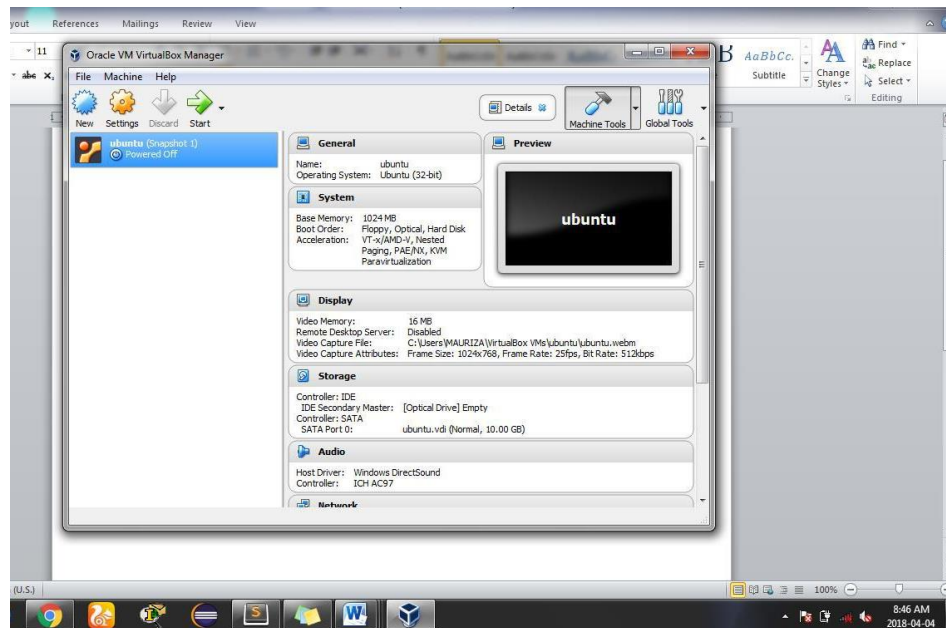


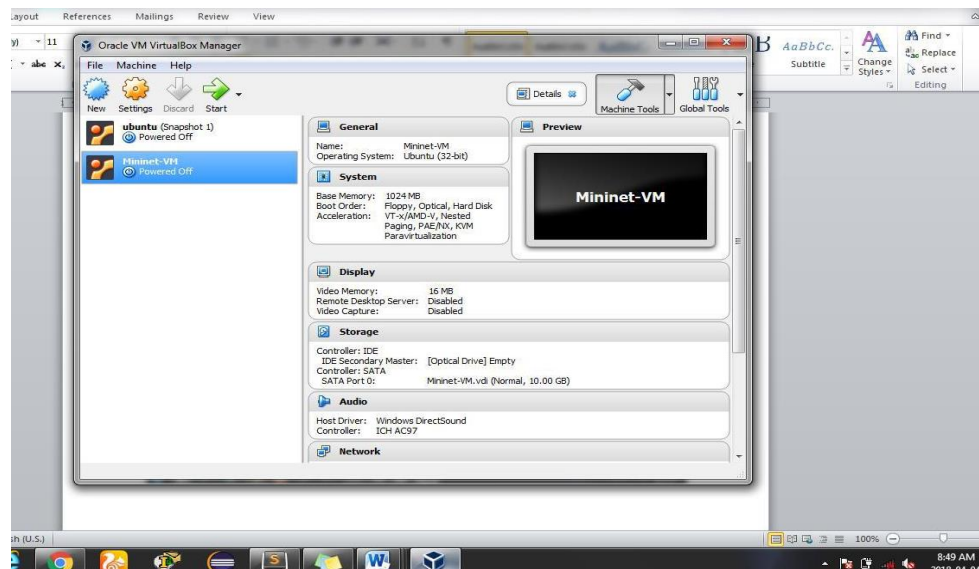
Mininet

Mininet adalah sebuah simulator jaringan (jaringan virtual) yang dapat membuat sebuah jaringan yang terdiri dari virtual hosts, switches, controllers dan links. Virtual jaringan Mininet menyerupai jaringan fisik yang aslinya. Kita dapat membuat topologi jaringan, mensimulasikannya dan mengimplementasikan berbagai parameter untuk performa jaringan seperti bandwidth, latency, packet loss, dll, dengan Mininet, bisa membuat aplikasi/code sederhana. Berikut adalah tahapan instalasi Mininet :

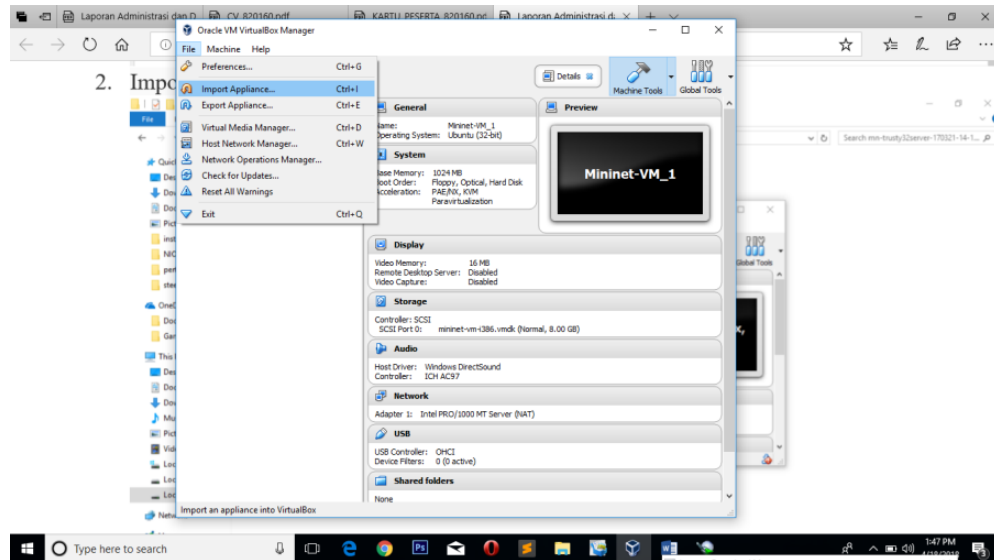
1. Buka oracle VM virtual box seperti pada gambar.



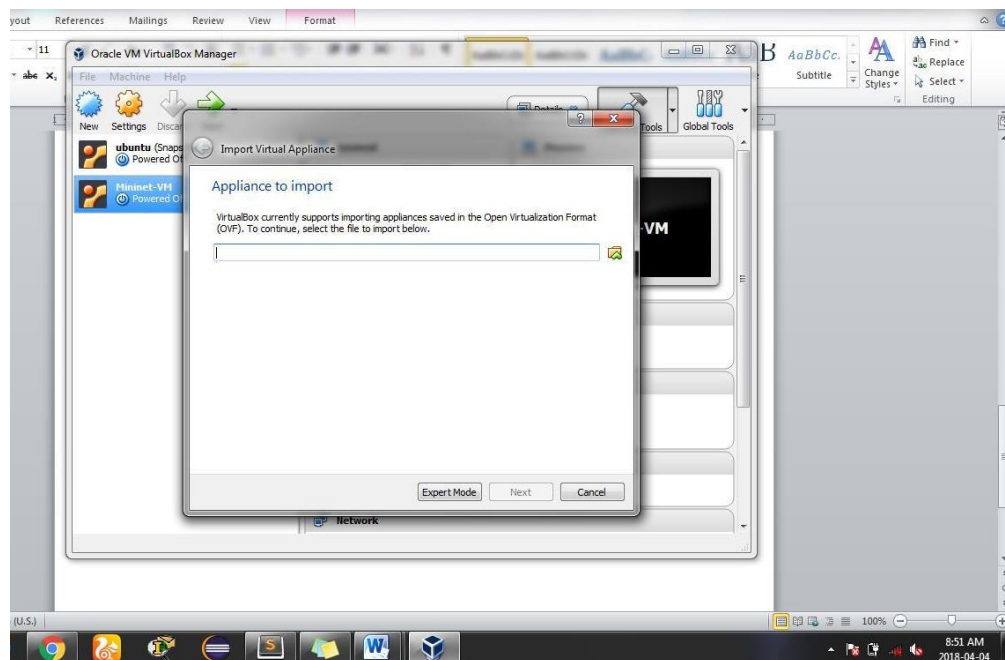
2. Kemudian pilih menu seperti pada gambar dibawah yaitu Mininet-VM.

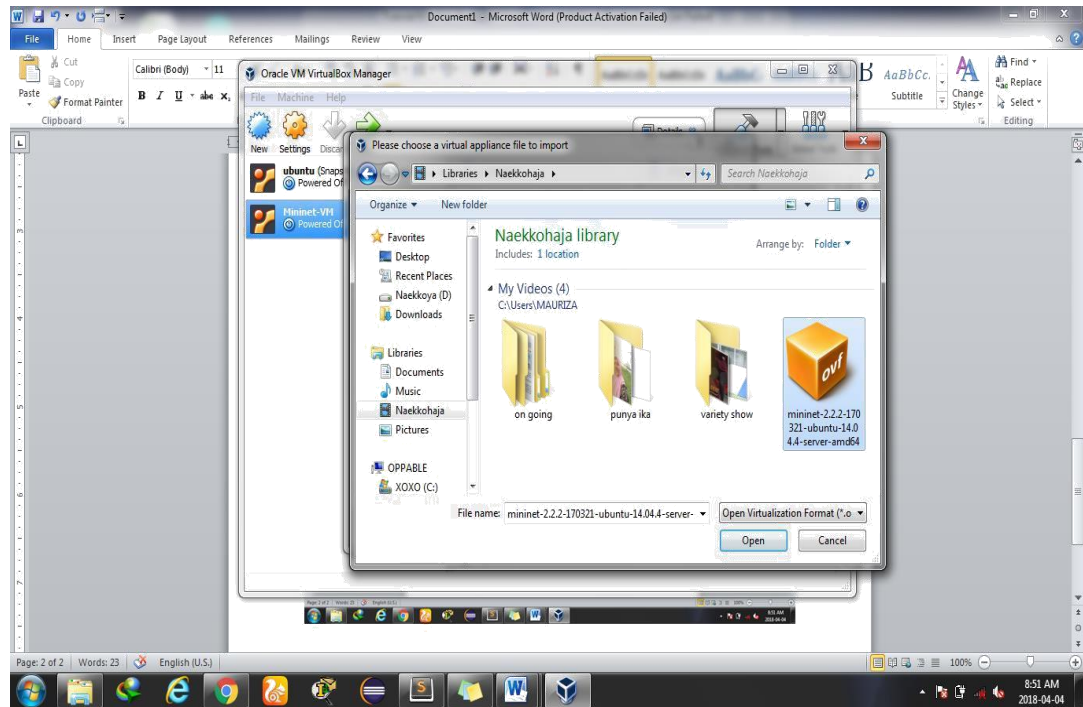


- Setelah itu pilih menu file dan klik import appliance.

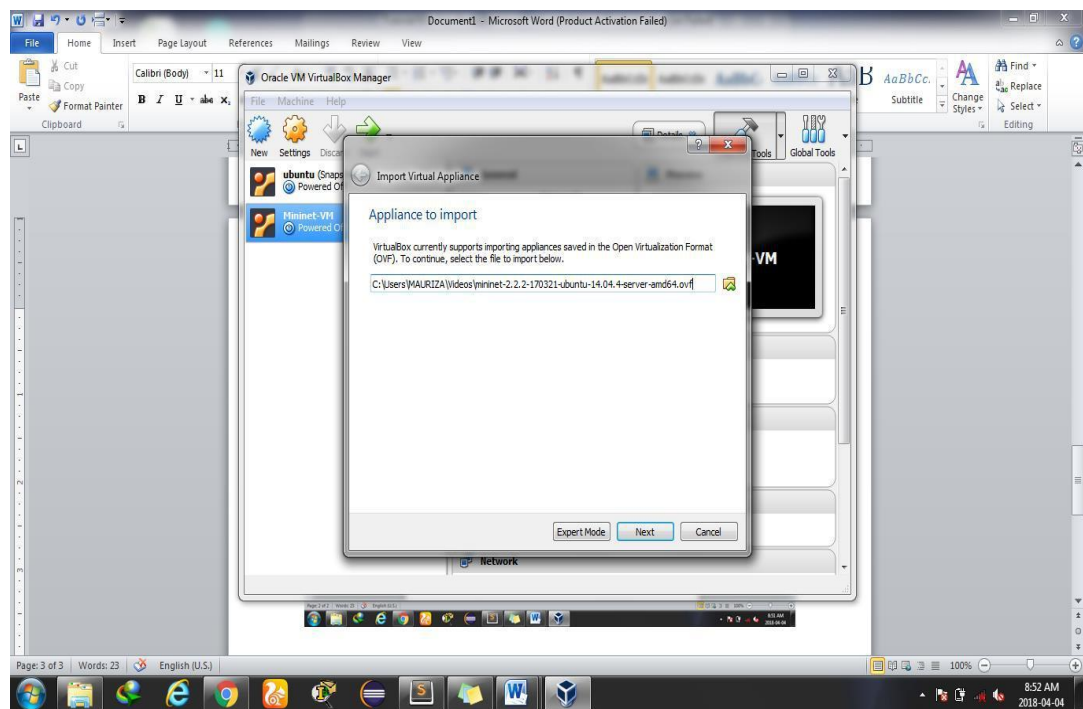


- Kemudian setelah kita klik import appliance, selanjutnya pilih dimana folder dan mininet berada dan klik open.

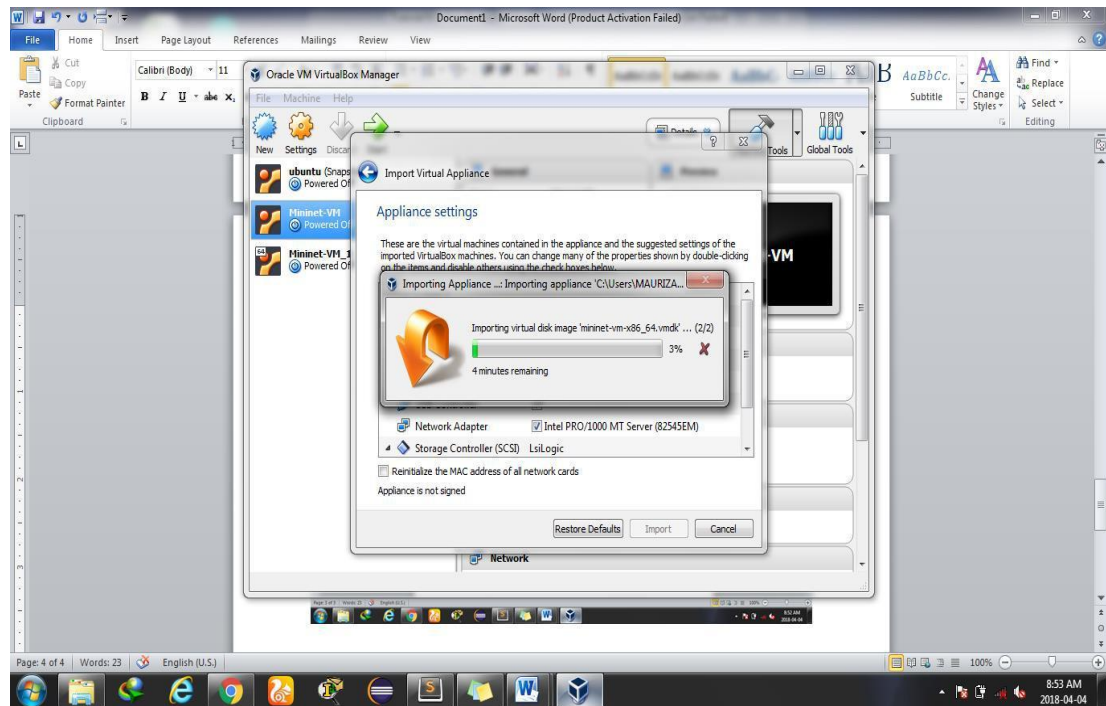




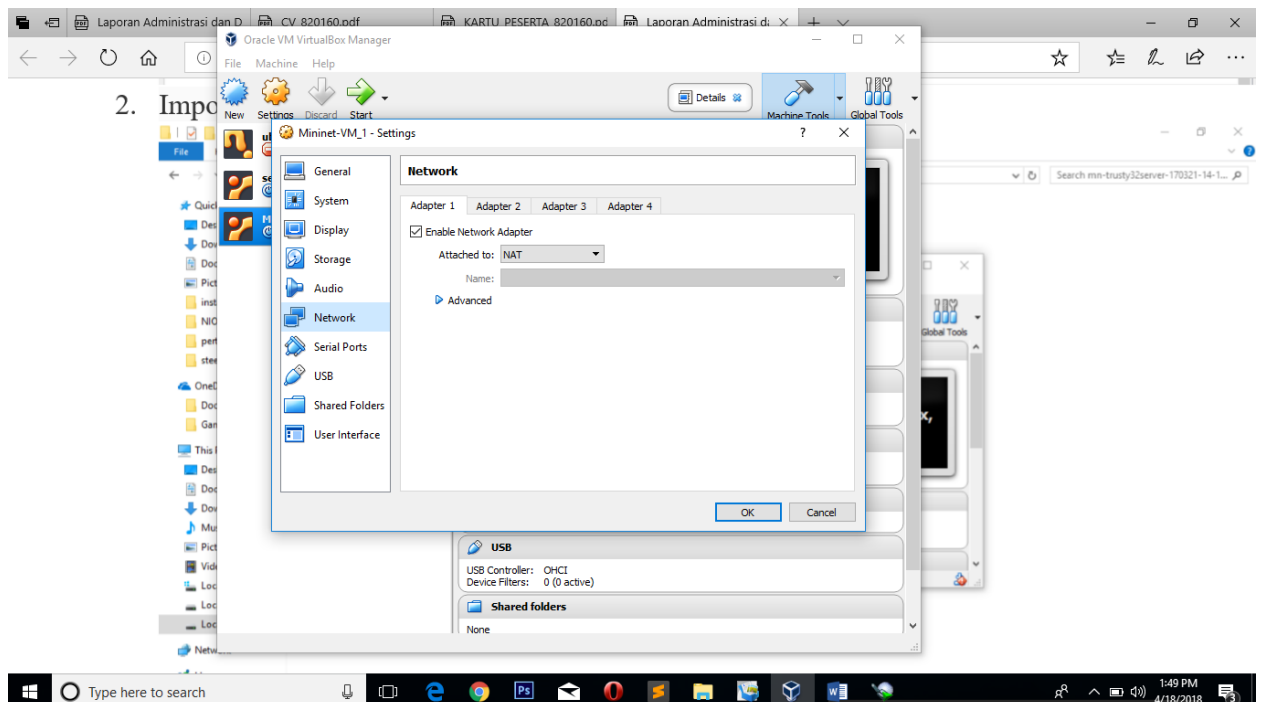
5. Selanjutnya kita klik file appliance dan klik next seperti pada gambar.

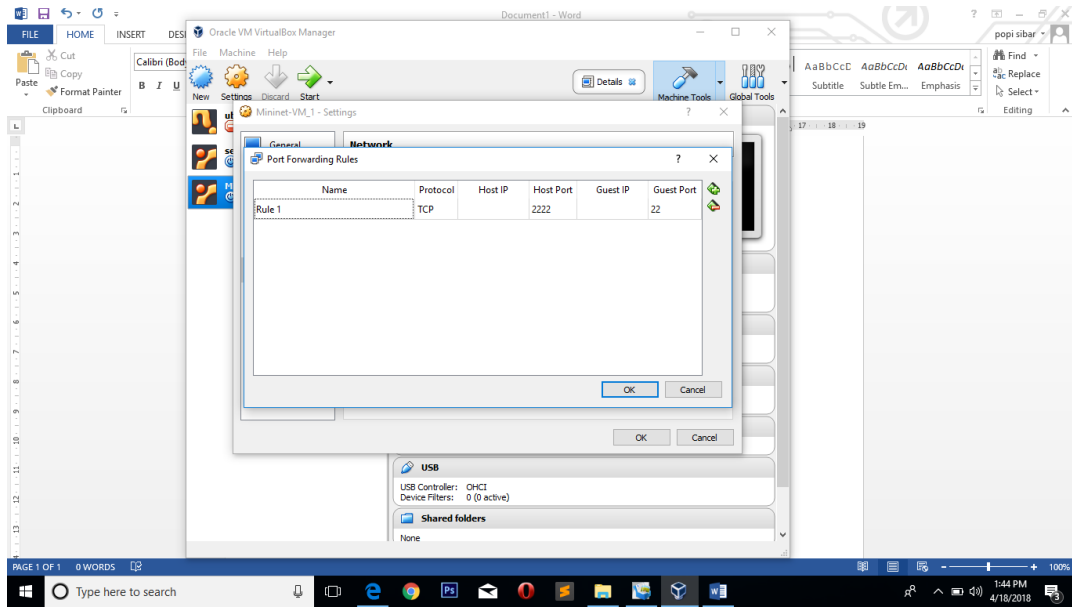


6. Kemudian klik import dan enter. Tunggu prosesnya sampai selesai untuk beralih ke tahap selanjutnya.

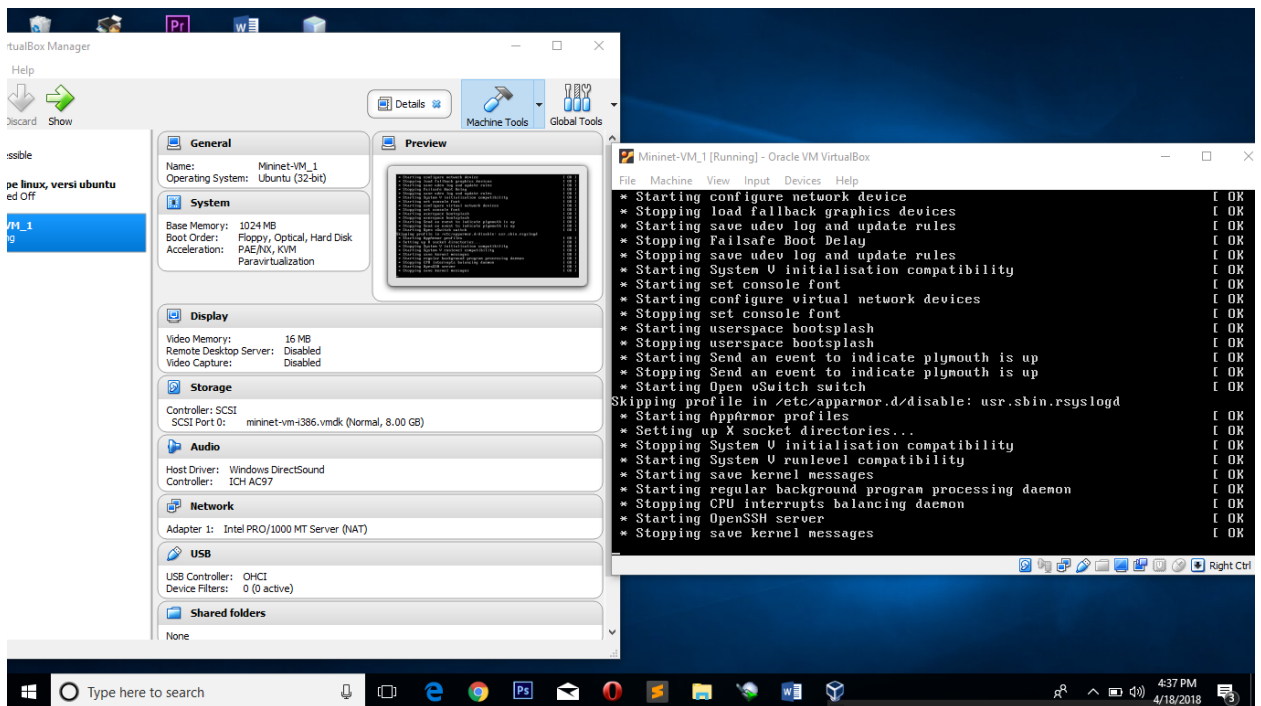


7. Lakukan Configure Access, dengan menyetting konfigurasi network agar berkomunikasi nantinya, lalu melakukan post forwarding.

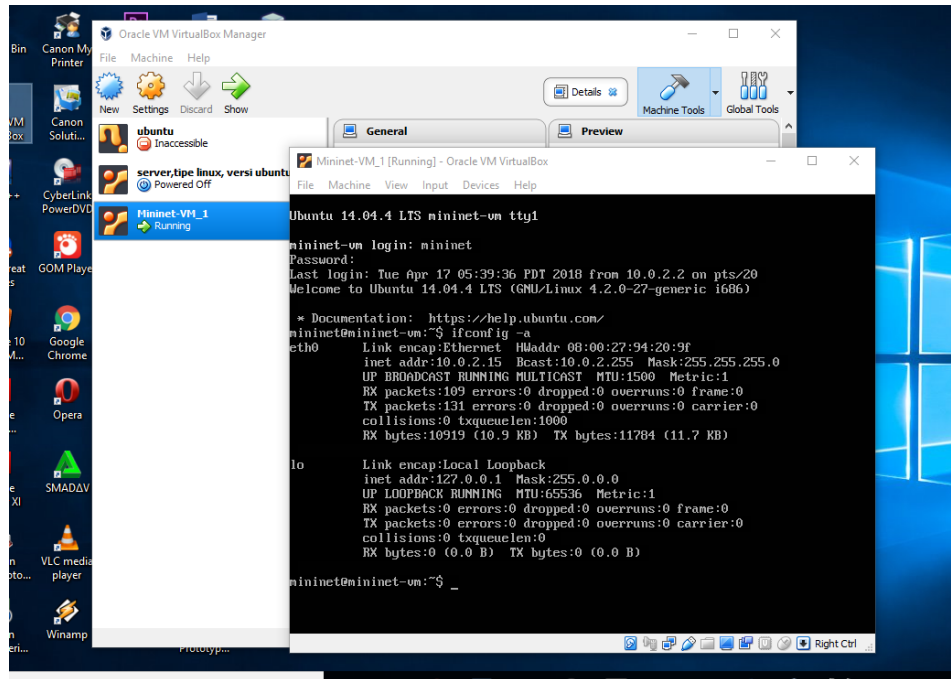




8. Jalankan vm

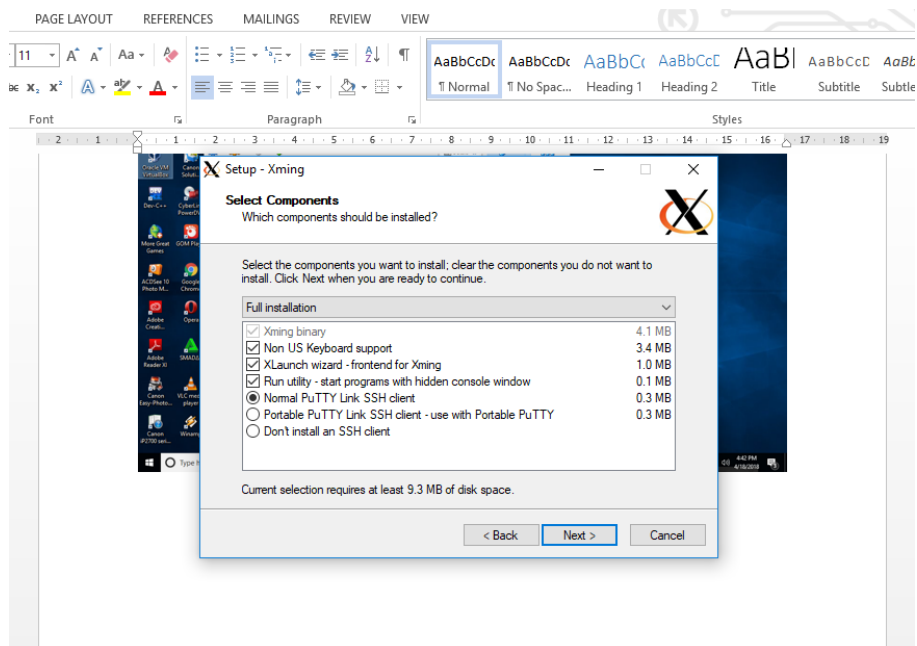


9. Run mininet dengan memasukkan username dan password



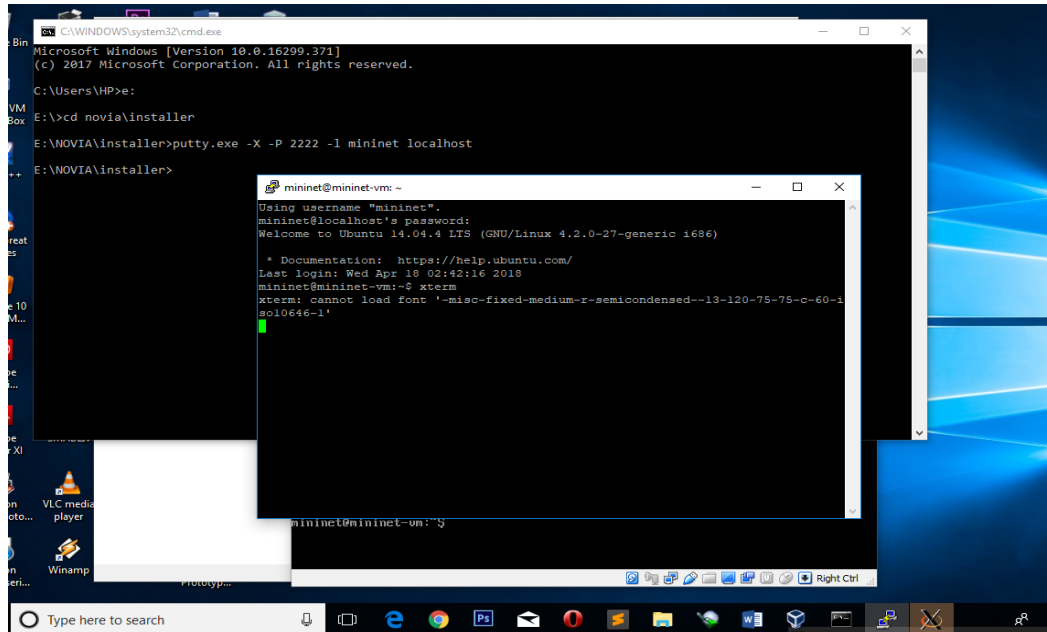
10. Mengaktifkan Xming

Xming merupakan server yang digunakan untuk mengakses ssh x11 untuk windows

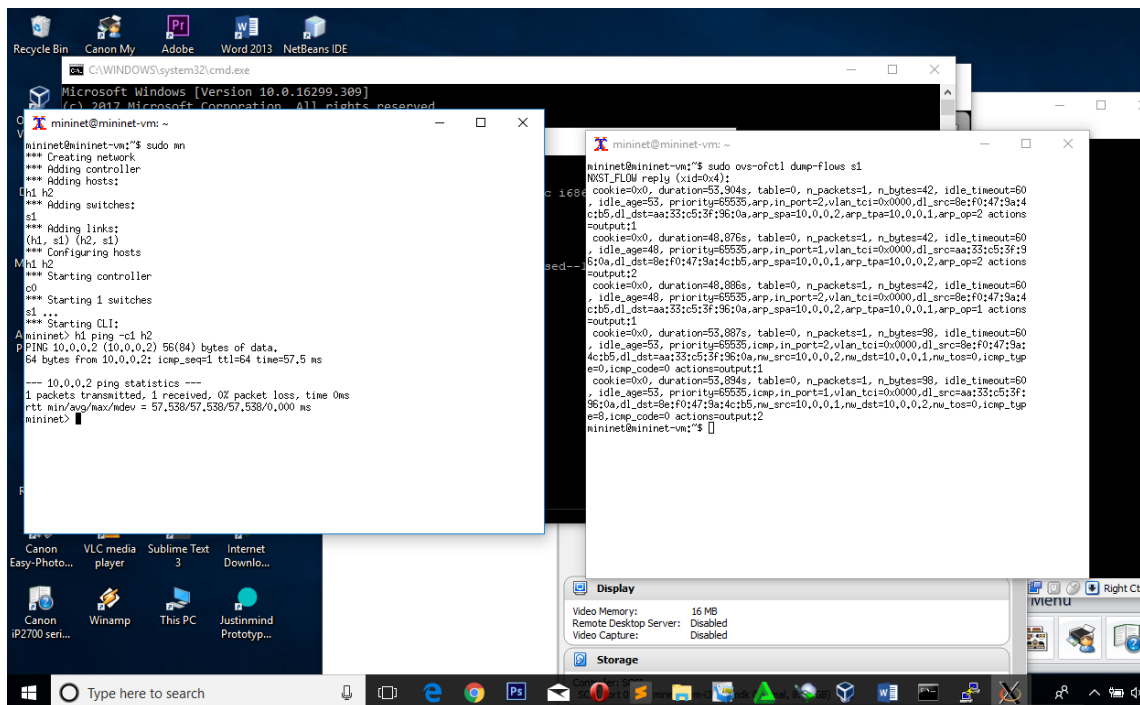


11. SSH to VM

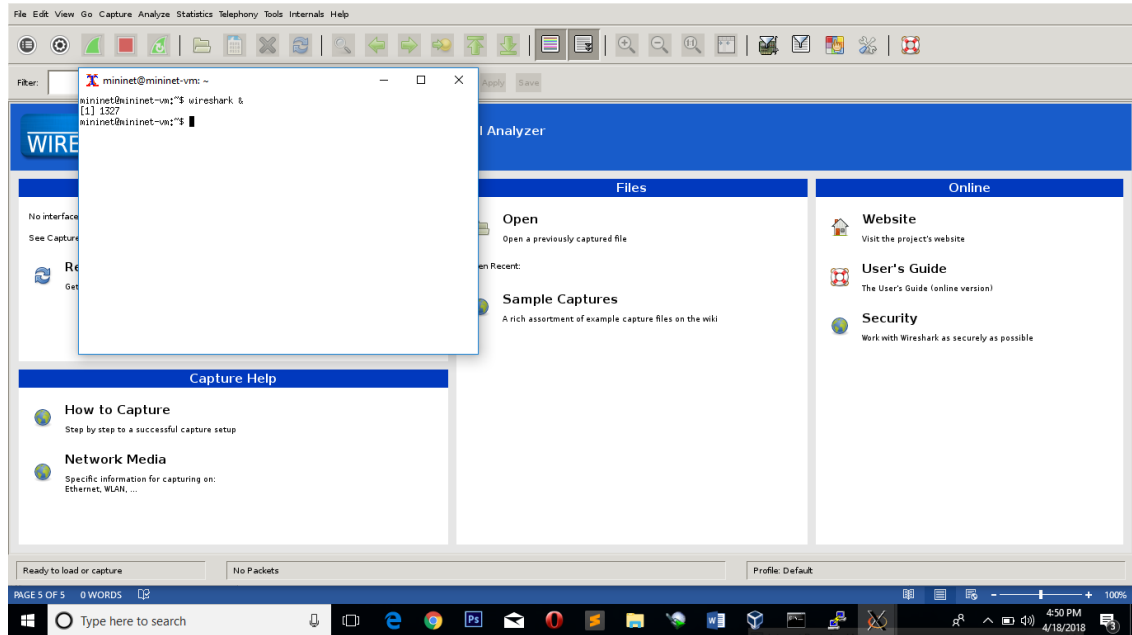
SSH (Secure Shell) yang merupakan sebuah protokol jaringan yang memanfaatkan kriptografi untuk melakukan komunikasi data pada perangkat jaringan agar lebih aman.



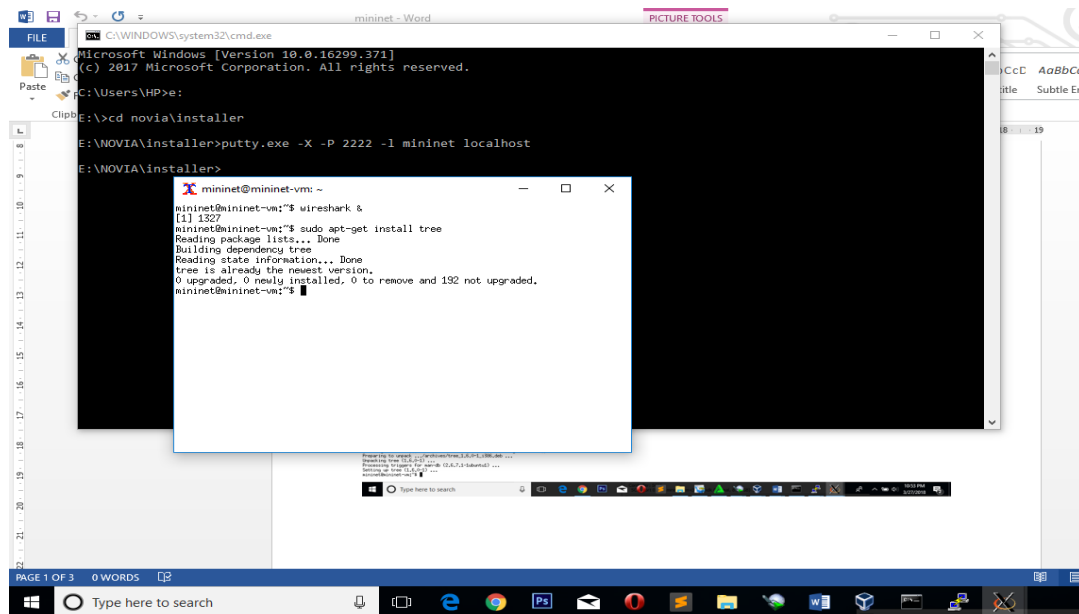
12. Mengakses melalui SSH (Access via SSH).



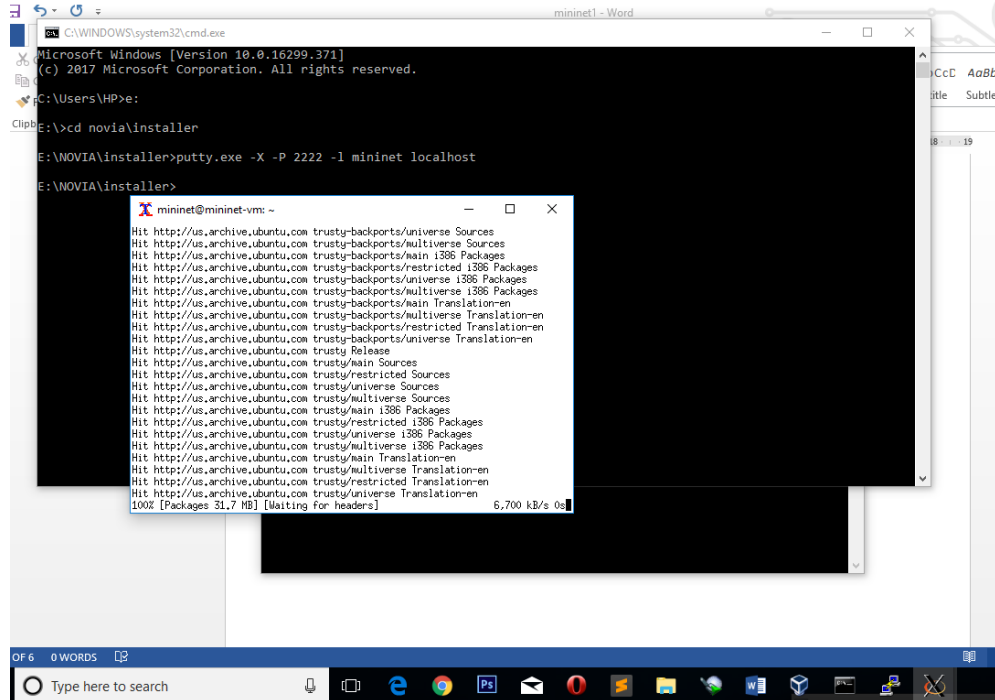
13. Melakukan test WireShark



14. Melakukan Install tree



15. Melakukan update tree

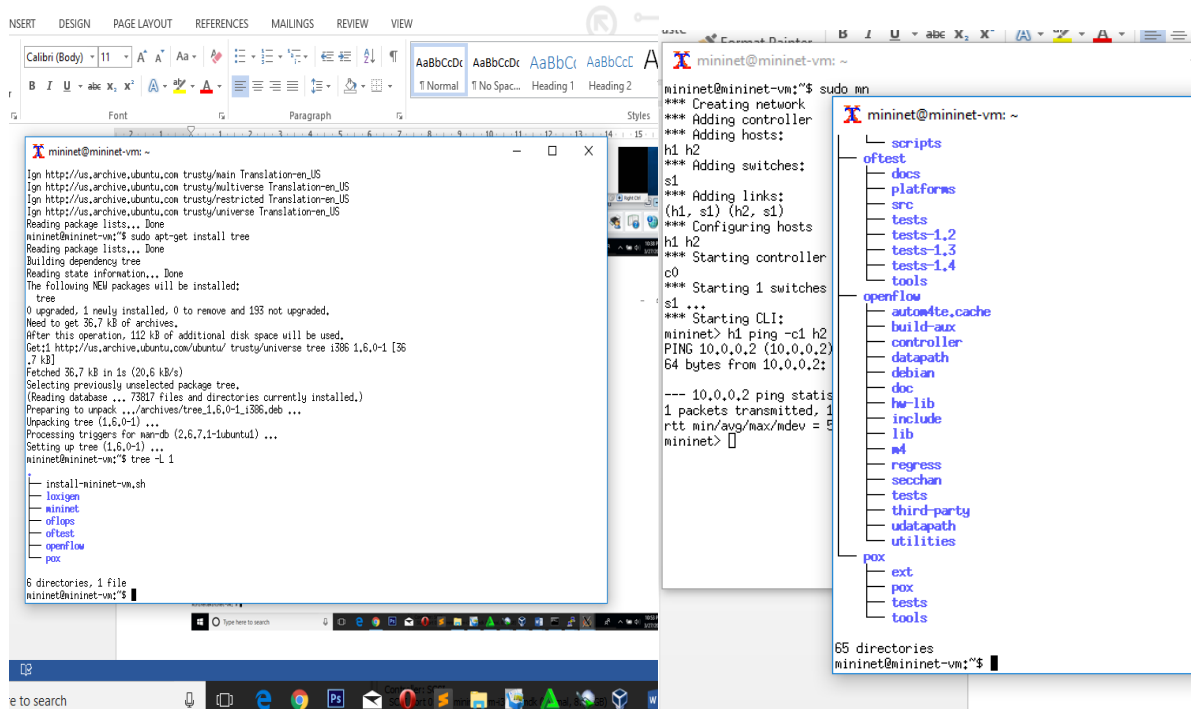


```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows [Version 10.0.16299.371]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\HP>
C:\Users\HP>cd novia\installer
E:\NOVIA\installer>putty.exe -X -P 2222 -l mininet localhost
E:\NOVIA\installer>

mininet@mininet-vm: ~
Hit http://us.archive.ubuntu.com trusty-backports/universe Sources
Hit http://us.archive.ubuntu.com trusty-backports/multiverse Sources
Hit http://us.archive.ubuntu.com trusty-backports/main i386 Packages
Hit http://us.archive.ubuntu.com trusty-backports/restricted i386 Packages
Hit http://us.archive.ubuntu.com trusty-backports/universe i386 Packages
Hit http://us.archive.ubuntu.com trusty-backports/multiverse i386 Packages
Hit http://us.archive.ubuntu.com trusty-backports/main Translation-en
Hit http://us.archive.ubuntu.com trusty-backports/multiverse Translation-en
Hit http://us.archive.ubuntu.com trusty-backports/restricted Translation-en
Hit http://us.archive.ubuntu.com trusty-backports/universe Translation-en
Hit http://us.archive.ubuntu.com trusty Release
Hit http://us.archive.ubuntu.com trusty Sources
Hit http://us.archive.ubuntu.com trusty/restricted Sources
Hit http://us.archive.ubuntu.com trusty/universe Sources
Hit http://us.archive.ubuntu.com trusty/multiverse Sources
Hit http://us.archive.ubuntu.com trusty/main i386 Packages
Hit http://us.archive.ubuntu.com trusty/restricted i386 Packages
Hit http://us.archive.ubuntu.com trusty/universe i386 Packages
Hit http://us.archive.ubuntu.com trusty/multiverse i386 Packages
Hit http://us.archive.ubuntu.com trusty/main Translation-en
Hit http://us.archive.ubuntu.com trusty/restricted Translation-en
Hit http://us.archive.ubuntu.com trusty/universe Translation-en
Hit http://us.archive.ubuntu.com trusty/multiverse Translation-en
100% [Packages 31.7 MB] [Waiting for headers] 6,700 kB/s
```

16. Pemeriksaan pada Mininet tree



```
mininet@mininet-vm: ~
Ign http://us.archive.ubuntu.com trusty/main Translation-en_US
Ign http://us.archive.ubuntu.com trusty/multiverse Translation-en_US
Ign http://us.archive.ubuntu.com trusty/restricted Translation-en_US
Ign http://us.archive.ubuntu.com trusty/universe Translation-en_US
Reading package lists... Done
mininet@mininet-vm:~$ sudo apt-get install tree
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  tree
0 upgraded, 1 newly installed, 0 to remove and 193 not upgraded.
Need to get 36,7 kB of archives.
After this operation, 112 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu/trusty/universe tree 1.6.0-1 [36,7 kB]
Fetched 36,7 kB in 1s (20,6 kB/s)
Selecting previously unselected package tree.
(Reading database ... 73017 files and directories currently installed.)
Preparing to unpack .../archives/tree_1.6.0-1_i386.deb ...
Unpacking tree (1.6.0-1) ...
Processing triggers for nano-bd (2.6.7.1-1ubuntu1) ...
Setting up tree (1.6.0-1) ...
mininet@mininet-vm:~$ tree -l 1
.
├── install-mininet-vm.sh
├── toxigen
├── mininet
├── oflops
├── oftest
├── openflow
└── pox

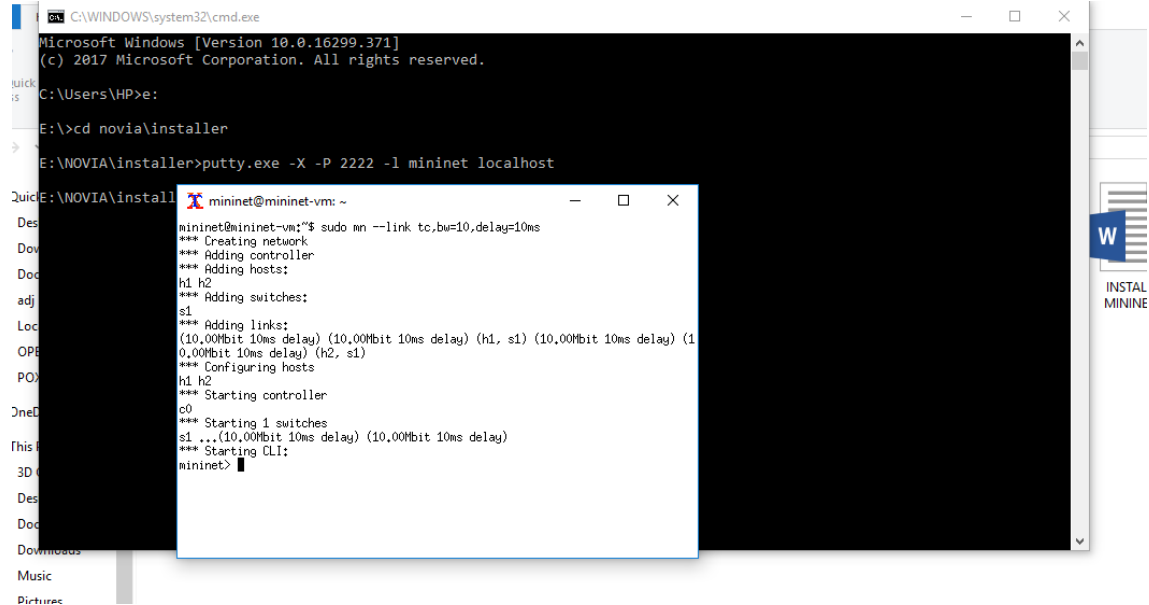
6 directories, 1 file
mininet@mininet-vm:~$

mininet@mininet-vm: ~
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1)
*** Configuring hosts
h1 h2
*** Starting controller
c0
*** Starting 1 switches
s1 ...
*** Starting CLI:
mininet> h1 ping -c1 h2
PING 10.0.0.2 (10.0.0.2)
64 bytes from 10.0.0.2:
--- 10.0.0.2 ping statistics ---
1 packets transmitted, 1
rtt min/avg/max/mdev = 0
mininet>

mininet@mininet-vm: ~
├── scripts
├── oftest
├── docs
├── platforms
├── src
├── tests
├── tests-1.2
├── tests-1.3
├── tests-1.4
├── tools
├── openflow
├── autow4te.cache
├── build-aux
├── controller
├── datapath
├── debian
├── doc
├── hw-lib
├── include
├── lib
├── m4
├── regress
├── secchan
├── tests
├── third-party
├── datapath
├── utilities
├── pox
├── ext
├── pox
├── tests
└── tools

65 directories
mininet@mininet-vm:~$
```

17. Melakukan link tc



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows [Version 10.0.16299.371]
(c) 2017 Microsoft Corporation. All rights reserved.

C:\Users\HP>E:
E:\>cd novia\installer
E:\NOVIA\installer>putty.exe -X -P 2222 -l mininet localhost

mininet@mininet-vm: ~
mininet@mininet-vm:~$ sudo mn --link tc,bw=10,delay=10ms
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2
*** Adding switches:
s1
*** Adding links:
(10,00Mbit 10ms delay) (10,00Mbit 10ms delay) (h1, s1) (10,00Mbit 10ms delay) (1
0,00Mbit 10ms delay) (h2, s1)
*** Configuring hosts
h1 h2
*** Starting controller
c0
*** Starting 1 switches
s1 ... (10,00Mbit 10ms delay) (10,00Mbit 10ms delay)
*** Starting CLI:
mininet>
```

18. Melakukan Ping all single

```
mininet@mininet-vm: ~
mininet@mininet-vm:~$ sudo mn --test pingall --topo single,3
*** Creating network
*** Adding controller

-----
Caught exception. Cleaning up...

Exception: Please shut down the controller which is running on port 6653:
Active Internet connections (servers and established)
tcp        0      0 0.0.0.0:6653          0.0.0.0:*             LISTEN     1575/controller
tcp        0      0 127.0.0.1:57332      127.0.0.1:6653        TIME_WAIT  -
tcp        0      0 127.0.0.1:57328      127.0.0.1:6653        ESTABLISHED 823/ovs-vsitchd
tcp        0      0 127.0.0.1:6653       127.0.0.1:57328      ESTABLISHED 1575/controller
-----

*** Removing excess controllers/ofprotocols/ofdatapaths/pings/noxes
killall controller ofprotocol ofdatapath ping nox_core lt-nox_core ovs-openflowd ovs-controller udpbwtest mnexec ivs 2> /dev/null
killall -9 controller ofprotocol ofdatapath ping nox_core lt-nox_core ovs-openflowd ovs-controller udpbwtest mnexec ivs 2> /dev/null
kill -9 -f "sudo mnexec"
*** Removing junk from /tmp
rm -f /tmp/vconn* /tmp/vlogs* /tmp/*.out /tmp/*.log
*** Removing old X11 tunnels
*** Removing excess kernel datapaths
ps ax | egrep -o 'dp[0-9]+' | sed 's/dp/nl:/'
*** Removing OVS datapaths
ovs-vsctl --timeout=1 list-br
ovs-vsctl --if-exists del-br s1
ovs-vsctl --timeout=1 list-br
*** Removing all links of the pattern foo-ethX
ip link show | egrep -o '([-.[:alnum:]]+-eth[[:digit:]]+)'
( ip link del s1-eth1; ip link del s1-eth2 ) 2> /dev/null
ip link show
*** Killing stale mininet node processes
kill -9 -f mininet:
*** Shutting down stale tunnels
kill -9 -f Tunnel=Ethernet
kill -9 -f .ssh/mn
rm -f ~/.ssh/mn/*
*** Cleanup complete.
mininet@mininet-vm:~$
```

19. Melakukan Ping all topo

```
mininet@mininet-vm: ~
mininet@mininet-vm:~$ sudo mn --test pingall --topo mytopo --custom ~/mininet/cu
stom/topo-2sw-2host.py
**** Creating network
**** Adding controller
**** Adding hosts:
h1 h2
**** Adding switches:
s3 s4
**** Adding links:
(h1, s3) (s3, s4) (s4, h2)
**** Configuring hosts
h1 h2
**** Starting controller
c0
**** Starting 2 switches
s3 s4 ...
**** Waiting for switches to connect
s3 s4
**** Ping: testing ping reachability
h1 -> h2
h2 -> h1
**** Results: 0% dropped (2/2 received)
**** Stopping 1 controllers
c0
**** Stopping 3 links
...
**** Stopping 2 switches
s3 s4
**** Stopping 2 hosts
h1 h2
**** Done
completed in 7.167 seconds
mininet@mininet-vm:~$
```

20. Membuat sebuah jaringan (create a network)

```
mininet@mininet-vm: ~
mininet@mininet-vm:~$ #Creating a Network
mininet@mininet-vm:~$ sudo mn --switch ovs --controller ref --topo tree,depth=2,
fanout=3 --test pingall
**** Creating network
**** Adding controller
**** Adding hosts:
h1 h2 h3 h4 h5 h6 h7 h8 h9
**** Adding switches:
s1 s2 s3 s4
**** Adding links:
(s1, s2) (s1, s3) (s1, s4) (s2, h1) (s2, h2) (s2, h3) (s3, h4) (s3, h5) (s3, h6)
(s4, h7) (s4, h8) (s4, h9)
**** Configuring hosts
h1 h2 h3 h4 h5 h6 h7 h8 h9
**** Starting controller
c0
**** Starting 4 switches
s1 s2 s3 s4 ...
**** Waiting for switches to connect
s4 s1 s2 s3
**** Ping: testing ping reachability
h1 -> h2 h3 h4 h5 h6 h7 h8 h9
h2 -> h1 h3 h4 h5 h6 h7 h8 h9
h3 -> h1 h2 h4 h5 h6 h7 h8 h9
h4 -> h1 h2 h3 h5 h6 h7 h8 h9
h5 -> h1 h2 h3 h4 h6 h7 h8 h9
h6 -> h1 h2 h3 h4 h5 h7 h8 h9
h7 -> h1 h2 h3 h4 h5 h6 h8 h9
h8 -> h1 h2 h3 h4 h5 h6 h7 h9
h9 -> h1 h2 h3 h4 h5 h6 h7 h8
**** Results: 0% dropped (72/72 received)
**** Stopping 1 controllers
c0
**** Stopping 12 links
*****
**** Stopping 4 switches
s1 s2 s3 s4
**** Stopping 9 hosts
h1 h2 h3 h4 h5 h6 h7 h8 h9
**** Done
completed in 21.451 seconds
mininet@mininet-vm:~$
```

21. Berinteraksi dengan sebuah jaringan (interacting with a network)

```
mininet@mininet-vm: ~
mininet@mininet-vm:~$ #interacting with a Network
mininet@mininet-vm:~$ sudo mn --link tc,bw=5,delay=10ms
**** Creating network
**** Adding controller
**** Adding hosts:
h1 h2
**** Adding switches:
s1
**** Adding links:
(5.00Mbit 10ms delay) (5.00Mbit 10ms delay) (h1, s1) (5.00Mbit 10ms delay) (5.00
Mbit 10ms delay) (h2, s1)
**** Configuring hosts
h1 h2
**** Starting controller
c0
**** Starting 1 switches
s1 ... (5.00Mbit 10ms delay) (5.00Mbit 10ms delay)
**** Starting CLI:
mininet> h1 ping h2
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=106 ms
64 bytes from 10.0.0.2: icmp_seq=2 ttl=64 time=48.1 ms
64 bytes from 10.0.0.2: icmp_seq=3 ttl=64 time=44.0 ms
64 bytes from 10.0.0.2: icmp_seq=4 ttl=64 time=44.7 ms
64 bytes from 10.0.0.2: icmp_seq=5 ttl=64 time=44.2 ms
64 bytes from 10.0.0.2: icmp_seq=6 ttl=64 time=43.0 ms
64 bytes from 10.0.0.2: icmp_seq=7 ttl=64 time=45.7 ms
64 bytes from 10.0.0.2: icmp_seq=8 ttl=64 time=43.5 ms
64 bytes from 10.0.0.2: icmp_seq=9 ttl=64 time=42.8 ms
64 bytes from 10.0.0.2: icmp_seq=10 ttl=64 time=43.1 ms
64 bytes from 10.0.0.2: icmp_seq=11 ttl=64 time=44.1 ms
64 bytes from 10.0.0.2: icmp_seq=12 ttl=64 time=42.1 ms
64 bytes from 10.0.0.2: icmp_seq=13 ttl=64 time=41.1 ms
64 bytes from 10.0.0.2: icmp_seq=14 ttl=64 time=43.8 ms
64 bytes from 10.0.0.2: icmp_seq=15 ttl=64 time=44.7 ms
64 bytes from 10.0.0.2: icmp_seq=16 ttl=64 time=42.1 ms
64 bytes from 10.0.0.2: icmp_seq=17 ttl=64 time=45.1 ms
64 bytes from 10.0.0.2: icmp_seq=18 ttl=64 time=43.2 ms
64 bytes from 10.0.0.2: icmp_seq=19 ttl=64 time=42.2 ms
64 bytes from 10.0.0.2: icmp_seq=20 ttl=64 time=42.6 ms
64 bytes from 10.0.0.2: icmp_seq=21 ttl=64 time=44.8 ms
64 bytes from 10.0.0.2: icmp_seq=22 ttl=64 time=43.8 ms
64 bytes from 10.0.0.2: icmp_seq=23 ttl=64 time=42.9 ms
64 bytes from 10.0.0.2: icmp_seq=24 ttl=64 time=43.2 ms
64 bytes from 10.0.0.2: icmp_seq=25 ttl=64 time=44.2 ms
64 bytes from 10.0.0.2: icmp_seq=26 ttl=64 time=44.4 ms
64 bytes from 10.0.0.2: icmp_seq=27 ttl=64 time=42.4 ms
64 bytes from 10.0.0.2: icmp_seq=28 ttl=64 time=42.1 ms
64 bytes from 10.0.0.2: icmp_seq=29 ttl=64 time=42.7 ms
64 bytes from 10.0.0.2: icmp_seq=30 ttl=64 time=44.8 ms
64 bytes from 10.0.0.2: icmp_seq=31 ttl=64 time=45.8 ms
64 bytes from 10.0.0.2: icmp_seq=32 ttl=64 time=40.9 ms
64 bytes from 10.0.0.2: icmp_seq=33 ttl=64 time=41.6 ms
```