



The Business Benefits of Robustel POE Solutions

Concept

Power over Ethernet, commonly abbreviated to '**PoE**', is a simple concept that describes how to deliver both power and data to an electronic device over the same piece of (typically) CAT 5 or CAT 6 cable. Its origins are in consumer electronics where the ease of installation and convenience of not having to have many additional power supplies around a building are a very obvious benefit.

Traditionally, POE has been used to connect the following devices:

VoIP handsets – one less PSU is required if power supplied over data cable

WiFi Access Point – for optimal radio coverage, siting of APs can be in hard to access places. PoE means that only having to get one cable to the AP can save significant time and cabling cost

IP Cameras – cameras are often located in difficult to reach places as they need an optimal field of view to perform their primary purpose. This is another perfect example of POE reducing cost.

Types of POE Device:

It is important for users to be clear on the two fundamental types of POE device.

A device that provides power is known as PSE (Power Sourcing Equipment)

A device that uses / consumes power is a PD (Powered Device)

More detailed descriptions (source = Wikipedia) below:

Power sourcing equipment

"Power sourcing equipment" (PSE) are devices that provide (source) power on the Ethernet cable. This device may be a network switch, commonly called an endspan (IEEE 802.3af refers to it as endpoint), or an intermediary device between a non-PoE-capable switch and a PoE device, an external PoE injector, called a midspan device.

Powered device

A "Powered device" (PD) is any device powered by PoE, thus consuming energy. Examples include wireless access points, VoIP phones, and IP cameras.

As the PoE standard has evolved, the power delivery capability has evolved with it. The table below highlights the different standards available.

Property	802.3af	802.3af	802.3bt Type 3	802.3bt Type 4
Power available at PD	12.95 W	25.50 W	51 W	71 W
Power available at PD	15.40 W	30.0 W	60 W	100 W

Figure 1 – POE Standards and associated Power limits

It is important to note that at the time of writing (September 2019) Robustel only has products with 802.3af or 802.3at capability as the majority of applications can be handled by the minimum 25W that 802.3at makes available to the end device.

Robustel Portfolio for PoE Applications

The table below highlights the capabilities of Robustel's product range at the time of writing (September 2019).

Product	PD	PSE
R2000 Dual	X	802.3at
R2000 Enterprise	802.3af	X
R2000 Standard	802.3af	X
R2110	802.3af	X

PSE Solutions / Innovations

As is clear from the table above, the R2000 Dual is Robustel's primary PSE capable device that can be used as a 4G router as well as providing power to attached devices.

This product operates effectively as a managed POE switch + router in one product. This means less points of failure than a 2-product solution and a simpler / smaller footprint physical installation.

It is commonly used in the security industry to connect to remote IP cameras as highlighted in the diagram below.

PSE Connection (OPTIONAL)

R2000 Dual's four fast Ethernet LAN ports support POE feature (Voltage range: 48 to 57 VDC), which can electrify the network terminal devices such as IP camera and other WLAN AP etc. See figure below for more details.

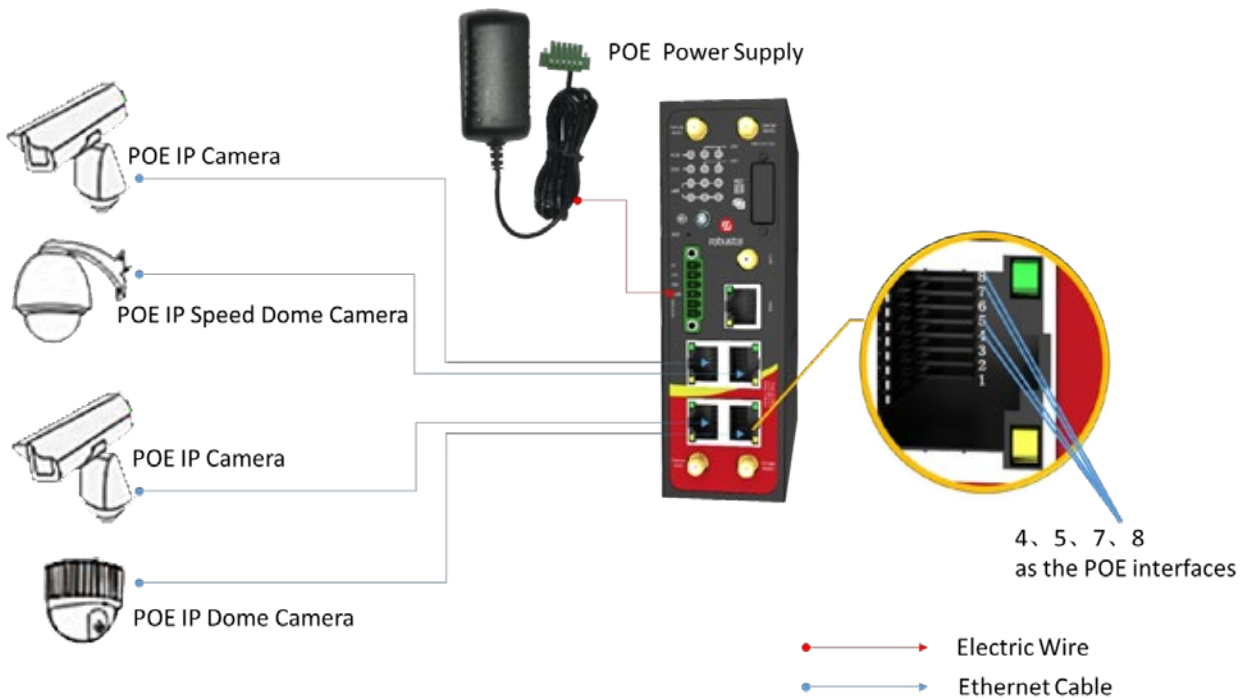


Figure 2 – R2000 Dual router connecting to Dome, Speed Dome & fixed IP Cameras

The screenshot below shows the corresponding page in the router's menu system. Not only is the power status (on/off) made available to the user but also the voltage and current allowing basic diagnostics to be carried out and also power consumption calculations to make sure the most cost-effective 48 VDC PSU is selected for the application.

^ Port Status		
Index	Port	Link
1	eth0	Down
2	eth1	up
		Index 2
		Port eth1
		Link up
		POE Status Power OFF
		POE Voltage 0.000V
		POE Current 0.000mA
3	eth2	Down
4	eth3	Down
5	eth4	Down

The ability to switch POE on/off on a per port basis effectively gives a ‘remote reboot’ capability for all attached devices. This remote reboot capability from the R2000 Dual can potentially save the cost of a site visit just to power cycle a POE powered device that has ‘locked up’ & this is where the business case for POE attached devices can be very strong.

Robustel are frequently asked what the options are for remotely raising / lowering the POE power to an Ethernet port on the R2000 Dual router. These are as follows:

- 1 – Use a fixed IP SIM to remotely access the router GUI and change the status through the HTTP(S) browser interface
- 2 – Use a fixed IP SIM to remotely access the Command Line Interface (using SSH or Telnet) and issue text commands to change configuration status
- 3 – Use RCMS (Robustel’s cloud management platform) to easily access the Command Line Interface of the R2000 Dual and issue text commands to change configuration status (Does not require fixed IP SIM!)
- 4 – Embed the Command Line Interface commands into the payload of an SMS message sent to the telephone number of the SIM in the router. Sender whitelist and User/Password authentication provide the security to make this a very plausible & flexible “out of band” solution.

Using a 'PoE Splitter' for added value and innovation

An important logical extension of the above 'remote reboot' capability is that non-POE devices can also be powered by the R2000 Dual with the use of a 'POE splitter'.

A splitter is able to "split" the Data and Power connections back into their component parts and is able to provide a solution for remote powering of non-PoE devices.



Figure 3 - A typical POE Splitter – 'POE IN' terminates the powered run of CAT5 / CAT6 cable. 'DATA OUT' connects to external device. 'DC OUT' provides power to attached device.

Some POE splitters provide a flexible DC output voltage. The example below shows a 12 VDC or 24 VDC selectable model as supplied by Robustel.



Figure 4 – typical industrial / light-industrial POE splitter

Below is a list of devices that ‘could’ be run from the power supplied by an 802.3at standard POE splitter:

- Raspberry Pi
- RS232 / RS485 to Ethernet converter
- Other Single Board Computer

PD Solutions / Innovations

The table below highlights all of Robustel’s PD options with the R2110 and R2000 being the most popular for general use.

Product	PD	PSE
R2000 Dual	X	802.3at
R2000 Enterprise	802.3af	X
R2000 Standard	802.3af	X
R2110	802.3af	X

Below are the key reasons why you might select a POE-PD model from Robustel’s portfolio:

1 – Optimal siting of Router for 3G/4G signal strength

Plant rooms are often located in the basement / cellar of buildings, places where traditionally it can be hard to receive a cellular network signal. Even the use of roaming (multi-network) SIMs might not solve the problem so the only solution may be to physically locate the router elsewhere. In this instance the 100m cable run that POE allows can be used to good effect to easily change the location of the router without having to route power and data separately. There may even be existing CAT5/6 infrastructure that can be used for this purpose.

2 – In-vehicle installations

Some buses and commercial vehicles already have powered Ethernet infrastructure to make installation of IP Cameras easy. This can also be leveraged to make 4G router installation easy and provide flexibility as to where they can be installed in a space-constrained vehicle.

3 – Reliability

If a UPS is used to hold up the power to a POE enabled switch, then the PDs (R2110/R2000) connected to that switch will also benefit from the security provided by the UPS (Uninterruptible Power Supply). The router can also be appropriately connected to be aware of power loss to the UPS (typically a Digital Input or RS232 connection) and send a warning that power has been lost to the UPS and shutdown in x minutes is pending.

Summary

To buy a router with POE capability generally costs more than a standard device. However, in many instances, the cost-saving benefits of simpler, faster and cheaper installations of electronic equipment can far outweigh the small additional cost of POE capability.

An electrician will typically be able to offer professional services at around \$100 per electrical spur (averaged). If you compare this with the small increase in cost for a POE enabled router, the total installation cost for a project can be significantly reduced by the smart use of POE Technology.

To learn more about how Robustel's POE solutions can add value to your next project, contact info@robustel.com to be introduced to a local partner in your region.