Proposal on Remote Linux Environment

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Contents

The goal of this document is to discover and evaluate methods to set up a remote Linux a machine to bypass the problem that the school laptop won't be able to run VMware® Workstation 16 Pro.

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1 Environment

OS Windows 11 Pro N for Workstations

```
Edition         Windows 11 Pro N for Workstations
Version         21H2
Installed on    7/12/2022
OS build        22000.856
Experience      Windows Feature Experience Pack 1000.22000.856.0
```

In addition, this system has hyper-v and WSL2 enabled.

VMware VMware® Workstation 16 Pro 16.2.4 build-20089737

Ubuntu Ubuntu 22.04.3 LTS (Jammy Jellyfish) `https://releases.ubuntu.com/22.04.1/ubuntu-22.04.1-desktop-amd64.iso`

TigerVNC TigerVNC Viewer v1.12.0 (Built on: 2011-11-10 03:56) `https://sourceforge.net/projects/tigervnc/files/stable/1.12.0/vncviewer64-1.12.0.exe/download`

Win32 SSH OpenSSH For Windows 8.1p1, LibreSSL 3.0.2

Docker Desktop Docker 4.12.0 (85629) `https://www.docker.com/products/docker-desktop/`

2 VMware® Workstation 16 Pro

2.1 Setup

The normal setup of VMware® Workstation 16 Pro on Windows 11 would be sufficient. There is nothing special except a cracked key + enhanced keyboard driver. Everything else is just kept default. The exact steps are in the CyberPatriot slide today. Following all those screenshots, sorting by create time.

2.2 Install Ubuntu

Ubuntu is installed on VMware® Workstation 16 Pro. The username is `cs` and the password is `123456`.

2.3 SSH

The following command is executed to establish an SSH server on Ubuntu:

```
sudo visudo # add NOPASSWD: ALL
sudo apt install openssh-server vim # install SSH server and VIM
sudo passwd root # set root password
sudo vim /etc/ssh/sshd_config # allow root login
sudo systemctl restart sshd # restart SSH server
```

```
sudo systemctl status sshd # check SSH server status
ip -4 -c addr show # get IP address
```

which is then connected to windows by OpenSSH For Windows 8.1p1, LibreSSL 3.0.2.

```
PS C:\Users\Cao20> ssh root@192.168.142.128
root@192.168.142.128's password: # password is 123456
root@cs-virtual-machine:~#
```

2.4 VNC

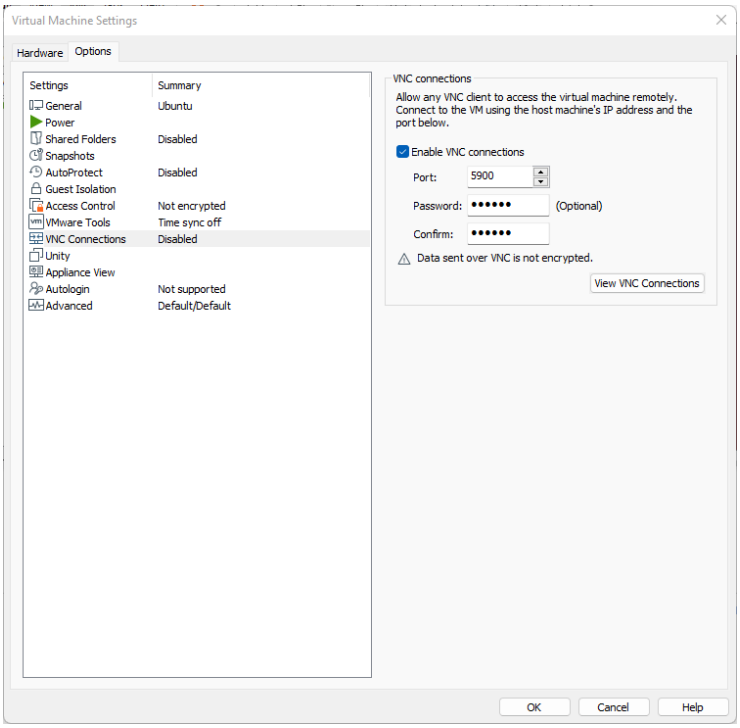
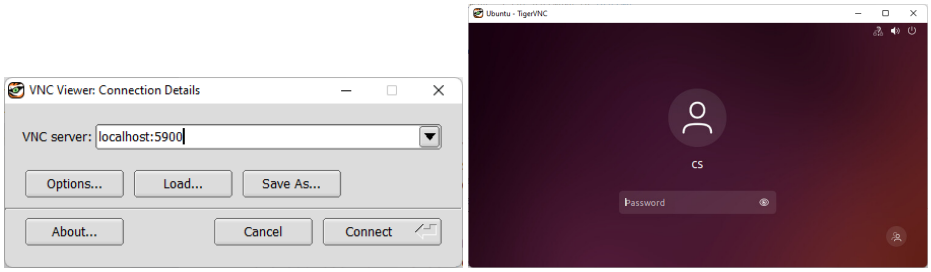


Figure 1: VMware® Workstation 16 Pro VNC settings

Click on the toolbar, VM » Settings » Options » VNC Connections » Enable VNC connections as shown in Figure 1. As always, I set the password to `123456`. In addition, VMware® Workstation 16 Pro provided an entry to set the VNC server's port into something other than 5900, which simply allows us to run multiple VNC servers on the same machine.

After that, open TigerVNC Viewer and connect to VMware® Workstation 16 Pro. Type the `localhost:5900` as the address for the VNC server; then connect and type `123456`, as shown in Figure 2.



(a) VNC settings (b) Connected

Figure 2: VNC viewer with VMware® Workstation 16 Pro

2.5 Limitations

- VMware® Workstation 16 Pro is not free. However, VMware®Player, as Anish already demonstrated, simply does not work.
- `vctl` need to be studied to quickly deploy multiple VMs. Potentially, one might consider just setting up 1 VM and preventing club members from root privilege.

3 Docker

I acknowledge I lack knowledge about docker. I will try my best to setup docker container on Windows 11 Pro N for Workstations, however, I can't guarantee the failure of the following test should be considered inconclusive.

3.1 Setup

Just install Docker and click Next. I didn't change any settings. Since I have WSL enabled, as mentioned in , docker is automatically installed on WSL2.

3.2 Image

The following command are used to pull the Ubuntu image and run it:

```
docker pull ubuntu:latest # pull the latest ubuntu image
docker images # list all images
docker run -it --name cs -p 65535:22 ubuntu:latest # run the image
```

Listing 1: Pull and run the image

`-it` interactive terminal

`--name` name the container

`-p` port forwarding. by default, nothing is forwarded; 65535 is the the port on the host machine, 22 is the port on the container, from `https://docs.docker.com/config/containers/container-networking/`.

3.3 SSH

After that, the Ubuntu container is running. The following command is used to set up the SSH server. Notice the root account is enabled by default, hence, `visudo` and enable root account procedures can be skipped, unlike in section 2.

```
apt update # update the package list
apt install openssh-server vim # install SSH server and VIM
vim /etc/ssh/sshd_config # allow root login
passwd root # set root password
service ssh start # start SSH server. systemctl is not available
```

After setting up the SSH server, the following command is used to connect to the container:

```
PS C:\Users\Cao20> ssh root@localhost -p 65535
root@localhost's password: # password is 123456
root@263cca94f3b3:~#
```

Obviously, by changing the port number, one can connect to multiple containers.

3.4 VNC

3.4.1 Gnome (Failed)

First, run the following command is used to install the VNC server:

```
apt install gnome-session gnome-terminal gnome-core
apt install vnc4server
```

This first attempt, failed because the complexity of gnome desktop environment turns the docker image into read only file system, for which I can't find a solution. After stop the container and restart it, docker refuse to launch it and claims the disk is damaged, from user forum.

3.4.2 LXDE

Thence, an alternative solution exists from this github project, docker-ubuntu-vnc-desktop. *Notice this is not Ubuntu 22.04.3 LTS (Jammy Jellyfish), but Ubuntu 20.04.*

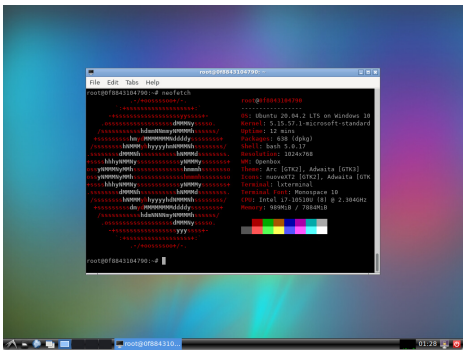


Figure 3: Connected

```
docker pull dorowu/ubuntu-desktop-lxde-vnc
docker run -p 6080:80 -p 5900:5900 --name cs dorowu/ubuntu-desktop-lxde-vnc
```

After that, use the same configuration as Figure 2 to connect to the container. The result looks like Figure 3.

3.5 Note

- Every time the command in Listing 1 is executed, a *new* the container is created. To enter old containers, use `docker start -i cs`. If just want to start `ssh` server, use `docker start cs`. If want to enter the container, while it is already running, use `docker exec -it cs bash`.
- To list containers, execute `docker container ls --all`
- To remove a container, execute `docker container rm [container_name/container_id]`

I suspect the necessity, as well as feasibility of installing Gnome to fully emulate a desktop environment that would like the one that would meet in the competition, it takes half an hour to download 2.144 GB of data. Without it, a huge amount of time would be saved.

4 Conclusion

VMware® Workstation 16 Pro is capable of remote Linux environments. It is easy to set up and use. Docker, despite the steeper learning curve, is also capable of remote Linux environments and takes far fewer resources.

More test under school WIFI is necessary to determine feasibility. The same procedure in section 2 and section 3 will be repeated, however, the client will be a school computer or personal laptop that is connected to `GCPS-Mobile`. In addition, `ssh` client under different platforms like Windows, Mac, and Linux

will be tested. Additionally, we plan to explore the possibility to host multiple VMs/containers on a single machine while letting multiple users connect to them.

Techniques to prevent users from obtaining root privileges will be explored, e.g., `chroot`, `sudo`, and `su`. One might also consider just don't give them root privileges at all.