

9.3.4 Power Management Facts

The ability for a computer to manage devices to conserve power is made possible by implementing the Advanced Configuration and Power Interface (ACPI) standards.

- ACPI is also known as Instant Available and Always On. Is often mistakenly referred to as APM (an older standard).
- The operating system, BIOS, and devices interact to manage power.
- Users can configure settings that identify events and power consumption characteristics. For example, you can configure the display to turn off after 5 minutes of inactivity.
- The system can monitor the battery and other device states and dynamically change power consumption on one or more devices.
- ACPI supports Plug and Play.

ACPI standardizes a number of power states as are listed in the table below:

Power State	Characteristics
Working	<ul style="list-style-type: none"> ▪ The whole system is usable. ▪ Unused save power in a low power state.
Sleep (Modern Standby)	<ul style="list-style-type: none"> ▪ Able to switch from a low-power state to a high-power state quickly.
Sleep	<ul style="list-style-type: none"> ▪ The system appears to be off. ▪ Volatile memory is refreshed. ▪ Some components are powered so the computer can wake from keyboard, LAN, or USB input. <p>In Hybrid Sleep mode, used on desktops, the hibernation file saves the system state in case the system loses power.</p>
Hibernate	<ul style="list-style-type: none"> ▪ The system appears to be off. ▪ Power consumption is at the lowest level. ▪ Volatile memory is saved to a hibernation file to preserve the system state. ▪ Some components are powered so the computer can wake from keyboard, LAN, or USB input.
Soft Off	<ul style="list-style-type: none"> ▪ The system appears to be off. ▪ This state is comprised of a full shutdown and boot cycle.
Mechanical Off	<ul style="list-style-type: none"> ▪ The system is completely off and consumes no power. ▪ The system returns to a working state only after a full reboot.

Windows uses Power Schemes to manage power for the system. A *power scheme* is a collection of power settings that are either predefined or created by a user for use in different computing environments.

- Each power scheme controls power down settings for the monitor, hard drives, and the entire system, and has settings for when running on AC power or on battery power.
- You can modify the existing schemes or create new ones to meet your needs through the Power Options utility in the Control Panel. In Windows 10, you can edit power schemes by right-clicking the **desktop** and selecting **Display Settings > Power & Sleep**.
- The preconfigured power schemes available depend on the operating system version and the computer type (laptop or desktop). Some manufacturers also include preconfigured power schemes. Default power schemes are often included to maximize performance or power savings.
- Power schemes work for both laptop and desktop systems.
- Edit the power scheme to control what the device does when you press the power button, shut down the system, or close the laptop lid.
- In Windows, sleep corresponds to the suspend ACPI state. With hybrid sleep, data in memory is retained as well as written to the hard disk. If the computer is turned off while in hybrid sleep, it can be resumed using the data stored on disk.

Be aware of the following when working with power settings:

- Power management must be supported by the BIOS, devices, and the operating system.
- In Windows, hibernation must be enabled before you can select Hibernate as an option for shutting down the system or in a power scheme.
- The BIOS must have ACPI support enabled before you can enable hibernation in Windows. If the Hibernate tab is missing, check the BIOS. If the BIOS does not have a setting for ACPI, you might need to upgrade the BIOS.
- By default, Windows is allowed to control power to all devices that support the feature. You can edit the device properties in Device Manager to prevent Windows from controlling the device.
- The Wake on LAN (WoL) feature allows a device that receives a special network signal to wake the computer from a sleeping or hibernated state. WoL is often used by desktop administrators to remotely start up computers for management purposes.
 - By default, devices are not allowed to wake the computer, although they might support this feature.
 - Edit the device properties in Device Manager to allow a device to wake the computer.
 - WoL is not recommended for laptop computers, as the computer will periodically come out of standby to check its network state which runs down the battery.

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