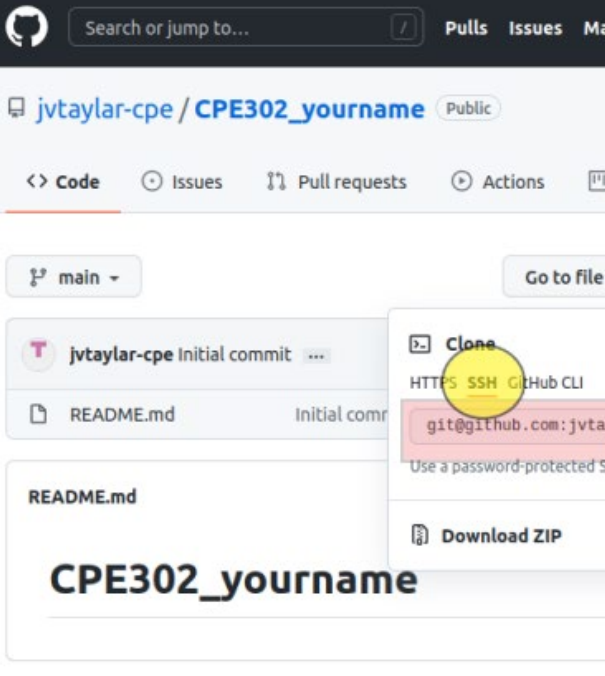


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|  | Date Performed: 08/25/2022 |
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| Course/Section: CPE31S23 | Date Submitted: 08/25/2022 |
| Instructor: Engr. Jonathan Taylar | Semester and SY: 1st sem 2022-2023 |
| Activity 2: SSH Key-Based Authentication and Setting up Git | |
| <ol style="list-style-type: none"> 1. Objectives: <ol style="list-style-type: none"> 1.1 Configure remote and local machine to connect via SSH using a KEY instead of using a password 1.2 Create a public key and private key 1.3 Verify connectivity 1.4 Setup Git Repository using local and remote repositories 1.5 Configure and Run ad hoc commands from local machine to remote servers | |
| <p>Part 1: Discussion</p> <p>It is assumed that you are already done with the last Activity (Activity 1: Configure Network using Virtual Machines). <i>Provide screenshots for each task.</i></p> <p>It is also assumed that you have VMs running that you can SSH but requires a password. Our goal is to remotely login through SSH using a key without using a password. In this activity, we create a public and a private key. The private key resides in the local machine while the public key will be pushed to remote machines. Thus, instead of using a password, the local machine can connect automatically using SSH through an authorized key.</p> <p>What Is ssh-keygen?</p> | |

Ssh-keygen is a tool for creating new authentication key pairs for SSH. Such key pairs are used for automating logins, single sign-on, and for authenticating hosts.

SSH Keys and Public Key Authentication

The SSH protocol uses public key cryptography for authenticating hosts and users. The authentication keys, called SSH keys, are created using the keygen program.

SSH introduced public key authentication as a more secure alternative to the older .rhosts authentication. It improved security by avoiding the need to have password stored in files and eliminated the possibility of a compromised server stealing the user's password.

However, SSH keys are authentication credentials just like passwords. Thus, they must be managed somewhat analogously to usernames and passwords. They should have a proper termination process so that keys are removed when no longer needed.

Task 1: Create an SSH Key Pair for User Authentication

1. The simplest way to generate a key pair is to run *ssh-keygen* without arguments. In this case, it will prompt for the file in which to store keys. First, the tool asked where to save the file. SSH keys for user authentication are usually stored in the users .ssh directory under the home directory. However, in enterprise environments, the location is often different. The default key file name depends on the algorithm, in this case *id_rsa* when using the default RSA algorithm. It could also be, for example, *id_dsa* or *id_ecdsa*.

```
TIPQC@Q5202-16 MINGW64 ~/.ssh
$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/c/Users/TIPQC/.ssh/id_rsa):
/c/Users/TIPQC/.ssh/id_rsa already exists.
Overwrite (y/n)? y
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /c/Users/TIPQC/.ssh/id_rsa
Your public key has been saved in /c/Users/TIPQC/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:QwJHCT2R5BJJ8grqBdGSuhCdjVbEZKKI7VQBQbIa9Sk TIPQC@Q5202-16
The key's randomart image is:
+----[RSA 3072]-----+
|. +X%%B=+ |
|+0*0+*= |
|O+E = o.. |
|==.o . o |
|+.o. S |
|o . . |
|. |
| |
+----[SHA256]-----+
```

2. Issue the command `ssh-keygen -t rsa -b 4096`. The algorithm is selected using the `-t` option and key size using the `-b` option.
3. When asked for a passphrase, just press enter. The passphrase is used for encrypting the key, so that it cannot be used even if someone obtains the private key file. The passphrase should be cryptographically strong.
4. Verify that you have created the key by issuing the command `ls -la .ssh`. The command should show the `.ssh` directory containing a pair of keys. For example, `id_rsa.pub` and `id_rsa`.

```
TIPQC@Q5202-16 MINGW64 ~/.ssh
$ ls
CPE232_twinkle/ DNSCache/ id_rsa id_rsa.pub known_hosts known_hosts.old
TIPQC@Q5202-16 MINGW64 ~/.ssh
```

Task 2: Copying the Public Key to the remote servers

1. To use public key authentication, the public key must be copied to a server and installed in an `authorized_keys` file. This can be conveniently done using the `ssh-copy-id` tool.
2. Issue the command similar to this: `ssh-copy-id -i ~/.ssh/id_rsa user@host`
3. Once the public key has been configured on the server, the server will allow any connecting user that has the private key to log in. During the login process, the client proves possession of the private key by digitally signing the key exchange.

```
TIPQC@Q5202-16 MINGW64 ~/.ssh
$ ssh-copy-id jhermitano@192.168.56.106
/usr/bin/ssh-copy-id: INFO: Source of key(s) to be installed: "/c/Users/TIPQC/.ssh/id_rsa.pub"
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that are already installed
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is to install the new keys
jhermitano@192.168.56.106's password:

Number of key(s) added: 1

Now try logging into the machine, with: "ssh 'jhermitano@192.168.56.106'"
and check to make sure that only the key(s) you wanted were added.
```

4. On the local machine, verify that you can SSH with Server 1 and Server 2. What did you notice? Did the connection ask for a password? If not, why?

```
TIPQC@Q5202-16 MINGW64 ~/.ssh
$ ssh jhermitano@192.168.56.106
Welcome to Ubuntu 22.04.1 LTS (GNU/Linux 5.15.0-46-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

0 updates can be applied immediately.

Last login: Thu Aug 25 08:54:43 2022 from 192.168.56.1
jhermitano@jhermitano-VirtualBox:~$
```

It does not require any password to enter the server 1 thru ssh. No, because of the id/keys that are copied from local machine to the remote server.

Reflections:

Answer the following:

1. How will you describe the ssh-program? What does it do?
Ssh-program, it helps you to enter an another server from your device.
2. How do you know that you already installed the public key to the remote servers?
You can verify it on your remote server by entering the folder .ssh and an ls command.

Part 2: Discussion

Provide screenshots for each task.

It is assumed that you are done with the last activity (**Activity 2: SSH Key-Based Authentication**).

Set up Git

At the heart of GitHub is an open-source version control system (VCS) called Git. Git is responsible for everything GitHub-related that happens locally on your computer. To use Git on the command line, you'll need to download, install, and configure Git on your computer. You can also install GitHub CLI to use GitHub from the command line. If you don't need to work with files locally, GitHub lets you complete many Git-related actions directly in the browser, including:

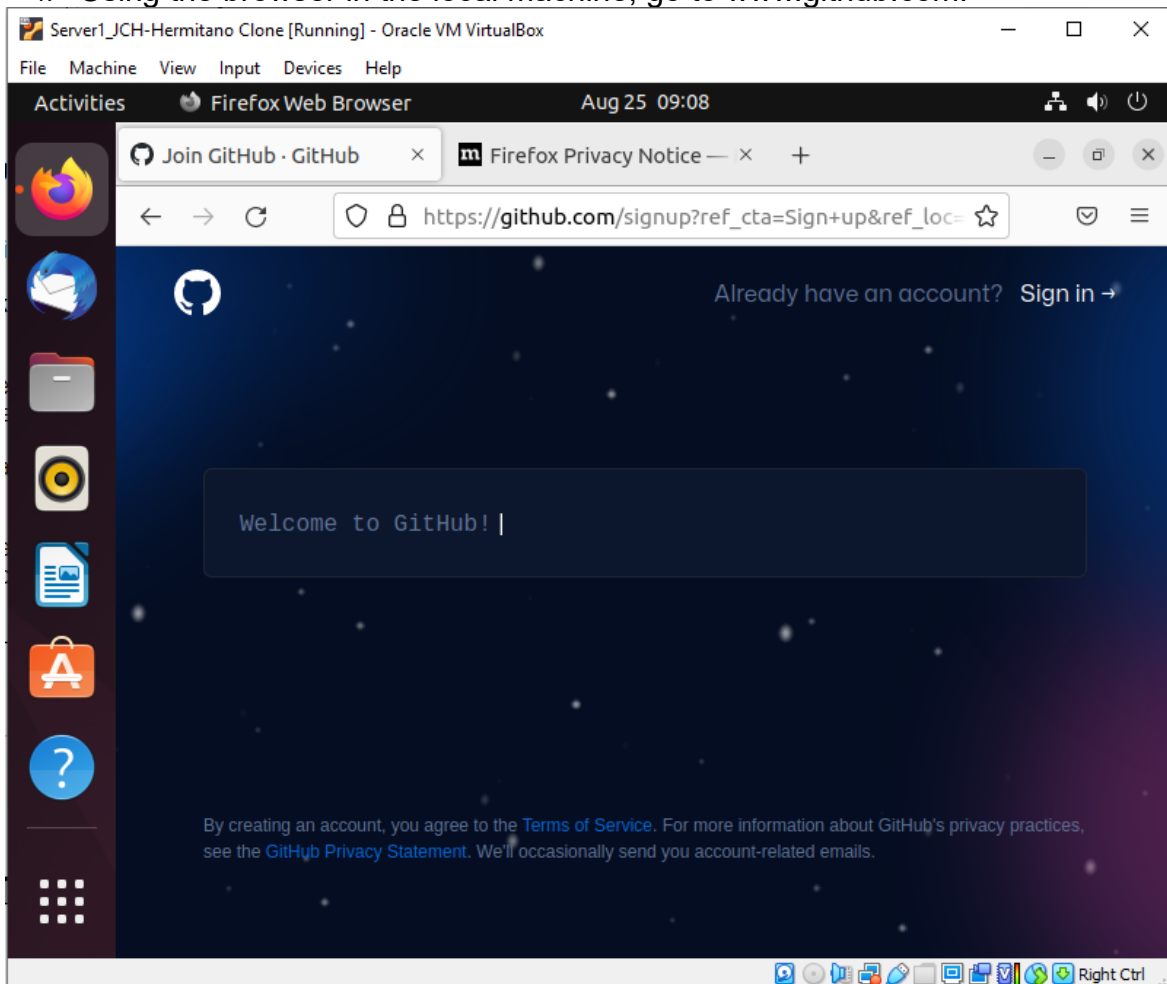
- Creating a repository
- Forking a repository
- Managing files
- Being social

Task 3: Set up the Git Repository

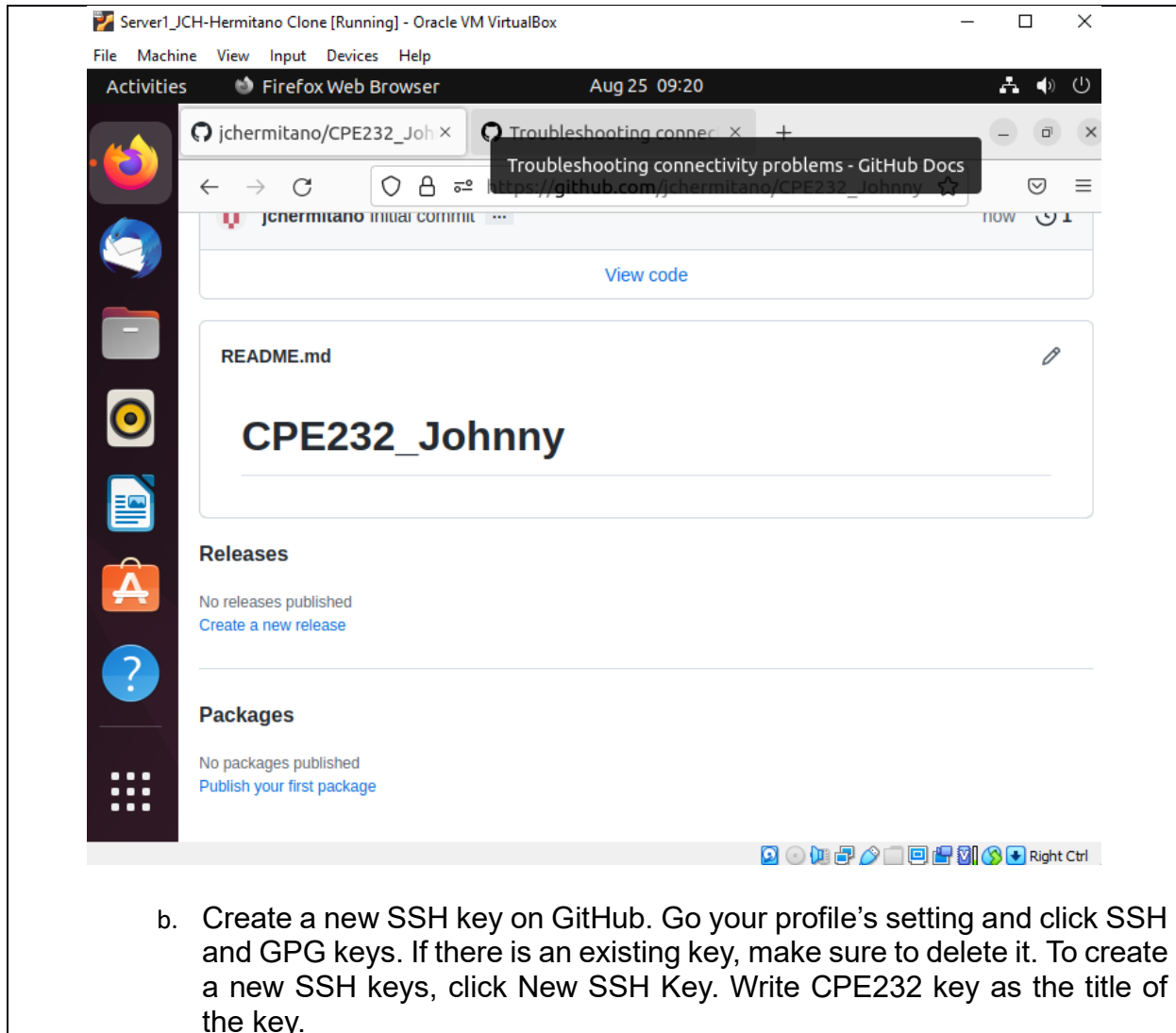
1. On the local machine, verify the version of your git using the command *which git*. If a directory of git is displayed, then you don't need to install git. Otherwise, to install git, use the following command: *sudo apt install git*

```
TIPQC@Q5202-16 MINGW64 ~/.ssh
$ which git
/mingw64/bin/git
```

2. After the installation, issue the command *which git* again. The directory of git is usually installed in this location: *user/bin/git*.
3. The version of git installed in your device is the latest. Try issuing the command *git --version* to know the version installed.
4. Using the browser in the local machine, go to www.github.com.



5. Sign up in case you don't have an account yet. Otherwise, login to your GitHub account.
 - a. Create a new repository and name it as CPE232_yourname. Check Add a README file and click Create repository.




The screenshot shows a virtual machine window titled "Server1_JCH-Hermitano Clone [Running] - Oracle VM VirtualBox". Inside the VM, a Firefox Web Browser is open, displaying the GitHub repository page for "jchermitano/CPE232_Johnny". The browser's address bar shows the URL "https://github.com/jchermitano/CPE232_Johnny". The repository page includes a "View code" button, a "README.md" file, and sections for "Releases" and "Packages". The "Releases" section states "No releases published" with a link to "Create a new release". The "Packages" section states "No packages published" with a link to "Publish your first package". A system tray at the bottom of the VM window shows various icons and the text "Right Ctrl".

b. Create a new SSH key on GitHub. Go your profile's setting and click SSH and GPG keys. If there is an existing key, make sure to delete it. To create a new SSH keys, click New SSH Key. Write CPE232 key as the title of the key.

This is a list of SSH keys associated with your account. Remove any keys that you do not recognize.

Authentication Keys

**CPE232**
SHA256:QwJHCT2R5BJJ8grqBdGSuhCdjVbEZKKI7VQBQbIa9Sk
Added on Aug 25, 2022
Never used — Read/write

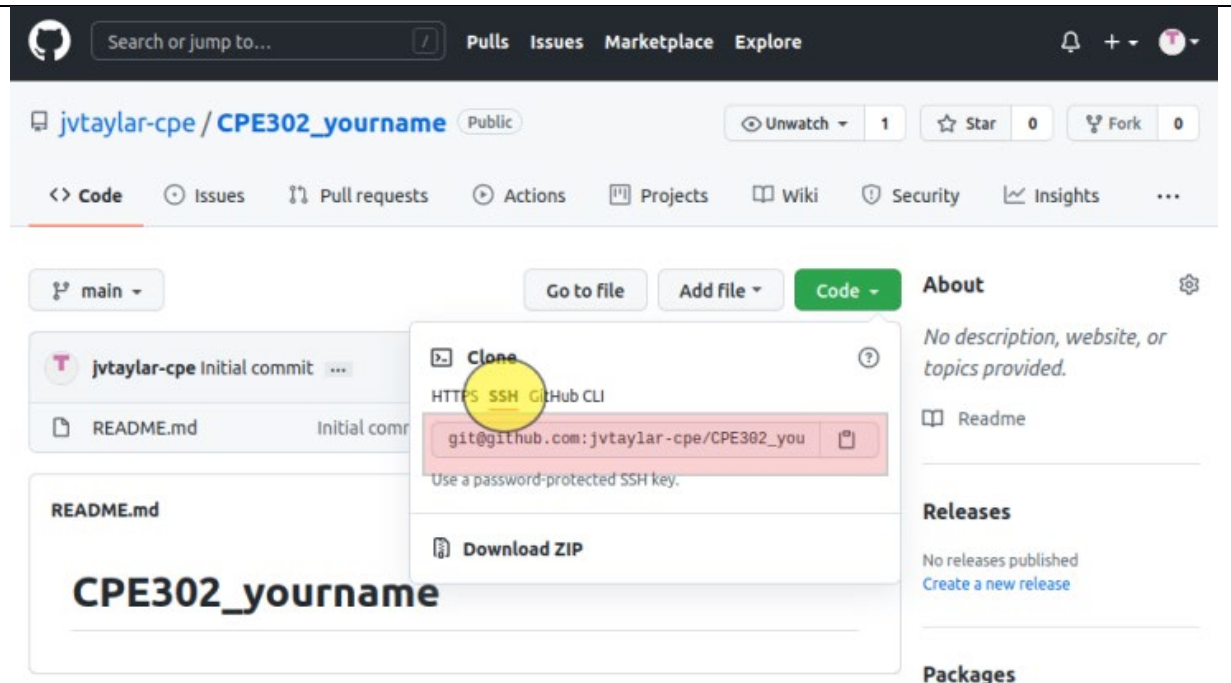
Delete

Check out our [guide to generating SSH keys](#) or [troubleshoot common SSH problems](#).

- c. On the local machine's terminal, issue the command `cat .ssh/id_rsa.pub` and copy the public key. Paste it on the GitHub key and press Add SSH key.

```
jhermitano@jhermitano-VirtualBox: ~/.ssh$ cat authorized_keys
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQGCVa0B0jAVP0y3to+0YnWSsG1/meKvjKa5PtYB/42a
RpT+22mxZuMQ9GppAXEM/EkJo1Mi6wVEPIcNRPNy6yEKBC7o13HCl0S8EcGNZ4rRU/xknbDS8ckMgVY
fIX1S6XxR3Ld3VLWSq2XsHtVIfHnk3UFCUXRtH4ZLant9aWCJWQ1HwpEj+Yowx3pGQWx6LA+ZV0sNkK
bY9RW2YwtQ+mY44f8pzZbrf0UiVXFalZR27QXz0RkRo27kMcLjhvvEIMncE5BcME4ZQN+WTlmpbXy8i
/7tzmF6M89XwUjL65RE24jXRd1/GZ+p5aKL0exFNso0AZsoYLwjprTbIj0W1/Pdvv2FXp3p9xb1F2w0
tiX47PC8L/WBAR0881AXSBSY1dDC6BTnD5aBU+74UWMXPScHsELYPNLDQVGccckIjiIJ/W1HVkYTR6
0N9+Z7TS+UqsuSwSUqZdkmpNUB48+BIU10Hg7qby0YXZqix+0FmMndv+s2ACg4rRyvC5Vhct2mQ1s=
TIPQC@Q5202-16
```

- d. Clone the repository that you created. In doing this, you need to get the link from GitHub. Browse to your repository as shown below. Click on the Code drop down menu. Select SSH and copy the link.



- e. Issue the command `git clone` followed by the copied link. For example, `git clone git@github.com:jvtaylor-cpe/CPE232_yourname.git`. When prompted to continue connecting, type yes and press enter.

```
TIPQC@Q5202-16 MINGW64 ~/hermitano (master)
$ git clone git@github.com:jchermitano/CPE232_Johnny
Cloning into 'CPE232_Johnny'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (3/3), done.
```

- f. To verify that you have cloned the GitHub repository, issue the command `ls`. Observe that you have the CPE232_yourname in the list of your directories. Use `CD` command to go to that directory and `LS` command to see the file `README.md`.

```
TIPQC@Q5202-16 MINGW64 ~/hermitano (master)
$ ls
CPE232_Johnny/  project/  sample.txt
```

- g. Use the following commands to personalize your git.
- `git config --global user.name "Your Name"`
 - `git config --global user.email yourname@email.com`
 - Verify that you have personalized the config file using the command `cat ~/.gitconfig`


```
TIPQC@Q5202-16 MINGW64 ~/hermitano (master)
$ git config --global user.name "Johnny"

TIPQC@Q5202-16 MINGW64 ~/hermitano (master)
$ git config --global user.email qjchermitano@tip.edu.ph

TIPQC@Q5202-16 MINGW64 ~/hermitano (master)
$ cat ~/.gitconfig
[user]
    name = Johnny
    email = qjchermitano@tip.edu.ph
```

- h. Edit the README.md file using nano command. Provide any information on the markdown file pertaining to the repository you created. Make sure to write out or save the file and exit.

```
MINGW64: c:/Users/TIPQC/hermitano/CPE232_Johnny
GNU nano 6.4 README.md
provide any information on the markdown file pertaining to the repository you
created.

[ Read 2 lines ]
^G Help    ^O Write Out ^W Where Is ^K Cut     ^T Execute  ^C Location
^X Exit    ^R Read File ^_ Replace  ^U Paste   ^J Justify  ^_/ Go To Line
```

- i. Use the *git status* command to display the state of the working directory and the staging area. This command shows which changes have been staged, which haven't, and which files aren't being tracked by Git. Status output does not show any information regarding the committed project history. What is the result of issuing this command?

The result is shown below. The repository I cloned is on untracked files and ready to commit.

```
TIPQC@Q5202-16 MINGW64 ~/hermitano/CPE232_Johnny (main)
$ git status
On branch main
Your branch is up to date with 'origin/main'.

Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
        modified:   README.md

no changes added to commit (use "git add" and/or "git commit -a")
```

- j. Use the command *git add README.md* to add the file into the staging area.

```
TIPQC@Q5202-16 MINGW64 ~/hermitano/CPE232_Johnny (main)
$ git add README.md
warning: in the working copy of 'README.md', LF will be replaced by CRLF the next time Git touches it
```

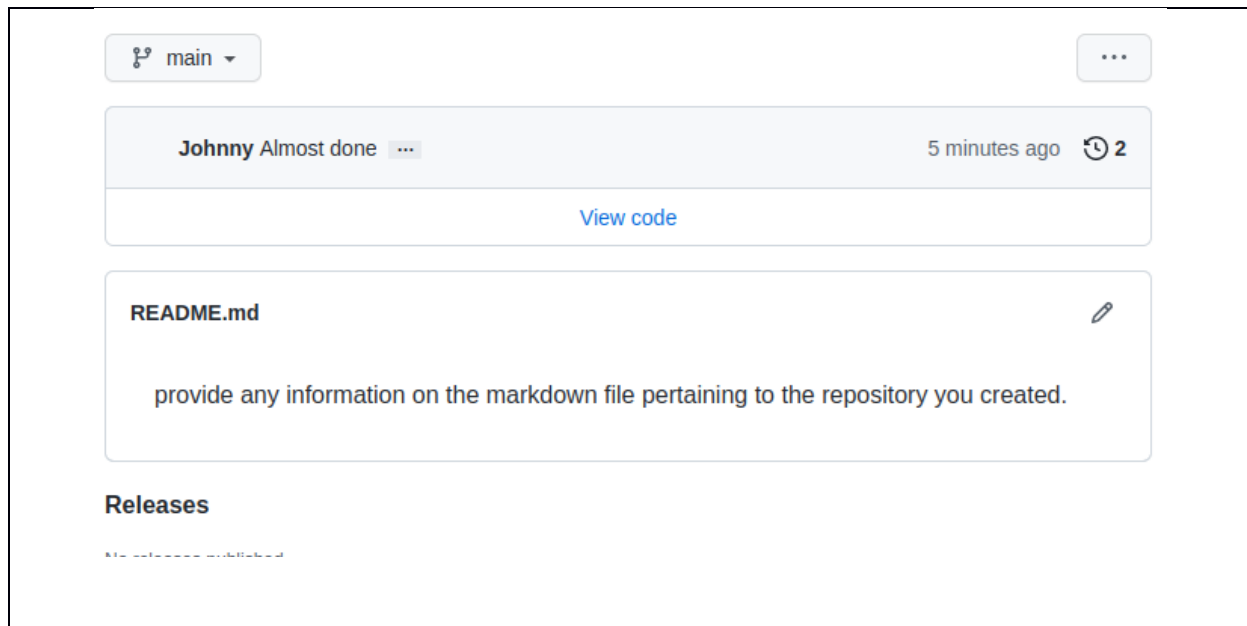
- k. Use the *git commit -m "your message"* to create a snapshot of the staged changes along the timeline of the Git projects history. The use of this command is required to select the changes that will be staged for the next commit.

```
TIPQC@Q5202-16 MINGW64 ~/hermitano/CPE232_Johnny (main)
$ git commit -m "Almost done"
[main 90504b7] Almost done
1 file changed, 2 insertions(+), 1 deletion(-)
```

- l. Use the command *git push <remote><branch>* to upload the local repository content to GitHub repository. Pushing means to transfer commits from the local repository to the remote repository. As an example, you may issue *git push origin main*.

```
TIPQC@Q5202-16 MINGW64 ~/hermitano/CPE232_Johnny (main)
$ git push origin main
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 4 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 316 bytes | 316.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To github.com:jchermitano/CPE232_Johnny
4724d26..90504b7  main -> main
```

- m. On the GitHub repository, verify that the changes have been made to README.md by refreshing the page. Describe the README.md file. You can notice the how long was the last commit. It should be some minutes ago and the message you typed on the git commit command should be there. Also, the README.md file should have been edited according to the text you wrote.



Reflections:

Answer the following:

3. What sort of things have we so far done to the remote servers using ansible commands?

We did cloning git hub repository and editing inside the repository.

4. How important is the inventory file?

Inventory is mostly used for storing, it is important because we can store our created/modified files on one place.

Conclusions/Learnings:

In this activity, I've learned creating and copying ssh keys from one machine to another. I also learned on how to use git hub and git bash at the same time. Cloning on git bash made it all easier to work on.