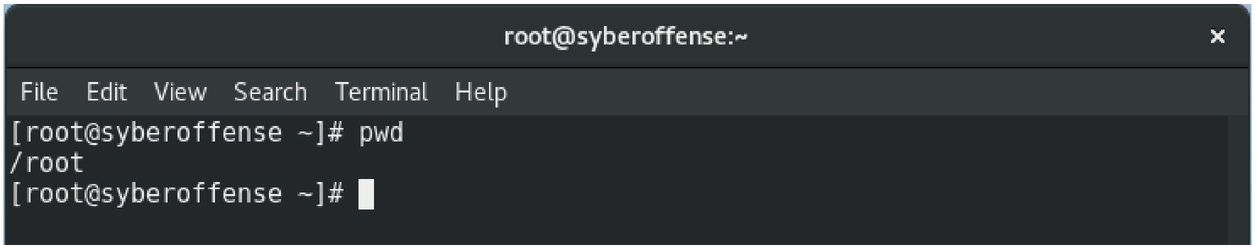
Most operating systems implement the concept of directories to aid in the organization of files. You can think of the root directory as the file cabinet. Subdirectories of the root are like drawers in the file cabinet. Subdirectories of them are like folders in the drawers, and subdirectories of them are like envelopes in the folders. This analogy helps explain the hierarchy of directories, but it can misrepresent the size of directories. Nested subdirectories may contain more items and larger items than their parent directories.

To work with appropriate files, it is useful to navigate around the directory structure of a Linux system. In this section of the lab, use the `cd` command to navigate and explore a bit. You will also be introduced to some special path specifications.

Step 7

Examine the current system prompt: **`root@syberoffense:~$`**. It is easy to recognize **root** as the username and **syberoffense** as the hostname of the system. The third item on the prompt, ~, is your current working directly. The ~ character is a special character that is used as shorthand for your home directory. To print your working directory and see your actual home directory, execute the **`pwd`** command.

Answer



```
[root@syberoffense ~]# pwd
/root
[root@syberoffense ~]#
```

Note the following:

- The **root** directory is the directory on Unix-like operating systems that contains all other directories and files on the system and which is designated by a forward slash (/).

Step 8

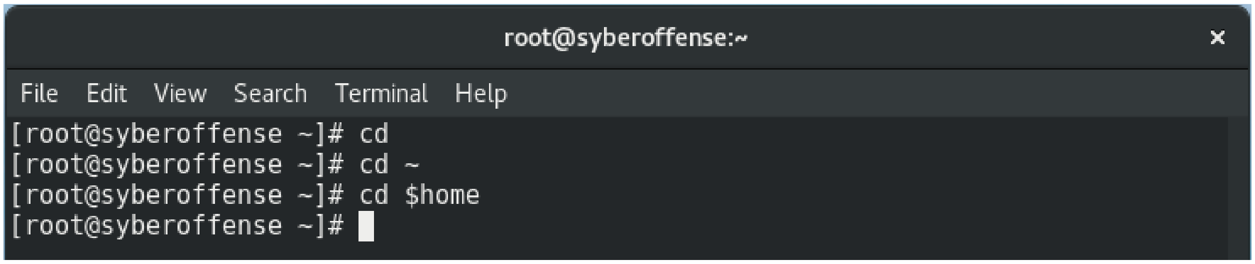
Type `cd` to change to the home directory.

Where ~ is shorthand for your root directory, **..** is shorthand for the parent directory of your current working directory. The `cd` command is used to change your current working directory.

Execute the command `cd ..` to change your current working directory from your home directory to its parent directory.

Knowing this, we now have a number of ways to get back to our home or root directory.

Answer



```
[root@syberoffense ~]# cd
[root@syberoffense ~]# cd ~
[root@syberoffense ~]# cd $home
[root@syberoffense ~]# 
```

Note the following:

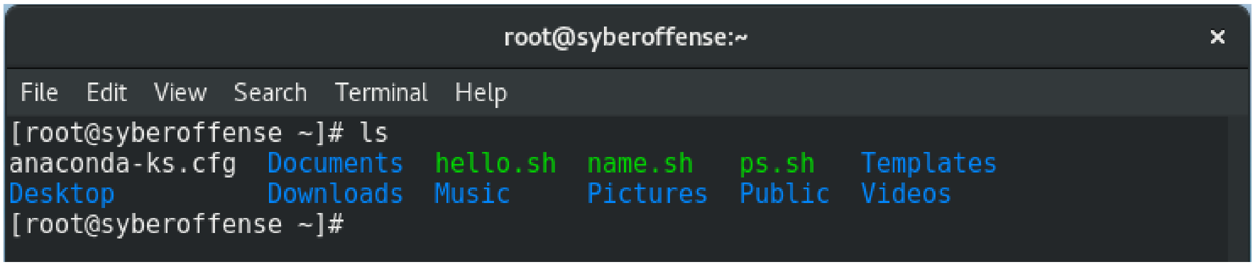
- The prompt can no longer use the shorthand notation for the current working directory.
- You moved from **/root/home** to **/root**.

Step 9

Use your up arrow to find the `cd` command. Hit enter.

Use the `ls` command to list the contents of the /home directory.

Answer



```
[root@syberoffense ~]# ls
anaconda-ks.cfg  Documents  hello.sh  name.sh   ps.sh   Templates
Desktop          Downloads  Music     Pictures  Public  Videos
[root@syberoffense ~]#
```

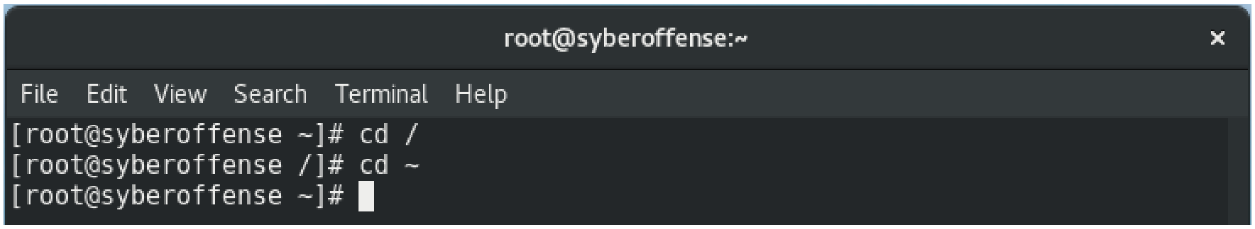
Note the following:

- Users' home directory names normally match the username. This is home directory for all users.
- If you created a user, this is where their home directory would be.

Step 10

The / character is used to separate directories in a path specification. When the / character is used by itself or as the first character in a path, it represents the root directory. Change to the root directory.

Answer



```
[root@syberoffense ~]# cd /
[root@syberoffense /]# cd ~
[root@syberoffense ~]# 
```

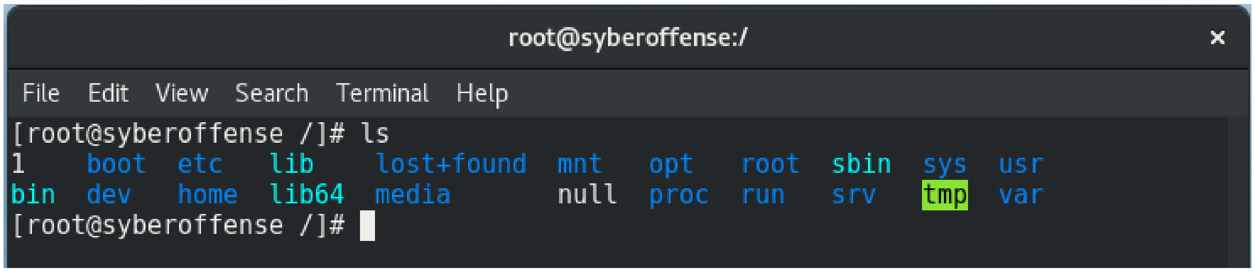
Note the following:

- The command `cd /` will take you to the root directory, no matter what your current working directory happens to be.

Step 11

Display the contents of the root directory. Examine the names of the items in the root directory.

Answer



```
[root@syberoffense /]# ls
1    boot  etc   lib    lost+found  mnt   opt   root  sbin  sys  usr
bin  dev   home  lib64  media       null  proc  run   srv   tmp  var
[root@syberoffense /]# 
```

Note the following:

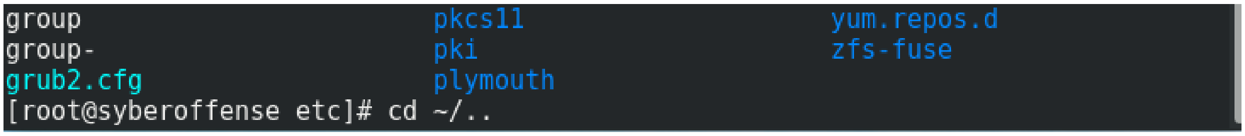
- There are several directories that are valuable to know about:
  1. The home directories are organized here.
  2. Since the root account is quite special, its home directory is separated from the others in /home.
  3. **/tmp:** This directory is used for temporary files. Many Linux distributions will automatically clear the contents of /tmp during system bootup. Users can also make use of /tmp as a temporary holding place for files.
  4. **/etc:** System configuration files are stored here. A few examples include:

        - **/etc/passwd:** User accounts
        - **/etc/shadow:** Salted hashes of user account passwords
        - **/etc/network/interfaces:** IP configuration for network interface cards
        - **/etc/resolv.conf:** DNS configuration
        - **/etc/adduser.conf:** Defines the behavior of the `adduser` command, including home directory assignment and shell assignment
    5. **/var:** Runtime data and log files
    6. **/opt:** Application software and add-on packages that are not part of the base operating system
    7. **/bin and /sbin:** Traditionally, binary files required at system bootup
    8. **/lib:** Traditionally, libraries are required by executable files.
    9. **/usr:** Traditionally, user space programs and data. Includes **/usr/lib**, **/usr/bin** and **/usr/sbin**.
- The distinction between the directories that exist in both the **root** directory and the **/usr** directory has been lost over the years. For example, some files that are found in **/usr/bin** and **/usr/sbin** are required at system bootup time.

Step 12

From any directory, the `cd ~/..` command will navigate to the same predictable location. Can you guess what it is? Execute the `cd ~/..` command and examine the results.

Answer



```
group                          pkcs11                      yum.repos.d
group-                         pki                         zfs-fuse
grub2.cfg                      plymouth
[root@syberoffense etc]# cd ~/..
```

Note the following:

- ~ is shorthand for your home directory and **..** is shorthand for a directory's parent directory.
- **~/..** refers to the parent directory of the user's home directory. For the root user, it will be resolved to /. For standard users, it will resolve to /home.
- **Since we are at the top of the folder hierarchy, we are as far as we can go.**

Summary

In this lab, you learned some basic navigation using the BASH shell. The BASH shell is the command line interpreter use to the comnad operation and access directories and files using a terminal. The BASH shell knows how to respond when we type in a command since it sits in the same directory where the commands reside. You'll learn more about this in the sections and labs to come.You also learned how to find your home and the root directory regardless of where in the Linux file system you're currently at.

Finally, you learned how to use the BASH shell to see the contents of a directory and how to show any hidden files using the ls command.