

Omada EAP Solution 2

EAP Indoor Wi-Fi Solution for Medium-Sized and
Single-Subnet Networks

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Background

Free Wi-Fi can increasingly be found in supermarkets, hotels, canteens, factories, schools and other public spaces. The network solutions in these locations must provide a stable connection for the user while also being available at a competitive price to the customer.

TP-Link's Omada EAP Series products provide a range of cost-effective indoor solutions carefully engineered to meet the networking needs of indoor business environments. With 20 years of networking experience behind us, TP-Link has an outstanding track record as a commercial wireless network solutions provider, owing to our dedicated technical support team and trusted partners.

Application Scenarios

The solution provided here applies to the following customers and application scenarios:

1. Supermarkets, hotels, dormitories, canteens, factories, schools and other medium-sized indoor wireless networks with between 100 and 500 clients.
2. Sites that require centralized configuration and management of access points.
3. Sites that require business-class, high-speed and stable wireless access.
4. Customers requiring portal authentication service, where products and services are advertised to guests when they connect.

For enquiries about the selection or implementation of these solutions, please contact TP-Link Technical Support.

Why TP-Link?

1. 20 years of experience delivering quality products at an affordable price
2. Over 1000 global professional and reliable partners
3. Effective, economical and reliable wireless solutions
4. Diverse range of products available for your business
5. Outstanding technical support team with both pre-sales and post-sales support
6. Free and dependable global hotline support and warranty service available 24/7

Solution

This document introduces a solution suitable for medium-sized wireless networks with 100-500 wireless clients and less than 50 access points. If you just want to extend a wireless network with our EAP products based on your existing wired network, you need to make sure that your existing wired network meets the basic network requirements detailed in this document. If you need to build a brand new wired and wireless network, we will also recommend a set of indoor wired & wireless solutions based on TP-Link products for your reference.

The TP-Link EAP solution contains the following parts:

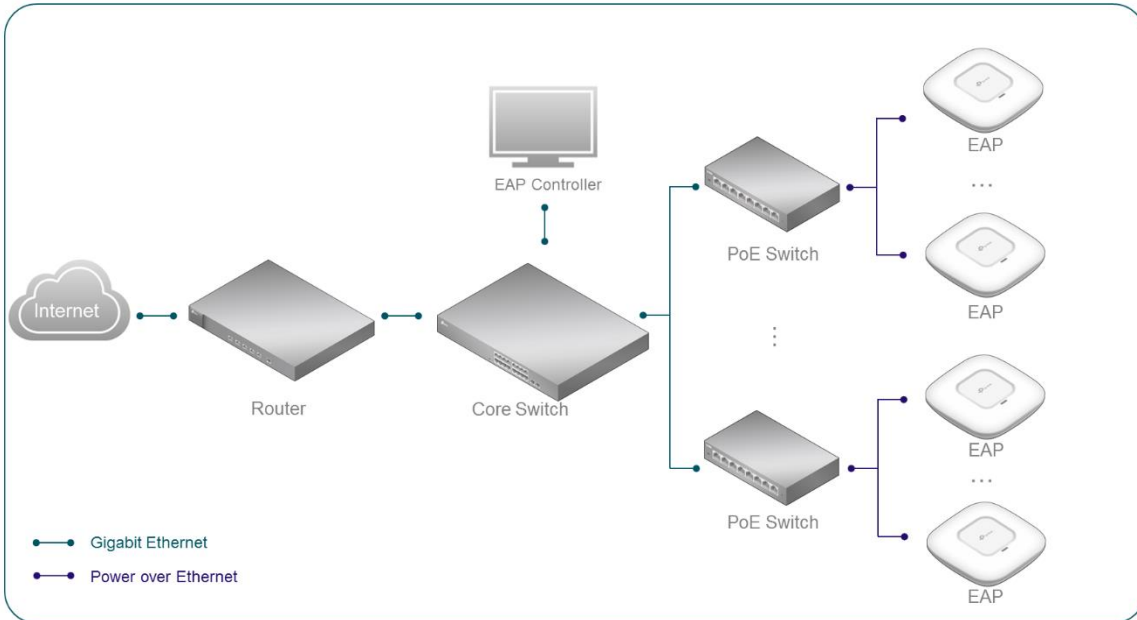
A: Solution Overview and Network Topology Description.

B. Wired Network Deployment and Configuration Guide.

C. Wireless Network Deployment and Configuration Guide.

A. Solution Overview and Network Topology Description

Solution --- Indoor Wi-Fi Networking Solution for Medium-Sized and Single-Subnet Networks based on EAP Products



As shown above:

- 1) This is an L2 network (single subnet), with an AC controller centrally managing all EAPs locally.
- 2) EAP products can expand a wireless network without changing the existing wired infrastructure.
- 3) Use an SMB router as the gateway of the network, an L2 switch as the Core Switch, and several PoE switches to supply power to the EAPs.

You can deploy an appropriate number of EAPs for your indoor wireless network by considering the area where wireless coverage is needed and the number of clients during peak usage. The recommended number of wireless clients for each EAP is 25. (For dual-band EAPs the number is 50, or 25 for each band.) A single EAP has a range of 15 meters. For guidelines on the number of EAPs needed in an ideal environment, you can refer to the test report in Part C of this document, entitled "Wireless Network Deployment and Configuration Guide 3: EAP Product Deployment". However, please note that the actual number of required EAPs will depend on the environment they are deployed in, since wireless signal is affected by obstacles, RF interference and other factors.

B. Wired Network Deployment and Configuration Guide

1. Wired Network Deployment and Configuration Guide 1: Gateway Selection

There are no special requirements for the gateway router, but you need to consider the performance of the router, such as the number of concurrent connections, NAT throughput, etc., in order to provide stable internet access to multiple wireless clients. TP-Link offers various SMB routers. In this solution, we recommend using the following TP-Link SafeStream Routers as the gateway device:

Model	TL-ER6120	TL-ER6020	TL-ER5120
Concurrent Session	60000	30000	120000
Recommended Client Number	300	150	600
NAT Throughput	350Mbps	180Mbps	350Mbps
Multi-nets NAT Subnet Number	16	8	16
Maximum Number of WAN Port	2	2	4

To learn more about our [SafeStream VPN Routers](#) and [SafeStream Load Balance Routers](#), please visit our official website.

2. Wired Network Deployment and Configuration Guide 2: Core/Convergence Layer Switch Selection

Core/Convergence Layer switches must have sufficient data forwarding and processing capabilities. You can select an appropriate switch according to your actual network size and requirements. TP-Link provides a variety of SMB Switches. In this solution, we recommend the following TP-Link Switches. For more information about [TP-Link Switches](#), please visit our official website.

Model	T1600G-28TS	T1600G-52TS	T2500G-10TS	T2600G-28TS	T2600G-52TS
Static/Dynamic LAG	Supported	Supported	Supported	Supported	Supported
Switching Capacity	56Gbps	104Gbps	20Gbps	56Gbps	104Gbps
Packet Forwarding Rate	41.7Mpps	77.4Mpps	14.9Mpps	41.7Mpps	77.4Mpps

3. Wired Network Deployment and Configuration Guide 3: EAP Power Supply Selection

PoE (Power over Ethernet) allows a single cable to transfer both network data and electrical power. Using PoE switches can simplify network deployment and save costs since there's no need to install additional power cabling. TP-Link provides different levels of PoE switches with a variety of port numbers, which can meet the requirements of PoE power supply and network access in various scenarios. In this solution, we recommend using the following PoE switches:

Model	T1500-28PCT	T1500G-10MPS	T1600G-28PS	T1600G-52PS	T2600G-28MPS
Standard	802.3at	802.3at	802.3at	802.3at	802.3at
PoE+ Ports	24	8	24	48	24
Power Supply	180W	116W	192W	384W	384W
Ethernet Ports	24 Fast RJ45 Ports 4 Gigabit RJ45 Ports 2 Combo Gigabit SFP Slots	8 Gigabit RJ45 Ports 2 Gigabit SFP Slots	24 Gigabit RJ45 Ports 4 Gigabit SFP Slots	48 Gigabit RJ45 Ports 4 Gigabit SFP Slots	24 Gigabit RJ45 Ports 4 Gigabits SFP Slots

In addition, different TP-Link EAP products support different standards of PoE power supply. PoE power supply standards adopted on the TP-Link Omada series EAP are listed for reference in the following table:

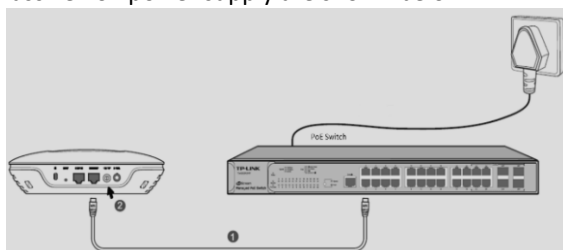
Model	EAP320	EAP330	EAP245	EAP225	EAP115	EAP115-wall	EAP110
PoE Standard	802.3at			802.3af			Passive PoE

Find out more about [TP-Link PoE switches](#) on our official website.

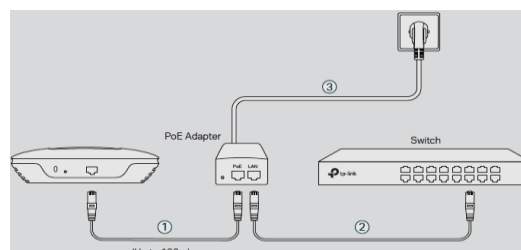
Why can't 802.3af standard PoE switches supply power for 802.3at standard EAPs?

The maximum output power per PoE port in IEEE 802.3af is 15.40W. A more recently developed standard, IEEE 802.3at, offers up to 30W on each port. 802.3at PSE (power source equipment) is backward-compatible with 802.3af PD (powered device). The IEEE 802.3af PoE switch cannot provide power to the 802.3at devices such as EAP320, EAP330, and EAP245. However, an 802.3at standard PoE switch can power either 802.3af or 802.3at standard EAPs.

EAP110 and EAP110-Outdoor support passive PoE which requires an out-of-box passive PoE adapter or injector for power supply, but can't be powered by an 802.3af/ 802.3at PoE switch. With Passive PoE, it's important to note that the adapter requires a power socket. Sketches of Standard PoE power supply and Passive PoE power supply are shown below:

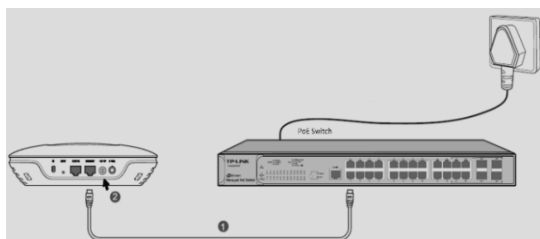


Standard PoE Power Supply

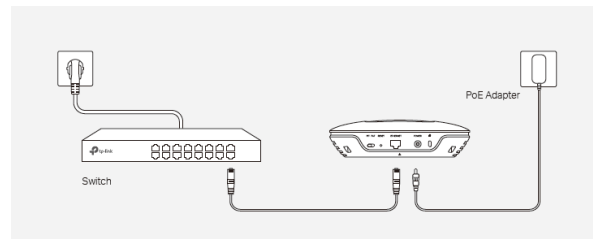


Passive PoE Power Supply

If you do not have a standard PoE switch or Passive PoE Adapter, you can also use the DC Power Adapter that comes with the EAP product. However, when using a power adapter for power supply, the location of your EAP may be limited by the location of power sockets.



Standard PoE Power Supply



External Power Adapter Power Supply

Note: EAP110 and EAP110-Outdoor cannot be powered by an external power adapter.

C. Wireless Network Deployment and Configuration Guide

1. Wireless Network Deployment and Configuration Guide 1: Solution Selection

Here we choose the TP-Link EAP Controller & EAP wireless access points to extend the wireless network based on the preexisting or new built wired network and manage all the EAPs centrally by using an EAP Controller. The main advantages of this solution are:

- Deployment is convenient. There's no need to change the existing wired network.
- The EAP Controller can discover and manage the EAPs automatically, and provide real-time monitoring of the EAPs' working status.
- EAP Controller software is totally free and can be installed on any Windows PC.

2. Wireless Network Deployment and Configuration Guide 2: EAP Product Selection

TP-Link provides different levels of 11n/11ac EAP products to meet different requirements. See the table below for details.

Model	EAP330	EAP245	EAP320	EAP225	EAP115	EAP115-Wall	EAP110
Wireless Throughput	2.4GHz:600Mbps 5GHz:1300Mbps	2.4GHz:450Mbps 5GHz:1300Mbps	2.4GHz:300Mbps 5GHz:867Mbps		2.4GHz: 300Mbps		
Internal Antennas	2.4GHz:3*6dBi 5GHz:3*7dBi	2.4GHz:3*4dBi 5GHz:3*4dBi	2.4GHz:2*6dBi 5GHz:2*7dBi	2.4GHz:2*4dBi 5GHz:2*4dBi	2.4GHz: 2*3dBi	2.4GHz: 2*1.8dBi	2.4GHz: 2*3dBi
Captive Portal	√	√	√	√	√	√	√
Airtime Fairness	√	×	√	×	×	×	×
Beam forming	√	×	√	×	×	×	×
Band Steering	√	√	√	√	×	×	×
Load Balance	√	√	√	√	√	√	√
Management Mode	EAP Controller, Standalone				EAP Controller Standalone Cluster	EAP Controller, Standalone	

Why choose 5GHz EAP products?

- 1) The 2.4GHz band only has three available non-overlapping channels for transmission: 1, 6, and 11. The 5GHz band can provide a much larger number of channels.

Please note that due to different local regulations, available 5GHz channels differ between countries and regions. For example, in the United States twenty-two 5GHz channels are supported, while in Europe nineteen 5GHz channels are supported.

- 2) The 5GHz channel is much cleaner, with less interference. The 2.4GHz wireless band uses the same channel signals as other devices such as Bluetooth and microwave ovens, so it is more likely to experience interference in a noisy environment. Compatibility with 5GHz band Wi-Fi is becoming widespread, with greater and greater numbers of devices now supporting it. Furthermore, it allows dual-band EAP products to handle larger numbers of simultaneous connections.

3. Wireless Network Deployment and Configuration Guide 3: EAP Controller Introduction

- 1) Why is centralized management necessary?

- Medium or large scale networks can contain a high number of EAPs. Hence, configuration and management is much more convenient if all EAPs can be managed at the same time using the EAP controller. Managing each EAP individually in Standalone mode would be time consuming and inefficient.
- It is difficult to monitor all EAPs and keep track of their working status in real time if they are in Standalone mode.
- A single EAP in Standalone mode has limited hardware capabilities. Certain advanced functions are not supported and some functions cannot be upgraded in Standalone mode.

2) The advantages of the EAP Controller software:

- Configure and manage all access points simultaneously through an intuitive interface. Keep every access point up to date with unified software updates.
- Easily monitor the working status, network traffic statistics and user information of all EAPs.
- Portal Authentication, Load Balance and many other advanced wireless functions are supported.

EAP Controller info:

EAP Controller (ver. 2.4.7 or above)		
Operation System		Windows OS
Configuration Requirement		Recommend Intel I3 CPU, 2GB RAM, 10G HDD or above
L3 Management		Support
L3 Discovery Methods		Discovery Utility、DHCP Option 82
Main Software Function	Captive Portal	No Authentication、Simple Password、Hotspot、External Radius Server、External Portal Server
	WLAN Group	Support
	Management Sites	Support
	Load Balance	Support
	Rate Limit	Support
	Management VLAN	Support
	Mail Log	Support
	Map	Support

Functions listed here are the main functions of the EAP Controller. For more information about the [EAP Controller](#), please visit our official website. After configuration is complete, you may need to keep the EAP controller software open depending on the features you are using. Captive Portal, for example, requires the EAP Controller to be constantly running. For more details, please read [FAQ 1024](#) on our website.

4. Wireless Network Deployment and Configuration Guide 4: EAP Product Deployment

1) EAP Product Installation

TP-Link EAP products can be ceiling-mounted, wall-mounted and ceiling-rail mounted. Installation methods are simple and fast. The installation procedure differs between EAP products.

- For the installation of EAP330/EAP320, please refer to the [EAP320 Installation Guide](#).
- For the installation method of EAP225 and other EAP products, please refer to the [EAP225 Installation Guide](#).
- For the installation of EAP115-Wall, please refer to the [EAP115-Wall Installation Guide](#).

2) EAP Product Cabling

If you are using EAP245 and other Standard PoE EAPs, you can simply use Ethernet cables to connect the EAPs to your network. To ensure normal communication and power transmission, we recommend that you use Ethernet cables that are Cat. 5E or above, with a maximum length of 100 meters.

If you are using EAP110 (This does not support Standard PoE, but does support Passive PoE.), any

standard of Ethernet cable is fine. However, you need to consider the position of the power socket which supplies power to the Passive PoE Adapter. Considering the simplicity and flexibility of wiring/cabling, if you have a Standard PoE switch, and your network scale is large, we recommend that you use the Standard PoE switch.

For every EAP product, you will need to decide the number of EAPs and where to install them based on your indoor environment. You should consider the following factors:

- **Carpet Area:** In theory, the wireless coverage of an access point can reach up to 500 square meters. However, the actual coverage may be less than that value, due to the effects of signal interference and obstacles.
- **Number of Connections and Internet Behaviors:** A single band (2.4GHz or 5GHz) of an AP has a recommended number of connected devices of 30, and the connected capacity of the 5GHz band is slightly more than that of the 2.4GHz band. A series of tests carried out with a selection of EAP products produced the following results when users streamed 720P HD videos:

	2.4 GHz			5 GHz	
	EAP330	EAP320	EAP110	EAP330	EAP320
Smooth Play*	28	26	25	40	38
Occasional Error**	30	30	30	42	42

* Smooth Play indicates the maximum number of connected devices when all clients are able to smoothly stream 720P HD videos.

**Occasional Error indicates the maximum number of connected devices when clients experience occasional buffering or pausing when streaming 720P HD videos.

- **Obstacles:** Obstacles cause varying degrees of wireless signal attenuation. To ensure complete coverage, try to install the EAPs in the center of an open room, which reduces the interference between the EAPs and their surroundings. It is recommended to test the signal reception in the corner of the room.

3) Discover and Manage the EAPs

After setting up EAPs and the EAP Controller host in the same local area (L2) network, EAPs can be managed easily in the LAN using the EAP Controller. When the EAP Controller discovers the EAPs, their status will change to "Pending". Later, when the EAPs are adopted, their status will change to "Connected". The EAPs with "Connected" status can be managed and configured by the EAP Controller. The controller can assign configurations such as wireless SSID and password to all connected EAPs. For more information, refer to the [EAP Controller's User Guide](#).

4) Wireless Network Optimization

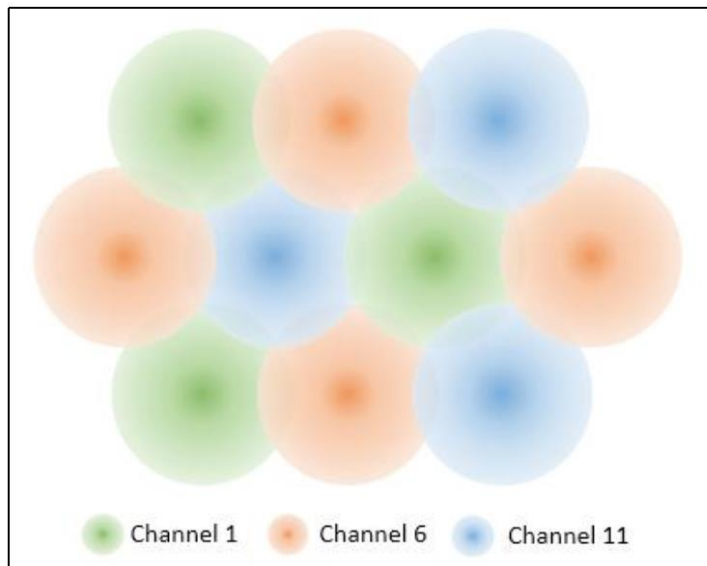
Once the wireless network is set up, you can access the internet or configure features such as wireless authentication, VoIP and more.

The following features can help to build a more stable wireless network:

- **Wireless Channel Assignment**

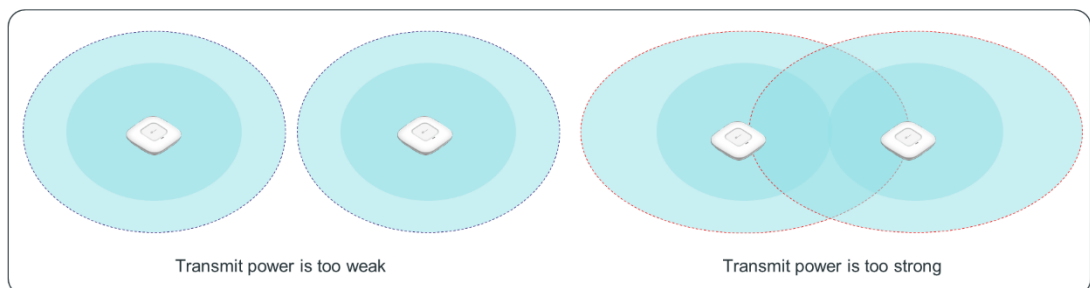
No matter whether you select the 2.4GHz or 5GHz band when deploying your wireless network, it is

important to ensure that wireless signals of adjacent EAPs do not interfere with each other. To achieve this, we can manually assign and fix channels for each access point. The following figure shows a possible channel assignment layout based on the three non-overlapping 2.4GHz wireless channels (1, 6 and 11).



- **Transmission Power Adjustment**

Generally, the higher the transmission power is, the larger the area that the wireless signal can cover. In places with a high density of clients, however, access points tend to be placed very close together, which may result in their wireless signals interfering. High transmission power is another factor that can result in interference between adjacent access points. Analyzing transmission power requires professional wireless signal analysis tools such as inSSIDer. When two access points are close together and there is no obstacle between them, it is recommended to reduce the transmission power. If there are many obstacles and access points are spread far apart from one another, the transmission power may be increased.



- **Load Balance**

Load Balance attempts to distribute wireless clients evenly between access points. Clients with a weak wireless signal can also be removed from the network, creating a smoother connection for users. To learn more about how Load Balance works, and how to configure it, please refer to the [EAP Controller's User Guide \(Page 61\)](#).

- **Band Steering**

This feature is supported by 2.4GHz/5GHz dual band products. When possible, dual-band clients

will be connected to the cleaner and faster 5GHz network instead of the 2.4GHz band. This provides a better online experience for users on both bands since network traffic on the 2.4GHz band will also be reduced. To learn more about how Load Balance works, and how to configure it, please refer to the [EAP Controller's User Guide \(Page 31\)](#).

5. Wireless Network Deployment and Configuration Guide 5: Improve Wi-Fi Access Experience

TP-Link Omada EAPs provide more than just basic Wi-Fi. They also provide a wealth of software features and value-added services, such as Captive Portal, SSID Isolation and Rate Limit.

- 1) By using Captive Portal Authentication, you can advertise your business while providing authentication for the users. TP-Link Omada EAPs support a variety of Captive Portal authentication modes. Users can select Captive Portal authentication modes according to their network size, application scenario and customers.
- 2) SSID Isolation can ensure the customers' network security. By setting up SSID Isolation, you can isolate communication between all wireless clients. This not only reduces broadcast traffic, but also enhances network security.
- 3) Rate Limit works by limiting P2P download speeds and other bandwidth intensive applications to ensure that all users have a good internet experience. With the Rate Limit function enabled, we can set up the maximum allowed upload and download rate for each client. This avoids situations where individual clients are taking up a large proportion of the bandwidth and slowing down the internet connection of other users.