

# Ubiquiti UAP-AC-MESH configuration using Ubiquiti Unifi Cloud KEY

**Ubiquiti Networks** after many years has established its position on the equipment market for ISP operators. At this moment, the range of products is huge: starting with devices from the **AirMAX**, **EdgeMAX**, **UniFi**, **SunMAX** series, and ending with devices working in GPON standard (e.g. **Ubiquiti U-Fiber GPON OLT**, **Ubiquiti ONU NanoG**). In addition, Ubiquiti has recently provided devices for home users such as **AirCube** and devices from **Amplifi** series.

In this guide we'll focus on the configuration of Ubiquiti **UAP AC MESH** - one of the best AP solutions available on the market. In addition to devices configuration we'll use **Unifi CloudKey** controller, which greatly simplifies this process. We'll also use **UniFi Switch 8-150W** which will serve as a PoE switch and the main power unit for our devices. As the main router, we'll use **Totolink 300RH** operating in Client mode.

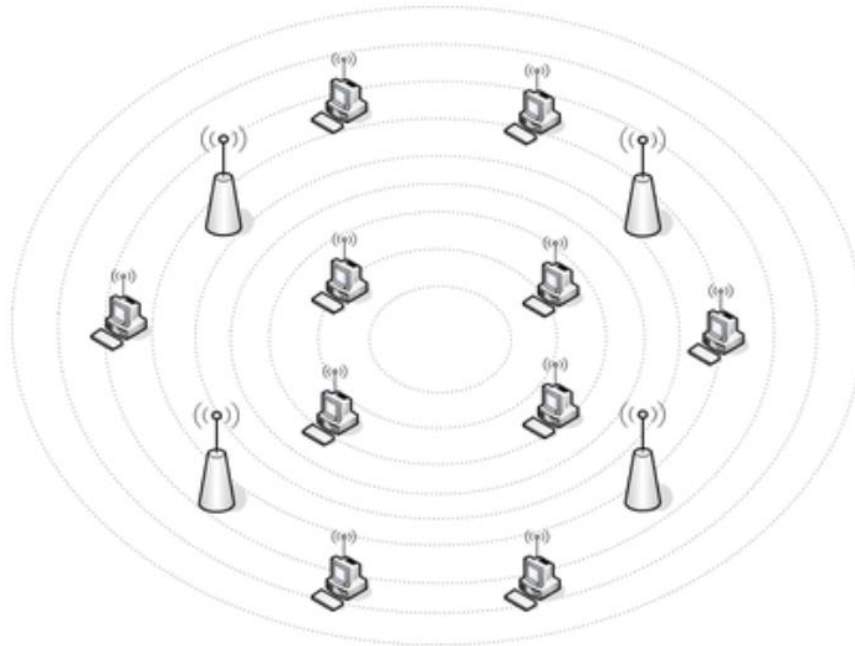
It's worth to start with **MESH** network topology explanation. The assumption of **MESH** network topology is the ability to communicate between network elements without the need of central unit as Access Point.

Differences between star network and **MESH** network are presented by the following illustrations:

**STAR NETWORK**



## MESH NETWORK



In a network with such topology, the most important thing is that each network device can communicate with any other device directly (of course if these devices are adjacent to each other) or by any other network elements (in case when target element is out of the source's direct range).

The practical application for a network based on **MESH** topology can be found in hard-to-reach areas where cable installations are impossible to implement (e.g. concert or sport halls). In addition, **MESH** network is scalable. Therefore, it's very easy to expand.

The great advantage of this topology is that it is **self-correcting**. In case when any of the elements ceases to work, other network elements automatically take over the function of mediating at the time of information sending. It's also worth to note, that thanks to this solution we have nice energy savings. This is because communication occurs only on short distances between directly adjacent elements.

**MESH** network operates on the basis of the IEEE 802.11s standard. When it comes to the field of security standards they are: IEEE 802.11i and IEEE 802.1X. In short, PMK (**Pairwise Master Key**), is used for devices authorization. PMK must be accepted on both sides i.e. by devices which connect to each other. You can also create group keys that are used for broadcast and multicast.

With this knowledge, you can start configuring your network. In order to better understand the structure of a network, below you can find its illustrated scheme and all included elements.

The network was built using the following devices:

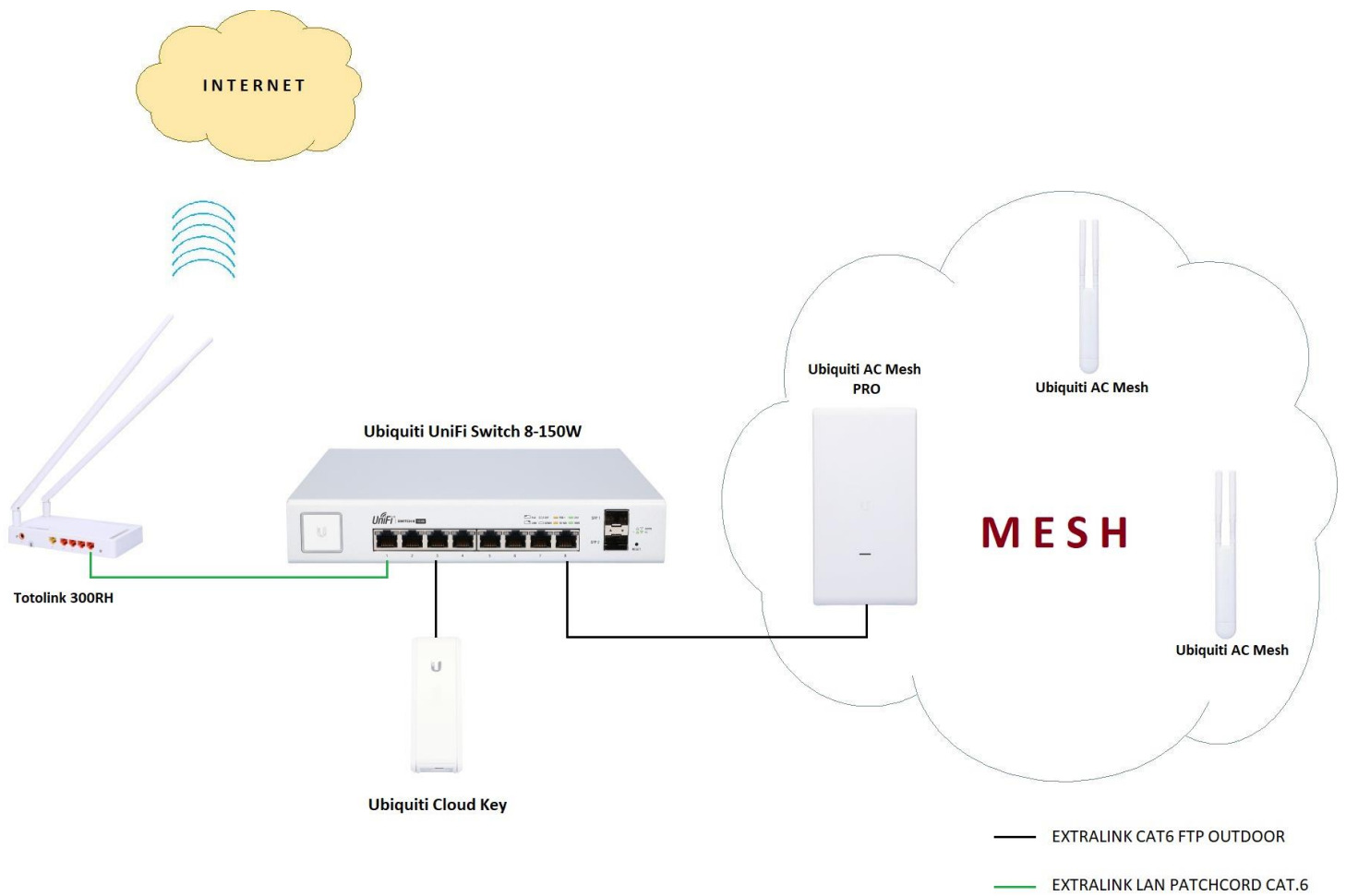
- 1x **Totolink 300RH** (operating in Wireless ISP Client)

- 1x Ubiquiti Unifi Switch 8-150W
- 1x Ubiquiti Cloud Key (acting as our controller)
- 2x Ubiquiti UAP AC Mesh
- 1x Ubiquiti UAP AC Mesh PRO
- 1x EXTRALINK LAN PATCHCORD CAT.6 FTP 3M
- 1x EXTRALINK CAT6 FTP OUTDOOR TWISTED PAIR 305M

**UAP AC MESH** and **UAP AC MESH-PRO** deserve the most attention:

Model	UAP-AC-M	UAP-AC-M-PRO
Operating environment	Indoor/Outdoor	Outdoor
Dual-Band	v	v
2.4GHz Speed	300 Mbps	450 Mbps
MIMO 2.4GHz	2x2	3x3
5GHz Speed	867 Mbps	1300 Mbps
MIMO 5GHz	2x2	3x3
Max. TX Power 2.4GHz	20 dBm	22 dBm
5GHz	20 dBm	22 dBm
Range	183 m	183 m
Second Ethernet Port		v
PoE Standard	24V Passive PoE	802.3af PoE
Power supply	24V 0.5A	48V 0.5A
Max. Power Consumption	8.5W	9W
BSSID	4 SSID per radio	4 SSID per radio

The network built for the purpose of this guide looks as follows:



Ok. You already know how our network is built. Proceed to device configuration.

The most important thing is to obtain Internet on our router from the ISP. In our case we received the signal wirelessly using **Totolink 300RH** operating in Wireless ISP Client mode.

The procedure is very simple:

- first of all select the appropriate operating mode

**TOTO LINK**  
The Smartest Network Device

Model No. N300RH (Firmware V3.0.4)

**Operation Mode** Operation Mode Help

- Router  
In this mode, the device is supposed to connect to the internet via ADSL/Cable modem. The WAN type can be setup on WAN page, including PPPOE, DHCP Client, PPTP Client, L2TP Client and Static IP.
- Repeater(Range Extender)  
This mode extends your existing wireless network to wider coverage. You can access the Internet by wireless or wired connection to the device
- Bridge with AP  
Combine two local networks via wireless connection. You can only connect to the device by cable.
- Wireless ISP Client  
In this mode, the device connect to WISP Station wirelessly through PPPOE/DHCP Client/PPTP Client/L2TP Client/Static IP WAN types. You are able to share Internet via local wireless and wired network
- Wireless Client  
In this mode, the router only allows users to access the Internet by wired connection. You can connect to the ISP AP on Site-Survey page.
- Client  
The router is used as a "Wireless Adapter" to connect your wired devices(e.g.Xbox/PS3) to a wireless network.

- scan available networks, choose the one that interests you, enter WPA2 key and that's all 😊

**TOTO LINK**  
The Smartest Network Device

Model No. N300RH (Firmware V3.0.4)

**Wireless Repeater**

Wireless Repeater: Enabled

SSID: PWB

Encryption: WPA2

Authentication Mode:  Enterprise (RADIUS)  Personal (Pre-Shared Key)

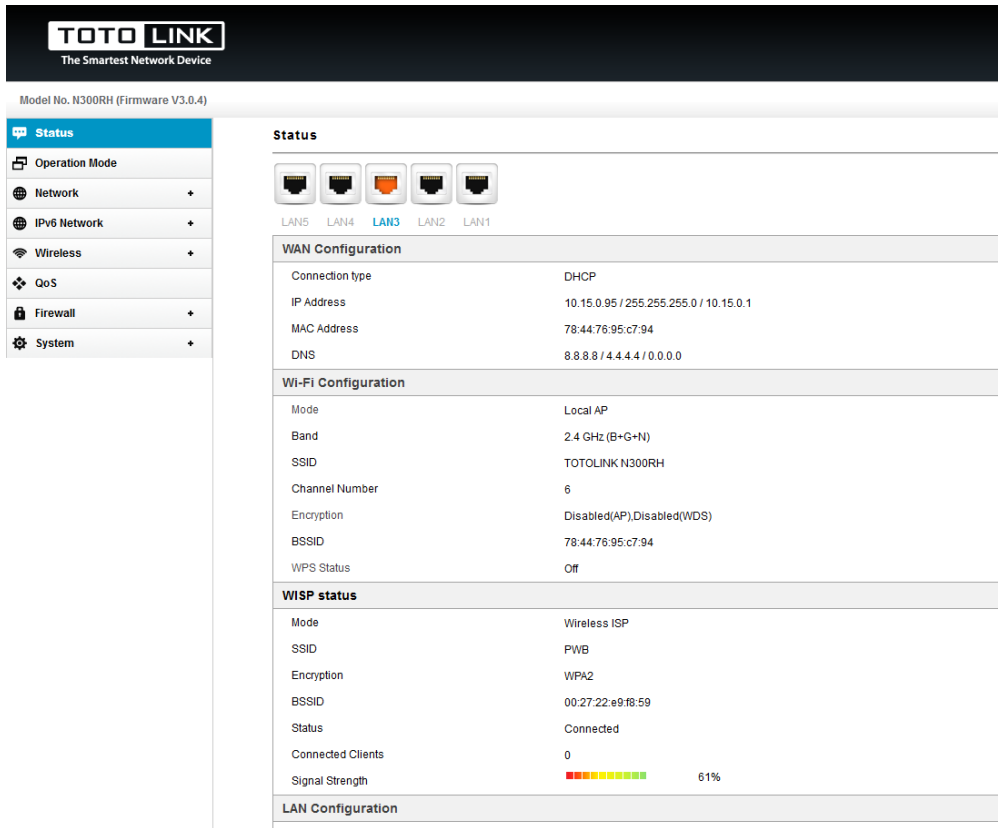
WPA2 Cipher Suite:  TKIP  AES

Pre-Shared Key Format: Passphrase

Pre-Shared Key: .....

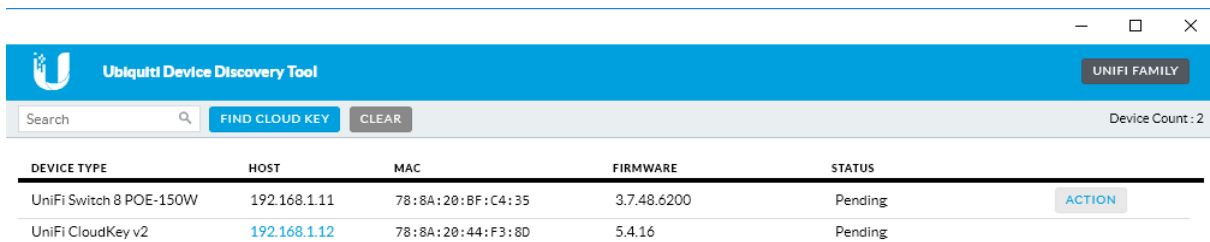
SSID	BSSID	Channel	Type	Encrypt	Signal	Select
PWB-s	80:2a:a8:5a:19:e8	11 (B+G+N)	AP	WPA2-PSK	100	<input type="radio"/>
Guest	82:2a:a8:5a:19:e8	11 (B+G+N)	AP	no	100	<input type="radio"/>
HP-Print-F1-LaserJet 1102	c0:18:85:99:31:f1	11 (B+G)	AP	no	89	<input type="radio"/>
PWB	00:27:22:e9:f8:59	6 (B+G+N)	AP	WPA2-PSK	87	<input type="radio"/>
mimosam437	20:b5:c6:0b:d0:2c	6 (B+G+N)	AP	WPA2-PSK	67	<input type="radio"/>
HP-Print-3B-LaserJet 1102	14:2d:27:17:e8:3b	6 (G)	AP	no	59	<input type="radio"/>
PWB	04:18:d6:0b:85:4f	1 (B+G+N)	AP	WPA2-PSK	55	<input checked="" type="radio"/>
aaaaaaaa	00:0e:8e:7e:e2:ef	5 (B)	AP	no	48	<input type="radio"/>
m-PWB	68:72:51:00:05:9e	7 (B+G+N)	AP	WPA2-PSK	44	<input type="radio"/>
test2,4	00:0c:42:44:77:fb	1 (B+G)	AP	no	40	<input type="radio"/>
maxim	00:27:22:48:27:7d	13 (B+G)	AP	no	40	<input type="radio"/>

- Of course, you can also look at the state of your connection and monitor it:



When you have Internet on your router, proceed to configuration of **Ubiquiti** devices. Connect the equipment as shown on the scheme attached above.

Firstly, run the Discovery Tool to see addresses of each device and find **Unifi CloudKey**.



When our tool successfully located the controller, click on the assigned address and you'll be immediately redirected to the web browser, where you can access **Unifi Cloud Key** configuration. You can also manage all connected devices.



When you log in to **UniFi CloudKey** you must change the default password and update the firmware to the latest one. Then you can proceed to manage your devices.

It's also very easy. There's a very clear wizard, which guides you step-by-step through the whole process.

## Configure devices

Please select the devices you would like to configure.

<input type="checkbox"/>	DEVICE NAME	MODEL	IP ADDRESS	UPTIME ↓
<input type="checkbox"/>	78:8a:20:bf:c4:35	UniFi Switch 8 POE-150W	192.168.1.10	3m 55s
<input type="checkbox"/>	78:8a:20:23:9c:d9	UniFi AP-AC-Mesh-Pro	192.168.1.12	1m 17s

Showing 1-2 of 2 records. Items per page: 10

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## Configure WiFi

You may skip this step if you are not setting up any UniFi access points.

Optionally, you may create an open wireless network for your guests:

Enable Guest Access

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[SKIP](#)

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## Controller Access

Please provide an administrator name and password for UniFi Controller access.

<input type="text" value="anteny24"/>	<input type="text" value="leszek@anteny24.pl"/>
<input type="password" value="....."/>	<input type="password" value="....."/>
Password strength: Great	
<input checked="" type="checkbox"/> Use the same name and password for SSH access.	
Device Authentication <span>?</span>	
<input type="text" value="admin"/>	<input type="password" value="....."/>

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At the very end you will be asked to enter the login and password for your account on the **Ubiquiti** website in order to manage everything through the cloud, but you can also omit this step.

### Confirm

Please review the settings below. Once finished you will be redirected to the management interface.

Country	United States
Timezone	Europe/Brussels
Secure SSID	www.anteny24.com MEH
Guest SSID	-
Admin Name	anteny24
Device Admin Name	admin

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#### CLOUD LOGIN CREDENTIALS

**Please enter your UBNT.com account credentials.**  
Note that this is not the account that you used to sign into this controller.

Email or Username

Password

No Account? Register now.

[SKIP](#) [ENABLE CLOUD ACCESS](#)

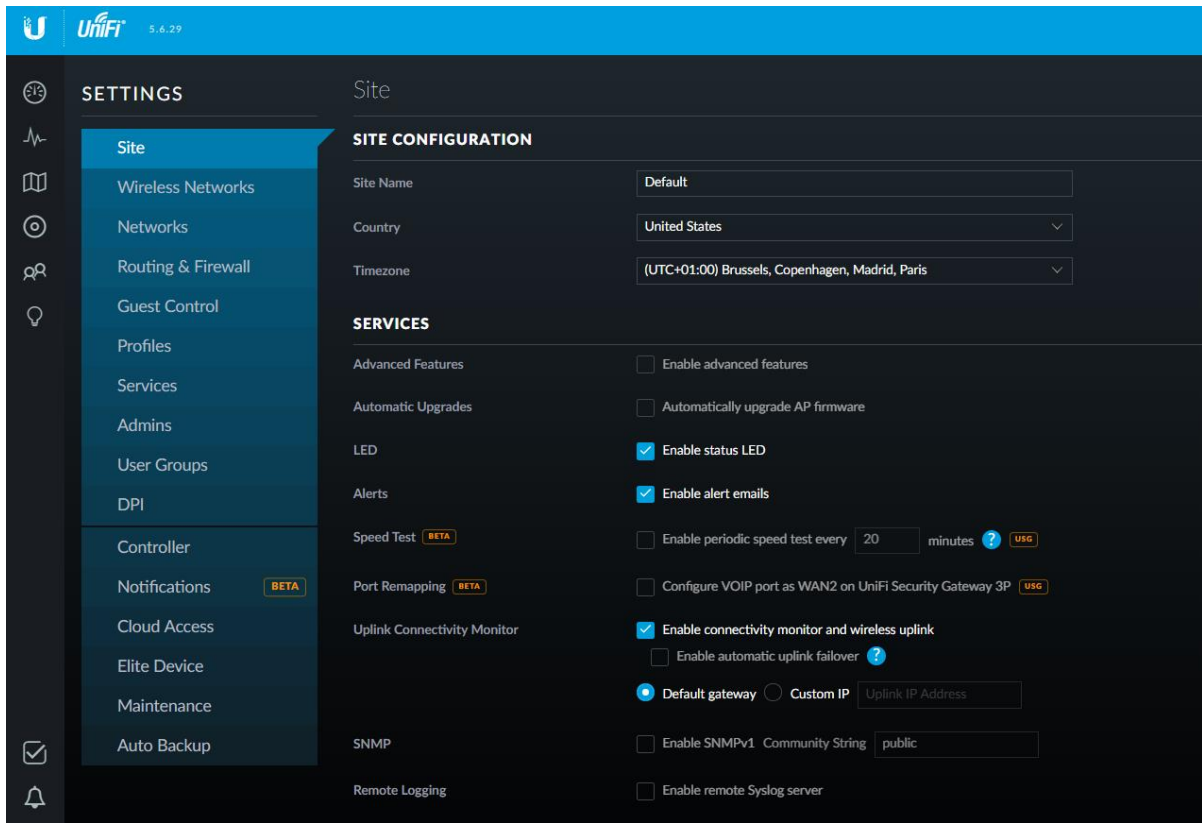
If you get through the wizard correctly, you'll get direct access to configuration of individual devices. Important, or rather the most important thing is to update the firmware of all devices, and then you must adapt them.



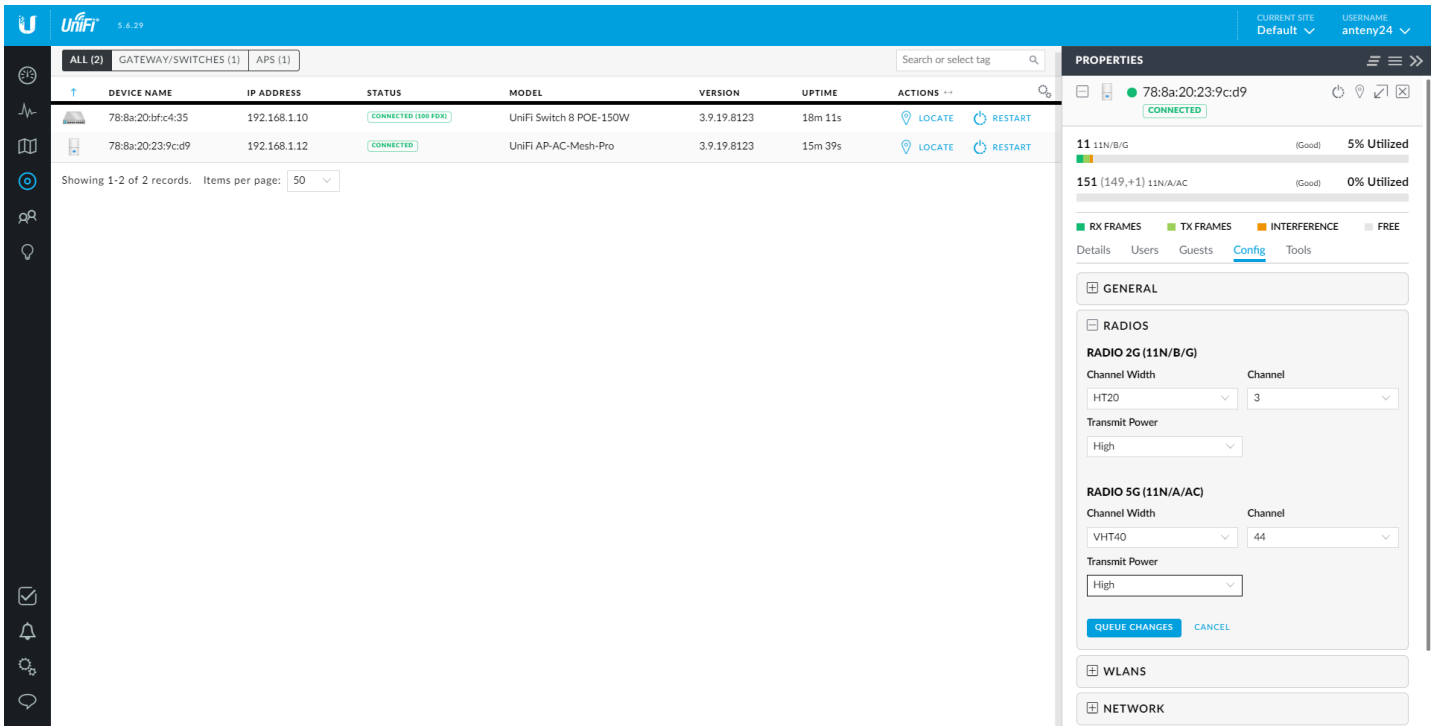
DEVICE NAME	IP ADDRESS	STATUS	MODEL	VERSION	UPTIME	ACTIONS
78:8a:20:23:9c:d9	192.168.1.12	CONNECTED	UniFi AP-AC-Mesh-Pro	3.9.19.8123	7m 33s	LOCATE RESTART
78:8a:20:bf:c4:35	192.168.1.10	PENDING ADOPTION	UniFi Switch 8 POE-150W	3.9.19.8123	10m 16s	ADOPT

DEVICE NAME	IP ADDRESS	STATUS	MODEL	VERSION	UPTIME	ACTIONS
78:8a:20:bf:c4:35	192.168.1.10	CONNECTED 100% FIRM	UniFi Switch 8 POE-150W	3.9.19.8123	16m 12s	LOCATE RESTART
78:8a:20:23:9c:d9	192.168.1.12	CONNECTED	UniFi AP-AC-Mesh-Pro	3.9.19.8123	13m 24s	LOCATE RESTART

Once all devices have been properly adapted, you can start configuring **MESH** network. At the very beginning you need to enable **“connectivity monitor and wireless uplink”** in your controller, because if you don’t do it, subsequent devices connected to your network won’t be visible and won’t establish a connection.



Then set the appropriate frequencies on your **UniFi AC Mesh Pro**, due to the fact that "Auto" option is on by default on both radios (2.4 GHz and 5GHz). This isn't a good solution for channels to be set in "Auto" mode because of interference coming from the environment.



Ok, now you can connect more devices that will co-create **MESH** network. In your case these're two **UniFi AC Mesh**.

After starting, the devices are immediately visible in the controller with the status "**PENDING ADOPTION (WIRELESS)**" – You must adapt them and update the firmware if required.

The screenshot shows the UniFi controller interface with a table of devices. The table has columns for Device Name, IP Address, Status, Model, Version, Uptime, and Actions. The first device is a UniFi Switch 8 POE-150W with status 'CONNECTED (100 FDX)'. The next two are UniFi AP-AC-Mesh-Pro and UniFi AP-AC-Mesh, both with status 'PENDING ADOPTION (WIRELESS)'. The last device is another UniFi AP-AC-Mesh with status 'PENDING ADOPTION (WIRELESS)'. The interface includes a search bar, a sidebar with navigation icons, and a top header with site and user information.

DEVICE NAME	IP ADDRESS	STATUS	MODEL	VERSION	UPTIME	ACTIONS
78:8a:20:bfc4:35	192.168.1.10	CONNECTED (100 FDX)	UniFi Switch 8 POE-150W	3.9.19.8123	35m 52s	LOCATE RESTART
78:8a:20:23:9cd9	192.168.1.12	CONNECTED	UniFi AP-AC-Mesh-Pro	3.9.19.8123	33m 4s	LOCATE RESTART
78:8a:20:29:3f:1d		PENDING ADOPTION (WIRELESS)	UniFi AP-AC-Mesh			ADOPT
78:8a:20:29:3f:25		PENDING ADOPTION (WIRELESS)	UniFi AP-AC-Mesh			ADOPT

The screenshot shows the UniFi controller interface with a table of devices. The table has columns for Device Name, IP Address, Status, Model, Version, Uptime, and Actions. The first device is a UniFi Switch 8 POE-150W with status 'CONNECTED (100 FDX)'. The next three are UniFi AP-AC-Mesh-Pro and UniFi AP-AC-Mesh, all with status 'CONNECTED (WIRELESS)'. The interface includes a search bar, a sidebar with navigation icons, and a top header with site and user information.

DEVICE NAME	IP ADDRESS	STATUS	MODEL	VERSION	UPTIME	ACTIONS
78:8a:20:bfc4:35	192.168.1.10	CONNECTED (100 FDX)	UniFi Switch 8 POE-150W	3.9.19.8123	39m 49s	LOCATE RESTART
78:8a:20:23:9cd9	192.168.1.12	CONNECTED	UniFi AP-AC-Mesh-Pro	3.9.19.8123	37m 17s	LOCATE RESTART
78:8a:20:29:3f:1d	192.168.1.14	CONNECTED (WIRELESS)	UniFi AP-AC-Mesh	3.9.19.8123	5m 55s	LOCATE RESTART
78:8a:20:29:3f:25	192.168.1.15	CONNECTED (WIRELESS)	UniFi AP-AC-Mesh	3.9.19.8123	10m 2s	LOCATE RESTART

That's all 😊. In this quick and simple way we configured our network on the basis of **MESH** topology. Of course, you have full access to the status of individual wireless links on both **UniFi AC Mesh Pro** and **UniFi AC Mesh**. You can check both signal strength and TX/RX status.

The screenshot shows the UniFi Controller interface. The main table lists the following devices:

DEVICE NAME	IP ADDRESS	STATUS	MODEL	VERSION	UPTIME	ACTIONS
78:8a:20:bfc:435	192.168.1.10	CONNECTED (Wired PoE)	UniFi Switch 8 POE-150W	3.9.19.8123	39m 49s	LOCATE RESTART
78:8a:20:23:9cd9	192.168.1.12	CONNECTED	UniFi AP-AC-Mesh-Pro	3.9.19.8123	37m 17s	LOCATE RESTART
78:8a:20:29:3f:1d	192.168.1.14	CONNECTED (WIRELESS)	UniFi AP-AC-Mesh	3.9.19.8123	5m 55s	LOCATE RESTART
78:8a:20:29:3f:25	192.168.1.15	CONNECTED (WIRELESS)	UniFi AP-AC-Mesh	3.9.19.8123	10m 2s	LOCATE RESTART

The right sidebar shows the 'PROPERTIES' for the selected AP (78:8a:20:23:9cd9). It displays a signal strength of 11 (11N/B/G) and 151 (149,+1) 11N/A/AC. Utilization is shown as 16% for 11N/B/G and 2% for 11N/A/AC. The 'DOWNLINKS' section shows:

AP	SIGNAL	ACTIONS
78:8a:20:29:3f:25	99% (-44 dBm)	LOCATE
78:8a:20:29:3f:1d	67% (-63 dBm)	LOCATE

The screenshot shows the UniFi Controller interface. The main table lists the following devices:

DEVICE NAME	IP ADDRESS	STATUS	MODEL	VERSION	UPTIME	ACTIONS
78:8a:20:bfc:435	192.168.1.10	CONNECTED (Wired PoE)	UniFi Switch 8 POE-150W	3.9.19.8123	42m 9s	LOCATE RESTART
78:8a:20:23:9cd9	192.168.1.12	CONNECTED	UniFi AP-AC-Mesh-Pro	3.9.19.8123	39m 38s	LOCATE RESTART
78:8a:20:29:3f:1d	192.168.1.14	CONNECTED (WIRELESS)	UniFi AP-AC-Mesh	3.9.19.8123	7m 48s	LOCATE RESTART
78:8a:20:29:3f:25	192.168.1.15	CONNECTED (WIRELESS)	UniFi AP-AC-Mesh	3.9.19.8123	11m 48s	LOCATE RESTART

The right sidebar shows the 'PROPERTIES' for the selected AP (78:8a:20:23:9cd9). It displays a signal strength of 11 (11N/B/G) and 151 (149,+1) 11N/A/AC. Utilization is shown as 17% for 11N/B/G and 2% for 11N/A/AC. The 'UPLINK (WIRELESS)' section shows:

Uplink AP	Signal	Tx Rate	Rx Rate	Down Pkts/Bytes	Up Pkts/Bytes	Activity
78:8a:20:23:9cd9	67% (-63 dBm)	216 Mbps	216 Mbps	437 / 47 KB	126 / 41.5 KB	5.2 Kbps

Network based on **MESH** topology is the most viable alternative for wired connections. Considering the continuous development of wireless technologies, you can count on increase in both bandwidth and coverage.

In addition, **MESH** network has very high noise immunity and provides better coverage of an area. Also thanks to separate radio interfaces for customers and backbone connections, you can get very attractive bandwidths.

**MESH** architecture is primarily distinguished by scalability and auto-configuration. With regard to self-organization of **MESH** network as well as negligible costs of infrastructure deployment and development, it can be claimed that IEEE 802.11s standard is the future of building wireless networks.

**Author:** Leszek Błaszczyk

**Translation:** Łukasz Sikora