Navigating the Linux File System via the RStudio Terminal Tab

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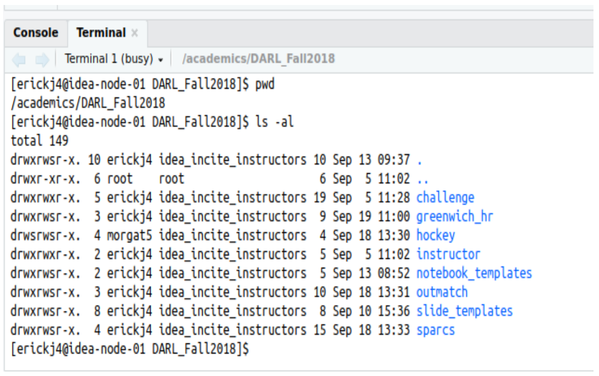
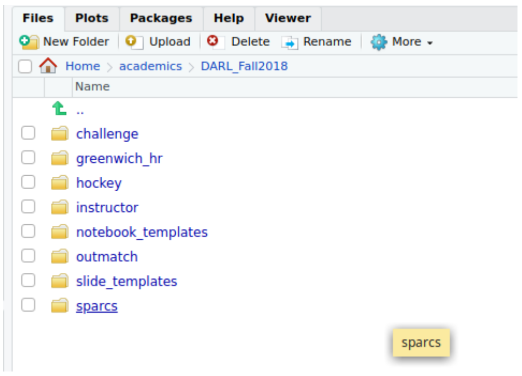
RStudio gives you two ways to "navigate" the directory tree: via the "Files" tab in the lower-right panel (default), and through the Linux file system via the "Terminal" tab in the lower left (default).

Note: These two directory views are not synchronized; navigating in "Files" does not change your current directory in the Terminal, and visa versa. Furthermore, setting your working directory in the Files tab does not change where you are in the Terminal.



```
[erickj4@idea-node-01 DARL_Fall2018]$ pwd
/academics/DARL_Fall2018
[erickj4@idea-node-01 DARL_Fall2018]$ ls -al
total 149
drwxrwsr-x. 10 erickj4 idea_incite_instructors 10 Sep 13 09:37 .
drwxr-xr-x.  6 root    root                     6 Sep  5 11:02 ..
drwxrwxr-x.  5 erickj4 idea_incite_instructors 19 Sep  5 11:28 challenge
drwxrwsr-x.  3 erickj4 idea_incite_instructors  9 Sep 19 11:00 greenwich_hr
drwsrwsr-x.  4 morgat5 idea_incite_instructors  4 Sep 18 13:30 hockey
drwxrwxr-x.  2 erickj4 idea_incite_instructors  5 Sep  5 11:02 instructor
drwxrwsr-x.  2 erickj4 idea_incite_instructors  5 Sep 13 08:52 notebook_templates
drwxrwsr-x.  3 erickj4 idea_incite_instructors 10 Sep 18 13:31 outmatch
drwxrwsr-x.  8 erickj4 idea_incite_instructors  8 Sep 10 15:36 slide_templates
drwxrwsr-x.  4 erickj4 idea_incite_instructors 15 Sep 18 13:33 sparcs
[erickj4@idea-node-01 DARL_Fall2018]$
```



A new feature in the RStudio interface allows you to create a new terminal based on your current location in the Files view; this is very useful!

Certain operations such as managing file and directory permissions (required for group work) will require you to work in the Linux terminal, which means learning a few Linux commands. The following guide, excerpted from **Basic Linux Navigation and File Management**, should tell you everything you need to know!

Navigation and Exploration

The most fundamental skills you need to master are moving around the filesystem and getting an idea of what is around you. We will discuss the tools that allow you to do this in this section.

Finding Where You Are with the "pwd" Command

When you log into your server, you are typically dropped into your user account's home directory. A home directory is a directory set aside for your user to store files and create directories. It is the location in the filesystem where you have full dominion.

To find out where your home directory is in relationship to the rest of the filesystem, you can use the pwd command. This command displays the directory that we are currently in:

```
pwd
```

You should get back some information that looks like this:

```
/home/demo
```

The home directory is named after the user account, so the above example is what the value would be if you were logged into the server with an account called demo. This directory is within a directory called /home, which is itself within the top-level directory, which is called "root" but represented by a single slash "/".

Looking at the Contents of Directories with "ls"

Now that you know how to display the directory that you are in, we can show you how to look at the contents of a directory.

Currently, your home directory that we saw above does not have much to see, so we will go to another, more populated directory to explore. Type the following in your terminal to move to this directory (we will explain the details of moving directories in the next section). Afterward, we'll use pwd to confirm that we successfully moved:

```
cd /usr/share
pwd

/usr/share
```

Now that we are in a new directory, let's look at what's inside. To do this, we can use the ls command:

```
ls

adduser            groff                           pam-configs
applications       grub                            perl
apport             grub-gfxpayload-lists           perl5
apps               hal                             pixmaps
apt                i18n                            pkgconfig
aptitude           icons                           polkit-1
apt-xapian-index   info                            popularity-contest
...
```

As you can see, there are *many* items in this directory. We can add some optional flags to the command to modify the default behavior. For instance, to list all of the contents in an extended form, we can use the -lflag (for "long" output):

```
ls -l

total 440
drwxr-xr-x   2 root root  4096 Apr 17  2014 adduser
drwxr-xr-x   2 root root  4096 Sep 24 19:11 applications
drwxr-xr-x   6 root root  4096 Oct  9 18:16 apport
drwxr-xr-x   3 root root  4096 Apr 17  2014 apps
drwxr-xr-x   2 root root  4096 Oct  9 18:15 apt
drwxr-xr-x   2 root root  4096 Apr 17  2014 aptitude
drwxr-xr-x   4 root root  4096 Apr 17  2014 apt-xapian-index
drwxr-xr-x   2 root root  4096 Apr 17  2014 awk
. . .
```

This view gives us plenty of information, most of which looks rather unusual. The first block describes the file type (if the first column is a "d" the item is a directory, if it is a "-", it is a normal file) and permissions. Each subsequent column, separated by white space, describes the number of hard links, the owner, group owner, item size, last modification time, and the name of the item. We will describe some of these at another time, but for now, just know that you can view this information with the -l flag of ls.

To get a listing of all files, including *hidden* files and directories, you can add the -a flag. Since there are no real hidden files in the /usr/share directory, let's go back to our home directory and try that command. You can get back to the home directory by typing cd with no arguments:

```
cd
ls -a
```

```
.  ..  .bash_logout  .bashrc  .profile
```

As you can see, there are three hidden files in this demonstration, along with . and .., which are special indicators. You will find that often, configuration files are stored as hidden files, as is the case here.

For the dot and double dot entries, these aren't exactly directories as much as built-in methods of referring to related directories. The single dot indicates the current directory, and the double dot indicates this directory's parent directory. This will come in handy in the next section.

Moving Around the Filesystem with "cd"

We have already made two directory moves in order to demonstrate some properties of ls in the last section. Let's take a better look at the command here.

Begin by going back to the /usr/share directory by typing this:

```
cd /usr/share
```

This is an example of changing a directory by giving an absolute path. In Linux, every file and directory is under the top-most directory, which is called the "root" directory, but referred to by a single leading slash "/". An absolute path indicates the location of a directory in relation to this top-level directory. This lets us refer to directories in an unambiguous way from any place in the filesystem. Every absolute path mustbegin with a slash.

The alternative is to use relative paths. Relative paths refer to directories in relation to the *current*directory. For directories close to the current directory in the hierarchy, this is usually easier and shorter. Any directory within the current directory can be referenced by name without a leading slash. We can change to the locale directory within /usr/share from our current location by typing:

```
cd locale
```

We can likewise move multiple directory levels with relative paths by providing the portion of the path that comes after the current directory's path. From here, we can get to the LC_MESSAGES directory within the en directory by typing:

```
cd en/LC_MESSAGES
```

To go back up, travelling to the parent of the current directory, we use the special double dot indicator we talked about earlier. For instance, we are now in the /usr/share/locale/en/LC_MESSAGES directory. To move up one level, we can type:

```
cd ..
```

This takes us to the /usr/share/locale/en directory.

A shortcut that you saw earlier that will always take you back to your home directory is to use cd without providing a directory:

```
cd
pwd
```

```
/home/demo
```

To learn more about how to use these three commands, you can check out our guide on exploring the Linux filesystem.

Viewing Files

In the last section, we learned a bit about how to navigate the filesystem. You probably saw some files when using the ls command in various directories. In this section, we'll discuss different ways that you can use to view files. In contrast to some operating systems, Linux and other Unix-like operating systems rely on plain text files for vast portions of the system.

The main way that we will view files is with the less command. This is what we call a "pager", because it allows us to scroll through pages of a file. While the previous commands immediately executed and returned you to the command line, less is an application that will continue to run and occupy the screen until you exit.

We will open the /etc/services file, which is a configuration file that contains service information that the system knows about:

```
less /etc/services
```

The file will be opened in less, allowing you to see the portion of the document that fits in the area of the terminal window:

```
# Network services, Internet style
#
# Note that it is presently the policy of IANA to assign a single well-known
# port number for both TCP and UDP; hence, officially ports have two entries
# even if the protocol doesn't support UDP operations.
#
# Updated from http://www.iana.org/assignments/port-numbers and other
# sources like http://www.freebsd.org/cgi/cvsweb.cgi/src/etc/services .
# New ports will be added on request if they have been officially assigned
# by IANA and used in the real-world or are needed by a debian package.
# If you need a huge list of used numbers please install the nmap package.

tcpmux          1/tcp                           # TCP port service multiplexer
echo            7/tcp
. . .
```

To scroll, you can use the up and down arrow keys on your keyboard. To page down one whole screens-worth of information, you can use either the space bar, the "Page Down" button on your keyboard, or the CTRL-f shortcut.

To scroll back up, you can use either the "Page Up" button, or the CTRL-b keyboard shortcut.

To search for some text in the document, you can type a forward slash "/" followed by the search term. For instance, to search for "mail", we would type:

```
/mail
```

This will search forward through the document and stop at the first result. To get to another result, you can type the lower-case n key:

```
n
```

To move backwards to the previous result, use a capital N instead:

```
N
```

When you wish to exit the less program, you can type q to quit:

```
q
```

While we focused on the less tool in this section, there are many other ways of viewing a file that come in handy in certain circumstances. The cat command displays a file's contents and returns you to the prompt immediately. The head command, by default, shows the first 10 lines of a file. Likewise, the tailcommand shows the last 10 lines by default. These commands display file contents in a way that is useful for "piping" to other programs. We will discuss this concept in a future guide.

Feel free to see how these commands display the /etc/services file differently.

File and Directory Manipulation

We learned in the last section how to view a file. In this section, we'll demonstrate how to create and manipulate files and directories.

Create a File with "touch"

Many commands and programs can create files. The most basic method of creating a file is with the touch command. This will create an empty file using the name and location specified.

First, we should make sure we are in our home directory, since this is a location where we have permission to save files. Then, we can create a file called file1 by typing:

```
cd
touch file1
```

Now, if we view the files in our directory, we can see our newly created file:

```
ls
```

```
file1
```

If we use this command on an existing file, the command simply updates the data our filesystem stores on the time when the file was last accessed and modified. This won't have much use for us at the moment.

We can also create multiple files at the same time. We can use absolute paths as well. For instance, if our user account is called demo, we could type:

```
touch /home/demo/file2 /home/demo/file3
ls
```

```
file1  file2  file3
```

Create a Directory with "mkdir"

Similar to the touch command, the mkdir command allows us to create empty directories.

For instance, to create a directory within our home directory called test, we could type:

```
cd
mkdir test
```

We can make a directory *within* the test directory called example by typing:

```
mkdir test/example
```

For the above command to work, the test directory must already exist. To tell mkdir that it should create any directories necessary to construct a given directory path, you can use the -p option. This allows you to create nested directories in one step. We can create a directory structure that looks like some/other/directories by typing:

```
mkdir -p some/other/directories
```

The command will make the some directory first, then it will create the other directory inside of that. Finally it will create the directories directory within those two directories.

Moving and Renaming Files and Directories with "mv"

We can move a file to a new location using the mv command. For instance, we can move file1 into the test directory by typing:

```
mv file1 test
```

For this command, we give all of the items that we wish to move, with the location to move them at the end. We can move that file *back* to our home directory by using the special dot reference to refer to our current directory. We should make sure we're in our home directory, and then execute the command:

```
cd
mv test/file1 .
```

This may seem unintuitive at first, but the mv command is also used to *rename* files and directories. In essence, moving and renaming are both just adjusting the location and name for an existing item.

So to rename the test directory to testing, we could type:

```
mv test testing
```

Note: It is important to realize that your Linux system will not prevent you from certain destructive actions. If you are renaming a file and choose a name that *already* exists, the previous file will be overwritten by the file you are moving. There is no way to recover the previous file if you accidentally overwrite it.

Copying Files and Directories with "cp"

With the mv command, we could move or rename a file or directory, but we could not duplicate it. The cpcommand can make a new copy of an existing item.

For instance, we can copy file3 to a new file called file4:

```
cp file3 file4
```

Unlike a mv operation, after which file3 would no longer exist, we now have both file3 and file4.

Note: As with the mv command, it is possible to overwrite a file if you are not careful about the filename you are using as the target of the operation. For instance, if file4 already existed in the above example, its content would be completely replaced by the content of file3.

In order to copy directories, you must include the -r option to the command. This stands for "recursive", as it copies the directory, plus all of the directory's contents. This option is necessary with directories, regardless of whether the directory is empty.

For instance, to copy the some directory structure to a new structure called again, we could type:

```
cp -r some again
```

Unlike with files, with which an existing destination would lead to an overwrite, if the target is an *existing directory*, the file or directory is copied *into* the target:

```
cp file1 again
```

This will create a new copy of file1 and place it inside of the again directory.

Removing Files and Directories with "rm" and "rmdir"

To delete a file, you can use the rm command.

Note: Be extremely careful when using any destructive command like rm. There is no "undo" command for these actions so it is possible to accidentally destroy important files permanently.

To remove a regular file, just pass it to the rm command:

```
cd
rm file4
```

Likewise, to remove *empty* directories, we can use the rmdir command. This will only succeed if there is nothing in the directory in question. For instance, to remove the example directory within the testingdirectory, we can type:

```
rmdir testing/example
```

If you wish to remove a *non-empty* directory, you will have to use the rm command again. This time, you will have to pass the -r option, which removes all of the directory's contents recursively, plus the directory itself.

For instance, to remove the again directory and everything within it, we can type:

```
rm -r again
```

Once again, it is worth reiterating that these are permanent actions. Be entirely sure that the command you typed is the one that you wish to execute.

Editing Files

Currently, we know how to manipulate files as objects, but we have not learned how to actually edit them and add content to them.

The nano command is one of the simplest command-line Linux text editors, and is a great starting point for beginners. It operates somewhat similarly to the less program discussed above, in that it occupies the entire terminal for the duration of its use.

The nano editor can open existing files, or create a file. If you decide to create a new file, you can give it a name when you call the nano editor, or later on, when you wish to save your content.

We can open the file1 file for editing by typing:

```
cd
nano file1
```

The nano application will open the file (which is currently blank). The interface looks something like this:

```
 GNU nano 2.2.6              File: file1
```

```
                              [ Read 0 lines ]
^G Get Help   ^O WriteOut   ^R Read File  ^Y Prev Page  ^K Cut Text   ^C Cur Pos
^X Exit       ^J Justify    ^W Where Is   ^V Next Page  ^U UnCut Text ^T To Spell
```

Along the top, we have the name of the application and the name of the file we are editing. In the middle, the content of the file, currently blank, is displayed. Along the bottom, we have a number of key combinations that indicate some basic controls for the editor. For each of these, the ^ character means the CTRL key.

To get help from within the editor, type:

```
CTRL-G
```

When you are finished browsing the help, type CTRL-X to get back to your document.

Type in or modify any text you would like. For this example, we'll just type these two sentences:

```
Hello there.

Here is some text.
```

To save our work, we can type:

```
CTRL-O
```

This is the letter "o", not a zero. It will ask you to confirm the name of the file you wish to save to:

```
File Name to Write: file1
^G Get Help        M-D DOS Format     M-A Append         M-B Backup File
^C Cancel          M-M Mac Format     M-P Prepend
```

As you can see, the options at the bottom have also changed. These are contextual, meaning they will change depending on what you are trying to do. If file1 is still the file you wish to write to, hit "ENTER".

If we make some additional changes and wish to save the file and exit the program, we will see a similar prompt. Add a new line, and then try to exit the program by typing:

```
CTRL-X
```

If you have not saved after making your modification, you will be asked whether you wish to save the modifications you made:

```
Save modified buffer (ANSWERING "No" WILL DESTROY CHANGES) ?
 Y Yes
 N No          ^C Cancel
```

You can type "Y" to save your changes, "N" to discard your changes and exit, or "CTRL-C" to cancel the exit operation. If you choose to save, you will be given the same file prompt that you received before, confirming that you want to save the changes to the same file. Press ENTER to save the file and exit the editor.

You can see the contents of the file you created using either the cat program to display the contents, or the less program to open the file for viewing. After viewing with less, remember that you should hit qto get back to the terminal.

```
less file1

Hello there.

Here is some text.

Another line.
```

Another editor that you may see referenced in certain guides is vim or vi. This is a more advanced editor that is very powerful, but comes with a very steep learning curve. If you are ever told to use vim or vi, feel free to use nano instead. If you wish to learn how to use vim, read our guide to getting started with vim.

Conclusion

By now, you should have a basic understanding of how to get around your Linux server and how to see the files and directories available. You should also know some basic file manipulation commands that will allow you to view, copy, move, or delete files. Finally, you should be comfortable with some basic editing using the nano text editor.

With these few skills, you should be able to continue on with other guides and learn how to get the most out of your server.