AX Series
Dynamic Power Saving Functionality Configuration Guide

for the Guaranteed Network

Edition 2

Preface

The trend towards green computing has created a need for power saving solutions in routers, switches, and other network equipment. The purpose of this *AX Series Dynamic Power Saving Functionality User's Guide* is to show users how to use the new Dynamic Power Saving Functionality supported in ALAXALA Networks Corporation's AX6700S, AX6600S, and AX1240S model switches. It also provides examples of how to incorporate it as part of an energy saving network system that is friendly to the environment.

Relevant documents

- AX series product manual (http://www.alaxala.com/en/techinfo/manual/index.html)

Notes on using this document

The contents of this document reflect data obtained through basic operation in specific environments. Functionality, performance, and reliability may vary in other operating environments and cannot be guaranteed. Moreover, the data on power consumption and performance was obtained through testing under specific conditions in ALAXALA Networks' labs. Results obtained under different conditions and in other environments may vary. The information herein is intended solely as a guide to assist those looking to build a system incorporating ALAXALA products.

Unless otherwise noted, the information in this document applies to the following OS software versions and earlier:

AX6700S / AX6600S	Ver11.2
AX1240S	Ver2.1

Information in this document is subject to change without notice.

Export restrictions

If you export this guide, you must check and comply with all applicable laws, rules and restrictions of Japan and any other countries, such as Japan's Foreign Exchange and Foreign Trade Law and U.S. export control laws and regulations.

Conventions: The terms "Switch" and "switch"

The term Switch (upper-case "S") is an abbreviation for any or all of the following models:

- AX6700S series switch
- AX6600S series switch
- AX1240S series switch

The term switch (lower-case "s") might refer to a Switch, another type of switch from the current vendor, or a switch from another vendor. The context decides the meaning.

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Relevant switches

- AX6700S/AX6600S (version 11.2)
- AX1240S (version 2.1)
- AX2430S (version 11.1.A)

History of Amendments

Edition	rev.	Date	Changes	Location
First edition	-	5/29/2009	Publication of first edition	-
Second edition	-	31/3/2010	A description of dynamic power saving functionality in a scenario where an AX6700S is used as a core switch has been added.	2.2, 3.1-3.4, 3.8, 4.1, 4.2, 5.1
			Compatible devices: AX6700S/AX6600S (Ver11.2)	Preface
			Table 1.3-1 now shows the degree to which power consumption is reduced by device type.	1.3(1)
			A description of the power savings achieved by the unused port power saving functionality (AX1240S) has been added.	1.3(6)
			Section 2.4: A description of using the scheduling function to switch the dynamic power saving functionality has been added.	2.4
			Table 3.1-1 now shows the degree to which power consumption is reduced by device type.	3.1(3)
			Scheduling for fiscal 2010 (from April 1st 2010 to March 31st 2011) has been added.	3.4, 3.6
			Messages and log entries have been updated for the AX6600S (Ver11.2).	3.7
			The examples of power savings achieved now conform to the NIF configuration in chapter 3.	4
			"Explicitly specify the power control mode when setting scheduled time ranges" has been added to the cautionary notes for AX6700S/AX6600S.	5.1(7)

Contents

1. Green IT by ALAXALA

1.1 ALAXALA's approach to green IT: Finding ways to eliminate "wastefulness"

Energy efficiency has become a key concern for those in the IT industry. Owing to the ever-increasing traffic volumes carried by data networks, the rapid increase in power consumption by equipment such as routers and LAN switches has emerged as a significant issue.

ALAXALA responded quickly to the need for power saving solutions in routers and LAN switches. For example, ALAXALA managed to balance high performance and reduced power consumption by increasing the performance of its processing engine through proprietary device technology and the adoption of an integrated architecture.

ALAXALA also decided to see if anything could be done at the system level. The answer took the form of dynamic power saving functionality, whose novel approach is to reduce power consumption by limiting power during periods where the equipment goes unused. In doing so, ALAXALA's dynamic power saving functionality solves the problem of "wastefulness" on networks.

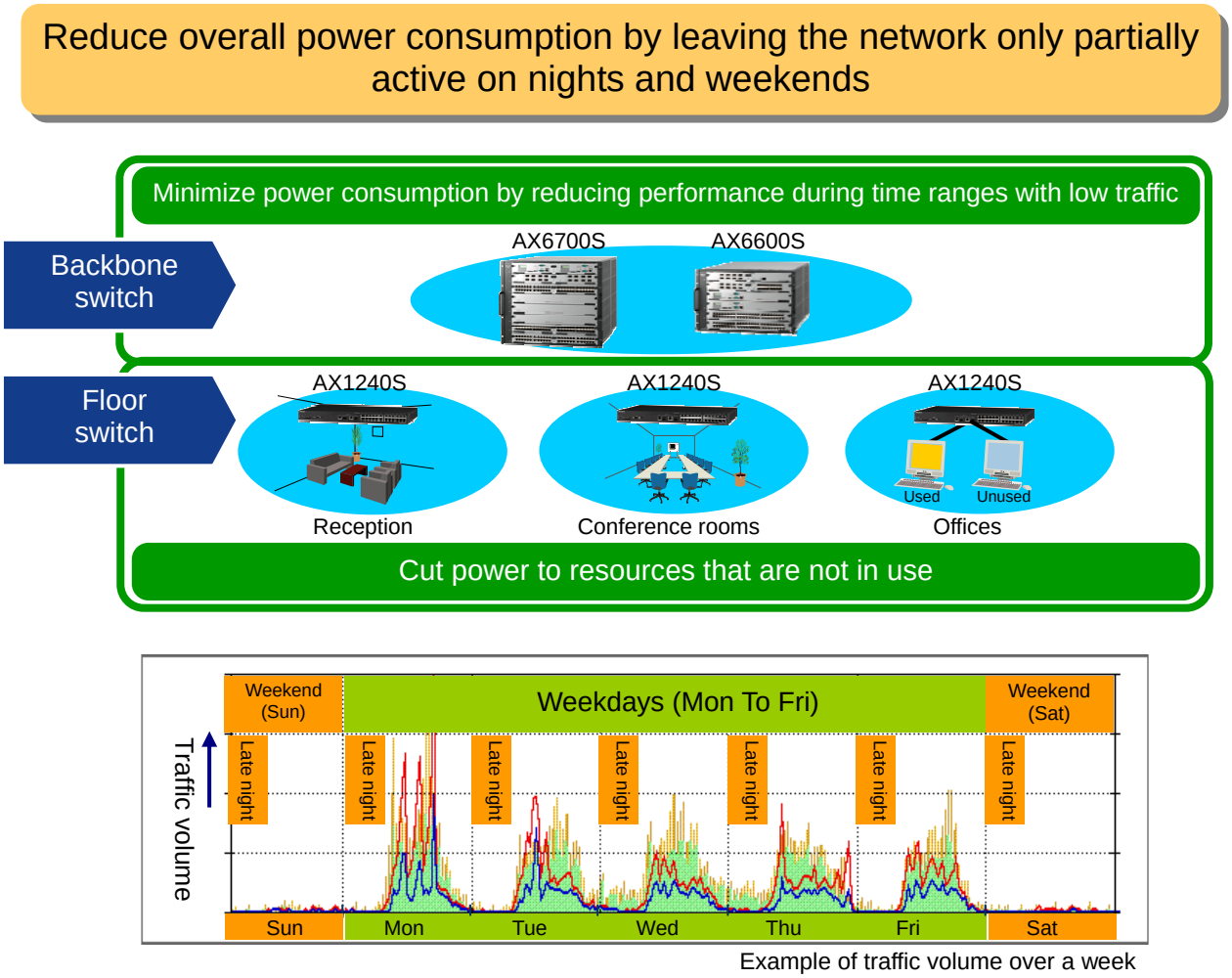


Figure 1.1-1 Concept of dynamic power saving

1.2 Dynamic power saving functionality lets you cut power to unused resources

As a matter of course, standard electrical equipment like lighting and air conditioning is shut off when not in use. In a networking context, although some systems require 24/7 uptime, there are many cases where only partial operability is needed at night and on holidays.

For example, suppose that the hours from 00:00 to 06:00 on weekdays are considered late night hours, and 06:00 to 24:00 is considered daytime. Organizations like universities can have approximately 200 days off each year. Adding this to the late night hours on weekdays gives a time range of 5,790 hours, or approximately 2/3 of the 8,760 hours in a year, in which the network does not need to be operating at full capacity. Organizations that close for two days each week have approximately 130 days off each year, which when added to the late night hours on weekdays, equates to 4,530 hours or almost half a year.

This led ALAXALA to change its way of thinking. The idea that further power savings could be realized by cutting power or enabling power saving mode for resources that are not in use led to the development of ALAXALA's dynamic power saving functionality.

Table 1.2-1 Key dynamic power saving functionality in AX series products

	Location	Models	Functionality	Description
	Backbone switch	AX6700S AX6600S	On-line switchover to power saving mode	Switches between normal power mode and power saving mode without interrupting communication.
Dynamic power saving			Standby switch unit power-off function	Stops supplying power to standby units in a redundant configuration.
			Unused NIF and port power-off function	Stops supplying power to unused NIFs and ports.
			LED off function	Turns off the LEDs at NIF ports.
			Scheduling function	Automatically controls the power saving functionality at specific times on specific dates (or days of the week).
	Floor switch	AX1240S	Sleep function	Puts the device to sleep at specific times on specific dates (or days of the week).
			Unused port power saving function	- Operates link-down ports in power saving mode - Stops supplying power to unused ports
			LED brightness setting function	Changes the brightness of the LEDs to reduce power consumption. (full brightness/dimmed/off)
			Scheduling function	Automatically controls the power saving functionality at specific times on specific dates (or days of the week).

Eliminate wasted energy by supplying power to components that need it, and reducing or cutting power to those that do not

1.3 Dynamic power saving functionality

(1) "On-line switchover to power saving mode" and "Standby switch unit power-off function" (AX6700S/AX6600S)

On-line switchover to power saving mode is a functionality that switches equipment from normal power mode to power saving mode without any interruption to service. Power saving mode offers reduced power consumption, and is indicated by the SYSTEM2 LED. This LED is off in normal power mode, blinks green when transitioning between modes, and is lit green when in power saving mode.

The *standby switch unit power-off function* reduces power consumption by stopping the supply of power to standby units in a redundant switch configuration.

This functionality can be implemented on BSUs (AX6700S) or CSUs (AX6600S) in a redundant configuration.

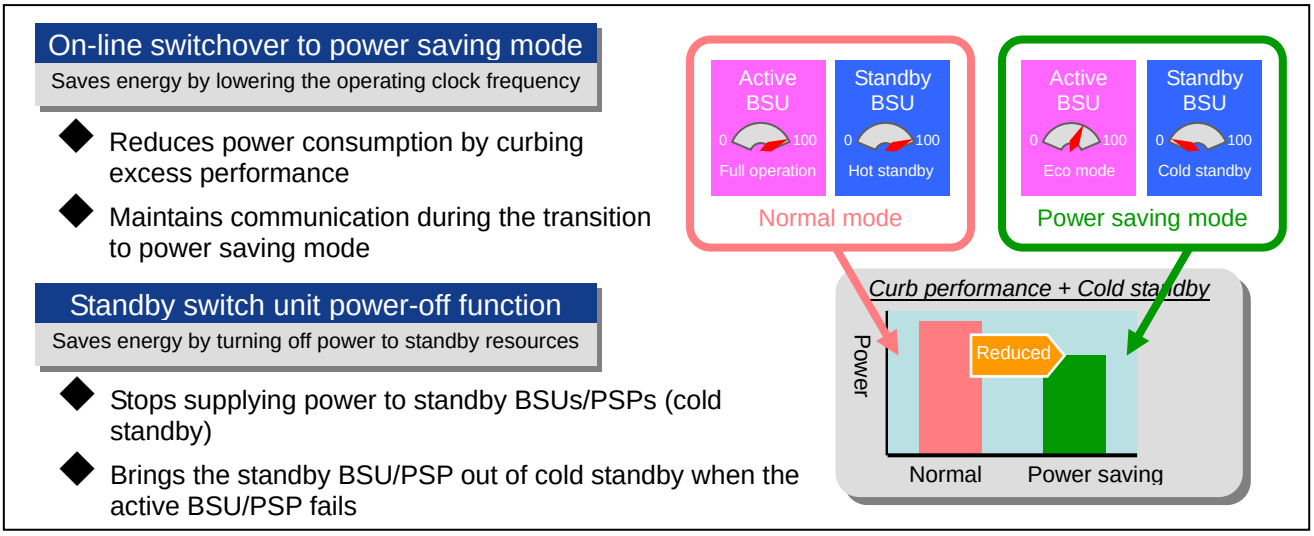


Figure 1.3-1 Power saving mode and standby switch power-off (AX6700S/AX6600S)

On-line switchover to power saving mode and the *standby switch unit power-off function* can be used together. There are two ways of combining these functions, as described in the table below. The table also shows the kind of energy savings that might be achieved by each method.

Table 1.3-1 Combinations of power saving modes in AX6700S/AX6600S and energy savings

Method	On-line switchover to power saving mode	Standby switch unit (BSU/PSP) power-off function	Potential energy savings[#]	Switchover in the event the active BSU/PSP fails
Normal power mode	Not used	Not used	--	Recovers quickly from failures
Method 1	Used	Not used Hot standby	AX6708S: 10 to 20% AX6608S: 5 to 15%	Recovers quickly from failures
Method 2	Used	Used Cold standby	AX6708S: 20 to 50% AX6608S: 10 to 30%	Can take several minutes to restart BSU/PSP

[#] How much energy is conserved depends on the type of device and line, the load conditions, and other factors. This data was obtained through testing under specific conditions in ALAXALA Networks' labs. Results obtained under different conditions may vary. Use this information as a guideline when choosing whether to implement this functionality.

(2) Unused NIF and port power-off function (AX6700S/AX6600S)

The unused NIF and port power-off function can reduce power consumption by stopping the supply of power to unused NIFs and ports.

(3) LED off function (AX6700S/AX6600S)

The LED off function can turn off all the NIF port LEDs.

If you enable this function, you can still check the operating status of the ports by pressing any key on the system operation panel. The LEDs turn off again 60 seconds after the key is pressed.

(4) Scheduling function (AX6700S/AX6600S)

You can control the power saving functionality automatically by using the scheduling function to designate the time ranges in which it operates. Time ranges can be defined by specifying a date or day of the week and a time range.

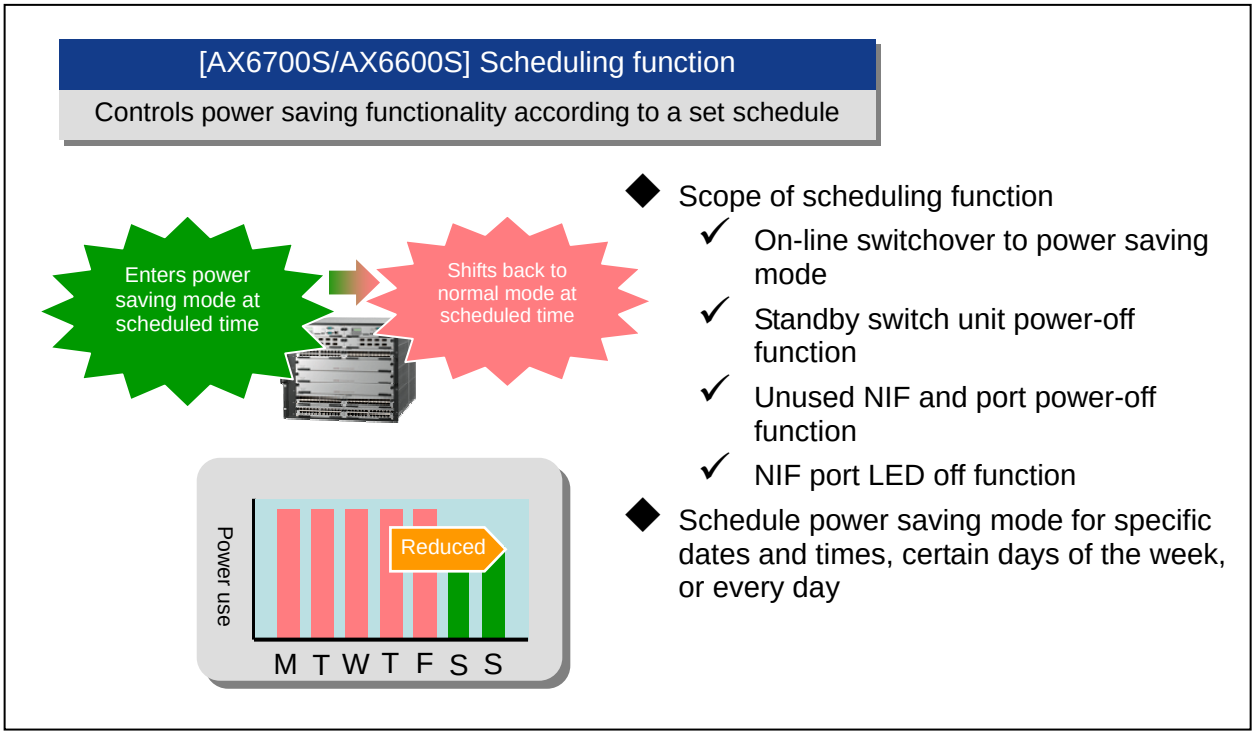


Figure 1.3-2 Scheduling function (AX6700S/AX6600S)

(5) Sleep function (AX1240S)

The sleep function greatly reduces power consumption by putting the device to sleep within scheduled time ranges. When the device is in sleep mode, the PWR LED blinks slowly in green, and all features from switching to remote access are disabled. Upon entering a normal time range, the device wakes from sleep mode and comes back online.

Potential energy savings: Approximately 70% (for AX1240S-24T2C)[#]

[#] How much energy is conserved depends on the type of device and line, the load conditions, and other factors. This data was obtained through testing under specific conditions in ALAXALA Networks' labs. Results obtained under different conditions may vary. Use this information as a guideline when choosing whether to implement this functionality.

(6) Unused port power saving function (AX1240S)

(1) Link-down port power saving operation

This function reduces power consumption by operating link-down ports in power saving mode.
You cannot apply this function to optical ports.

Potential energy savings:

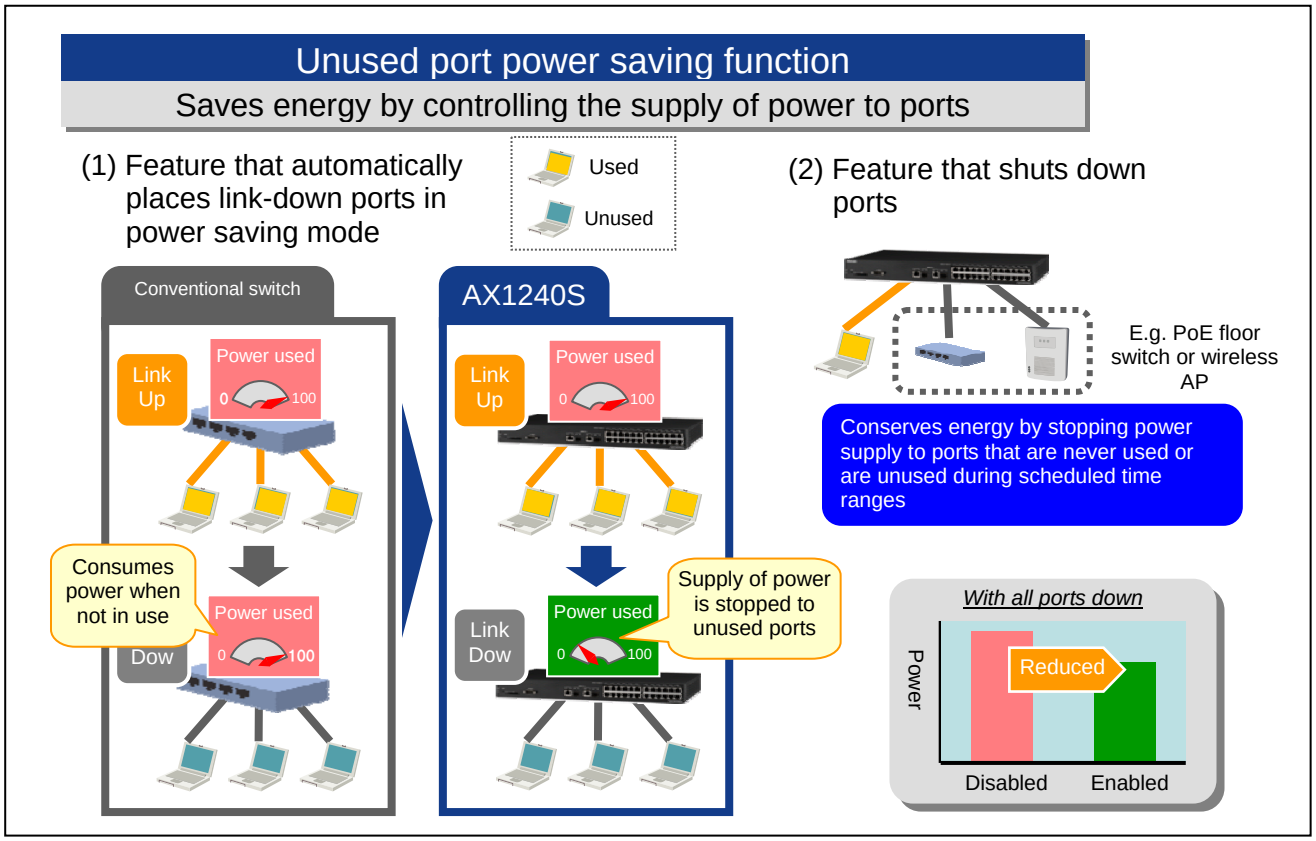
A difference of approximately 13%[#] when this function is enabled in a AX1240S-24T2C model on which all 24 ports are down.

(2) Deactivating ports (settings for port deactivation)

This function reduces power consumption by stopping the supply of power to unused ports.

Potential energy savings:

A difference of approximately 13%[#] when this function is enabled in a AX1240S-24T2C model on which all 24 ports are disconnected.



A "conventional switch" means a switch that does not support the unused port power saving function.

Figure 1.3-3 Unused port power saving function (AX1240S)

[#] How much energy is conserved depends on the type of device and line, the load conditions, and other factors.
This data was obtained through testing under specific conditions in ALAXALA Networks' labs. Results obtained under different conditions may vary. Use this information as a guideline when choosing whether to implement this functionality.

(7) LED brightness setting function (AX1240S)

This function reduces power consumption by changing the LED brightness.

You can configure this function to display the LEDs at normal brightness, dimmed, or not at all. You can also configure the function to automatically switch between the three brightness levels in certain scenarios.

(8) Scheduling function (AX1240S)

The scheduling function simplifies operation by automatically controlling the power saving functionality based on time ranges. You can define time ranges by specifying a date or day of the week and a start and end time.

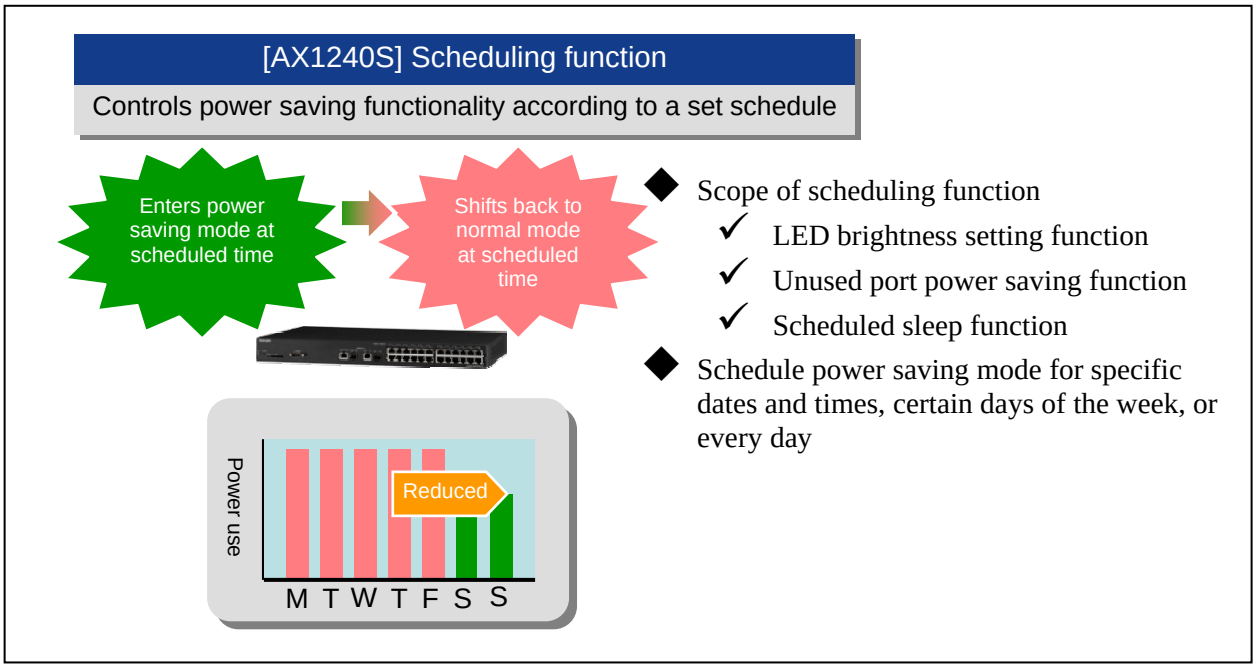


Figure 1.3-4 Scheduling function (AX1240S)

2. Dynamic Power Saving Functionality and the Support Status

This chapter describes which dynamic power saving functionality is supported by each AX series product.

2.1 AX series dynamic power saving functionality and the support status

The following table lists the major dynamic power saving functionality and the support status.

Table 2.1-1 List of major dynamic power saving functionality and the support status

		Model	AX6700S	AX6600S	AX6300S	AX3600S	AX2400S	AX1240S	AX1230S
Dynamic power Saving functionality	Backbone switch	Switchover to the power saving mode online	Y#1	Y#2	N	N	N	--	N
		Standby switch unit power-off function	Y	Y				--	
		Unused NIF and port power-off function	Y	Y				--	
		LED off function	Y	Y				--	
	Floor switch	LED brightness setting function	--	--				Y	
		Unused port power saving function	--	--				Y	
		Sleep function	--	--				Y	
	Common	Scheduling function	Y	Y				Y	

(Legend: Y: Supported, N: Not support the dynamic power saving functionality, --: Not fall under this category
#1: When using two or more BSUs
#2: When using two CSUs

2.2 AX6700S/AX6600S dynamic power saving functionality

Depending on the purpose, you can select the AX6700S series switch or an AX6600S series switch as a backbone switch. The AX6700S series switch can contain up to three BSUs and provides high-switching performance and high-packet processing performance. The AX6600S series switches contain up to two CSUs per switch and are compact.

Table *2.2-1* shows the major dynamic power saving functionality of the AX6700S and AX6600S series switches. By installing two or more BSUs or CSUs to switch power control, the dynamic power saving function, which switches the mode to the power saving mode online, becomes available. In addition to this, the standby switch units (BSUs or a CSU) can be used in hot standby mode, or can be used in cold standby mode by using "the standby switch unit power-off function".

Moreover, "the NIF and port power-off function", which stops supplying power to unused NIFs and ports, and "the LED off function", which turns off the LED of the port, can be used together.

You can configure settings so that the power saving functionality can operate continuously, or can schedule the time range when a switch operates in the power saving mode by using the scheduling function.

Table 2.2-1 Major dynamic power saving functionality of AX6700S/AX6600S series switches

Power saving functionality	Term in manuals	Features
Switchover to the power saving mode online	BSU/PSP power control#1	Performs switchover between normal power mode and power saving mode without restarting the switches. The power consumption is reduced but the transfer performance is decreased in power saving mode#2.
Standby switch unit power-off function (Standby switch units in cold standby)	Standby BSU/PSP power-off#1 (Standby BSU/PSP in cold standby 2)	Further reduces the power consumption. However it takes time to switch systems when an error occurred on an active BSU or PSP.
NIF and port power-off function	NIF and port power OFF	Stops supplying power to unused NIFs and ports to reduce power consumption.
LED off function	NIF port LED OFF	Turns off the LED of the NIF port to reduce power consumption.
Scheduling function	Scheduling	Schedules the time range when the power saving functionality is operated.

#1: For AX6700S: Enabled when two or more BSUs are installed.
For AX6600S: Enabled when two CSUs are installed.
PSP (Packet Switching Processor) is a part of a CSU.
#2: Packet processing performance is reduced to about 50 % (compared with it in normal power mode).
However, this value varies depending on the types and the numbers of installed BSUs, CSUs, and NIFs, the load conditions, and other causes

2.3 AX1240S dynamic power saving functionality

The table *2.3-1* shows the major dynamic functionality of the AX1240S series switches.

The "LED brightness setting" function, which changes the LED brightness, and the "unused port power saving" function can be used together.

In addition, you can specify settings so that the power saving functionality can operate continuously, or can schedule the time range when a switch operates in the power saving mode by using the scheduling function.

You can also specify the time range when a switch is in the sleep status by using both the scheduling function and the sleep function.

Table 2.3-1 Major dynamic power saving functionality of the AX1240S series switches

Power saving functionality	Term in manual		Features
Sleep function	Sleep mode		Brings the switches into sleep status to reduce power consumption.
Unused port power saving function	Port power saving	Link-down port power saving operation	Changes the status to the power saving status by disconnecting the LAN cable and turning off the power of the connection destination.
		Deactivating ports (Settings for deactivate ports)	Stops supplying power to unused pots to reduce power consumption.
LED brightness setting function (normal brightness/lower brightness/off)	LED behavior (normal brightness/power saving brightness/OFF)		Changes the brightness of the LED to reduce power consumption. You can also specify the settings for automatically changing the brightness.
Scheduling function	Scheduling		Schedules the time range when the power saving functionality operates.

2.4 Scheduling function (scheduling the power saving functionality)

AX6700S, AX6600S, and AX1240S series switches can use the scheduling function to execute the scheduled power saving function. The scheduling function allows you to specify a combination of the power saving functionality and up to 50 time periods during which they are to be run. When the specified start time arrives, the power saving functionality automatically starts and changes the Switches to power saving status. When the specified end time arrives, normal time range settings are automatically recovered.

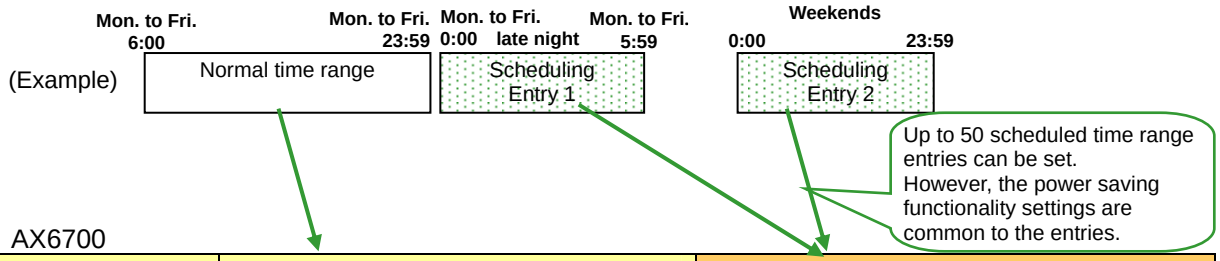
The time periods during which the power saving functionality is enabled are referred to as the *scheduled time range* and the time periods during which the power saving functionality is not enabled are referred to as the *normal time range.*

A combination of the power saving functionality settings shown in Tables *2.4-1* to *2.4-3* must be specified for the scheduled time range and the normal time range, respectively. When the scheduled time range starts, the all of the settings for the scheduled time range are activated, and those for the normal time range are deactivated. When the scheduled time range is reached, the all of the settings are switched to the settings for the normal time range.

A combination of the power saving functionality settings once determined for the scheduled time range is applied to all of the scheduled time range entries. Therefore, it is not possible to specify a different combination of the power saving functionality settings for each entry.

The settings for the normal time range are not automatically inherited by the settings for the scheduled time range, and vice versa. Therefore, you must configure the settings for the scheduled time range and the normal time range respectively with care. If commands are omitted, default commands are executed.

Table 2.4-1 Power saving settings by using the AX6700S scheduling function and command names



AX6700

Settings	Normal time range	Scheduled time range
BSU power control mode	`power-control mode` (default: `normal`: Normal power)	`schedule-power-control mode` (default: `mode2`: BSUs are switched to power saving mode.)
Active BSUs	`redundancy max-bsu` (default: The number of active BSUs is 3.)	`schedule-power-control max-bsu` (default: The number of active BSUs is 1. The other BSUs are for standby)
Standby BSU power supply off	`redundancy standby-bsu` (default: `hot`: The power supply is on.)	schedule-power-control standby-bsu (default: `cold2`: The power supply is off.)
Unused NIF power supply off	`no power enable nif` (default: The power supply is on.)	`schedule-power-control shutdown nif` (default: The power supply is on.)
Unused port power supply off	`shutdown` (default: The power supply is on.)	`schedule-power-control shutdown interface` (default: The power supply is on.)
LED of the NIF port	`system port-led` (default: `enable`: LED is normally lit.)	`schedule-power-control port-led` (default: `disable`: LED is turned off.)

The name of the command to set a scheduled time range entry: `schedule-power-control time-range`
The number of scheduled time range entries : 50

The power saving functionality applies these command settings during scheduled time ranges. A scheduled time range cannot be specified for each function separately.

Table 2.4-2 Power saving settings by using the AX6600S scheduling function and command names

Settings	Normal time range	Scheduled time range
PSP power control mode	`power-control mode` (default: `normal`: Normal power)	`schedule-power-control mode` (default: `mode2`: PSPs are switched to power saving mode.)
Active PSPs	`redundancy max-psp` (default: All PSPs are activated.)	`schedule-power-control max-bsu` (default: The number of active PSPs is 1. The other PSP is for standby)
Standby PSP power supply off	`redundancy standby-psp` (default: `hot`: The power supply is on.)	`schedule-power-control standby-psp` (default: `cold2`: The power supply is off.)
Unused NIF power supply off	`no power enable nif` (default: The power supply is on.)	`schedule-power-control shutdown nif` (default: The power supply is on.)
Unused port power supply off	`Shutdown` (default: The power supply is on.)	`schedule-power-control shutdown interface` (default: The power supply is on.)
LED of the NIF port	`system port-led` (default: `enable`: LED is normally lit.)	`schedule-power-control port-led` (default: `disable`: LED is turned off.)

The name of the command to set a scheduled time range entry: `schedule-power-control time-range`
The number of scheduled time range entries : 50

Table 2.4-3 Power saving settings by using the AX1240S scheduling function and command names

Settings	Normal time range	Scheduled time range
Link-down port power saving operation	`power-control port cool-standby` (default: Normal power)	`schedule-power-control port cool-standby` (default: Normal power)
Deactivating ports	`shutdown` (default: The power supply is on.)	`schedule-power-control shutdown interface` (default: The power supply is on.)
LED behavior	`system port-led` (default: `enable`: LED is normally lit.)	`schedule-power-control port-led` (default: `economy`: The LED brightness is reduced.)

The name of the command to set a scheduled time range entry: `schedule-power-control time-range`
The number of scheduled time range entries : 50

3. Application Example of Power Saving Network System

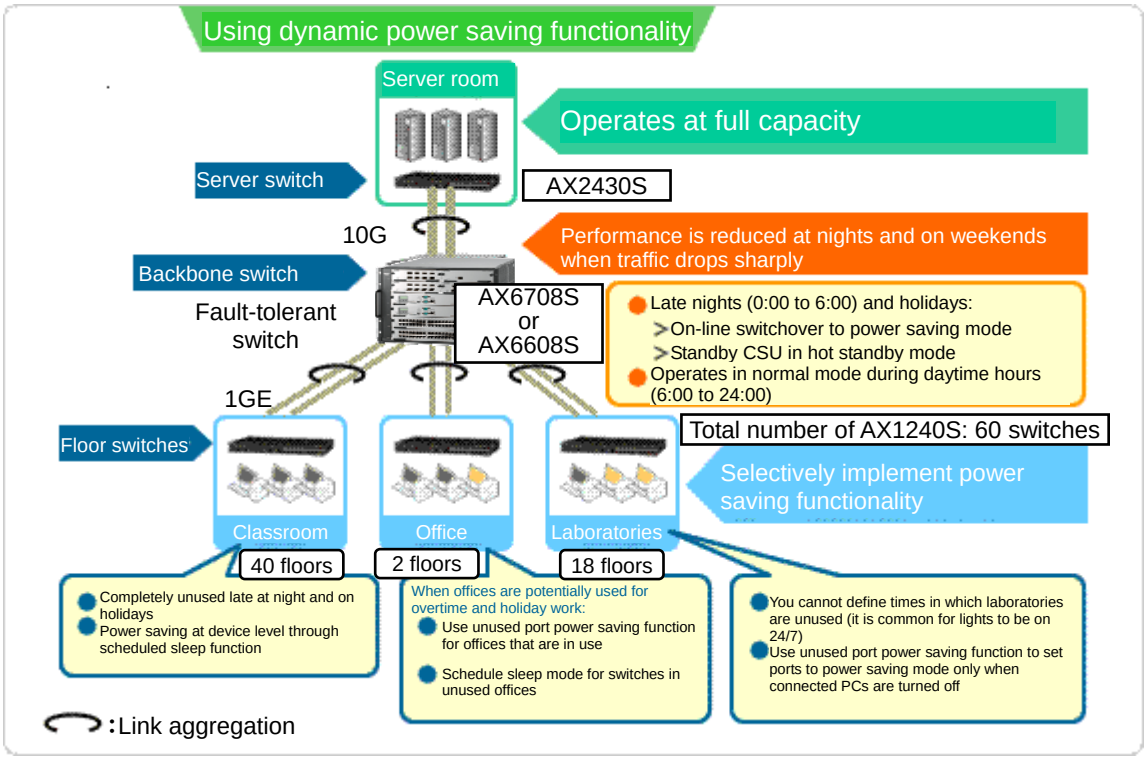
This chapter uses an example of a network system to describe a recommended implementation of dynamic power saving functionality.

3.1 Power saving network system overview

This section explains how to apply the dynamic power saving functionality by using Figure *3.1-1 Example of a system configuration.*

(1) Example of a network system configuration (using a university as an example)

- Server switch in a server room: AX2430S x 1
- Backbone switch: AX6708S fault tolerant switch x 1 or AX6608S fault tolerant switch x 1
  The AX6708S fault tolerant switch has three BSUs in a redundant configuration.
  The AX6608S fault tolerant switch has two CSUs in a redundant configuration.
- Total number of switches installed in 40 classrooms, 2 office rooms, and 18 laboratories: AX1240S x 60 (installing a switch per floor)



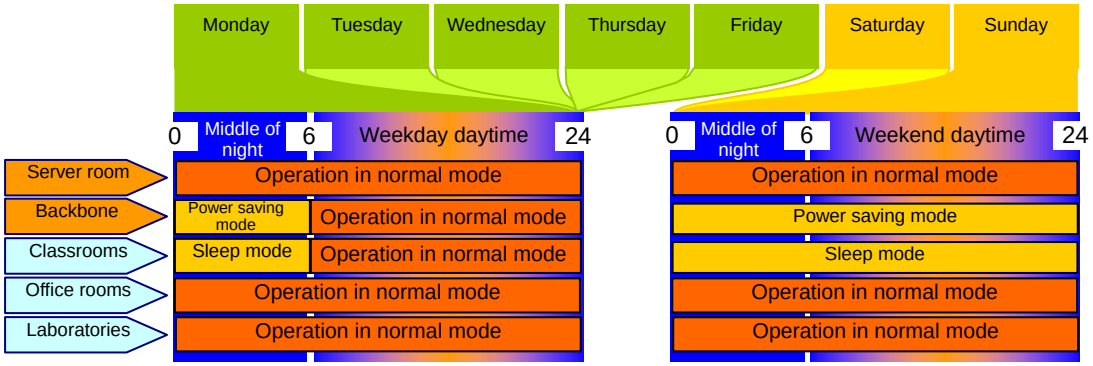


Figure 3.1-1 Using the dynamic power saving functionality

(2) Example of an operation policy for each switch

First, decide on the policy for how the switches will operate, considering the usage of each switch.

- The **AX2430S** server switch **performs full operation** for 24 hours a day because the server switch is used at any time 24 hours a day.
- The backbone AX6708S or AX6608S switch is switched to power saving mode, in which the performance is reduced, during the middle of the night (0:00 to 6:00) and weekends.
  During daytime hours (6:00 to 24:00), the switch operates in **normal mode**.
- On the **AX1240S** individual floor switches, power saving functions are implemented as the situation demands. That is, switches in classrooms enter sleep mode late at night and on holidays, while switches in offices and laboratories are always on.

(3) Using dynamic power saving functionality on the backbone switch (AX6708S/AX6608S)

Dynamic power saving functionality offers a variety of modes and functions. First, we need to decide which combination best suits this example.

Dynamic power saving functionality offered in AX6700S/AX6600S series devices:

- On-line switchover to power saving mode
- Standby switch unit power-off function
- Unused NIF and port power-off function
- NIF port LED off
- Scheduling function

On-line switchover to power saving mode and the *standby switch unit power-off function* can be used together. There are two ways of combining these functions, as described in the following table 3.1-1.

Table 3.1-1 Combinations of power saving modes in the AX6700S/AX6600S series

	On-line switchover to power saving mode	Standby switch unit (BSU/PSP) power-off function	Potential energy savings(*1)	Switchover characteristics and expected switching speeds in the event the active BSU/PSP fails (*1)
Method 1	Used	Not used Hot standby	AX6708S: 10 - 20% AX6608S: 5 - 15%	Recovers quickly from failures 5 milliseconds or less
Method 2	Used	Used Cold standby	AX6708S: 20 - 50% AX6608S: 10 - 30%	Can take several minutes to restart standby BSU/PSP AX6708S: 0.7 to 1.5 minutes (with OSPF disabled) AX6608S: 0.5 to 2 minutes (with OSPF disabled)

(*1) Measured through testing of a specific configuration. Results obtained with different devices and under different conditions may vary.

The example in this chapter will use the more basic method 1 (on-line switchover to power saving mode + hot standby), which reduces power consumption to an extent and performs node switching with minimal effect on operation.

Standard hours	Normal mode	+	Hot standby
	↓↑ Switch		
Nights/holidays	Power saving mode	+	Hot standby

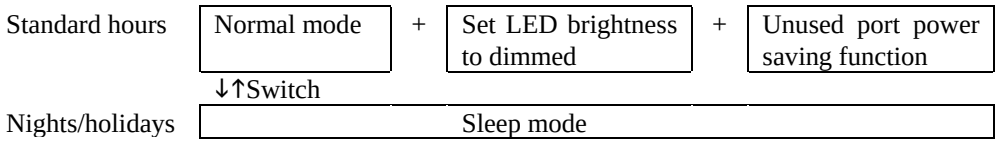
The *unused NIF and port power-off function* will be used to stop the backbone switch from supplying power to NIFs 3 to 6 (which connect to the 40 floors of classrooms) when in power saving mode. The LEDs of these NIF ports will also be turned off.

(4) Using dynamic power saving functionality in floor switches (AX1240S)

Dynamic power saving functionality offered on AX1240S series devices:

- LED brightness setting function (dimmed or off)
- Unused port power saving function (link-down port power saving operation, deactivating ports (port deactivation settings))
- Sleep function
- Scheduling function

For the application example in this chapter, to achieve the greatest possible energy savings, LEDs will be dimmed at all times on floor switches, and the unused port power saving function (link-down port power saving operation and port deactivation) will be implemented. Switches on floors that are not used at night or on holidays will be set to sleep mode during these times.



3.2 Configuration of power saving network system

Figure 3.2-1 (using an AX6708S as the backbone switch) and figure 3.2-2 (using an AX6608S as the backbone switch) show examples of the logical configuration of the example network. In these examples, ports 21 to 24 of each AX1240S device are unused as they are reserved for future use.

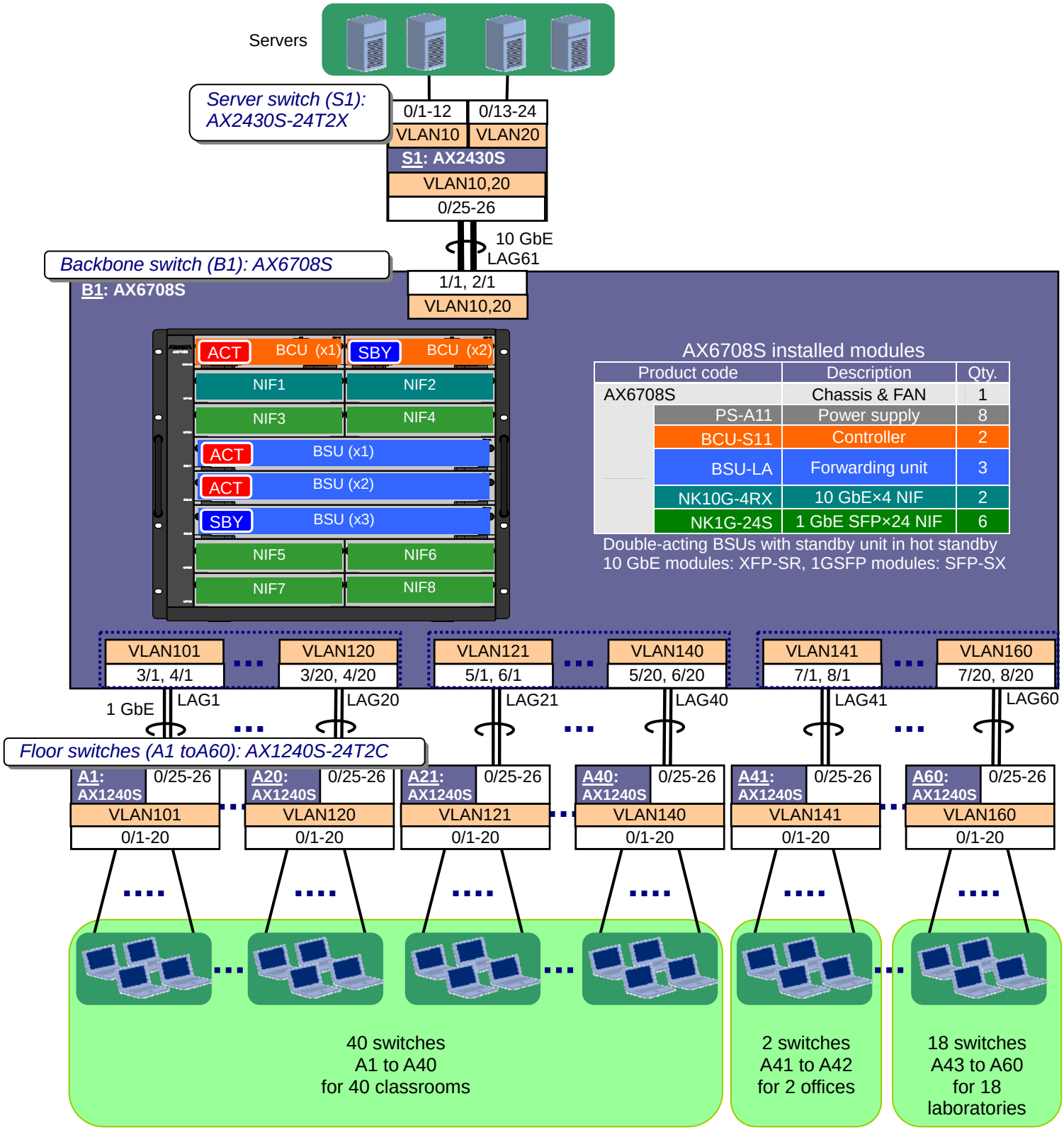


Figure 3.2-1 Logical configuration with an AX6708S as a backbone switch

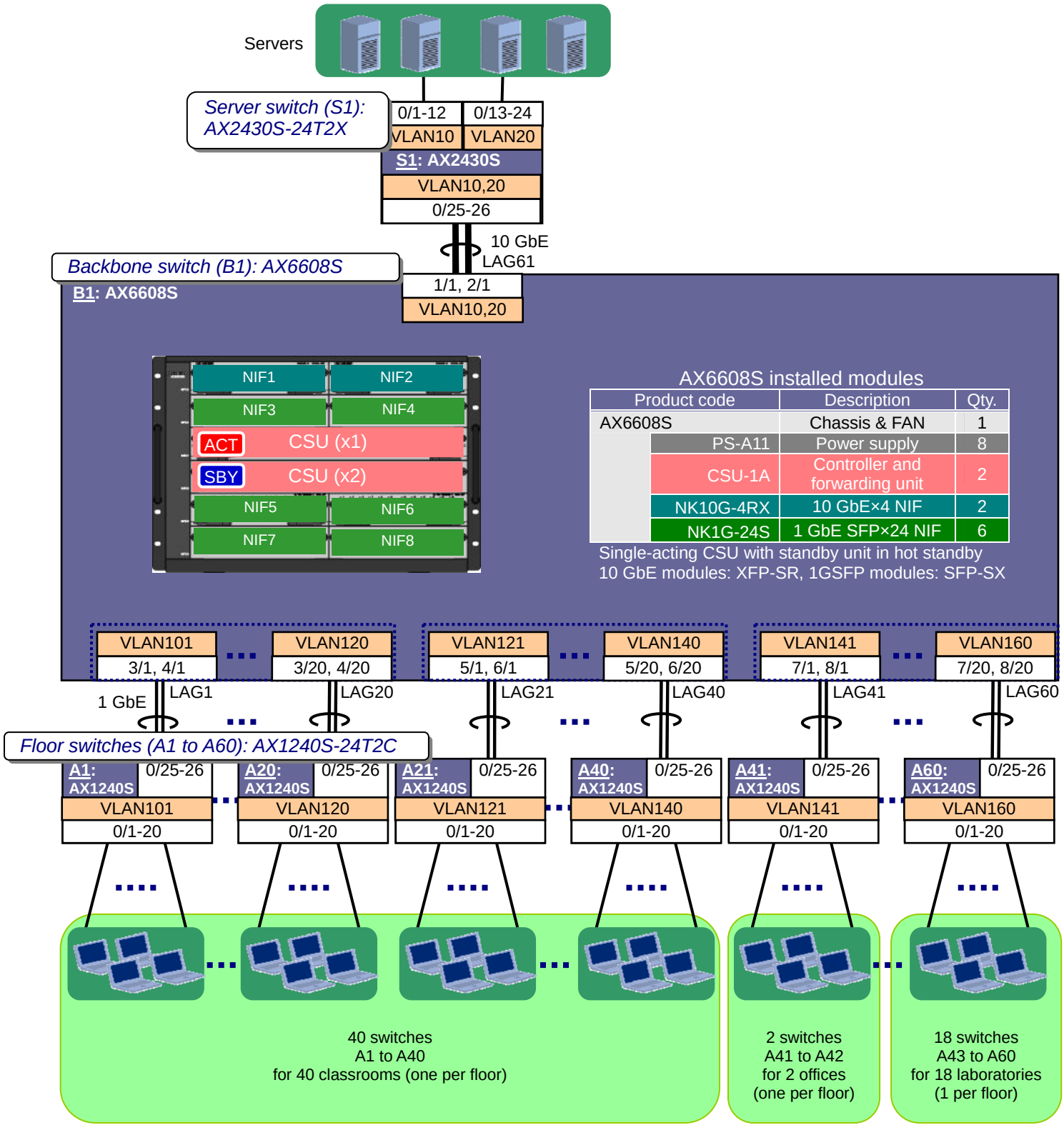


Figure 3.2-2 Logical configuration with an AX6608S as a backbone switch

3.3 Configuring power saving on AX6700S/AX6600S backbone switches

There are seven steps to implementing the dynamic power saving functionality for this example.
A time range such as nights and weekends in which power saving is scheduled is referred to as a *scheduled*

time range. A time range such as daytime on a weekday when power saving is not scheduled is called a *normal time range*.

(1) [Power saving in normal time range] Use the power-off function to reduce power consumption.
(2) Schedule power saving functionality for nights and holidays using the scheduling function.
(3) [Power saving in scheduled time range] Set the power control mode to dynamic power saving mode.
(4) [Power saving in scheduled time range] Set the number of active BSUs/PSPs and the operating mode of the standby BSU/PSP.
(5) [Power saving in scheduled time range] Set the power-off function that applies for both normal and scheduled time ranges.
(6) [Power saving in scheduled time range] Configure the NIF power-off and LED off functions.
(7) Specify scheduled time ranges using a simple approach.

Each step is described in detail below.

(1) [Power saving in normal time range] Use the power-off function to reduce power consumption.

Set the power control mode for normal time ranges to *normal*, specify the number of active BSUs/PSPs, and configure the operating mode of standby BSUs/PSPs. Then, to save power in normal time ranges, configure the switches to stop the supply of power to unused NIFs and ports as needed.

Use the `no power enable` command to designate NIFs as unused, and the `shutdown` command to designate ports as unused.

Because the example in this chapter has no unused NIFs during normal time ranges, only the unused port power saving function will be used.

(2) Schedule power saving functionality for nights and holidays using the scheduling function.

You can save power on the backbone switch by switching it to power saving mode at times like nights and holidays when fewer packets are in transit and performance is not an issue. If you intend to switch between normal and power saving modes on a regular basis, you can use the scheduling function to automate the process.

Scheduling is configured separately from normal time ranges using the following set of commands. The purpose of each command is described in (3) onwards.

schedule-power-control max-bsu : Number of BSUs active during scheduled time ranges [AX6700S]
schedule-power-control max-psp : Number of PSPs active during scheduled time ranges [AX6600S]
schedule-power-control standby-bsu: Operating mode of standby BSU in scheduled time ranges [AX6700S]
schedule-power-control standby-psp: Operating mode of standby PSP in scheduled time ranges [AX6600S]
schedule-power-control port-led : Control of NIF port LEDs in scheduled time ranges
schedule-power-control shutdown : Control power to unused NIFs and ports in scheduled time ranges
schedule-power-control mode : Power control mode used by power saving functionality in scheduled time ranges.
schedule-power-control time-range : Sets dates, times, and other properties that govern when the above features operate.

(3) [Power saving in scheduled time range] Set the power control mode to dynamic power saving mode.

Use the `schedule-power-control mode` command to set the power control mode used by the power saving functionality.

Specify `mode2` to switch dynamically to power saving mode without any downtime.

After specifying the above mode, a message appears prompting you to confirm the power control mode. Enter `y` to apply the setting.

(4) [Power saving in scheduled time range] Set the number of active BSUs/PSPs and operating modes of standby BSU/PSP.

When you use the scheduling function, you can use the `schedule-power-control max-bsu` and

`schedule-power-control max-psp` commands to set the number of active BSUs and PSPs.

You can then use the `schedule-power-control standby-bsu` and `schedule-power-control standby-psp` commands to set the operating mode of the standby BSUs and PSPs. The example in this chapter uses hot standby as its operating mode, so specify `hot`. To use cold standby, specify `cold2`.

(5) [Power saving in scheduled time range] Set the power-off function that applies for both normal and scheduled time ranges

Use the `schedule-power-control shutdown` command to configure the power-off function for the unused NIFs and ports that you want to be retained even after the device transitions from a normal time range to a scheduled time range. If you neglect to do so, unused NIFs and ports lose their `shutdown` attribute and draw power in scheduled time ranges.

The functions and commands are as follows:

- Unused NIF power-off: Set by `schedule-power-control shutdown nif`

  Specify a single NIF by using the `nif` parameter of the `schedule-power-control shutdown` command.

  To specify multiple NIFs, enter the command individually for each NIF.

- Unused port power-off: Set by `schedule-power-control shutdown interface` [{`add` | `remove`}]

  Use the `interface` parameter of the `schedule-power-control shutdown` command to specify ports. You can specify multiple ports in one operation. If the command spans multiple lines, use the `add` parameter for the second and subsequent items. You can disable the function for selected ports by executing the command with the `remove` parameter specified.

(6) [Power saving in scheduled time range] Configure the NIF power-off and LED off functions.

Configure NIF-related power saving functionality that applies only to scheduled time ranges.

The commands that configure scheduled power saving functionality for NIFs are as follows:

- NIF port LED off: Set by `schedule-power-control port-led`
- Unused NIF power off: Set by `schedule-power-control shutdown nif`
- Unused port power off: Set by `schedule-power-control shutdown interface` [{`add` | `remove`}]

(7) Specify scheduled time ranges using a simple approach.

Use `schedule-power-control time-range` commands to specify a maximum of 50 time ranges in which scheduled power saving functionality operates. You can use this command to implement power saving functionality on specific dates, certain days of the week, or every day. Make sure that the start and end times of a time range are separated by at least 30 minutes.

To avoid complexity, we recommend that you take a simple approach to configuring schedules using only `enable` for the `action` parameter, by specifying daily time ranges first, then days of the week, and finally specific dates.

The `disable` option of the `action` parameter can be used to disable a schedule for a specified duration.

If the time range you specify overlaps with an `enable` parameter, `action disable` takes precedence. This also lets you disable power saving mode in a scheduled time range at short notice should the need arise. We recommend you leave the final entry (entry 50) in the `schedule-power-control time-range` command blank for this purpose.

3.4 Example of an AX6700S/AX6600S configured as a backbone switch

In this example, late night hours and holidays (weekends, public holidays, and extended breaks) are defined as shown in table 3.4-1. Described below is an example of a configuration that implements dynamic power saving functionality in AX6700S/AX6600S devices. See *Appendix 1* for an overview of the network configuration.

Table 3.4-1 Example of scheduled time ranges

Scheduling for fiscal 2009 and 2010 (April 1 2009 to March 31 2011)

Item	Description	#	Date and time	
			start-time	end-time
Daily schedule	Late night hours	1	0000	0600
Weekly schedule	Saturday and Sunday	2	sat 0000	mon 0000
2009 public holidays	Public holiday on 4/29/2009	3	090429 0000	090430 0000
	Public holiday from 5/3/2009 to substitute holiday 5/6/2009	4	090503 0000	090507 0000
	Public holiday on 7/20/2009	5	090720 0000	090721 0000
	Public holiday on 9/21/2009 to 9/23/2009	6	090921 0000	090924 0000
	Public holiday on 10/12/2009	7	091012 0000	091013 0000
	Public holiday on 11/3/2009	8	091103 0000	091104 0000
	Substitute holiday on 11/23/2009	9	091123 0000	091124 0000
	Public holiday on 12/23/2009	10	091223 0000	091224 0000
	Public holiday on 1/1/2010	11	100101 0000	100102 0000
	Public holiday on 1/11/2010	12	100111 0000	100112 0000
	Public holiday on 2/11/2010	13	100211 0000	100212 0000
	Substitute holiday on 3/22/2010	14	100322 0000	100323 0000
2009 extended breaks	Summer break (7/24/2009 to 9/13/2009)	15	090724 0000	090914 0000
	Winter break (12/23/2009 to 1/6/2010)	16	091223 0000	100107 0000
	Spring break (4/1/2009 to 4/2/2009)	17	090401 0000	090403 0000
	Spring break (2/11/2010 to 3/31/2010)	18	100211 0000	100401 0000
2010 public holidays	Public holiday on 4/29/2010	19	100429 0000	100430 0000
	Public holiday on 5/3/2010 to 5/5/2010	20	100503 0000	100506 0000
	Public holiday on 7/19/2010	21	100719 0000	100720 0000
	Public holiday on 9/20/2010	22	100920 0000	100921 0000
	Public holiday on 9/23/2010	23	100923 0000	100924 0000
	Public holiday on 10/11/2010	24	101011 0000	101012 0000
	Public holiday on 11/3/2010	25	101103 0000	101104 0000
	Public holiday on 11/23/2010	26	101123 0000	101124 0000
	Public holiday on 12/23/2010	27	101223 0000	101224 0000
	Public holiday on 1/1/2011	28	110101 0000	110102 0000
	Public holiday on 1/11/2011	29	110111 0000	110112 0000
	Public holiday on 2/11/2011	30	110211 0000	110212 0000
	Public holiday on 3/21/2011	31	110321 0000	110322 0000
2010 extended breaks	Summer break (8/1/2010 to 9/20/2010)	32	100801 0000	100921 0000
	Winter break (12/23/2010 to 1/10/2011)	33	101223 0000	110111 0000
	Spring break (4/1/2010 to 4/2/2010)	34	100401 0000	100403 0000
	Spring break (2/11/2011 to 3/31/2011)	35	110211 0000	110401 0000

(1) Device B1 (AX6608S)

Table 3.4-2 shows an example of the configuration of power saving functionality on the AX6700S/AX6608S device serving as a backbone switch (device B1), in normal time ranges (normal power mode) and scheduled time ranges (power saving mode).

Table 3.4-2 Example of an AX6700S/AX6608S power saving functionality configuration

Item	Status in normal time ranges (normal power mode)	Status in scheduled time ranges (power saving mode)
Number of active BSUs/PSPs	BSU=2, PSP=1	BSU=2, PSP=1
Number of standby BSUs/PSPs	1	1
BSU/PSP power control mode	Normal power	BSU/PSP power saving
Power supply to standby BSU/PSP	ON (hot standby)	ON (hot standby)
Power supply to NIFs and ports	All NIFs are ON Ports 2 to 4 of NIFs 1 to 2 are OFF Ports 21 to 24 of NIFs 3 to 8 are OFF	NIF3 to NIF6 are OFF Ports 2 to 4 of NIFs 1 to 2 are OFF Ports 21 to 24 of NIFs 3 to 8 are OFF
NIF port LEDs	Lit	Off

B1 (AX6708S/AX6608S) configuration	
[Configuration of power saving functionality in normal time ranges]	
Set the power control mode to normal	
`(config)# power-control mode normal`	Sets the power control mode to *normal* for normal time ranges.
Set the number of active BSUs/PSPs	
`(config)# redundancy max-bsu 2`	[AX6708S] Sets the number of active BSUs in normal time ranges to 2.
`(config)# redundancy max-psp 1`	[AX6608S] Sets the number of active PSPs in normal time ranges to 1.
Set the operating mode of standby BSUs/PSPs	
`(config)# redundancy standby-bsu hot`	[AX6708S] Sets the operating mode of standby BSUs in normal time ranges to *hot standby*.
`(config)# redundancy standby-psp hot`	[AX6608S] Sets the operating mode of standby PSPs in normal time ranges to *hot standby*.
Configure power saving operation for unused ports	

`(config)# interface range tengigabitethernet 1/2-4, tengigabitethernet 2/2-4`
`(config-if-range)# shutdown`
`(config-if-range)# top`
`(config)# interface range gigabitethernet 3/21-24, gigabitethernet 4/21-24, gigabitethernet 5/21-24, gigabitethernet 6/21-24, gigabitethernet 7/21-24, gigabitethernet 8/21-24`
`(config-if-range)# shutdown`
`(config-if-range)# top`
	Stops the supply of power to unused ports.
	Ports 2 to 4 of NIFs 1 and 2
	
	Ports 21 to 24 of NIFs 3 and 8
	Important points on constructing a system **3.3(1)**

B1 (AX6708S/AX6608S) configuration	
[Configuration of power saving functionality in scheduled time ranges]	
Set the power control mode to dynamic power saving for BSUs/PSPs in scheduled time ranges	

`(config)# schedule-power-control mode mode2`
`BSU and NIF might be restarted automatically when the mode is changed.`
`Do you wish to change mode (y/n): y`
	[AX6708S] Sets the power control mode of BSUs to dynamic power saving mode (mode2).
	A confirmation message appears. Enter y to confirm the change.
	Important points on constructing a system **3.3(3)**

`(config)# schedule-power-control mode mode2`
`PSP and NIF might be restarted automatically when the mode is changed.`
`Do you wish to change mode (y/n): y`
	[AX6608S] Sets the power control mode of PSPs to dynamic power saving mode (mode2).
	A confirmation message appears. Enter y to confirm the change.
	Important points on constructing a system **3.3(3)**

Set the number of active BSUs/PSPs in scheduled time ranges	
`(config)# schedule-power-control max-bsu 2`	[AX6708S] Sets the number of active BSUs in scheduled time ranges to 2. *Important points on constructing a system* 3.3(4)
`(config)# schedule-power-control max-psp 1`	[AX6608S] Sets the number of active PSPs in scheduled time ranges to 1. *Important points on constructing a system* 3.3(4)
Set the operating mode of standby BSUs/PSPs in scheduled time ranges	
`(config)# schedule-power-control standby-bsu hot`	[AX6708S] Specifies hot standby as the operating mode for standby BSUs in scheduled time ranges. *Important points on constructing a system* 3.3(4)
`(config)# schedule-power-control standby-psp hot`	[AX6608S] Specifies hot standby as the operating mode for standby PSPs in scheduled time ranges. *Important points on constructing a system* 3.3(4)
Set power saving operation for unused ports in scheduled time ranges (to be carried over from normal time ranges)	
`(config)# schedule-power-control shutdown interface gigabitethernet 3/21-24, gigabitethernet 4/21-24, gigabitethernet 5/21-24, gigabitethernet 6/21-24, gigabitethernet 7/21-24, gigabitethernet 8/21-24, tengigabitethernet 1/2-4, tengigabitethernet 2/2-4`	Stops the supply of power to unused ports. Ports 21 to 24 of NIFs 3 to 8, ports 2 to 4 of NIFs 1 and 2 *Important points on constructing a system* 3.3(5)
Configure NIF port LEDs to turn off in scheduled time ranges	
`(config)# schedule-power-control port-led disable`	Disables the LEDs for NIF ports. *Important points on constructing a system* 3.3(6)
Configure unused NIF power off function in scheduled time ranges	

`(config)# schedule-power-control shutdown nif 3`
`(config)# schedule-power-control shutdown nif 4`
`(config)# schedule-power-control shutdown nif 5`
`(config)# schedule-power-control shutdown nif 6`
	Stops the supply of power to NIF 3.
	Stops the supply of power to NIF 4.
	Stops the supply of power to NIF 5.
	Stops the supply of power to NIF 6.
	Important points on constructing a system 3.3(6)

Configure the scheduled time ranges	
`(config)# schedule-power-control time-range 1 everyday start-time 0000 end-time 0600 action enable`	Configures power saving functionality to operate every day from 0:00 to 6:00.
`(config)# schedule-power-control time-range 2 weekly start-time sat 0000 end-time mon 0000 action enable`	Configures power saving functionality to run all day on weekends (0:00 on Saturday to 0:00 on Monday).
`(config)# schedule-power-control time-range 3 date start-time 090429 0000 end-time 090430 0000 action enable`	Configures power saving functionality to operate on the public holiday 4/29/2009.
`(config)# schedule-power-control time-range 4 date start-time 090503 0000 end-time 090507 0000 action enable`	Configures power saving functionality to operate from public holiday 5/3/2009 until the substitute holiday 5/6.
`(config)# schedule-power-control time-range 5 date start-time 090720 0000 end-time 090721 0000 action enable`	Configures power saving functionality to operate on the public holiday 7/20/2009.
`(config)# schedule-power-control time-range 6 date start-time 090921 0000 end-time 090924 0000 action enable`	Configures power saving functionality to operate on the public holiday from 9/21/2009 to 9/23/2009.
`(config)# schedule-power-control time-range 7 date start-time 091012 0000 end-time 091013 0000 action enable`	Configures power saving functionality to operate on the public holiday 10/12/2009.
`(config)# schedule-power-control time-range 8 date start-time 091103 0000 end-time 091104 0000 action enable`	Configures power saving functionality to operate on the public holiday 11/3/2009.

B1 (AX6708S/AX6608S) configuration	
(config)# schedule-power-control time-range 9 date start-time 091123 0000 end-time 091124 0000 action enable	Configures power saving functionality to operate on the substitute holiday 11/23/2009.
(config)# schedule-power-control time-range 10 date start-time 091223 0000 end-time 091224 0000 action enable	Configures power saving functionality to operate on the public holiday 12/23/2009.
(config)# schedule-power-control time-range 11 date start-time 100101 0000 end-time 100102 0000 action enable	Configures power saving functionality to operate on the public holiday 1/1/2010.
(config)# schedule-power-control time-range 12 date start-time 100111 0000 end-time 100112 0000 action enable	Configures power saving functionality to operate on the public holiday 1/11/2010.
(config)# schedule-power-control time-range 13 date start-time 100211 0000 end-time 100212 0000 action enable	Configures power saving functionality to operate on the public holiday 2/11/2010.
(config)# schedule-power-control time-range 14 date start-time 100322 0000 end-time 100323 0000 action enable	Configures power saving functionality to operate on the substitute holiday 3/22/2010.
(config)# schedule-power-control time-range 15 date start-time 090724 0000 end-time 090914 0000 action enable	Configures power saving to operate over summer break: (Example: 7/24/2009 to 9/13/2009)
(config)# schedule-power-control time-range 16 date start-time 091223 0000 end-time 100107 0000 action enable	Configures power saving to operate over winter break: (Example: 12/23/2009 to 1/6/2010)
(config)# schedule-power-control time-range 17 date start-time 090401 0000 end-time 090403 0000 action enable	Configures power saving to operate over spring break: (Example: 4/1/2009 to 4/2/2009)
(config)# schedule-power-control time-range 18 date start-time 100211 0000 end-time 100401 0000 action enable	(Example: 2/11/2010 to 3/31/2010)
(config)# schedule-power-control time-range 19 date start-time 100429 0000 end-time 100430 0000 action enable	Configures power saving functionality to operate on the public holiday 4/29/2010.
(config)# schedule-power-control time-range 20 date start-time 100503 0000 end-time 100506 0000 action enable	Configures power saving functionality to operate on the public holiday from 5/3/2010 to 5/5/2010.
(config)# schedule-power-control time-range 21 date start-time 100719 0000 end-time 100720 0000 action enable	Configures power saving functionality to operate on the public holiday 7/19/2010.
(config)# schedule-power-control time-range 22 date start-time 100920 0000 end-time 100921 0000 action enable	Configures power saving functionality to operate on the public holiday 9/20/2010.
(config)# schedule-power-control time-range 23 date start-time 100923 0000 end-time 100924 0000 action enable	Configures power saving functionality to operate on the public holiday 9/23/2010.
(config)# schedule-power-control time-range 24 date start-time 101011 0000 end-time 101012 0000 action enable	Configures power saving functionality to operate on the public holiday 10/11/2010.
(config)# schedule-power-control time-range 25 date start-time 101103 0000 end-time 101104 0000 action enable	Configures power saving functionality to operate on the public holiday 11/3/2010.
(config)# schedule-power-control time-range 26 date start-time 101123 0000 end-time 101124 0000 action enable	Configures power saving functionality to operate on the public holiday 11/23/2010.
(config)# schedule-power-control time-range 27 date start-time 101223 0000 end-time 101224 0000 action enable	Configures power saving functionality to operate on the public holiday 12/23/2010.
(config)# schedule-power-control time-range 28 date start-time 110101 0000 end-time 110102 0000 action enable	Configures power saving functionality to operate on the public holiday 1/1/2011.
(config)# schedule-power-control time-range 29 date start-time 110111 0000 end-time 110112 0000 action enable	Configures power saving functionality to operate on the public holiday 1/11/2011.
(config)# schedule-power-control time-range 30 date start-time 110211 0000 end-time 110212 0000 action enable	Configures power saving functionality to operate on the public holiday 2/11/2011.
(config)# schedule-power-control time-range 31 date start-time 110321 0000 end-time 110322 0000 action enable	Configures power saving functionality to operate on the public holiday 3/21/2011.
(config)# schedule-power-control time-range 32 date start-time 100801 0000 end-time 100921 0000 action enable	Configures power saving to operate over summer break: (Example: 8/1/2010 to 9/20/2010)
(config)# schedule-power-control time-range 33 date start-time 101223 0000 end-time 110111 0000 action enable	Configures power saving to operate over winter break: (Example: 12/23/2010 to 1/10/2011)
(config)# schedule-power-control time-range 34 date start-time 100401 0000 end-time 100403 0000 action enable	Configures power saving to operate over spring break: (Example: 4/1/2010 to 4/2/2010)
(config)# schedule-power-control time-range 35 date start-time 110211 0000 end-time 110401 0000 action enable	(Example: 2/11/2011 to 3/31/2011) *Important points on constructing a system* 3.3(7)
(config)# save (config)# end #	Saves the configuration. Exits configuration mode.

3.5 Configuring power saving on AX1240S floor switches

There are seven steps to implementing the dynamic power saving functionality for this application example.

(1) [Power saving in normal time range] Use power saving functionality to reduce power consumption.
(2) Schedule power saving functionality for nights and holidays using the scheduling function.
(3) [Power saving in scheduled time range] Set the power-off function that applies for both normal and scheduled time ranges.
(4) [Power saving in scheduled time range] Set port-related power saving functionality
(5) [Power saving in scheduled time range] Configure the sleep function for the device.
(6) Specify scheduled time ranges using a simple approach.
(7) Save the configuration as the startup configuration before the device enters sleep mode.

Each step is described in detail below.

(1) [Power saving in normal time range] Use power saving functionality to reduce power consumption.

To save power, set the LED brightness setting function, unused port power saving function (link-down port power saving operation and port deactivation) as needed.

The power saving functionality and associated commands are as follows:
- LED brightness setting function: Set by the `system port-led` command.
- Link-down port power saving operation: Set by the `power-control port cool-standby` command.
  Ports with this function configured will take slightly longer (3 to 5 seconds) to re-establish the link.
- Deactivating ports (port deactivation settings): Set by `shutdown` command.

(2) Schedule power saving functionality for nights and holidays using the scheduling function.

You can save power by using scheduling to implement power saving functionality on the AX1240S in time ranges when there are no users on the premises, like nights and weekends. If you intend to switch between normal and power saving modes on a regular basis, you can use the scheduling function to automate the process. You can also significantly reduce power consumption by putting the device to sleep on a scheduled basis.

Scheduling is configured separately from normal time ranges using the following set of commands. The purpose of each command is described in (3) onwards.

`schedule-power-control port-led` : Controls port LED brightness in scheduled time ranges
`schedule-power-control shutdown interface` : Controls power to unused ports in scheduled time ranges
`schedule-power-control system-sleep` : Puts the device to sleep in scheduled time ranges
`schedule-power-control time-range` : Sets dates, times, and other properties that govern when power saving functionality operates.

(3) [Power saving in scheduled time range] Set the power-off function that applies for both normal and scheduled time ranges.

Configure the LED brightness setting function and unused port power saving function (link-down port power saving operation and port deactivation) that you want to be retained when the device transitions from a normal time range to a scheduled time range.

If you choose not to use the sleep function and neglect to schedule the unused port power saving function, unused ports will draw power during scheduled time ranges.

The functions and commands are as follows:

- LED brightness setting function: Set by `schedule-power-control port-led`
- Link-down port power saving operation: Set by `schedule-power-control port cool-standby`
- Deactivating ports (port deactivation settings): Set by `schedule-power-control shutdown interface [{add | remove}]`

Use the `interface` parameter of the `schedule-power-control shutdown` command to specify ports. You can specify multiple ports in one operation. If the command spans multiple lines, use the `add` parameter for the second and subsequent items. You can disable the function for selected ports by executing the command with the `remove` parameter specified.

If you combine these functions with the sleep function, the LEDs will be off and ports will be deactivated when the device is asleep regardless of how these functions are configured.

(4) [Power saving in scheduled time range] Set port-related power saving functionality.

Configure power saving functionality for additional ports in scheduled time ranges.

The following shows the power saving functionality you can set for ports and the associated commands.

- LED brightness setting function : Set by `schedule-power-control port-led`
- Link-down port power saving operation: Set by `schedule-power-control port cool-standby`
- Deactivating ports (port deactivation settings): Set by `schedule-power-control shutdown interface [{add | remove}]`

(5) [Power saving in scheduled time range] Configure the sleep function on the device.

Use the `schedule-power-control system-sleep` command to configure the sleep function for devices that go unused during scheduled time ranges.

(6) Specify scheduled time ranges using a simple approach.

Use `schedule-power-control time-range` commands to specify a maximum of 50 time ranges in which scheduled power saving functionality operates. You can use this command to implement power saving functionality on specific dates, certain days of the week, or every day. Make sure that the start and end times of a time range are separated by at least 30 minutes.

To avoid complexity, we recommend that you take a simple approach to configuring schedules using only `enable` for the `action` parameter, by specifying daily time ranges first, followed by days of the week and then specific dates.

The `disable` option of the `action` parameter can be used to disable a schedule for a specified duration.

If the time range you specify overlaps with an `enable` parameter, `action disable` takes precedence.

(7) Save the startup configuration before the device enters sleep mode.

When the device goes to sleep, all communication stops and the console is disabled. Any unsaved configuration changes are lost. The device uses the startup configuration when exiting sleep mode, so make sure that you have saved the configuration before the device enters sleep mode.

3.6 Example of AX1240S devices configured as floor switches

In this example, late night hours and holidays (weekends, public holidays, and extended breaks) are defined in the same manner as Table 3.4-1. Described below is an example of a configuration that implements dynamic power saving functionality in AX1240S devices. See *Appendix 1* for an overview of the network configuration.

(1) Devices A1 to A40 (AX1240S)

On the AX1240S floor switches, set LED switches to dimmed and configure power saving functionality for link-down ports and for unused ports 21 to 24.

Schedule the power saving functionality on the AX1240S devices A1 to A40 as shown in *Table 3.6-1*.

Table 3.6-1 Example of scheduling for AX1240S devices A1 to A40

Item		Status in normal time ranges	Status in scheduled time ranges
LED operation		Dimmed	Off
Port power saving	For link-down ports	All ports	All ports
	For unused ports	Ports 21 to 24	Ports 21 to 24
Device sleep		Normal operation	Sleep mode

A1 to A40 (AX1240S) configuration	
[Configuration of power saving functionality in normal time ranges]	
Set LED brightness to dimmed	
`(config)# system port-led economy`	Dims lit and blinking LEDs. *Important points on constructing a system* 3.5(1)
Configure power saving functionality for link-down ports	
`(config)# power-control port cool-standby`	Configures link-down ports to operate in power saving mode. *Important points on constructing a system* 3.5(1)
Configure power saving functionality for unused ports (port deactivation settings)	

`(config)# interface range fastethernet 0/21-24`
`(config-if-range)# shutdown`
`(config)# top`
	Stops the supply of power to unused ports 21 to 24.
	Important points on constructing a system 3.5(1)

[Configuration of power saving functionality in scheduled time ranges]	
Configure power saving functionality for link-down ports (to be carried over from normal time ranges)	
`(config)# schedule-power-control port cool-standby`	Configures link-down ports to operate in power saving mode. *Important points on constructing a system* 3.5(2), 3.5(3)
Configure power saving functionality for unused ports (to be carried over from normal time ranges)	
`(config)# schedule-power-control shutdown interface 0/21-24`	Stops the supply of power to unused ports 21 to 24. *Important points on constructing a system* 3.5(3)
Set LED brightness to off	
`(config)# schedule-power-control port-led disable`	Turns active LEDs off. *Important points on constructing a system* 3.5(4)
Enable the sleep function on the device	
`(config)# schedule-power-control system-sleep`	Sets the device to sleep mode. *Important points on constructing a system* 3.5(5)

A1 to A40 (AX1240S) configuration	
Configure the scheduled time ranges	
(config)# schedule-power-control time-range 1 everyday start-time 0000 end-time 0600 action enable	Configures power saving functionality to operate every day from 0:00 to 6:00.
(config)# schedule-power-control time-range 2 weekly start-time sat 0000 end-time mon 0000 action enable	Configures power saving functionality to run all day on weekends (0:00 on Saturday to 0:00 on Monday).
(config)# schedule-power-control time-range 3 date start-time 090429 0000 end-time 090430 0000 action enable	Configures power saving functionality to operate on the public holiday 4/29/2009.
(config)# schedule-power-control time-range 4 date start-time 090503 0000 end-time 090507 0000 action enable	Configures power saving functionality to operate from public holiday 5/3/2009 until the substitute holiday 5/6/2009.
(config)# schedule-power-control time-range 5 date start-time 090720 0000 end-time 090721 0000 action enable	Configures power saving functionality to operate on the public holiday 7/20/2009.
(config)# schedule-power-control time-range 6 date start-time 090921 0000 end-time 090924 0000 action enable	Configures power saving functionality to operate on the public holiday from the 9/21/2009 to 9/23/2009.
(config)# schedule-power-control time-range 7 date start-time 091012 0000 end-time 091013 0000 action enable	Configures power saving functionality to operate on the public holiday 10/12/2009.
(config)# schedule-power-control time-range 8 date start-time 091103 0000 end-time 091104 0000 action enable	Configures power saving functionality to operate on the public holiday 11/3/2009
(config)# schedule-power-control time-range 9 date start-time 091123 0000 end-time 091124 0000 action enable	Configures power saving functionality to operate on the substitute holiday 11/23/2009.
(config)# schedule-power-control time-range 10 date start-time 091223 0000 end-time 091224 0000 action enable	Configures power saving functionality to operate on the public holiday 12/23/2009.
(config)# schedule-power-control time-range 11 date start-time 100101 0000 end-time 100102 0000 action enable	Configures power saving functionality to operate on the public holiday 1/1/2010.
(config)# schedule-power-control time-range 12 date start-time 100111 0000 end-time 100112 0000 action enable	Configures power saving functionality to operate on the public holiday 1/11/2010.
(config)# schedule-power-control time-range 13 date start-time 100211 0000 end-time 100212 0000 action enable	Configures power saving functionality to operate on the public holiday 2/11/2010.
(config)# schedule-power-control time-range 14 date start-time 100322 0000 end-time 100323 0000 action enable	Configures power saving functionality to operate on the substitute holiday 3/22/2010.
(config)# schedule-power-control time-range 15 date start-time 090724 0000 end-time 090914 0000 action enable	Configures power saving to operate over summer break: (Example: 7/24/2009 to 9/13/2009)
(config)# schedule-power-control time-range 16 date start-time 091223 0000 end-time 100107 0000 action enable	Configures power saving to operate over winter break: (Example: 12/23/2009 to 1/6/2010)
(config)# schedule-power-control time-range 17 date start-time 090401 0000 end-time 090403 0000 action enable (config)# schedule-power-control time-range 18 date start-time 100211 0000 end-time 100401 0000 action enable	Configures power saving to operate over spring break: (Example: 4/1/2009 to 4/2/2009) (Example: 2/11/2010 to 3/31/2010)
(config)# schedule-power-control time-range 19 date start-time 100429 0000 end-time 100430 0000 action enable	Configures power saving functionality to operate on the public holiday 4/29/2010.
(config)# schedule-power-control time-range 20 date start-time 100503 0000 end-time 100506 0000 action enable	Configures power saving functionality to operate on the public holiday from 5/3/2010 to 5/5/2010.
(config)# schedule-power-control time-range 21 date start-time 100719 0000 end-time 100720 0000 action enable	Configures power saving functionality to operate on the public holiday 7/19/2010.
(config)# schedule-power-control time-range 22 date start-time 100920 0000 end-time 100921 0000 action enable	Configures power saving functionality to operate on the public holiday 9/20/2010.
(config)# schedule-power-control time-range 23 date start-time 100923 0000 end-time 100924 0000 action enable	Configures power saving functionality to operate on the public holiday 9/23/2010.
(config)# schedule-power-control time-range 24 date start-time 101011 0000 end-time 101012 0000 action enable	Configures power saving functionality to operate on the public holiday 10/11/2010.
(config)# schedule-power-control time-range 25 date start-time 101103 0000 end-time 101104 0000 action enable	Configures power saving functionality to operate on the public holiday 11/3/2010.
(config)# schedule-power-control time-range 26 date start-time 101123 0000 end-time 101124 0000 action enable	Configures power saving functionality to operate on the public holiday 11/23/2010.
(config)# schedule-power-control time-range 27 date start-time 101223 0000 end-time 101224 0000 action enable	Configures power saving functionality to operate on the public holiday 12/23/2010.
(config)# schedule-power-control time-range 28 date start-time 110101 0000 end-time 110102 0000 action enable	Configures power saving functionality to operate on the public holiday 1/1/2011.
(config)# schedule-power-control time-range 29 date start-time 110111 0000 end-time 110112 0000 action enable	Configures power saving functionality to operate on the public holiday 1/11/2011.
(config)# schedule-power-control time-range 30 date start-time 110211 0000 end-time 110212 0000 action enable	Configures power saving functionality to operate on the public holiday 2/11/2011.
(config)# schedule-power-control time-range 31 date	Configures power saving functionality to operate on the

A1 to A40 (AX1240S) configuration	

`start-time 110321 0000 end-time 110322 0000 action enable`
 	
`(config)# schedule-power-control time-range 32 date start-time 100801 0000 end-time 100921 0000 action enable`
 	
`(config)# schedule-power-control time-range 33 date start-time 101223 0000 end-time 110111 0000 action enable`
 	
`(config)# schedule-power-control time-range 34 date start-time 100401 0000 end-time 100403 0000 action enable`
`(config)# schedule-power-control time-range 35 date start-time 110211 0000 end-time 110401 0000 action enable`
 	
`(config)# save`
`(config)# end`
`#`
	public holiday 3/21/2011.
	
	Configures power saving to operate over summer break:
	(Example: 8/1/2010 to 9/20/2010)
	
	Configures power saving to operate over winter break:
	(Example: 12/23/2010 to 1/10/2011)
	
	Configures power saving to operate over spring break:
	(Example: 4/1/2010 to 4/2/2010)
	(Example: 2/11/2011 to 3/31/2011)
	
	Important points on constructing a system 3.5(6)
	
	After configuring sleep mode for scheduled time ranges, if you exit configuration mode without saving the configuration, the message shown on the left appears. To save the configuration, enter `n`, execute the `save` command, and then exit configuration mode.
	Important points on constructing a system 3.5(7)

(2) Devices A41 to A60 (AX1240S)

On AX1240S devices A41 to A60, configure power saving functionality for normal time ranges as described in *Table 3.6-2*.

You do not need to configure scheduling as there are no scheduled time ranges for these devices.

Table 3.6-2 Example of scheduling for AX1240S devices A41 to A60

Item		Status in normal time ranges
LED operation		Dimmed
Port power saving	For link-down ports	All ports
	For unused ports	Ports 21 to 24

A41 to A60 (AX1240S) configuration	
[Configuration of power saving functionality in normal time ranges]	
Set LED brightness to dimmed	
`(config)# system port-led economy`	Dims lit and blinking LEDs. *Important points on constructing a system* 3.5(1)
Configure power saving functionality for link-down ports	
`(config)# power-control port cool-standby`	Configures link-down ports to operate in power saving mode. *Important points on constructing a system* 3.5(1)
Configure power saving functionality for unused ports (port deactivation settings)	

`(config)# interface range fastethernet 0/21-24`
`(config-if-range)# shutdown`
`(config)# top`
 	
`(config)# save`
`(config)# end`
`#`
	Stops the supply of power to unused ports 21 to 24.
	Important points on constructing a system 3.5(1)
	
	Saves the configuration.
	Exits configuration mode.

3.7 Checking settings and description of messages and log entries

The descriptions that follow assume the use of an AX6600S device as the backbone switch (log entries are for OS Ver.11.2 on AX6600S).

3.7.1 Checking settings for normal time ranges on an AX6600S backbone switch

(1) Use the show system command to check the number of active PSPs, the operating mode of standby PSPs, and the normal power mode

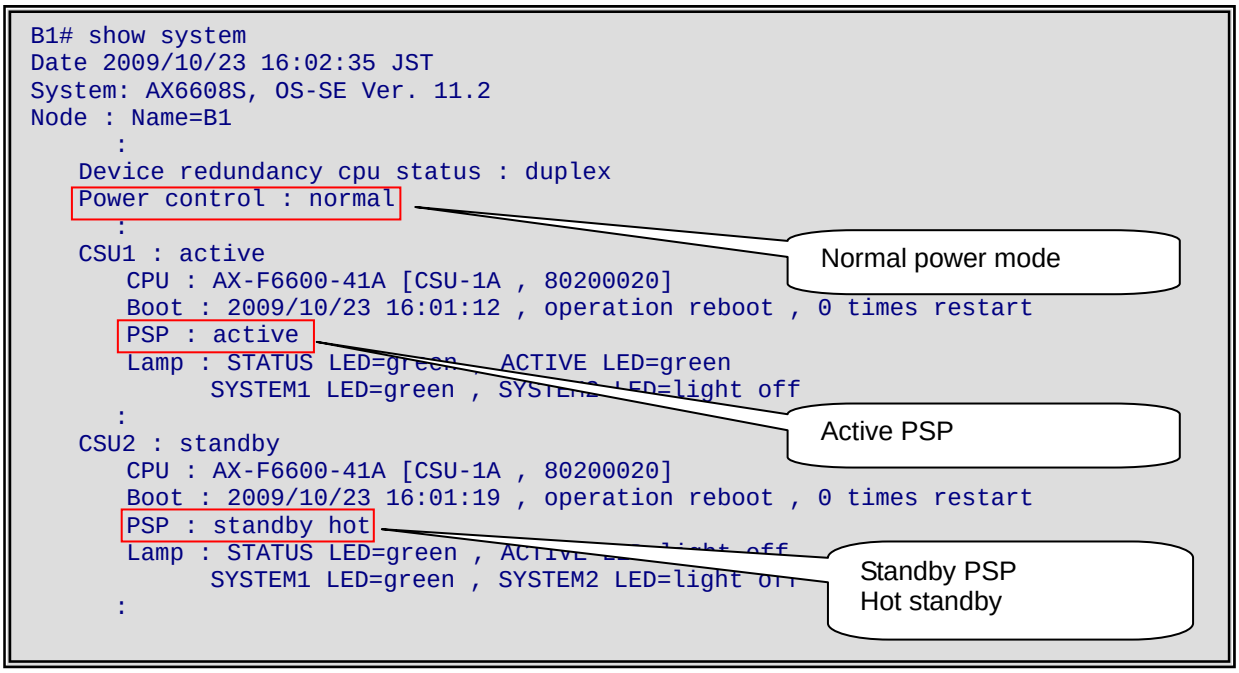


Figure 3.7-1 Example of checking active PSPs, standby PSP operation, and normal power mode from within a normal time range

(2) Use the show port command to check the status of power saving operation for unused ports

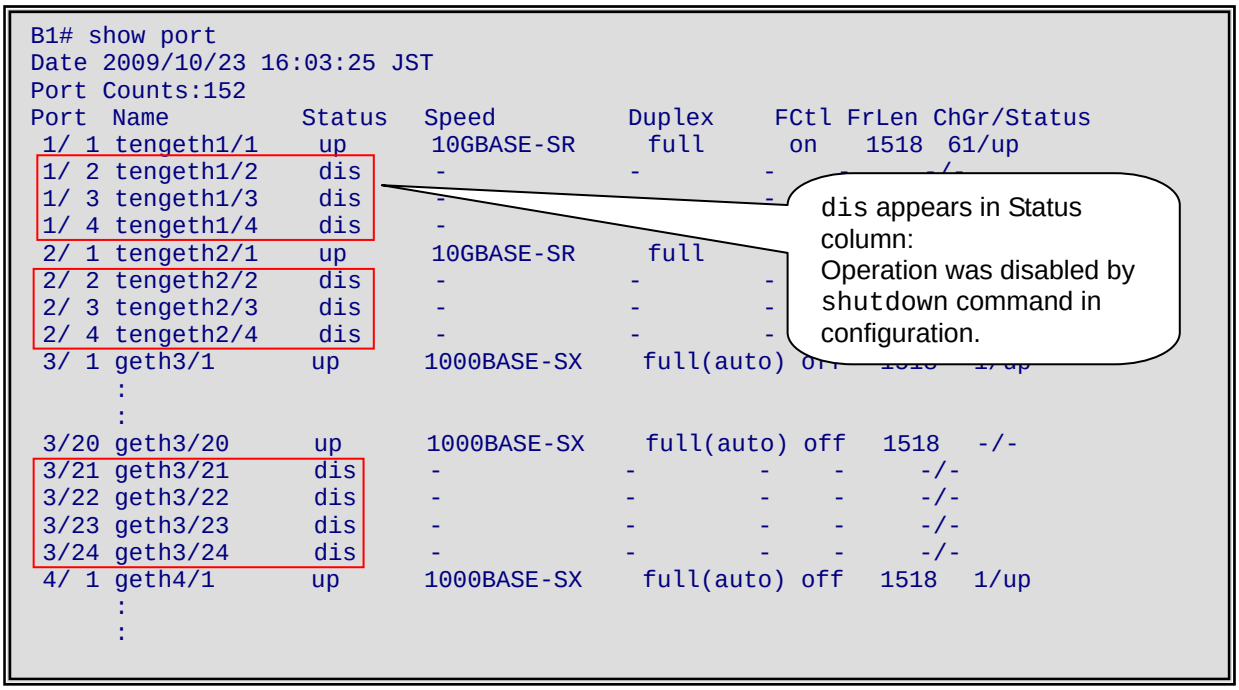


Figure 3.7-2 Example of checking unused port power saving operation from within a normal time range

(3) Use the show power-control schedule command to check the scheduled time ranges

You can use the `show power-control schedule` command to check the current status of the power saving schedule, and the dates and times when the power saving schedule applies.

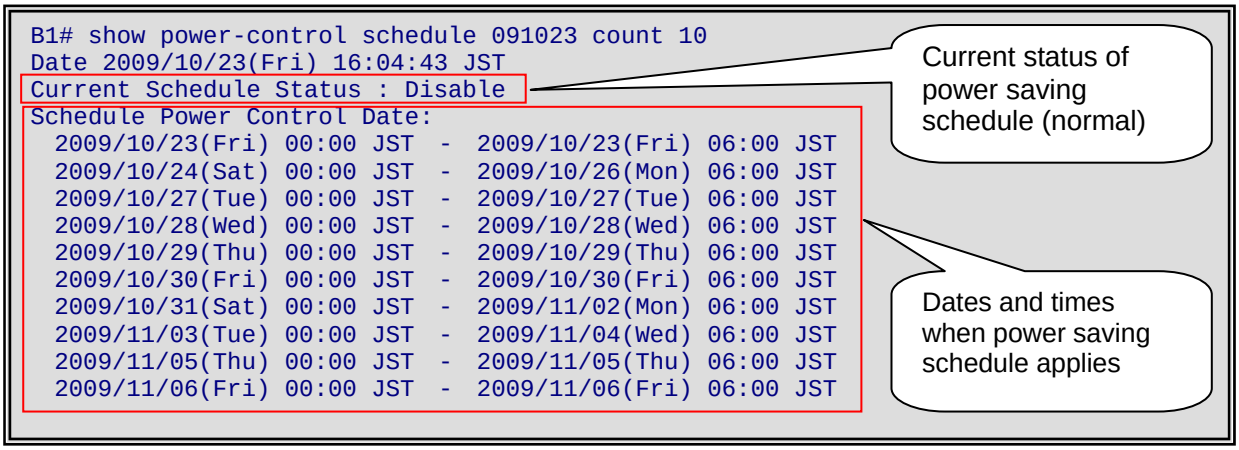


Figure 3.7-3 Example of checking scheduled time ranges from within a normal time range (showing the first 10 events from 10/23/2009)

3.7.2 Checking settings for scheduled time ranges on an AX6600S backbone switch

(1) Use the show system command to check the number of active PSPs, the operating mode of standby PSPs, and the power saving mode

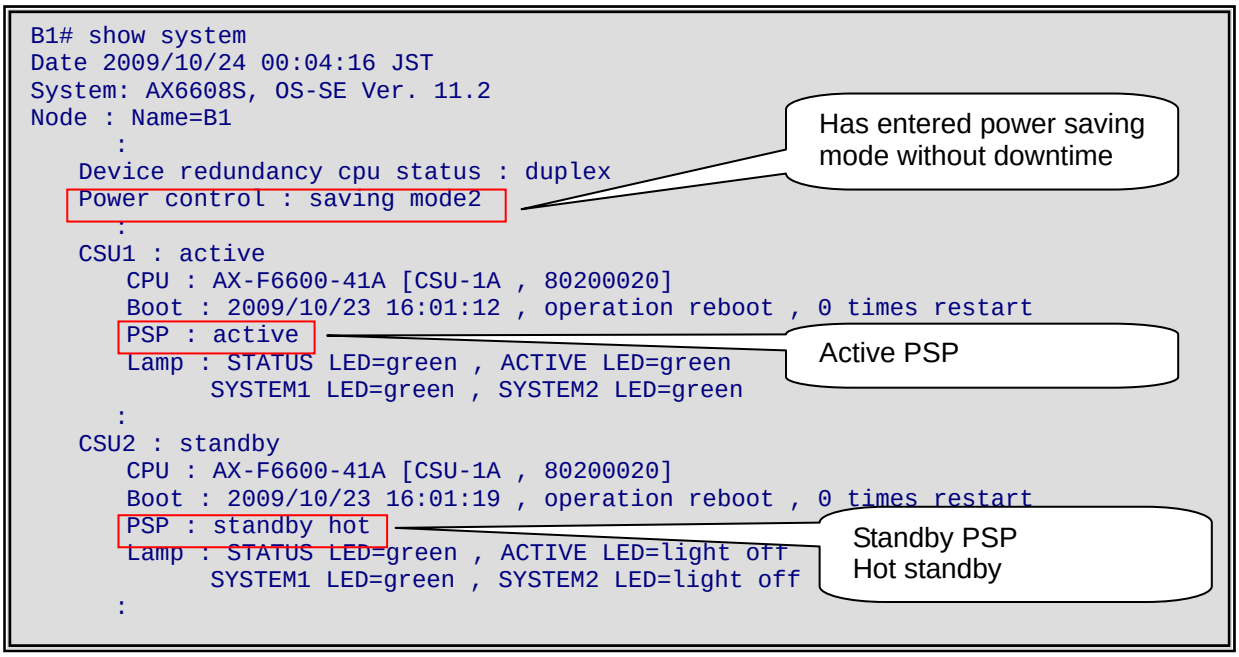


Figure 3.7-4 Example of checking active PSPs, standby PSP operation, and scheduled power mode from within a normal time range

(2) Use the show nif command to check shutdown status of unused NIFs

```
B1# show nif
Date 2009/10/24 00:04:52 JST
NIF1: active  4-port 10GBASE-R(XFP)   retry:0
       Average:0Mbps/80Gbps  Peak:0Mbps at 09:00:00
Port1: active up  10GBASE-SR   0012.e2a0.4503
       XFP connect
       Bandwidth:10000000kbps  Average out:0Mbps  Average in:0Mbps
Port2: disable  -   0012.e2a0.4504
       XFP notconnect
       Bandwidth:10000000kbps  Average out:0Mbps  Average in:0Mbps
Port3: disable  -   0012.e2a0.4505
       XFP notconnect
       Bandwidth:10000000kbps  Average out:0Mbps  Average in:0Mbps
Port4: disable  -   0012.e2a0.4506
       XFP notconnect
       Bandwidth:10000000kbps  Average out:0Mbps  Average in:0Mbps
NIF2: active  4-port 10GBASE-R(XFP)   retry:0
       Average:0Mbps/80Gbps  Peak:0Mbps at 09:00:00
Port1: active up  10GBASE-SR   0012.e2a0.4533
       XFP connect
       Bandwidth:10000000kbps  Average out:0Mbps  Average in:0Mbps
Port2: disable  -   0012.e2a0.4534
       XFP notconnect
       Bandwidth:10000000kbps  Average out:0Mbps  Average in:0Mbps
Port3: disable  -   0012.e2a0.4535
       XFP notconnect
       Bandwidth:10000000kbps  Average out:0Mbps  Average in:0Mbps
Port4: disable  -   0012.e2a0.4536
       XFP notconnect
       Bandwidth:10000000kbps  Average out:0Mbps  Average in:0Mbps
NIF3: disable  24-port 1000BASE-X(SFP)   retry:0
       Average:0Mbps/48Gbps  Peak:0Mbps at 09:00:00
NIF4: disable  24-port 1000BASE-X(SFP)   retry:0
       Average:0Mbps/48Gbps  Peak:0Mbps at 09:00:00
NIF5: disable  24-port 1000BASE-X(SFP)   retry:0
       Average:0Mbps/48Gbps  Peak:0Mbps at 09:00:00
NIF6: disable  24-port 1000BASE-X(SFP)   retry:0
       Average:0Mbps/24Gbps  Peak:0Mbps at 09:00:00
NIF7: active  24-port 1000BASE-X(SFP)   retry:0
       Average:0Mbps/24Gbps  Peak:10Mbps at 16:01:49
Port1: active up  1000BASE-SX full(auto)   0012.e2a0.c530
       SFP connect
       Bandwidth:1000000kbps  Average out:0Mbps  Average in:0Mbps
Port2: active up  1000BASE-SX full(auto)   0012.e2a0.c531
       SFP connect
       Bandwidth:1000000kbps  Average out:0Mbps  Average in:0Mbps
Port3: active up  1000BASE-SX full(auto)   0012.e2a0.c532
       SFP connect
       Bandwidth:1000000kbps  Average out:0Mbps  Average in:0Mbps
      :
      :
      :
```

NIF3 is disabled

NIF4 is disabled

NIF5 is disabled

NIF6 is disabled

Figure 3.7-5 Example of checking shutdown status of unused NIFs

(3) Messages output when switching to power saving mode

The figure below shows an example of the messages output when an AX6600S device has entered the power saving mode. See *Appendix 1* for examples of complete messages and examples of the messages output by AX6700S devices.

```
B1#
10/24 00:00:01 E3 SOFTWARE 25090003 1001:000000000000 System changes to the schedule power control because
it became schedule time.
B1#
10/24 00:00:01 E3 SOFTWARE 25090001 1001:000000000000 The change of power control mode was started.
B1#
10/24 00:00:01 E3 NIF NIF:3 25000100 1240:000000000000 NIF disabled administratively.
B1#
10/24 00:00:01 E3 NIF NIF:4 25000100 1240:000000000000 NIF disabled administratively.
B1#
10/24 00:00:01 E3 NIF NIF:5 25000100 1240:000000000000 NIF disabled administratively.
B1#
10/24 00:00:01 E3 NIF NIF:6 25000100 1240:000000000000 NIF disabled administratively.
B1#
10/24 00:00:01 E3 CSU 25070912 2301:000000000000 PSP on this system (CSU1) changed from active.
B1#
10/24 00:00:01 E3 CSU 25070917 2301:000000000000 PSP on other system (CSU2) changed to active.
B1#
10/24 00:00:01 E3 MAC 20120010 0800:000000000000 Port(3/1) detached from Channel Group(1) - Port down.
B1#
10/24 00:00:01 E3 MAC 20120010 0800:000000000000 Port(3/2) detached from Channel Group(2) - Port down.
B1#

      :
      :
      :

10/24 00:00:01 E3 MAC 20120010 0800:000000000000 Port(3/19) detached from Channel Group(19) - Port down.
B1#
10/24 00:00:01 E4 VLAN 25100002 0700:006600000000 VLAN (102) Status is Down.
B1#
10/24 00:00:03 E4 VLAN 25100002 0700:008a00000000 VLAN (138) Status is Down.
B1#
10/24 00:00:03 E4 VLAN 25100002 0700:008c00000000 VLAN (140) Status is Down.
B1#
10/24 00:00:03 E3 MAC 20120010 0800:000000000000 Port(6/20) detached from Channel Group(40) - Port down.
B1#
10/24 00:00:42 R8 CSU 25070002 2301:000000000000 PSP initialized.
B1#
10/24 00:00:42 E3 CSU 25070918 2301:000000000000 PSP on other system (CSU2) changed from active.
B1#
10/24 00:00:42 E3 CSU 25070911 2301:000000000000 PSP on this system (CSU1) changed to active.
B1#
10/24 00:00:42 E3 CSU 01300412 2314:0dae00000000 System status changed from duplex to simplex.
B1#
10/24 00:01:24 E3 SOFTWARE 25090002 1001:000000000000 The change of power control mode was completed.
B1#
10/24 00:01:25 E3 CSU 01300413 2314:0dac00000000 System status changed from simplex to duplex.
```

Power to NIFs 3 to 6 is OFF

CSU is switched when power mode changes

Figure 3.7-6 Example of messages output when switching to power saving mode

(4) Log entries output when switching to power saving mode

The figure below shows an example of the log entries output when an AX6600S device has entered the power saving mode. See *Appendix 1* for complete log entries and examples of the log entries output by AX6700S devices.

```
B1# show logging
Date 2009/10/24 00:02:22 JST
System information
   AX6608S, OS-SE Ver. 11.2 (Build:62), CSU1(active)
Logging information
KEY 10/24 00:02:22 operator(tty00):B1# show logging
EVT 10/24 00:01:25 E3 CSU 01300413 2314:0dac00000000 System status changed from simplex to duplex.
EVT 10/24 00:01:24 E3 SOFTWARE 25090002 1001:000000000000 The change of power control mode was
completed.
EVT 10/24 00:00:42 E3 CSU 01300412 2314:0dae00000000 System status changed from duplex to simplex.
EVT 10/24 00:00:42 E3 CSU 25070911 2301:000000000000 PSP on this system (CSU1) changed to active.
EVT 10/24 00:00:42 E3 CSU 25070918 2301:000000000000 PSP on other system (CSU2) changed from
active.
EVT 10/24 00:00:42 R8 CSU 25070002 2301:000000000000 PSP initialized.
EVT 10/24 00:00:03 E4 MAC 20120003 0800:000000000000 Channel Group(40) is Down - All port detached.
EVT 10/24 00:00:03 E3 MAC 20120010 0800:000000000000 Port(6/20) detached from Channel Group(40)
- Port down.
EVT 10/24 00:00:03 E4 VLAN 25100002 0700:008c00000000 VLAN (140) Status is Down.
EVT 10/24 00:00:03 E4 MAC 20120003 0800:000000000000 Channel Group(39) is Down - All port detached.
EVT 10/24 00:00:03 E3 MAC 20120010 0800:000000000000 Port(6/19) detached from Channel Group(39)
- Port down..

      :
      :
      :

EVT 10/24 00:00:01 E3 MAC 20120010 0800:000000000000 Port(3/2) detached from Channel Group(2)
- Port down.
EVT 10/24 00:00:01 E3 MAC 20120010 0800:000000000000 Port(3/1) detached from Channel Group(1)
- Port down.
EVT 10/24 00:00:01 E3 CSU 25070917 2301:000000000000 PSP on other system (CSU2) changed to active.
EVT 10/24 00:00:01 E3 CSU 25070912 2301:000000000000 PSP on this system (CSU1) changed from
active.
EVT 10/24 00:00:01 E3 NIF NIF:6 25000100 1240:000000000000 NIF disabled administratively.
EVT 10/24 00:00:01 E3 NIF NIF:5 25000100 1240:000000000000 NIF disabled administratively.
EVT 10/24 00:00:01 E3 NIF NIF:4 25000100 1240:000000000000 NIF disabled administratively.
EVT 10/24 00:00:01 E3 NIF NIF:3 25000100 1240:000000000000 NIF disabled administratively.
EVT 10/24 00:00:01 E3 SOFTWARE 25090001 1001:000000000000 The change of power control mode was
started.
EVT 10/24 00:00:01 E3 SOFTWARE 25090003 1001:000000000000 System changes to the schedule power
control because it became schedule time.
```

Figure 3.7-7 Example of log entries output when switching to power saving mode

3.7.3 Checking the configuration of AX1240S floor switches in normal time ranges

(1) Checking LED operation status

You can check the status of LEDs by the value of `Brightness mode` in the output of the `show system` operation command.

```
A1# show system

Date 2009/05/14 19:01:15 JST
System: AX1240S-24T2C Ver. 2.1 (Build:60)
   Name        : A1
   Contact     : -
   Locate      : -
   Machine ID   : 0012.e294.05b2
   Boot Date    : 2009/05/14 19:00:21
   Elapsed time : 0 days 00:00:54
   LED
      ST1 LED   : Green
      Brightness mode : economy
      :
      :
```

economy:
LED is dimmed (operating with reduced power)

Figure 3.7-8 Example of checking LED status

(2) Checking port power saving control status

Use the `show power-control port` operation command to check the status of port power saving control.

```
A1# show power-control port

Date 2009/05/14 20:31:59 JST
Port  status  cool-standby
 0/1  up      -
 0/2  up      -
      :
      :
 0/19 up      -
 0/20 up      -
 0/21 down    applied
 0/22 down    applied
 0/23 down    applied
 0/24 down    applied
 0/25 up      -
 0/26 up      -
```

Applied:
Port power saving function is running

Figure 3.7-9 Example of checking port power saving control status

(3) Checking schedule status

You can use the `show power-control schedule` command to check the current status of the power saving schedule, and the dates and times when the power saving schedule applies.

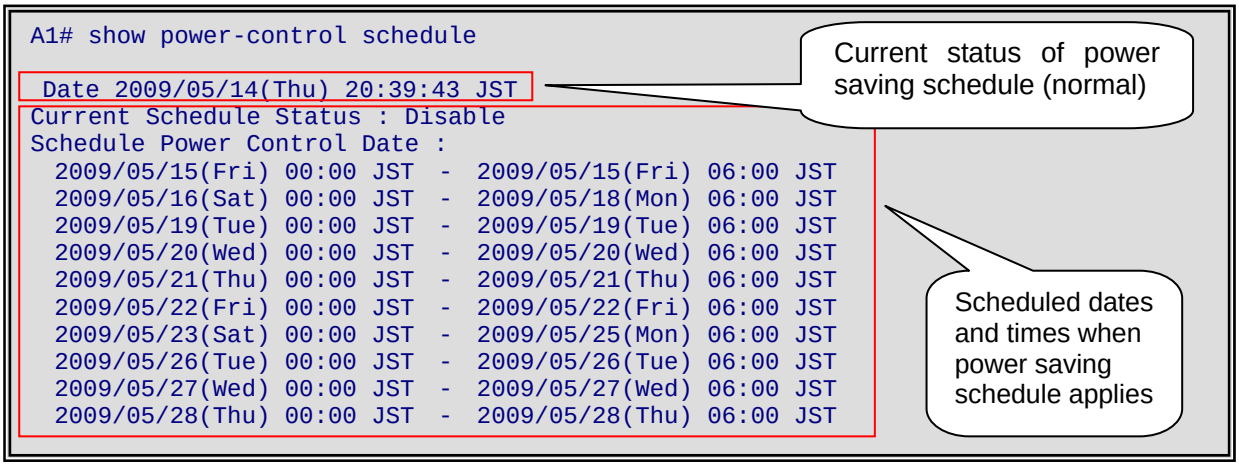


Figure 3.7-10 Example of checking schedule operating status

(4) Messages output when switching to sleep mode

The following figure shows an example of the messages output when an AX1240S device goes to sleep.

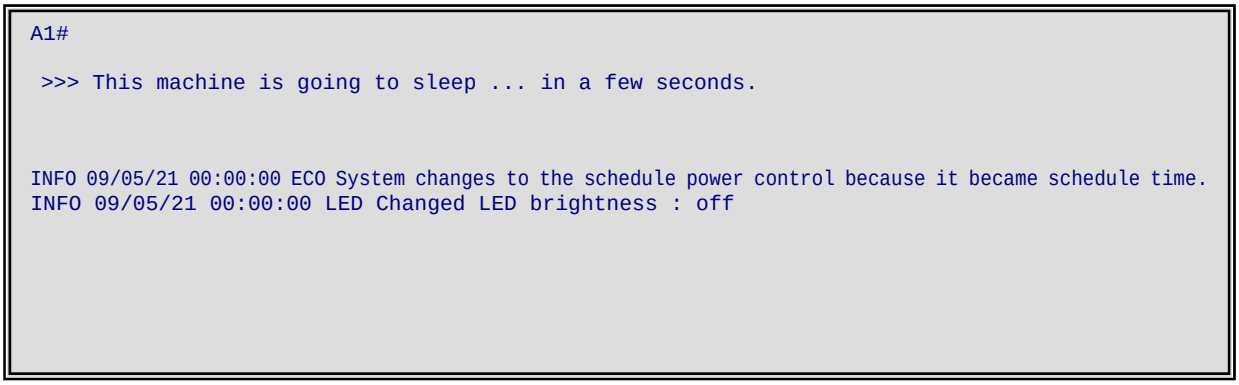


Figure 3.7-11 Example of messages output when switching to sleep mode

(5) Log entries output when switching to sleep mode according to schedule

The AX1240S does not output log entries when entering sleep mode.

The following figure shows an example of the log entries the AX1240S outputs when waking from sleep mode.

```
A1# show logging

Date 2009/05/21 06:00:56 JST
System Information
   AX1240S-24T2C, OS-LT2, Ver. 2.1 (Build:60)
Logging Information
Total Entry : 18
KEY INFO  09/05/21 06:00:56 console:show logging
KEY INFO  09/05/21 06:00:53 console:enable
EVT INFO  09/05/21 06:00:50 SESSION Login operator from console.
EVT INFO  09/05/21 06:00:48 VLAN VLAN (101) Status is Up.
EVT INFO  09/05/21 06:00:48 PORT FastEthernet 0/1 Link Up/Speed 100M-Full(auto)
EVT INFO  09/05/21 06:00:46 PORT Active Medium Change Notification. (0/26, SFP)
EVT INFO  09/05/21 06:00:46 LINKAGG Port 0/26 attached to Channel Group 1.
EVT INFO  09/05/21 06:00:46 PORT Active Medium Change Notification. (0/25, SFP)
EVT INFO  09/05/21 06:00:46 LINKAGG Port 0/25 attached to Channel Group 1.
EVT INFO  09/05/21 06:00:46 PORT 0/24 is disabled.
EVT INFO  09/05/21 06:00:46 PORT 0/23 is disabled.
EVT INFO  09/05/21 06:00:46 PORT 0/22 is disabled.
EVT INFO  09/05/21 06:00:46 PORT 0/21 is disabled.
EVT INFO  09/05/21 06:00:45 LED Changed LED brightness : economy
EVT INFO  09/05/21 06:00:42 SFP Detect to mount Transceiver module[1000BASE-SX] on the port(0/26).
EVT INFO  09/05/21 06:00:41 SFP Detect to mount Transceiver module[1000BASE-SX] on the port(0/25).
EVT INFO  09/05/21 06:00:28 KERNEL Boot cause is expired sleep time.
EVT INFO  09/05/21 06:00:28 SVP SVP started.
```

The device restarts when the sleep time expires

Figure 3.7-12 Example of log entries output when waking from sleep mode

3.8 Canceling schedules

3.8.1 Disabling power saving schedules at specific times (AX6700S/AX6600S, AX1240S)

You can disable scheduled power saving by specifying the start and end times of a time range to disable. You can disable the specified time range on a specific date or day of the week, or every day.

Example: schedule-power-control time-range 1 everyday start-time 0000 end-time 0600 action enable
schedule-power-control time-range 5 date start-time 090720 0000 end-time 090721 0000 action enable

Supposing that the above schedule is configured, you can disable the schedule from 6:00 to 24:00 on 7/20/2009 by using the commands below.

There are two ways to disable power saving: deleting a schedule entry from the configuration, and using the `action disable` command to specify a disabled time range.

Method 1: Delete information associated with the fifth schedule entry	
`(config)# no schedule-power-control time-range 5`	Deletes entry number 5 from the schedule configuration while leaving number 1.

Method 2: Set a disabled time range	
`(config)# schedule-power-control time-range 49 date start-time 090720 0600 end-time 090721 0000 action disable`	Disables power saving in the scheduled time range from 6:00 to 24:00 on 7/20/2009.

3.8.2 Returning quickly to normal mode from power saving mode (AX6700S/AX6600S and AX1240S without sleep mode)

Use the method for disabling power saving schedules at specific times, as described in 3.8.1 above.

We recommend that you use the second method which is based on the `action disable` command. Specify the start and end times of the time range in which to disable power saving (you can specify the current time or earlier as the start time).

To avoid overwriting an existing schedule, you assign the new entry an unused entry number. However, it is not always easy to identify unused entry numbers in an emergency. You can avoid this problem by leaving a specific number unused (for example the final number 50) for this purpose.

Returning to normal mode quickly	
`(config)# schedule-power-control time-range 50 date start-time 090516 0600 end-time 090517 0000 action disable`	To quickly exit power saving mode at 7:00 on 5/16/2009: Disables the scheduled time range from 6:00 to 24:00 on 5/16/2009.

Alternatively, you can use the first method to delete the entry associated with the scheduled time range. Because this approach involves deleting one or more specific entries from the configuration, and considering the maintenance required afterwards, we do not recommend it for urgent mode changes.

3.8.3 Quickly waking a device from scheduled sleep mode (AX1240S)

You can forcibly wake a device from sleep mode by pressing the reset switch on the front panel for 3 or more seconds until all the LEDs are lit. Scheduling will not be active on the device when it wakes.

You can reinstate scheduling on the device by executing the `set power-control schedule enable` operation command after it wakes.

Simply turning the device off and on again will not wake it from sleep mode. The device will go to sleep again because it is still in a scheduled time range.

4. Power Saving Achieved in Application Example

For the application example described in chapter 3, ALAXALA calculated the power savings achieved by the AX switch and the system in general based on power consumption measured at the device level.

In the first edition of this guide, the results in this section were for a device in which NK1G-24T interfaces replaced NK1G-24S NIFs 5 to 8. In this second edition, the results reflect a device in which NIFs 5 to 8 are also NK1G-24S interfaces (though there is little difference in terms of actual results).

4.1 Power savings at device level

Measurements were conducted on the devices listed below.

- Devices used for measurement
  (Device B1) Backbone switch
  AX6708S or AX6608S
  1 unit
  Using SFP-SX as SFP
  Using XFP-SR as XFP

AX6708S configuration		Product code	Qty.
Chassis		AX6708S	1
Power supply		PS-A11	8
BCU1 - 2	BCU		2
BSU1 - 3	BSU	BSU-LA	3
NIF1 - 2	10GbE NIF	NK10G-4RX	2
NIF3 - 8	1GbE SFP NIF	NK1G-24S	6

AX6608S configuration		Product code	Qty.
Chassis		AX6608S	1
Power supply		PS-A11	4
CSU1 - 2	CSU	CSU-1A	2
NIF1 - 2	10GbE NIF	NK10G-4RX	2
NIF3 - 8	1GbE SFP NIF	NK1G-24S	6

(Device A1) Floor switch AX1240S-24T2C, scheduled time ranges configured, 1 unit, SFP-SX used as SFP
(Device A41) Floor switch AX1240S-24T2C, always in normal time range, 1 unit
(Device S1) Server switch AX2430S-24T2X, 1 unit, XFP-SR used as XFP, UTP used on 1-GbE ports 1 to 4

• Load conditions: A load device which sends and receives 256-byte packets is connected to the ports of each device

On the basis of actual measurements, Table 4.1-1 shows the reduction in power consumption achieved per device in scheduled time ranges with dynamic power saving functionality implemented in the application example of chapter 3. Percentage values indicate the reduction in power consumption relative to normal mode.

Table 4.1-1 Power savings achieved per device with dynamic power saving

Overview of measurement conditions used for application example			**256-byte packet load** **Reduction in power consumption per device**
AX6708S as backbone switch (device B1)	<Normal time ranges> 2 x active switch unit BSUs 1 x standby switch unit BSU Power saving configuration: *- 6 unused 10-GbE ports* *- 8 unused 1-GbE ports*		0.0%
	<Scheduled time ranges> 2 x active switch unit BSUs 1 x standby switch unit BSU Power saving configuration: *- Power saving mode* *- 4 NIFs Shutdown* *- 6 unused 10-GbE ports* *- 8 unused 1-GbE ports* *- Port LEDs off*	*- BSU mode: Hot standby (hot)*	31%
		- BSU mode: Cold standby (cold2)	42%
AX6608S as backbone switch (device B1)	<Normal time ranges> 1 x active switch unit PSP 1 x standby switch unit PSP Power saving configuration: *- 6 unused 10-GbE ports* *- 8 unused 1-GbE ports*		0.0%
	<Scheduled time ranges> 1 x active switch unit PSP 1 x standby switch unit PSP Power saving configuration: *- Power saving mode* *- 4 NIFs Shutdown* *- 6 unused 10-GbE ports* *- 8 unused 1-GbE ports* *- Port LEDs off*	*- PSP mode: Hot standby (hot)*	36%
		- PSP mode: Cold standby (cold2)	43%
AX1240S -24T2C as classroom floor switch (device A1)	<Normal time ranges> Power saving configuration: *- LEDs dimmed* *- Link-down port power saving enabled* *- 4 unused ports*		3%
	<Scheduled time ranges> Power saving configuration: *- Device in sleep mode*		67%

The data on this page was obtained through testing under specific conditions in ALAXALA Networks' labs. Results obtained under different conditions and in other environments may vary.

4.2 System-level power savings over a year

Over the course of a year (the 8,760 hours from 4/1/2009 until 3/31/2010), the application example in chapter 3 operates in normal mode for 2,970 hours, and in power saving mode for 5,790 hours as a result of scheduling.

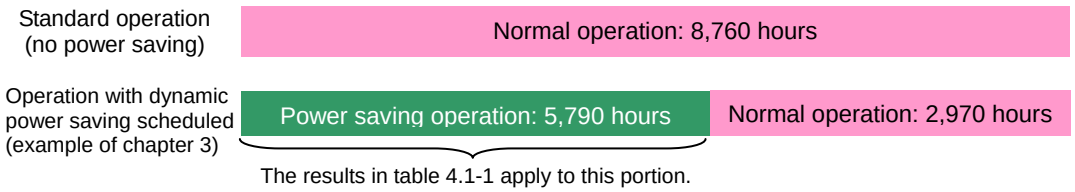


Table 4.2-1 and 4.2-2 show the power savings that can be achieved over a year.

Table 4.2-1 Reduction in system power consumption over one year (backbone switch AX6708S)

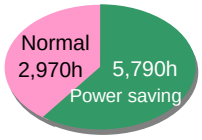
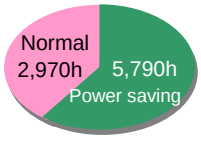
Power saving settings and time operating in each mode	Used devices	Device B1 standby unit used in hot standby mode	Device B1 standby unit used in cold standby mode
Power saving set according to application example Breakdown of operation time: Year: 8,760 hours Scheduling breakdown: 	Server switch (device S1) AX2430S-24T2X	0%	
	Backbone switch (device B1) AX6708S *Scheduled time ranges configured*	21%	28%
	Classroom floor switches (devices A1 to A40) AX1240S-24T2C *Scheduled time ranges configured*	45%	
	Office and laboratory floor switches (devices A41 to A60) AX1240S-24T2C		
	Overall system	24%	28%

Table 4.2-2 Reduction in system power consumption over one year (backbone switch AX6608S)

Power saving settings and time operating in each mode	Used devices	Device B1 standby unit used in hot standby mode	Device B1 standby unit used in cold standby mode
Power saving set according to application example Breakdown of operation time: Year: 8,760 hours Scheduling breakdown: 	Server switch (device S1) AX2430S-24T2X	0%	
	Backbone switch (device B1) AX6608S *Scheduled time ranges configured*	24%	28%
	Classroom floor switches (devices A1 to A40) AX1240S-24T2C *Scheduled time ranges configured*	45%	
	Office and laboratory floor switches (devices A41 to A60) AX1240S-24T2C		
	Overall system	27%	29%

The data on this page was obtained through testing under specific conditions in ALAXALA Networks' labs. Results obtained under different conditions and in other environments may vary.

5. Cautionary Notes

5.1 Notes on using AX6700S/AX6600S devices

(1) The dynamic power saving functionality "On-line switchover to power saving mode" is only supported for redundant configurations (consisting of two or more BSUs or CSUs).

This function switches power control by restarting BSUs or PSPs in sequence, and can only be used in redundant configurations.

In AX6700S devices, *on-line switchover to power saving mode (BSU/PSP power control)* can be set when `redundancy bsu-load-balancing smac`, `redundancy bsu-mode fixed`, and `redundancy standby-bsu cold` are not set on the device.

(2) A device does not switch power modes at the scheduled switching time if only one BSU or PSP is active on the device. A device with one active BSU or PSP will restart and switch power modes when the power-control mode command is executed.

(3) While dynamic power saving is performing an on-line mode switch (BSU/PSP power control), do not execute a command that might affect the switching operation.

Do not perform the following actions while BSU/PSP power control is changing the power mode:
- Change (add, change, or delete) settings associated with power saving functionality, power saving schedules, bandwidth monitoring, or storm control.
- Execute `redundancy force-switchover` to force a node switch.
- Press the ACH switch.

(4) Leave at least 30 minutes between on-line mode switches (BSU/PSP power control) by dynamic power saving

When switching power modes, there can be a delay of 1 to 30 minutes before all settings take effect.

(In the application example in chapter 3, the AX6608S device took about 1 minute and 30 seconds to switch to power saving mode).

(5) If you want to retain the unused NIF and port settings you configured for normal time ranges, you must repeat the settings for scheduled time ranges.

If you neglect to do so, unused NIFs and ports lose their `shutdown` attribute and draw power in scheduled time ranges.

(6) Explicitly specify the power control mode of standby nodes when setting scheduled time ranges.

The default operating mode for standby BSUs and PSPs differs for normal time ranges and scheduled time ranges. To avoid mistakes, we recommend that you specify the operating mode explicitly for each time range.

Normal time ranges

AX6700S: The default operating mode of the `redundancy standby-bsu` command is **hot**

AX6600S: The default operating mode of the `redundancy standby-psp` command is **hot**

Scheduled time ranges

AX6700S: The default operating mode of the `schedule-power-control standby-bsu` command is **cold2**

AX6600S: The default operating mode of the `schedule-power-control standby-psp` command is **cold2**

(7) Explicitly specify the power control mode when setting scheduled time ranges.

The default power mode differs for normal time ranges and scheduled time ranges. To avoid mistakes, we recommend that you also specify the power mode explicitly for normal time ranges.

Normal time ranges
The default operating mode of the `power-control mode` command is **normal**
Scheduled time ranges
The default operating mode of the `schedule-power-control mode` command is **mode2**

5.2 Notes on using AX1240S devices

(1) If you want to retain the unused port settings you configured for normal time ranges, you must repeat the settings for scheduled time ranges.

If you fail to designate these ports as unused on a device that does not enter sleep mode, power might be supplied unnecessarily to these ports because the power saving functionality will not apply during scheduled time ranges.

(2) Turning a device off and on again will not wake it from sleep mode. Still being in a scheduled time range, the device will immediately re-enter sleep mode after it restarts.

Wake the device from sleep mode by pressing the reset switch on the front panel for 3 or more seconds.
See *3.8.3 Quickly waking a device from scheduled sleep mode (AX1240S)*.

A device that remains in sleep mode for 20 days automatically wakes and restarts on the 20th day. The device then re-enters sleep mode.

(3) Note the following when using the sleep function (schedule-power-control system-sleep command).

- A device will not transition to sleep mode if you are in configuration command mode when a scheduled time range arrives. The device will go to sleep after you exit configuration command mode (that is, you transition to admin mode).
- Any unsaved configuration entries will be lost when a device enters sleep mode. For this reason, the following message appears when you exit configuration command mode:

```
Unsaved changes would be lost when the machine goes to sleep!
Do you exit "configure" without save ? (y/n):
```

To save the configuration, enter `n` and then execute the `save` command.
The device will not enter sleep mode if configuration is still in progress when a scheduled power saving time is reached.
- You are automatically logged out if no key is pressed for a fixed period (default: 30 minutes). If you are automatically logged out during the editing process and the device enters sleep mode, any configuration not saved is lost.
- A device that remains in sleep mode for 20 days automatically wakes and restarts on the 20th day. The device then re-enters sleep mode.

Appendix 1: Configuration Files and Log Entries

This appendix provides configuration examples for the system introduced in this document, and examples of log entries.

The full configuration of devices in the power saving network system described in chapter 3 is stored in text files attached to this document. (To extract the attached files, you will need Adobe Acrobat 5.0 or later or Adobe Reader 6.0 or later).

For details on the configuration examples and sample log entries, see the attached files with the file names listed in the following tables.

● **Configuration examples (related page: 3. Application example of power saving network system)**

	Device name and type	Associated file
Backbone switch	B1 (AX6708S)	3-SavingEne_B1_AX67.txt
Backbone switch	B1 (AX6608S)	3-SavingEne_B1_AX66.txt
Floor switch (with power saving scheduled)	A1 (AX1240S-24T2C)	3-SavingEne_A1.txt
Floor switch (normal mode only)	A41 (AX1240S-24T2C)	3-SavingEne_A41.txt
Server switch	S1 (AX2430S-24T2X)	3-SavingEne_S1.txt

● **Log examples (related page: 3.7.2(4) Log entries output when switching to power saving mode)**

	Device name and type	Associated file
Backbone switch	B1 (AX6708S)	AX6708S_LogSummary.txt
Backbone switch	B1 (AX6608S)	AX6600S_LogSummary.txt

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