Outdoor Wireless Bridging

What is an outdoor access point and what do they do?

The primary purpose of outdoor access points is to create a wireless bridge that allows two separate buildings (or locations) to network and communicate with each other. Like all IP devices, an outdoor access point functions both as a transmitter and a receiver; it will send and receive data simultaneously. Two or more access points are required to create a point-to-point or point-to-multi-point wireless bridge links.

Wireless bridging is a common application for surveillance solutions with a remote end point. A less common application for outdoor access points is to provide wireless access to client devices outdoors.

Site Survey

Before you get started on any networking project, a site survey must be done. A site survey is crucial to planning and designing a wireless network; it helps to determine the necessary parameters to meet the requirements for the network.

Site surveys help to determine requirements for a specific application or project, including network capacity, wireless coverage, data rates, and radio interference. A site survey also helps to determine the best locations to install the access points.

Be sure to analyze floor plans, inspect the site location, and meet with the IT management team before you get started with the installation process. Site surveys also include testing, auditing, analysis, and diagnostics of the existing network to help determine what is required for the level of service demanded.

There are several free tools available including computer software and mobile apps. Using a laptop is preferred over a mobile device due to radio strength. For the best analysis, select one of the several professional tools available on the market.

Pro Tip: When deciding mounting locations, keep in mind to consider the polar plot and the radius.

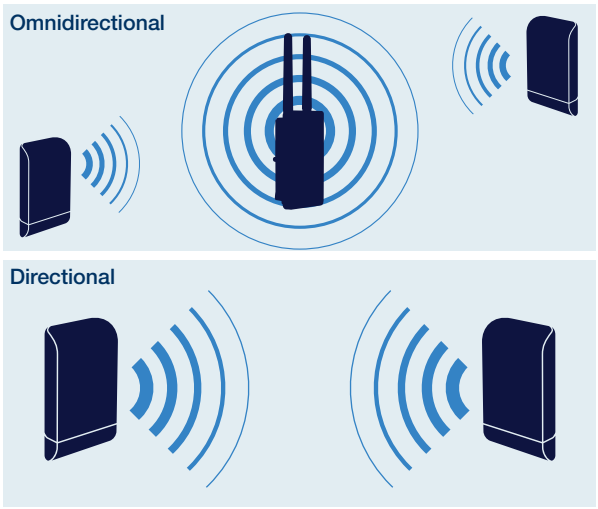
TRENDnet

Omnidirectional vs Directional

Omnidirectional access points receive and transmit signals 360°, to and from all directions. Directional access points communicate back and forth in the same direction.

Omnidirectional access points are most common where there are multiple buildings with one building used as the main hub or center. When working with directional APs, be sure you install them correctly at an appropriate height and angle. Directional APs must have line of sight and be pointed directly at each other to work.

Outdoor wireless applications for client devices require an omnidirectional access point for best results. Using a directional access point will reduce the area where wireless signals are sent. Wireless range will be limited by the maximum wireless range of a client device.



PoE vs Proprietary/Passive PoE

Standard PoE
Up to 15.4W

PoE+
Up to 30W

UPoE
Up to 60W

Power over Ethernet or PoE allows you to use a single cable to deliver both power and data. Utilizing PoE allows you to save on installation costs and time; there's only one cable to buy, and only one cable to run.

PoE standards are set by the IEEE organization. Standard PoE (802.3af) provides up to 15.4 watts of power per port; PoE+ (802.3at) provides up to 30 watts of power. Ultra PoE, or UPoE, is a new standard developed to handle up to 60 watts of power.

However, it is not uncommon to use proprietary or passive PoE for devices that require more power, such as advanced speed dome cameras with heating or other features. Devices that require the use of proprietary or passive PoE usually include a PoE injector which allows you to easily integrate the device with the rest of your PoE devices and network.

Ingress Protection Ratings

The Ingress Protection Rating (IP Code, International Protection Marking) identifies the level of protection a product has against solids and liquids. Most outdoor AP housing will have an IP rating such IP55, IP66, or IP67. The first number is related to solids, and the second is related to liquids. For most applications, a 5 or 6 rating on both solids and liquids will be sufficient for outdoor applications.

Level	Solid Particle Protection	Level	Liquid Ingress Protection
	Effective against solids larger than…		Protection against…
0	None	0	None
1	50mm	1	Dripping water
2	12.5mm	2	Dripping water, tilted up to 15°
3	2.5mm	3	Spraying water
4	1mm	4	Splashing of water
5	Dust protected	5	Water jets
6	Dust tight	6	Powerful water jets
		6K	Powerful water jets with increased pressure
		7	Submerged, up to 1m
		8	Submerged, 1m or more
		9K	Powerful high temperature water jets

IP Rating Table with code description and details.

Outdoor Wireless Range and Bandwidth

Standard range for an outdoor wireless bridge is approximately 0.31 to 5 miles. This is assuming that there is a line of sight to each access point with no obstructions or interference.

Useable Distance and Bandwidth

There are many factors that can affect the useable distance and bandwidth of wireless bridge solutions. Physical obstructions, radio interference, and placement play important roles. Carefully select mounting location and height to avoid physical obstructions. The site survey you conducted will help determine the ideal location.

In regards to radio interference, the 2.4GHz band is the most commonly used and often the most saturated radio frequency. Try using a different channel, moving the AP to a location with no interference, or use an AP that supports the less congested 5GHz band. A site survey is required to help you choose the best location.

Distance can also be increased by using a lower performing wireless band, however wireless n is the lowest wireless band you'll want to use for today's applications. Distance is also dictated by the weaker radio specification. For best results, use the same model access point for your installation.

The FCC (and other government organizations) limits the transmit power of wireless products, which directly effects the maximum wireless range. Some access points use uncommon and/or unlicensed frequencies to increase the distance and can have a larger distance range. Using an unlicensed frequency has its benefits, but it locks you into a specific brand since it uses a unique and/or uncommon frequency.

Pro Tip: For outdoor wireless solutions for client devices, the AP to client connections are further limited by the client device's range limitations, usually about 50-300 feet.

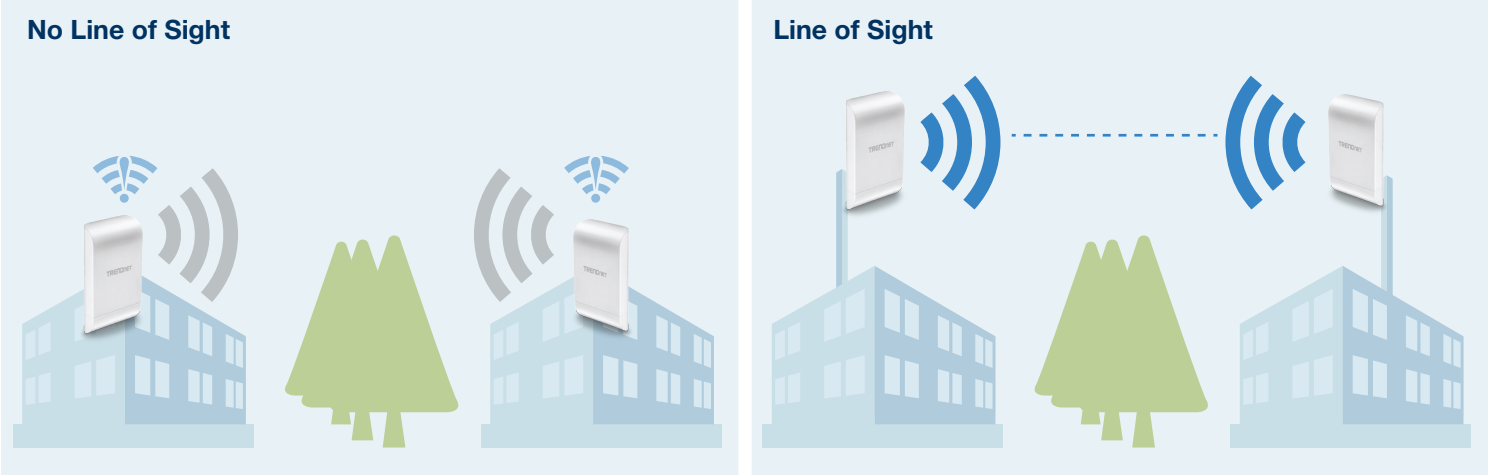
Line of Sight

When installing access points, ensure that there is a direct line of sight from one AP to the other AP. There should be no obstructions of any kind, including other buildings or trees.

If line of sight is compromised, there are alternative installation methods to consider such as wireless repeating, hub and spoke (point to multiple point), or adjusting installation location.

Wireless repeating or wireless hopping is where the connection is repeated from Building A to Building B to then reach Building C. Daisy chaining is not a recommended option as bandwidth will be lost with each wireless touch point. Depending on your application, we don't usually recommend repeating more than once. Be sure you have enough bandwidth for your specific project.

Another method is to increase the installation height of both access points until there is no obstruction in view.

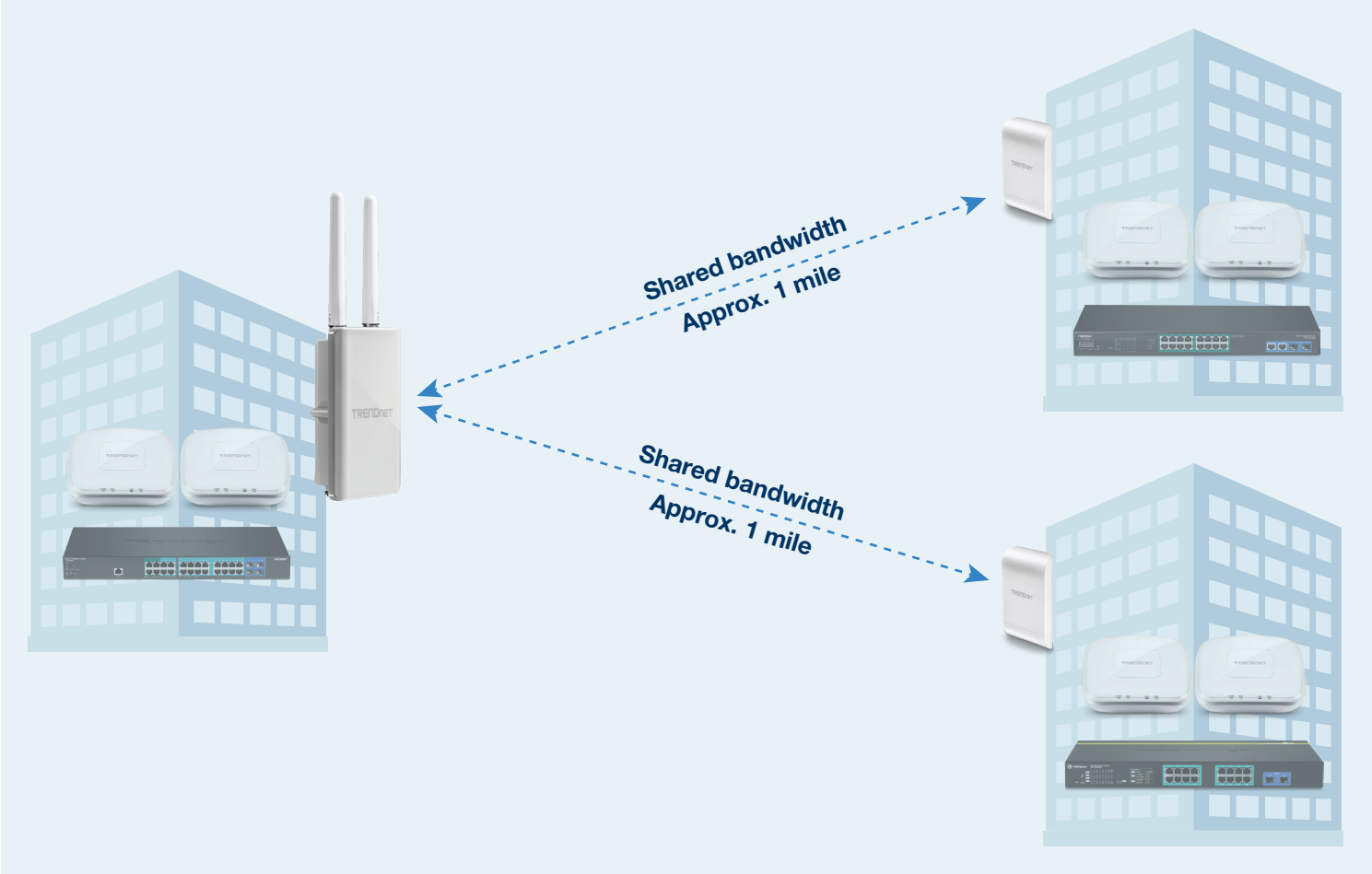


Applications

Point to Point

A common application for wireless bridging is for surveillance where cabling is not an option. The installation can take place between two different buildings or from a building to a pole in a parking lot. Wireless bridge solutions are especially useful for projects in remote locations.

Point to Multi-Point



A point to multi-point solution uses both omnidirectional and directional access points. This is a popular solution because it can be more cost effective, as long as you do not require a large amount of bandwidth. When using a point to multi-point solution, bandwidth is shared with other access points in the network.

WDS Bridge Setup

Building with Internet access

Building with no Internet (until WDS bridge)

WDS Bridge can be used to share internet access to a building that is not able to get internet otherwise. This is also a cost-effective solution since it does not require major rework of existing infrastructure (in the building without internet access).