PoE-Out

Summary

Sub-menu: `/interface ethernet poe`

This page describes how PoE-Out (Power over Ethernet) feature can be used on MikroTik devices with at least one PoE-Out interface. MikroTik uses RJ45 mode B pinout for power distribution, where the PoE is passed trough pins 4,5 (+) and 7,8 (-). If a device supports powering other devices using PoE-out, then it is recommended to use **at least 18V** as the input voltage, except for devices that support multiple output voltages (e.g. CRS112-8P-4S-IN, CRS328-24P-4S+RM, CRS354-48P-4S+2Q+RM).

MikroTik supported PoE-Out standards

MikroTik devices can support some or all of the following PoE standards:

- **Passive PoE-Out up to 30 V** - PoE standard, which does not require negotiation between PSE (Power Sourcing Equipment) and PD (Powered Device). PoE-out uses the same voltage as supplied to the PSE (Power Sourcing Equipment). PoE-Out Standard for devices that supports input voltage up to 30 V. PD resistance should have ranged from 3kΩ to 26.5kΩ. (e.g. hEX PoE lite, RB3011UiAS-RM, RB2011iL-IN.)

- **Passive PoE-Out up to 57 V** - Works the same as low voltage (up to 30 V) PoE-Out, but is also capable to deliver high voltage over PoE ports. The output voltage depends on the power source connected to PSE. Can power up af/at compatible devices, which accepts power over 4,5 (+) and 7,8 (-), and does not require PoE negotiation. PD resistance should have ranged from 3kΩ to 26.5kΩ. (e.g. cAP ac, hAP ac, wsAP ac lite.)
- **IEEE Standards 802.3af/at** - Also called PoE Type 1/PoE+ Type 2, are PoE standards Defined by the IEEE. The aim of these standards is to reduce incompatibility between vendors. MikroTik PSE with af/at support is capable of powering both a Type 1 and a Type 2 PD. Valid PD should have PoE-In resistance from 23.75kΩ to 26.25kΩ. MikroTik devices that support af/at standard can also switch to Passive PoE-Out mode. (e.g. CRS112-8P-4S-IN, CRS328-24P-4S+RM, CRS354-48P-4S+2Q+RM.)

Each PoE-Out implementation supports overload and short-circuits detection.

> **Note:** Some MikroTik devices support all of the described standards (e.g. CRS112-8P-4S-IN, CRS328-24P-4S+RM, netPower 16P, CRS354-48P-4S+2Q+RM etc...)

How to choose your PoE PSE

This table can help you choose which PSE device is best suitable for your needs.

Device name	PoE-Out port count	Passive PoE	802.3af/at	802.3bt	Power input	Maximum output per port		Maximum power output, W
						Input 18-30V, mA	Input 30-57V, mA	
CSS610-8P-2S+IN	8	+	+	-	AC &DC 48-57 V	1000	625	140
CRS328-24P-4S+RM	24	+	+	-	AC	1000	450	450
CRS354-48P-4S+2Q+RM	48	+	+	-	AC	1000	570	700
CRS112-8P-4S-IN	8	+	+	-	DC 18-30V & DC 30-57V	1000	450	80
netPower 16P	16	+	+	-	DC 18-30V & DC 30-57V	1100	600	160
RB5009UPr+S+IN	8	+	+	-	DC 18-30V or DC 30-57V	640	420	130
hEX PoE	4	+	+	-	DC 18-30V or DC 30-57V	1000	450	102
PowerBox Pro	4	+	+	-	DC 18-30V or DC 30-57V	1000	450	102
OmniTIK 5 PoE ac	4	+	+	-	DC 18-30V or DC 30-57V	1000	450	102
hEX PoE lite	4	+	-	-	DC 18-30V	1000	-	60
PowerBox	4	+	-	-	DC 18-30V	1000		60
RB260GSP	4	+	-	-	DC 18-30V	1000		60
OmniTIK 5 PoE	4	+	-	-	DC 18-30V	1000		60

PoE-Out Configuration

PoE Configuration is supported on all MikroTik devices with PoE-Out interfaces, the configurations can be edited from the RouterOS and SwOS interfaces.

RouterOS

Usage

RouterOS provides an option to configure PoE-Out over Winbox, Webfig, and CLI, basic commands using the CLI are

Property	Description
print ()	Prints PoE-Out related settings.
export ()	export is displayed under `/interface ethernet` menu.
monitor (*string*| *interface*)	Shows poe-out-status of a specified port, or all ports with `/interface ethernet poe monitor [find]` command.

power-cycle (*duration:0..1m* |; Default: **5s**)	Disables PoE-Out power for a specified period of time.

Global Settings

Some MikroTik PoE-Out devices support the global PoE setting which can be configured under `/interface ethernet poe settings` menu. Global setting ether1-poe-in-long-cable feature disables strict input/output current monitoring (short detection) to allow the use of PoE-Out with long ethernet cables and/or avoiding improper short-circuit detection.

Property	Description
ether1-poe-in-long-cable (*yes* | *no*)	Setting it to "yes" will disable short detection on all poe-out ports. This is potentially dangerous settings and should be used with caution

Note: Global setting of ***ether1-poe-in-long-cable*** can also affect PoE-Out behavior on PSE which is powered using a DC connector

Port Settings

PoE-Out can be configured under the menu. Each port can be controlled independently.

Property	Description
name ()	Name of an interface
poe-out (*auto-on* | *forced-on* | *off*; Default: **auto-on**)	Specifies PoE-Out state • auto-on - the board will attempt to detect if power can be applied to the port. For powering there should be resistance in the range from 3kΩ to 26.5kΩ • forced-on - detection range is removed. As a result power over Ethernet will be always on • off - all detection and power is turned off for this port
poe-priority (*integer: 0..99* | *any*; Default: **10**)	poe-priority specifies the importance of PoE-Out ports, in cases when a total PoE-Out limit is reached, interface with the lowest port priority will be powered off first. Highest priority is 0, the lowest priority is 99. If there are 2 or more ports with the same priority then port with the smallest port number will have a higher priority. For example, if ether2 and ether3 have the same priority and over-current is detected then PoE-Out on ether3 will be turned off. Every 6 seconds ports will be checked for a possibility to provide PoE-Out if it was turned off due to port priority.
poe-voltage (*auto* | *low* | *high*; Default: **auto**)	A feature that allows us to manually switch between two voltage outputs on PoE-Out ports. It will take effect only on PSE with switchable voltage modes (CRS112-8P-4S-IN, CRS328-24P-4S+RM, netPower 16P, CRS354-48P-4S+2Q+RM).

Note: If poe-voltage=auto and poe-out is set to "forced-on", LOW voltage will be used by default. If the PD supports only high voltage, make sure you also set poe-voltage=high when forcing the PoE output.

Power-cycle settings

RouterOS provides a possibility to monitor PD using a ping, and power-cycle a PoE-Out port when the host does not respond. power-cycle-ping feature can be enabled under `/interface ethernet poe` menu.

Property	Description
power-cycle-ping-enabled (*yes* | *no*; Default: **no**)	Enables ping watchdog, power-cycles port if a host does not respond to ICMP or MAC-Telnet packets.
power-cycle-ping-address (*IPv4* | *IPv6* | *MAC*; Default:)	An address which will be monitored. Since RouterOS 6.46beta16, an active route towards PD is required in case an IP address is configured, so make sure PSE can reach the PD. In case the MAC address is specified, PSE will send MAC-Telnet ping requests only from a specified ethernet interface. When configuring a bridge vlan-filtering or some way of VLAN switching, it is recommended to use the IP address for monitoring your PD.
power-cycle-ping-timeout (*time:0..1h* |; Default: **5s**)	If the host does not respond for more than <timeout> period of time, then PoE-Out port is switched off for 5s.
power-cycle-interval (*time*| *any*; Default:)	Disables PoE-Out power for 5s between the specified intervals. Not related with the power-cycle-ping feature.

If power-cycle is enabled, `/interface ethernet poe monitor` will show the actual status of the host and time when power cycle will be performed [1]

SwOS

SwOS interface provides basic PoE-Out configuration and monitoring options, see more details in the SwOS PoE user manual.

PoE-Out Monitoring

RouterOS

MikroTik devices with PoE-Out controller (not injector) provides port monitoring option. `/interface ethernet poe monitor [find]`

Property	Description
name ()	Name of an interface
poe-out ()	Shows PoE-Out settings
poe-out-status ()	Shows current PoE-Out status on port • powered-on - Power is applied to the port, and PoE-Out is operating normally, • waiting-for-load - PSE attempts to detect if power can be applied to the port. For powering there should be resistance in the range from 3kΩ to 26.5kΩ; • short-circuit - Short-circuit is detected on PoE-Out port, power is switched off, the only detection with low voltage takes place. • overload - The PoE-Out current limit is exceeded, power is switched off on PoE-Out port. For port limits see each model specifications. • voltage-too-low - PD can not be powered with the voltage provided from PSE. • current-too-low - current-too-low means that PD draws too low current (<10mA) than normal PoE-Out device should, the reason for this can be: The delivered voltage at PD is too low for normal powering (for example Vmin =>30V, but provided 24V); PD uses a second power source which has a higher voltage than PSE, so all current is taken from the second DC source, not PSE PoE-Out port; • off - all detection and power is turned off for this port;
poe-out-voltage ()	Displays PoE Voltage which is applied to the PD.

poe-out-current ()	Displays port current (mA) which is drawn by the PD.
poe-out-power ()	Displays PD power consumption

If `power-cycle-ping` feature is used, `/interface ethernet poe monitor [find]` will show additional fields:

> power-cycle-host-alive: <YES/NO> (Shows if monitored host is reachable)
> power-cycle-after:<TIME> (Shows time, after which the port will be power-cycled)

SNMP

It is possible to monitor PoE-Out values using SNMP protocol, this requires enabled SNMP on PSE. SNMP Wiki

SNMP OID tables:

- 1.3.6.1.4.1.14988.1.1.15.1.1.1 - interface-id
- 1.3.6.1.4.1.14988.1.1.15.1.1.2 - interface names
- 1.3.6.1.4.1.14988.1.1.15.1.1.4 - voltage in dV (decivolt)
- 1.3.6.1.4.1.14988.1.1.15.1.1.5 - current in mA
- 1.3.6.1.4.1.14988.1.1.15.1.1.6 - power usage in dW (deviwatt)

SNMP values can be requested also from the RouterOS, for example, `snmp-walk` will print current mA from all available PoE-Out ports:

> /tool snmp-walk address=10.155.149.252 oid=1.3.6.1.4.1.14988.1.1.15.1.1.5

To get very specific OID value, use `snmp-get` tool (displays current mA on ether3 interface):

> tool snmp-get address=10.155.149.252 oid=1.3.6.1.4.1.14988.1.1.15.1.1.5.3

PoE-Out notifications

PoE-Out LEDs

Models with dependant voltage output

PoE-Out LED behavior can differ between models, but most of them will indicate PoE-Out state on one additional LED. Devices with one voltage output will light:

- Red color LED - PoE-Out port state is **powered-on** (auto or forced-on mode).
- Blinking Red color LED - PoE-Out port state is **short-circuit**

Models with selectable voltage output

Models with multiple voltage options can indicate additional information:

- Green color triangle LED - PoE-Out port state is **powered-on** (auto or forced-on mode), PD uses low voltage.
- Red color triangle LED - PoE-Out port state is **powered-on** (auto or forced-on mode), PD uses high voltage (af/at or passive).
- Blinking Green color triangle LED - PoE-Out port state (low voltage) is **short-circuit** or **overload**
- Blinking Red color triangle LED - PoE-Out port state (high voltage) is **short-circuit** or **overload**

Model-specific LED behavior

- CRS112-8P-4S-IN - All PoE LEDs flashing: wrong voltage PSU plugged into one of the ports.
- netPower 16P - All PoE LEDs flashing: wrong voltage PSU plugged into one of the ports.
- CRS328-24P-4S+RM - indicates an exceeded overall max PoE output limit. Port PoE-Out priorities will work in 3 independent sections (8 ports each) and overload will happen in any section that breaches 150W consumption.

PoE-Out Logs

By default PoE-Out, event logging is enabled and uses "warning" and "info" topics to notify the user about PoE-Out state changes. Log entries will be added to each PoE-Out state change. Important logs will be added with a "warning" topic, informative logs will be added with the "info" topic.

To avoid unnecessary logging in cases when PD is not powered because of current-too-low, RouterOS will filter such events, and add one log per every 512 current-too-low events.

Logs can be disabled if necessary:

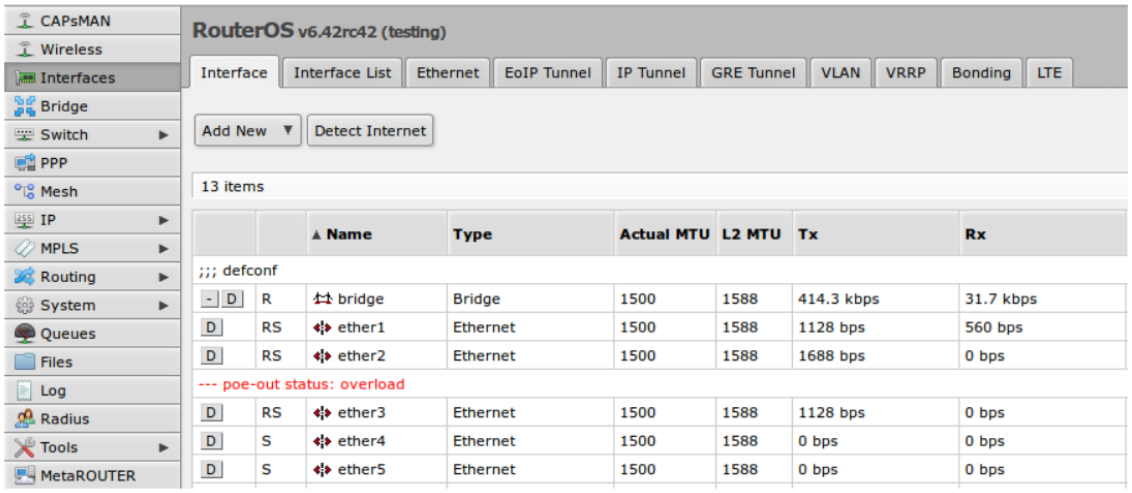
```
/system logging set [find topics~"info"] topics=info,!poe-out
/system logging set [find topics~"warning"] topics=warning,!poe-out
```

PoE-Out Warnings in GUI/CLI

To notify a user about important PoE-Out related problems, messages will be shown in Winbox / WebFig and CLI interface fields:

```
1 RS ;;; poe-out status: overload
ether1 ether 1500 1588 9204 64:D1:54:61:D5:E0
```

WebFig and Winbox will notify user under interfaces:



How it works

PoE-Out Modes

auto-on mode

If auto-on is selected on PoE-Out interface, then port operates in this strict order:

- PSE with low voltage checks for resistance on the connected port. If the detected resistance range is between (3kΩ to 26.5kΩ) power is turned on;
- When power is applied, the PSE continuously checks if the overload limit is not reached or short circuit detected
- If the cable is unplugged, the port returns in detection state and will remain off until suitable PD is detected

forced-on mode

If forced-on is selected then port operates in this strict order:

- PSE disables resistance check on the port, and apply power on pins 4,5 (+) and 7,8 (-), even if no cable is attached
- When power is applied, PSE still continuously checks if an overload or short circuit is not detected
- After the cable is unplugged, the power still remains enabled on the port.

off mode

If off mode is used, PoE-Out on the port will be turned off, no detection will take place, and the interface will behave like a simple Ethernet port.

PoE-Out limitations

It is important to check PoE-Out specification to find out hardware limitations because it can differ between models

PoE-Out port limitation

PoE-Out ports are limited with max amp values which are supported in particular voltage, usually max current will differ for low voltage devices (up to 30 V), and for high voltage devices (31 to 57 V).

PoE-Out total limitation

PSE has also a total PoE-Out current limitation which can't be exceeded, even if the individual port limit allows it.

PoE Out polarity

All MikroTik PSE uses the same PoE-Out pin polarity Mode B4,5 (+) and 7,8 (-), however other vendors can use opposite or Mode A pinout on PD. Reverse polarity would require using a crossover cable but Mode A PD would require Mode B to Mode A converter.

> **Note:** Passive PD with high input inrush current can result in overcurrent protection on PSE, make sure that PD specification supports powering from PSE (not only from the passive power injector)

Safety

PSE has the following safety features:

PoE-Out compatibility detection

The auto-on mode is considered safe, it will check if the resistance on the port is within allowed range and only then enable PoE out on the interface. The range is 3kΩ to 26.5kΩ

Overload protection

When a PoE-Out port is powered-on, it is constantly checked for overload. If the overload is detected, PoE-Out is turned off on the port to avoid damage to the PD or PSE.

In seconds the PoE Out feature will be turned on again to see if the environment has changed and PD can be supplied with power again. That is important for configurations that are not connected to mains (solar installations, equipment running on batteries due to mains failure) so that when voltage drops - overload will be detected and connected devices turned off. After a while when the voltage level returns to usual operating value - connected equipment can be powered up again.

Short circuit detection

When power is enabled on PoE-Out port, PSE continuously checks for a short circuit. If it is detected to ensure that there is no additional damage to PD and PSE, the power is turned off on all ports. PSE will continue to check PoE-Out port until the environment returns to normal.

> **Warning:** Make sure that non-standard incompatible PD which does not have the resistance range 3kΩ to 26.5kΩ are not attached, so the PSE would not try to apply power on them

Model-specific features

PSE with independent 8-port sections (CRS112-8P-4S-IN, CRS328-24P-4S+RM, netPower 16P, CRS354-48P-4S+2Q+RM) allows PoE-Out to work independently from the RouterOS, this means that you can reboot/upgrade your RouterOS and the PD will not be rebooted.

Note: CRS328-24P-4S+, netPower 16P Poe-Out priorities work independently on each 8 port section!

PoE Out examples

RouterOS allows us to define priorities on PoE-Out ports, so if your installation is going overpower budget, the PSE will disable less important PD with the lowest priority.

The priority of *0* is the highest priority, *99* - lowest

Setting up priority

Example of how to set priorities from CLI:

```
/interface ethernet poe set ether2 poe-priority=10
/interface ethernet poe set ether3 poe-priority=13
/interface ethernet poe set ether4 poe-priority=11
/interface ethernet poe set ether5 poe-priority=14
```

What will happen when power budget will go over total PoE-Out limit - first if the overload is detected, ether5 will be turned off (lowest priority), then recheck is done and if the still total limit overload is detected next port in priority will be turned off, in this example, ether3 will be turned off. Both of these ports will be reached every few seconds to check if it is possible to turn PoE-Out on for these ports. Power up will happen in reverse order as the power was cut.

Same priority

if all, or some ports will have the same poe-priority, then port with the lowest port number will have higher priority

```
/interface ethernet poe set ether2 poe-priority=10
/interface ethernet poe set ether3 poe-priority=10
/interface ethernet poe set ether4 poe-priority=10
/interface ethernet poe set ether5 poe-priority=10
```

In this example, if the total PoE-Out limit is reached ether5 will be turned off first, then ether4 then ether3 as all of these ports have same poe priority.

Monitoring PoE-Out

PoE-Out ports can be monitored using a command `/interface ethernet poe monitor <interface>`

```
[admin@MikroTik] > interface ethernet poe monitor [find]
name: ether2 ether3 ether4 ether5
poe-out-voltage: 23.2V 23.2V 23.2V
poe-out-current: 224mA 116mA 64mA
poe-out-power: 5.1W 2.6W 1.4W
```

Power-cycle ping

Monitor connected PD with power-cycle-ping feature:

/interface ethernet poe set ether1 power-cycle-ping-enabled=yes power-cycle-ping-address=192.168.88.10 power-cycle-ping-timeout=30s

In this example, PD attached to ether1 will be continuously monitored using a power-cycle-ping feature, which will send ICMP ping requests and wait for a reply. If PD with IP address 192.168.88.10 will not respond for more than 30s, the PoE-Out port will be switched off for 5s.

Troubleshooting

In cases where a PD does not power-up or reboots unexpectedly when powered from your PSE, it's suggested to the first check:

- **PD supported input voltage** - PSE output voltage must be in the range supported by the PD. Otherwise, the PD is incompatible with the PSE, and will not be able to power-up. Check the PD datasheet.
- **PD supported input PoE-in standard** - Some PDs do not support af/at standard even if it has PoE-in support up to 57 V, check PD datasheet.
- **PD is rebooted from PSE**
  - Check if PD does not exceed PoE-Out port limit and Total-PoE-Out port limit of the PSE, check PSE datasheet.
  - Check if the Voltage limit does not drop bellow supported (Can be caused by voltage drop on the wires).
  - Check if you are using a proper power supply, the output power of PSU should be calculated from:
    ```
    (MAX power consumption of PSE) + (MAX power consumption of all PD) + 10%)
    ```
  - Check if you are using good quality ethernet cables, it's important especially in cases if PoE is used.
- **Check RouterOS version** - it's possible, that some PoE related features will be updated with RouterOS, make sure that you are running the latest RouterOS version.
- **PD Does not power up**
  - There can be cases where a PD does not power up, even though it supports passive PoE, and does not consume more power than the specified PSE port limit. This can be caused by inrush current triggering overcurrent protection on the PSE. Make sure that PD specification supports powering from PSE (not only from passive power injector)
  - Polarity - Devices with opposite or different pinouts can be unable to powerup from all PSE. Check the PD datasheet.
  - Incompatible resistance - PD resistance should have ranged from 3kΩ to 26.5kΩ (For Passive-PoE) and from 23.75kΩ to 26.25kΩ on af /at.

Legacy

PoE-Out Controller upgrade

PoE-Out devices which are running RouterOS 5.x can also hold old PoE-Out controller firmware, upgrade to RouterOS 6.x will automatically update the PoE-Out firmware. Changes between 1.x and 2.x PoE-Out controller firmware will result in higher Max-port limits (0.5A to 1A) in case if it's supported by the hardware, also will provide some additional data which can be monitored, and allow to use PoE-Out priorities.

All MikroTik devices which come with RouterOS 6.x already support the latest PoE-Out firmware.