# TP-Link Omada Mesh Introduction

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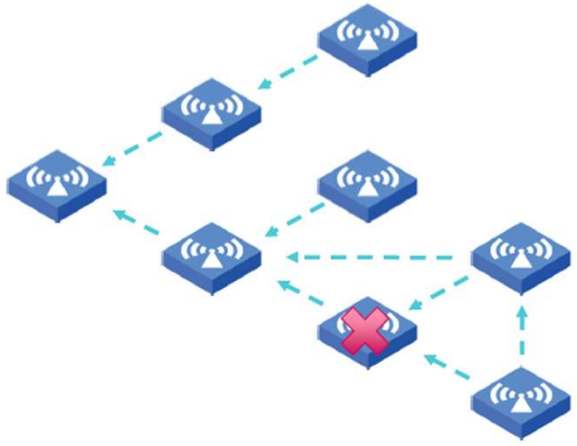
- What is Mesh Network,  Omada Mesh Device and Typical Scenario
- Brief Introduction of EAP Mesh Network
- Configuration Guide for EAP Mesh Network
- Deployment & Optimization for EAP Mesh Network
- Chain Topology Three Hops Mesh Aps

# What is Mesh Network, Omada Mesh Device and Typical Scenario

## What is Mesh Network？

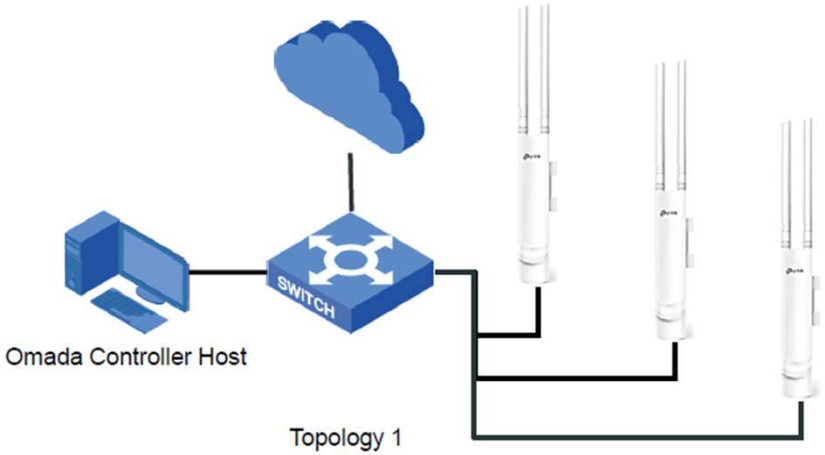
**The Mesh network we are talking about now often refers to a wireless mesh network with following characteristics:**

- **The Mesh network is formed by multiple wireless APs (node), these APs will connect to each other wirelessly.**
- **The Mesh network has certain robustness and adaptability, which means the Mesh network can still work even some of the APs are failed.**

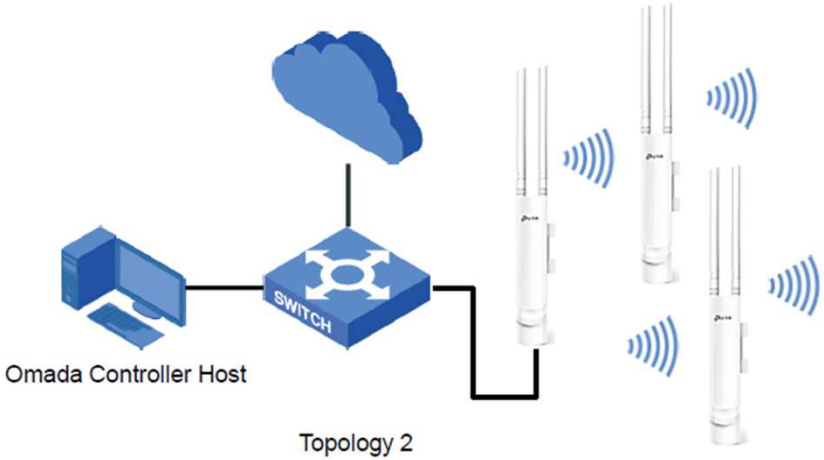


## Why do we need Mesh?

- In traditional wired AP deployment, all APs will be connected with Ethernet cable, like topology 1 shows:
- But in some cases, for example: To provide Wi-Fi coverage for a beach or a farm. To use traditional deploy method, Ethernet cable wiring can be very expensive and time-consuming. Sometimes due to environmental restriction, the wired deployed can be very difficult, even impossible.
- Mesh network is designed to provide a solution for these situations. With Mesh network, most of cable wiring is no longer required, AP can be deployed anywhere the user need (within the wireless coverage of any uplink AP).



Topology 1



Topology 2

# Omada Mesh Devices

**Note: The products marked "Planned" require subsequent firmware update and are not guaranteed. The compatible device list will be updated regularly, and TP-Link reserves the right to modify this page at any time without notifying the user. Both listed and higher hardware versions of these models support Omada Mesh.**

***Omada Mesh requires the use of Omada Controllers. And please make sure the latest firmware of the devices are installed. If not, download the latest firmware and follow the instructions to upgrade it.**

## Controllers

**OC300 V1**

Omada Hardware Controller

**OC200 V1**

Omada Hardware Controller

**Omada Software Controller**

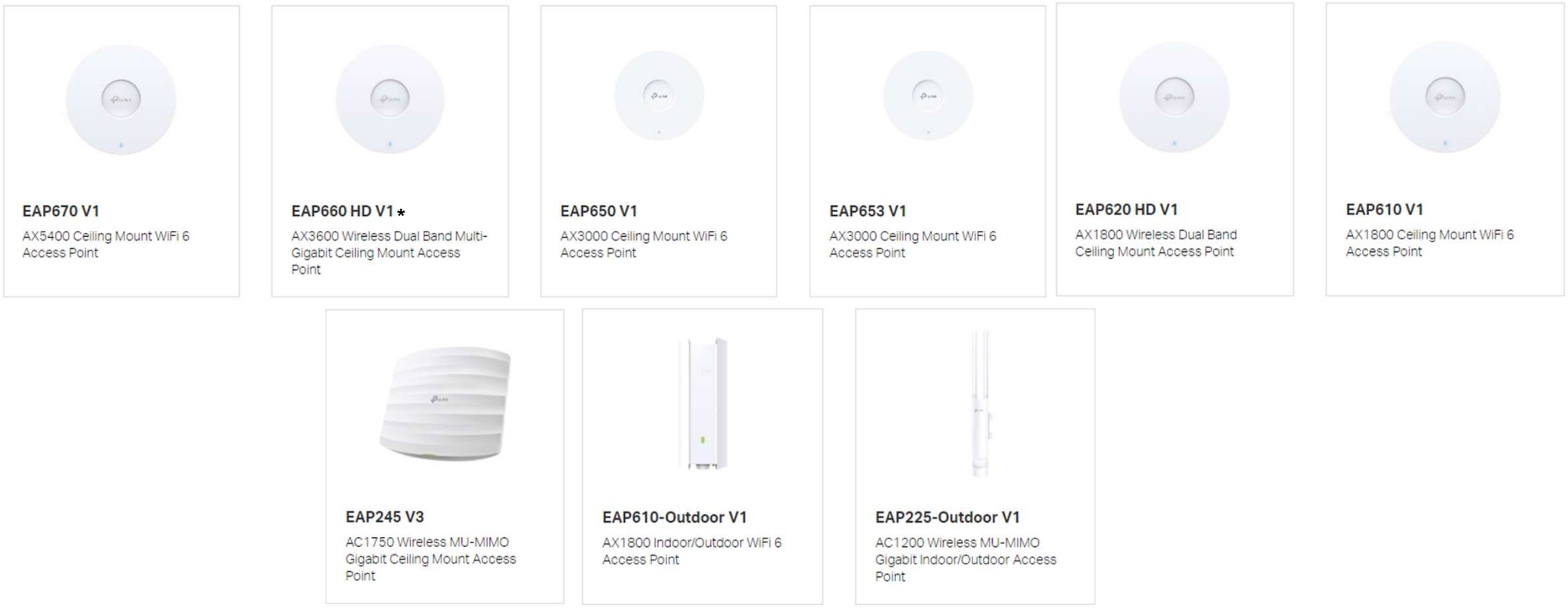
**V5.4**

Omada Software Controller

# Omada Mesh Devices

## Both listed and higher hardware versions of these models support Omada Mesh.

### Access Points



**EAP670 V1**
AX5400 Ceiling Mount WiFi 6 Access Point

**EAP660 HD V1 ***
AX3600 Wireless Dual Band Multi-Gigabit Ceiling Mount Access Point

**EAP650 V1**
AX3000 Ceiling Mount WiFi 6 Access Point

**EAP653 V1**
AX3000 Ceiling Mount WiFi 6 Access Point

**EAP620 HD V1**
AX1800 Wireless Dual Band Ceiling Mount Access Point

**EAP610 V1**
AX1800 Ceiling Mount WiFi 6 Access Point

**EAP245 V3**
AC1750 Wireless MU-MIMO Gigabit Ceiling Mount Access Point

**EAP610-Outdoor V1**
AX1800 Indoor/Outdoor WiFi 6 Access Point

**EAP225-Outdoor V1**
AC1200 Wireless MU-MIMO Gigabit Indoor/Outdoor Access Point

***The firmware version EAP660HD(JP)_V1_1.1.0 build 20211224 or more is needed**

# Typical Scenario : Beach

**A park manager plan to provide Wi-Fi coverage for a beach. Beach size is 400x180 ㎡. Wireless clients number is about 50 smartphones and tablets in average. Internet gateway locates at the red arrow in the picture. According to wireless clients distribution and coverage requirement, set the APs' location as the blue arrows.**

**Wired Networking Plan:**

- **Difficult in Ethernet cabling. Since maximum length for normal twisted-pair cable is only 100m. For some parts (like A-D in picture), the Ethernet cabling can be very complicated and expensive.**
- **Inflexible Deployment. Once the Ethernet cable wiring is done, AP's position will be fixed. To change AP's position, the cabling will need to be redone.**

# Typical Scenario : Beach

- **Mesh Networking Plan:**

➢ **Easy to deploy. No Ethernet cabling is required for the Mesh AP. Save time and money for Ethernet cable wiring.**

➢ **Flexible Deployment. Deploy AP wherever needed (within the uplink AP coverage).**

➢ **The AP close to Root AP can make direct wireless uplink to Root AP, we call it as 1-hop Mesh AP.**

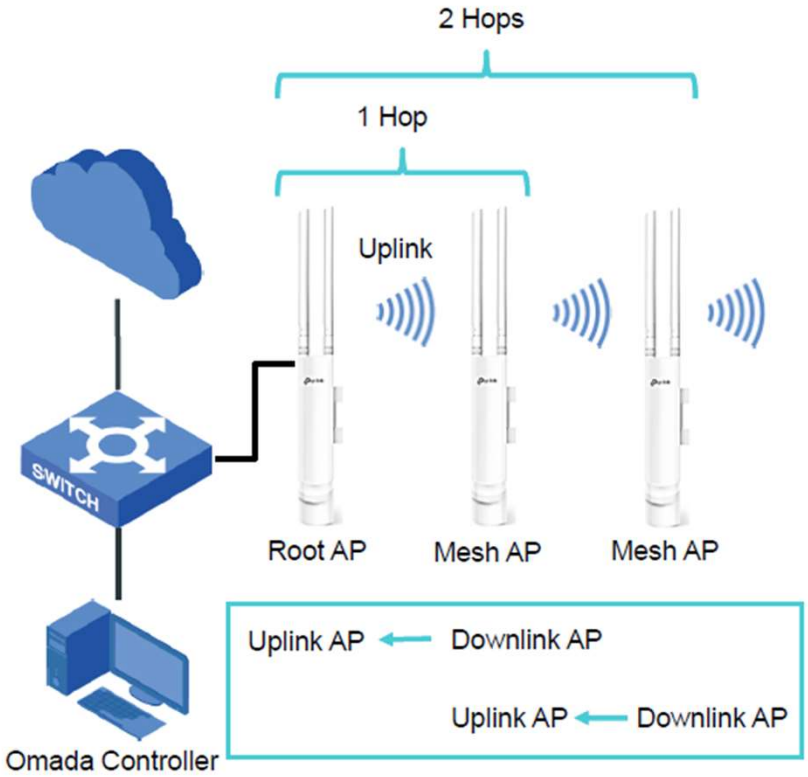
➢ **For the AP locates out of Root AP's coverage, you can build a wireless uplink with the Mesh AP and make it as 2-hop Mesh AP or 3-hop Mesh AP.**

- **Note: Root AP, 1-hop Mesh AP and 2-hop Mesh AP will be introduced in later chapter.**

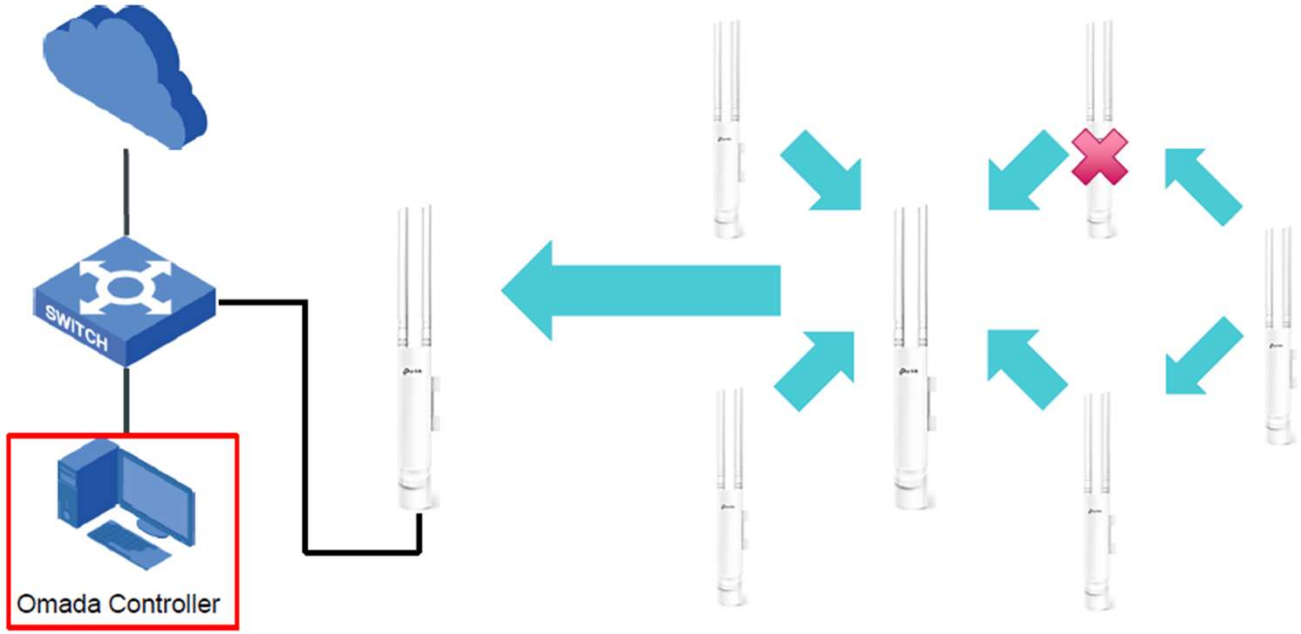
# Brief Introduction of EAP Mesh Network

# Basic Concepts for Mesh of EAP

| Basic Concepts | Explanation: |
|---|---|
| Uplink | Data link between AP and its direct front-end EAP device. |
| Root AP | The wired AP in a Mesh network. |
| Mesh AP | AP with wireless uplink. |
| Uplink AP | The AP provide wireless uplink for Mesh AP will be called the Uplink AP for this Mesh AP. |
| Downlink AP | The Mesh AP connect to other AP wirelessly will be called as Downlink AP for the other AP. |
| Hop | The relative distance between Mesh AP and Root AP. For TP-Link Mesh network, it supports 3 hops in maximum. |



# Brief Intro for Mesh of EAP

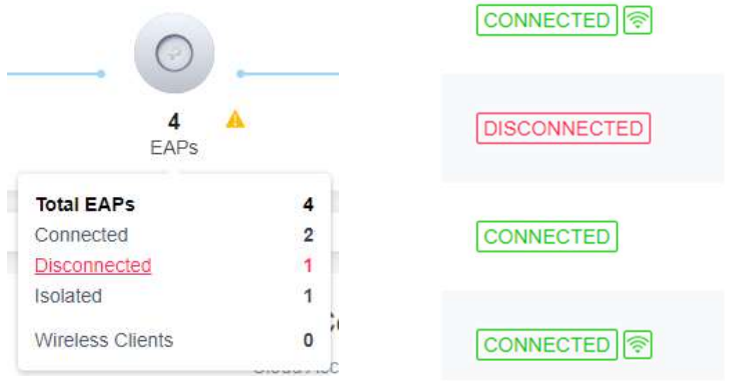



- An EAP Mesh network is formed by at most 1 Root AP and at least 1 Mesh AP.
- A Mesh AP can have up to 1 uplink, but it can have up to 4 downlinks.
- When one or more AP failed in EAP Mesh network, with Auto Failover feature enabled, the Mesh network will recover automatically.
- The EAP Mesh feature requires Omada Controller to keep running. User can only make Mesh related configuration in Omada Controller.

# Configuration Guide for EAP Mesh Network

# Explanation about EAP status

**Here we will introduce different status of EAP, since mesh EAP is connected via wireless instead of wired, so compared with before, there are some new status like Pending (wireless), Connected (wireless), isolated, etc.**

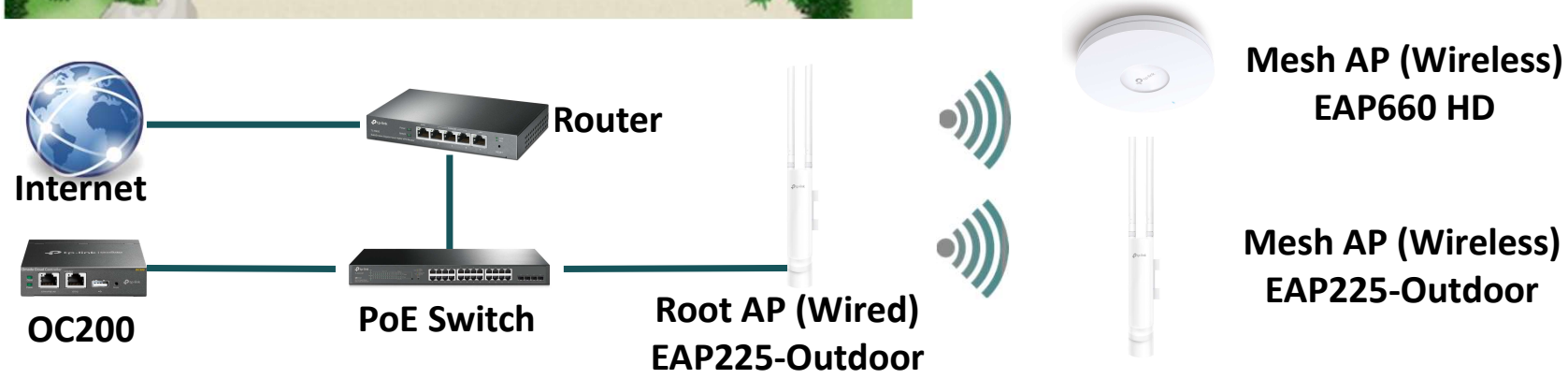



| Status | When will you see this status |
|---|---|
| Pending | Controller find unmanaged EAP with wired connection. |
| Pending(wireless) | Controller find unmanaged EAP with wireless connection. (For Mesh Network) |
| Adopting | Controller is establishing session to EAP with wired connection. |
| Adopting(wireless) | Controller is establishing session to EAP with wireless connection. (For Mesh Network) |
| Configuring | Controller is distributing configuration to the EAP. |
| Connected | EAP is successfully managed by Controller with wired connection. |
| Connected(wireless) | EAP is successfully managed by Controller with wireless connection. (For Mesh Network) |
| Disconnected | Controller lose both wired and wireless connection to the EAP. |
| Isolated | Controller lose wired connection to EAP but find it in wireless. (For Mesh Network) |

## Network Topology


**Mesh is used to establish a wireless network or expand a wired network through a wireless connection on the 5GHz radio band.**

**We can use Omada EAP products to build a mesh network for indoor and outdoor places together. Here is an example of how to build a Mesh Network in a home scenario via indoor and outdoor Mesh EAP. We are using EAP225-Outdoor, EAP660 HD, and EAP225-Outdoor to build the Mesh network. The EAP225-Outdoor connect with PoE Switch works as the Root AP. The EAP660 HD and EAP225-Outdoor connect with EAP225-Outdoor (Root AP) wirelessly as the Mesh AP.**

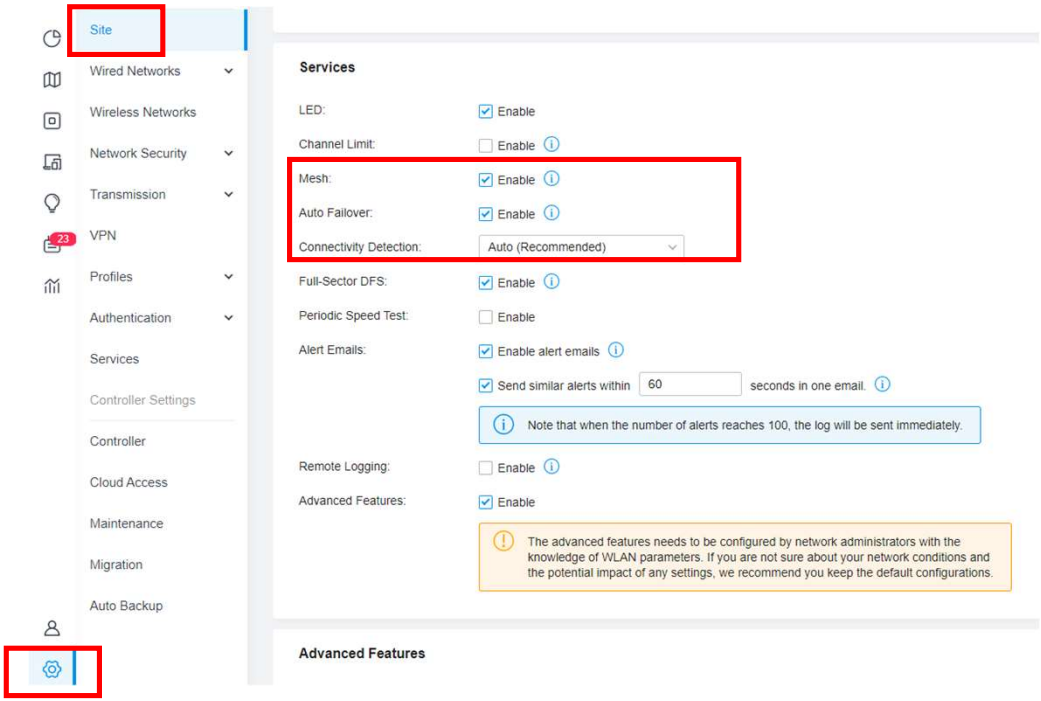



*TP-Link suggests to select a higher performance EAP like 802.11ax supported as Root AP and deploy to lower performance EAPs as Mesh APs.

## Configuration Steps*

1. Following the topology to connect the devices. Power on the EAPs and OC200 (you can also use a software controller) via PoE adapter or PoE switch.

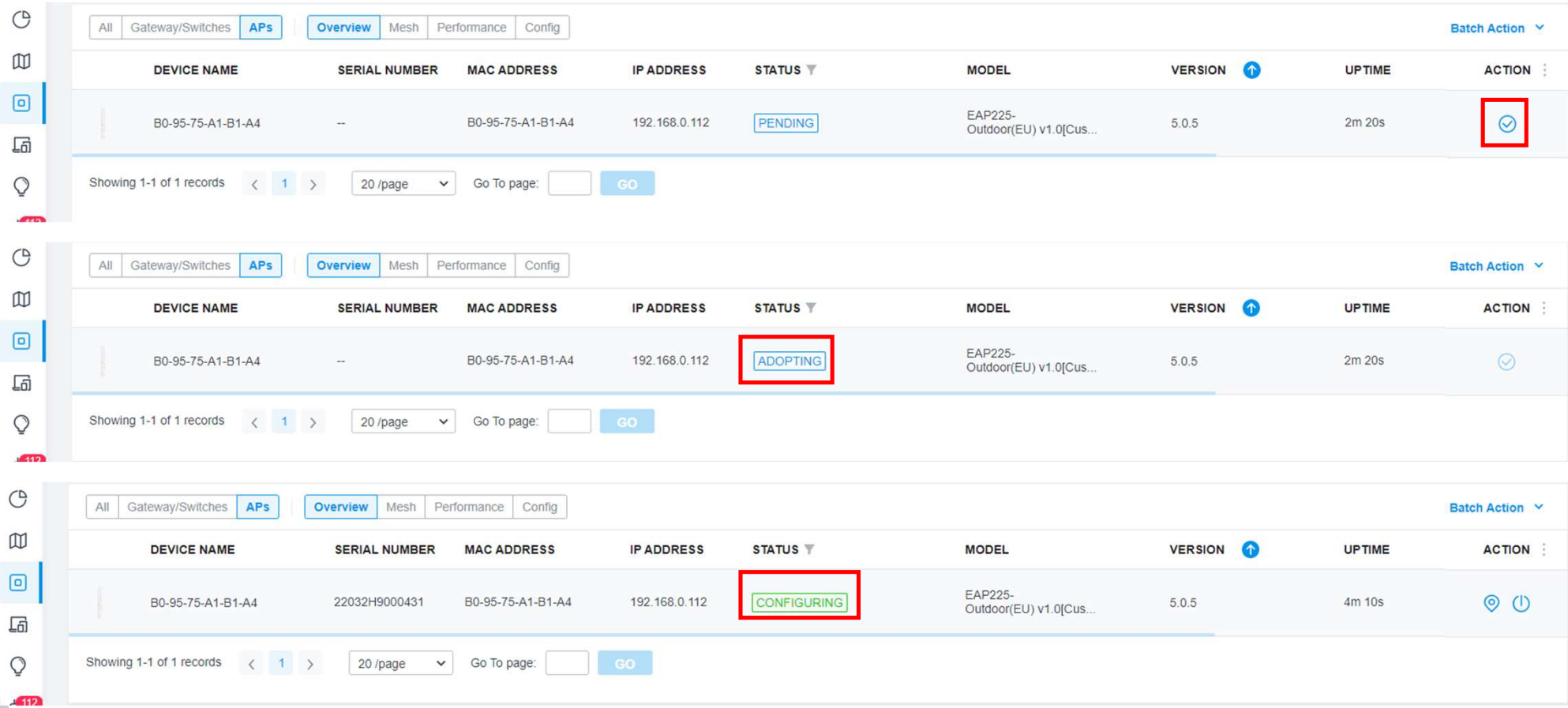
2. Use the IP address of OC200 to log in to the management page. Go to Settings-> Site to enable the Mesh function. (It is enabled by default)




*This example is based on Omada Controller v5.1.7.

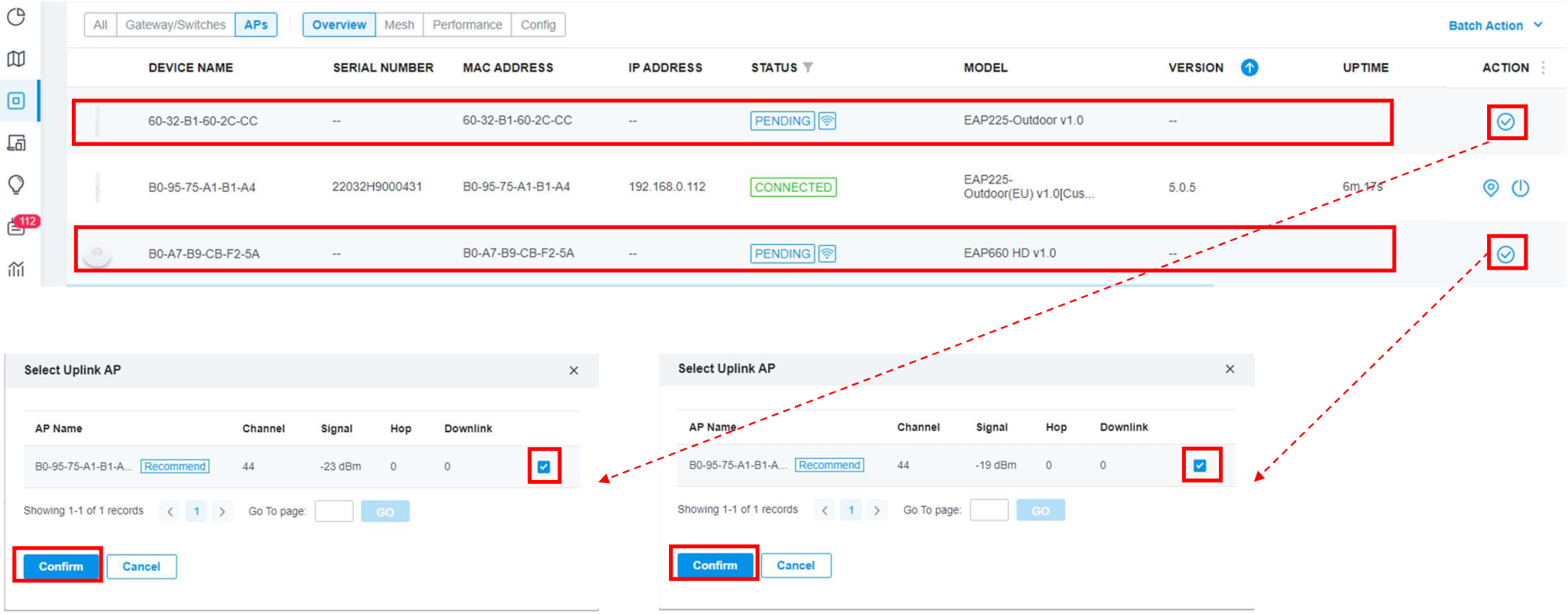
# Configuration Steps

3. Go to Device page. And you can find the EAP225-Outdoor (Root AP) in the pending list. Click the “adopt” button to adopt the EAP225-Outdoor.



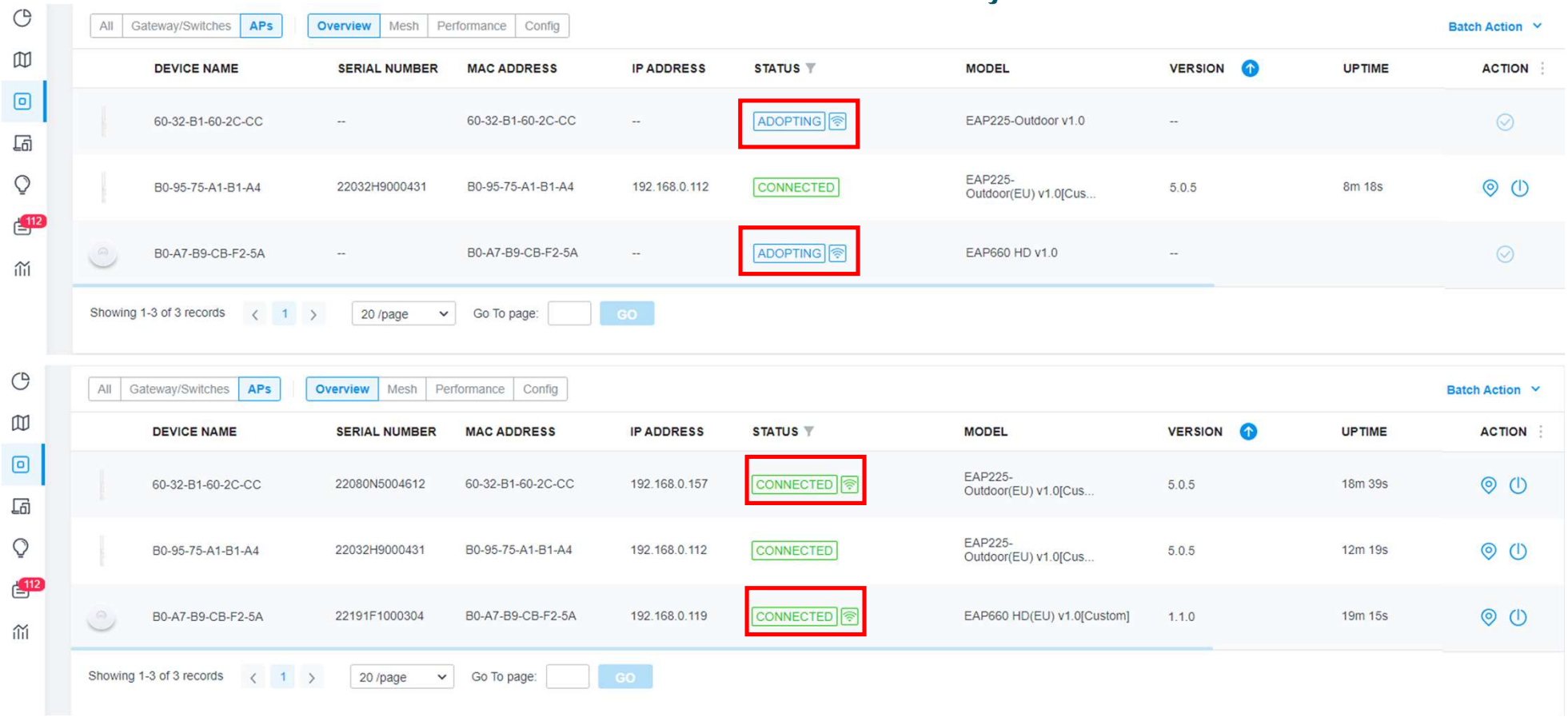
# Configuration Steps

4. After adopting the EAP225-Outdoor (Wired, Root AP), the Controller will find other wireless EAPs automatically. Click the “adopt” button to adopt the EAP660 HD (Mesh AP) and EAP225-Outdoor (Mesh AP).

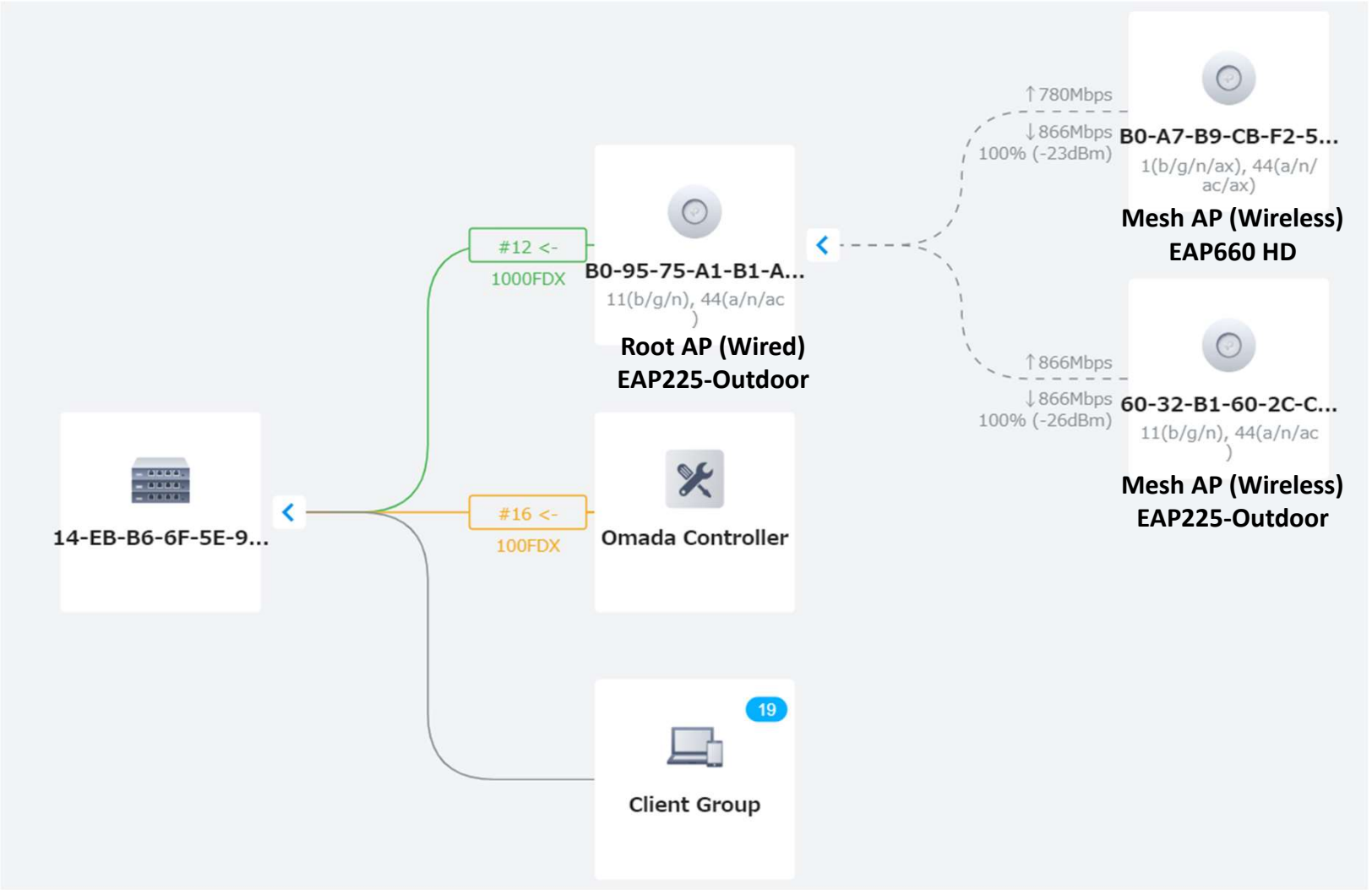


# Configuration Steps

5. After 3-5 minutes, the EAP660 HD (Mesh AP) and EAP225-Outdoor (Mesh AP) will get an IP address from DHCP Server and connect with Omada Controller automatically.



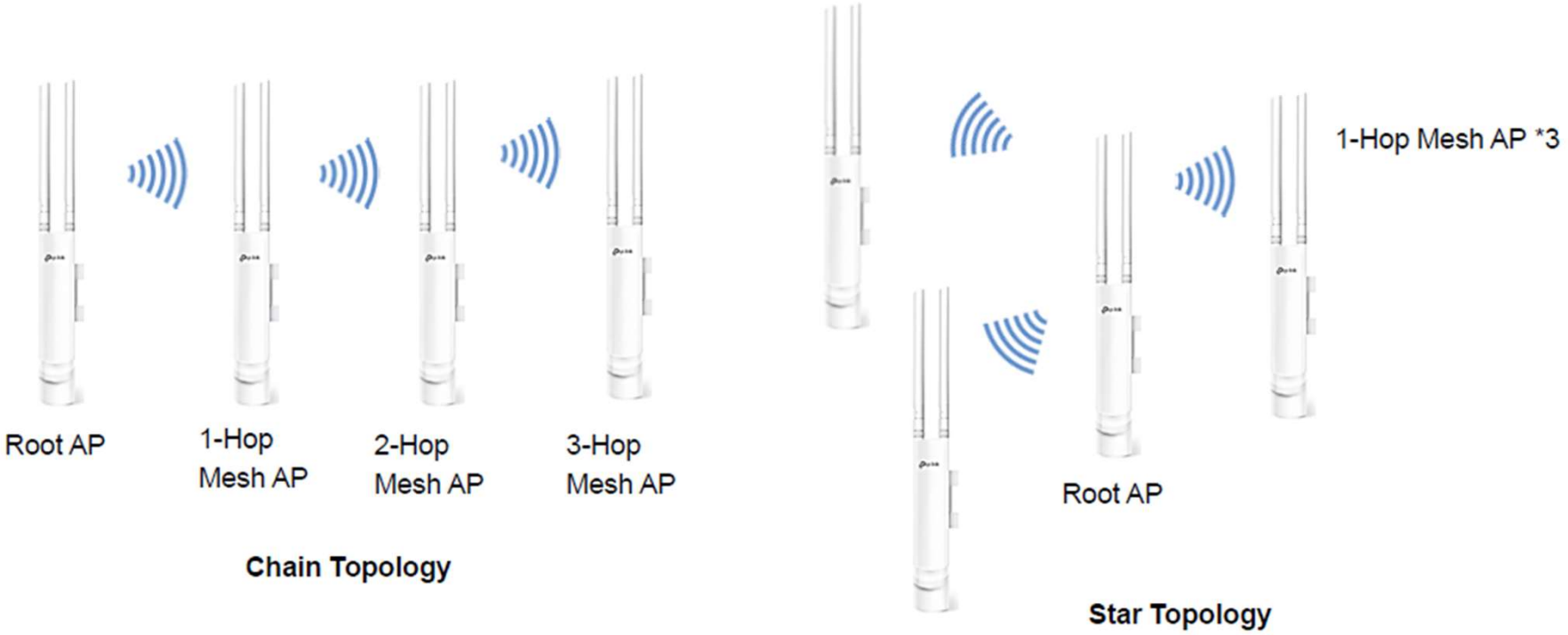
# Topology



# Deployment & Optimization for EAP Mesh Network

# Deployment Optimization for Mesh Network

## 1. Topology Optimization:



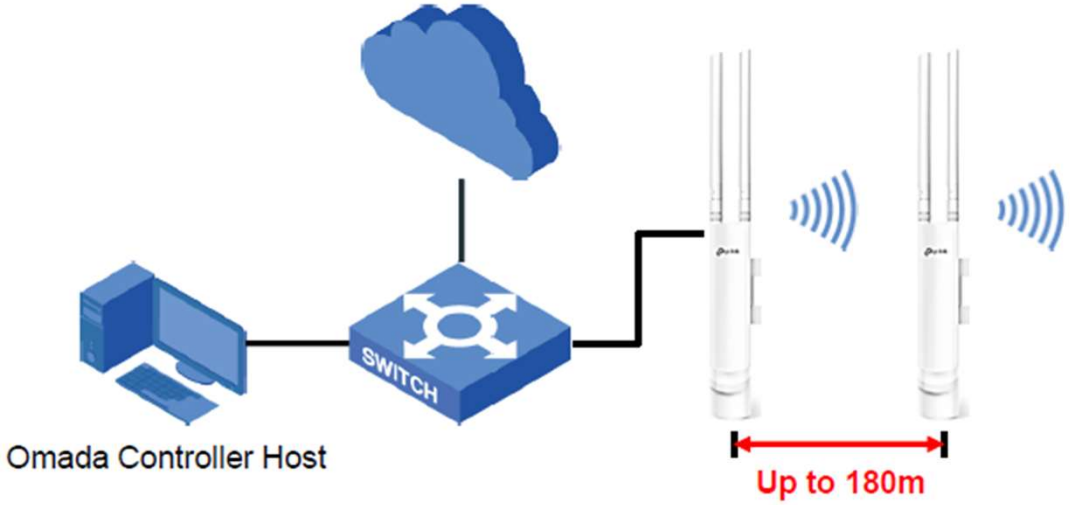

**Note:**

- **Due to the half-duplex characteristics of wireless communication and the signal loss during transmission, the wireless performance will drop inevitably alone with the hop increase in Mesh network.**
- **To reduce the hop number in a Mesh network, use star topology instead of chain topology. Star topology with less hops usually has a better wireless performance compared with chain topology.**

## Deployment Optimization for Mesh Network

### 2. Distance between Mesh AP and Uplink AP:

**To make sure the stability of wireless link and provide high-speed Wi-Fi experience when roaming between the EAPs, the recommended distance between Uplink AP and Downlink AP is up to 180m.**

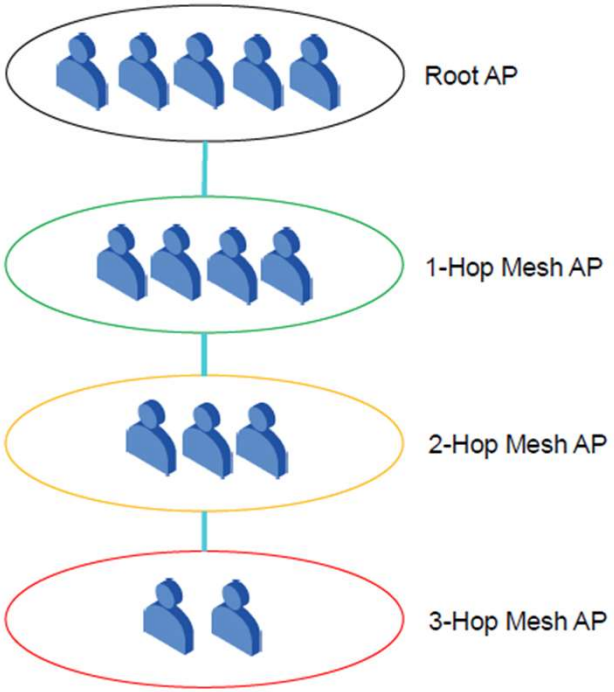



**Note: The real supported distance depends on the real environment such as obstacles and wireless interference between Mesh AP and Uplink AP.**

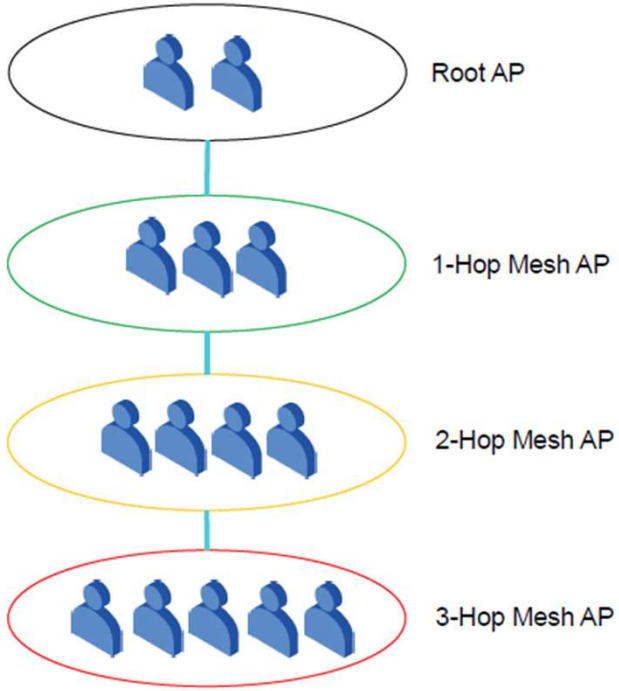
## Deployment Optimization for Mesh Network

### 3. Wireless Client Distribution:

**Make sure most of the wireless clients connect to root AP or 1-Hop AP(s). Because the Root AP and 1-Hop Mesh AP usually have better wireless performance than 2 or 3-Hop AP.**




Most clients connect to root AP & 1-Hop Mesh AP(Recommended)

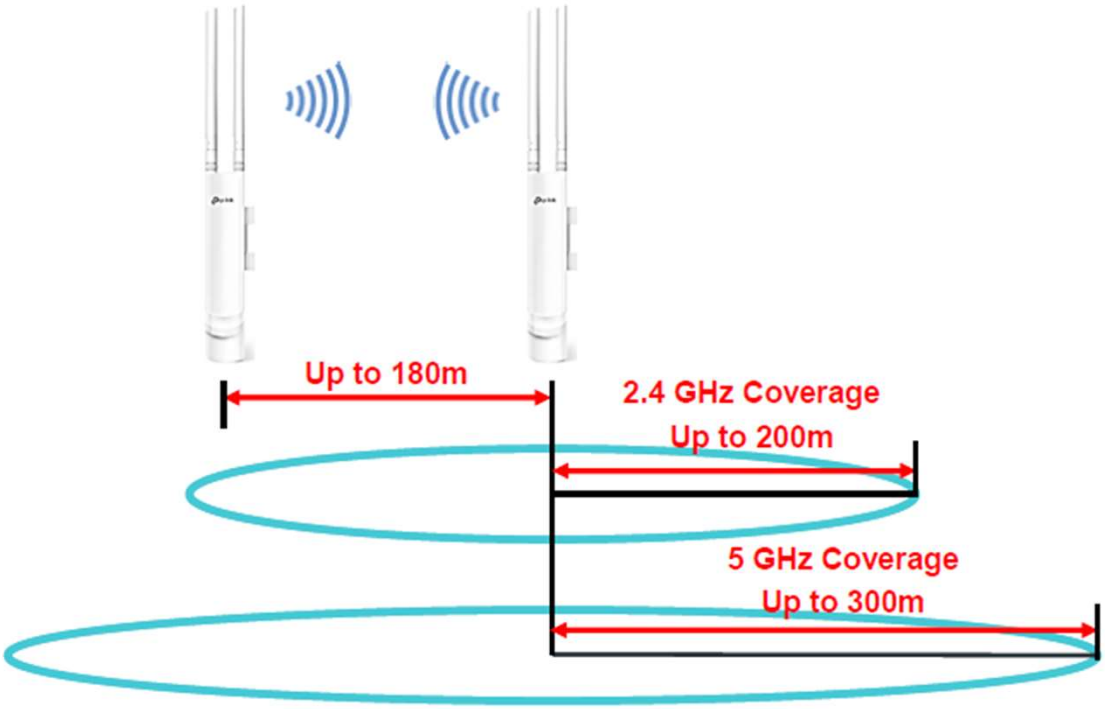



Most clients connect to 2 & 3-Hop Mesh AP (NOT Recommended)

# Deployment Optimization for Mesh Network

## 4. Coverage (For EAP225-Outdoor):

**The recommended coverage for EAP225-Outdoor is up to 200m (in 2.4GHz) and 300m (in 5GHz) in open space. The actual coverage depends on the obstacles, deployment height, wireless interference, wireless client's antenna gain & transmitting power and local laws & regulations about transmitting power.**




**To improve the coverage:**

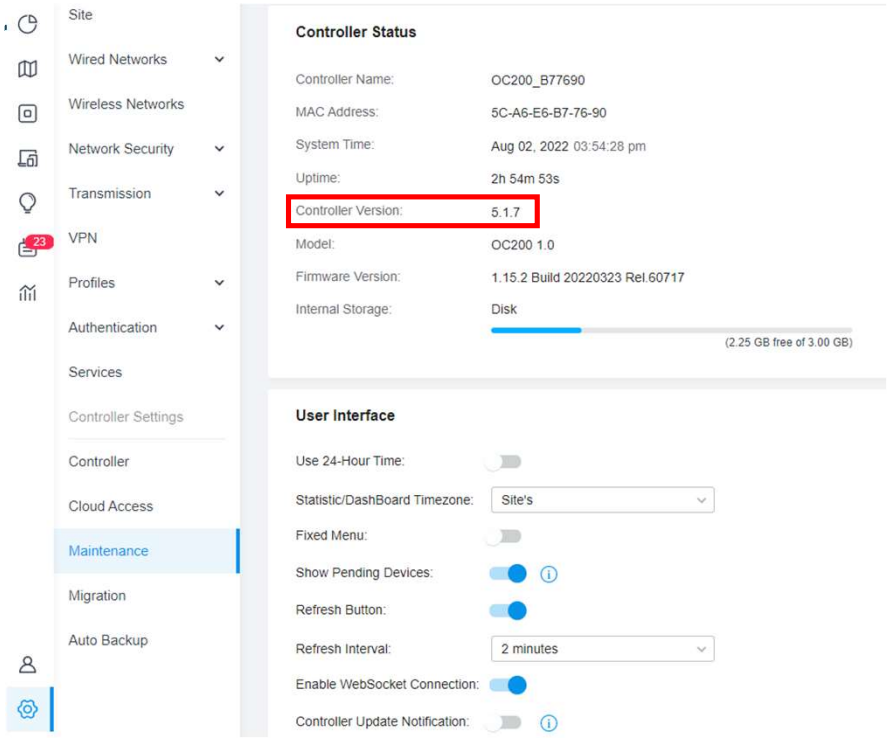
- **Make sure there is no obstacle between the AP and wireless clients.**
- **Use the channel with least interference.**
- **For dual band clients, use 5GHz instead of 2.4GHz to connect. etc.**

# Deployment Optimization for Mesh Network

## 5. Can I configure Mesh in EAP's web interface?

**No. Mesh network can only be configured with Omada Controller 2.7.0 or later version.**

**All the EAPs in Mesh network must be managed by Omada Controller. What's more, Omada Controller can't be shut down when Mesh network is running. If Controller is shut down accidentally, the wireless uplink for Mesh AP will be broken.**



# Deployment Optimization for Mesh Network

6. What's the recommend capacity/coverage of EAP Mesh network?

For EAP225-Outdoor, the recommend maximum coverage in open space is 200m (656 feet) in 2.4GHz and 300m (984 feet) in 5GHz; The recommend maximum capacity for one Mesh network is 50~60.

When talking about capacity/coverage, here are some information you may need to know:

A) First of all, the recommend capacity/coverage is related to the model of EAP.

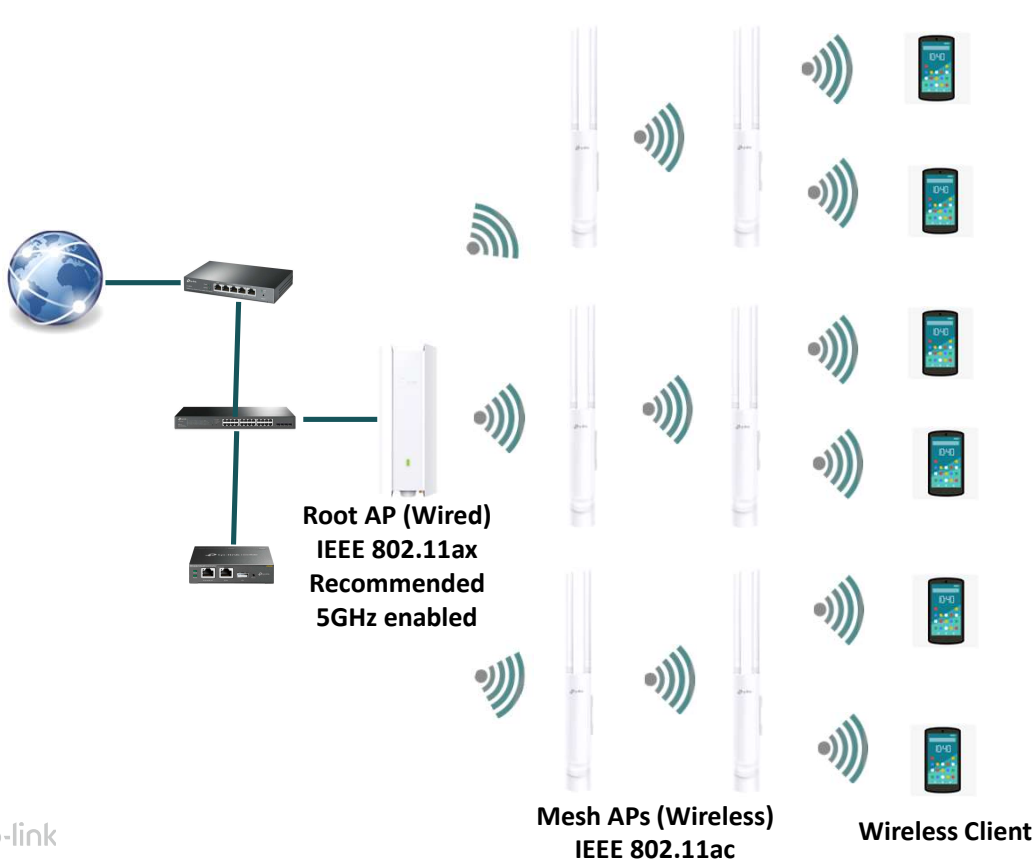
B) The capacity/coverage will always depend on wireless interference, deployment plan, application of the wireless clients and so on, so the capacity/coverage here is just an average value for reference.

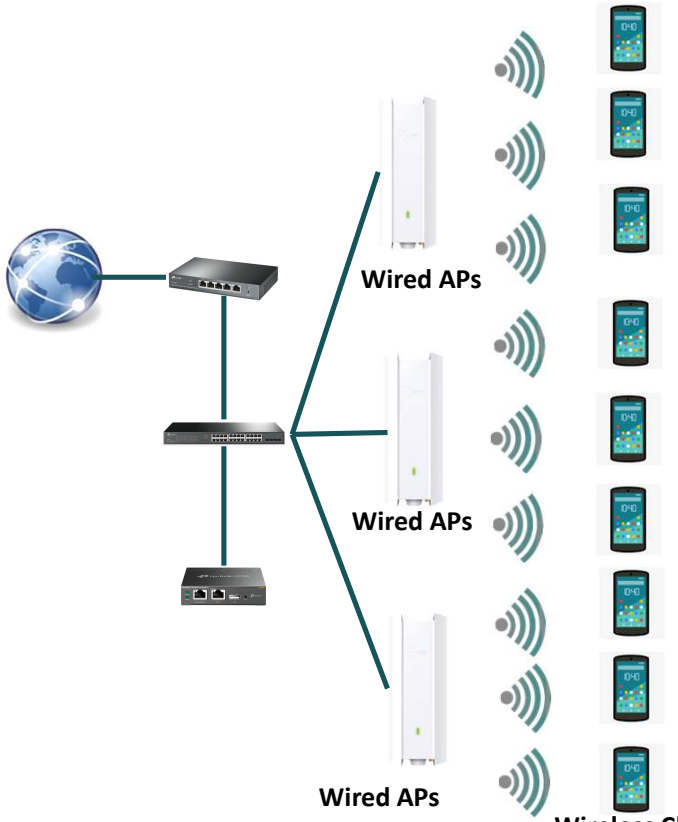
C) The Mesh network is mainly designed to simplify EAP deployment and extend the coverage, but not aim to expand the wireless client capacity. So the capacity here is for the whole Mesh network including Root AP and all Mesh APs together rather than for one single Mesh AP. So if you need to provide Wi-Fi coverage for high user density environment, please use wired deployment plan.

Note: This coverage is a little longer than the recommend maximum distance between Mesh AP and Uplink AP, the reason is that the Mesh AP need to be closer to get better signal strength for the wireless clients connected to it.

# Deployment Optimization for Mesh Network

C) The Mesh network is mainly designed to simplify EAP deployment and extend the coverage, but not aim to expand the wireless client capacity. So the capacity here is for the whole Mesh network including Root AP and all Mesh APs together rather than for one single Mesh AP. So if you need to provide Wi-Fi coverage for high user density environment, please use wired deployment plan.

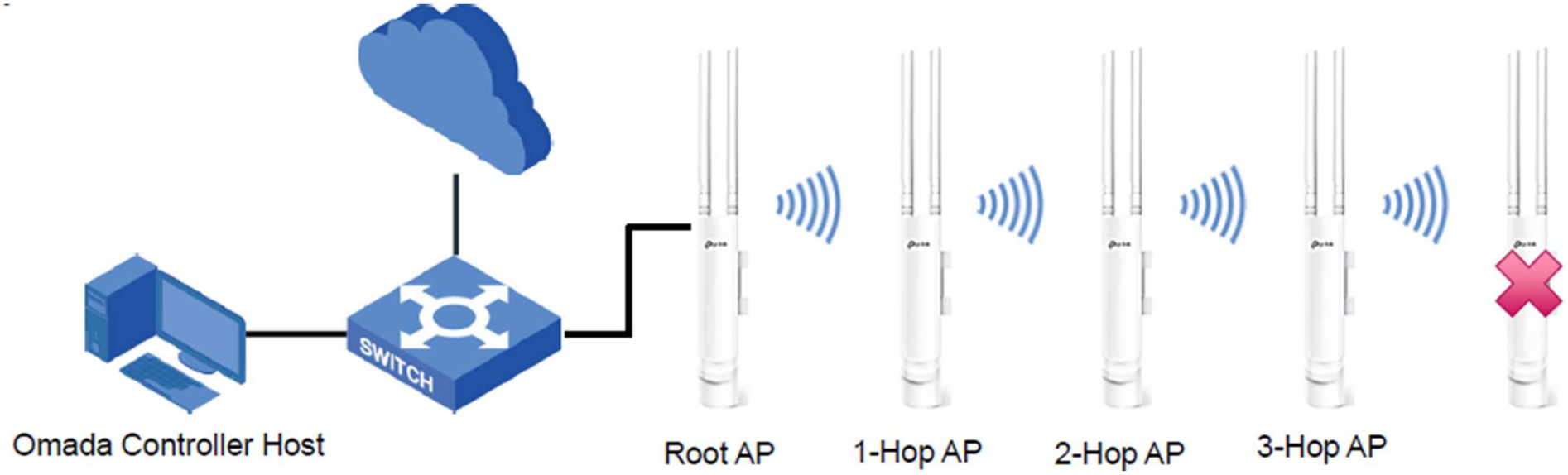


## Deployment Optimization for Mesh Network

### 7. What's supported maximum hop number and Downlink AP number?

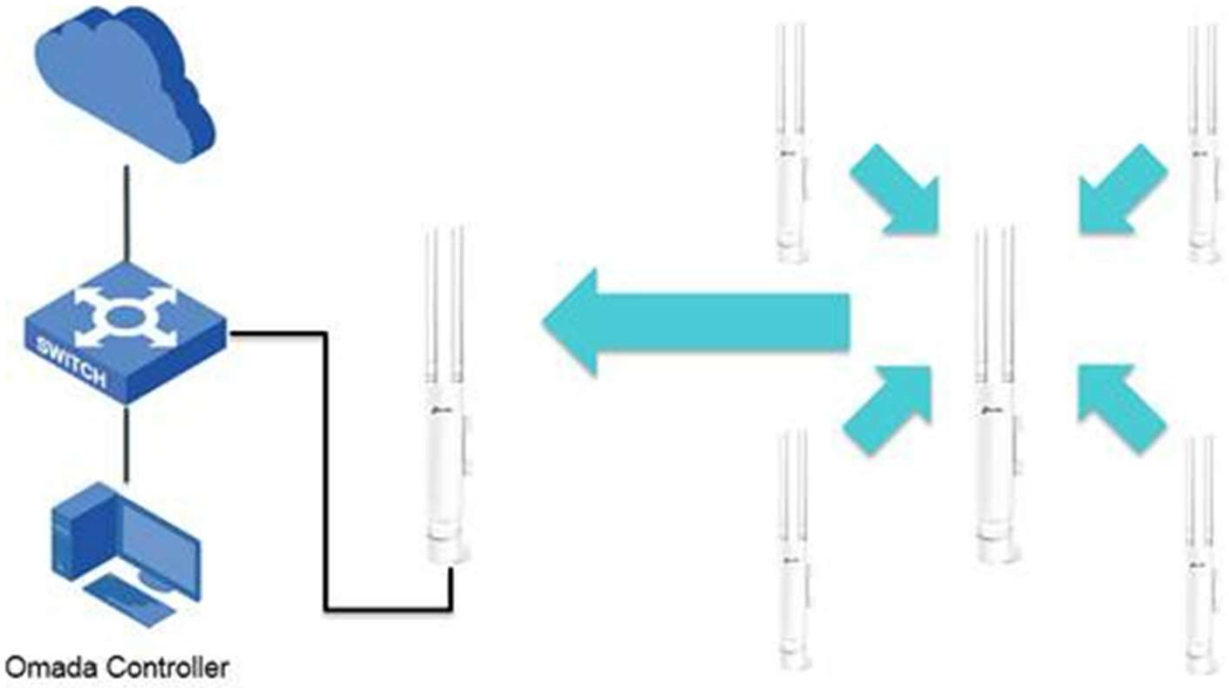
**The supported maximum hop number is up to 3 hops. For each Uplink AP, it can have up to 4 Downlink APs connected to it directly.**



# Deployment Optimization for Mesh Network

## 8. Maximum Downlink AP number is 4.

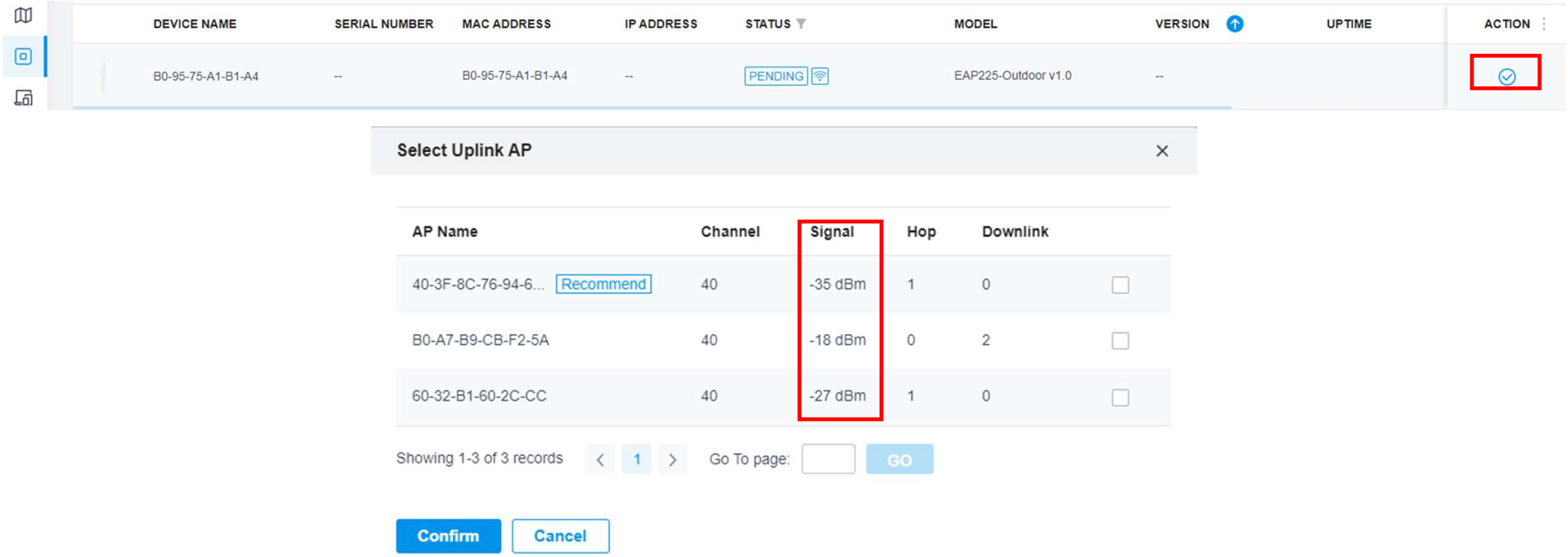
**It means for one single Uplink AP, it can have at most 4 Downlink APs connected to it.**



# Deployment Optimization for Mesh Network

## 9. What's the recommended RSSI when choosing Uplink AP?

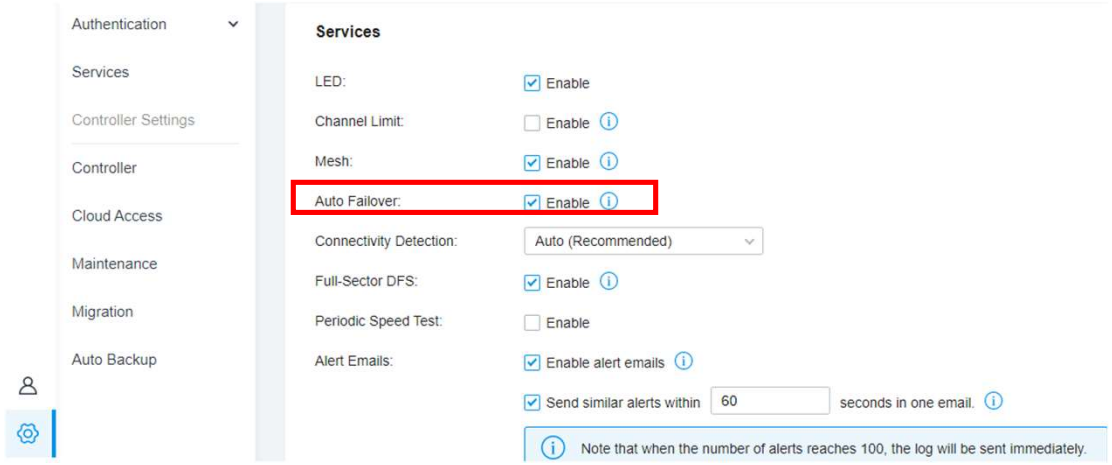
**Uplink AP with RSSI higher than -60 dBm can provide better uplink performance. The AP with RSSI lower than -80 dBm is not recommended. The RSSI will be displayed when you choose an Uplink AP.**



# Deployment Optimization for Mesh Network

## 10. What is “Auto Failover” feature and how to use it?

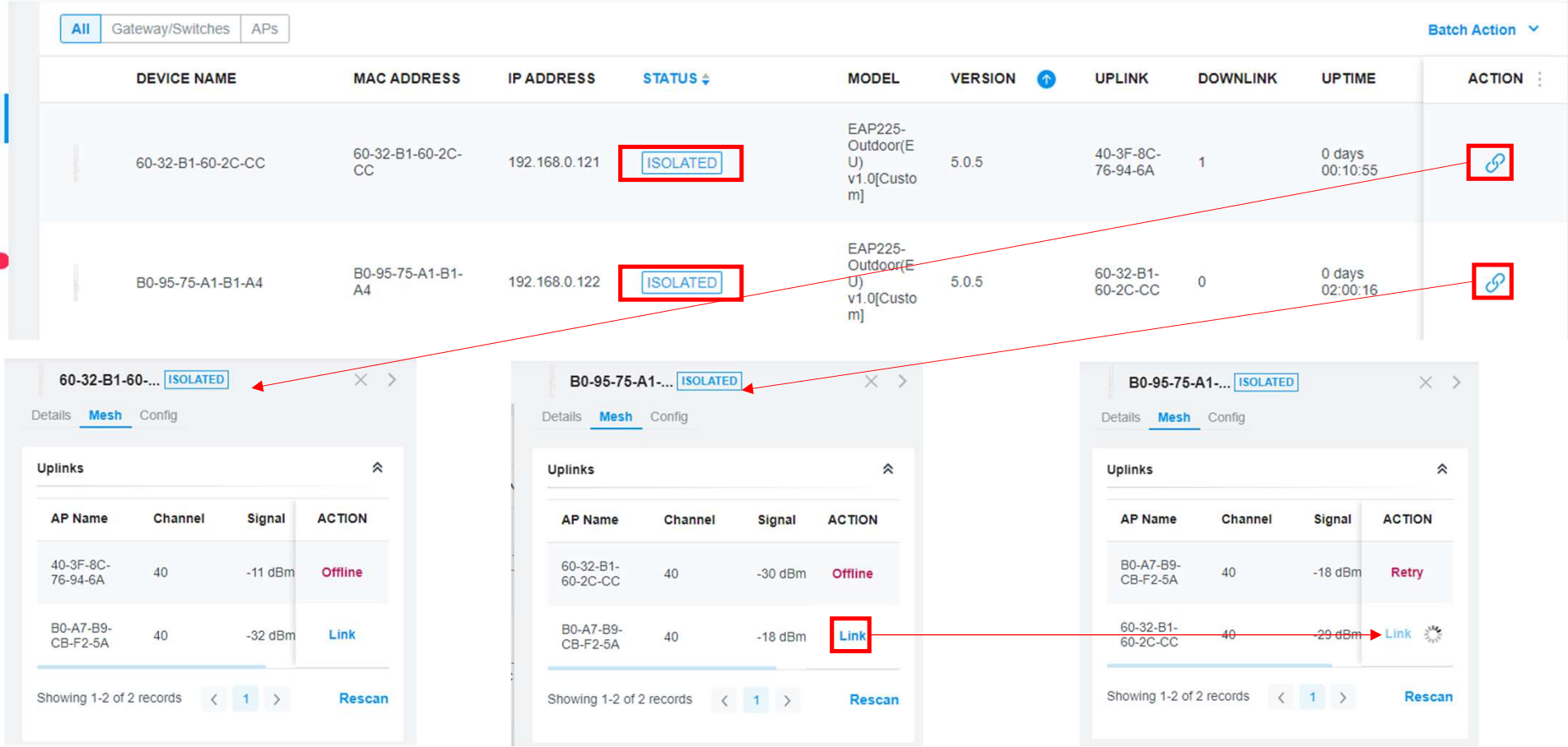
- When some Mesh APs are failed in Mesh network, with Auto Failover enabled, the Mesh network will recover automatically (controller will select a new wireless uplink for the AP automatically).
- To use this feature, you just need to enable it in Omada Controller.




***Note: When multiple Mesh APs failed and get back online at the same time, the Auto Failover may not be able to build the best topology. Because each Mesh AP’s uptime may be different and they will connect to an uplink AP once back online, while they will not turn to other uplink Aps automatically during this process even there might have a better choice. So the topology might not be the best one compared with build up this topology manually (disable auto failover).***

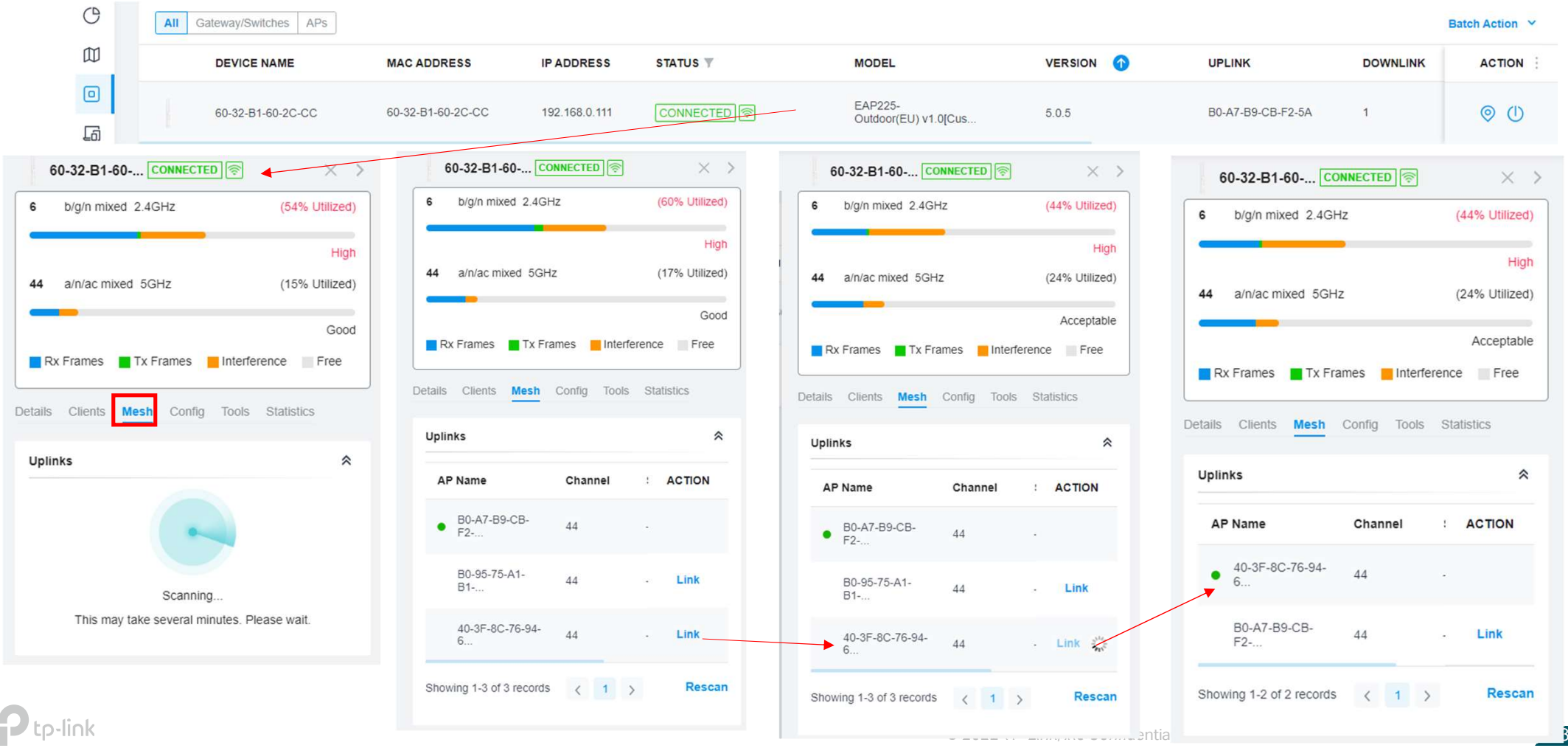
# Deployment Optimization for Mesh Network

## Build up this topology manually (disable auto failover).



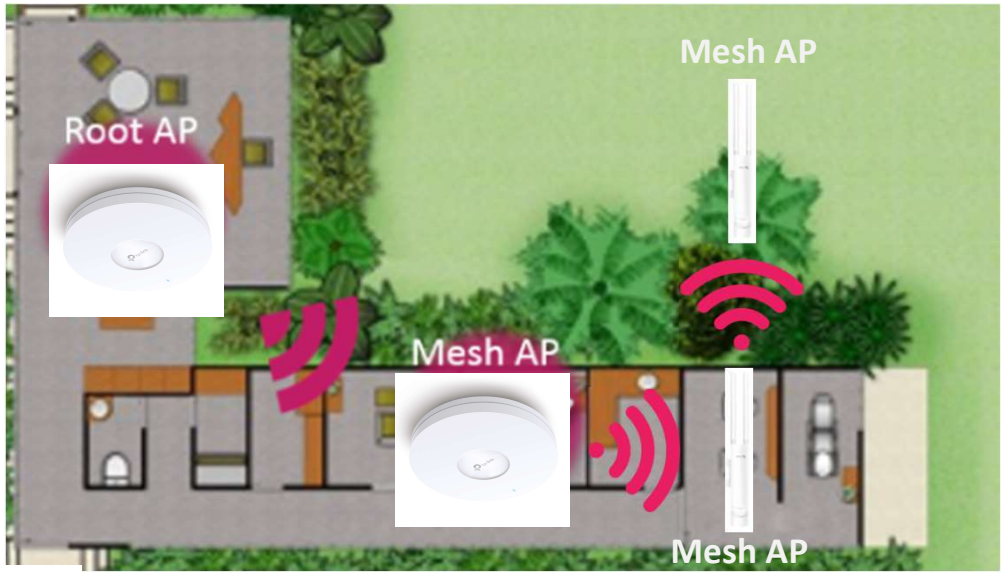
# Deployment Optimization for Mesh Network

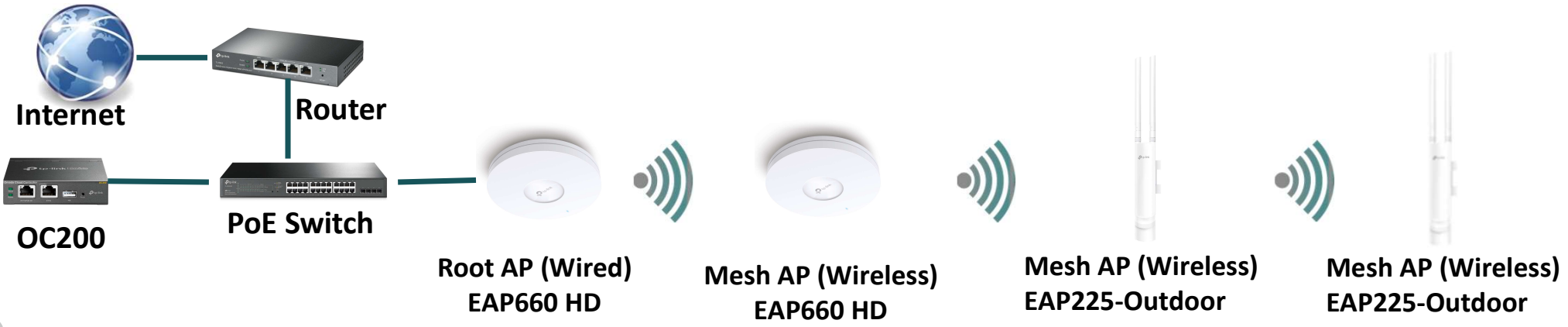
## Build up this topology manually (disable auto failover).



# Chain Topology
# Three Hops Mesh Aps

# Chain Topology Three Hops Mesh Aps Configuration

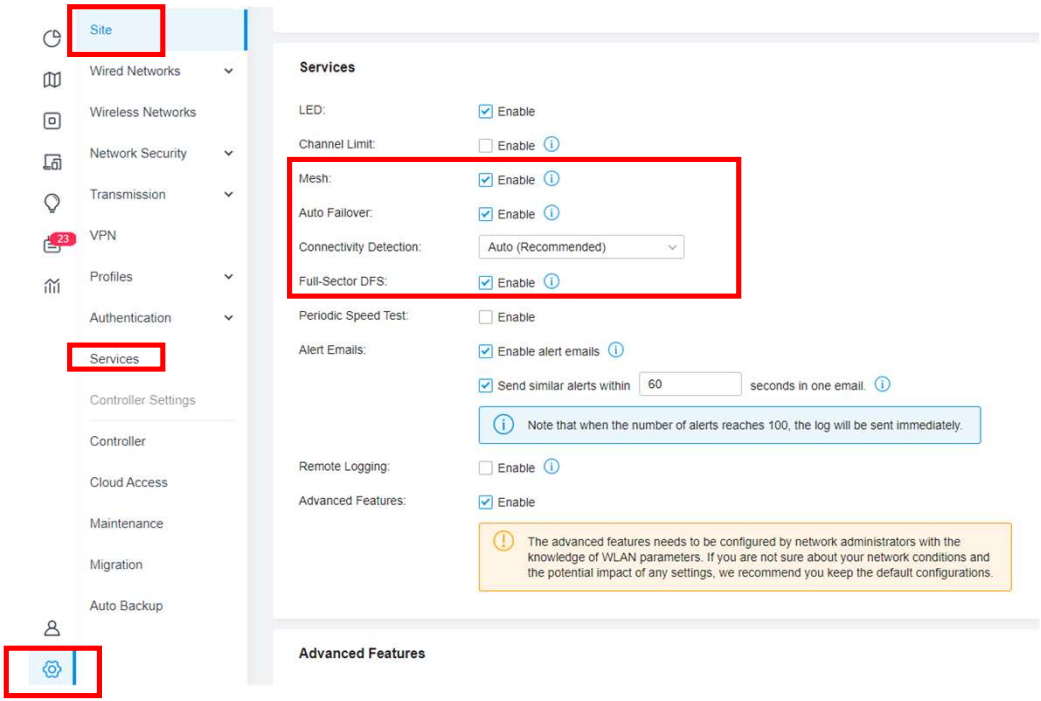


## Configuration Steps*

1. Following the topology to connect the devices. Power on the EAPs and OC200 (you can also use a software controller) via PoE adapter or PoE switch.

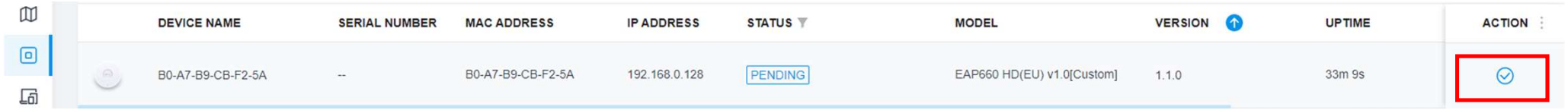
2. Use the IP address of OC200 to log in to the management page. Go to Settings-> Site to enable the Mesh function. (It enables by default)

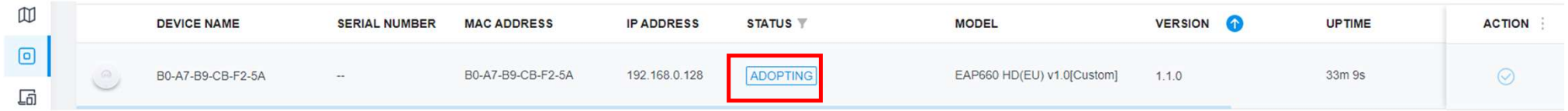



*This example is based on Omada Controller v5.1.7.

# Configuration Steps

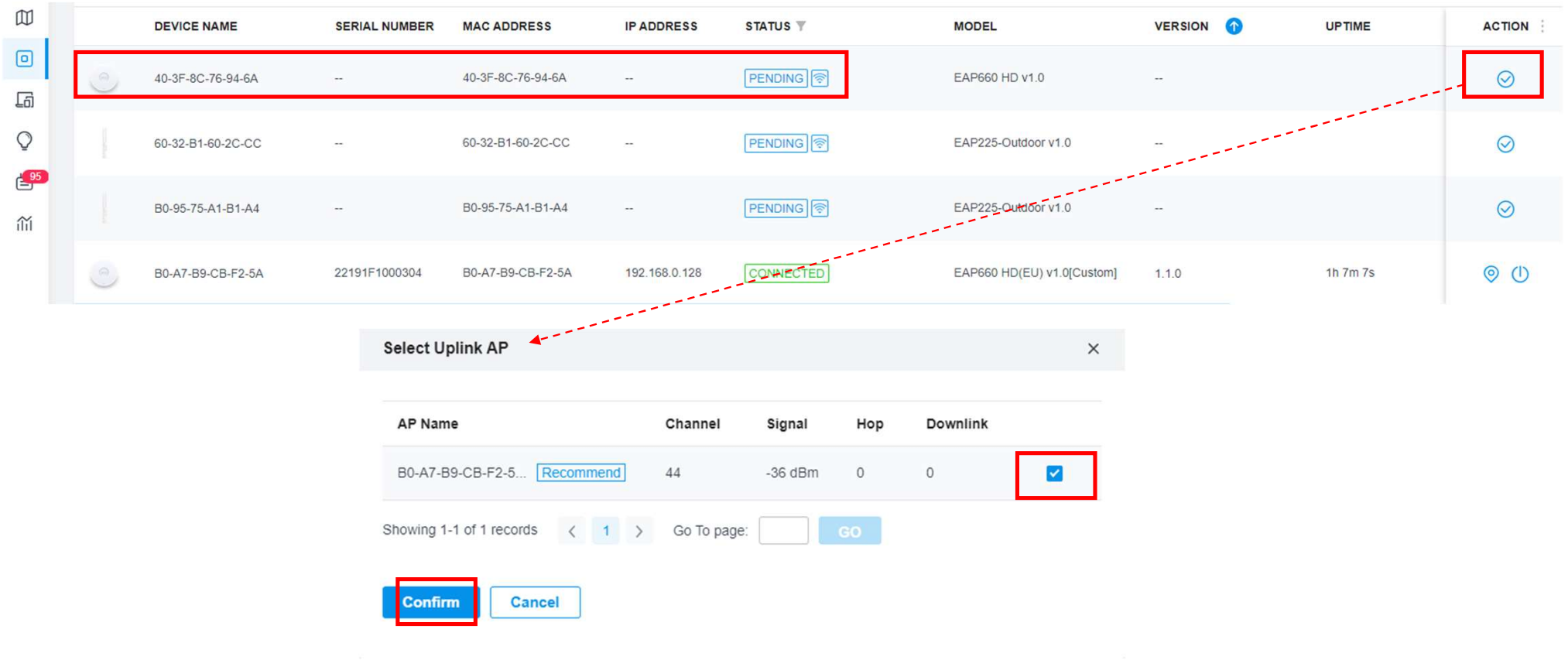
3. Go to Device page. And you can find the EAP660 HD (Root AP) in the pending list. Click the “adopt” button to adopt the EAP660 HD.



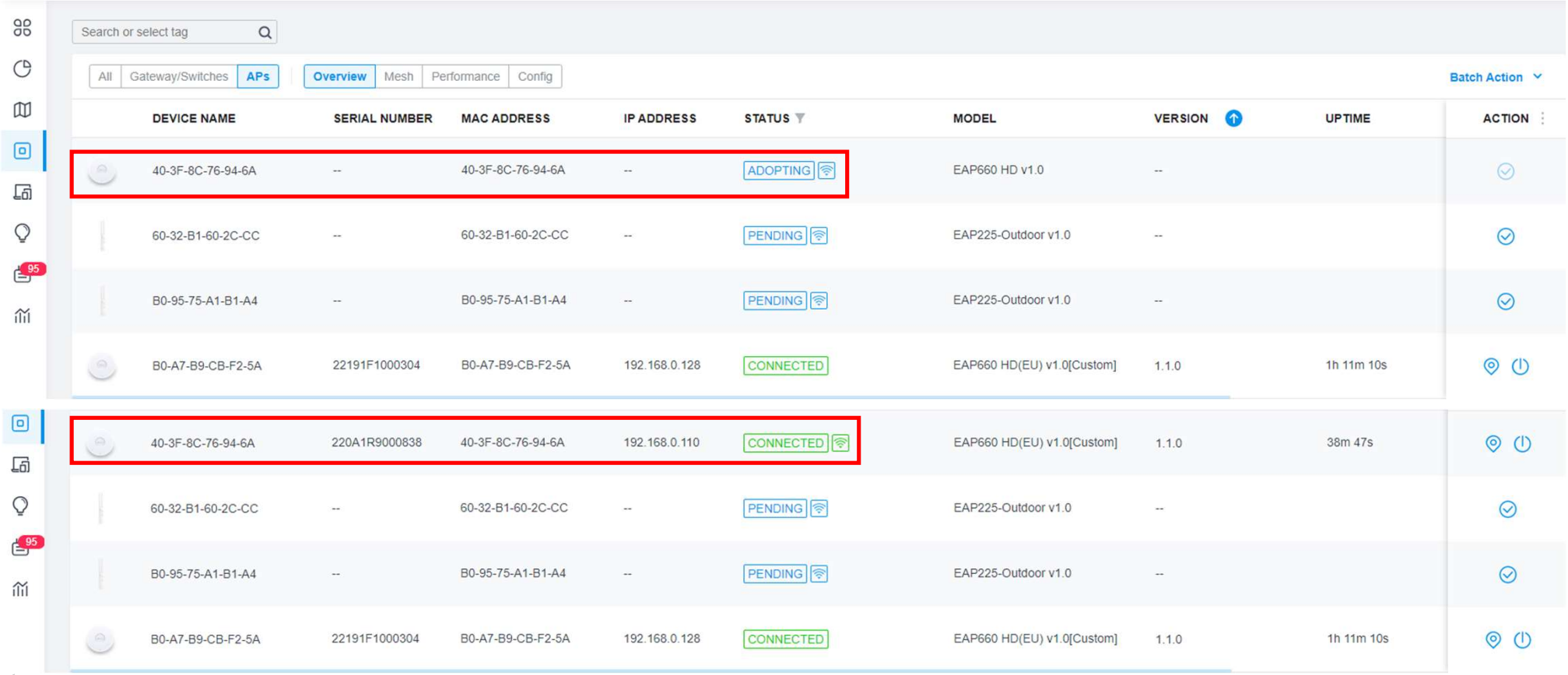
# Configuration Steps

4. After adopting the EAP660 HD (Wired, Root AP), the Controller will find other wireless EAPs automatically. Click the “adopt” button to adopt the first hop EAP660 HD (Mesh AP).



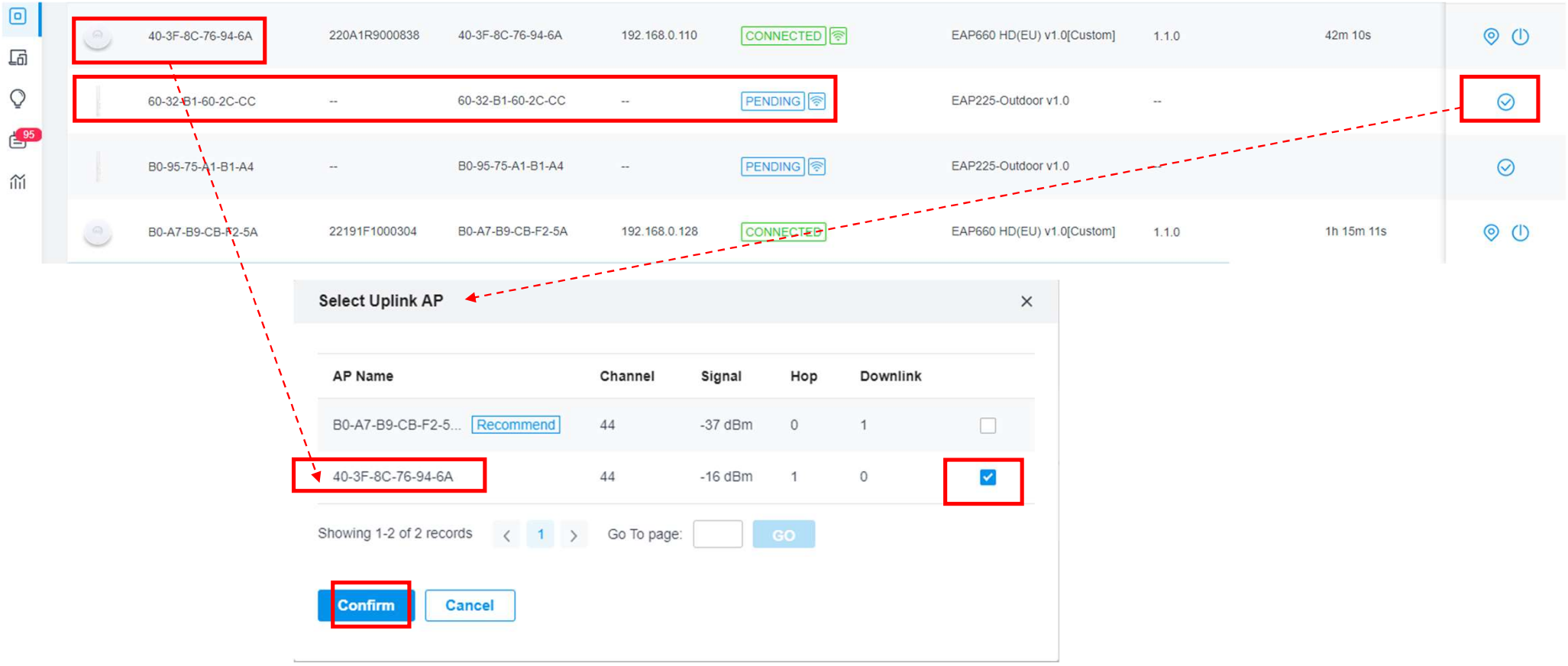
# Configuration Steps

5. After 3-5 minutes, the first hop EAP660 HD (Mesh AP) will get an IP address from DHCP Server and connect with Omada Controller automatically.



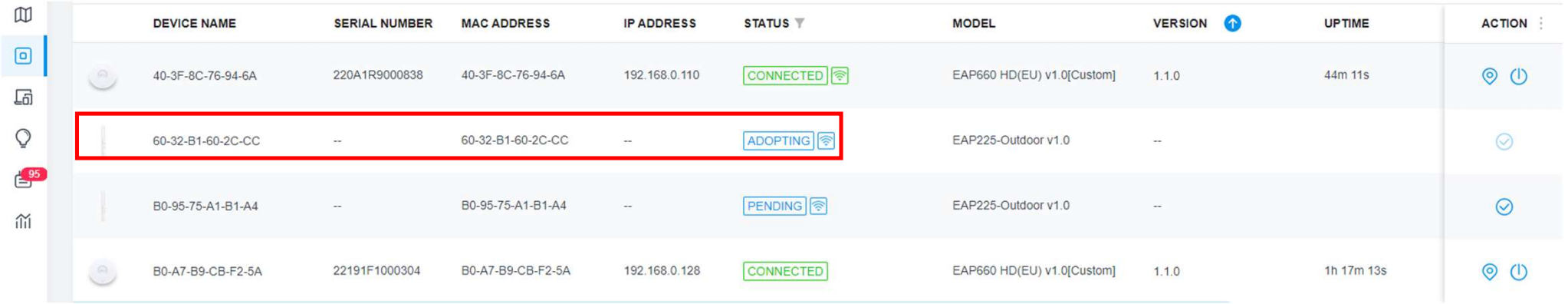
# Configuration Steps

## 6. Click the “adopt” button to adopt the second hop EAP225-Outdoor (Mesh AP).

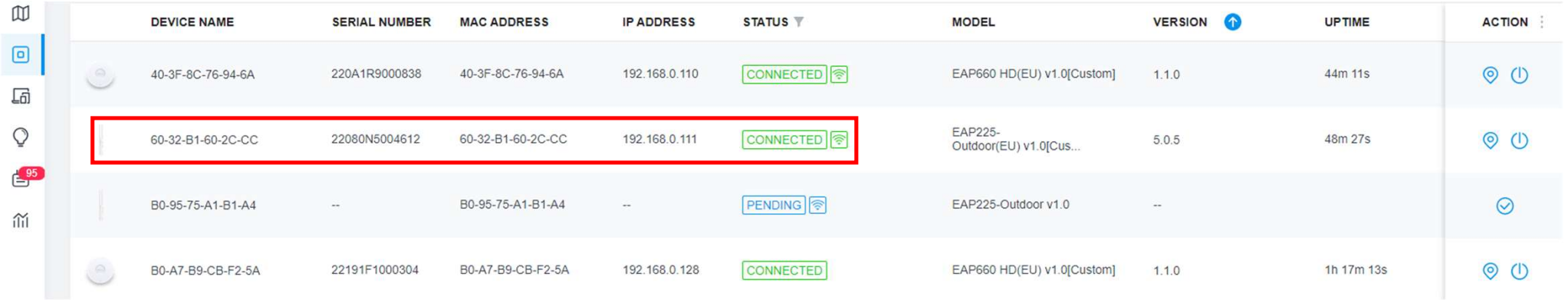


# Configuration Steps

7. After 3-5 minutes, the second hop EAP225-Outdoor (Mesh AP) will get an IP address from DHCP Server and connect with Omada Controller automatically.



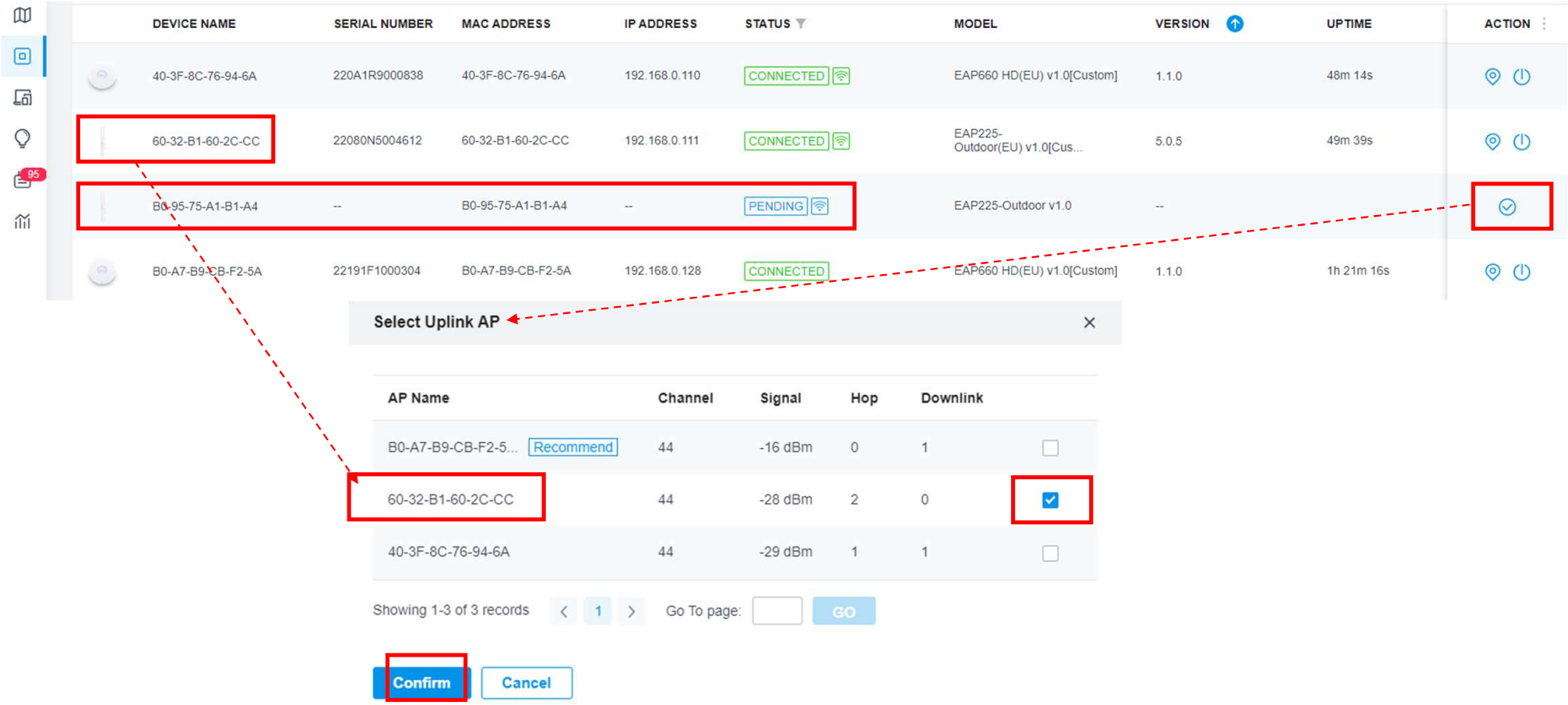
| DEVICE NAME | SERIAL NUMBER | MAC ADDRESS | IP ADDRESS | STATUS | MODEL | VERSION | UPTIME | ACTION |
|---|---|---|---|---|---|---|---|---|
| 40-3F-8C-76-94-6A | 220A1R9000838 | 40-3F-8C-76-94-6A | 192.168.0.110 | CONNECTED | EAP660 HD(EU) v1.0[Custom] | 1.1.0 | 44m 11s | |
| 60-32-B1-60-2C-CC | -- | 60-32-B1-60-2C-CC | -- | ADOPTING | EAP225-Outdoor v1.0 | -- | | |
| B0-95-75-A1-B1-A4 | -- | B0-95-75-A1-B1-A4 | -- | PENDING | EAP225-Outdoor v1.0 | -- | | |
| B0-A7-B9-CB-F2-5A | 22191F1000304 | B0-A7-B9-CB-F2-5A | 192.168.0.128 | CONNECTED | EAP660 HD(EU) v1.0[Custom] | 1.1.0 | 1h 17m 13s | |



| DEVICE NAME | SERIAL NUMBER | MAC ADDRESS | IP ADDRESS | STATUS | MODEL | VERSION | UPTIME | ACTION |
|---|---|---|---|---|---|---|---|---|
| 40-3F-8C-76-94-6A | 220A1R9000838 | 40-3F-8C-76-94-6A | 192.168.0.110 | CONNECTED | EAP660 HD(EU) v1.0[Custom] | 1.1.0 | 44m 11s | |
| 60-32-B1-60-2C-CC | 22080N5004612 | 60-32-B1-60-2C-CC | 192.168.0.111 | CONNECTED | EAP225-Outdoor(EU) v1.0[Cus... | 5.0.5 | 48m 27s | |
| B0-95-75-A1-B1-A4 | -- | B0-95-75-A1-B1-A4 | -- | PENDING | EAP225-Outdoor v1.0 | -- | | |
| B0-A7-B9-CB-F2-5A | 22191F1000304 | B0-A7-B9-CB-F2-5A | 192.168.0.128 | CONNECTED | EAP660 HD(EU) v1.0[Custom] | 1.1.0 | 1h 17m 13s | |

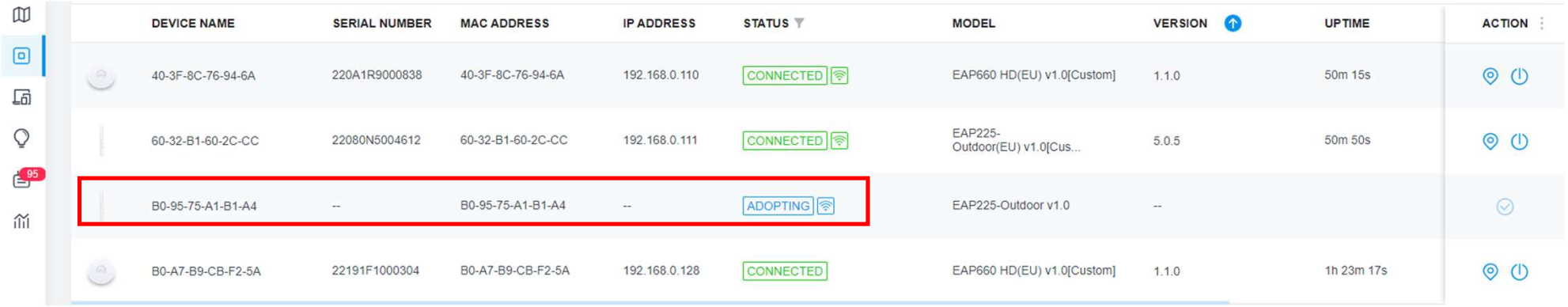
# Configuration Steps

## 8. Click the “adopt” button to adopt the third hop EAP225-Outdoor (Mesh AP).

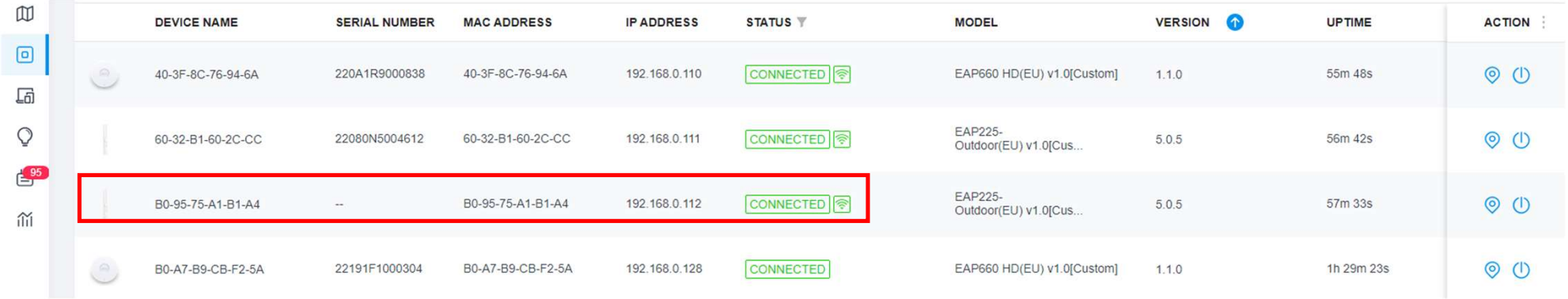


# Configuration Steps

9. After 3-5 minutes, the third hop EAP225-Outdoor (Mesh AP) will get an IP address from DHCP Server and connect with Omada Controller automatically.



| DEVICE NAME | SERIAL NUMBER | MAC ADDRESS | IP ADDRESS | STATUS | MODEL | VERSION | UPTIME | ACTION |
|---|---|---|---|---|---|---|---|---|
| 40-3F-8C-76-94-6A | 220A1R9000838 | 40-3F-8C-76-94-6A | 192.168.0.110 | CONNECTED | EAP660 HD(EU) v1.0[Custom] | 1.1.0 | 50m 15s | |
| 60-32-B1-60-2C-CC | 22080N5004612 | 60-32-B1-60-2C-CC | 192.168.0.111 | CONNECTED | EAP225-Outdoor(EU) v1.0[Cus... | 5.0.5 | 50m 50s | |
| B0-95-75-A1-B1-A4 | -- | B0-95-75-A1-B1-A4 | -- | ADOPTING | EAP225-Outdoor v1.0 | -- | | |
| B0-A7-B9-CB-F2-5A | 22191F1000304 | B0-A7-B9-CB-F2-5A | 192.168.0.128 | CONNECTED | EAP660 HD(EU) v1.0[Custom] | 1.1.0 | 1h 23m 17s | |



| DEVICE NAME | SERIAL NUMBER | MAC ADDRESS | IP ADDRESS | STATUS | MODEL | VERSION | UPTIME | ACTION |
|---|---|---|---|---|---|---|---|---|
| 40-3F-8C-76-94-6A | 220A1R9000838 | 40-3F-8C-76-94-6A | 192.168.0.110 | CONNECTED | EAP660 HD(EU) v1.0[Custom] | 1.1.0 | 55m 48s | |
| 60-32-B1-60-2C-CC | 22080N5004612 | 60-32-B1-60-2C-CC | 192.168.0.111 | CONNECTED | EAP225-Outdoor(EU) v1.0[Cus... | 5.0.5 | 56m 42s | |
| B0-95-75-A1-B1-A4 | -- | B0-95-75-A1-B1-A4 | 192.168.0.112 | CONNECTED | EAP225-Outdoor(EU) v1.0[Cus... | 5.0.5 | 57m 33s | |
| B0-A7-B9-CB-F2-5A | 22191F1000304 | B0-A7-B9-CB-F2-5A | 192.168.0.128 | CONNECTED | EAP660 HD(EU) v1.0[Custom] | 1.1.0 | 1h 29m 23s | |

# Configuration Steps