Sustainability Configuration Guide

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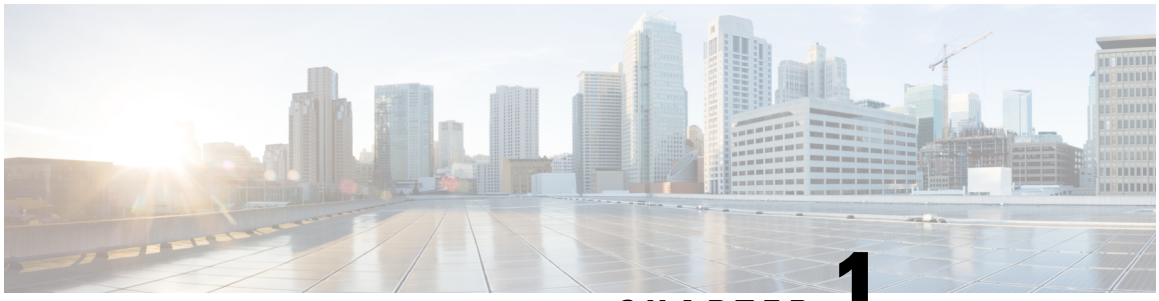

CHAPTER 1

Smart Power

Feature history for Smart Power

This table provides release and platform support information for the features explained in this module.

These features are available in all the releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature name and description	Supported platform
Cisco IOS XE 17.18.1	Smart Power: Smart Power is a power management capability that enables energy-saving operations by managing power consumption of device components and connected devices. It provides interfaces to create an energy management domain for C9350 devices and its connected PoE devices.	Cisco C9350 Series Smart Switches
Cisco IOS XE 17.18.2	Sleep mode: Smart Power level 2 functions as the sleep mode.	Cisco C9350 Series Smart Switches

Introduction to Smart Power

Smart Power is a power management capability that enables energy-saving operations by managing power consumption of device components and connected devices.

- Provides interfaces to create an energy management domain for C9350 devices.
- Manages power consumption of connected PoE devices.

Power saving features

Power saving features are available both on the device and on the PoE interface, each offering specific options for reducing energy consumption.

On the device

- auto-off optics
- auto-off led
- auto-off PSU

On the PoE interface

- power-down
- full power
- sleep

If auto-off features are enabled explicitly using the **enable** command, the configured feature will be enabled with or without any Smart Power level option.

Power levels

Smart Power has a set of defined power levels from 0 to 10 which provides infrastructure to software features to enable or disable at appropriate power saving levels.

Power level 0 on PoE interfaces turns off power. This setting is used for scheduled or manual shutdown of PoE ports.

Default power level

The default power level for device and PoE interfaces is 10 (Full Power).

Supported Smart Power Levels and Their Functions

This topic provides information about the available Smart Power levels and their associated functions on the device and PoE interface.

Table 1: On the device

Smart Power level	Function
1-6, 10	Full Power
7	Power-save auto-off PSU, LED, and optics features enabled
8	Power-save auto-off LED and optics features enabled
9	Power-save auto-off optics feature enabled

Table 2: On the PoE interface

Smart Power level	Function

0	Power down
1, 3-10	Full power
2[1]	Sleep

[1] See Operational Considerations for IP Phone as Endpoint in Sleep Mode for details.

Benefits of Smart Power

Smart Power reduces energy costs, enables scheduled PoE port power control, and simplifies enforcement of energy-saving policies.

- Lowers energy costs by turning off unused hardware automatically.
- Enables scheduled PoE port power control.
- Simplifies enforcement of energy-saving policies.

How to Configure Smart Power

Smart Power is disabled by default. It must be enabled on the device before you configure different power levels on the device and the interfaces.

Enable Smart Power

Procedure

Step 1 **enable**

Example:

```
Device> enable
```

Enables privileged EXEC mode. Enter your password, if prompted.

Step 2 **configure terminal**

Example:

```
Device# configure terminal
```

Enters global configuration mode.

Step 3 **smartpower domain** *domain-name* **security shared-secret** *domain-password* **protocol udp port** *udp-port-number*

Example:

```
Device(config)# smartpower domain cisco security shared-secret cisco123 protocol udp port
43440
```

Enables Smart Power on the network device, assigns it to a domain with the specified domain name, sets the domain security mode, and sets the domain password to authenticate all communication in the domain.

Step 4 **end**

Example:

```
Device(config)# end
```

Exits to privileged EXEC mode.

Configure Power Levels

Configuring power levels involves setting the appropriate transmission power for devices to ensure optimal performance and compliance with regulatory requirements.

Global Configuration

This procedure shows the steps to configure Smart Power level on the device.

Procedure

Step 1 **enable**

Enables privileged EXEC mode. Enter your password, if prompted.

Step 2 **configure terminal**

Enters global configuration mode.

Step 3 **smartpower level** *levels*

Specifies the Smart Power level. The range varies from 1 to 10.

- 1-6,10 - Full Power
- 7 - Power-save auto-off 'PSU, led and optics' features enabled
- 8 - Power-save auto-off 'led and optics' features enabled
- 9 - Power-save auto-off 'optics' feature enabled

Example:

```
Device(config)# smartpower level 1
```

Step 4 **end**

Exits to privileged EXEC mode.

Interface Configuration

This procedure shows the steps to configure Smart Power level on the interface.

Procedure

Step 1 **enable**

Enables privileged EXEC mode. Enter your password, if prompted.

Step 2 **configure terminal**

Enters global configuration mode.

Step 3 **interface** *interface-name*

Enters interface configuration mode for the specified interface.

Step 4 **smartpower level** *levels*

Specifies the Smart Power level. The range varies from 0 to 10.

- 0 - Power Down
- 1,3-10 - Full Power
- 2 - Sleep

Example:

```
Device(config-if)# smartpower level 0
```

Step 5 **end**

Exits to privileged EXEC mode.

Configure Recurrences

Procedure

Step 1 **enable**

Enables privileged EXEC mode. Enter your password, if prompted.

Step 2 **configure terminal**

Enters global configuration mode.

Step 3 **time-range** *time-range-name*

Assigns a name to the time range, and enters the time-range configuration mode. If you do not configure a time range, go to Step 6.

Use the absolute and the periodic time-range configuration commands to specify times and days for a recurrence. You can use one absolute condition and multiple periodic conditions.

Example:

```
Device(config)# time-range T1
```

Step 4 **absolute start** *hh:mm day_of_month month year* **end** *hh:mm day_of_month month year*

Sets the start time and day for the recurrence. If the absolute condition has an end time and day, the domain member ignores these values.

- hh:mm —Specifies the time (24-hour format) in hours and minutes.
- day month year —Specifies the date.
- day_of_month —The range is from 1 to 31.
- month —The range is from January to December.
- year —The minimum year is 1993.

When configuring the absolute time range, the wild card * option is not supported for day_of_month and month.

Example:

```
Device(config-time-range)# absolute start 17:20 10 June 2025 end 17:22 10 June 2025
```

Step 5 **interface** *interface-name*

Enters interface configuration mode for the specified interface.

Step 6 **smartpower level** *level* **recurrence importance** *importance* **at** *minute hour day_of_month month day_of_week* **time-range** *time-range-name*

Schedules a power-on or power-off event.

- **level** *level* —Specifies the power level.
  - To power off a PoE port, enter 0.
  - To power on PoE port, enter 10.
- **importance** *importance* —The event occurs if the importance value of the endpoint is less than or equal to the importance value. The range is from 1 to 100.
- **at** minute hour day_of_month month day_of_week —Specifies the time (24-hour format) in cron format for the recurrence.
  - minute —The range is from 0 to 59. Use * for the wildcard.
  - hour —The range is from 0 to 23. Use * for the wildcard.
  - day_of_month —The range is from 1 to 31. Use * for the wildcard.
  - month —The range is from 1 (January) to 12 (December). Use * for the wildcard.
  - day_of_week —The range is from 0 to 7. 0 and 7 are Sunday. Use * for the wildcard.
- **time-range** time-range-name —Specifies the time range for the recurrence.

Example:

```
Device(config-if)# smartpower level 0 recurrence importance 1 at 30 20 * * 5
```

Specifies that every Friday the port will go down at 20:30.

```
Device(config-if)# smartpower level 10 recurrence importance 1 at 30 08 * * 1
```

Specifies that every Monday the port will be up at 8:30.

```
Device(config-if)# smartpower level 0 recurrence importance 100 time-range T1
```

Step 7 **end**

Exits to privileged EXEC mode.

Operational Considerations for IP Phone as Endpoint in Sleep Mode

When a scheduled recurrence or time-range for Smart Power level 2 expires, the IP phone remains in a deep-sleep state, and its entry is removed. In this state, the IP phone does not automatically return to Full Power (Level 10).

Use one of the following methods to wake the IP phone from sleep state:

Manual Recovery: Perform a **shutdown** followed by a **no shutdown** on the interface connected to the IP phone.

Recommended Configuration Sequence: Follow the sequence of level 2 and level 0 for **time-range** and level 2,0 and 10 for **recurrence at** commands.

Configuration Example Using time-range

```
interface GigabitEthernet3/0/11
smartpower level 2 recurrence importance 100 time-range sleep_time
smartpower level 0 recurrence importance 100 time-range portshut
end
```

Configuration Example Using recurrence at

```
interface GigabitEthernet3/0/11
smartpower level 2 recurrence importance 100 at 10 0 26 9 *   -> sleep
smartpower level 0 recurrence importance 100 at 48 1 26 9 *   -> shut
smartpower level 10 recurrence importance 100 at 49 1 26 9 *  -> no shut
end
```

Verify the Smart Power configuration

Verify the Smart Power status

```
Device#show smartpower
SmartPower is Disabled
```

Verify the Smart Power running version

```
Device#show smartpower
SmartPower is Enabled
```

```
IOS Version:  17.18.20250608:013424101
SmartPower Version:  1.0
Powernet SDK Version:  4.0.1
```

Verify the Smart Power Domain

```
Device#show smartpower domain
Name      : 9350
Domain    : cisco
Protocol  : udp
IP        : 192.168.1.1
Port      : 43440
```

Display the Smart Power Status with Default Level for Switch and PoE Interface as 10 (Full Power)

```
Device#show smartpower
Module/
Interface   Role              Name                  Usage      Category
 Lvl   Imp  Type
---------   ----              ----                  -----      --------
 ---   ---  ----
            C9350-24P         4M-Mix-9350-1         78.0  (W)  consumer
 10    1    parent
            C9350-48TX        4M-Mix-9350-3         155.0 (W)  consumer
 10    1    parent
Subtotals: (Consumer: 233.0 (W), Meter: 0.0 (W),
Total: 233.0 (W), Count: 2


Device#show smartpower children
Module/
Interface   Role              Name                  Usage      Category
 Lvl   Imp  Type
---------   ----              ----                  -----      --------
 ---   ---  ----
Gi1/0/1     WS-C2960CPD-8TT-L SW-Choya8             7.2   (W)  consumer
 10    1    PoE
Gi1/0/3     WS-C3560CX-8PT-S  c3560-Raitt1          20.0  (W)  consumer
 10    1    PoE
Gi1/0/4     interface         Gi1.0.4               9.2   (W)  consumer
 10    1    PoE
Gi1/0/5     interface         Gi1.0.5               9.1   (W)  consumer
 10    1    PoE
Gi1/0/6     interface         Gi1.0.6               5.1   (W)  consumer
 10    1    PoE
```

Displaying Smart Power Status: With Smart Power level as 9 (auto-off optics) on the switch

```
Device#show smartpower

Module/
Interface   Role              Name                  Usage      Category
 Lvl   Imp  Type
---------   ----              ----                  -----      --------
 ---   ---  ----
            C9350-24P         4M-Mix-9350-1         78.0  (W)  consumer
 10    1    parent
            C9350-48TX        4M-Mix-9350-3         155.0 (W)  consumer
 10    1    parent
Subtotals: (Consumer: 233.0 (W), Meter: 0.0 (W),
Total: 233.0 (W), Count: 2


Device(config)#smartpower level 9

*Jun 10 17:03:39.649 GMT: SMRTPWR:INFO:SmartPower level 9 is configured
on switch 3
*Jun 10 17:03:39.649 GMT: SMRTPWR:INFO:SmartPower level 9 is configured
on switch 1

Device(config)#do show smartpower

Module/
Interface   Role              Name                  Usage      Category
 Lvl   Imp  Type
---------   ----              ----                  -----      --------
 ---   ---  ----
            C9350-24P         4M-Mix-9350-1         77.0  (W)  consumer
 9     1    parent
            C9350-48TX        4M-Mix-9350-3         154.0 (W)  consumer
 9     1    parent
Subtotals: (Consumer: 231.0 (W), Meter: 0.0 (W),
Total: 231.0 (W), Count: 2
```

Verify if the auto-off PSU and LED feature is disabled

```
Device(config)#do show hardware led | i LED
LED auto-off: Disabled
LED Hardware State: NORMAL
```

Display Smart Power Status with Smart Power Level 8 on the Switch

```
Device(config)#smartpower level 8

*Jun 10 17:00:47.596 GMT: SMRTPWR:INFO:SmartPower level 8 is configured
```

```
on switch 1
*Jun 10 17:00:47.596 GMT: SMRTPWR:INFO:SmartPower level 8 is configured
on switch 3

Device(config)#do show smartpower

Module/
Interface   Role              Name                  Usage      Category
 Lvl   Imp  Type
---------   ----              ----                  -----      --------
 ---   ---  ----
            C9350-24P         4M-Mix-9350-1         78.0  (W)  consumer
 8     1    parent
            C9350-48TX        4M-Mix-9350-3         157.0 (W)  consumer
 8     1    parent
Subtotals: (Consumer: 235.0 (W), Meter: 0.0 (W),
Total: 235.0 (W), Count: 2
```

Verify if the auto-off PSU feature is disabled

```
Device(config)#do show stack-power detail | i auto-off
Power Supply auto-off: Enable
```

Verify the auto-off LED and optics feature is enabled

```
Device(config)#do show hardware led | i LED
LED auto-off: Enabled
LED Hardware State: OFF
```

Display Smart Power Status with Smart Power Level 7 on the Switch

```
Device(config)#smartpower level 7
*Jun 10 17:03:39.649 GMT: SMRTPWR:INFO:SmartPower level 7 is configured
on switch 3
*Jun 10 17:03:39.649 GMT: SMRTPWR:INFO:SmartPower level 7 is configured
on switch 1

Device(config)#do sh smartpower
Module/
Interface   Role              Name                  Usage      Category
 Lvl   Imp  Type
---------   ----              ----                  -----      --------
 ---   ---  ----
            C9350-24P         4M-Mix-9350-1         77.0  (W)  consumer
 7     1    parent
            C9350-48TX        4M-Mix-9350-3         159.0 (W)  consumer
 7     1    parent
Subtotals: (Consumer: 236.0 (W), Meter: 0.0 (W),
Total: 236.0 (W), Count: 2
```

Verify if the auto-off PSU, LED, and optics feature is enabled

```
Device(config)#do show stack-power detail | i auto-off
Power Supply auto-off: Enable

Device(config)#do show hardware led | i LED

LED auto-off: Enabled
LED Hardware State: OFF
```

Display the running configuration with Smart Power level 0 and 10 using recurrence

```
Device#show running-config interface GigabitEthernet 8/0/1
Building configuration...
Current configuration : 157 bytes
!
interface GigabitEthernet8/0/1
 smartpower level 0 recurrence importance 1 at 30 20 * * 5 >> Every Friday
 @ 20:30 the port will go down
 smartpower level 10 recurrence importance 1 at 30 08 * * 1   >> Every
Monday @ 08:30 the port will be up.
end
```

Below are the logs when interface is going down at level 0:

```
*May  3 20:30:27.140 GMT: %ILPOWER-5-PD_ENTRY_REMOVAL: Interface
GigabitEthernet8/0/1: power device entry
removed, admin_state=OFF oper_state=OFF
*May  3 20:30:28.287 GMT: %LINEPROTO-5-UPDOWN: Line protocol on Interface
 GigabitEthernet8/0/1, changed state to down
*May  3 20:30:29.292 GMT: %LINK-3-UPDOWN: Interface GigabitEthernet8/0/1,
 changed state to down
```

Below are the logs when interface coming up at level 10:

```
May 6 08:30:00.463 GMT: %ILPOWER-5-DETECT: Interface Gi8/0/1: Power Device
 detected: IEEE PD
May 6 08:30:01.469 GMT: %ILPOWER-5-POWER_GRANTED: Interface Gi8/0/1: Power
 granted
May 6 08:30:05.708 GMT: %LINK-3-UPDOWN: Interface GigabitEthernet8/0/1,
changed state to up
May 6 08:30:06.707 GMT: %LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet8/0/1, changed state to up
```

Display the running configuration with Smart Power level 0 and 10 using recurrence and time range

```
Device# show time-range
time-range entry: T1 (inactive)
   absolute start 17:20 10 June 2025 end 17:22 10 June 2025
```

```
   used in: Smartpower

show smartpower recurrences
System level recurrence
Level  Time-range
-----  ----------
Id     Interface  Class Action Lvl Cron/Time-range
--     ---------  ----- ------ --- ---------------
1      Gi1/0/1    QUERY SET     0  minutes: 15 hour: 17 day: 10 month: 6
 weekday: 2
2      Gi1/0/1    QUERY SET     0  T1
3      Gi1/0/1    QUERY SET    10  minutes: 17 hour: 17 day: 10 month: 6
 weekday: 2
Alarms
Endpoint        Id    Interface  Lvl Status
--------        --    ---------  --- ------
```

System Messages with Smart Power level as 0 and 10

System Message Sequences for Smart Power Levels

```
Level 0 was configured at 17:15
*Jun 10 17:15:38.348 GMT: %ILPOWER-6-SET_AVAILABLE_ILPOWER: Available POE
 budget for switch 1 is updated. New available POE budget = 395.5 Watts
*Jun 10 17:15:38.349 GMT: %ILPOWER-5-PD_ENTRY_REMOVAL: Interface
GigabitEthernet1/0/1: power device entry removed, admin_state=OFF
oper_state=OFF
*Jun 10 17:15:39.373 GMT: %LINEPROTO-5-UPDOWN: Line protocol on Interface
 GigabitEthernet1/0/1, changed state to down
*Jun 10 17:15:40.373 GMT: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/1,
 changed state to down

Level 10 was configured at 17:17
*Jun 10 17:17:30.824 GMT: %ILPOWER-5-DETECT: Interface Gi1/0/1: Power
Device detected: IEEE PD
*Jun 10 17:17:30.824 GMT: %ILPOWER-6-SET_AVAILABLE_ILPOWER: Available POE
 budget for switch 1 is updated. New available POE budget = 365.5 Watts
*Jun 10 17:17:31.824 GMT: %ILPOWER-5-POWER_GRANTED: Interface Gi1/0/1:
Power granted

Level 0 was configured with time-range start 17:20 and end 17:22
*Jun 10 17:20:39.586 GMT: %ILPOWER-6-SET_AVAILABLE_ILPOWER: Available POE
 budget for switch 1 is updated. New available POE budget = 395.5 Watts
*Jun 10 17:20:39.588 GMT: %ILPOWER-5-PD_ENTRY_REMOVAL: Interface
GigabitEthernet1/0/1: power device entry removed, admin_state=OFF
oper_state=OFF
*Jun 10 17:23:40.874 GMT: %ILPOWER-5-DETECT: Interface Gi1/0/1: Power
Device detected: IEEE PD
*Jun 10 17:23:40.874 GMT: %ILPOWER-6-SET_AVAILABLE_ILPOWER: Available POE
 budget for switch 1 is updated. New available POE budget = 365.5 Watts
```

```
*Jun 10 17:23:41.876 GMT: %ILPOWER-5-POWER_GRANTED: Interface Gi1/0/1:
Power granted
*Jun 10 17:27:44.723 GMT: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/1,
 changed state to up
*Jun 10 17:27:45.723 GMT: %LINEPROTO-5-UPDOWN: Line protocol on Interface
 GigabitEthernet1/0/1, changed state to up
```