Windows PowerShell

```
PS C:\Users\andre> cd downloads/iot
PS C:\Users\andre\downloads\iot> ls


    Directory: C:\Users\andre\downloads\iot


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
d-----        5/6/2024  12:21 AM                apps
d-----        5/6/2024  12:21 AM                cases
d-----        5/6/2024  12:22 AM                demo
d-----        5/6/2024  12:21 AM                economics
d-----        5/6/2024  12:21 AM                health
d-----        5/6/2024  12:21 AM                hype
d-----        5/6/2024  12:21 AM                lesson1
d-----        5/6/2024  12:21 AM                lesson10
d-----        5/6/2024  12:21 AM                lesson2
d-----        5/6/2024  12:21 AM                lesson3
d-----        5/6/2024  12:21 AM                lesson4
d-----        5/6/2024  12:21 AM                lesson5
d-----        5/6/2024  12:21 AM                lesson6
d-----        5/6/2024  12:21 AM                lesson7
d-----        5/6/2024  12:21 AM                lesson8
d-----        5/6/2024  12:21 AM                lesson9
d-----        5/6/2024  12:21 AM                make
d-----        5/6/2024  12:21 AM                projects
d-----        5/6/2024  12:21 AM                special_problems
d-----        5/6/2024  12:21 AM                standards
d-----        5/6/2024  12:21 AM                systems
```
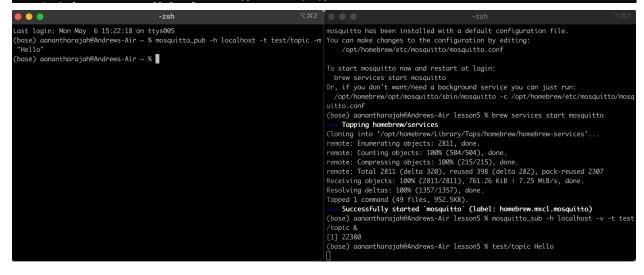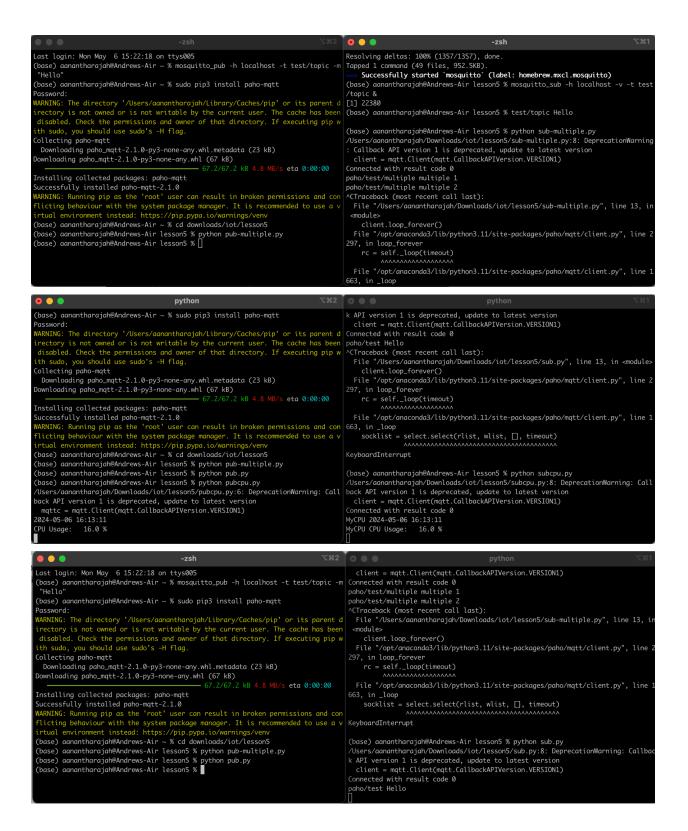
```
PS C:\Users\andre\downloads\iot> git pull
Already up to date.
PS C:\Users\andre\downloads\iot> cd lesson5
PS C:\Users\andre\downloads\iot\lesson5> python subcpu.py
```

-zsh

```
Last login: Mon May  6 15:22:18 on ttys005
(base) aanantharajah@Andrews-Air ~ % mosquitto_pub -h localhost -t test/topic -m
 "Hello"
(base) aanantharajah@Andrews-Air ~ %
```

-zsh

```
mosquitto has been installed with a default configuration file.
You can make changes to the configuration by editing:
    /opt/homebrew/etc/mosquitto/mosquitto.conf

To start mosquitto now and restart at login:
  brew services start mosquitto
Or, if you don't want/need a background service you can just run:
    /opt/homebrew/opt/mosquitto/sbin/mosquitto -c /opt/homebrew/etc/mosquitto/mosq
uitto.conf
(base) aanantharajah@Andrews-Air lesson5 % brew services start mosquitto
==> Tapping homebrew/services
Cloning into '/opt/homebrew/Library/Taps/homebrew/homebrew-services'...
remote: Enumerating objects: 2811, done.
remote: Counting objects: 100% (504/504), done.
remote: Compressing objects: 100% (215/215), done.
remote: Total 2811 (delta 320), reused 398 (delta 282), pack-reused 2307
Receiving objects: 100% (2811/2811), 761.26 KiB | 7.25 MiB/s, done.
Resolving deltas: 100% (1357/1357), done.
Tapped 1 command (49 files, 952.5KB).
==> Successfully started `mosquitto` (label: homebrew.mxcl.mosquitto)
(base) aanantharajah@Andrews-Air lesson5 % mosquitto_sub -h localhost -v -t test
/topic &
[1] 22380
(base) aanantharajah@Andrews-Air lesson5 % test/topic Hello
```

Terminal 1 (top-left, -zsh):
```
Last login: Mon May  6 15:22:18 on ttys005
(base) aanantharajah@Andrews-Air ~ % mosquitto_pub -h localhost -t test/topic -m
"Hello"
(base) aanantharajah@Andrews-Air ~ % sudo pip3 install paho-mqtt
Password:
WARNING: The directory '/Users/aanantharajah/Library/Caches/pip' or its parent d
irectory is not owned or is not writable by the current user. The cache has been
 disabled. Check the permissions and owner of that directory. If executing pip w
ith sudo, you should use sudo's -H flag.
Collecting paho-mqtt
  Downloading paho_mqtt-2.1.0-py3-none-any.whl.metadata (23 kB)
Downloading paho_mqtt-2.1.0-py3-none-any.whl (67 kB)
                                    ── 67.2/67.2 kB 4.8 MB/s eta 0:00:00
Installing collected packages: paho-mqtt
Successfully installed paho-mqtt-2.1.0
WARNING: Running pip as the 'root' user can result in broken permissions and con
flicting behaviour with the system package manager. It is recommended to use a v
irtual environment instead: https://pip.pypa.io/warnings/venv
(base) aanantharajah@Andrews-Air ~ % cd downloads/iot/lesson5
(base) aanantharajah@Andrews-Air lesson5 % python pub-multiple.py
(base) aanantharajah@Andrews-Air lesson5 %
```

Terminal 2 (top-right, -zsh):
```
Resolving deltas: 100% (1357/1357), done.
Tapped 1 command (49 files, 952.5KB).
==> Successfully started `mosquitto` (label: homebrew.mxcl.mosquitto)
(base) aanantharajah@Andrews-Air lesson5 % mosquitto_sub -h localhost -v -t test
/topic &
[1] 22380
(base) aanantharajah@Andrews-Air lesson5 % test/topic Hello

(base) aanantharajah@Andrews-Air lesson5 % python sub-multiple.py
/Users/aanantharajah/Downloads/iot/lesson5/sub-multiple.py:8: DeprecationWarning
: Callback API version 1 is deprecated, update to latest version
  client = mqtt.Client(mqtt.CallbackAPIVersion.VERSION1)
Connected with result code 0
paho/test/multiple multiple 1
paho/test/multiple multiple 2
^CTraceback (most recent call last):
  File "/Users/aanantharajah/Downloads/iot/lesson5/sub-multiple.py", line 13, in
 <module>
    client.loop_forever()
  File "/opt/anaconda3/lib/python3.11/site-packages/paho/mqtt/client.py", line 2
297, in loop_forever
    rc = self._loop(timeout)
         ^^^^^^^^^^^^^^^^^^^^
  File "/opt/anaconda3/lib/python3.11/site-packages/paho/mqtt/client.py", line 1
663, in _loop
```

Terminal 3 (middle-left, python):
```
(base) aanantharajah@Andrews-Air ~ % sudo pip3 install paho-mqtt
Password:
WARNING: The directory '/Users/aanantharajah/Library/Caches/pip' or its parent d
irectory is not owned or is not writable by the current user. The cache has been
 disabled. Check the permissions and owner of that directory. If executing pip w
ith sudo, you should use sudo's -H flag.
Collecting paho-mqtt
  Downloading paho_mqtt-2.1.0-py3-none-any.whl.metadata (23 kB)
Downloading paho_mqtt-2.1.0-py3-none-any.whl (67 kB)
                                    ── 67.2/67.2 kB 4.8 MB/s eta 0:00:00
Installing collected packages: paho-mqtt
Successfully installed paho-mqtt-2.1.0
WARNING: Running pip as the 'root' user can result in broken permissions and con
flicting behaviour with the system package manager. It is recommended to use a v
irtual environment instead: https://pip.pypa.io/warnings/venv
(base) aanantharajah@Andrews-Air ~ % cd downloads/iot/lesson5
(base) aanantharajah@Andrews-Air lesson5 % python pub-multiple.py
(base) aanantharajah@Andrews-Air lesson5 % python pub.py
(base) aanantharajah@Andrews-Air lesson5 % python pubcpu.py
/Users/aanantharajah/Downloads/iot/lesson5/pubcpu.py:6: DeprecationWarning: Call
back API version 1 is deprecated, update to latest version
  mqttc = mqtt.Client(mqtt.CallbackAPIVersion.VERSION1)
2024-05-06 16:13:11
CPU Usage:   16.0 %
```

Terminal 4 (middle-right, python):
```
k API version 1 is deprecated, update to latest version
  client = mqtt.Client(mqtt.CallbackAPIVersion.VERSION1)
Connected with result code 0
paho/test Hello
^CTraceback (most recent call last):
  File "/Users/aanantharajah/Downloads/iot/lesson5/sub.py", line 13, in <module>
    client.loop_forever()
  File "/opt/anaconda3/lib/python3.11/site-packages/paho/mqtt/client.py", line 2
297, in loop_forever
    rc = self._loop(timeout)
         ^^^^^^^^^^^^^^^^^^^^
  File "/opt/anaconda3/lib/python3.11/site-packages/paho/mqtt/client.py", line 1
663, in _loop
    socklist = select.select(rlist, wlist, [], timeout)
               ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
KeyboardInterrupt

(base) aanantharajah@Andrews-Air lesson5 % python subcpu.py
/Users/aanantharajah/Downloads/iot/lesson5/subcpu.py:8: DeprecationWarning: Call
back API version 1 is deprecated, update to latest version
  client = mqtt.Client(mqtt.CallbackAPIVersion.VERSION1)
Connected with result code 0
MyCPU 2024-05-06 16:13:11
MyCPU CPU Usage:   16.0 %
```

Terminal 5 (bottom-left, -zsh):
```
Last login: Mon May  6 15:22:18 on ttys005
(base) aanantharajah@Andrews-Air ~ % mosquitto_pub -h localhost -t test/topic -m
"Hello"
(base) aanantharajah@Andrews-Air ~ % sudo pip3 install paho-mqtt
Password:
WARNING: The directory '/Users/aanantharajah/Library/Caches/pip' or its parent d
irectory is not owned or is not writable by the current user. The cache has been
 disabled. Check the permissions and owner of that directory. If executing pip w
ith sudo, you should use sudo's -H flag.
Collecting paho-mqtt
  Downloading paho_mqtt-2.1.0-py3-none-any.whl.metadata (23 kB)
Downloading paho_mqtt-2.1.0-py3-none-any.whl (67 kB)
                                    ── 67.2/67.2 kB 4.8 MB/s eta 0:00:00
Installing collected packages: paho-mqtt
Successfully installed paho-mqtt-2.1.0
WARNING: Running pip as the 'root' user can result in broken permissions and con
flicting behaviour with the system package manager. It is recommended to use a v
irtual environment instead: https://pip.pypa.io/warnings/venv
(base) aanantharajah@Andrews-Air ~ % cd downloads/iot/lesson5
(base) aanantharajah@Andrews-Air lesson5 % python pub-multiple.py
(base) aanantharajah@Andrews-Air lesson5 % python pub.py
(base) aanantharajah@Andrews-Air lesson5 %
```

Terminal 6 (bottom-right, python):
```
  client = mqtt.Client(mqtt.CallbackAPIVersion.VERSION1)
Connected with result code 0
paho/test/multiple multiple 1
paho/test/multiple multiple 2
^CTraceback (most recent call last):
  File "/Users/aanantharajah/Downloads/iot/lesson5/sub-multiple.py", line 13, in
 <module>
    client.loop_forever()
  File "/opt/anaconda3/lib/python3.11/site-packages/paho/mqtt/client.py", line 2
297, in loop_forever
    rc = self._loop(timeout)
         ^^^^^^^^^^^^^^^^^^^^
  File "/opt/anaconda3/lib/python3.11/site-packages/paho/mqtt/client.py", line 1
663, in _loop
    socklist = select.select(rlist, wlist, [], timeout)
               ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
KeyboardInterrupt

(base) aanantharajah@Andrews-Air lesson5 % python sub.py
/Users/aanantharajah/Downloads/iot/lesson5/sub.py:8: DeprecationWarning: Callbac
k API version 1 is deprecated, update to latest version
  client = mqtt.Client(mqtt.CallbackAPIVersion.VERSION1)
Connected with result code 0
paho/test Hello
```

With this lab we were able to allow for our two terminals to communicate with one another, running one python script on one and another on the second.