



ADTRAN Operating System

NetVanta 1531P Power Budgeting

Technology Brief

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To the Holder of this Document

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1. Overview

This document explains Power over Ethernet (PoE) detection and delivery on NetVanta PoE switches, power budgeting for the NetVanta 1531P, and commands available on the NetVanta 1531P to bypass the default detection settings.

This document assumes the reader is familiar with PoE and the IEEE 802.3 standard, specifically the 802.3af and 802.3at (PoE+) amendments. For more information on PoE in AOS switches, refer to the configuration guide *Understanding Power over Ethernet (PoE) and Power Management in AOS*, available online at <https://supportforums.adtran.com>.

2. Detection and Power Delivery in NetVanta Switches

Before providing power to a newly connected Powered Device (PD), such as an IP phone or a wireless access point (AP), NetVanta switches detect the maximum power required by the PD and determine whether that power exceeds the total power available. During device detection, the maximum power required by a PD is determined by the PD Classification. Class 4 PoE+ (802.3at) PDs require 30 W. Classes 0 to 3 PoE (802.3af) PDs require up to 15.4 W. When a new PoE+ PD is discovered, the switch must have 30 W of power available before power will be provided to the PD. For PoE PDs, 15.4 W of power must be available before the switch will power the device.

In addition, NetVanta switches have a PoE guard band, which is a band or range of power that acts as a buffer to prevent a switch from supplying power to a PD unless this minimum amount of power is available. The guard band allows for slight fluctuations in power requirements from the PDs currently connected without oversubscribing the PoE load of the power supply. If the connected PDs cause the total power to enter the guard band, no new devices can be powered until more power becomes available. The PoE guard band on ADTRAN PoE switches is 19 W.

The following requirements must be met for a NetVanta switch to deliver power to a newly connected PD:

- The total power used must be outside the guard band.
- The total power available must be greater than the maximum power required for the PD.

To display the switch's power information, use the **show power inline** command from the Enable mode of the command line interface (CLI):

```
>enable
#show power inline
Total Power: 65.0W
Total Power Used: 43.000W
Total Power Available: 22.00W
Average Total Power Used: 41.500W
For a new device to be powered, there must be at least 19W available power.
To power a Class 4 device, there must be at least 30W available power.
'Limited' status is only valid for PoE+ devices that negotiate power using LLDP.
It is indicated when the requested power of the PD is not met.
```

In this example, the PDs plugged into the device are pulling a total of 43 W, leaving 22 W available. The PoE guard band has not been entered because greater than 19 W are available. If a Class 0 to 3 PD is plugged in, that device will be provided power. However, because the available power is less than 30 W, a Class 4 PD that is plugged in will be denied power, even if it does not require more than the 22 W currently available.

Using the prior example, if the currently connected PD's power requirements increased by 6 W due to a fluctuation, the NetVanta 1531P would enter the PoE guard band, meaning no additional devices could be powered.

If the guard band is entered on a NetVanta switch, an event message similar to the following displays:

```
2014.05.17 03:25:19 POWER_OVER_ETHERNET Total Power Used (49.001W) has entered
the Guard Band (46W)
```

If this fluctuation occurs immediately before a new 802.3af PD requests PoE, the new device will be denied power. When a device is denied power, a corresponding event message is created:

```
2014.05.17 03:25:19 POWER_OVER_ETHERNET.giga-swx 0/1 changed state from
SEARCHING to DENIED
```

3. NetVanta 1531P Power Budgeting Guidelines

The NetVanta 1531P has a PoE budget of 65 W. When budgeting PoE power, determine the amount of power needed for the PDs by summing the maximum power draw of each PD. Ensure that this total is less than 65 W. To fully utilize the 65 W PoE budget, you may need to override the guard band.

To override the default guard band setting, use the **power guard-band** *<value>* command from the Global Configuration mode, where *<value>* specifies a guard band setting between **0** and **30** W. The default value is **19** W. Setting the value to **0** effectively disables the guard band. Remember that a new PD will not be powered if the switch has entered the guard band. In the following example, the guard band is set to **0**:

```
>enable
#configure terminal
(config)#power guard-band 0
```



NOTE

*The **power guard-band** command is available only in AOS firmware version R11.2.0 and later, but the command is hidden and does not provide any help text.*

To set the maximum amount of power that can be allocated to a PD connected to a specific port interface, use the **power inline limit** *<value>* command, where *<value>* is the maximum amount of power available for allocation on that particular port. When you set the limit using this command, the switch will use this value instead of the PD Classification value to determine the amount of power that must be available before delivering power to a newly connected PD. If the total power available is greater than this setting, power will be delivered to the PD. In addition, if the PD ever tries to draw more power than this setting, power to the PD will be shut off. The following example sets the maximum amount of power allocated to a PD on a Gigabit switchport interface to **12**:

```
(config)#interface gigabit-switchport 0/1
(config-giga-swx 0/1)#power inline limit 12
```



NOTE

*The **power inline limit** command is available only in AOS firmware version R11.2.0 and later, but the command is hidden and does not provide any help text.*

The **power guard-band** and the **power inline limit** commands can be used in conjunction to maximize the usage of the NetVanta 1531P's power budget. These commands also can be useful in Bluesocket AP (BSAP) 19xx deployments as described in the following section.

4. Using ADTRAN BSAPs with NetVanta 1531P

All current BSAPs report themselves as Class 4 devices. When these BSAPs connect to a NetVanta switch, the switch must have **30 W** of available power before a new BSAP can be powered. [Table 1](#) shows the maximum PoE power draw for each ADTRAN BSAP series.

Table 1. Maximum PoE Power Drawn

ADTRAN BSAPs	Max PoE Power Used*
1800 Series	10.51 W
1920 Series	11.76 W
1930 Series	11.568 W
1940	22.08 W
2020 Series	15.48 W
2030 Series	11.86 W
2135 Series	17.14 W
3040 Series	23.83 W

*The AP's maximum power shown in [Table 1](#) does not account for line loss.

[Table 2](#) shows the maximum number of each AP type supported today and the maximum PoE power used on the NetVanta 1531P. It also indicates the number of APs that can be powered with default settings on the NetVanta 1531P.

Table 2. Number of BSAPs Supported with NetVanta 1531P Default Settings

ADTRAN BSAPs	Number of APs Supported	Max PoE Power Used
1800 Series	5	52.535 W
1920 Series	4	47.04 W
1930 Series	4	46.272 W
1940	2	44.16 W
2020 Series	3	46.44 W
2030 Series	4	47.44 W
2135 Series	2	34.28 W
3040 Series	1	23.83 W

[Table 3](#) shows the number of APs supported when the new commands are utilized (recommended settings are also shown in the table). The advertised PoE classification of the APs is not relevant for this scenario.

Table 3. Number of APs Supported with Guard Band Disabled

ADTRAN BSAPs	Number of APs Supported	Max PoE Power Used	Recommended Guard Band Setting	Required Per-Port Setting for Connected PDs
1800 Series	6	63.04 W	power guard-band 0	power inline limit 11
1920 Series	5	58.80 W	power guard-band 0	power inline limit 12
1930 Series	5	58.40 W	power guard-band 0	power inline limit 12
1940	2	44.16 W	power guard-band 0	power inline limit 23
2020 Series	4	61.92 W	power guard-band 0	power inline limit 16
2030 Series	5	59.30 W	power guard-band 0	power inline limit 16
2135 Series	3	51.42 W	power guard-band 0	power inline limit 18
3040 Series	2	47.66	power guard-band 0	power inline limit 24



NOTE

If a Bluesocket AP attempts to pull more power than its port is allowed, or than the switch has available (due to more PDs than it can fully power to max), the AP will reboot and a “Power Denied” message will appear in the switch event history.