ECSE 2920 Outline

The first course of action we took onto this project is creating a new Git repository as a place for us to archive all documentations and pictures. Andrew clicked the "+" dropdown menu, then clicked New repository, then named it "Group-5". All group members created individual directory hierarchies using the terminal to store our workspace for all deliverables and documentations. This is done using mkdir [directory_name] to make a new directory, and cd [directory_name] to change the current directory to work on. Because we cannot have the repository owner to only submit progress for this project, the rest of us needed to have remote access to the Group-5 repository so that we can publish updates to any contained file if necessary.

We gain this access by executing this Git command:

```
$ git clone [SSH Address]
```

This way of cloning the Git repository using an SSH key is more secure than HTTPS because the data is encrypted by a key pair; a private key is handled by a group member to sign, and a public key is handled by GitHub, but kept in the group member's Git account. In order to execute the command, however, each group member needs to create an individual private SSH key on the computer.

The group member generates an SSH key by opening the terminal and running this command:

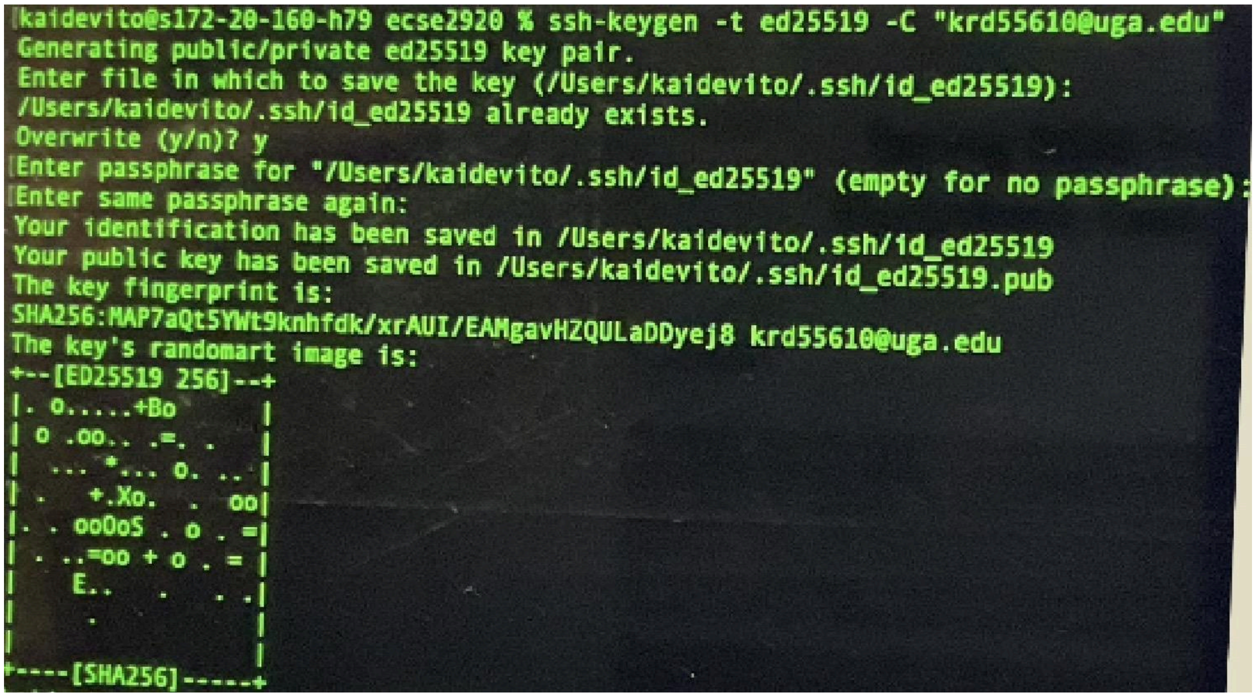
```
$ ssh-keygen -t ed25519 -C "[student_email@uga.edu]"
```

When the terminal displays the following messages, the enter key is pressed to save the key to the default file location:

```
> Generating public/private ALGORITHM key pair.
> Enter a file in which to save the key (/Users/YOU/.ssh/id_ALGORITHM): [Press enter]
```

Including the passphrase for the SSH key is optional.

```
> Enter passphrase (empty for no passphrase): [Type a passphrase]
```



```
kaidevito@s172-20-160-h79 ecse2920 % ssh-keygen -t ed25519 -C "krd55610@uga.edu"
Generating public/private ed25519 key pair.
Enter file in which to save the key (/Users/kaidevito/.ssh/id_ed25519):
/Users/kaidevito/.ssh/id_ed25519 already exists.
Overwrite (y/n)? y
Enter passphrase for "/Users/kaidevito/.ssh/id_ed25519" (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /Users/kaidevito/.ssh/id_ed25519
Your public key has been saved in /Users/kaidevito/.ssh/id_ed25519.pub
The key fingerprint is:
SHA256:MAP7aQt5YWt9knhfdk/xrAUI/EAMgavHZQULaDDyej8 krd55610@uga.edu
The key's randomart image is:
+--[ED25519 256]--+
|. o.....+Bo      |
| o .oo.. .=. .   |
|  ... *... o. .. |
| .   +.Xo.  .  oo|
|. . ooOoS . o . =|
| . ..=oo + o . = |
|    E..   .   . .|
|     .           |
|                 |
+----[SHA256]-----+
```

Figure 1. The image of the terminal showing the successfully created public SSH key.

Once the public key is saved into the .pub file, a group member copies and displays its contents like so:

```
$ pbcopy < ~/.ssh/id_ed25519.pub
$ pbpaste
```

The result from $ pbpaste is then pasted into the textbox under GitHub Profile Picture -> Settings -> SSH and GPG keys -> New SSH key.

All group members had to create a Python file that prints out our name using the print() function to then upload to our repository. Before executing the commands, we reviewed the Git Workflow and its corresponding commands to traverse each member's saves from our computers to the Git repository.

There are four areas where saves are kept: the working repository on the computer, then the staging area for organizing the files for pushing to the Git repository, then the local repository storing a copy of the Git repository, and finally the remote (Git) repository itself.

This is the sequence of Git commands we had to run:

```
$ git add . - moves saves from working repository to staging area.
$ git commit -m "message" - moves saves from staging area to local repository
$ git push - moves saves from local repository to remote (Git) repository
$ git status - verify current states of working directory and staging area
```

After every group member has access to the Github repository, the Raspberry Pi4 must be connected to the Internet

Raspberry Pi Setup and Initial Configuration

After all group members had access to the shared GitHub repository, we began setting up the Raspberry Pi 4 as the primary hardware platform for our project. The Raspberry Pi operating system was installed and configured to allow the device to function independently as a development and demonstration system. Once the system was running, we verified that the Raspberry Pi was operating correctly and ready for software setup.

During this process, we ran into difficulties connecting the Raspberry Pi directly to the UGA Wi Fi network. Because the network requires authentication methods that are not easily supported by the Raspberry Pi, the device was unable to maintain a stable wireless connection. To resolve this issue, we used an Ethernet cable to create a bridge connection between the Raspberry Pi and one of our teammate's laptops. The laptop was connected to the UGA Wi Fi network and shared its internet connection with the Raspberry Pi through the Ethernet port. This approach allowed the Raspberry Pi to reliably access the internet and continue the setup process without interruption.

Once the bridge connection was established, we were able to update the system and prepare the Raspberry Pi for development use.

Python Environment Setup on the Raspberry Pi

With reliable internet access available, we confirmed that Python was installed and functioning correctly on the Raspberry Pi. Since Python is the primary language used throughout the project, it was important to ensure that scripts could be written and executed without issues.

To keep project dependencies organized and separate from the system environment, we created a Python virtual environment on the Raspberry Pi. This allowed us to install and manage project specific libraries without affecting other software on the device.

GitHub Integration on the Raspberry Pi

After confirming that Python was working correctly, we set up Git on the Raspberry Pi so it could be used as part of our normal development workflow. The shared Group 5 repository was cloned onto the Raspberry Pi, which allowed files stored on GitHub to be accessed and run directly on the device.

To verify that this integration was working as expected, we ran the Hello_WorldPI.py file from the repository on the Raspberry Pi. Successfully executing this file confirmed that code pulled from GitHub could be run on the hardware without modification.