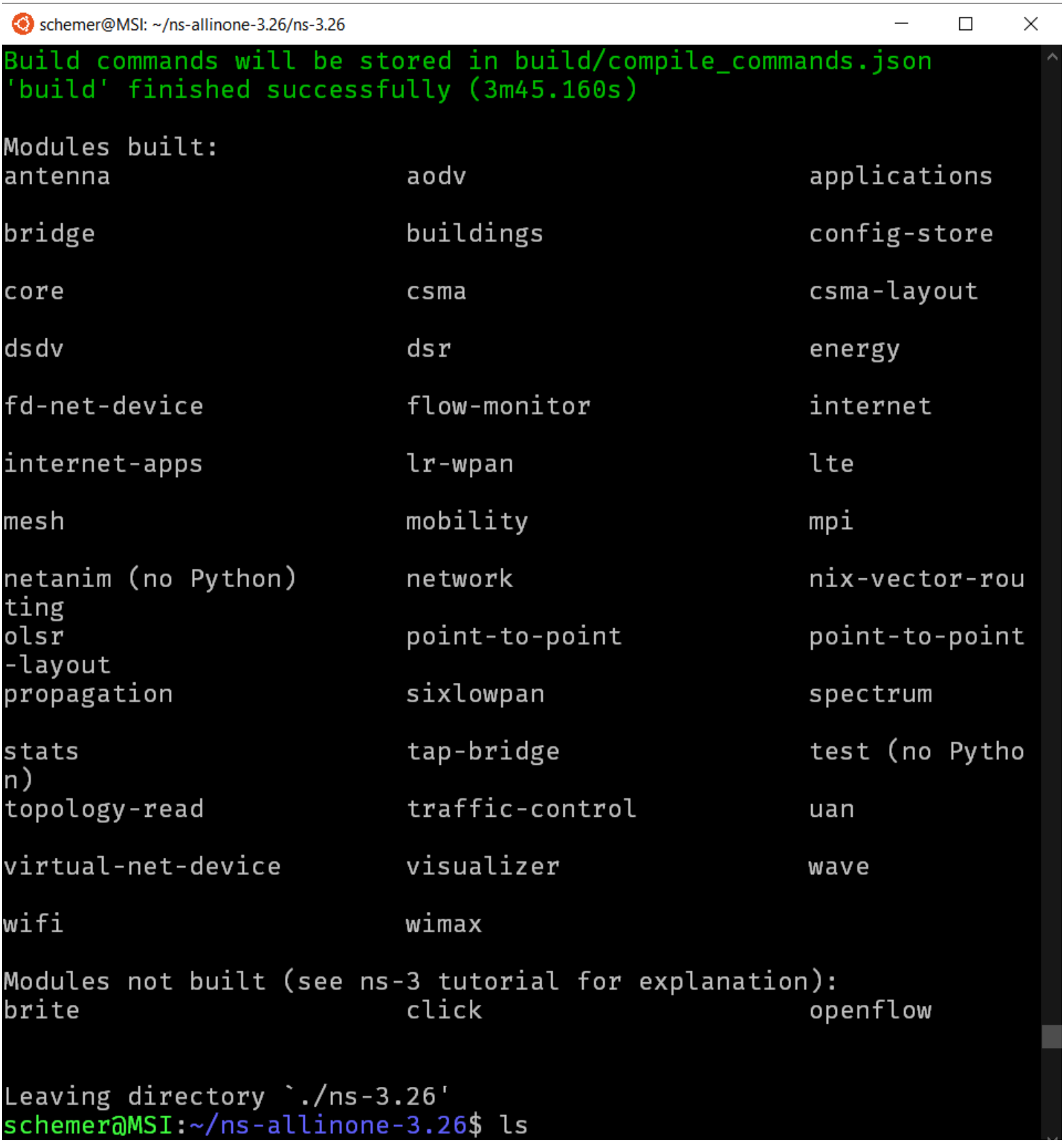
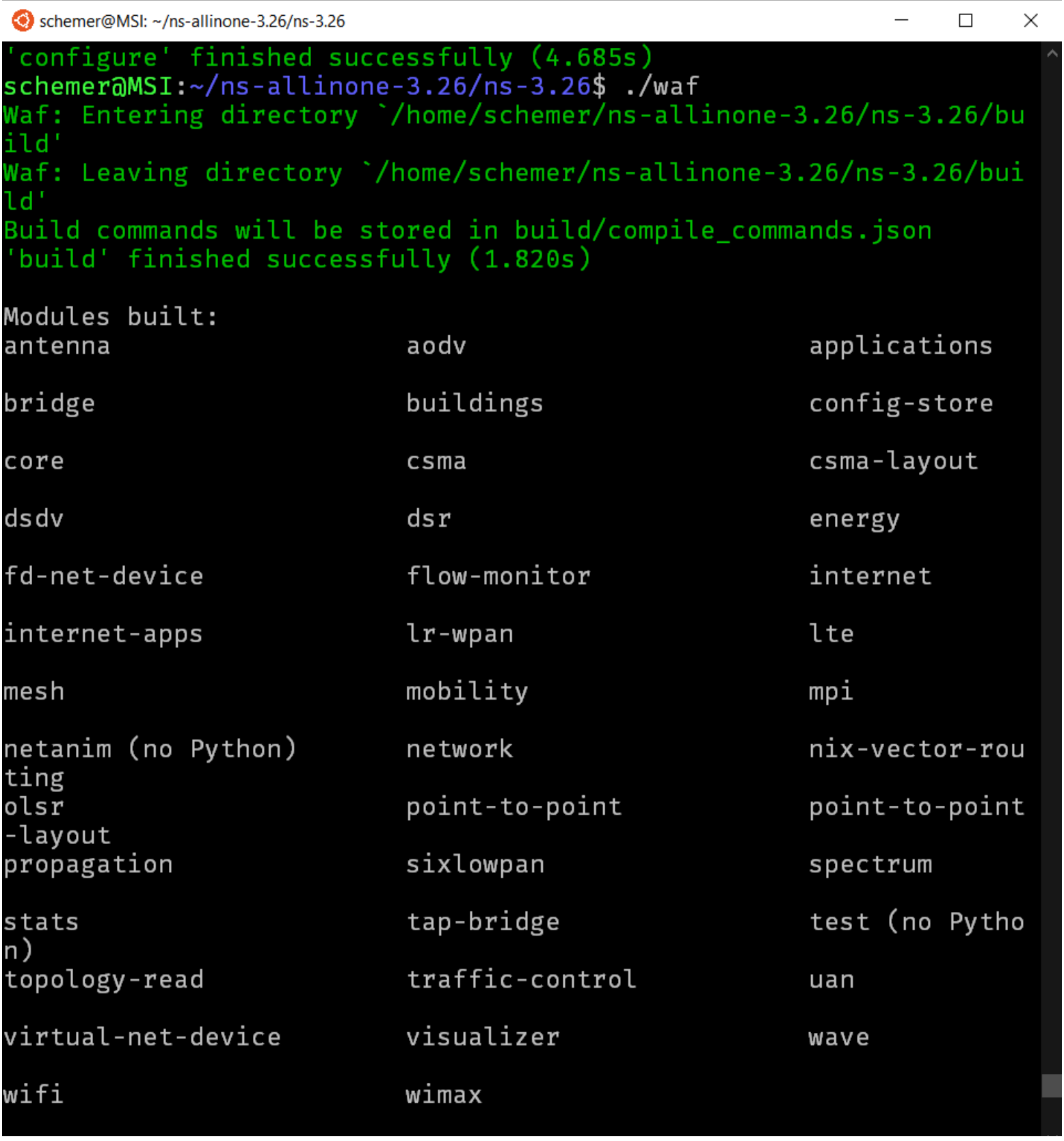
Lab 1-1

NS-3 3.26 in Ubuntu 16.04 安裝設定成功，截圖如下：

步驟三



步驟四

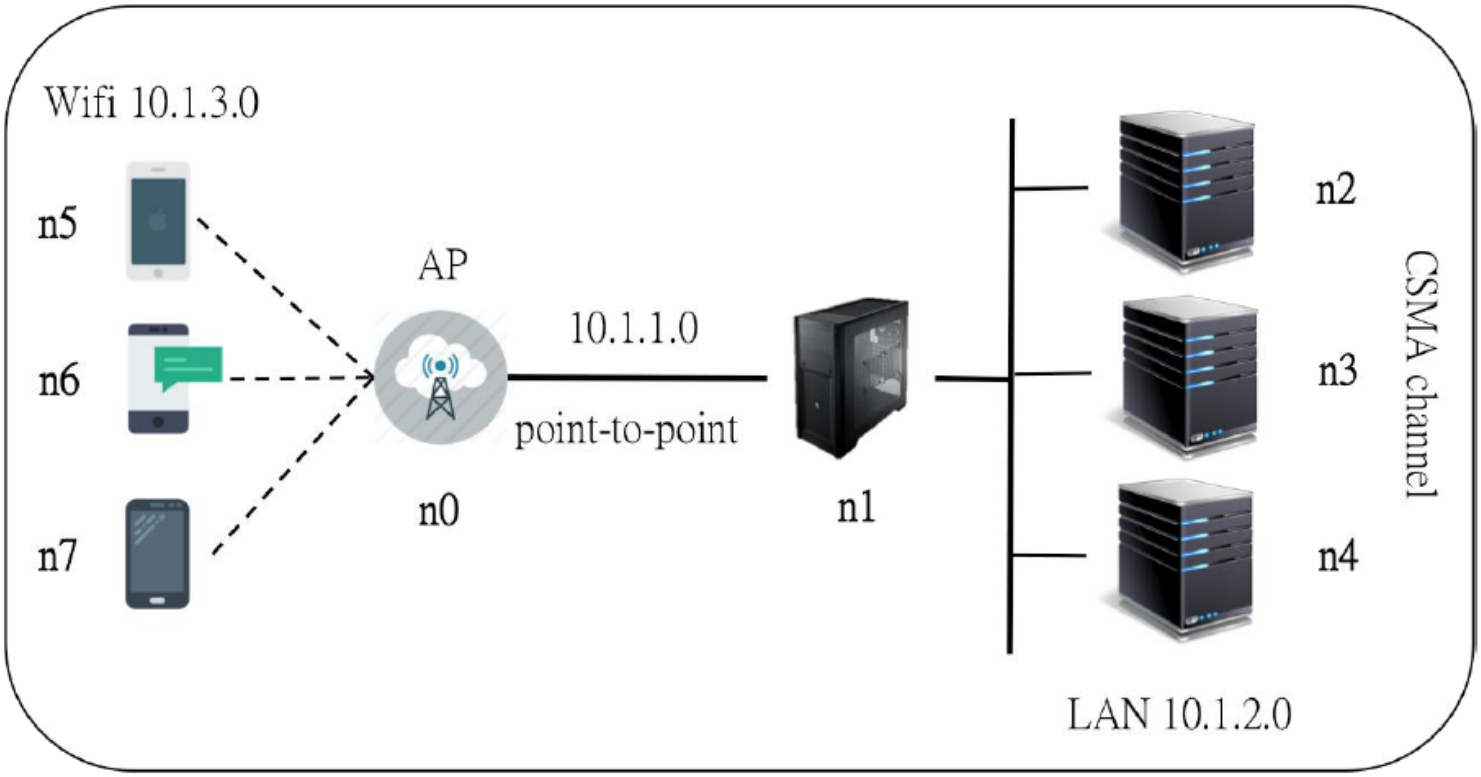

schemer@MSI: ~/ns-allinone-3.26/ns-3.26
'configure' finished successfully (4.685s)
schemer@MSI:~/ns-allinone-3.26/ns-3.26$ ./waf
Waf: Entering directory `/home/schemer/ns-allinone-3.26/ns-3.26/build'
Waf: Leaving directory `/home/schemer/ns-allinone-3.26/ns-3.26/build'
Build commands will be stored in build/compile_commands.json
'build' finished successfully (1.820s)
Modules built:
antenna aodv applications
bridge buildings config-store
core csma csma-layout
dsdv dsr energy
fd-net-device flow-monitor internet
internet-apps lr-wpan lte
mesh mobility mpi
netanim (no Python) network nix-vector-routing
olsr point-to-point point-to-point-layout
propagation sixlowpan spectrum
stats tap-bridge test (no Python)
topology-read traffic-control uan
virtual-net-device visualizer wave
wifi wimax

步驟五

```
PASS: TestSuite devices-mesh-flame-regression
PASS: TestSuite fq-codel-queue-disc
SKIP: TestSuite ns3-tcp-cwnd
SKIP: TestSuite ns3-tcp-interoperability
PASS: TestSuite pfifo-fast-queue-disc
PASS: TestSuite ns3-tcp-no-delay
PASS: TestSuite devices-mesh-dot11s-regression
PASS: TestSuite ns3-tcp-socket
SKIP: TestSuite nsc-tcp-loss
PASS: TestSuite ns3-tcp-state
PASS: TestSuite ns3-wifi-interference
PASS: TestSuite csma-system
PASS: TestSuite ns3-wifi-ac-mapping
PASS: TestSuite traced-callback-typedef
PASS: TestSuite traced-value-callback
PASS: TestSuite adaptive-red-queue-disc
PASS: TestSuite aodv-routing-id-cache
PASS: TestSuite ns3-wifi-msdu-aggregator
PASS: TestSuite pie-queue-disc
PASS: TestSuite ns3-tcp-loss
PASS: TestSuite routing-aodv
PASS: TestSuite routing-aodv-loopback
PASS: TestSuite routing-aodv-regression
PASS: TestSuite lte-test-deactivate-bearer
PASS: TestSuite lte-ue-measurements-piecewise-2
PASS: TestSuite lte-interference-fr
PASS: TestSuite lte-cqi-generation
PASS: TestSuite lte-x2-handover-measures
PASS: TestSuite lte-frequency-reuse
229 of 233 tests passed (229 passed, 3 skipped, 1 failed, 0 crashe
d, 0 valgrind errors)
List of SKIPped tests:
    ns3-tcp-cwnd
    ns3-tcp-interoperability
    nsc-tcp-loss
List of FAILed tests:
    int64x64
```

Lab 1-2

拓樸圖



third.cc script拓撲示意圖

操作結果

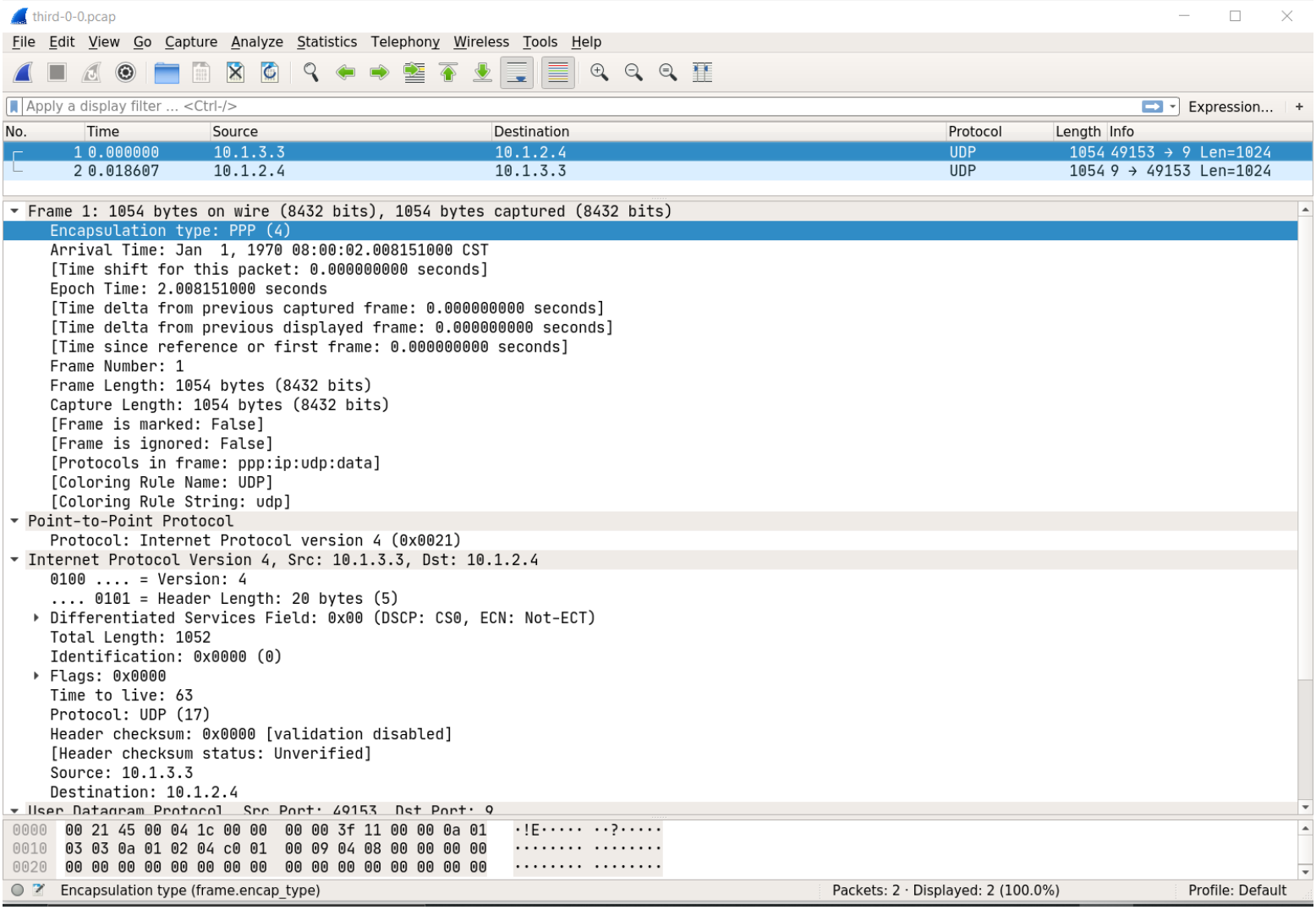
執行 third.cc 之後，會產生四個 pcap 檔：

1. third-0-0.pcap
2. third-0-1.pcap
3. third-1-0.pcap
4. third-1-1.pcap

用 Wireshark 開啟後，其說明與截圖如下：

third-0-0.pcap

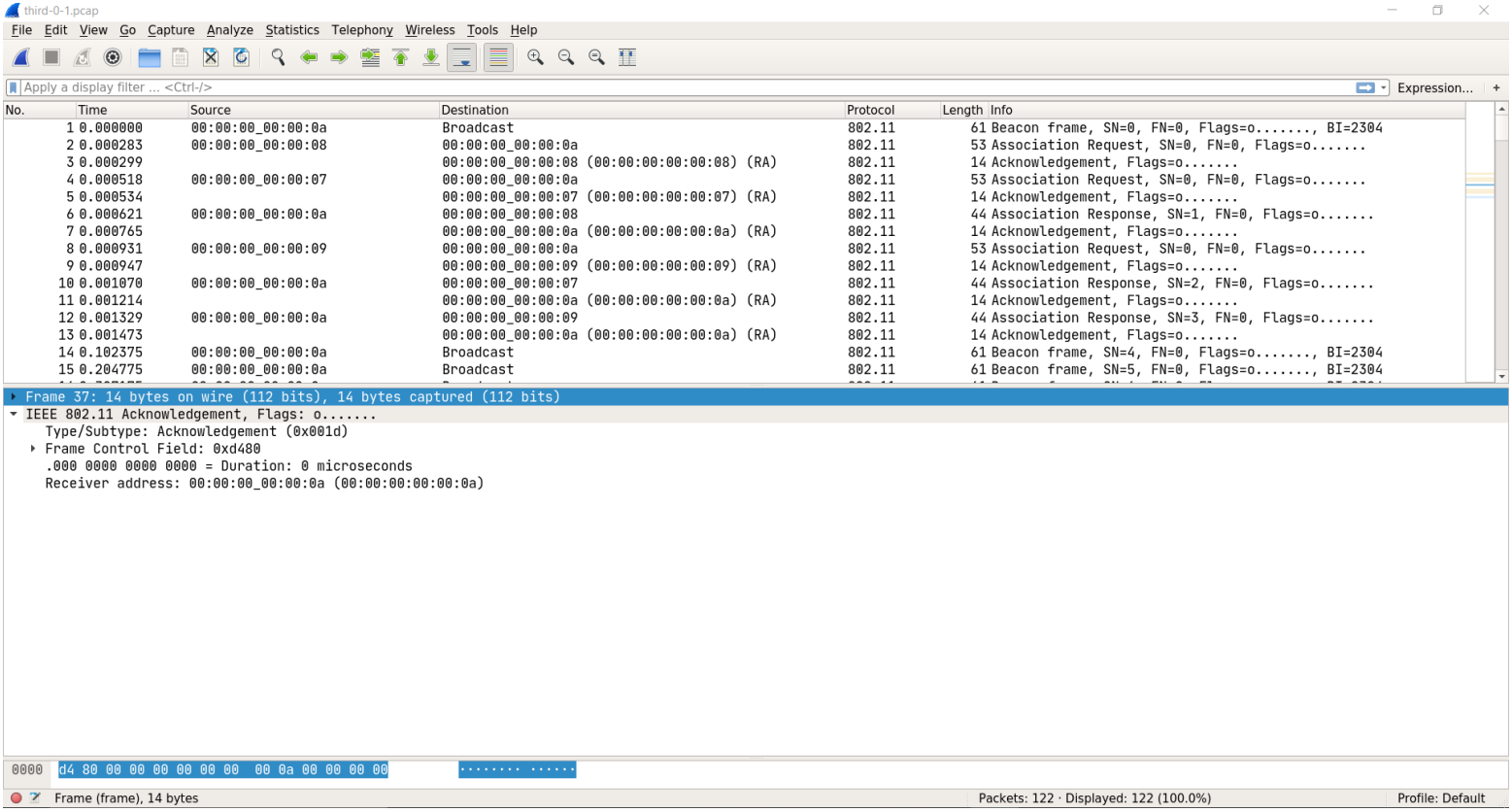
這是 n0 <-> n1 之間的 echo 連線：



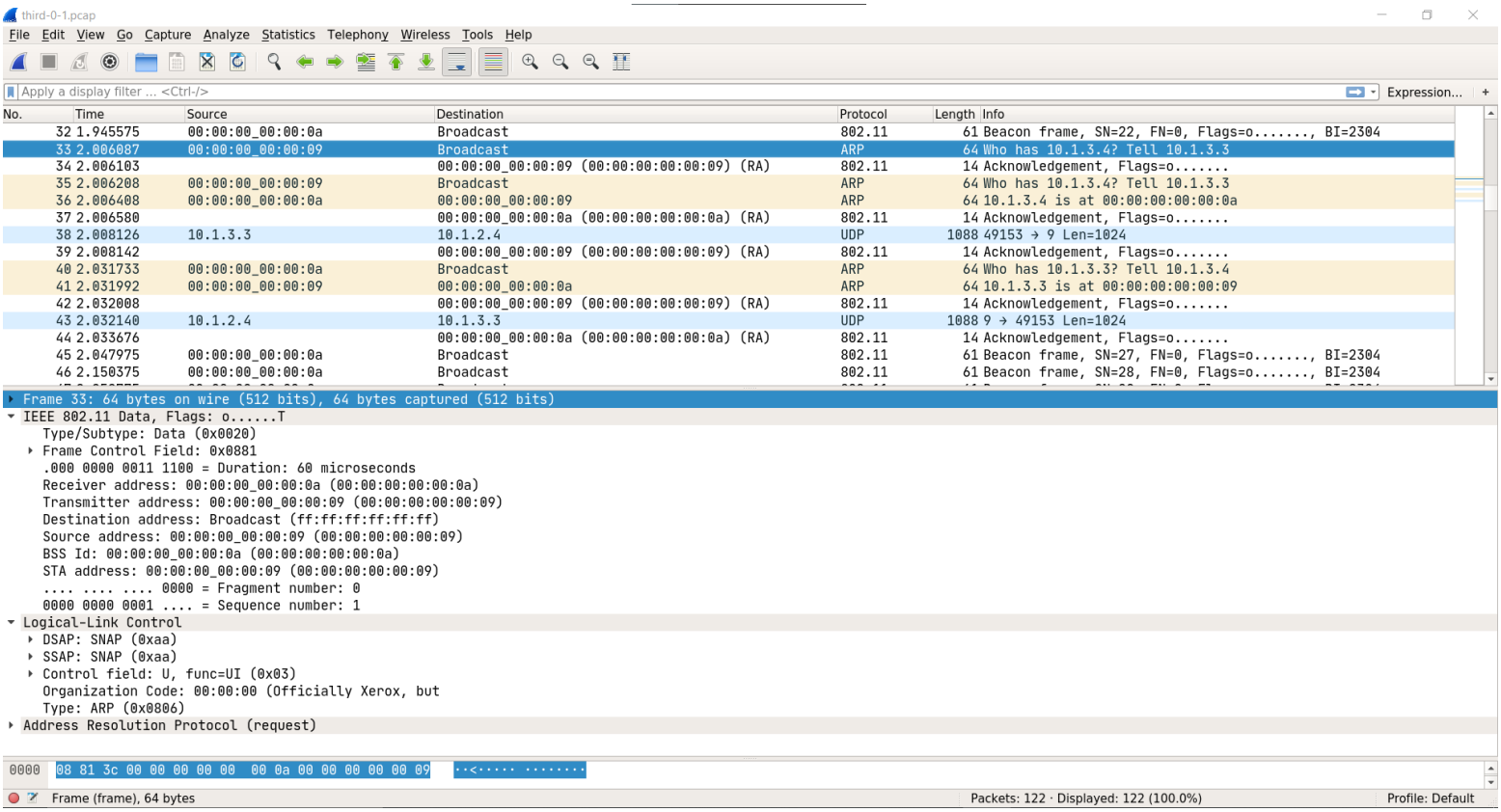
third-0-1.pcap

這是 [n5, n6, n7] <-> n0 之間，n0 做 broadcast，其中一個發訊號找尋其他 WiFi device

第一段

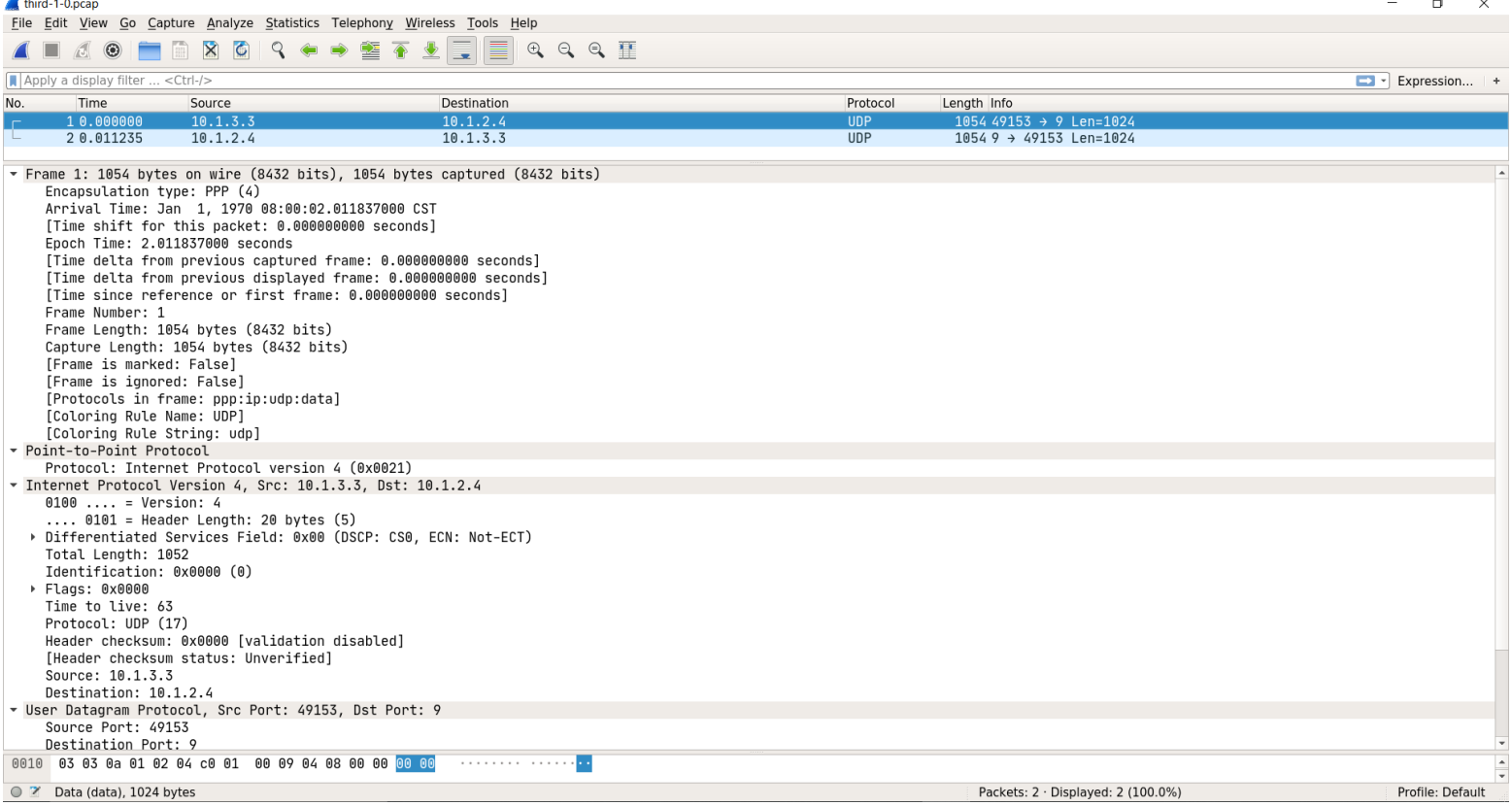


第二段



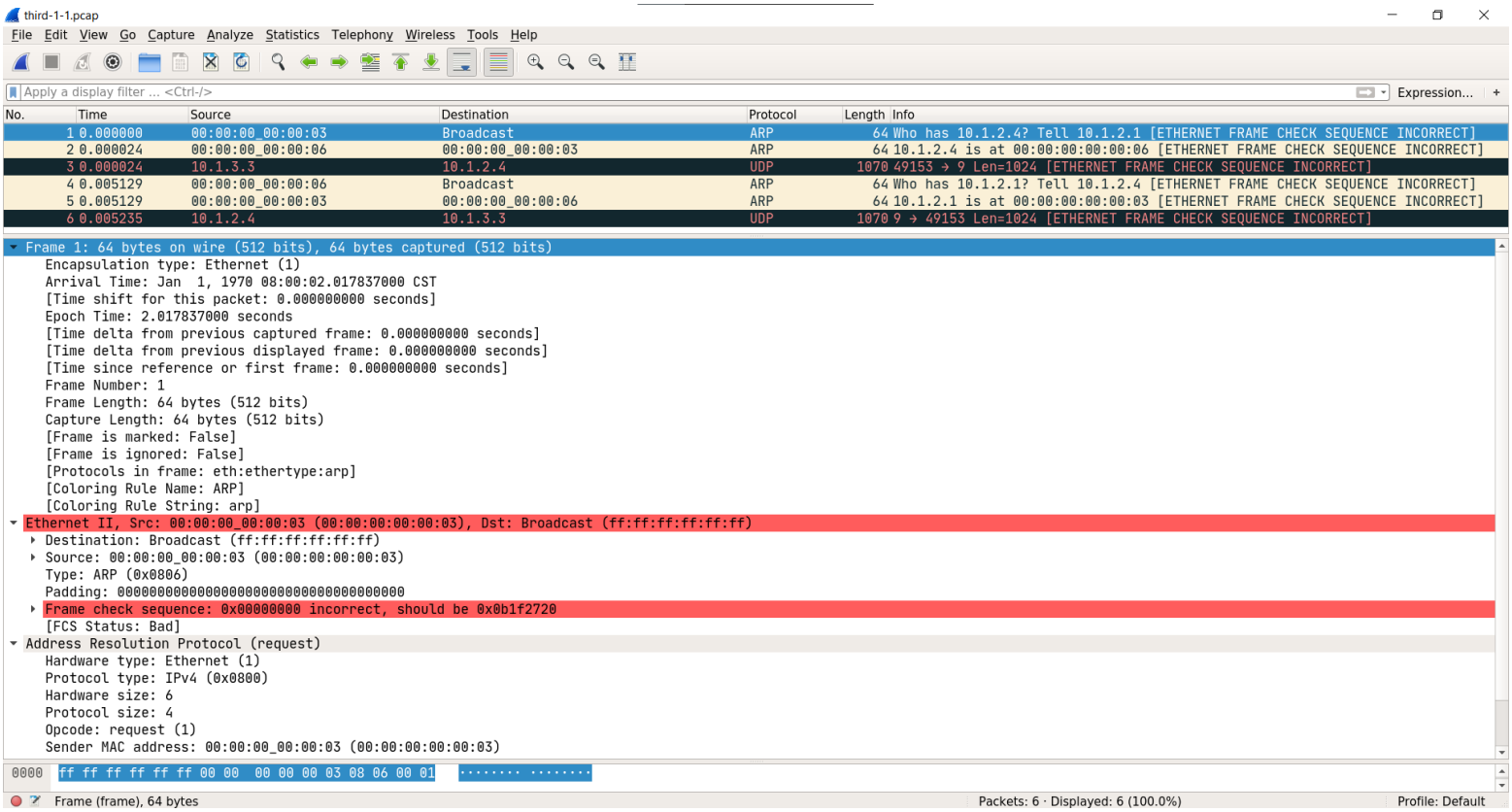
third-1-0.pcap

在上一動作裡，WiFi 裝置找到彼此後，彼此 echo



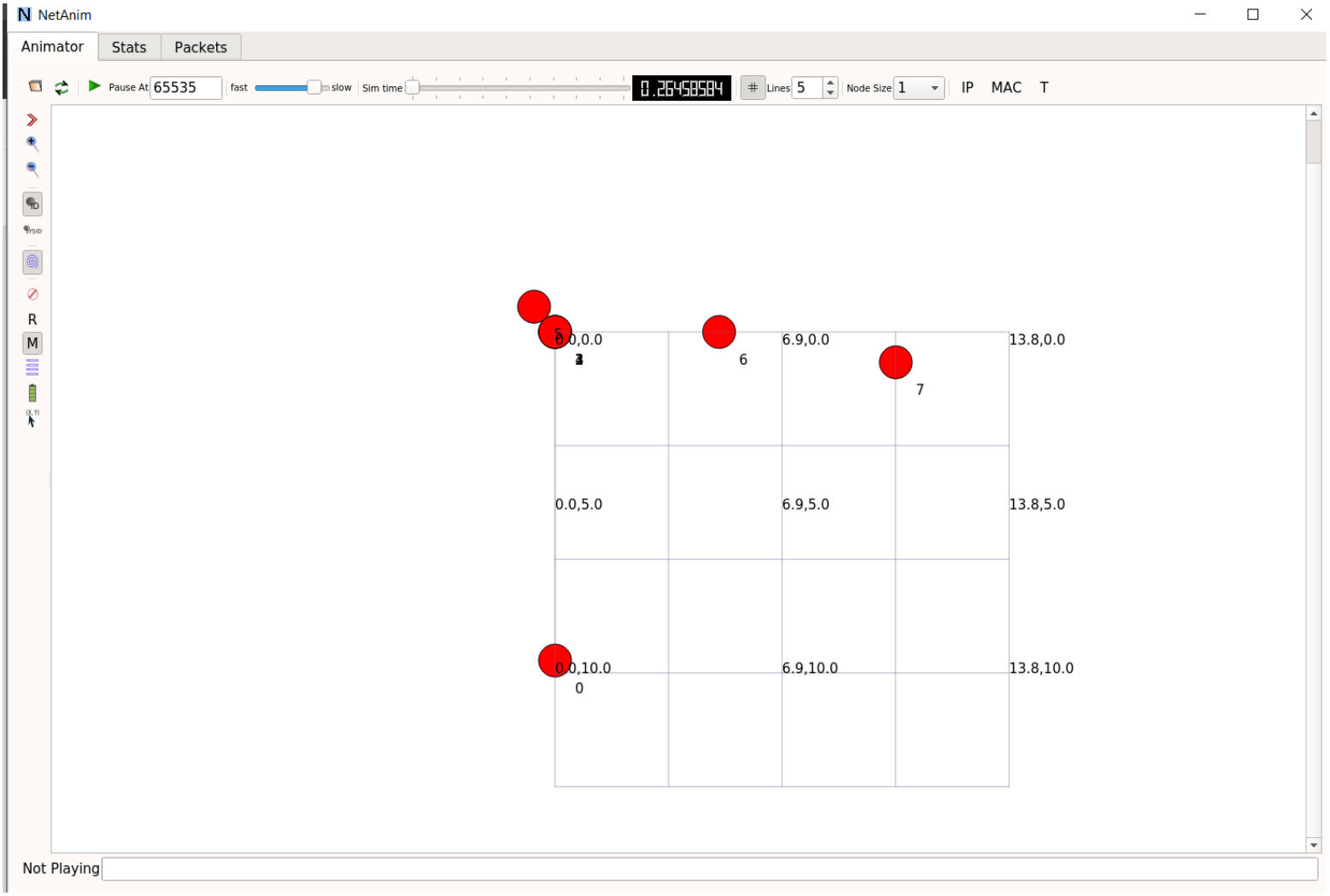
third-1-1.pcap

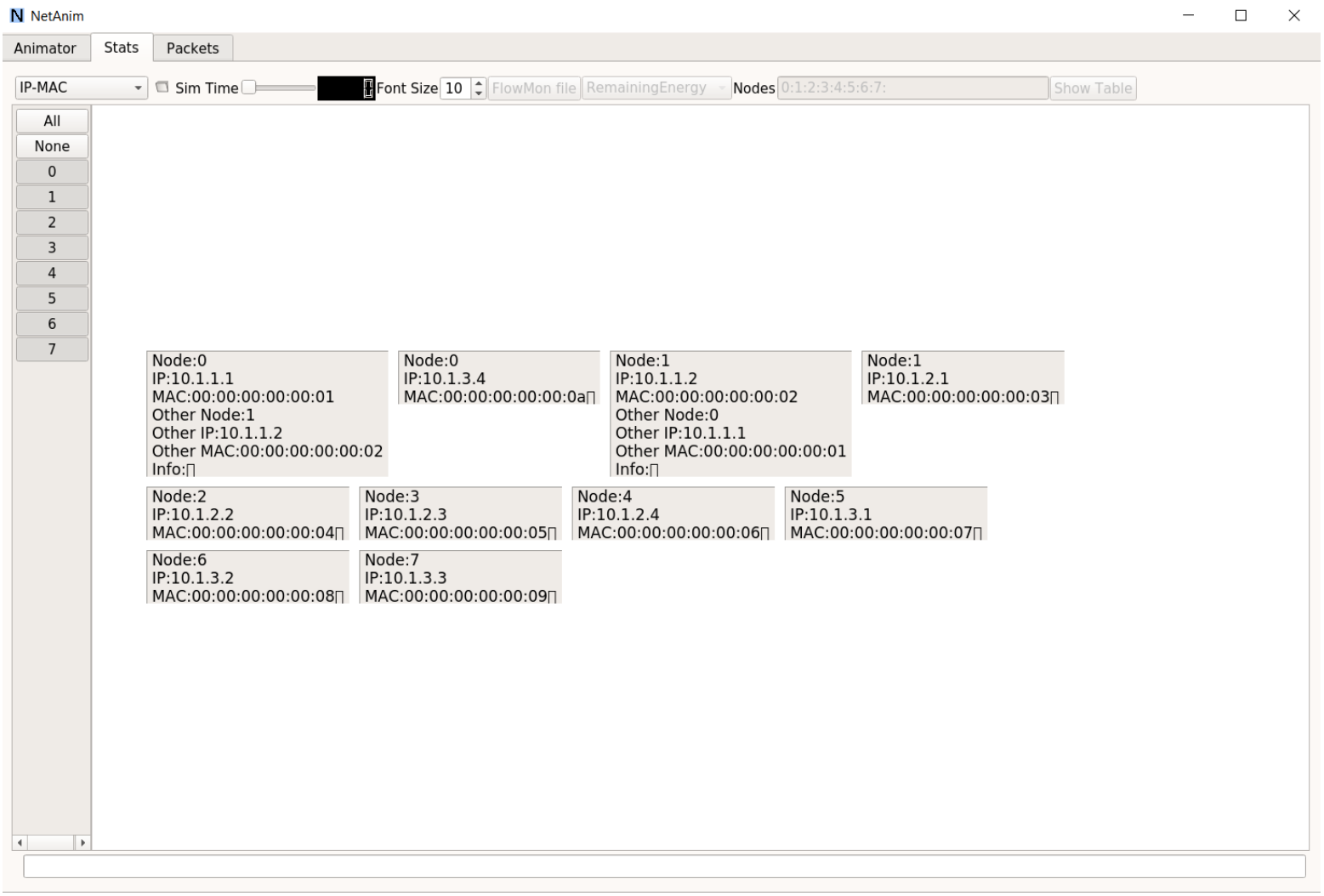
這是另一邊，CSMA station 之間互相查找對方的動作

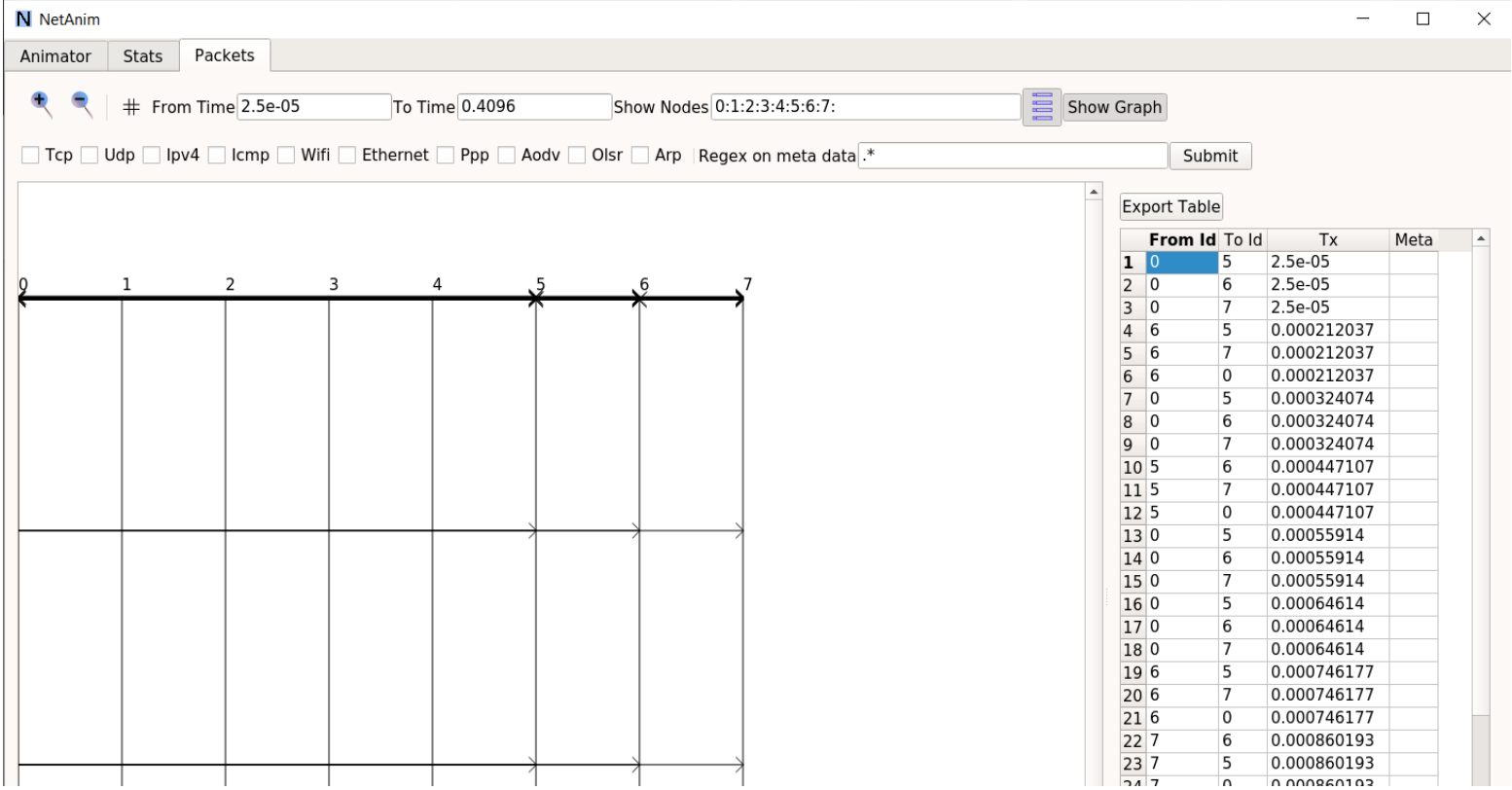


Lab 1-3

執行 NetAnim 結果如下：




NetAnim
Animator
Stats
Packets
IP-MAC
Sim Time
Font Size
10
FlowMon file
RemainingEnergy
Nodes
0:1:2:3:4:5:6:7:
Show Table
All
None
0
1
2
3
4
5
6
7
Node:0
IP:10.1.1.1
MAC:00:00:00:00:00:01
Other Node:1
Other IP:10.1.1.2
Other MAC:00:00:00:00:00:02
Info:
Node:0
IP:10.1.3.4
MAC:00:00:00:00:00:0a
Node:1
IP:10.1.1.2
MAC:00:00:00:00:00:02
Other Node:0
Other IP:10.1.1.1
Other MAC:00:00:00:00:00:01
Info:
Node:1
IP:10.1.2.1
MAC:00:00:00:00:00:03
Node:2
IP:10.1.2.2
MAC:00:00:00:00:00:04
Node:3
IP:10.1.2.3
MAC:00:00:00:00:00:05
Node:4
IP:10.1.2.4
MAC:00:00:00:00:00:06
Node:5
IP:10.1.3.1
MAC:00:00:00:00:00:07
Node:6
IP:10.1.3.2
MAC:00:00:00:00:00:08
Node:7
IP:10.1.3.3
MAC:00:00:00:00:00:09



	From Id	To Id	Tx	Meta
1	0	5	2.5e-05	
2	0	6	2.5e-05	
3	0	7	2.5e-05	
4	6	5	0.000212037	
5	6	7	0.000212037	
6	6	0	0.000212037	
7	0	5	0.000324074	
8	0	6	0.000324074	
9	0	7	0.000324074	
10	5	6	0.000447107	
11	5	7	0.000447107	
12	5	0	0.000447107	
13	0	5	0.00055914	
14	0	6	0.00055914	
15	0	7	0.00055914	
16	0	5	0.00064614	
17	0	6	0.00064614	
18	0	7	0.00064614	
19	6	5	0.000746177	
20	6	7	0.000746177	
21	6	0	0.000746177	
22	7	6	0.000860193	
23	7	5	0.000860193	

Lab 1-4

1. 試根據模擬及 NetAnim 的結果敘述此模擬過程做了哪些事

2. 請問此模擬適合對應 5G 三大服務場景 (URLLC/mMTC/eMBB) 的何者

從以下的這段設定中，可以推測這是 eMBB 的場景

```
// Create the Internet
  PointToPointHelper p2ph;
  p2ph.SetDeviceAttribute("DataRate", DataRateValue(DataRate("100Gb/s")));
  p2ph.SetDeviceAttribute("Mtu", UintegerValue(1500));
  p2ph.SetChannelAttribute("Delay", TimeValue(Seconds(0.010)));
```

因

1. data rate 目標為 100Gbps
2. 可容許的 delay (latency) 為 10ms (非 URLLC)
3. 實際執行時，只有 75 個 UE，遠不及 mMTC 的場景

3. 請問此模擬之程式碼中如何增加使用者數量

```
Config::SetDefault("ns3::LteEnbRrc::SrsPeriodicity",
                   UintegerValue(320)); //讓ue可以增加很多
```

4. 試觀察此模擬產生之 txt 檔，敘述模擬可能有的問題，及相對應可能的解決方法