NET3720 - Fall 2021 – Jenkins

Lab 6 – Rate Vs. Range

Erika Hernandez

Lab Objectives:

- Connect (2) Cisco AP's and find the Rate Vs. Range

Hardware needed:
- (2) Cisco Aironet 3700 AP
- (2) ZYCEL PoE Switch
- (1) USB to RS232 cable
- Computer 1 – Console
-

Software:
- Console application
  - PuTTY http://the.earth.li/~sgtatham/putty/latest/x86/putty.exe
  - Instructions on how to download PuTTY
    - https://www.weber.edu/CS/remote-access.html

Instructions:
In this lab you will learn how to configure a Cisco AP unit using the CLI. You will connect Cisco AP 1 to computer 1 and then configure the range and rate between both AP's

Method:
Power up two ZYXEL switches, and open up lab 5 commands after that. Open up PuTTY and click on **Serial** then type **/dev/ttyUSB0** and then open.
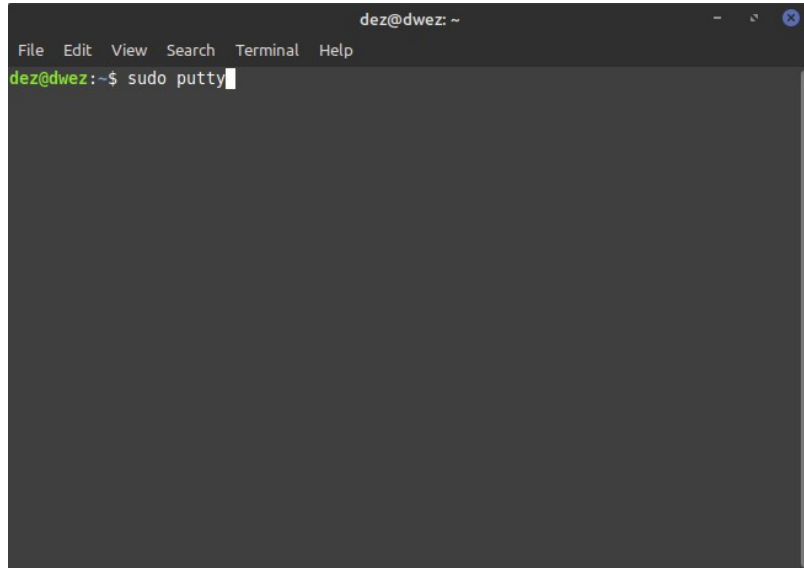
Connections:
Get a cat6 cable connect to the **ZYXEL switch**, Do this twice to both switches. Get your console computer and connect the USB to RS232 to your computer. Connect a bridge between both AP's. So make sure your AP's are connected to their own switch.

Turn on the **ZYXEL swtich** on, and make sure the USB is plugged in and make sure the computer pickups the USB.
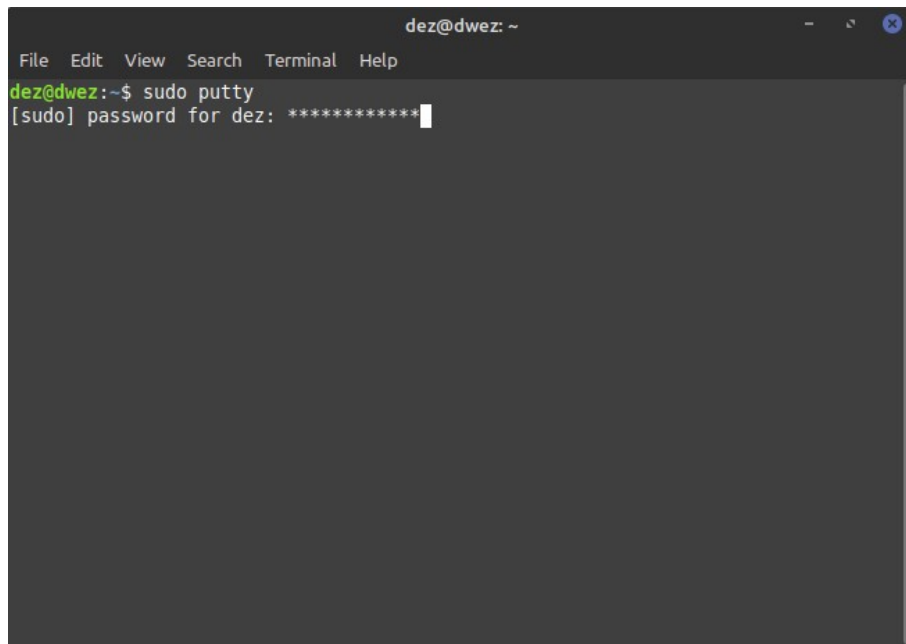
Open up you Linux **Terminal**

Type **sudo putty** in Terminal

Figure 1: Terminal - sudo putty

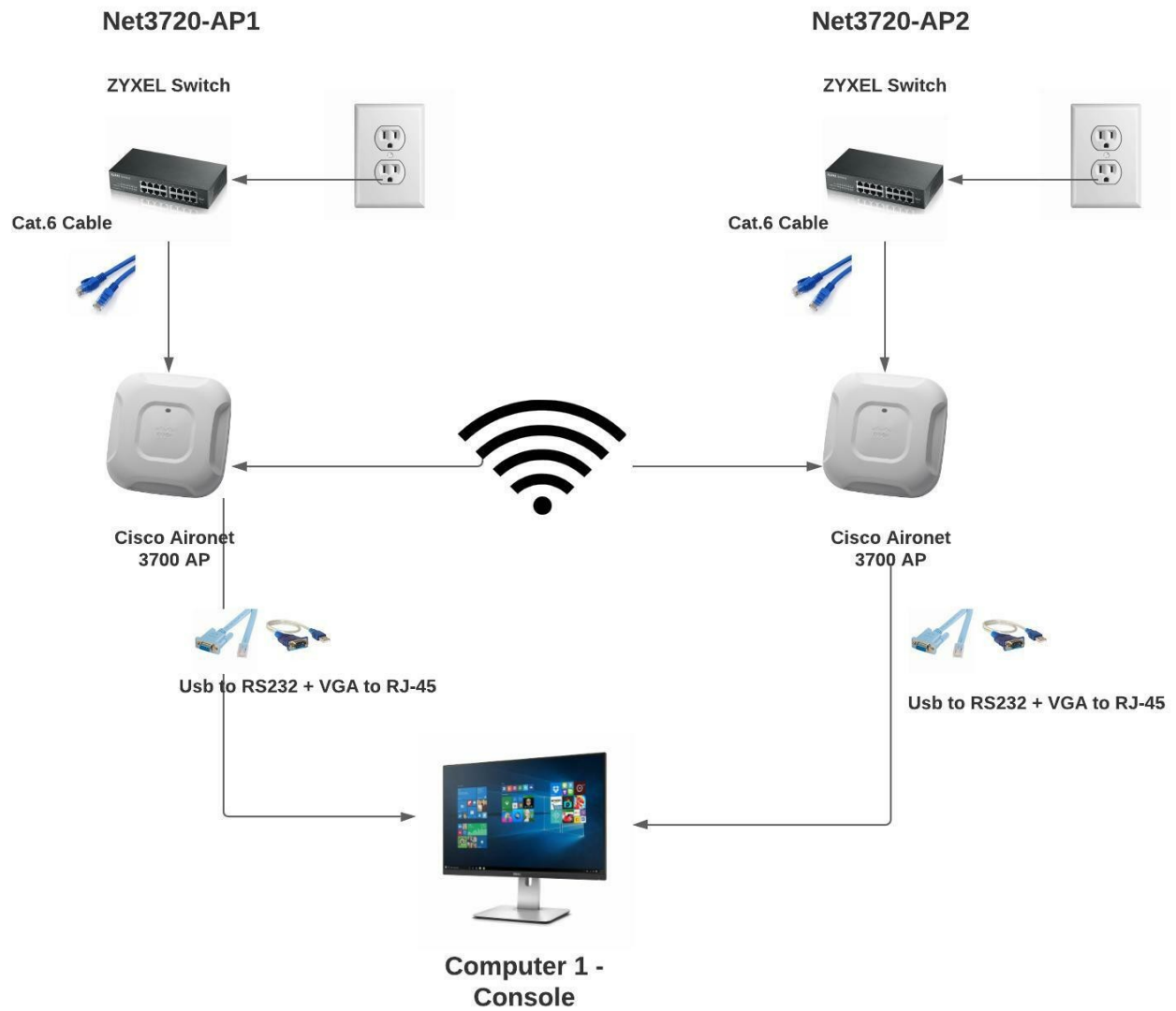Type your **password** ----

Figure 2: Type password

Net3720-AP1

ZYXEL Switch

Cat.6 Cable

Cisco Aironet 3700 AP

Usb to RS232 + VGA to RJ-45

Net3720-AP2

ZYXEL Switch

Cat.6 Cable

Cisco Aironet 3700 AP

Usb to RS232 + VGA to RJ-45

Computer 1 - Console

Figure 3: Network layout

After your putty should open up.
Serial Line – Location should be open
Speed – 9600

Figure 4: PuTTY - Make sure these are the same
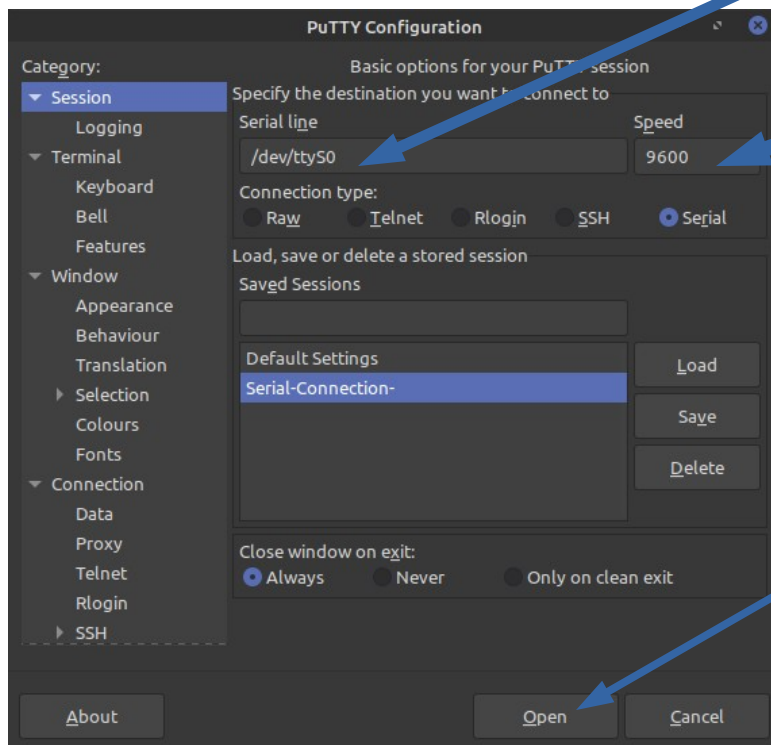
Setup 1 – This is the first part of this process. Input the

AP1 Configuration

Following commands:

ap> enable
Password: Cisco
ap# show running-config

(See if anything is configure- Move on if ok)

ap# hostname net3720-ap1

ap# config-term

net3720-ap1(config)#dot11 ssid net3720-Hernandez-bridge

net3720-ap1(config-ssid)#authentication open

net3720-ap1(config-ssid)#authentication key-management wpa version

net3720-ap1(config-ssid)#wpa-psk ascii 0 8012592236 (NOTE: This is a password and needs to be a
number)

net3720-ap1(config-ssid)#interface Dot11Radio1

net3720-ap1(config-if)#encryption mode ciphers aes-ccm

net3720-ap1(config-if)#ssid net3720-Hernandez-bridge

net3720-ap1(config-if)#channel 165

net3720-ap1(config-if)#station-role root bridge

net3720-ap1(config-if)#no shut

net3720-ap1(config)#interface BVI 1

net3720-ap1(config-if)#ip address 10.1.1.1 255.255.255.0 (NOTE: I picked 10.1.1.1)

AP2 Configuration

Setup 2 – Unplug Console cable from the Cisco AP 1 and plug into Cisco AP 2. Make sure switch 2 is powered up.

Input the following commands:

ap>enable
Password: Cisco

ap(config)#hostname net3720-ap2

net3720-ap2(config)#dot11 ssid net3720-Hernandez-bridge

net3720-ap2(config-ssid)#authentication open

net3720-ap2(config-ssid)#authentication key-management wpa version 2

net3720-ap2(config-ssid)#wpa-psk ascii 0 8012592236

net3720-ap2(config-ssid)#interface Dot11Radio1

net3720-ap2(config-if)#encryption mode ciphers aes-ccm

net3720-ap2(config-if)#ssid net3720-Hernandez-bridge

net3720-ap2(config-if)#channel 165

net3720-ap2(config-if)#station-role non-root bridge

net3720-ap2(config-if)#no shut

Net3720-ap2(config)#interface BVI1

Net3720-ap2(config-if)#ip address 10.1.1.1 255.255.255.0

Capturing the packet rates

We are now going to do 4 different test and see how we are able to get the rates of each packets. From on top each other. 10 ft away, 20 ft away and over 30 ft away.

Input the following commands after each attempt:
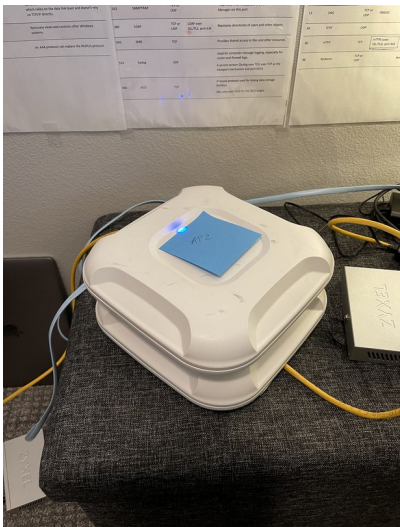
net3720-ap1# clear counters dot11radio 1

net3720-ap1#ping ip 10.1.1.2 size 18024 repeat 60000

net3720-ap1# show dot11 associations all-client

net3720-ap1#show controllers dot11Radio 1 radio-stats

Attempt 1: AP's stacked on top of each other with AP1

The following input will be the packet rates of the AP's when they are stacked on top of each other

Figure 5: AP's stacked on top of each other- Blue light means they are communicating

Figure 6: Phase 1- Rates print out

```
                              /dev/ttyUSB0 - PuTTY                          _  ⌐  ⊗

RATE a5.1-2
Rx Packets:              2041 / 0     Tx Packets:             86 / 0
Rx Bytes:             3030044 / 0     Tx Bytes:           122398 / 0
RTS Retries:               0 / 0      Data Retries:          333 / 0

RATE a7.1-2
Rx Packets:                 2 / 0     Tx Packets:              0 / 0
Rx Bytes:                 382 / 0     Tx Bytes:                0 / 0
RTS Retries:                0 / 0     Data Retries:            0 / 0

RATE a3.2-2
Rx Packets:                 0 / 0     Tx Packets:            213 / 0
Rx Bytes:                   0 / 0     Tx Bytes:           321204 / 0
RTS Retries:                0 / 0     Data Retries:          639 / 0

RATE a4.2-2
Rx Packets:                 1 / 0     Tx Packets:              1 / 0
Rx Bytes:                  50 / 0     Tx Bytes:               50 / 0
RTS Retries:                0 / 0     Data Retries:            0 / 0

RATE a5.2-2
Rx Packets:              4786 / 0     Tx Packets:           1068 / 0
Rx Bytes:             6939642 / 0     Tx Bytes:          1599768 / 0
RTS Retries:                0 / 0     Data Retries:         3194 / 0

RATE a7.2-2
Rx Packets:                 1 / 0     Tx Packets:              1 / 0
Rx Bytes:                  50 / 0     Tx Bytes:               50 / 0
RTS Retries:                0 / 0     Data Retries:            0 / 0

RATE a8.2-2
Rx Packets:                 0 / 0     Tx Packets:              6 / 0
Rx Bytes:                   0 / 0     Tx Bytes:             9048 / 0
RTS Retries:                0 / 0     Data Retries:            0 / 0

RATE a3.3-2
Rx Packets:                 1 / 0     Tx Packets:              1 / 0
Rx Bytes:                  50 / 0     Tx Bytes:               50 / 0
RTS Retries:                0 / 0     Data Retries:            0 / 0

RATE a4.3-2
Rx Packets:                 1 / 0     Tx Packets:            133 / 0
Rx Bytes:                  50 / 0     Tx Bytes:           195398 / 0
RTS Retries:                0 / 0     Data Retries:          264 / 0

RATE a5.3-2
Rx Packets:               601 / 0     Tx Packets:            367 / 1
Rx Bytes:              863896 / 0     Tx Bytes:           489648 / 50
RTS Retries:                0 / 0     Data Retries:          726 / 2

RATE a6.3-2
Rx Packets:                 0 / 0     Tx Packets:             17 / 0
Rx Bytes:                   0 / 0     Tx Bytes:            19238 / 0
RTS Retries:                0 / 0     Data Retries:            4 / 0

RATE a7.3-2
Rx Packets:                22 / 0     Tx Packets:          95091 / 0
Rx Bytes:               30260 / 0     Tx Bytes:        134322187 / 0
RTS Retries:                0 / 0     Data Retries:         9357 / 0

RATE a8.3-2
Rx Packets:            679011 / 0     Tx Packets:         460700 / 0
Rx Bytes:           959205476 / 0     Tx Bytes:        650792797 / 0
RTS Retries:                0 / 0     Data Retries:        44051 / 0

RATE a9.3-2
Rx Packets:             93933 / 4     Tx Packets:         222624 / 3
Rx Bytes:          132101220 / 200    Tx Bytes:        314190428 / 150
RTS Retries:                0 / 0     Data Retries:         4131 / 0

net3720-ap1#
```

Figure 7: Continuing with Phase 1

net3720-ap1# clear counters dot11radio 1

net3720-ap1#ping ip 10.1.1.2 size 18024 repeat 60000

net3720-ap1# show dot11 associations all-client

net3720-ap1#show controllers dot11Radio 1 radio-stats

Attempt 2: 10 feet away with AP1

Run the commands above and we will run the attempt from 10 feet away.

Figure 8: Show dot11 associations all-client print out

Figure 9: Phase 2 - AP's 10 feet away

```
net3720-ap1#show controllers dot11Radio 1 radio-stats
        DOT11 Statistics (Cumulative Total/Last 5 Seconds):
RECEIVER                              TRANSMITTER
Host Rx K Bytes:     1082567 / 0     Host Tx K Bytes:     1092370 / 0
Unicasts Rx:          780240 / 4     Unicasts Tx:          791864 / 5
Unicasts to host:     780240 / 4     Unicasts by host:     780123 / 4
Broadcasts Rx:           230 / 3     Broadcasts Tx:          4117 / 48
Beacons Rx:                0 / 0     Beacons Tx:             4117 / 48
Broadcasts to host:      230 / 3     Broadcasts by host:        0 / 0
Multicasts Rx:             0 / 0     Multicasts Tx:             0 / 0
Multicasts to host:        0 / 0     Multicasts by host:        0 / 0
Mgmt Packets Rx:         230 / 3     Mgmt Packets Tx:           0 / 0
RTS received:              0 / 0     RTS transmitted:       14788 / 0
Duplicate frames:          0 / 0     CTS not received:        129 / 0
CRC errors:            55707 / 25    Unicast Fragments Tx:  791866 / 5
WEP errors:                0 / 0     Retries:               34522 / 2
Buffer full:               0 / 0     Packets one retry:     23372 / 0
Host buffer full:          0 / 0     Packets > 1 retry:      5575 / 1
Header CRC errors:         0 / 0     Protocol defers:           0 / 0
Invalid header:            0 / 0     Energy detect defers:      0 / 0
Length invalid:            0 / 0     Jammer detected:           0 / 0
Incomplete fragments:      0 / 0     Packets aged:              0 / 0
Rx Concats:                0 / 0     Tx Concats:                0 / 0
R2H Buffer full:           0 / 0
Rx err len pkt:            0 / 0

 Tx Watchdog stats:
 Tx SW Watchdog        0 / 0
 Tx HW Watchdog        0 / 0

RATE 6.0
Rx Packets:              230 / 3     Tx Packets:                0 / 0
Rx Bytes:              41607 / 598   Tx Bytes:                  0 / 0
RTS Retries:               0 / 0     Data Retries:              0 / 0

RATE a7.1-2
Rx Packets:                2 / 0     Tx Packets:                2 / 0
Rx Bytes:                100 / 0     Tx Bytes:                100 / 0
RTS Retries:               0 / 0     Data Retries:              0 / 0

RATE a5.2-2
Rx Packets:                4 / 0     Tx Packets:                2 / 0
Rx Bytes:               3116 / 0     Tx Bytes:                100 / 0
RTS Retries:               0 / 0     Data Retries:              0 / 0

RATE a6.2-2
Rx Packets:                3 / 0     Tx Packets:                3 / 0
Rx Bytes:                150 / 0     Tx Bytes:                150 / 0
RTS Retries:               0 / 0     Data Retries:              0 / 0

RATE a7.2-2
Rx Packets:                3 / 0     Tx Packets:                3 / 0
Rx Bytes:                150 / 0     Tx Bytes:                150 / 0
RTS Retries:               0 / 0     Data Retries:              0 / 0

RATE a8.2-2
Rx Packets:                5 / 0     Tx Packets:                0 / 0
Rx Bytes:               7540 / 0     Tx Bytes:                  0 / 0
RTS Retries:               0 / 0     Data Retries:              0 / 0

RATE a3.3-2
Rx Packets:                1 / 0     Tx Packets:                1 / 0
Rx Bytes:                 50 / 0     Tx Bytes:                 50 / 0
RTS Retries:               0 / 0     Data Retries:              0 / 0

RATE a4.3-2
Rx Packets:                4 / 0     Tx Packets:                3 / 0
Rx Bytes:               1658 / 0     Tx Bytes:                150 / 0
RTS Retries:               0 / 0     Data Retries:              0 / 0

--More--
```

Figure 10: Phase 2 - Rates print out

```
Rx err len pkt:          0 / 0

 Tx Watchdog stats:
 Tx SW Watchdog      0 / 0
 Tx HW Watchdog      0 / 0

RATE 6.0
Rx Packets:         230 / 3      Tx Packets:            0 / 0
Rx Bytes:        41607 / 598     Tx Bytes:              0 / 0
RTS Retries:          0 / 0      Data Retries:          0 / 0

RATE a7.1-2
Rx Packets:           2 / 0      Tx Packets:            2 / 0
Rx Bytes:           100 / 0      Tx Bytes:            100 / 0
RTS Retries:          0 / 0      Data Retries:          0 / 0

RATE a5.2-2
Rx Packets:           4 / 0      Tx Packets:            2 / 0
Rx Bytes:          3116 / 0      Tx Bytes:            100 / 0
RTS Retries:          0 / 0      Data Retries:          0 / 0

RATE a6.2-2
Rx Packets:           3 / 0      Tx Packets:            3 / 0
Rx Bytes:           150 / 0      Tx Bytes:            150 / 0
RTS Retries:          0 / 0      Data Retries:          0 / 0

RATE a7.2-2
Rx Packets:           3 / 0      Tx Packets:            3 / 0
Rx Bytes:           150 / 0      Tx Bytes:            150 / 0
RTS Retries:          0 / 0      Data Retries:          0 / 0

RATE a8.2-2
Rx Packets:           5 / 0      Tx Packets:            0 / 0
Rx Bytes:          7540 / 0      Tx Bytes:              0 / 0
RTS Retries:          0 / 0      Data Retries:          0 / 0

RATE a3.3-2
Rx Packets:           1 / 0      Tx Packets:            1 / 0
Rx Bytes:            50 / 0      Tx Bytes:             50 / 0
RTS Retries:          0 / 0      Data Retries:          0 / 0

RATE a4.3-2
Rx Packets:           4 / 0      Tx Packets:            3 / 0
Rx Bytes:          1658 / 0      Tx Bytes:            150 / 0
RTS Retries:          0 / 0      Data Retries:          0 / 0

RATE a5.3-2
Rx Packets:       12230 / 1      Tx Packets:          995 / 2
Rx Bytes:      17470890 / 50     Tx Bytes:        1420114 / 100
RTS Retries:          0 / 0      Data Retries:       1956 / 2

RATE a6.3-2
Rx Packets:        2790 / 0      Tx Packets:            3 / 0
Rx Bytes:       3937206 / 0      Tx Bytes:            150 / 0
RTS Retries:          0 / 0      Data Retries:          0 / 0

RATE a7.3-2
Rx Packets:        3071 / 1      Tx Packets:           11 / 1
Rx Bytes:       4324902 / 50     Tx Bytes:           2008 / 50
RTS Retries:          0 / 0      Data Retries:          1 / 0

RATE a8.3-2
Rx Packets:      753972 / 1      Tx Packets:       733817 / 1
Rx Bytes:    1065135306 / 50     Tx Bytes:     1036725764 / 50
RTS Retries:          0 / 0      Data Retries:      26664 / 0

RATE a9.3-2
Rx Packets:        8155 / 1      Tx Packets:        45283 / 0
Rx Bytes:      11374678 / 50     Tx Bytes:       63940502 / 0
RTS Retries:          0 / 0      Data Retries:       5901 / 0

net3720-ap1#
```

Figure 11: Continuing with phase 2

net3720-ap1# clear counters dot11radio 1

net3720-ap1#ping ip 10.1.1.2 size 18024 repeat 60000

net3720-ap1# show dot11 associations all-client

net3720-ap1#show controllers dot11Radio 1 radio-stats

Attempt 3: 20 feet away with AP1

Run the commands above and we will run the attempt from 20 feet away.

Figure 12: Show dot11 associations all-client print out

```
                                        /dev/ttyUSB0 - PuTTY                          –   ⤢   ⊗

Session timeout  : 0 seconds
Reauthenticate in : never

net3720-ap1#show controllers dot11Radio 1 radio-stats
         DOT11 Statistics (Cumulative Total/Last 5 Seconds):
RECEIVER                              TRANSMITTER
Host Rx K Bytes:      1082568 / 0     Host Tx K Bytes:      1121034 / 0
Unicasts Rx:          780242 / 2      Unicasts Tx:          812661 / 4
Unicasts to host:     780242 / 2      Unicasts by host:     780109 / 3
Broadcasts Rx:           163 / 1      Broadcasts Tx:          4069 / 48
Beacons Rx:                0 / 0      Beacons Tx:             4069 / 48
Broadcasts to host:      163 / 1      Broadcasts by host:        0 / 0
Multicasts Rx:             0 / 0      Multicasts Tx:             0 / 0
Multicasts to host:        0 / 0      Multicasts by host:        0 / 0
Mgmt Packets Rx:         163 / 1      Mgmt Packets Tx:           0 / 0
RTS received:              0 / 0      RTS transmitted:       16329 / 0
Duplicate frames:          0 / 0      CTS not received:        101 / 0
CRC errors:            45074 / 19     Unicast Fragments Tx:  812663 / 4
WEP errors:                0 / 0      Retries:               80870 / 2
Buffer full:               0 / 0      Packets one retry:     43638 / 0
Host buffer full:          0 / 0      Packets / 1 retry:     18375 / 1
Header CRC errors:         0 / 0      Protocol defers:           0 / 0
Invalid header:            0 / 0      Energy detect defers:      0 / 0
Length invalid:            0 / 0      Jammer detected:           0 / 0
Incomplete fragments:      0 / 0      Packets aged:              0 / 0
Rx Concats:                0 / 0      Tx Concats:                0 / 0
R2H Buffer full:           0 / 0
Rx err len pkt:            0 / 0

 Tx Watchdog stats:
  Tx SW Watchdog          0 / 0
  Tx HW Watchdog          0 / 0

RATE 6.0
Rx Packets:              165 / 1      Tx Packets:                0 / 0
Rx Bytes:              24312 / 29     Tx Bytes:                  0 / 0
RTS Retries:               0 / 0      Data Retries:              0 / 0

RATE a0.1-2
Rx Packets:               16 / 0      Tx Packets:                0 / 0
Rx Bytes:              24128 / 0      Tx Bytes:                  0 / 0
RTS Retries:               0 / 0      Data Retries:              0 / 0

RATE a2.1-2
Rx Packets:                1 / 0      Tx Packets:                0 / 0
Rx Bytes:               1508 / 0      Tx Bytes:                  0 / 0
RTS Retries:               0 / 0      Data Retries:              0 / 0

RATE a3.1-2
Rx Packets:               51 / 0      Tx Packets:                0 / 0
Rx Bytes:              75672 / 0      Tx Bytes:                  0 / 0
RTS Retries:               0 / 0      Data Retries:              0 / 0

RATE a5.1-2
Rx Packets:              239 / 0      Tx Packets:                0 / 0
Rx Bytes:             345580 / 0      Tx Bytes:                  0 / 0
RTS Retries:               0 / 0      Data Retries:              0 / 0

RATE a7.1-2
Rx Packets:                4 / 0      Tx Packets:                0 / 0
Rx Bytes:               6032 / 0      Tx Bytes:                  0 / 0
RTS Retries:               0 / 0      Data Retries:              0 / 0

RATE a3.2-2
Rx Packets:                4 / 0      Tx Packets:                0 / 0
Rx Bytes:               6032 / 0      Tx Bytes:                  0 / 0
RTS Retries:               0 / 0      Data Retries:              0 / 0

RATE a5.2-2
Rx Packets:             2029 / 0      Tx Packets:               11 / 0
Rx Bytes:            2910176 / 0      Tx Bytes:              16588 / 0
RTS Retries:               0 / 0      Data Retries:             33 / 0

 --More--
```

Figure 13: Phase 3 Rates print out

```
                                    /dev/ttyUSB0 - PuTTY                        _  ⌐  ⊗

Rx Bytes:        24312 / 29    Tx Bytes:              0 / 0
RTS Retries:         0 / 0     Data Retries:          0 / 0

RATE a0.1-2
Rx Packets:         16 / 0     Tx Packets:            0 / 0
Rx Bytes:        24128 / 0     Tx Bytes:              0 / 0
RTS Retries:         0 / 0     Data Retries:          0 / 0

RATE a2.1-2
Rx Packets:          1 / 0     Tx Packets:            0 / 0
Rx Bytes:         1508 / 0     Tx Bytes:              0 / 0
RTS Retries:         0 / 0     Data Retries:          0 / 0

RATE a3.1-2
Rx Packets:         51 / 0     Tx Packets:            0 / 0
Rx Bytes:        75672 / 0     Tx Bytes:              0 / 0
RTS Retries:         0 / 0     Data Retries:          0 / 0

RATE a5.1-2
Rx Packets:        239 / 0     Tx Packets:            0 / 0
Rx Bytes:       345580 / 0     Tx Bytes:              0 / 0
RTS Retries:         0 / 0     Data Retries:          0 / 0

RATE a7.1-2
Rx Packets:          4 / 0     Tx Packets:            0 / 0
Rx Bytes:         6032 / 0     Tx Bytes:              0 / 0
RTS Retries:         0 / 0     Data Retries:          0 / 0

RATE a3.2-2
Rx Packets:          4 / 0     Tx Packets:            0 / 0
Rx Bytes:         6032 / 0     Tx Bytes:              0 / 0
RTS Retries:         0 / 0     Data Retries:          0 / 0

RATE a5.2-2
Rx Packets:       2029 / 0     Tx Packets:           11 / 0
Rx Bytes:      2910176 / 0     Tx Bytes:          16588 / 0
RTS Retries:         0 / 0     Data Retries:         33 / 0

RATE a8.2-2
Rx Packets:          5 / 0     Tx Packets:            5 / 0
Rx Bytes:         7540 / 0     Tx Bytes:           7540 / 0
RTS Retries:         0 / 0     Data Retries:          0 / 0

RATE a4.3-2
Rx Packets:        345 / 0     Tx Packets:           10 / 0
Rx Bytes:       491832 / 0     Tx Bytes:          12386 / 0
RTS Retries:         0 / 0     Data Retries:         20 / 0

RATE a5.3-2
Rx Packets:      24492 / 1     Tx Packets:         2642 / 2
Rx Bytes:     34657016 / 50    Tx Bytes:        3878440 / 100
RTS Retries:         0 / 0     Data Retries:       5260 / 2

RATE a6.3-2
Rx Packets:          5 / 0     Tx Packets:         6296 / 0
Rx Bytes:         7540 / 0     Tx Bytes:        8896144 / 0
RTS Retries:         0 / 0     Data Retries:          6 / 0

RATE a7.3-2
Rx Packets:      23748 / 0     Tx Packets:        11800 / 0
Rx Bytes:     33545730 / 0     Tx Bytes:       16674255 / 0
RTS Retries:         0 / 0     Data Retries:        439 / 0

RATE a8.3-2
Rx Packets:     231054 / 0     Tx Packets:       311963 / 0
Rx Bytes:    326444914 / 0     Tx Bytes:      440721026 / 0
RTS Retries:         0 / 0     Data Retries:      20084 / 0

RATE a9.3-2
Rx Packets:     498247 / 1     Tx Packets:       447382 / 1
Rx Bytes:    703753696 / 50    Tx Bytes:      631882276 / 387
RTS Retries:         0 / 0     Data Retries:      55028 / 0

net3720-ap1#
```

Figure 14: Continuing phase 3 print out

net3720-ap1# clear counters dot11radio 1
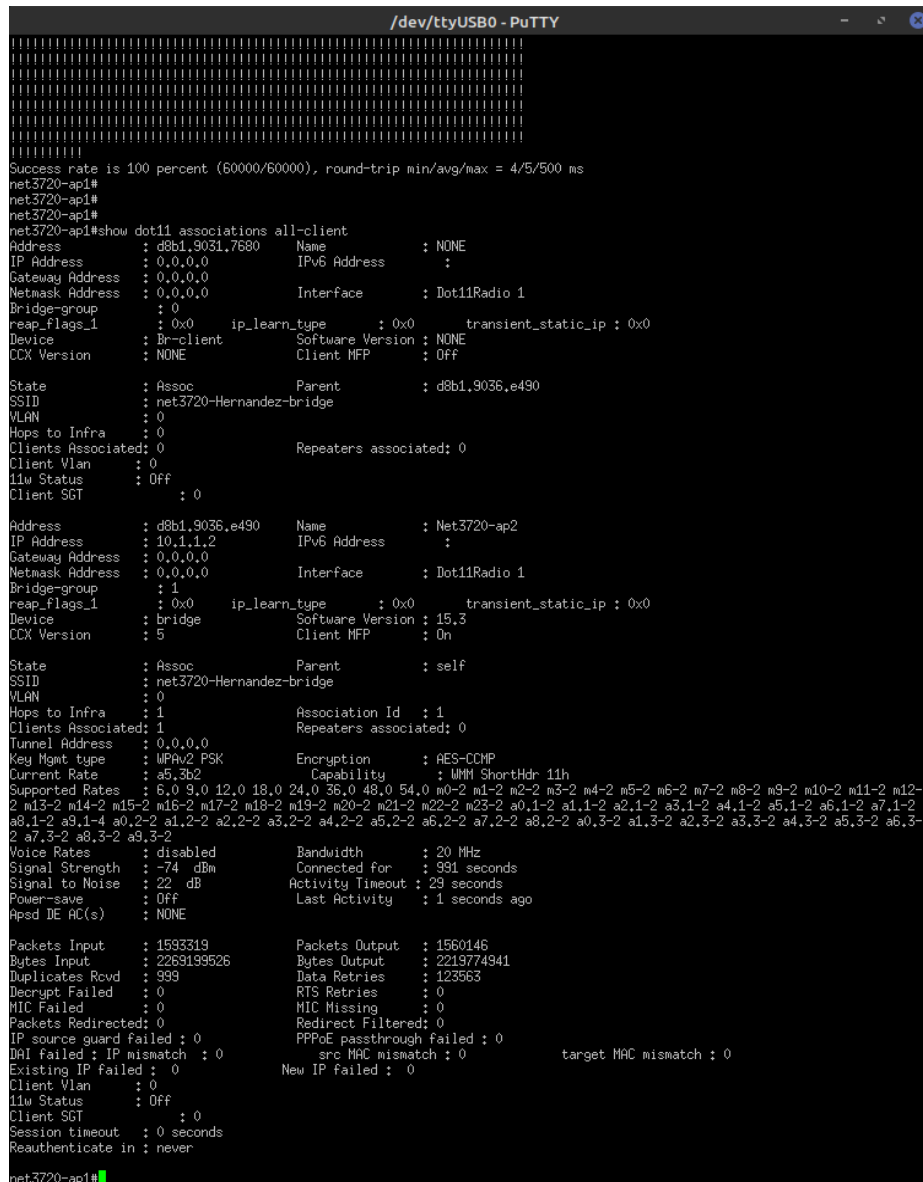
net3720-ap1#ping ip 10.1.1.2 size 18024 repeat 60000

net3720-ap1# show dot11 associations all-client

net3720-ap1#show controllers dot11Radio 1 radio-stats

Attempt 4: 30 feet + away with AP1

Run the commands above and we will run the attempt from 30 feet + away.

Figure 15: show dot11 associations all-client print out

Figure 16: Phase 4 rates print out

```
                                    /dev/ttyUSB0 - PuTTY                                    _  ⤢  ⊗

Rx Bytes:        5803016 / 0       Tx Bytes:         783652 / 0
RTS Retries:           0 / 0       Data Retries:       1545 / 0

RATE a7.1-2
Rx Packets:            5 / 0       Tx Packets:           11 / 0
Rx Bytes:           7540 / 0       Tx Bytes:          13898 / 0
RTS Retries:           0 / 0       Data Retries:         16 / 0

RATE a1.2-2
Rx Packets:            1 / 0       Tx Packets:            1 / 0
Rx Bytes:             50 / 0       Tx Bytes:             50 / 0
RTS Retries:           0 / 0       Data Retries:          0 / 0

RATE a2.2-2
Rx Packets:            7 / 0       Tx Packets:            3 / 0
Rx Bytes:           6182 / 0       Tx Bytes:            150 / 0
RTS Retries:           0 / 0       Data Retries:          0 / 0

RATE a3.2-2
Rx Packets:         5095 / 1       Tx Packets:          260 / 1
Rx Bytes:        7251038 / 50      Tx Bytes:         365836 / 50
RTS Retries:           0 / 0       Data Retries:        568 / 0

RATE a4.2-2
Rx Packets:        20674 / 1       Tx Packets:         2610 / 2
Rx Bytes:       29318042 / 50      Tx Bytes:        3663692 / 100
RTS Retries:           0 / 0       Data Retries:        973 / 2

RATE a5.2-2
Rx Packets:        39665 / 1       Tx Packets:        12682 / 1
Rx Bytes:       56088006 / 50      Tx Bytes:       18194937 / 50
RTS Retries:           0 / 0       Data Retries:       7160 / 0

RATE a6.2-2
Rx Packets:       982799 / 1       Tx Packets:       199873 / 0
Rx Bytes:     1389694916 / 50       Tx Bytes:      282339137 / 0
RTS Retries:           0 / 0       Data Retries:       8883 / 0

RATE a7.2-2
Rx Packets:            1 / 0       Tx Packets:            0 / 0
Rx Bytes:           1508 / 0       Tx Bytes:              0 / 0
RTS Retries:           0 / 0       Data Retries:          0 / 0

RATE a1.3-2
Rx Packets:            1 / 0       Tx Packets:            1 / 0
Rx Bytes:             50 / 0       Tx Bytes:             50 / 0
RTS Retries:           0 / 0       Data Retries:          0 / 0

RATE a2.3-2
Rx Packets:            1 / 0       Tx Packets:            1 / 0
Rx Bytes:             50 / 0       Tx Bytes:             50 / 0
RTS Retries:           0 / 0       Data Retries:          0 / 0

RATE a3.3-2
Rx Packets:           13 / 0       Tx Packets:            8 / 0
Rx Bytes:          13994 / 0       Tx Bytes:           6454 / 0
RTS Retries:           0 / 0       Data Retries:          0 / 0

RATE a4.3-2
Rx Packets:       535426 / 0       Tx Packets:       321479 / 0
Rx Bytes:      756979666 / 0        Tx Bytes:      454188880 / 0
RTS Retries:           0 / 0       Data Retries:      11752 / 0

RATE a5.3-2
Rx Packets:           35 / 0       Tx Packets:      1022181 / 0
Rx Bytes:          52780 / 0       Tx Bytes:     1443826344 / 0
RTS Retries:           0 / 0       Data Retries:      90193 / 0

RATE a6.3-2
Rx Packets:            0 / 0       Tx Packets:            4 / 0
Rx Bytes:              0 / 0       Tx Bytes:           6032 / 0
RTS Retries:           0 / 0       Data Retries:          2 / 0

net3720-ap1#
```

Figure 17: continuing with Phase 4 print out

Continued with part 2 of Attempt 4

Attempt 4: 30 feet + away with AP1

Run the following command when you have the AP at the furthest away. The goal is to get about a Success rate of 99 or 100. My office is upstairs and my AP was upstairs. I put the second AP downstairs in the garage and I ran this command and this was my output.

net3720-ap1#ping ip 10.1.1.2 size 18024 repeat 60000

Figure 18: Success rate 100% - What you would like to have

Rates graph

Here we have a chart that is showing the different phases.
Phase 1 – On top of each other
Phase 2 – 10 feet away
Phase 3 – 20 feet away
Phase 4 – Over 20 feet away
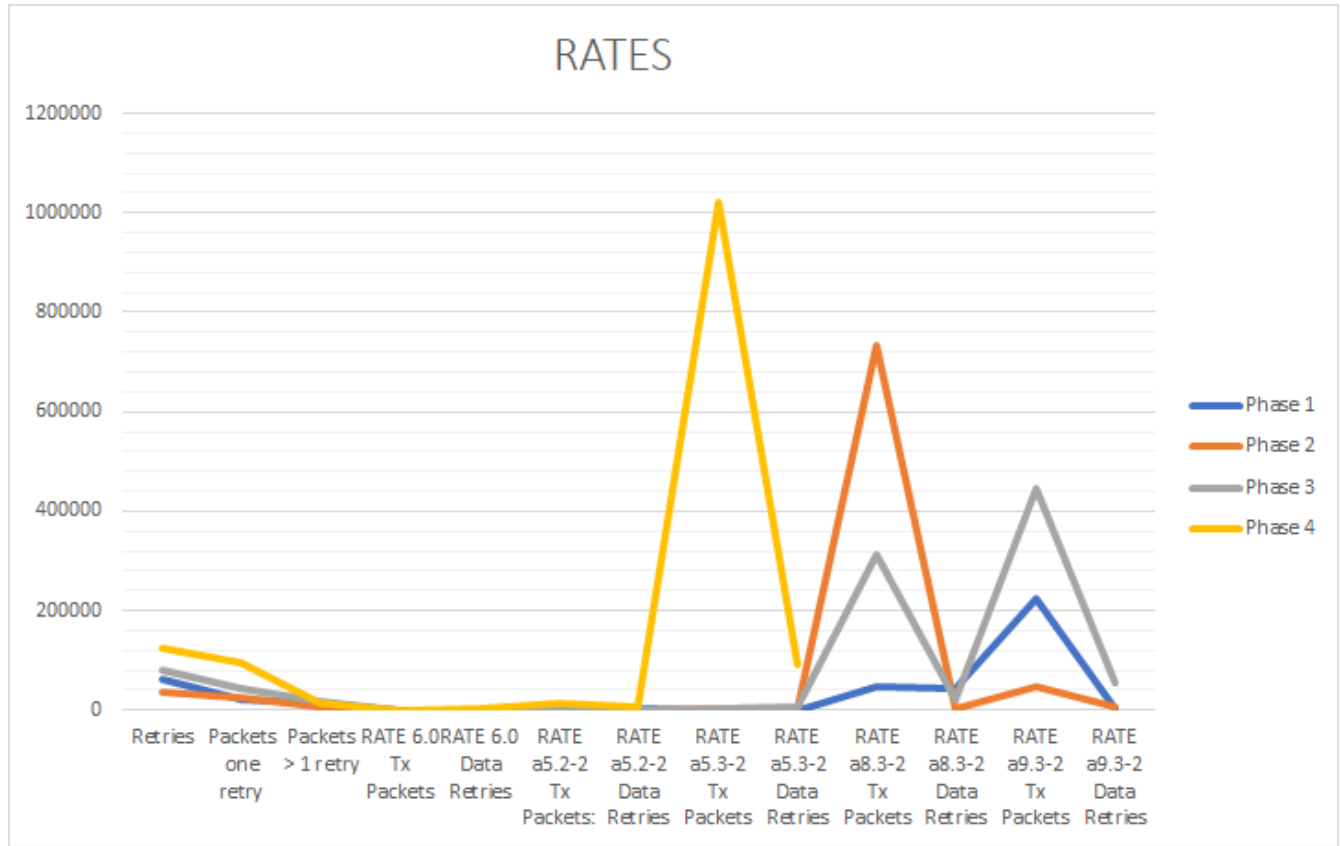
Figure 19: Graph of all the numbers combined of the rates

Phase 1	Phase 2	Phase 3	Phase 4

Retries: 62849 / 2 **Retries:** 34522 / 2 **Retries**: 80870/20 **Retries:** 123582/ 2
Packets one retry: 22003 / 0 **Packets one retry:** 23370 /0 **Packets one retry:** 43638/ 0 94429/0
Packets > 1 retry: 13160 / 1 **Packets > 1 retry:** 5575 / 1 **Packets > 1 retry:** 1875/1 13349/ 1

Rate 6.0 **Rate: 6.0** **Rate 6.0** **Rate 6.0**
Tx Packets: 25 / 0 **Tx Packets:** 0/0 **Tx Packets:** 0/0 **Tx Packets:** 114/ 0
Data Retries: 0 / 0 **Data Retries:** 0/0 **Data Retries:** 0/0 **Data Retries:** 873/ 0

Rate a5.2-2 **Rate: a5.2-2** **Rate: a5.2-2** **Rate a5.2-2**
Tx Packets: 1068 / 0 **Tx Packets:** 2/0 **Tx Packets:** 11/0 **Tx Packets:** 12682/ 1
Data Retries: 3194 / 0 **Data Retries:** 0/0 **Data Retries:** 33/0 **Data Retries:** 7160/ 0

Rate a5.3-2 **Rate a5.3-2** **Rate a5.3-2** **Rate a5.3-2**
Tx Packets: 367 / 1 **Tx Packets:** 995/2 **Tx Packets:** 2642/2 **Tx Packets:**1022181/0
Data Retries: 726 / 2 **Data Retries:** 1956 / 2 **Data Retries:** 5260/ 2 **Data Retires:**90193/ 0

Rate a8.3-2 **Rate a8.3-2** Rate a8.3-2 **Rate a8.3-2**
Tx Packets: 46070 / 0 **Tx Packets:** 733817/1 **Tx Packets:** 311963/ 0 **Tx Packets:** No data
Data Retries: 44051 / 0 **Data Retires:** 2664/0 **Data Retires:** 20084/ 0 **Data Retries:** No data

Rate a9.3-2 **Rate a9.3-2** **Rate a9.3-2** **Rate a9.3-2**
Tx Packets: 222624 / 3 **Tx Packets:** 45282/0 **Tx Packets:** 447382/ 1 **Tx Packets:** No data
Data Retries: 4131 / 0 **Data Retries:** 5901/0 **Data Retries**: 55028/ 0 **Data Retries:** No data

Closing- Tech-support for both AP's

AP1 – Report

net3720-ap1#show tech-support

------------------ show running-config ------------------

Building configuration...

Current configuration : 1623 bytes
!
! Last configuration change at 00:00:38 UTC Mon Mar 1 1993
version 15.3
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname net3720-ap1
!
!
logging rate-limit console 9
enable secret 5 <removed>
!
no aaa new-model
no ip source-route
no ip cef
!
!
!
!
dot11 pause-time 100
dot11 syslog
!
dot11 ssid net3720-Hernandez-bridge
  authentication open
  authentication key-management wpa version 2
  wpa-psk ascii 7 0757711D1C5C405745415D
!
!
!
no ipv6 cef

!
!
username Cisco password 7 <removed>
!
!
bridge irb
!
!
!
interface Dot11Radio0
 no ip address
 shutdown
 antenna gain 0
 station-role root
 bridge-group 1
 bridge-group 1 subscriber-loop-control
 bridge-group 1 spanning-disabled
 bridge-group 1 block-unknown-source
 no bridge-group 1 source-learning
 no bridge-group 1 unicast-flooding
!
interface Dot11Radio1
 no ip address
 !
 encryption mode ciphers aes-ccm
 !
 ssid net3720-Hernandez-bridge
 !
 antenna gain 0
 peakdetect
 no dfs band block
 channel 5825
 station-role root bridge
 bridge-group 1
 bridge-group 1 spanning-disabled
!
interface GigabitEthernet0
 no ip address
 duplex auto
 speed auto
 bridge-group 1
 bridge-group 1 spanning-disabled
!
interface BVI1
 mac-address d8b1.9043.08bc
 ip address 10.1.1.1 255.255.255.0
 ipv6 address dhcp

ipv6 address autoconfig
 ipv6 enable
!
ip forward-protocol nd
no ip http server
no ip http secure-server
ip http help-path http://www.cisco.com/warp/public/779/smbiz/prodconfig/help/eag
!
!
bridge 1 route ip
!
!
!
line con 0
line vty 0 4
 login local
 transport input all
!
end

```
/dev/ttyUSB0 - PuTTY
net3720-ap1#show dot11 associations all
net3720-ap1#show dot11 associations all-client
Address          : d8b1.9031.7680    Name            : NONE
IP Address       : 0.0.0.0           IPv6 Address      :
Gateway Address  : 0.0.0.0
Netmask Address  : 0.0.0.0           Interface       : Dot11Radio 1
Bridge-group     : 0
reap_flags_1     : 0x0    ip_learn_type      : 0x0      transient_static_ip : 0x0
Device           : Br-client         Software Version : NONE
CCX Version      : NONE              Client MFP      : Off

State            : Assoc             Parent          : d8b1.9036.e490
SSID             : net3720-Hernandez-bridge
VLAN             : 0
Hops to Infra    : 0
Clients Associated: 0                Repeaters associated: 0
Client Vlan      : 0
11w Status       : Off
Client SGT         : 0

Address          : d8b1.9036.e490    Name            : Net3720-ap2
IP Address       : 10.1.1.2          IPv6 Address      :
Gateway Address  : 0.0.0.0
Netmask Address  : 0.0.0.0           Interface       : Dot11Radio 1
Bridge-group     : 1
reap_flags_1     : 0x0    ip_learn_type      : 0x0      transient_static_ip : 0x0
Device           : bridge            Software Version : 15.3
CCX Version      : 5                 Client MFP      : On

State            : Assoc             Parent          : self
SSID             : net3720-Hernandez-bridge
VLAN             : 0
Hops to Infra    : 1                 Association Id   : 1
Clients Associated: 1                Repeaters associated: 0
Tunnel Address   : 0.0.0.0
Key Mgmt type    : WPAv2 PSK         Encryption      : AES-CCMP
Current Rate     : a8.3-2            Capability      : WMM ShortHdr 11h
Supported Rates  : 6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 m0-2 m1-2 m2-2 m3-2 m4-2 m5-2 m6-2 m7-2 m8-2 m9-2 m10-2 m11-2 m12-
2 m13-2 m14-2 m15-2 m16-2 m17-2 m18-2 m19-2 m20-2 m21-2 m22-2 m23-2 a0.1-2 a1.1-2 a2.1-2 a3.1-2 a4.1-2 a5.1-2 a6.1-2 a7.1-2
a8.1-2 a9.1-4 a0.2-2 a1.2-2 a2.2-2 a3.2-2 a4.2-2 a5.2-2 a6.2-2 a7.2-2 a8.2-2 a0.3-2 a1.3-2 a2.3-2 a3.3-2 a4.3-2 a5.3-2 a6.3-
2 a7.3-2 a8.3-2 a9.3-2
Voice Rates      : disabled          Bandwidth       : 20 MHz
Signal Strength  : -18  dBm          Connected for   : 141 seconds
Signal to Noise  : 80  dB            Activity Timeout : 27 seconds
Power-save       : Off               Last Activity   : 3 seconds ago
Apsd DE AC(s)    : NONE

Packets Input    : 118               Packets Output  : 124
Bytes Input      : 9604              Bytes Output    : 10172
Duplicates Rcvd  : 0                 Data Retries    : 54
Decrypt Failed   : 0                 RTS Retries     : 0
MIC Failed       : 0                 MIC Missing     : 0
Packets Redirected: 0                Redirect Filtered: 0
IP source guard failed : 0           PPPoE passthrough failed : 0
DAI failed : IP mismatch  : 0          src MAC mismatch : 0          target MAC mismatch : 0
Existing IP failed :  0           New IP failed :  0
Client Vlan      : 0
11w Status       : Off
Client SGT         : 0
Session timeout  : 0 seconds
Reauthenticate in : never

net3720-ap1#
```

AP2 – Show tech support Report

Net3720-ap2#show tech-support

------------------ show running-config ------------------

Building configuration...

Current configuration : 1535 bytes

!

version 15.3

no service pad

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

!

hostname Net3720-ap2

!

!

logging rate-limit console 9

enable secret 5 <removed>

!

no aaa new-model

no ip source-route

no ip cef

!

!

!

!

dot11 pause-time 100

dot11 syslog

!

dot11 ssid net3720-Hernandez-bridge

   authentication open

   authentication key-management wpa version 2

   wpa-psk ascii 7 065E5F701E1B504B574444

!

!

!

no ipv6 cef

!

!

username Cisco password 7 <removed>

!

!

bridge irb

!

!

!

interface Dot11Radio0

 no ip address

 shutdown

 antenna gain 0

 station-role root

 bridge-group 1

 bridge-group 1 subscriber-loop-control

 bridge-group 1 spanning-disabled

 bridge-group 1 block-unknown-source

```
  no bridge-group 1 source-learning

  no bridge-group 1 unicast-flooding

!

interface Dot11Radio1

 no ip address

 !

 encryption mode ciphers aes-ccm

 !

 ssid net3720-Hernandez-bridge

 !

 antenna gain 0

 peakdetect

 station-role non-root bridge

 bridge-group 1

 bridge-group 1 spanning-disabled

!

interface GigabitEthernet0

 no ip address

 duplex auto

 speed auto

 bridge-group 1

 bridge-group 1 spanning-disabled

!

interface BVI1

 mac-address d8b1.9038.86a0

 ip address 10.1.1.2 255.255.255.0

 ipv6 address dhcp

 ipv6 address autoconfig
```

```
 ipv6 enable
!
ip forward-protocol nd
no ip http server
no ip http secure-server
ip http help-path http://www.cisco.com/warp/public/779/smbiz/prodconfig/help/eag
!
!
bridge 1 route ip
!
!
!
line con 0
line vty 0 4
 login local
 transport input all
!
end
```

```
                              /dev/ttyUSB0 - PuTTY                                    –  ⟲  ⊗
*Mar  1 00:24:00.683: %DOT11-4-UPLINK_DOWN: Interface Dot11Radio1, parent lost: Missed beacons
*Mar  1 00:24:14.687: %DOT11-4-CANT_ASSOC: Interface Dot11Radio1, cannot associate: No Response
Net3720-ap2#
Net3720-ap2#
Net3720-ap2#
*Mar  1 00:25:09.699: %DOT11-4-CANT_ASSOC: Interface Dot11Radio1, cannot associate: Rcvd response from d8b1.9018.ce60 channe
l 165 741
*Mar  1 00:25:10.699: %DOT11-4-CANT_ASSOC: Interface Dot11Radio1, cannot associate: EAP authenticating
*Mar  1 00:25:11.227: %DOT11-4-UPLINK_ESTABLISHED: Interface Dot11Radio1, Associated To AP net3720-ap1 d8b1.9018.ce60 [None
WPAv2 PSK]
*Mar  1 00:25:13.699: %DOT11-4-UPLINK_DOWN: Interface Dot11Radio1, parent lost: Missed beacons
*Mar  1 00:25:17.715: %DOT11-4-UPLINK_ESTABLISHED: Interface Dot11Radio1, Associated To AP net3720-ap1 d8b1.9018.ce60 [None
WPAv2 PSK]
*Mar  1 00:25:17.715: %DOT11-4-UPLINK_DOWN: Interface Dot11Radio1, parent lost: Received deauthenticate (7) not authenticate
d
*Mar  1 00:25:20.771: %DOT11-4-UPLINK_ESTABLISHED: Interface Dot11Radio1, Associated To AP net3720-ap1 d8b1.9018.ce60 [None
WPAv2 PSK]
Net3720-ap2#
Net3720-ap2#
Net3720-ap2#show do
Net3720-ap2#show dot11 ass
Net3720-ap2#show dot11 associations all
Net3720-ap2#show dot11 associations all-client
Address           : d8b1.9018.ce60     Name               : net3720-ap1
IP Address        : 10.1.1.1           IPv6 Address       :
Gateway Address   : 0.0.0.0
Netmask Address   : 0.0.0.0            Interface          : Dot11Radio 1
Bridge-group      : 0
reap_flags_1      : 0x0      ip_learn_type      : 0x0      transient_static_ip : 0x0
Device            : bridge             Software Version : 15.3
CCX Version       : 5                  Client MFP         : On

State             : Assoc              Parent             : -
SSID              : net3720-Hernandez-bridge
VLAN              : 0
Hops to Infra     : 0                  Association Id     : 1
Tunnel Address    : 0.0.0.0
Key Mgmt type     : WPAv2 PSK          Encryption         : AES-CCMP
Current Rate      : a9.3b2             Capability         : WMM ShortHdr 11h
Supported Rates   : 6.0 9.0 12.0 18.0 24.0 36.0 48.0 54.0 m0-2 m1-2 m2-2 m3-2 m4-2 m5-2 m6-2 m7-2 m8-2 m9-2 m10-2 m11-2 m12-
2 m13-2 m14-2 m15-2 m16-2 m17-2 m18-2 m19-2 m20-2 m21-2 m22-2 m23-2 a0.1-2 a1.1-2 a2.1-2 a3.1-2 a4.1-2 a5.1-2 a6.1-2 a7.1-2
a8.1-2 a9.1-4 a0.2-2 a1.2-2 a2.2-2 a3.2-2 a4.2-2 a5.2-2 a6.2-2 a7.2-2 a8.2-2 a0.3-2 a1.3-2 a2.3-2 a3.3-2 a4.3-2 a5.3-2 a6.3-
2 a7.3-2 a8.3-2 a9.3-2
Voice Rates       : disabled           Bandwidth          : 20 MHz
Signal Strength   : -16  dBm           Connected for      : 29 seconds
Signal to Noise   : 82   dB            Activity Timeout   : 15 seconds
Power-save        : Off                Last Activity      : 0 seconds ago
Apsd DE AC(s)     : NONE

Packets Input     : 343                Packets Output     : 40
Bytes Input       : 78415              Bytes Output       : 4234
Duplicates Rcvd   : 0                  Data Retries       : 36
Decrypt Failed    : 0                  RTS Retries        : 0
MIC Failed        : 0                  MIC Missing        : 0
Packets Redirected: 0                  Redirect Filtered: 0
IP source guard failed : 0             PPPoE passthrough failed : 0
DAI failed : IP mismatch  : 0             src MAC mismatch : 0              target MAC mismatch : 0
Existing IP failed :  0            New IP failed :  0
Client Vlan       : 0
11w Status        : Off
Client SGT        : 0

Net3720-ap2#
```

References

Jenkins, L. (2021, October 13). Lecture. Interview. Layton, UT.