|  |  |
| --- | --- |
| **LECTURER** | John ORaw |
| **STUDENT NAME** | Edmund Connolly |
| **STUDENT NUMBER** | L00194727 |
| **PROGRAMME** | MSc Cloud |
| **MODULE CODE** | IaC |
| **ASSIGNMENT TITLE** | Week 4 Laboratory Report |
| **SUBMISSION DATE** | 19/10/2025 |

Student Declaration

1. I have accurately identified and included the sources of all facts, ideas, opinions, and viewpoints from others in the assignment references. All direct quotations, paraphrasing, and discussions of ideas from books, journal articles, internet sources, course materials, or any other sources used are properly acknowledged and cited in the assignment references.
2. I have not used unauthorised artificial intelligence tools or aids.
3. I understand and am compliant with ATU's policy and procedures regarding Academic Integrity and I am aware of the consequences of any violations.
4. I have followed the referencing guidelines recommended in the assignment instructions and / or programme documentation.
5. By signing this form or by submitting material online I confirm that this assignment, or any part of it, has not been previously submitted by me or any other person for assessment on this or any other programme of study.
6. By signing this form or by submitting material for assessment online I confirm that I have read and understood [AQAE022 Academic Integrity Policy](https://atlantictu.sharepoint.com/sites/PoliciesProcedures/AQAE%20Student%20Documents/Forms/AllItems.aspx?id=%2Fsites%2FPoliciesProcedures%2FAQAE+Student+Documents%2FAQAE022+Academic+Integrity+Policy.pdf&parent=%2Fsites%2FPoliciesProcedures%2FAQAE+Student+Documents)

|  |  |
| --- | --- |
| **Student Signature** | **Date** |
|  |  |

Contents

[Table of figures 2](#_Toc211794744)

[Description 3](#_Toc211794745)

[Aims 3](#_Toc211794746)

[Method 3](#_Toc211794747)

[Install Python on host machine 3](#_Toc211794748)

[Install Git host machine 4](#_Toc211794749)

[Install GitHub on host machine 4](#_Toc211794750)

[Install Notepad++ on host machine 4](#_Toc211794751)

[Install Visual Studio Code on host machine 5](#_Toc211794752)

[Install Putty on host machine 5](#_Toc211794753)

[Install WinSCP on host machine 5](#_Toc211794754)

[Install Python on Ubuntu virtual machine 6](#_Toc211794755)

[Install OpenSSH on Ubuntu virtual machine 6](#_Toc211794756)

[Install Git and GitHub on Ubuntu virtual machine 7](#_Toc211794757)

[Install Visual Studio Code on Ubuntu virtual machine 7](#_Toc211794758)

[Connecting using SSH via Putty to Ubuntu virtual machine 7](#_Toc211794759)

[Connecting via WinSCP to Ubuntu virtual machine 7](#_Toc211794760)

[Results and Testing 8](#_Toc211794761)

[Conclusions 10](#_Toc211794762)

[References 10](#_Toc211794763)

[Appendices 11](#_Toc211794764)

# Table of figures

[Figure 1 - Remote Desktop Connection to Ubuntu Virtual Machine 6](#_Toc211794726)

[Figure 2 – Connecting via Putty 8](#_Toc211794727)

[Figure 3- Connecting via WinSCP 8](#_Toc211794728)

[Figure 4 - Testing Python on host machine 11](#_Toc211794729)

[Figure 5- GitHub Desktop on Windows 12](#_Toc211794730)

[Figure 6- Verifying GitHub Desktop in Linux 12](#_Toc211794731)

[Figure 7 - Notepad++ Screenshot verifying it runs 13](#_Toc211794732)

[Figure 8 - Visual Studio Code on Windows Host Machine 13](#_Toc211794733)

[Figure 9 - Putty Configuration Window 14](#_Toc211794734)

[Figure 10 - Putty Terminal Screenshot 15](#_Toc211794735)

[Figure 11 - Testing Git was installed successfully 15](#_Toc211794736)

[Figure 12 - Testing Installed Git Version 16](#_Toc211794737)

[Figure 13 - WinSCP Commander Interface 16](#_Toc211794738)

[Figure 14 - Python Console 17](#_Toc211794739)

[Figure 15 - OpenSSH Server Status 17](#_Toc211794740)

[Figure 16 - Checking the installed Git Version on Virtual Machine 18](#_Toc211794741)

[Figure 17 - Executing GitHub Desktop on Virtual Machine 18](#_Toc211794742)

[Figure 18 - Verifying Visual Studio Code runs on Ubuntu Virtual Machine 19](#_Toc211794743)

# Description

To connect to virtual machines in a data centre requires we have a virtual machine setup up with software installed. In this technical report we describe the setup and configuration tasks to create a windows virtual machine to be used as a jump server. We install and setup the following software and tools Python, Git and Github desktop, Notepad++, Visual Studio Code, Putty and WinSCP on a windows host machine. We also perform virtual machine cloning of a gold ubuntu image, and install and setup Python, OpenSSH server, Git and GitHub desktop and Visual Studio Code .

# Aims

The primary aims of this work is to install software and setup software on the host machine and create a virtual machine which will have the basic minimum necessary software installed and setup to be used as a “jump” server.

This will require the installation, setup and testing of the following on a windows host computer:

1. Install and setup the currently latest version of python
2. Install and setup Git and Github
3. Install Notepad++
4. Instal Visual Studio Code
5. Install Putty and WinSCP

It will also require the installation, setup and testing of the following on a Ubuntu virtual machine:

1. Clone an ubuntu gold image
2. Python
3. OpenSSH Server
4. Git and GitHub desktop
5. Visual Studio Code

# Method

In this section of the report steps will be shown in sequence to repeat the work

To setup the windows host machine the following were done

## Install Python on host machine

To install python on the windows host machine.

1. Download the python install manager from the python website [1].
2. Run the installer.
3. Select Yes to add python to the windows path

## Install Git host machine

To install Git go to git download for window page [2], click button for the standalone installer “Git for Windows/x64 setup”

Open the installer, agree to the license by choosing install

Keep the defaults when choosing which components should be installed.

Select Use Visual Studio Code as Gits default editor

For adjusting the name of the initial branch in new repositories choose let get decide

For adjusting your PATH environment, select Git from the command line and also 3rd party software

For choosing the SSH executable, use bundled OpenSSH

Choosing HTTPs transport backend, use the OpenSSL library

For Configuring the line ending conversions, select Checkout Windows-style, commit Unix-style line endings

For Configuring the terminal emulator to use with Git Bash select Use MinTTY

For default behaviour of “git pull” choose fast-forward or merge

Choose a credential helper select use Git Credential Manager

Choose Enable file system caching for Configuring extra options

Then choose Install

## Install GitHub on host machine

To install Github Desktop go to the github desktop downloads webpage [3] click the Download for Windows 64 bit button.

Run the installer

Select sign-in to github.com,

then choose authorise GitHub Desktop access to GitHub account

then for configure git keep defaults of use my GitHub account name and email address then select finish

## Install Notepad++ on host machine

To install Notepad++, go to the Notepad++ downloads page [2].

Download and run the latest version’s installer, which currently is version 8.8.6. Select yes, and agree to terms and conditions.

## Install Visual Studio Code on host machine

To install visual studio code on windows go to the visual studio code downloads page [3] and download the windows installer.

Then run the installer and accept the licensce agreement

In the installer for select additional tasks keep the defaults, select next then click install.

## Install Putty on host machine

To download putty go to the putty website [4] and select download putty this will bring you to the downloads webpage [5]. Select the appropriate windows installer I choose 64-bit x86. Run the installer, first choose where the files will be installed and then press next. For product features keep the defaults and select install

## Install WinSCP on host machine

To install WinSCP go to the winscp downloads page [6]. Click on the download winscp 6.5.4 green button. WinSCP will start downloading automatically, after downloading choose to install.

First choose to install for all users which is the recommended install mode.

Accept the licence agreement, and choose the recommended typical installation.

Choose commander interface style

To check RDP not via VMWare Workstation

1. We got ubuntu virtual machines ip address using ip addr show, it was assigned 192.168.125.135/24
2. To enable RDP in ubuntu we must install xrdp, this is done by:

sudo apt update

sudo apt install xrdp -y

1. Then we must enable and start xrdp

Sudo systemctl enable xrdp

Sudo systemctl start xrdp

1. GNOME on Wayland doesn’t work well with xRDP so we must from xRDP to Xorg with a compatabile desktop. This is done by uncommenting the WaylandEnable=false in the file /etc/gdm3/custom.conf then we enable and restart xrdp  
   sudo systemctl enable xrdp

sudo systemctl restart xrdp

1. Open Remote Desktop Connection, choose Xorg, enter the username and password for the Virtual Machine and click connect, a remote desktop window will open showing ubuntu.

A computer screen shot of a mouse

AI-generated content may be incorrect.

Figure 1 - Remote Desktop Connection to Ubuntu Virtual Machine

## Install Python on Ubuntu virtual machine

To install python on the ubuntu virtual machine we used the APT installer, the following operations were done:

1. First, we updated the list of available packages using
   * sudo apt update
2. Then we executed the upgrade command using the following:
   * sudo apt upgrade
3. Then we instructed ubuntu to install python version 3.11 which is currently the latest version.
   * sudo apt install python3.11

## Install OpenSSH on Ubuntu virtual machine

To install OpenSSH

1. in the terminal enter sudo apt install openssh-server
2. To test the openssh we used the command sudo systemctl status ssh

## Install Git and GitHub on Ubuntu virtual machine

To install git on a Debian based machine such as Ubuntu we use the following command

* + Sudo apt-get install git-all , this was found on the git website [1]

To install github

I used the APT package feed @mwt by using the following command.

wget -qO - https://mirror.mwt.me/shiftkey-desktop/gpgkey | gpg --dearmor | sudo tee /usr/share/keyrings/mwt-desktop.gpg > /dev/null

sudo sh -c 'echo "deb [arch=amd64 signed-by=/usr/share/keyrings/mwt-desktop.gpg] https://mirror.mwt.me/shiftkey-desktop/deb/ any main" > /etc/apt/sources.list.d/mwt-desktop.list'

After configuring the APT package feed I ran the following command to install the github desktop application

sudo apt update && sudo apt install github-desktop

## Install Visual Studio Code on Ubuntu virtual machine

To install visual studio code, I went to visual studio code website [2] and downloaded the latest version of visual studio code for ubuntu/Debian version. In the terminal I then navigated to where this file was stored and used the command the following command where <file> is the downloaded file’s name.

sudo apt install ./<file>.deb

## Connecting using SSH via Putty to Ubuntu virtual machine

To connect via Putty to the Ubuntu virtual machine.

We open putty, enter the Ip Address, keep the defaults connection type of SSH and port 22 then click open. Then a console window will open asking for the username and password

## Connecting via WinSCP to Ubuntu virtual machine

To connect to Ubuntu virtual machine via WinSCP.

Open WinScp, a window will open enter the IP address, username and password keep all of the other defaults.

A screen shot of a computer

AI-generated content may be incorrect.

Figure 2 – Connecting via Putty

Connecting via WinSCP

A screenshot of a computer

AI-generated content may be incorrect.

Figure 3- Connecting via WinSCP

# Results and Testing

To verify Python was installed successfully we entered the python3 console and executed a print command to ensure currently installed version of python works on the virtual machine, see figure 4.

To verify Git was installed we did a basic check to see what version was installed, see appendix figure 11, we can see the git window opens and shows a shell prompt.

To verify that GitHub desktop was installed successfully and is correctly connected to the users GitHub account, GitHub Desktop was opened, and we can see GitHub Desktop lists the repositories in the connected users GitHub Account. The results can be seen in figure 5 and figure 6.

To verify that Notepad++ is installed and can be executed, Notepad++ was run and a text file was opened, the result can be seen in figure 7.

To verify visual studio code was installed correctly on the windows host machine a screenshot of it running is included in figure 8.

To verify Putty was installed and operates correctly we can see in the figure 9 the Putty Configuration window that is displayed when running Putty. In figure 10 we can see Putty has connected

In figure 12, we can see that a connection is successfully made from the host to ubuntu virtual machine.

In figure 13 in the appendix, we can see WinSCP correctly connected from the host windows machine to the Ubuntu virtual machine. We can see host machine files on the left and on the right files from the Ubuntu virtual machine.

The results of installing python on the ubuntu virtual machine can be seen in the appendix, figure 14. Here we open the python console and get it to print a message which is successful and then we exit the python console.

The results of installing OpenSSH Server are shown in the appendix as figure 15.

We can see that OpenSSH is “active (running)”: This status indicates that the Ubuntu SSH service is currently running. We also can see its enabled “preset: enabled”: Look at the “Loaded” line and search for the entry “preset: enabled.” It indicates that SSH will be available at every system restart.

To verify that git is installed correctly, the version was checked in the terminal, and we cloned the IaC repository from GitHub the result can be seen in the appendix labelled as figure 16.

GitHub desktop was shown to be installed and setup correctly on the virtual machine as it runs and we can see the repositories associated with the users account, the result can be seen in the appendix as figure 17

To verify visual studio code is installed correctly we ran the program, the result showing Visual Studio Code working can be seen in figure 18 in the appendix.

# Conclusions

Most marks, set out with aims these are the results I got, I achieved/didn’t achieve my aims. Level 9 show me a bit of background reading. Look at what a snapshot/clone etc give reference

We successfully installed and configured all the required software necessary for the host machine and ubuntu virtual server. We now have a basic “jump server” which has the necessary tools and software installed. In the results section we verified that all the software was installed correctly and executes.

We installed python which is a versatile scripting programming language, We installed git and github for version control and syncing of local and remote git repositories. Notepad++ is a text editor which can be used to convert windows text file encodings to linux text file encodings and vice versa. We also installed Visual Studio Code, which is a code editor that will allow us to write scripts and programmes and also execute them in a built in terminal. WinSCP stands for Windows Secure Copy it’s a free and open-source tool for secure file transfer between a Windows computer and a Linux computer. OpenSSH Server stands for Open Secure Shell it is a secure networking service that connets to systems remotely using the Secure Shell (SSH) protocol.

The Remote Desktop Protocol, Secure Shell Server and WinSCP was also found to allow communication between the host and the VM. Github is now synced locally and remotely. We can now transfer files between these machines and use Git and Github for version control.

This assignment improved my understanding of environment configuration, remote management, and version control integration. For future work, we now have a host machine and ubuntu virtual machine which can be used and expanded on for further work.

# References

|  |  |
| --- | --- |
| [1] | [Online]. Available: https://www.python.org/downloads/. |
| [2] | [Online]. Available: https://git-scm.com/downloads/win. |
| [3] | [Online]. Available: https://desktop.github.com/download/. |
| [4] | [Online]. Available: https://notepad-plus-plus.org/downloads/. |
| [5] | [Online]. Available: https://code.visualstudio.com/download. |
| [6] | [Online]. Available: https://putty.org/index.html. |
| [7] | [Online]. Available: https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html. |
| [8] | [Online]. Available: https://winscp.net/eng/download.php. |
| [9] | [Online]. Available: https://git-scm.com/book/en/v2/Getting-Started-Installing-Git. |
| [10] | [Online]. Available: https://code.visualstudio.com/download. |

# Appendices

A screenshot of a computer

AI-generated content may be incorrect.

Figure 4 - Testing Python on host machine

A screenshot of a computer

AI-generated content may be incorrect.

Figure 5- GitHub Desktop on Windows

A screenshot of a computer

AI-generated content may be incorrect.

Figure 6- Verifying GitHub Desktop in Linux

A screenshot of a computer

AI-generated content may be incorrect.

Figure 7 - Notepad++ Screenshot verifying it runs

A screenshot of a computer program

AI-generated content may be incorrect.

Figure 8 - Visual Studio Code on Windows Host Machine

A screenshot of a computer

AI-generated content may be incorrect.

Figure 9 - Putty Configuration Window

A screenshot of a computer program

AI-generated content may be incorrect.

Figure 10 - Putty Terminal Screenshot

A screenshot of a computer

AI-generated content may be incorrect.

Figure 11 - Testing Git was installed successfully

A screenshot of a computer

AI-generated content may be incorrect.

Figure 12 - Testing Installed Git Version

A screenshot of a computer

AI-generated content may be incorrect.

Figure 13 - WinSCP Commander Interface

A screenshot of a computer

AI-generated content may be incorrect.

Figure 14 - Python Console

A screenshot of a computer

AI-generated content may be incorrect.

Figure 15 - OpenSSH Server Status

A screenshot of a computer

AI-generated content may be incorrect.

Figure 16 - Checking the installed Git Version on Virtual Machine

A screenshot of a computer

AI-generated content may be incorrect.

Figure 17 - Executing GitHub Desktop on Virtual Machine

A screenshot of a computer

AI-generated content may be incorrect.

Figure 18 - Verifying Visual Studio Code runs on Ubuntu Virtual Machine