Hands-on Lab: Informational, File, and Directory Commands

Estimated time needed: **40** minutes

Objectives

In this lab, you will be introduced to the use of basic Unix commands related to the following categories:

- Informational commands
- File and Directory Management Commands
- Access control commands

About Skills Network Cloud IDE

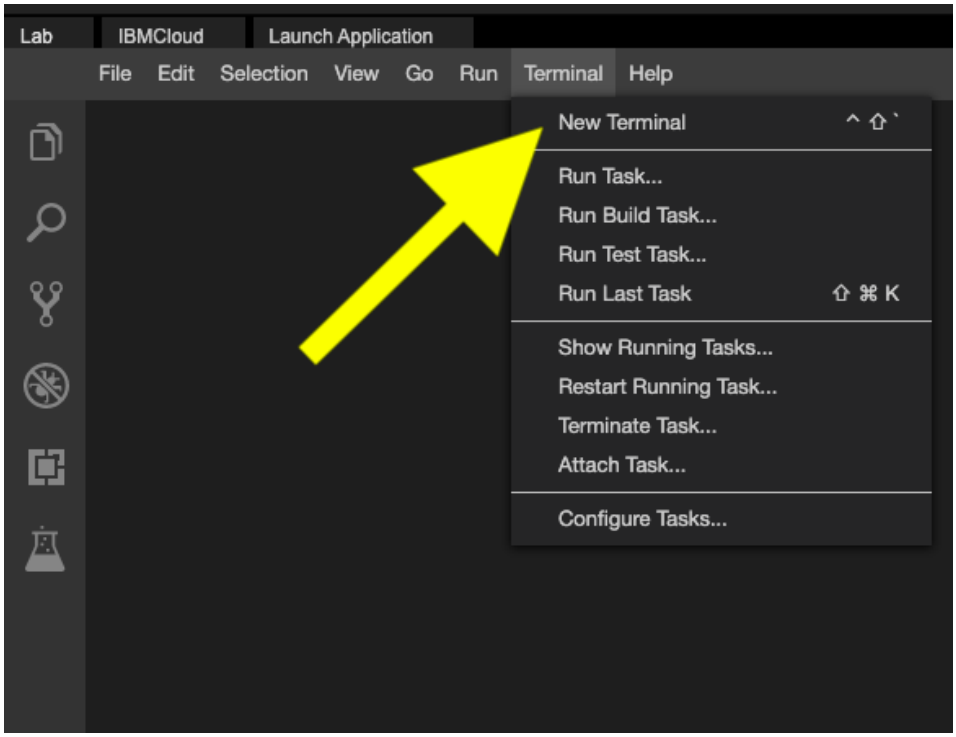
Skills Network Cloud IDE (based on Theia and Docker) provides an environment for hands on labs for course and project related labs. Theia is an open source IDE (Integrated Development Environment), that can be run on desktop or on the cloud. To complete this lab, you will be using the Cloud IDE based on Theia.

Important notice about this lab environment

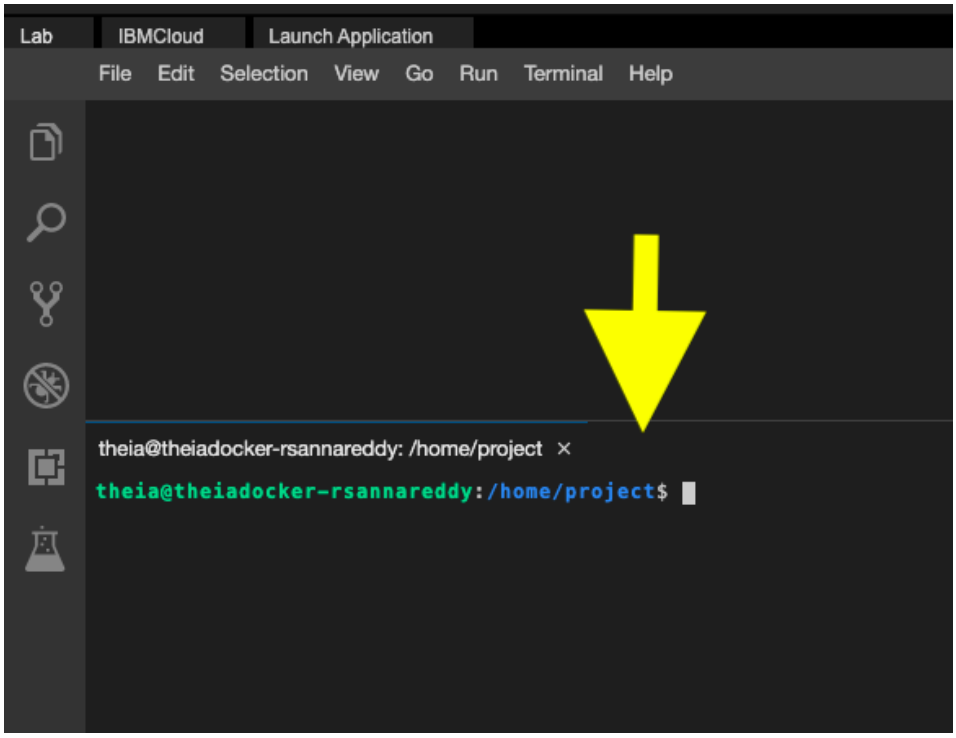
Please be aware that sessions for this lab environment are not persisted. Thus, every time you connect to this lab, a new environment is created for you and any data or files you may have saved in a previous session will be lost. To avoid losing your data, plan to complete these labs in a single session.

Setup

Open a new terminal by clicking on the menu bar and selecting **Terminal->New Terminal**, as in the image below.



This will open a new terminal at the bottom of the screen as seen below.



You can run the commands provided in the following excercises in your newly opened terminal. You can copy the code to your clipboard if you like by clicking on the little copy button on the bottom right of each codeblock, and then paste it on the command line.

Exercise 1 - Informational Commands

In this exercise, you will familiarize yourself with useful commands for providing system and user information.

1.1. Display the name of the current user

```
whoami
```

```
whoami
```

It will display the user name as `theia`. You are logged into this lab as `theia`.

You can get a list of currently logged in users using the command `who`. But this command doesn't work in the `theia` environment yet.

1.2. Get basic information about the operating system

`uname`

By default the command prints the kernel name.

```
uname
```

You will see `Linux` printed in the output.

Using the `-a` opton prints all the system information in the following order: Kernel name, network node hostname, kernel release date, kernel version, machine hardware name, hardware platform, operating system.

```
uname -a
```

1.3. Obtain the user and group identity information

`id`

This command displays the user id and group id information of the current user.

```
id
```

It will display the `uid` (user id) and `gid` (group id) for the user `theia`.

1.4 Get available disk space

`df`

The `df` command is used to display available disk space. Entering

```
df
```

It will display available disk space in 512-byte blocks. To get available disk space in a "human-readable" format, enter:

```
df -h
```

1.5. View currently running processes

`ps`

The `ps` command lists each processes that is currently running and its `PID` (process id).

```
ps
```

However, the output only contains the processes that are owned by you.

By using the `-e` option, you can display all of the processes running on the system. The includes processes owned by other users.

```
ps -e
```

1.6. Get information on the running processes and system resources

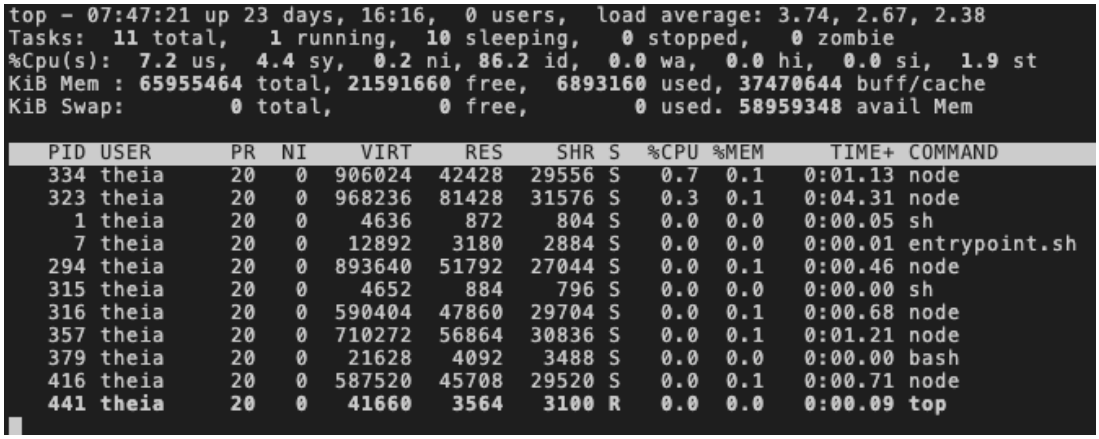
`top`

The `top` command provides a dynamic, real-time view of your system.

It shows summary information of the system and a table of more detailed information related to the processes or threads which are currently running and managed by the kernel. This includes information related to cpu and memory usage per process.

```
top
```

Here is a sample output.



When you start `top`, you'll be presented with the following elements on the main `top` screen.

1. Summary area - shows information like system uptime, number of users, load average, and overall memory usage
2. Column header - attribute names
3. Task area - displays the data for each process, or `PID`

The output keeps refreshing until you press `q` or `Ctrl+c`.

If you want to exit automatically after a specified number of repetitions, use the `-n` option as follows:

```
top -n 10
```

You can press the following keys while `top` is running to sort the table:

Key	Sorts by
`M`	Memory Usage
`P`	CPU Usage
`N`	Process ID (PID)
`T`	Running Time.

For example, you can find out which process is consuming the most memory by entering `shift + m`.

1.7. Display Messages

`echo`

The `echo` command displays the given text on the screen. For example, entering:

```
echo "Welcome to the linux lab"
```

prints `Welcome to the linux lab`.

These special characters help you better format your output.

Special Character	Effect
`\n`	start a new line
`\t`	insert a tab

Use the `-e` option of the echo command when working with special characters. For example:

```
echo -e "This will be printed \nin two lines"
```

1.8. Display date and time

`date`

The `date` command displays the current date and time.

```
date
```

It has several options which help you display the current date and time in your favourite format.
For example, the following command displays the current date in `mm/dd/yy` format.

```
date "+%D"
```

Here are some of the popular format specifiers that you can try out:

Specifier	Explanation
`%d`	Display the day of the month (01 to 31)
`%h`	Displays the abbreviated month name (Jan to Dec)
`%m`	Displays the month of year (01 to 12)
`%Y`	Displays the four-digit year
`%T`	Displays the time in 24 hour format as HH:MM:SS
`%H`	Displays the hour

```
date "+%"
```

1.9. View the Reference Manual For a Command

`man`

The `man` command displays the user manual for any command that you provide as its argument.

For example, to see the manual page for the `ls` command, enter:

```
man date
```

Scroll through the command's manual to find any info you may need. When you're done, press `q`to quit.

Excercise 2: File and directory management commands

In this exercise, you will practice using commands for managing files and directories.

2.1. Get the location of the current working directory

`pwd`

When working in a Linux terminal, you will always be working from a directory. By default, you will start in your home directory. To get the absolute path of your current working directory, enter:

```
pwd
```

2.2. List the files and directories

`ls`

To list the files and directories in the current directory, enter:

```
ls
```

If your directory happens to be empty, `ls` will not return anything.

The following command will list the many binary and executable files which are present in your `/bin` directory.

```
ls /bin
```

The `/bin` directory happens to be where Linux commmands such as `ls` and `pwd` are stored. For example, you can see that `ls` is present by entering:

```
ls /bin/ls
```

To list all files starting with `b` in the `/bin` directory, try entering:

```
ls /bin/b*
```

To list all files ending in `r` in the `/bin` directory, enter:

```
ls /bin/*r
```

To print a long list of files that has additional information compared to the simple `ls` command, such as the last modified date, enter:

```
ls  -l
```

Here are some popular options that you can try with the `ls` command.

Option	Description
`-a`	list all files, including hidden files
`-d`	list directories only, do not include files
`-h`	with `-l` and `-s`, print sizes like 1K, 234M, 2G
`-l`	include attributes like permissions, owner, size, and last-modified date
`-S`	sort by file size, largest first
`-t`	sort by last-modified date, newest first
`-r`	reverse the sort order

To get a long listing of all files in `/etc`, including any hidden files, enter:

```
ls -la /etc
```

Here we combined the options `-l` and `-a` using the shorter notation, `-la`.

2.3. Create a directory

`mkdir`

The `mkdir` command is used to create a new directory.

To create a directory named `scripts` in your current directory, run the following command:

```
mkdir scripts
```

Use the `ls` command to verify whether the `scripts` directories got created:

```
ls
```

2.4. Change your current working directory.

`cd`

To get into the directory `scripts` directory, run the following command:

```
cd scripts
```

Now use the `pwd` command to verify whether your current working directory has changed as expected:

```
pwd
```

If you use `cd` without any directory name as follows, it will move you back to your home directory:

```
cd
```

Again, enter the `pwd` command to verify whether your current working directory has changed:

```
pwd
```

The syntax `..` is a shortcut that refers to the parent directory of your current directory. Run the following command to change dictories up one level:

```
cd ..
```

2.5. Create an empty file

`touch`

First, return to your home directory by entering:

```
cd
```

Next, use the `touch` command to create an empty file named `myfile.txt`:

```
touch myfile.txt
```

Now use the `ls` command to verify creation of `myfile.txt`:

```
ls
```

If the file already exists, the `touch` command updates the access timestamp, or last-modified date of the file. To see this, enter:

```
touch myfile.txt
```

and use use the `date` command to verify the date change:

```
date -r myfile.txt
```

2.6. Search and locate files

`find`

The `find` command is used to search for files in a directory. You can search for files based on different attributes, such as the file's name, type, owner, size, or timestamp.

The `find` command conducts a search of the entire directory tree starting from the given directory name.

For example, the following command finds all `.txt` files in the subfolders of the `/etc` directory:

```
find /etc -name '*.txt'
```

Along with the listing of all `.txt` files, you may get some `Permission denied` errors.

These error are normal, as you have limited access on the lab machine.

2.7. Remove files

`rm`

The `rm` command is used to delete files, and is ideally used along with the `-i` option, which makes it ask for confirmation before every deletion.

To remove the file `myfile.txt`, enter the follwing command and press `y` to confirm deletion, or `n` to cancel:

```
rm -i myfile.txt
```

Use the `ls` command to verify removal:

```
ls
```

2.8. Move, Rename a file

`mv`

First, make a file called users.txt:

```
touch users.txt
```

The `mv` command moves a file from one directory to another.

Use caution when moving a file, because if the target file already exists, it will be overwritten by the source file.

Conveniently however, if the source and target directories are the same, you can employ `mv` as a rename operation.

To illustrate this, rename `users.txt` as `user-info.txt` by entering the following command:

```
mv users.txt user-info.txt
```

Now use the `ls` command to verify the name change:

```
ls
```

Now move `user-info.txt` to the `/tmp` directory, as follows:

```
mv user-info.txt /tmp
```

Now use the `ls` command twice to verify the move, as follows:

```
ls
ls -l /tmp
```

2.9. Copy files

`cp`

You can use the `cp` command to copy `user-info.txt`, which is now in your `/tmp` directory, to your current working directory as follows:

```
cp /tmp/user-info.txt user-info.txt
```

Now use the `ls` command to verify whether the copy was successful:

```
ls
```

The following command copies the content of `/etc/passwd` to a file named `users.txt` under the current directory:

```
cp /etc/passwd users.txt
```

Now use the `ls` command to verify whether the copy was successful:

```
ls
```

Exercise 3 - Access control commands

Required files:

Run the following code to acquire the required files for this exercise:

```
wget https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBM-LX0117EN-SkillsNetwork/labs/module%201/usdoi.txt
```

Each file and each directory has permissions set for three permission categories: the 'owner', the 'group' and 'all users'.

The following permissions are set for each file and directory:

Permission	symbol
read	`r`
write	`w`
execute	`x`

To see the permissions currently set for a file, run the command `ls -l`.

For example, to see the permissions for the file named `usdoi.txt` in your current directory, run:

```
ls -l usdoi.txt
```

A sample output looks like:

```
-rw-r--r-- 1 theia theia 8121 May 31 16:45 usdoi.txt
```

The permissions set here are `rw-r--r--`. The `-` preceeding these permissions indicates that `usdoi.txt` is a file. If it were a directory, you would see a `d` instead of the `-`.

The first three entries correspond to the owner, the next three correspond to the group, and the last threee are for all others. You can see the owner of the file has read and write permissions, while the user group only has read permissions, and all other users have read permission. No users have execute permissions, as indicated by the `-` instead of an `x` in the third position for each user category.

3.1. Change permissions

`chmod`

The `chmod` (change mode) command lets you change the permissions set for a file.

The change of permissions is specified with the help of a combination of the following characters:

Option	Description
`r`, `w` and `x`	permissions: read, write and execute, respectively
`u`,`g` and `o`	user categories: owner, group and all others, respectively
`+`, `-`	operations: grant and revoke, respectively

The command below removes read permission for all users (user, group and other) on the file `usdoi.txt`:

```
chmod -r usdoi.txt
```

You can verify the changed permissions by entering:

```
ls -l usdoi.txt
```

To add read access to all users on `usdoi.txt`, enter:

```
chmod +r usdoi.txt
```

Now verify the changed permissions:

```
ls -l usdoi.txt
```

To remove the read permission for 'all other users' category, enter:

```
chmod o-r usdoi.txt
```

Verify the changed permissions:

```
ls -l usdoi.txt
```

Practice exercises

1. Problem:

   Display the content of `/home` directory.

▼ Click here for Hint

   Use `ls` command.

▼ Click here for Solution

```
ls /home
```

2. Problem:

   Ensure that you are in your home directory.

▼ Click here for Hint

   Use `cd` to move to the home directory and then use `pwd` to verify.

▼ Click here for Solution

```
cd
pwd
```

3. Problem:

   Create a new directory called `final` in your home directory.

▼ Click here for Hint

   Use `mkdir` command.

▼ Click here for Solution

```
mkdir final
```

4. Problem:

   View the permissions of the newly created directory, `final`.

▼ Click here for Hint

   Use `-d` and `-l` options of the `ls` command.

▼ Click here for Solution

```
ls -ld final
```

5. Problem:

   Create a new blank file named 'display.sh' in the `final` directory

▼ Click here for Hint

   use 'cd and 'touch' commands.

▼ Click here for Solution

```
cd final
touch display.sh
```

6. Problem:

   Create a copy of `display.sh` called `report.sh`.

▶ Click here for Hint

▼ Click here for Solution

```
cp display.sh report.sh
```

7. Problem:

   Delete the file 'display.sh'.

▼ Click here for Hint

   Use `rm` command.

▼ Click here for Solution

```
rm -i display.sh
```

8. Problem:

   List the files in `/etc` directory in the ascending order of their access time.

▼ Click here for Hint

   Use the `ls` command with the right options.

▼ Click here for Solution

```
ls -ltr /etc/
```

9. Problem:

   Display the current time.

▼ Click here for Hint

   Use the format option `%T` of the `date` command.

▼ Click here for Solution

```
date "+%T"
```

10. Problem:

    Copy the file `/var/log/bootstrap.log` to your current directory.

▼ Click here for Hint

   Use the `cp` command to copy the file to your current directory `.`

▼ Click here for Solution

```
cp /var/log/bootstrap.log .
```

Authors

Ramesh Sannareddy Sam Prokopchuk

Other Contributors

Rav Ahuja Jeff Grossman

Change Log

Date (YYYY-MM-DD)	Version	Changed By	Change Description
2021-05-30	0.1	Ramesh Sannareddy	Created initial version of the lab
2021-11-29	0.2	Sam Prokopchuk	Update lab contents and split
2021-12-02	0.3	Jeff Grossman	Review and Update lab