Technical whitepaper

HP Wireless Wakeup

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Version 1.3

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Version No.	Version date	Revised by	Approved by	Affected section and description of change
1.0	08/11/2017	Danny Meng		
1.1	08/19/2017	Danny Meng		Incorporated feedbacks
1.2	11/01/2017	Danny Meng		Included marketing name
1.3	11/01/2018	Danny Meng		Updated 2018 platforms and Intel integrated WiFi limitations on DC

* Action types: Approve, Review, Inform, File, Action Required, Attend Meeting, Other (please specify).

1 HP Wireless Wakeup

1.1 Purpose

The purpose of this whitepaper is to describe the HP Wireless Wakeup feature and how to configure it on supported HP notebook systems.

1.2 HP Wireless Wakeup overview

HP Wireless Wakeup, also commonly known as Wake on Wireless LAN (WoWLAN), is a technology that can be used to remotely wake up computers connected to a wireless network in order to facilitate IT administration and system management. This HP Wireless Wakeup technology is based on the same concept as the Wake on LAN that is used in a wired network. An encoded broadcast packet, known as a "wakeup magic packet," is sent from a remote system management application in order to wake up the client computer from a system power-saving state such as standby (S3) or hibernation (S4). The industry-standard wakeup magic packet is a broadcast frame that contains 6 bytes, each set to 255 (FFh), and sixteen repetitions of the target computer's MAC address. It is sent typically as a UDP packet to port 7 or 9.

As the enterprise shifts to an all wireless network environment and the industry is trending to eliminate the traditional Ethernet adapter from thin form factor notebook client devices, the key benefit of HP Wireless Wakeup is enabling the management of enterprise clients the same way as in a wired network environment.
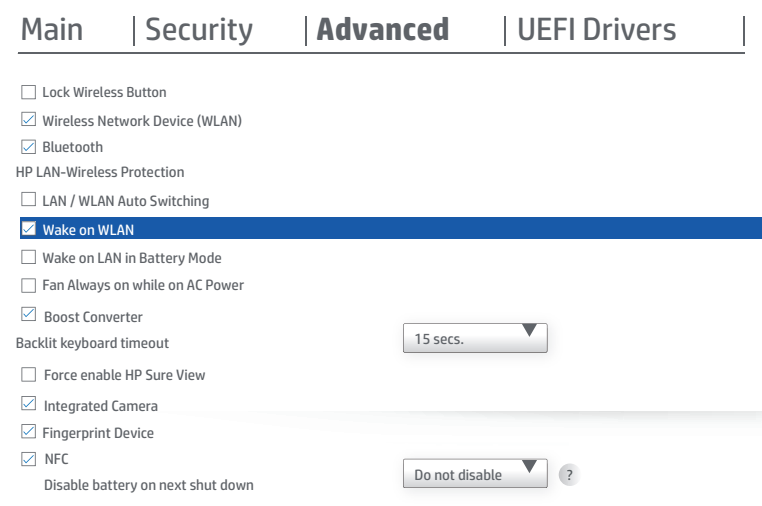
In order to support wake in a wireless environment, there are several dependencies.

• Client devices must be able to wake from a power-saving mode by a wireless network adapter.

• Client devices must be designed to maintain power to the wireless network adapter during system power-saving states in order to allow the wireless adapter to keep its association with a wireless access point.

• The wireless network adapter must support wake function and be able maintain a wireless association with a WLAN access point during supported system power-saving states.

• The OS must allow the configuration of the wireless network adapter to enable WoWLAN function.

• The client device must be associated with a wireless access point prior to entering a system power-saving state, and the association must persist during the system power-saving state so that the adapter can listen for a wakeup packet. If the client device loses its association with the wireless access point for any reason (for example, if the client device is moved out of the access point's range) while in a system power-saving state, then the wake function will no longer be available.

• Network infrastructure must be configured to allow wireless broadcast packets to traverse the network so that the wake magic packet reaches the client devices.

Typically, after a client system is awakened, a separate management solution is used to perform administrative actions such as system update or patch, inventory, policy update, etc. The configuration and operation of these IT administration and management application suites are beyond the scope of this whitepaper.

## 1.3 HP notebook support and BIOS configuration

In order for the wireless network adapter to control the power state of the system, the wireless adapter must be integrated with the system board power connector design of a notebook system. Therefore, external wireless adapters cannot be supported. HP notebook systems designed to support HP Wireless Wakeup will include a configuration option in F10 BIOS Setup under the Advanced Built-In Device Options menu:

Main	Security	**Advanced**	UEFI Drivers	

☐ Lock Wireless Button
☑ Wireless Network Device (WLAN)
☑ Bluetooth
HP LAN-Wireless Protection
☐ LAN / WLAN Auto Switching
☑ **Wake on WLAN**
☐ Wake on LAN in Battery Mode
☐ Fan Always on while on AC Power
☑ Boost Converter
Backlit keyboard timeout   15 secs. ▼
☐ Force enable HP Sure View
☑ Integrated Camera
☑ Fingerprint Device
☑ NFC
   Disable battery on next shut down   Do not disable ▼   (?)

The HP Wireless Wakeup feature is disabled by default. To enable it, select the Wake on WLAN check box and save the setting. Then exit BIOS Setup.

1.4 Wireless network adapter support and OS configuration

After the notebook BIOS is configured for HP Wireless Wakeup, the wireless network adapter must be configured to enable the wake function. A wireless network adapter that supports wake will expose the feature configuration and power management options to the Windows OS. From the wireless adapter properties dialog in Windows Device Manager, set the feature configuration to **Enabled** and select **Allow the device to wake the computer** on the Power Management tab.
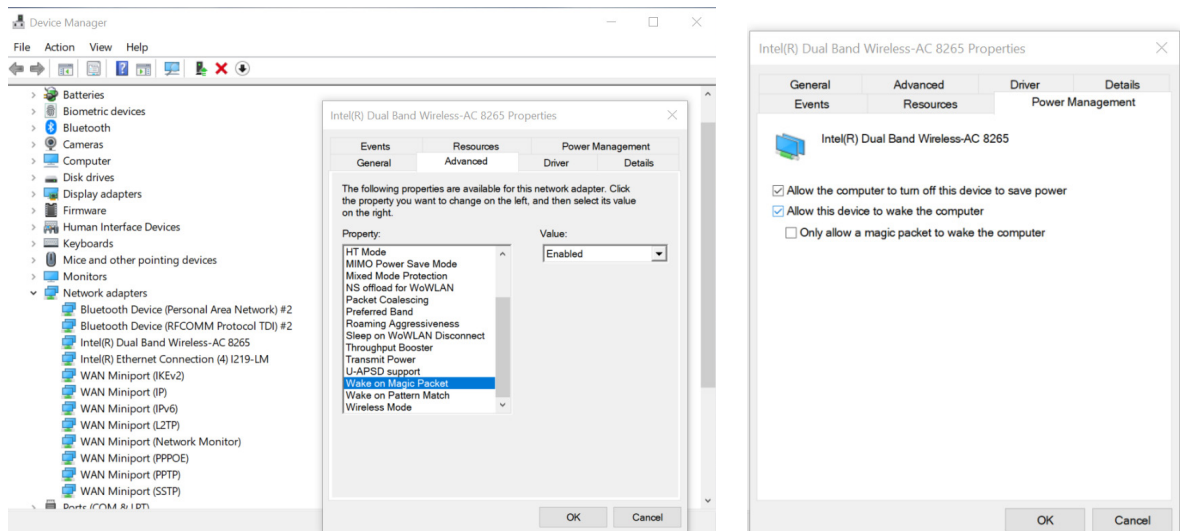
Microsoft introduced a new system power mode, Modern Standby, with Windows® 10. A system that supports Modern Standby Connected/Disconnected does not expose the power management option of the network adapter to the end user, so it cannot be configured to support wake using magic packets.

1.5 Network support and configuration

When a notebook client is in a power-saving state, the OS IP network stack is no longer active, so it may not be able respond to any Address Resolution Protocols (ARPs) from a router. Hence, a wakeup magic packet must be transmitted as a local subnet broadcast packet addressed with a client's wireless adapter MAC address. The network administrator must configure network devices and firewalls so that the wakeup magic packet is not blocked.

A system in a broadcast domain (subnet) can be assigned as a wake server to generate the broadcast wakeup packet. Generally, there is no issue if the targeted client computer to be awakened is in the same subnet as the server. If the wake server does not reside in the same broadcast domain, then the network must be configured to enable and forward directed broadcasts to allow wakeup magic packets to traverse broadcast domains.

Modern enterprise WLAN networks often block broadcast traffic to prevent denial-of-service attacks. Directed broadcast capability is typically disabled by default. The configurations of various network environments and equipment are beyond the scope of this whitepaper. It is advisable to contact the wireless network infrastructure provider to assist in the configuration for a specific network design to enable WoWLAN and to limit the direct broadcast traffic to only specific sources, such as the wake server's IP address.

An example of network configuration:
https://www.cisco.com/c/en/us/support/docs/switches/catalyst-3750-series-switches/91672-catl3-wol-vlans.html

1.6 Feature limitations

	HP 2016 KBL commercial notebooks	HP 2017-2018 commercial notebooks
Supported HP Notebooks	All commercial notebooks* except 400 series	All commercial notebooks*
Supported CPU	Intel® CPU only	Both Intel® and AMD CPU
Supported wireless network adapters	Only Intel® wireless network adapters	Intel® and Realtek wireless network adapters
Supported Wake from System power-saving mode	Standby (S3) Hibernate (S4)	Standby (S3) Hibernate (S4)
Supported system power source	AC and DC	AC and DC**

* The following notebook platforms cannot support HP Wireless Wakeup when configured as Modern Standby systems:

- HP Pro x2 612 G2
- HP Elite x2 1012 G2
- HP EliteBook x360 1020 G2
- HP Elite x2 1013 G3 Tablet
- HP EliteBook x360 1030 G3
- HP EliteBook x360 1040 G5

** The following notebook platforms equipped with Intel® Wireless-AC 9560 integrated WiFi module cannot fully support HP Wireless Wakeup when running on battery power:

- HP EliteBook 1050 G1
- HP ProBook 650 G4
- HP ZBook 15 G5
- HP ZBook 17 G5
- HP ZBook Studio G5
- HP ZBook Studio x360 G5.

With an Intel® wireless network adapter, when WoWLAN is enabled, if a notebook client leaves the AP coverage while in a power-saving mode, the client system may be awakened. If this is not the desired behavior, a registry key setting can be configured to override the wake when connection with AP is lost:

\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Class\{4d36e972-e325-11ce-bfc1-08002be10318}\000?
 (folder of Wi-Fi adapter)

- Registry key: WoWLanWakeUpConfig
- Disable 'Wake when connection with AP is lost' – 0x7C