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# Antigua 2020 Access Point Documentation

Newport High School

Alan Chu

[ualch9@gmail.com](mailto:ualch9@gmail.com)



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## Access Point Configurations

There are five different configurations for the two models of access points.

<b>Cisco “AP”</b>	A 2.4/5 GHz wireless access point connected to uplink via Ethernet.
<b>Cisco “Repeater” AP</b>	A 2.4 GHz wireless access point connected to uplink via omnidirectional 5 GHz.
<b>Cisco “Root” AP</b>	A 2.4 GHz wireless access point connected to uplink via Ethernet, broadcasting an uplink network via omnidirectional 5 GHz.
<b>Ubiquiti airMAX “Base”</b>	A point-to-multipoint (PtMP) broadcaster connected to uplink via Ethernet, broadcasting an uplink network via directional 5 GHz.
<b>Ubiquiti airMAX “Remote”</b>	A point-to-multipoint (PtMP) receiver connected to uplink via directional 5 GHz, providing client access via Ethernet.

## Technical Specifications

	PoE?	AC Power?	5 GHz Range (w/ line of sight)	5 GHz Direction	Theoretical Throughput
Cisco	✓	✓	100m (330 ft)	Omnidirectional	Medium
Ubiquiti	✓	✗	10km (6¼ miles)	Directional	High

The act of two intermediary devices wirelessly connecting to each other for uplink access will be referred to as a Wireless Link.

## Packaging

Cisco AP



Cisco Repeater

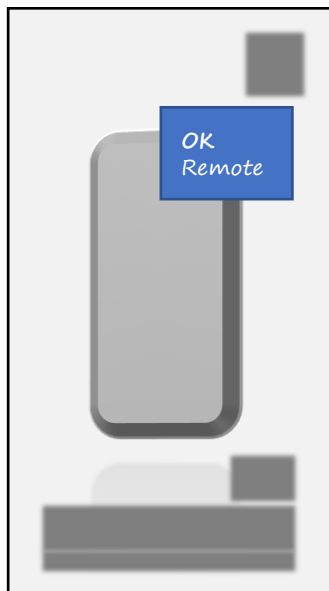


Cisco Root

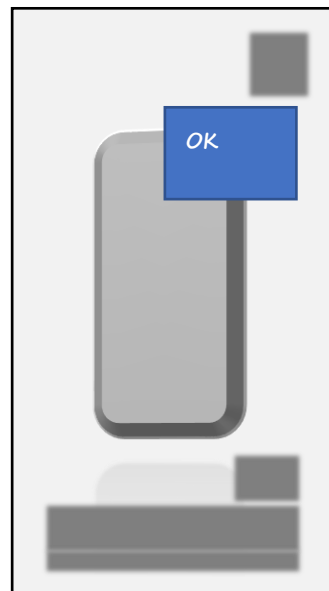


Note the configuration written on the white label. The exact wording may vary. The date on the label indicates the time the AP was configured.

airMAX Remote (Box)



airMAX Base (Box)



Just like the Ciscos (Ciscos?), the exact wording may vary. In general, the labels with only "OK" is preconfigured as BASE.

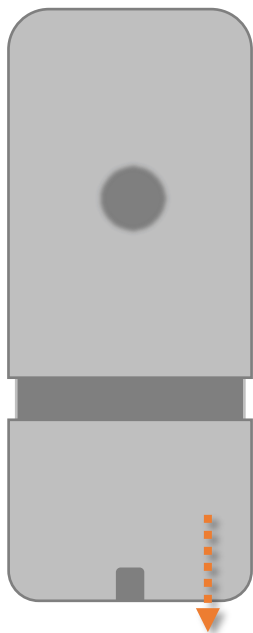
For the airMAXes, there are no labels on the actual device indicating if it is a Base or Remote. Refer to the table below to determine its preconfigured state.

Table 1 Ubiquiti airMAX Original Configurations (2019-12-20)

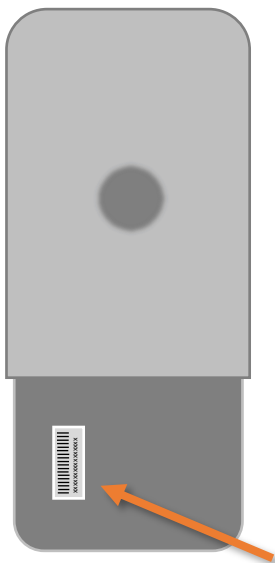
Hardware Address	Configuration	DHCP Fallback
REDACTED MAC ADDR	EITHER Base/Remote	Example: 192.168.1.12/24
PUBLIC RELEASE NOTE: removed device details.		
NOTE: DHCP fallback omits 192.168.1.20 because that is the default Static IP set on airMAX devices.		

Locating airMAX hardware (MAC) address

1. Remove bottom plate



2. Take out a magnifying glass



## Cisco Extender/Root

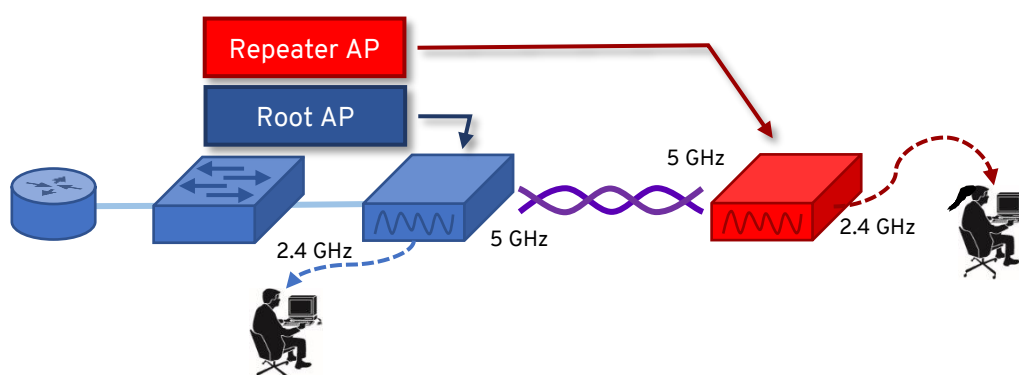
The Cisco Extender and Root devices operate on two radio networks, each serving a different purpose.

### Root Configuration

	<b>Ethernet</b>	<b>2.4 GHz</b>	<b>5 GHz</b>
Purpose	Uplink/PoE	Client access	Backhaul access
SSID	N/A	Broadcast REDACTED_SSID	Broadcast REDACTED_SSID (hidden)

### Extender Configuration

	<b>Ethernet</b>	<b>2.4 GHz</b>	<b>5 GHz</b>
Purpose	PoE	Client access	Backhaul access
SSID	N/A	Broadcast REDACTED_SSID	Connects to REDACTED_SSID



The backbone network is run on the 5 GHz to avoid common interference with other radio equipment.

Keep in mind, the Extender will connect to any backbone network on 5 GHz regardless of the MAC address. This may cause unexpected behavior if there are multiple backbone broadcasting in the area. That being said, multiple Extenders may connect to a single Root, but network bandwidth may be reduced.

IP addresses are DHCP'd on the BVI1 interface.

IOS Secret (case-sensitive): REDACTED

IOS Username: REDACTED

IOS Password: REDACTED

# Ubiquiti airMAX PtMP

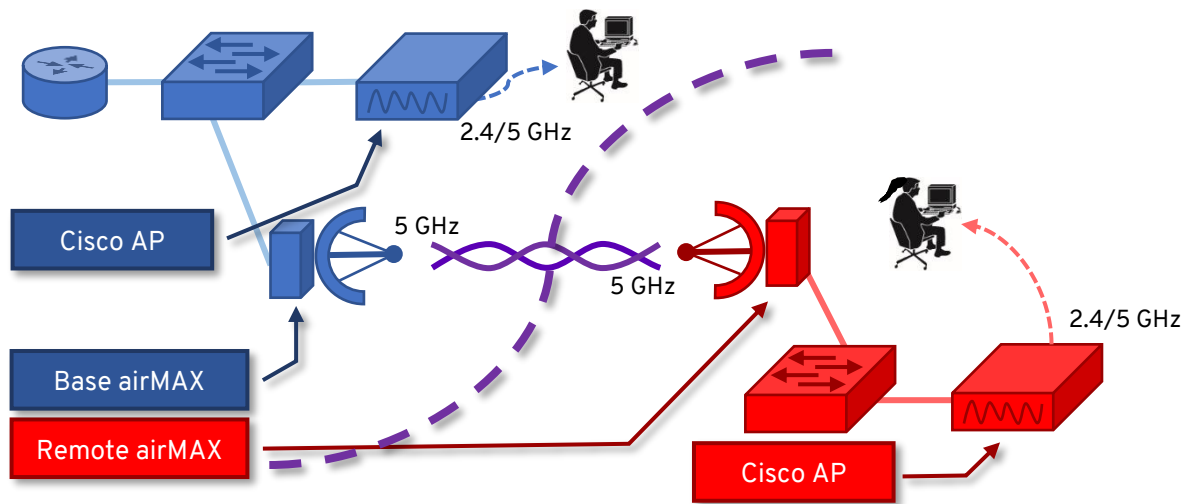
The airMAX PtMP devices operate on a single radio network and does not provide client wireless access.

## Base Configuration

	Ethernet	5 GHz
Purpose	Uplink/PoE	Backhaul access
SSID	N/A	Broadcast REDACTED_SSID (hidden)

## Remote Configuration

	Ethernet	5 GHz
Purpose	Downlink/PoE	Backhaul access
SSID	N/A	Connects to REDACTED_SSID



When setting up the airMAX, be aware of the direction the radio is pointing. The Base devices will broadcast the 5 GHz signal with a 45° beamwidth, so for maximum performance, keep Extenders within that 45° beamwidth with a direct line of sight.

airOS Username: REDACTED      airOS Password: REDACTED



AirOS web management can be accessed via the device's IP address. Refer to *Table 1 Ubiquiti airMAX Original Configurations (2019-12-20)* on page 3 for DHCP fallback IPs. To determine the IP address of a DHCP configured airMAX, use the Ubiquiti Discovery Tool.

To ensure a proper installation, use the Ubiquiti Discovery Tool to determine that all expected Ubiquiti devices appear in the Discovery Tool and are DHCP'd. There should be only one "[BASE]" airMAX and at least one "[REMOTE]" airMAX.

Follow the directions below to change the configuration of an airMAX via airOS.

### **Make a Base airMAX**

Choose the Wireless tab, change:  
Wireless Mode: Access Point  
WDS: ☒ Enable

### **Make a Remote airMAX**

Choose the Wireless tab, change:  
Wireless Mode: Station  
WDS: ☒ Enable

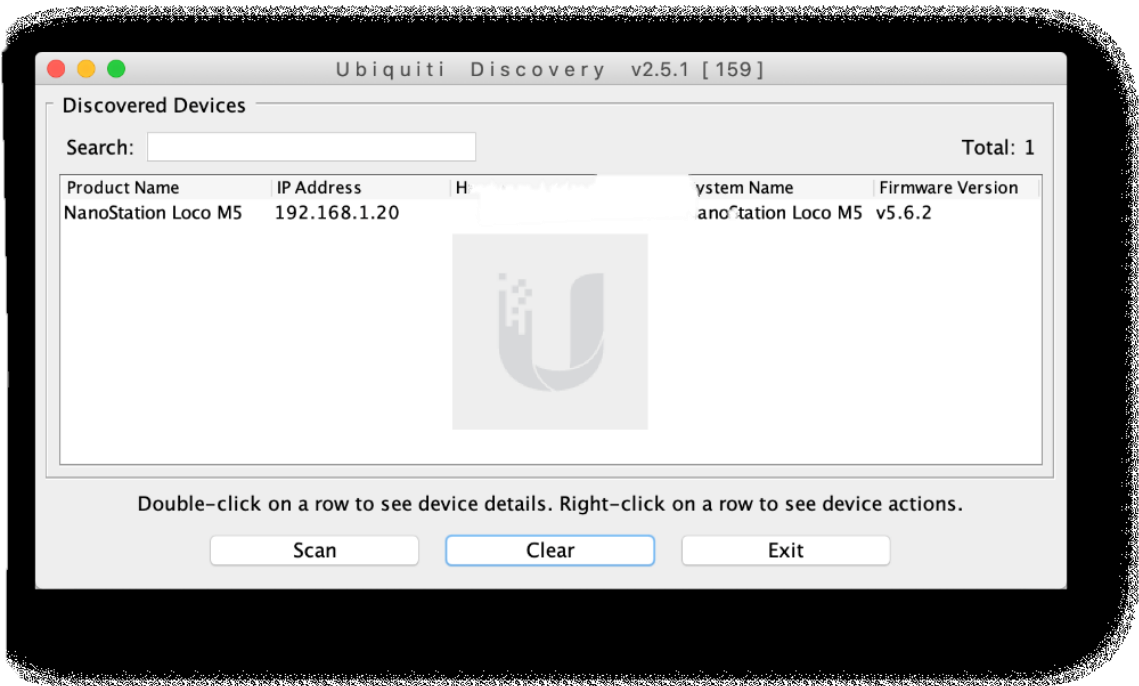
## **Antenna Alignment**

Source: <https://help.ubnt.com/hc/en-us/articles/360013252034-airMAX-How-to-Align-airMAX-Antennas>

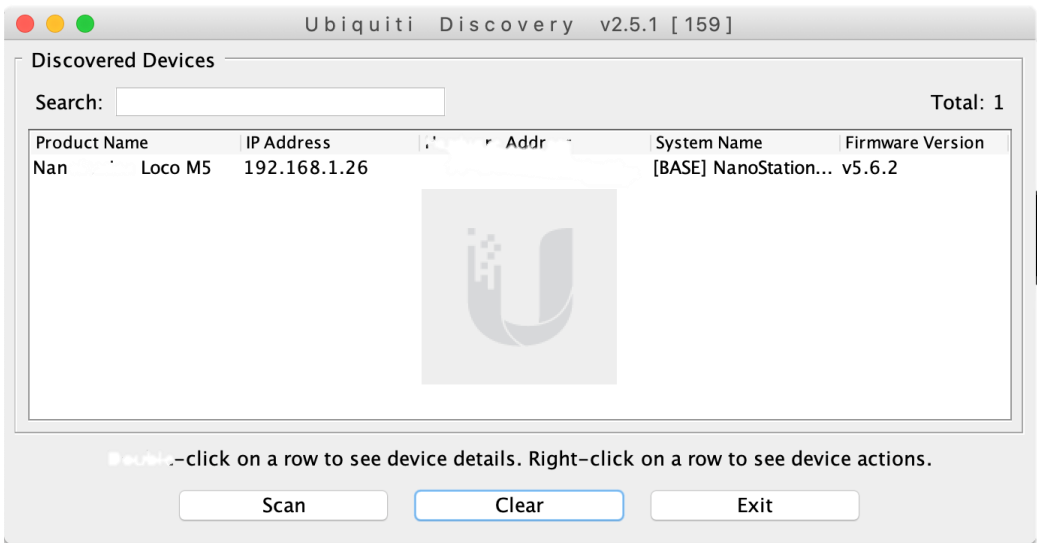
1. Mount the Access Point and slave radios with installers at both sides.
2. Have both installers use line-of-sight to establish a link. Each installer may need to change the azimuth and elevation a few degrees at a time in order to establish the initial link. Be sure only one antenna is being moved at a time!
3. Open up the alignment tool in the airOS WebUI and have one installer slowly adjust the azimuth on one antenna until the signal gets better, and then it begins to worsen.
4. Once you notice you're losing signal, start backing up the azimuth until you reach the peak signal.
5. Repeat step 5 for the elevation.
6. Do the same for the second installer: have the second installer slowly adjust the azimuth on one antenna until you see the signal improve, then get worse again, then again for elevation.

Ubiquiti Discovery Tool

The Ubiquiti Discovery Tool will list all Ubiquiti devices on your network.



↑ A factory-default airMAX listed with its factory static IP, 192.168.1.20

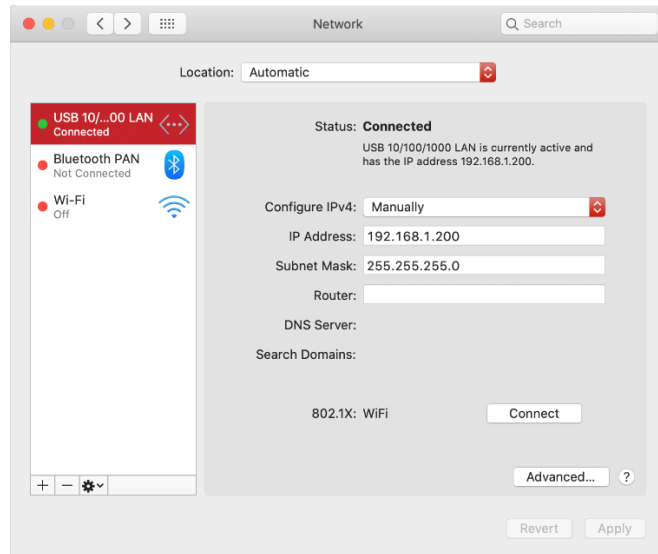


↑ An Antigua-configured airMAX. Note its Name and the DHCP IP address.

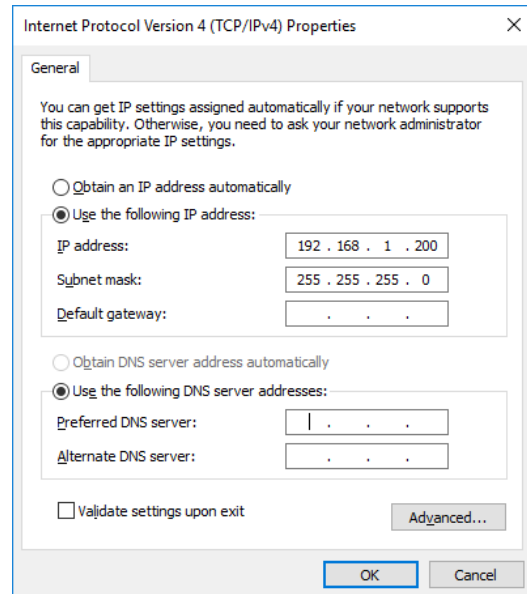
## Manual Configuration

1. Statically configure your computer to use the 192.168.1.0/24 network. Do not use 192.168.1.20 as that is the airMAX's default static IP.

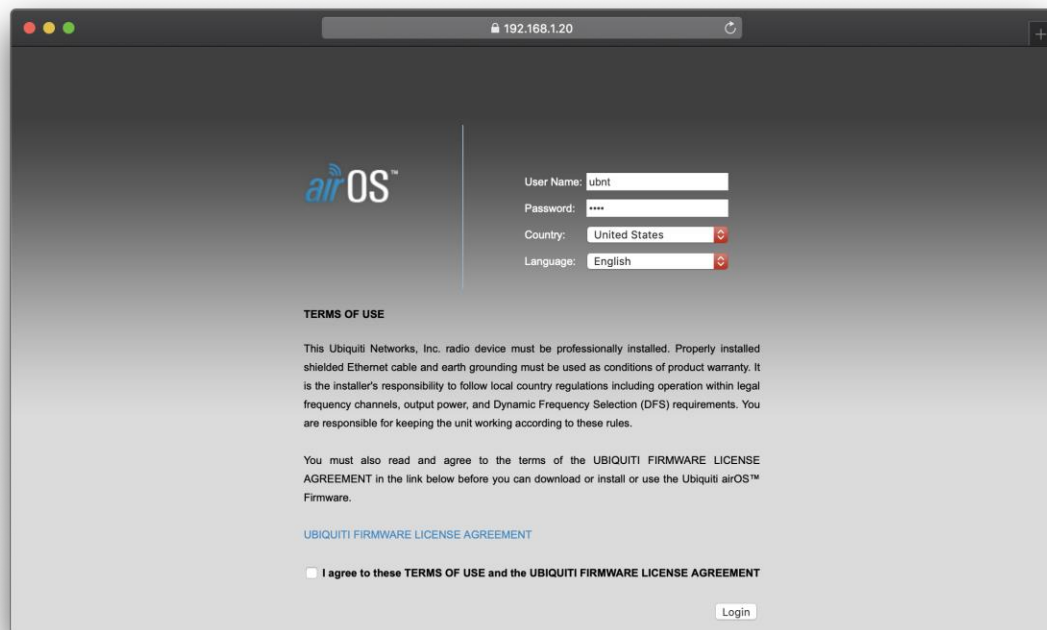
### macOS



### Windows



2. Go to <https://192.168.1.20>

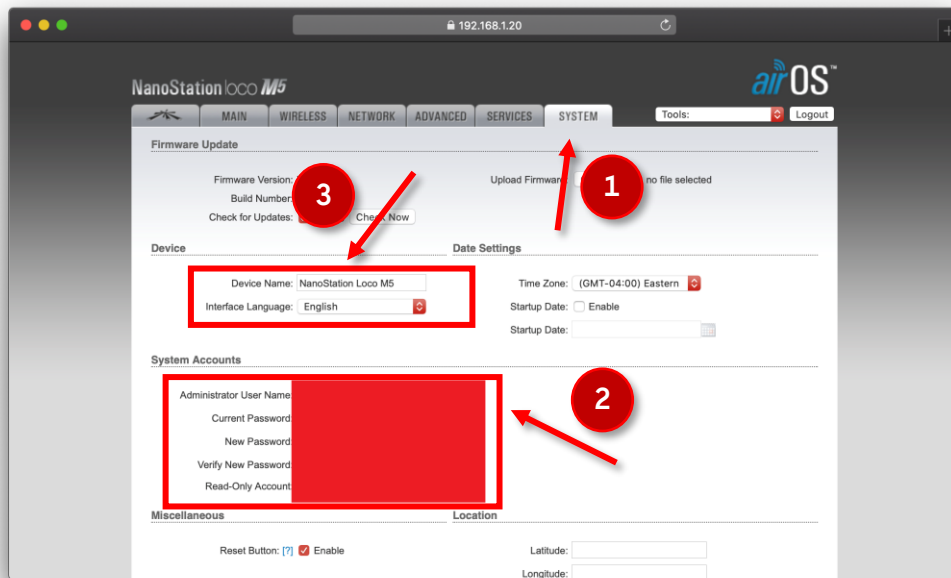


Username: ubnt

Password: ubnt

Country: United States

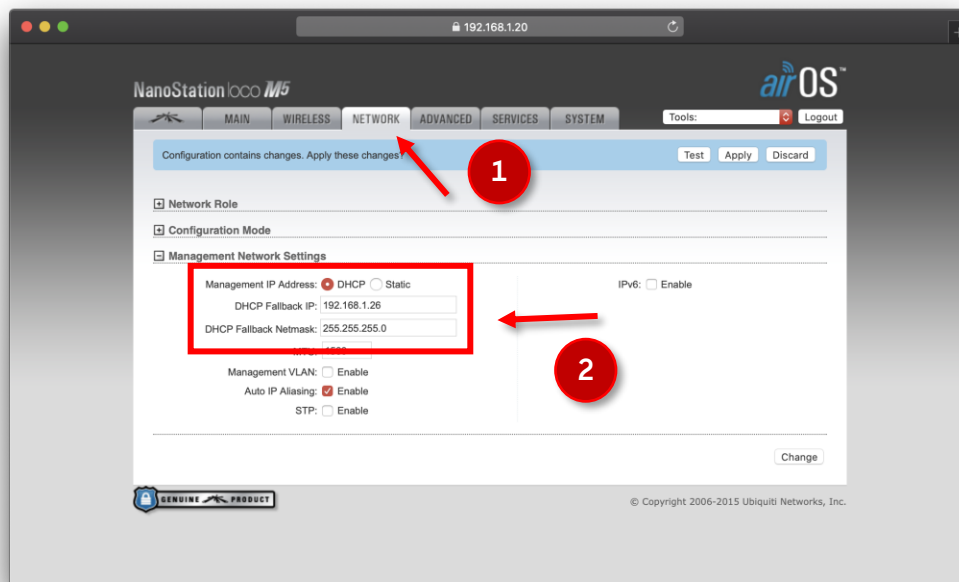
3. Go to System and change the Administrator account credentials. Also prefix the device's name to describe its role ([BASE] or [REMOTE]).



Username: REDACTED

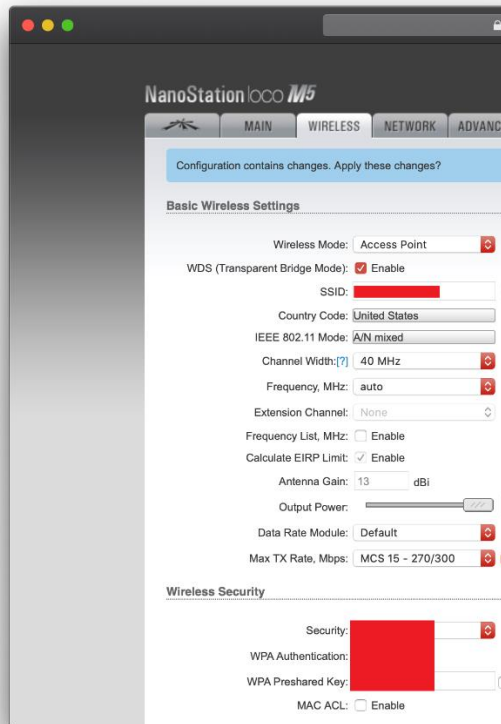
Password: REDACTED

4. Go to Network and change the Management IP to derive from DHCP. When choosing a DHCP Fallback IP, keep in mind and avoid using IPs already allocated for certain devices in our deployment (see page 3).



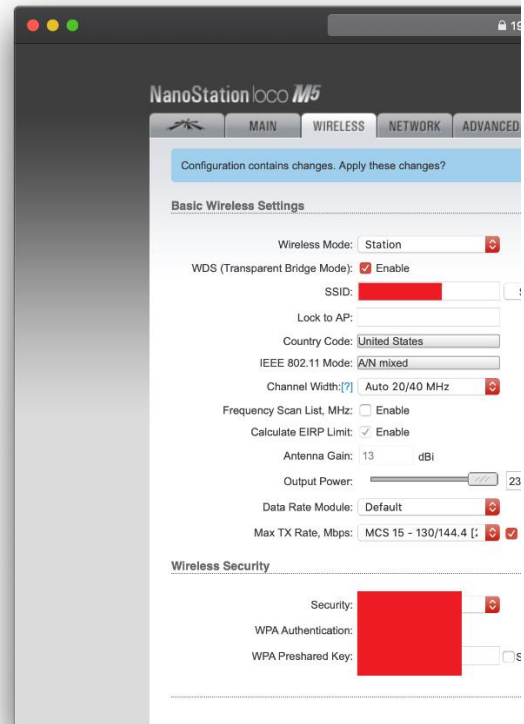
5. Go to Wireless and configure the wireless link depending on whether you are configuring a Base or Remote airMAX.

### Base



- Wireless Mode: Access Point
- WDS: ☒ Enable
- SSID: REDACTED\_SSID
- Security: REDACTED
- PSK: REDACTED

### Remote

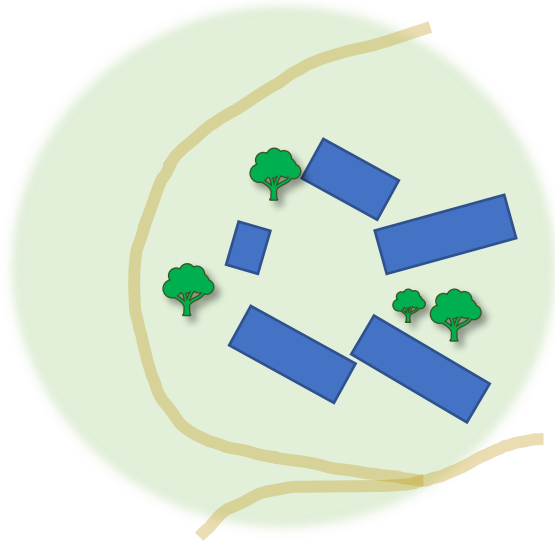


- Wireless Mode: Station
- WDS: ☒ Enable
- SSID: REDACTED\_SSID
- Security: REDACTED
- PSK: REDACTED

6. Click Apply in the top blue Banner to save and apply the changes we just made.
7. After a couple of minutes, switch to the Ubiquiti Discovery Tool and look for the device we just configured. It will display its DHCP IP, Name, and its MAC address. Verify that the name matches its role. If it doesn't, refer to step 3.

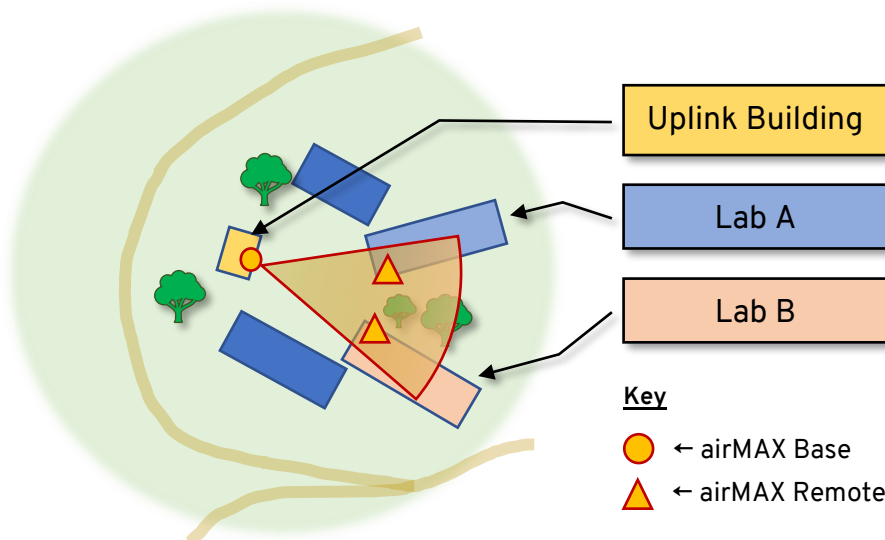
# Physical Topology Examples

## airMAX Setup

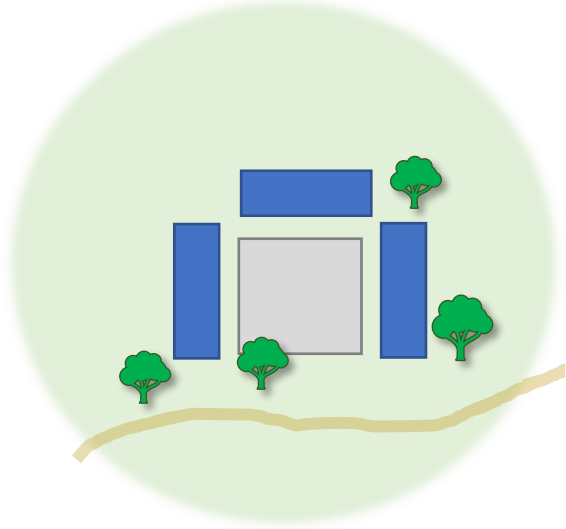


There are multiple buildings. The uplink is in the small building closest to the road at 11 o'clock. You need to provide Internet to the two buildings furthest from the uplink building (2 & 5 o'clock).

Use the airMAX to build a point-to-multipoint (PtMP) topology when trying to reach buildings opposite to each other. At each lab, you will still need to set up the Cisco access points to reach end clients. This topology is complex because you will have to setup a minimum of 5 intermediary devices (3 airMAX & 2 Cisco APs) to effectively service both labs.

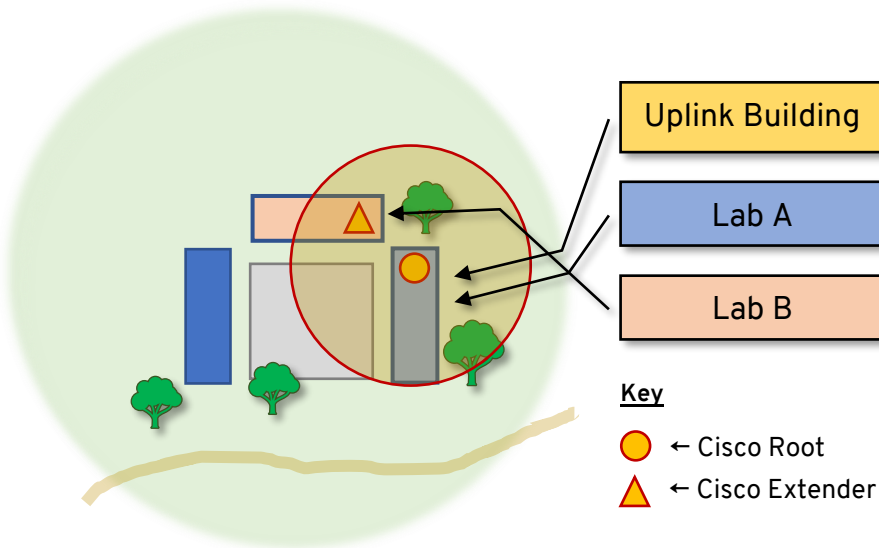


## Cisco Root/Extender Setup



There are three main buildings. There is a big flat concrete courtyard in the center. The uplink is at the 3 o'clock building. The Uplink and Lab A are the same building. Lab B is at the 12 o'clock building.

Use the Cisco Root/Extender because there is little distance between Lab A and Lab B and the tree is not blocking the direct line of sight. This topology requires less setup because you only have to setup two Cisco access points (1 Root & 1 Extender).



## Measuring Link Performance

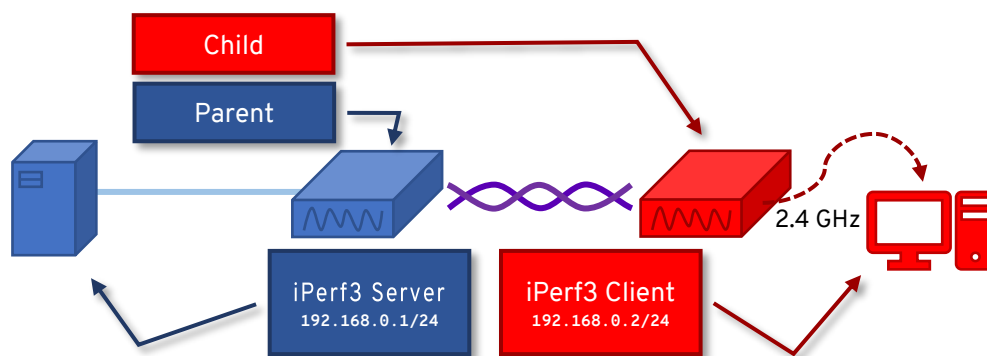
This section will explain how we can measure the network's bandwidth.

It is unnecessary to measure performance with just a single access point in our situation. This section is more appropriate for point-to-point/point-to-multipoint networks where we want to test the wireless link's throughput. The server and client should be placed on opposite sides of the network, with the server on the uplink side and the client on the downlink side.

The section will refer to the Root/Base access points as Parent and Repeater/Remote as Child.

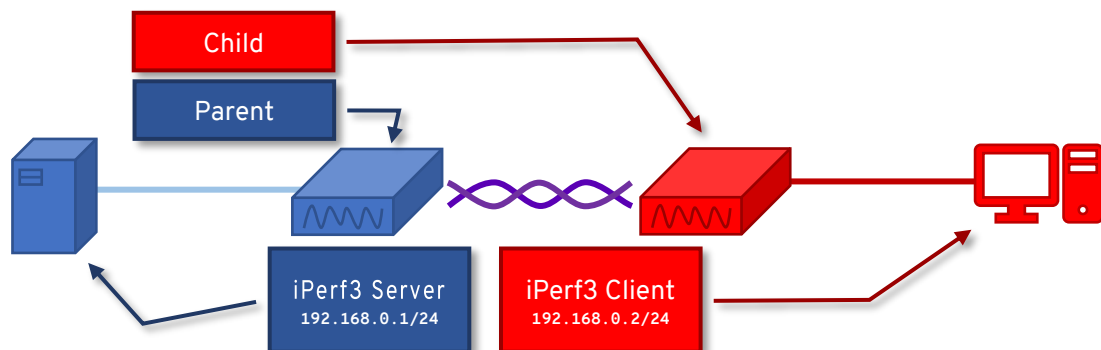
### Testing Topology A

Measuring the performance of the Child access point.



### Testing Topology B

Measuring the throughput of the wireless 5 GHz links.





## Measure Bandwidth (iPerf3)

To measure the bandwidth, use the open-source network tool iPerf3. You will need at least two devices, an iPerf3 server and an iPerf3 client.

### iPerf3 Windows

1. Take note of the server's IP address:

```
C:\server\iperf> ipconfig
Windows IP Configuration

Ethernet adapter Ethernet:

    IPv4 Address. . . . . : 192.168.0.1
    Subnet Mask . . . . . : 255.255.255.0
```

2. Run the following command in the directory containing iperf3.exe:

```
C:\server\iperf> iperf3 --server
-----
Server listening on 5201
-----
```

3. On the client, perform the performance test by connecting to the server:

```
C:\client\iperf> iperf3 --client 192.168.0.1
Connecting to host 192.168.0.1, port 5201
[ 4] local 192.168.0.2 port 50727 connected to 192.168.0.1 port 5201
[ ID] Interval           Transfer     Bandwidth
[ 4]   0.00-1.00   sec   13.1 MBytes  110 Mbits/sec
[ 4]   1.00-2.00   sec   13.4 MBytes  112 Mbits/sec
[ 4]   2.00-3.00   sec   12.8 MBytes  107 Mbits/sec
[ 4]   3.00-4.00   sec   13.6 MBytes  114 Mbits/sec
[ 4]   4.00-5.00   sec   14.0 MBytes  117 Mbits/sec
[ 4]   5.00-6.00   sec   14.1 MBytes  118 Mbits/sec
[ 4]   6.00-7.00   sec   14.1 MBytes  119 Mbits/sec
[ 4]   7.00-8.00   sec   13.6 MBytes  114 Mbits/sec
[ 4]   8.00-9.00   sec   14.2 MBytes  119 Mbits/sec
[ 4]   9.00-10.00  sec   14.1 MBytes  119 Mbits/sec
-----
[ ID] Interval           Transfer     Bandwidth
[ 4]   0.00-10.00  sec   137 MBytes  115 Mbits/sec    sender
[ 4]   0.00-10.00  sec   137 MBytes  115 Mbits/sec    receiver

iperf Done.
```