Intel® Centrino® Mobile Technology Wake on Wireless LAN (WoWLAN) Feature

Technical Brief

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1 Overview

The Intel® PROSet/Wireless Software v10.1 is the connection manager software that works in conjunction with Intel® PRO/Wireless 3945ABG Network Connection hardware to connect your notebook computer to a wireless LAN. Together they deliver next-generation Intel® Centrino® mobile technology to enable seamless wireless connectivity to wireless LAN networks in your home, at the office, or on the road at hotspots in airports, hotels and coffee shops.

The latest Intel® PROSet/Wireless Software release, v10.1 in conjunction with the Intel® PRO/Wireless 3945ABG wireless network adapter now support Wake on Wireless Local Area Network (WoWLAN) capability to deliver the same level of manageability and security as the Wake on LAN (WoLAN) standard for wired networks.

Note: The WoWLAN feature is not supported on Intel® PRO/Wireless 2200BG Network Connection and Intel® PRO/Wireless 2915ABG Network Connection adapters.

2 Wake on Wireless LAN Summary

WoWLAN is based on the well-established WoLAN standard used in wired network environments to remotely wake up computers using wakeup packets. WoWLAN enables on demand waking up of sleeping systems remotely through a wireless association. It works with the same network management application that sends the magic packet for WoLAN and does not require any changes to local operating system software used for WoLAN.

The key benefit of WoWLAN for the enterprise is wireless clients can now be managed in the same way as wired network assets. Corporate IT departments can use WoWLAN to persistently maintain connectivity to automate software upgrades, deliver messages, manage corporate assets, and track the location of a computer.

Persistent connectivity is accomplished by using a management console sending IP packets to a wireless adapter; then the adapter wakes the client from the S3 Standby/S4 Hibernate state to be managed by the management console.

3 How WoWLAN Works

WoWLAN allows a network professional to remotely power on a notebook or wake it up from *sleep mode* (S3 Standby/S4 Hibernate). By remotely triggering the notebook to wake up, the technician no longer needs to physically visit each computer on the network to perform scheduled maintenance tasks.

WoWLAN works by sending a wake-up packet to a client notebook from a server machine that has remote network management software installed. The Intel® Centrino® network adapter on the wireless client receives the wake-up frame and powers on. Scheduled tasks can then begin.

For WoWLAN to function, the notebook computer must be associated with an Access Point (AP) prior to moving into sleep state (S3/S4). The S3 power state, also known as Standby, is the first level of power-saving mode. The S4 state, also known as Hibernate, provides additional power savings. A very low-voltage connection to the Intel® PRO/Wireless Network Connection hardware allows the wireless adapter to continue to examine signals from the associated Access Point (AP). The adapter periodically scans for the presence of wake-up packet.

The persistent connection feature allows a wireless LAN connection to remain after the user logs off. This allows system maintenance of the machine by network administrators in a similar manner as over a wired LAN connection.

The Intel® PRO/Wireless 3945ABG Network Connection client wakes up on reception of a wake-up packet (e.g., from a management console). There are two types of management wake-up packets:

- **Magic Packet*** This wake-up packet wakes only a system targeted for start-up. It contains 16 contiguous copies of the receiving wireless network adapter's MAC address. The MAC address is unique to the network adapter in the system.

- **Pattern Byte Matching (PBM):** This wake-up packet enables the wake up a group of PCs with one single packet. This is achieved by pattern byte matching or packet filtering. The system downloads a series of patterns, configured by the administrator, to the wireless adapter, which in turn monitors for the arrival of these patterns in a packet. If it finds these patterns, the wireless adapter generates a wake signal to the system.

WoWLAN follows the similar steps of WoLAN. These steps are:

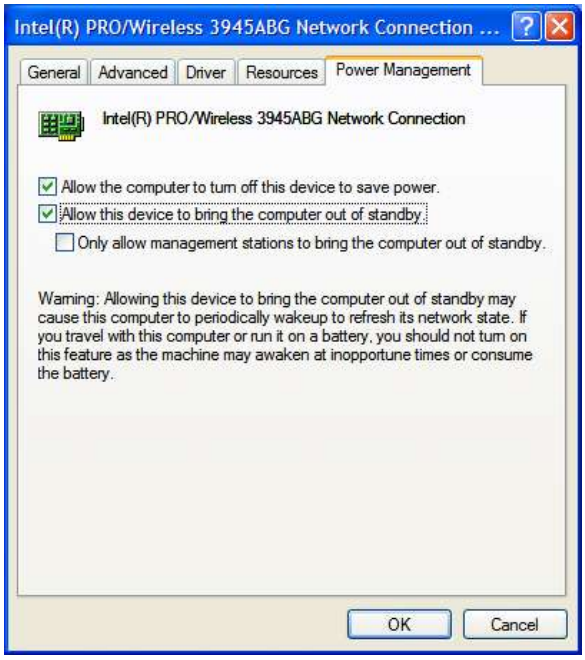
1. The operating system or network management application sets wake patterns in a wireless adapter through standard Microsoft Object IDs.

2. While the system is in sleep state (system in S3/S4, adapter in D3), the adapter receives data packets, attempts to match the pattern stored in the NIC to sequential bytes within the received packet.

3. The adapter on a sleeping system with WoWLAN capability wakes the system if a pattern match is found and then responds to directed wireless traffic. For example, initiating a VoIP call.

4 Configuring WoWLAN on a Intel® Centrino® Mobile Technology Notebook Computer

If WoWLAN capability is enabled on a notebook computer, there is a Power Management tab on the wireless adapter properties page. WoWLAN availability depends on whether the notebook computer manufacturer has enabled WoWLAN in the circuitry of your computer.



The adapter properties page is accessible through the Network Connections window (Microsoft Windows XP). The Power Management tab contains a checkbox *Allow this device to bring the computer out of standby*. WoWLAN is enabled by checking this box. After checking the box, the *Only allow management stations to bring the computer out of standby* box becomes active. Leaving this box unchecked configures the system to wake on both Magic Packets and operating system defined programmable patterns. Checking this box configures the system to wake only on Magic Packets. Operating system patterns are not set.

5 Secure Wireless Client Management

The WoWLAN protocol does not compromise the security of the wireless network. All wireless communications conform to the security settings of the network. The same level of encryption and authentication occurs between the wireless Access Point (AP) and the client PC during the wake-up process as during normal network operations. For example, a WLAN using WPA2-Enterprise with AES protects WoWLAN operations with the latest robust security. Once awake, the normal security software on the PC is fully operational.

6 Using WoWLAN in Enterprise Environments

Notebook computers are mobile assets. These highly mobile assets are best updated by management solutions that are automatically triggered upon sign-on to the enterprise network. WoWLAN features are designed for shared mobile resources within the business campus. The location of these mobile assets and their connectivity status are challenges facing the IT professional trying to manage and update their software configurations.

6.1 Using WoWLAN in a Hospital Environment

A hospital represents a large, complex technology infrastructure. Today's hospital incorporates mobile technology to allow the care staff freedom of movement and convenient access to patient care data. Located throughout the hospitals are notebook computers and PDAs connected to wireless networks. Many of these devices may be fastened to carts that are wheeled between rooms as needed. When the IT administrator attempts to initiate software patches or updates or commence critical data backup, there is no assurance that these devices are in active (S0) state. Hospitals can utilize the WoWLAN feature of Intel® Centrino® technology notebooks to transmit wake packets to enable critical remote updates or broadcast critical messages to alert staff of emergency conditions.

6.2 Managing Distributed Clients in a Warehouse Environment

In warehouse environments, mobile notebooks are commonly used to display pick orders or track inventory location. The sleep states of these assets can be unpredictable. Using WoWLAN enables IT administrators to deliver timely updates or backups of critical data remotely.

6.3 Updating Clients in an Office Environment

When there are shared notebooks in an office environment, the task of updating these assets is complicated by the mobility of the computers and the multi-user logins. To manage these assets, the IT administrator can use WoWLAN regardless of the notebook's location and update the user environments for all the login names.

7 Summary

The WoWLAN feature of Intel® Centrino® technology equipped notebooks allows IT administrators to provide the same high level of remote management capabilities for wireless clients as they do for wired clients. With WoWLAN, administrators can maintain powerful remote management capabilities by providing maximum access to wireless notebook computers.