

Pharos AP Solution 1

CPE&WBS Outdoor Wi-Fi Solutions for P2P Applications

Warne.Wang

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Contents

Background	2
Application Scenarios	2
Benefits	2
Solutions.....	2
A. Solution Overview and Network Topology Description	2
B. Network Deployment and Configuration Guide	3
1. Network Deployment and Configuration Guide 1: Solution Selection	3
2. Network Deployment and Configuration Guide 2: Introduction to Pharos.....	3
3. Network Deployment and Configuration Guide 3: Product Selection	4
4. Network Deployment and Configuration Guide 4: Field Deployment.....	5
1) Field Deployment 1: AP Installation	5
2) Field Deployment 2: Power Supply and Lightning Protection	5
3) Field Deployment 3: AP Configuration and Channel Optimization	7
4) Field Deployment 4: Antenna Alignment	7
5) Field Deployment 5: Wireless Performance Testing and Optimization.....	7
C. Wireless Network Optimization	7

Background

Traditional wired connections are impractical when linking areas separated by natural barriers, such as mountains or water. Instead, wireless point-to-point network connections are required to carry the signal over long distances. TP-Link's Pharos CPE and WBS products have been carefully engineered to provide secure, stable wireless links to deal with these cases.

Application Scenarios

- Connecting the networks of two sites, for example, to connect the networks of two separate offices of a company
- Providing network access to remote areas, for instance, internet access to remote farms, oil fields and coal mines
- Remote monitoring and operation of equipment, for example, to operate lifting equipment remotely, or controlling street lamps

Benefits

- 1) Cost-effective solution with a rich array of features
- 2) Simple deployment, management and maintenance, as well as high stability and reliability
- 3) Experienced and reliable technical support

Solutions

In the point-to-point (P2P) network topology, we configure one side as an access point (transmitting signal) and the other side as a client (receiving signal) to create a wireless connection. This setup allows the devices behind the client to access the internet via Wi-Fi. This article will introduce wireless P2P networking solutions based on TP-Link Pharos CPE and WBS products.

The solutions include three parts:

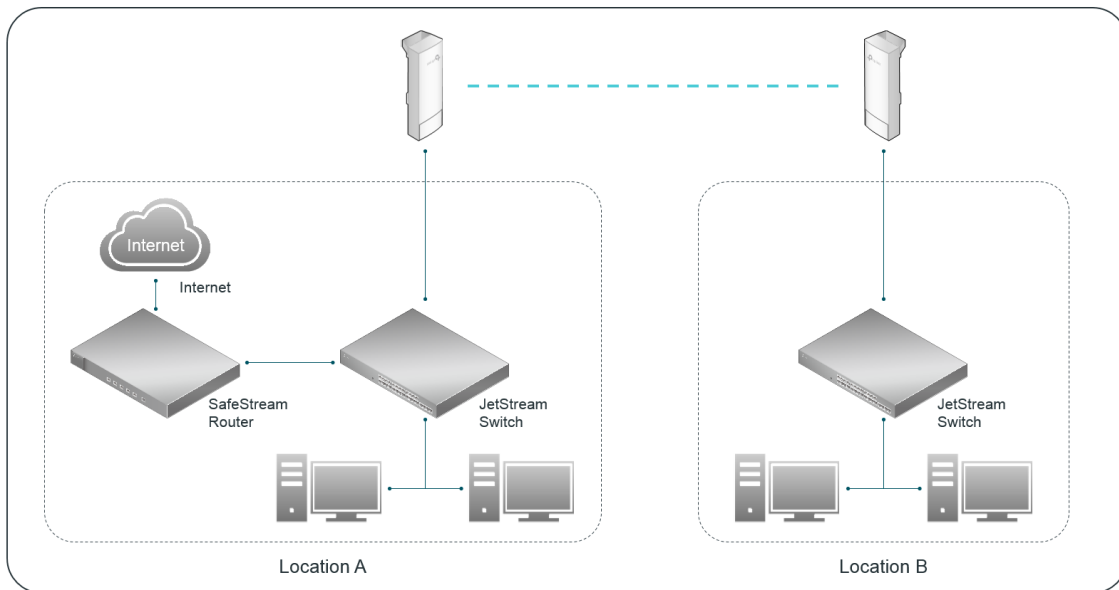
A. Solution Overview and Network Topology Description.

B. Network Deployment and Configuration Guide.

C. Wireless Network Optimization.

A. Solution Overview and Network Topology Description

Networking Solutions—— CPE&WBS Outdoor Wi-Fi Solutions for P2P Applications.



As shown above:

1. Deploy Pharos CPE (or WBS) products on two sites and connect them to the switches, without changing the original topology.
2. Configure CPE (or WBS) products on two sites to create a wireless P2P connection.
3. Devices in the network at Location B can now access the internet, without changes to the core configuration.

B. Network Deployment and Configuration Guide

1. Network Deployment and Configuration Guide 1: Solution Selection

TP-Link provides two Pharos networking solutions for P2P Wi-Fi. These are Economy (based on CPE), and Enhanced (based on WBS):

Solution	Economy	Enhanced
Product	CPE	WBS + Dish Antenna
Distance	0-20km	0-40km

In general, it is recommended to adopt the Enhanced solution of WBS + Dish Antenna due to the following advantages:

- 1) Concentrated signal, less wireless interference, and longer distance
- 2) More stable network and higher throughput compared with CPE over the same distance

2. Network Deployment and Configuration Guide 2: Introduction to Pharos

TP-Link's Pharos Solution includes three types of products: CPE, WBS and MIMO Antenna. This article will introduce them briefly. For more detailed information, please refer to the [CPE&WBS](#) and [MIMO Antenna](#) pages on our official website.

CPE is an access point device and has built-in directional antennas. So far there are four models of CPE: CPE210, CPE220, CPE510 and CPE520. The specifications are as follows:

Model	CPE210	CPE220	CPE510	CPE520
Wireless Speed	2.4G 300Mbps	2.4G 300Mbps	5G 300Mbps	5G 300Mbps

Transmit Power	27dBm	30dBm	23dBm	27dBm
Antenna Gain	9dBi	12dBi	13dBi	16dBi
HPBW Angle	65°	60°	45°	45°
Interface	10/100Mbps Ethernet port *1	10/100Mbps Ethernet port *2	10/100Mbps Ethernet port *1	10/100Mbps Ethernet port *2
Power Supply	24V Passive PoE	24V Passive PoE	24V Passive PoE	24V Passive PoE
Distance	3km	8km	15km	20km

WBS is another access point device and works together with external antennas (2*2 MIMO Antenna). So far we have two models of WBS: WBS210 and WBS520. The specifications are as follows:

Model	WBS210	WBS510
Wireless Speed	2.4GHz 300Mbps	5GHz 300Mbps
Transmission Power	27dBm	27dBm
Interface	2*10/100Mbps Ethernet Port 2*RP-SMA Male	2*10/100Mbps Ethernet Port 2*RP-SMA Male
Power Supply	24V Passive PoE	24V Passive PoE
Distance	Dish Antenna: 30km Sector Antenna: 5km Omni Antenna: 2km	Dish Antenna: 40km Sector Antenna: 15km

Pharos MIMO Antenna includes three types of antenna: Sector Antenna, Dish Antenna and Omni Antenna. They are able to provide wireless coverage for different scenarios and requirements. So far we have five models of MIMO Antennas: TL-ANT2424MD, TL-ANT2415MS, TL-2410MO, TL-5830MD and TL-ANT5819MS. The specifications are as follows:

Model	TL-ANT2424MD	TL-ANT2415MS	TL-ANT2410MO	TL-ANT5830MD	TL-ANT5819MS
Type	Dish	Sector	Omni	Dish	Sector
Frequency	2.4GHz	2.4GHz	2.4GHz	5GHz	5GHz
Gain	24dBi	15dBi	10dBi	30dBi	19dBi
HPBW Angle	<5°	120°(6dB) 90°(3dB)	360°	<5°	120°(6dB) 90°(3dB)
Interface	2*RP-SMA Female	2*RP-SMA Female	2*RP-SMA Female	2*RP-SMA Female	2*RP-SMA Female
Scenario	P2P	P2MP	Hotspot	P2P	P2MP

3. Network Deployment and Configuration Guide 3: Product Selection

Pharos contains a variety of models that can work together flexibly. Thus, you can deploy different products for your wireless network according to your requirements. We recommend the following Pharos CPE&WBS solutions for P2P networks:

Solution	Economy				Enhanced	
	CPE210	CPE220	CPE510	CPE520	WBS210+TL-ANT2424MD	WBS510+TL-ANT5830MD
Product in AP side	CPE210	CPE220	CPE510	CPE520	WBS210+TL-ANT2424MD	WBS510+TL-ANT5830MD
Product in Client side	CPE210	CPE220	CPE510	CPE520	WBS210+TL-ANT2424MD	WBS510+TL-ANT5830MD
Frequency (GHz)	2.4	2.4	5.8	5.8	2.4	5.8
Distance (km)	3	8	15	20	30	40
Throughput (Mbps)	~60	~67	~60	>25	30-60	30-50

Note: The throughput data is tested within the recommended distance, and the test data is for reference only. The wireless performance may differ in your own environment. Another consideration is that the wireless throughput performance may decrease since CE/FCC regulations limit wireless transmission power in outdoor areas.

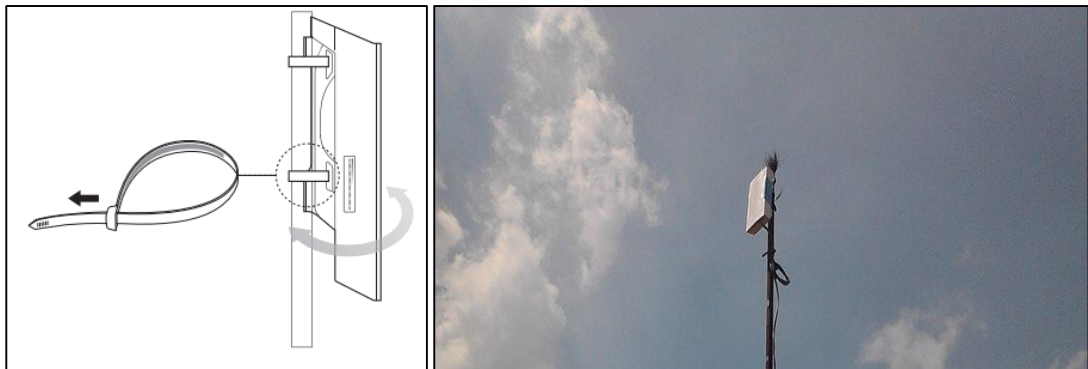
4. Network Deployment and Configuration Guide 4: Field Deployment

- **Field Deployment 1: AP Installation**

Note: Before installation, you should ensure the first Fresnel area between the installation sites is clear. If there are obstacles present that cannot be moved, you can increase your installation height to avoid it. For detailed information please refer to [FAQ-907](#).

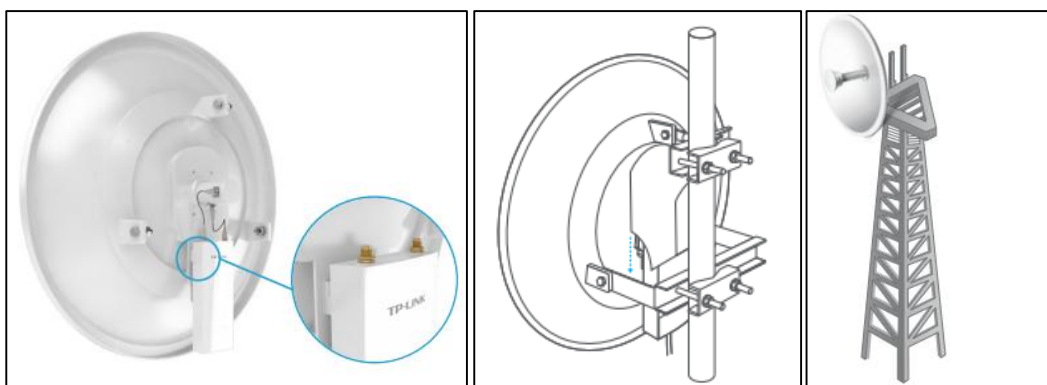
Economy Solution (CPE only):

This solution is used mainly by end users. Thus, pole mounted installation is most common since end users do not have a dedicated signal tower. CPEs are designed with a binding slot, and the product comes with a special cable that can fix the device in place.



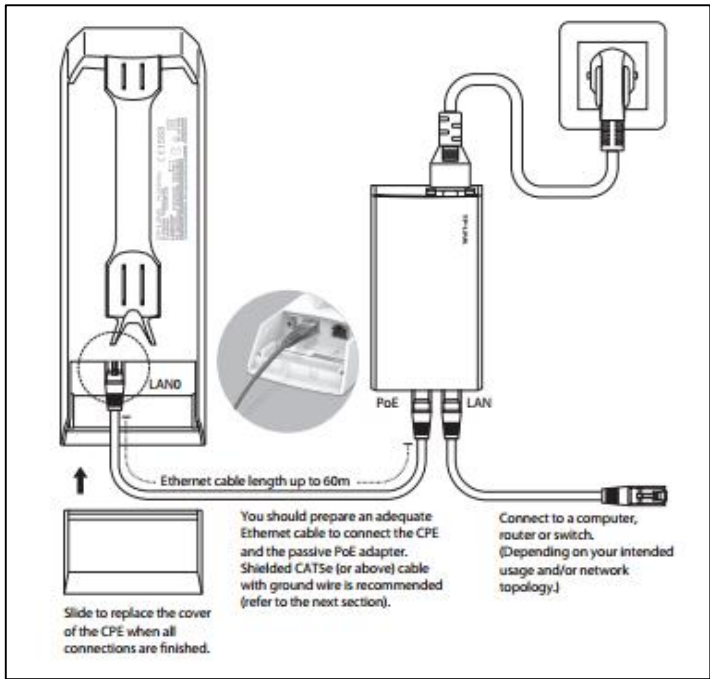
Enhanced Solutions (WBS + Dish Antenna):

This solution is used by ISP and business users. Generally it is installed on special brackets or a signal tower due to the large size of the Dish Antenna. Pharos dish antennas have a dedicated slot to affix a WBS product. The antenna is fixed to the signal tower with a metal bracket. For detailed information, please refer to the [TL-ANT5830MD Installation Guide](#).



- **Field Deployment 2: Power Supply and Lightning Protection**

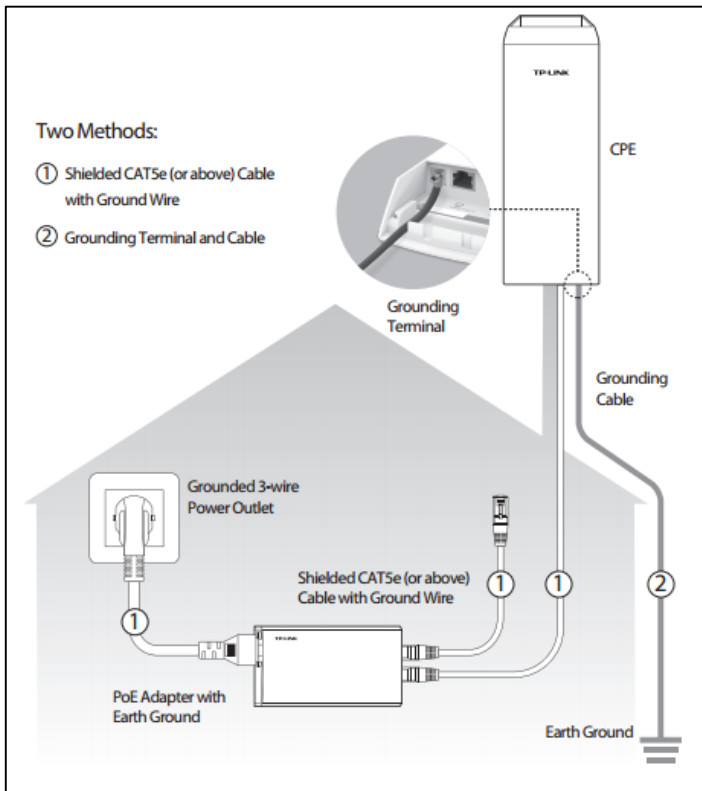
Pharos CPE/WBS products support 24V/1A Passive PoE power supply. The maximum distance from the power supply is 60m. Therefore, you can power the device with an indoor electric source.



Please note that Passive PoE is different to Standard PoE. You CANNOT supply power to CPE/WBS with PoE switches. For detailed information about PoE power supply, please refer to [FAQ-906](#).

If your project requires lightning protection:

- 1) Connect the ground electrode to the grounding terminal.
- 2) Use Cat5e (or above) Shielded twisted pair cables to work with the PoE Adapter (comes with product) for lightning protection.



- **Field Deployment 3: AP Configuration and Channel Optimization**

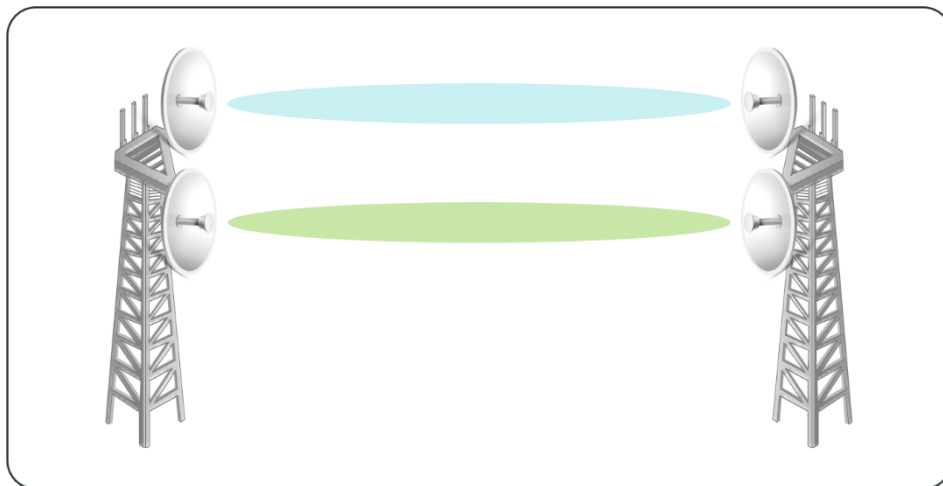
Log in to the management Web UI and configure one CPE/WBS in AP mode and another in Client mode. For details of how to configure them, please refer to [FAQ-730](#) and [FAQ-727](#). When configuring the devices, you should choose a clean channel to help improve the throughput. Therefore, it is recommended that you perform spectrum analysis with the tool Spectrum Analysis in the Web UI, then select a relatively clean channel manually.

- **Field Deployment 4: Antenna Alignment**

CPEs are designed with built-in directional antenna. This makes the wireless coverage very limited. WBS products work with a Dish Antenna to make the signal more concentrated. (The horizontal/vertical beam angle is only about 6° .) Thus, if you don't align the antenna for the two sides carefully when using WBS products, the stability of the wireless P2P link may be very poor. Antenna Alignment includes two parts: coarse tuning and fine tuning. You may need the help of some directional tools such as a compass when you align the antenna. For detailed information, please refer to [FAQ-1044](#).

- **Field Deployment 5: Wireless Performance Testing and Optimization**

You can test the wireless throughput with the Speed Test tool in Pharos Web UI. For a detailed testing method, please refer to the [Pharos User Guide](#), pages 97-98. If the test result does not satisfy your requirements, you can deploy another pair of CPEs (or WBSs) to improve the wireless throughput. In case of loops, please note that you should configure Port Isolation or Link Aggregation on switches at both ends.



C. Wireless Network Optimization

- **Wireless Network Optimization 1: Enable MAXtream to ensure Network Security**

If you have high requirements for network security, it is recommended that you enable the MAXtream function. MAXtream is a proprietary communication protocol developed by TP-Link, and is only compatible with the Pharos series. You should enable it when you deploy your wireless network solution. It will ensure that only Pharos CPE/WBS products can join the network, and prevents strangers with rouge equipment from accessing the network.

- **Wireless Network Optimization 2: Enable Ping Watch Dog to Ensure Network Stability**

Enable Ping Watch Dog on both the access point and client side to lock the remote IP address. Once the number of packets dropped goes over a certain number due to wireless interference, the devices will reboot and reselect the channel automatically.

This method effectively deals with the instability of wireless links caused by interference. For detailed information, please refer to the [Pharos User Guide](#), page 82.

- **Wireless Network Optimization 3: Enable Test Mode to Improve Wireless Throughput**

Pharos series software includes Test Mode, which allows the access point to use higher transmission power and cleaner channels so as to avoid wireless interference and improve network performance.

IMPORTANT: Enabling Test Mode may violate local regulations regarding the transmission of radio waves in your country. Please ensure your product complies with local regulations in Test Mode before enabling it. The transmission statistics of Pharos products when operating in Test Mode are shown below:

Model	Frequency	Maximum Transmit Power	Antenna Gain
WBS210	2312-2572 MHz	27dBm/500mW	/
WBS 510	4920-6100 MHz	27dBm/500mW	/
CPE210	2312-2572 MHz	27dBm/500mW	9dBi
CPE220	2312-2572 MHz	30dBm/1000mW	12dBi
CPE510	4920-6100 MHz	23dBm/200mW	13dBi
CPE520	4920-6100 MHz	27dBm/500mW	16dBi