KENTECH
Korea Institute of Energy Technology

Visionary Course – Energy AI
Week 04

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Week 04b – Getting Started with AI on Jetson Nano

Basic Development Environments for CS Engineering

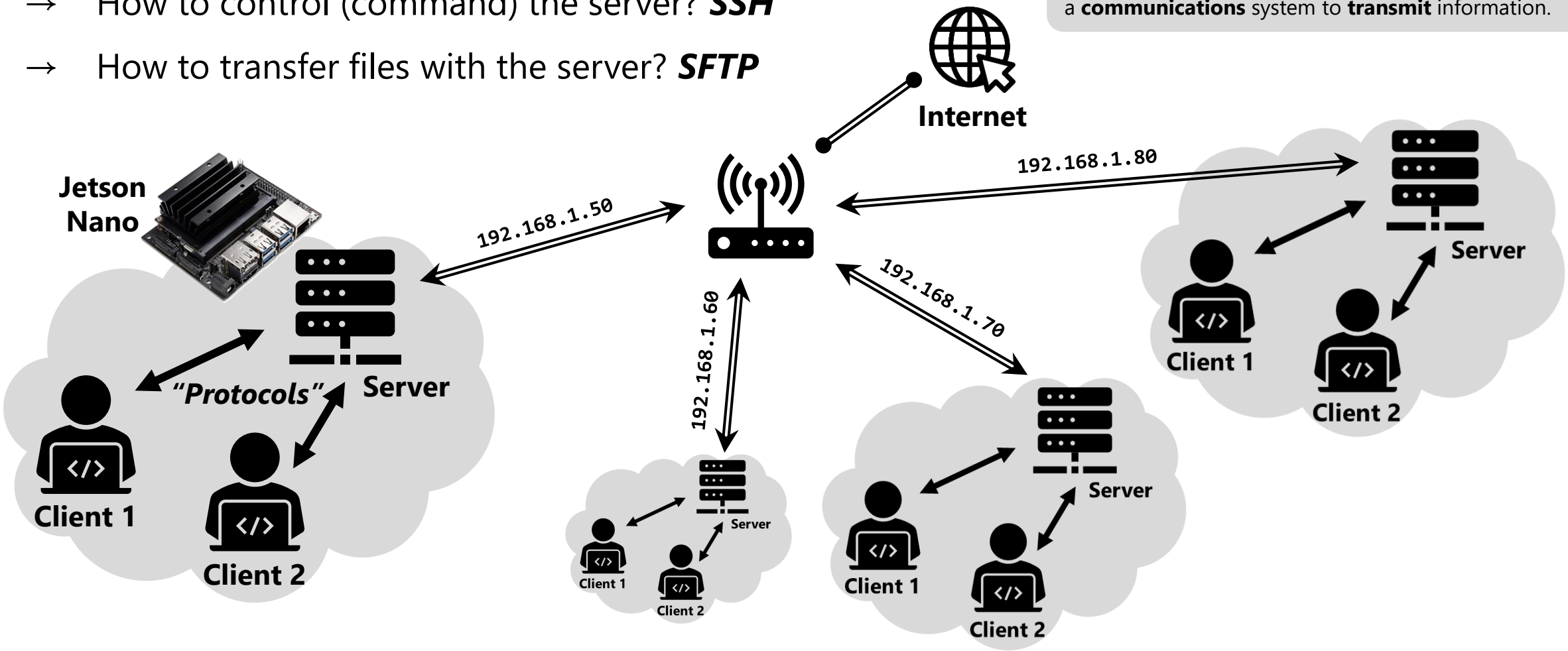
How to communicate remotely with a server?

→ How to control (command) the server? ***SSH***

→ How to transfer files with the server? ***SFTP***

Protocol?

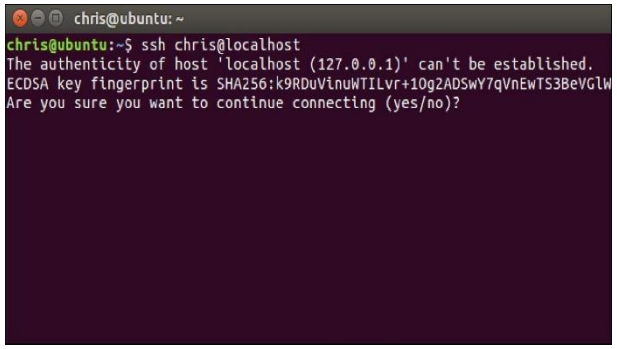
→ A system of **rules** that allows two or more entities of a **communications** system to **transmit** information.

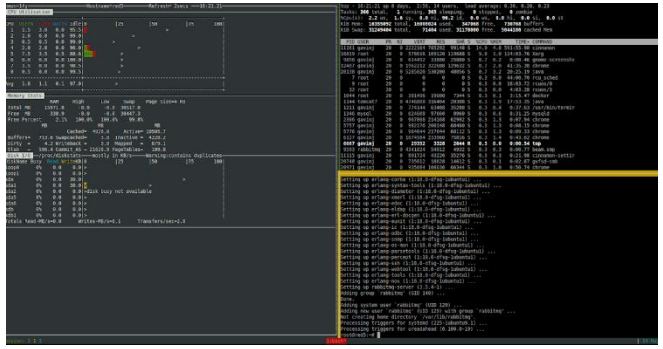


SSH & SFTP

SSH: Secure Shell Protocol

→ A cryptographic network protocol for operating network services securely over an unsecured network.





SFTP: Secure File Transfer Protocol

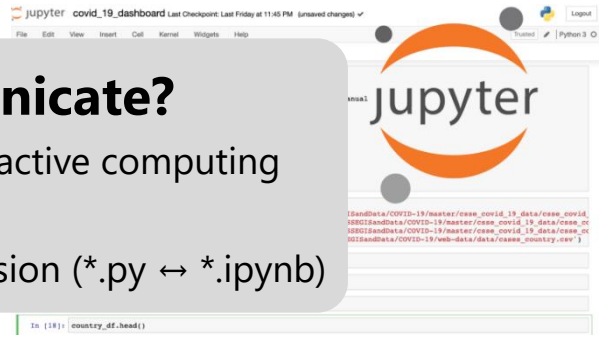
→ A network protocol that provides file access, transfer, and management over any reliable data stream.

Any other ways to communicate?

→ **IPython** or **Jupyter**: web-based interactive computing

→ Pros: easy to use, simple navigation

→ Cons: not stable, only Python, conversion (*.py ↔ *.ipynb)

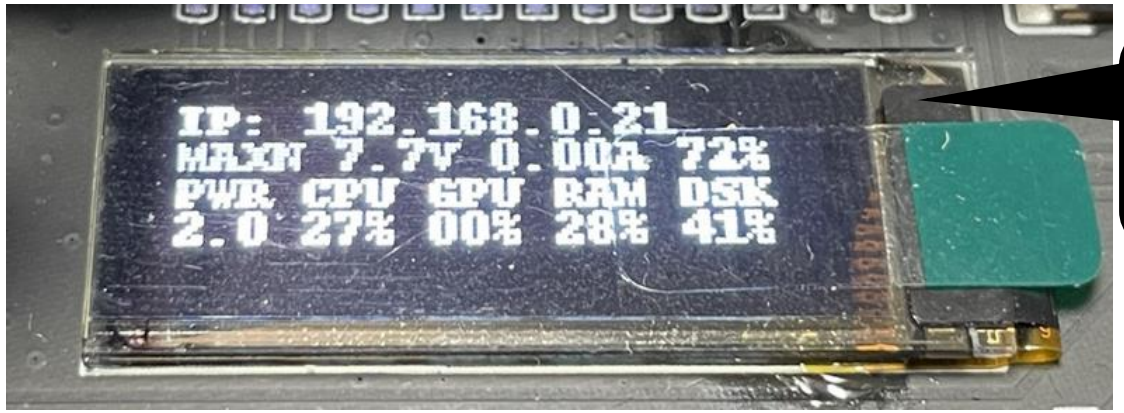


Last Class, We Assembled the Board

+ How to connect WiFi:

→ Connect display via HDMI → SSID: **`VC_AI`**, PW: **`kentech12345`**

→ You can check the IP address in your board.




```
IP: 192.168.***.***
Battery: 7.7 V (72 %)
CPU/GPU/RAM/DSK usage
```

*Batteries will be distributed for the JetRacer Project.

*Charge cut-off voltage **4.2V**, discharge cut-off voltage is **3.0V**.

→ For teams who didn't/can't connect WiFi, please get helps from TA.

Today, We Explore the Linux Server

+ Jupyter Notebook

→ Web-based terminal & code editor.

→ How to connect?

→ Open a new browser tab and navigate to `http://192.168.***.***:8888`

IP address

Port number for Jupyter

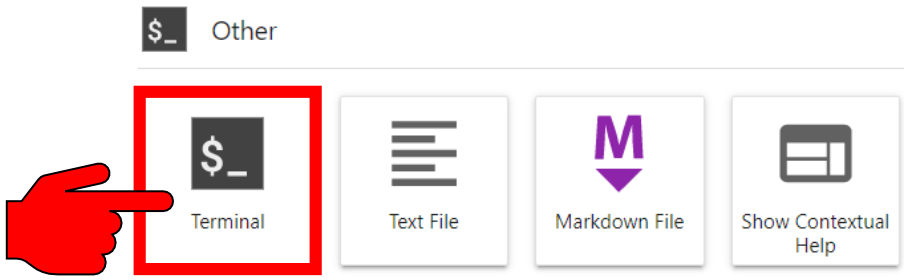
Passwd: **jetson**

+ Open Terminal, and please try some basic Linux commands

→ Example of basic Linux commands:

→ https://view.kentech.ac.kr/lecture/2022s/supp/ref01

→ https://www.youtube.com/watch?v=-BQtLkZMXnA



Directory Operations	
pwd	Show current directory
mkdir *dir*	Make directory *dir*
cd *dir*	Change directory to *dir*
cd ..	Go up a directory
ls	List files

Examples of Linux Commands

https://view.kentech.ac.kr/lecture/2022s/supp/ref01

https://www.youtube.com/watch?v=-BQtLkZMXnA

jetson@jetson-desktop: ~

```
jetson@jetson-desktop:~$ pwd
/home/jetson
jetson@jetson-desktop:~$ ls
Desktop    examples.desktop  jetracer                      Pictures   TF-models                                torchvision
Documents  jetcam            jupyter_clickable_image_widget Public     torch-1.6.0-cp36-cp36m-linux_aarch64.whl Videos
Downloads  jetcard           Music                         Templates  torch2trt                                ws
jetson@jetson-desktop:~$ python -V
Python 2.7.17
jetson@jetson-desktop:~$ python3 -V
Python 3.6.9
jetson@jetson-desktop:~$ ll
total 262928
drwxr-xr-x 30 jetson jetson      4096 3月  27 17:44 ./
drwxr-xr-x  3 root   root        4096 3月   9  2021 ../
-rw-------  1 jetson jetson      8973 3月  27 18:48 .bash_history
-rw-r--r--  1 jetson jetson       220 3月   9  2021 .bash_logout
-rw-r--r--  1 jetson jetson      3771 3月   9  2021 .bashrc
drwx------ 14 jetson jetson      4096 3月  11  2021 .cache/
drwx------  3 jetson jetson      4096 3月  10  2021 .compiz/
drwx------ 16 jetson jetson      4096 3月  11  2021 .config/
drwxr-xr-x  2 jetson jetson      4096 3月   9  2021 Desktop/
drwxr-xr-x  2 jetson jetson      4096 3月   9  2021 Documents/
drwxr-xr-x  2 jetson jetson      4096 3月   9  2021 Downloads/
```

```
$ pwd
$ ls
$ python -V
$ python3 -V
```

```
jetson@jetson-desktop:~$ sudo adduser slee
[sudo] password for jetson:
Adding user `slee' ...
Adding new group `slee' (1002) ...
Adding new user `slee' (1001) with group `slee' ...
Creating home directory `/home/slee' ...
Copying files from `/etc/skel' ...
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
Changing the user information for slee
Enter the new value, or press ENTER for the default
        Full Name []:
        Room Number []:
        Work Phone []:
        Home Phone []:
        Other []:
Is the information correct? [Y/n]
Adding new user `slee' to extra groups ...
Adding user `slee' to group `audio' ...
Adding user `slee' to group `gdm' ...
Adding user `slee' to group `gpio' ...
Adding user `slee' to group `i2c' ...
Adding user `slee' to group `lightdm' ...
Adding user `slee' to group `video' ...
Adding user `slee' to group `weston-launch' ...
jetson@jetson-desktop:~$ sudo usermod -aG sudo slee
jetson@jetson-desktop:~$
```

User ID: “Your-Student-ID”
Passwd: “Your-Student-ID”

jetson@jetson-desktop: ~

```
jetson@jetson-desktop:~$ ifconfig
eth0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 48:b0:2d:5b:c1:d1  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device interrupt 150  base 0xe000

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1  (Local Loopback)
        RX packets 1137  bytes 183842 (183.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1137  bytes 183842 (183.8 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

rndis0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet6 fe80::f402:a6ff:fe86:e36d  prefixlen 64  scopeid 0x20<link>
        ether f6:02:a6:86:e3:6d  txqueuelen 1000  (Ethernet)
        RX packets 17806  bytes 1048774 (1.0 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 28535  bytes 43428645 (43.4 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

usb0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether f6:02:a6:86:e3:6f  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.0.21  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::1e95:b92e:ee1:fc21  prefixlen 64  scopeid 0x20<link>
        ether e8:84:a5:f5:e7:a4  txqueuelen 1000  (Ethernet)
        RX packets 149757  bytes 25076894 (25.0 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 228865  bytes 138651377 (138.6 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

```
$ ifconfig
→ What is your IP?
→ What is wlan?
```

***Please create an account for each team member following below commands.**

```
$ sudo adduser [your_student_id]
$ sudo usermod -aG sudo [your_student_id]
$ cat /etc/passwd
```

Configure SSH/SFTP for Jetson Nano Projects

SSH to connect Jetson remotely

→ Windows: *MobaXterm* / Mac: *Terminal* (basic app)

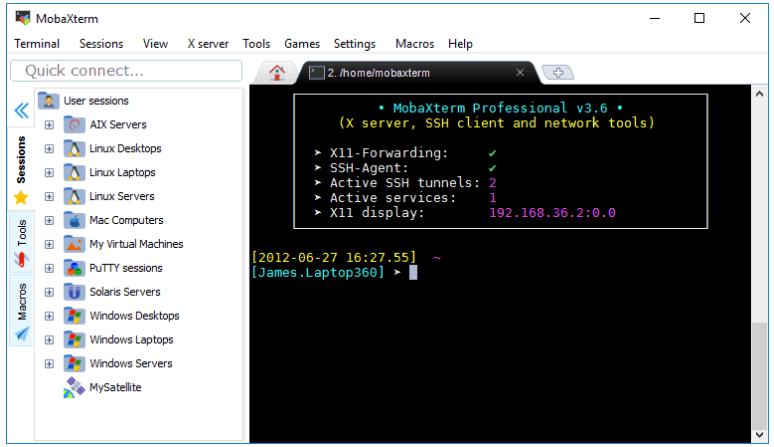
Mac is similar to Linux

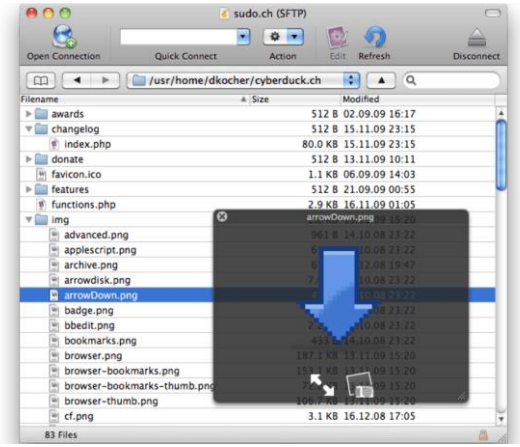
SFTP for file transfer

→ Windows: *MobaXterm* / Mac: *Cyberduck* (link), *Sharing* (basic app)

Code editor

→ *Sublime Text, VS Code*

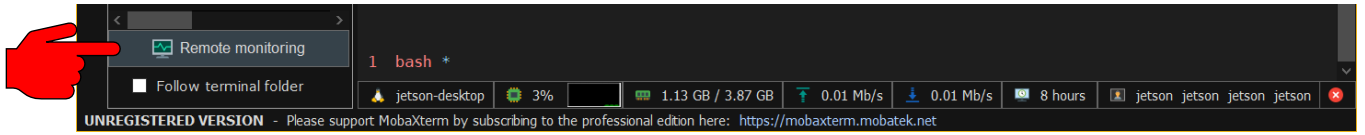


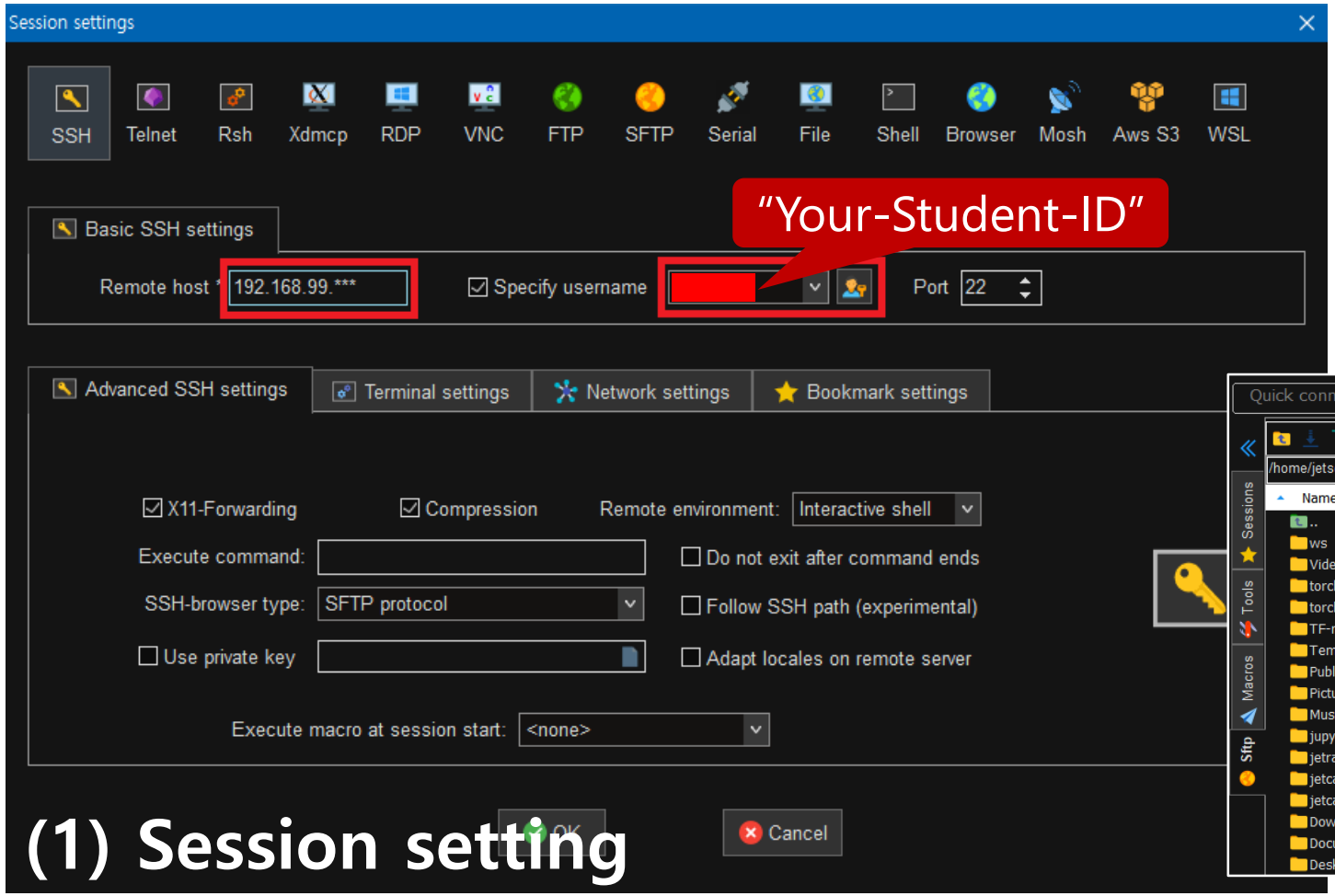


Configure SSH/SFTP

Windows: MobaXterm

(2) System monitoring





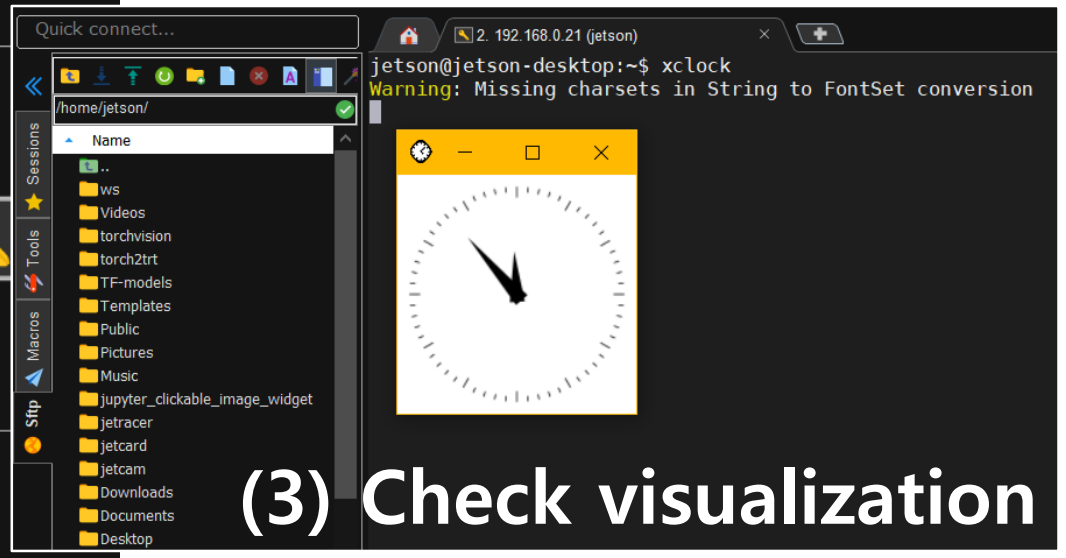
(1) Session setting

Type password `[your_student_id]`, and log in.

Check SFTP in the left panel.

Check visualization by typing below:

`$ xclock` `$ xeyes` `$ xcalc`



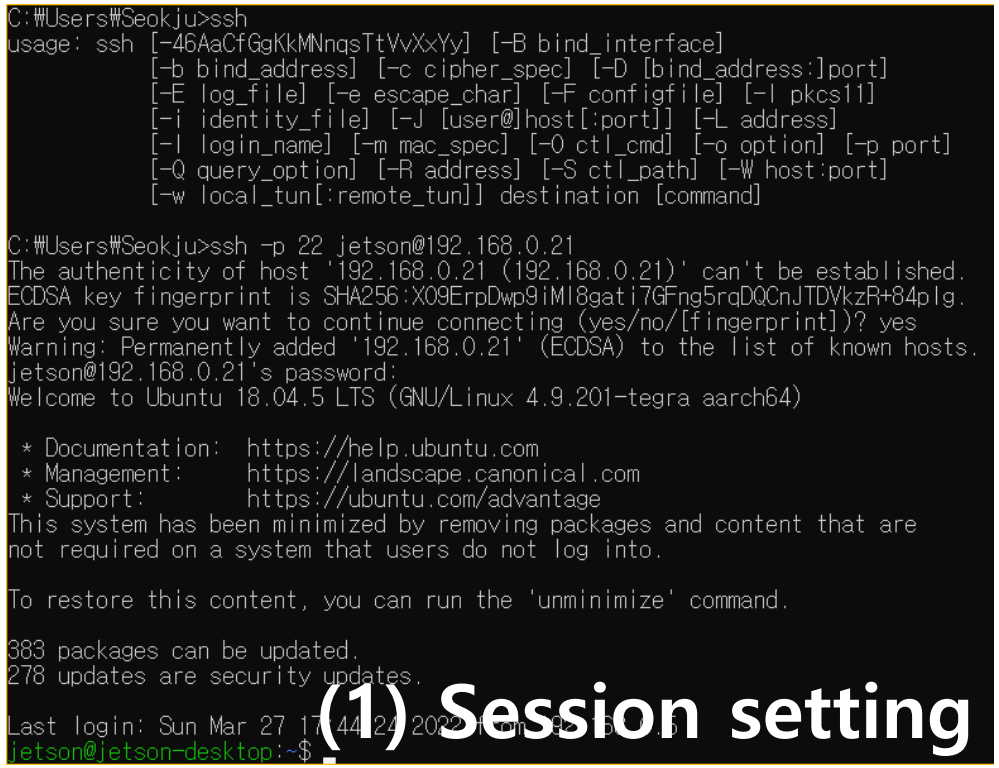
(3) Check visualization

Configure SSH/SFTP

Mac: Terminal or iTerm2

→ Open Terminal and type below commands:

```
$ ssh -p 22 [your_student_id]@192.168.***.***
```

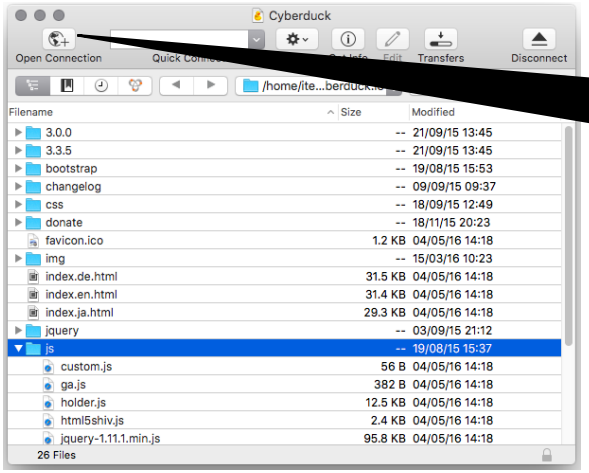


(1) Session setting

→ If the visualization is not available, please refer below link:

- **XQuartz solution:** https://www.cyberciti.biz/faq/apple-osx-mountain-lion-mavericks-install-xquartz-server/

→ SFTP setting (Cyberduck, or VS Code)

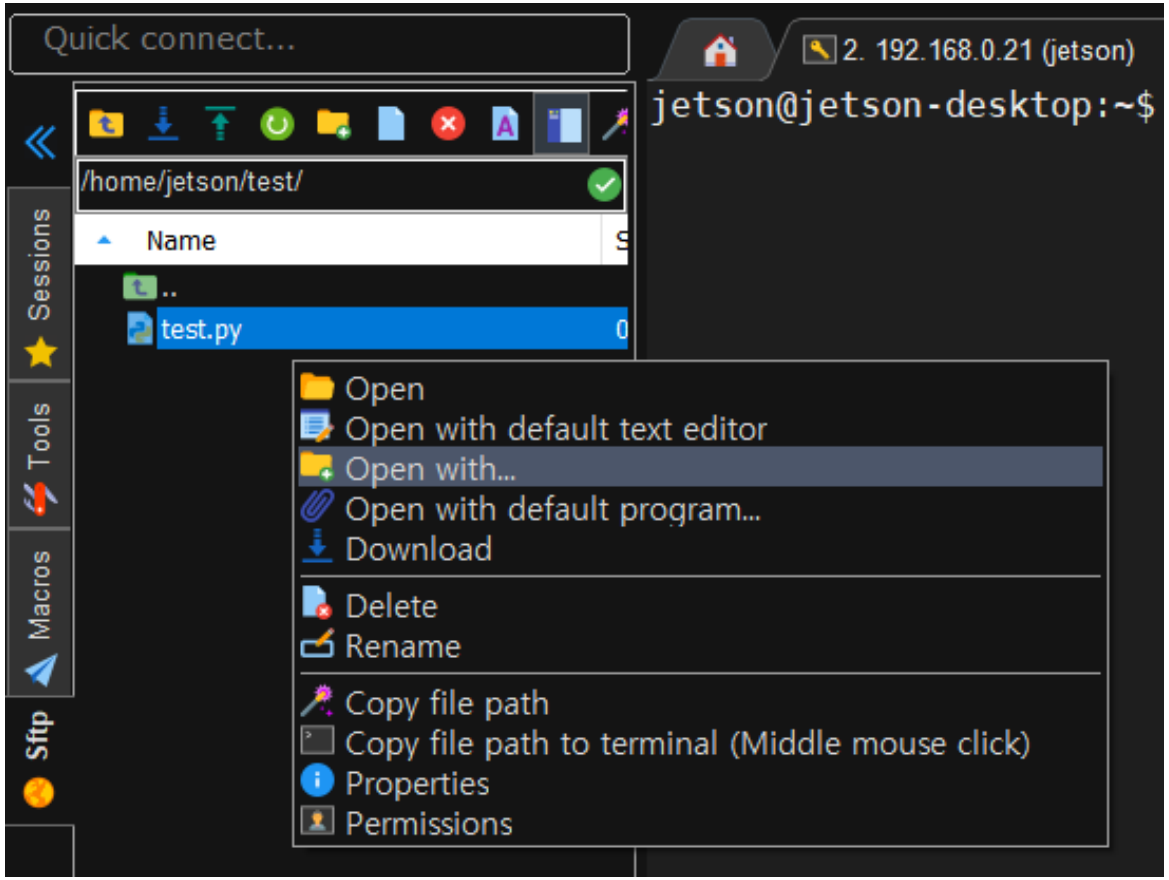


Click Open Connection, and configure your IP, port number, and ID/PW.

(2) SFTP setting

Edit Files via SFTP

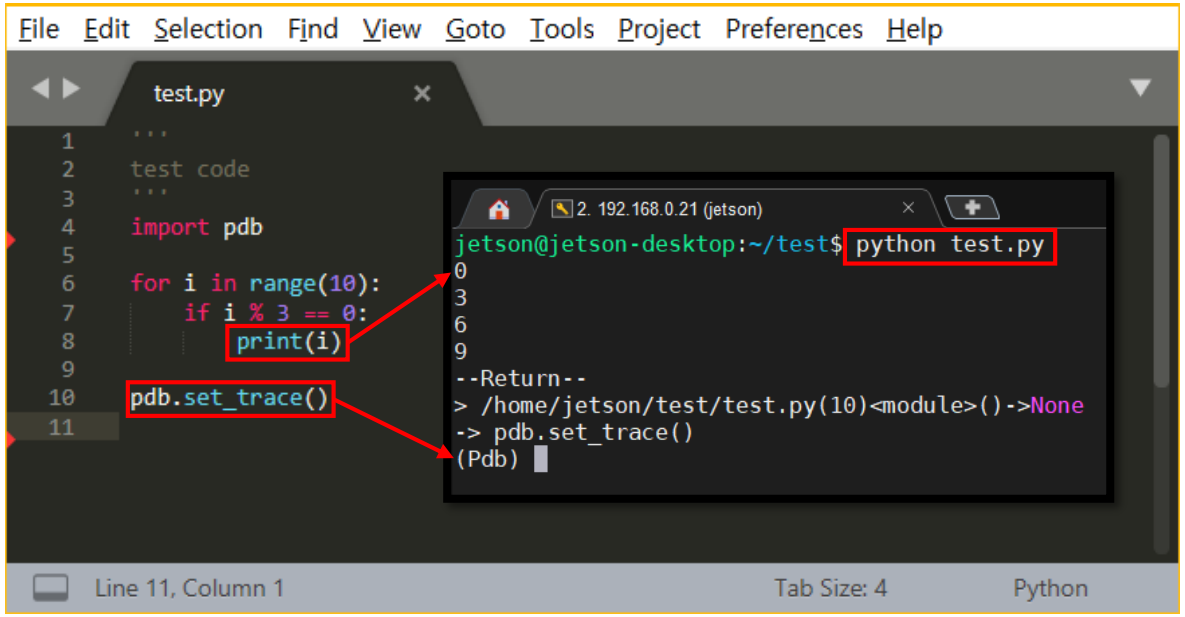
Windows/Mac: Sublime Text



→ Right-click the filename, and click **"Open with..."**.

Select **"Sublime Text"** as a default program.

While saving the file, click **"Autosave"** for convenience.

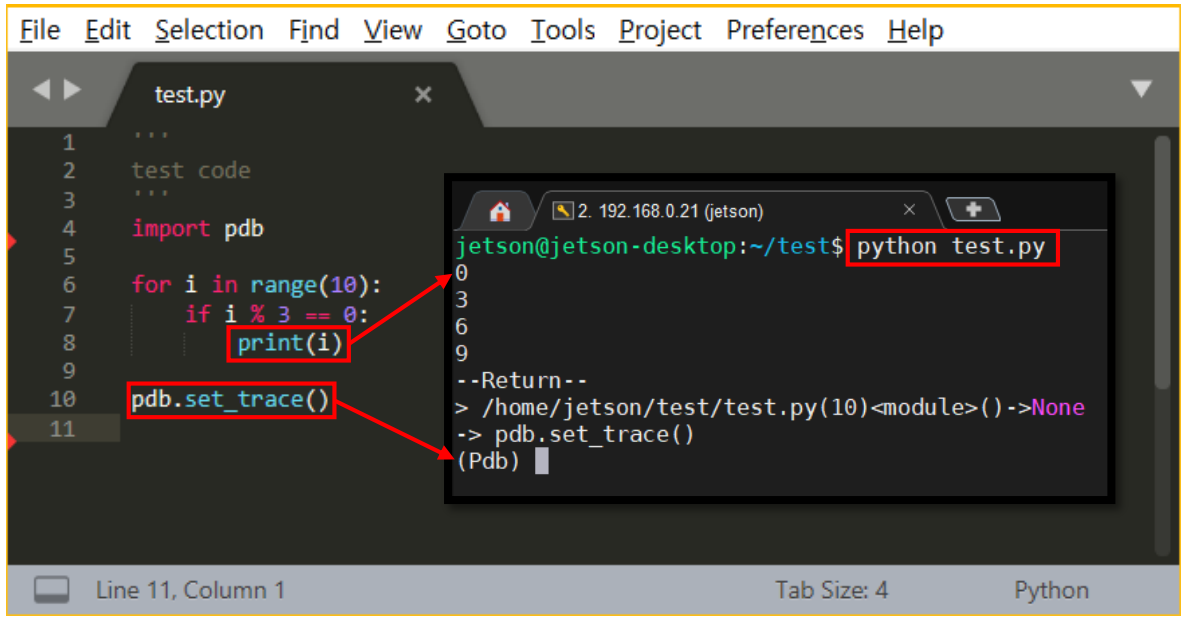


(line 4) `import pdb;` (line 10) `pdb.set_trace();`

→ A **breakpoint** is an **intentional stopping** or **pausing place** in a program, put in place for **debugging** purposes.

Discussions: Python Debugging – HW (1)

Please copy the below python code into your server and execute it.



Q1. What happens if you type "c", "n", or "p [variable]" in (Pdb)? Please discuss each role. Type "ctrl+d" or "q" to exit (Pdb).

```
(Pdb) c
(Pdb) n
(Pdb) p i
```

Q2. Please insert break points into *line 7* (right after the loop begins), and into *line 8* (right after the condition is satisfied). What is the value of "i" after each loop? Please trace the value.

```
(Pdb) p i
(Pdb) c
```

Q3. What is the meaning of the operator "%"?

Q4. Please implement a code to determine whether an input is a prime number or not.

```
### script ###
n = int(input())
is_prime = True
for i in [redacted]:
    if [redacted]:
        is_prime = False

print("{} is prime: {}".format(n, is_prime))
```

Summary

Communicate with Jetson Nano

→ **SSH**: Secure Shell Protocol

→ **SFTP**: Secure File Transfer Protocol

→ Jupyter Notebook: Easy to use & simple navigation, but low stability

→ Some basic Linux commands

Debugging

→ Break points with `pdb.set_trace()`

→ Hope **`debugging`** makes you more computer friendly!