

PoE Considerations in Ethernet over Coax Applications

Power-over-Ethernet (PoE) is an effective tool for powering Ethernet devices that need to be located in areas where power is not currently available and would be difficult or costly to install. In such cases, power can be provided over existing cable, such as coaxial cabling, which simplifies installation, saves time, and eliminates the cost of new wiring or hiring an electrician. Transition Networks' [Ethernet Over Coax Extender With PoE+](#) converts conventional Ethernet to a signal that can be carried over 75 ohm impedance coaxial cable, allowing upgrades from analog cameras to high-quality digital IP cameras in security and surveillance applications, interconnection of communication equipment in cellular backhaul applications, and interconnection of wireless equipment in WAN/LAN networks – all without the high cost of replacing the existing coax cable.

It may be tempting to compare Ethernet extenders from various manufacturers based on a single factor such as distance. However, it is important to note that many additional factors affect the total performance of a PoE solution and results can vary greatly. When comparing products from different vendors, one must consider the following factors to determine their effect throughout the entire system:

- Power level needed at the end device
- Desired data throughput rates
- Operating temperature of the environment
- Distance to the end device
- The quality of the coax cable used

Power at the End Device

In order to be compliant with IEEE 802.3af standards, a PoE system must deliver 15.4 Watts of power to the end device. To be IEEE 802.3at compliant, a PoE+ system must deliver a full 30 Watts of power to the end device. As the distance the power has to travel increases, the amount of power available to the end device is reduced. Figure 1 illustrates the maximum distance versus power load that the Transition Networks' [Ethernet Over Coax Extender With PoE+](#) are capable of delivering, based on a standard quality coax cable*.

* Throughout this document, a typical 75 ohm RG59U cable with DC resistance of 50 ohm per 1000 feet was used to determine values. A better quality cable with less resistance will provide better results.



Figure 1: Transition Networks [Ethernet Over Coax Extender With PoE+](#) Power versus Distance Performance*

Desired Data Throughput

Similar to how the available power level degrades over distance, there is also a trade-off between distance and the data throughput that can be achieved within a PoE coax solution. Many products will claim they can achieve very long distances, for instance up to 10,000 feet, but in reality may only achieve those distances at Ethernet rates of 5 Mbps or less. In order to achieve or maintain a Fast Ethernet (100 Mbps) speed, the actual distance that data can be transported may reduce to 500 feet or less. In contrast, Transition Networks [Ethernet Over Coax Extender With PoE+](#) provides near-Gigabit Ethernet speed at similar distances. It is equally important to confirm if the distances being quoted include delivering power and not solely Ethernet traffic. Figure 2 illustrates the bandwidth and power Transition Networks' [Ethernet Over Coax Extender With PoE+](#) provide over standard RG59U coax with 50 ohm resistance. Using a higher quality cable will provide even better results.

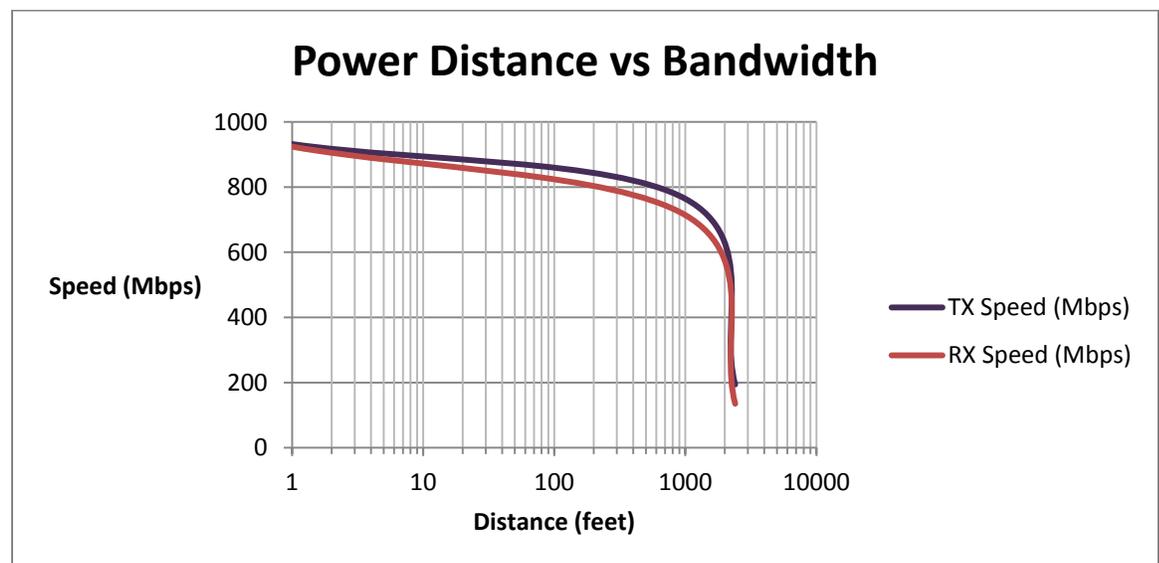


Figure 2: Transition Networks [Ethernet Over Coax Extender With PoE+](#) Ethernet Bandwidth vs Distance Performance

Operating Environment

Next, the temperature of the operating environment also affects the level of power that can be delivered. Systems located in environments with extreme operating temperatures will require de-rating of the power supply in order to reliably operate at the desired temperature. Transition Networks' [Ethernet Over Coax Extender With PoE+](#) power supplies have already been de-rated for an operating temperature of 0-65°C to ensure delivery of full PoE+ power according to IEEE 802.3at standards for distances of approximately 122 meters (400 feet) over the coaxial cable between the local and remote device and an additional 100 meters (328 feet) of CAT5 cable to the end powered device for a total combined distance of 222 meters (728 feet). Not all competitive products have de-rated their power supplies to account for temperature as well as the additional power loss over the final cable run to the IEEE 802.3at powered device. Therefore, their temperature ranges may not be accurate. Figure 3 illustrates the effect of ambient temperature on power.

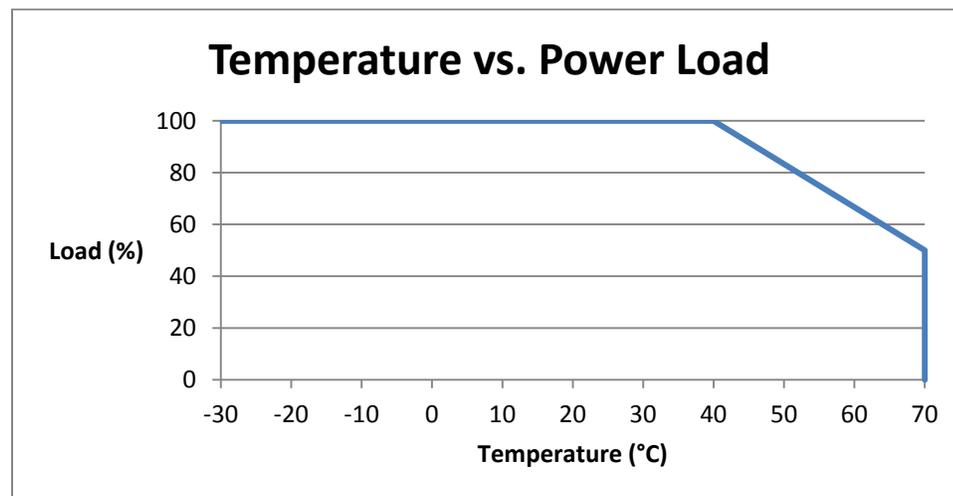


Figure 3: Effect of Temperature on Power

In applications requiring SFP fiber optic connections, both the ambient temperature as well as the operating temperature within the enclosed product must also be considered. In environments with a 50°C ambient temp, an additional 20°C temp rise inside the enclosure would require an SFP rated to 70°C. Since the SFP temperature limits the upper end of the product's operating temperature range, in environments above 50°C, industrial SFP modules (rated to 85°C) are required.

Distance

As previously illustrated, distance cannot be considered by itself. Other factors related to the system, such as power required to the end device, bandwidth of the Ethernet data, and temperature of the operating environment, will impact the total distance achieved. Transition Networks offers a [calculator](#) to input variables specific to your environment, which will help you determine the maximum distance that can be achieved while providing the desired power for your end device.

Coaxial Cable Quality

A factor that has perhaps the most critical impact on the performance of your Ethernet over Coax PoE system is the quality of the coaxial cable used. Various types of coax cable are available—with different types of cladding, diameter of the cable, and resistance of the cable to name a few. The better the quality of the cable, the better your Ethernet over Coax PoE system results will be.

Summary

In summary, it is important to look at all aspects of your system to determine if you will achieve the desired results. Don't be misled by comparing a single claim without determining other components' full effect on your total Ethernet over Coax PoE system. For assistance with design of your Ethernet over Coax system, contact our network experts at www.transition.com.