Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

Your Intel(R) PRO/Wireless 2200BG Network Connection adapter works with the 802.11b or 802.11g wireless standard. Operating at 2.4 GHz frequency at speeds of up to 54 Mbps you can now connect your computer to high-capacity existing 802.11b networks using multiple access points within large or small environments, and also to high-speed 802.11g networks. Your wireless adapter maintains automatic data rate control according to access point location to achieve the fastest possible connection. All of your wireless client connections can be easily managed by the Intel(R) PROSet for Wireless utility. Using the Intel(R) PROSet for Wireless Profile Wizard, you can create profiles automatically to suite your specific connection requirements. Enhanced security measures using 802.1x, WPA and WPA-PSK authentication, and 128-bit AES, WEP, TKIP, and CKIP encryption is standard for both 802.11b and 802.11g.

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March 2004

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Using PROSet Profiles: Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

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Using Intel(R) PROSet for Wireless Profiles

Setting up Network Profiles

A profile is a saved group of network settings. Profiles are displayed in

the Profiles List in the wireless client manager General page. Profiles can be arranged in order of network connection priority. You can connect to one network using the first profile in the Profiles List, then automatically connect to another network using the next profile. This allows you to stay connected while roaming freely from one wireless network to another. Although you can assign multiple profiles to a single network, you can only use one profile per connection. To add a new profile, use the Profile Wizard sequence of dialogs to configure the profile contents. The following example uses all of the Profile Wizard dialogs. Some settings may not be required for all profiles.

Refer to the following to configure the profile connection preferences:

Profile Connection Preferences (Advanced Settings)

To access the profile connection preference option:

1. From the General page, click the **Networks** tab.
2. Click the **Advanced** button.
3. Under the **Auto-connection** heading, click the one of the following options:

    - **Connect to available networks using profiles only** (Default setting): Use the profiles in the Profiles List to connect to any available network.
    - **Connect to any available network if no matching profile is found:** Connect to any available network without using a profile from the Profiles List.
    - **Connect to any network based on profiles only (Cisco Mode):** Connect to any available network access point using profiles enabled for Cisco CCX (version 2) mode. This mode allows connection to access points that support multiple and blank

network names (SSIDs).

- **Enable Mixed-Cell (Requires Cisco CCX options)**: Select this Advanced Settings check box to allow the wireless LAN adapter to communicate with mixed cells. A mixed cell is a wireless network in which some devices use WEP and some do not. The option **Enable Cisco Compatible Extensions** in the Profile Wizard General Settings page must be enabled for mixed cell support.

4. Under the **Profiles to use** heading, click the one of the following options:

   - **Use User Based Profiles:** (Default) Profiles created by the user. These profiles are not accessible to other users of a wireless network.
   - **Use Common Profiles:** Profiles that are accessible to all users of a wireless network.

5. Under the **Profiles conversion option** heading, click the one of the following options:

   - **No Action:** Select this option to convert profiles without deleting the existing profiles.

   - **Delete the existing profiles:** Select this option to delete existing profiles.

   - **Convert profiles and delete the existing:** Select this option to delete existing profiles. This option is used to decide on the conversion algorithm during the switch between Common Profiles and User Based Profiles. The default value is to delete the

existing profiles.

6. Click **OK** to save the settings and close the dialog.

Profile Types

There are two types of profiles that can be used to connect to a wireless network. The profile types are enabled in the Advanced Settings dialog. The profile types are:

- **Common Profiles:** These profiles are accessible to all users of a wireless network. Common Profiles allows the IT administrator to provide every network user with the same number as well as same type of wireless profiles and can easily be managed and maintained (add/delete/modify across a wireless network). The Persistent Connect profile is only used with a Common profile. A Persistent Connect profile uses pre-configured profile information to maintain a network connection. A Common profile with the 'Persistent' connect feature can be used by all users and have the highest priority when connecting to a network. This type of profile allows you to disconnect from the wireless network during a Windows session then reconnect without re-entering your network credentials. The 'Persistent connection is established when no user is logged on to the system. The Persistent Connect option in the Advanced Settings must also be selected in order to enable a 'Persistent' connection.
- **User Based Profiles:** These profiles are user created wireless profiles and are not accessible by other network users.

Note: Other users logged on to a system will not be able to view User Based profiles, whereas all users on a system, as well as all users of the wireless network will be able to view Common profiles (i.e., distinguish between users of the networks and multiple users logged on to a system).

Using a Common Profile for a Specific Connection

You can select a Common profile to use to connect to a specific wireless network. Using this mode will disable profile switching in the Profiles list.

Specify a Common profile to connect to a network:

1. From the General page, click the Networks page.
2. Click the **Advanced** button.
3. Select **Only connect with this profile**.
4. Select a Common profile (with or without Persistent Connect) from the list of profiles. Common profiles are indicated with an asterisk (*). Selecting this feature disables profile switching in the Profiles List. Deleting, renaming or changing the state of the profile (Common to User Based) will cause this feature to be disabled.
5. Click **OK** to save.
6. The selected Common profile displays in the Profiles List.
7. Select the new profile that is positioned at the bottom of the Profiles List. Use the up and down arrows to position the priority of new profile in the priority list. Refer to Administrator Privileges and Restricted Users for information about how Common and Persistent profiles affect the Network page buttons.
8. Click the **Connect** button to connect to the wireless network.
9. Click **OK** to close the Intel(R) PROSet for Wireless.

How to Password Protect the Advanced Settings dialog

To set a password for the Advanced Settings dialog:

1. From the **General** page, click the **Networks** tab.
2. Click the **Advanced** button.
3. Click the **Password** button.
4. Enter a password in the New Password text box.
5. Enter the new password again in the Confirm Password text box. The entered password characters display as asterisks.
6. Click **OK** to save the new password and close the dialog.

    - Note that the Password button is not accessible and the Advanced Settings dialog is now password protected.
    - To edit the Advanced Settings options click the **Edit** button to launch the password protect dialog, then enter the assigned password. Click **OK** to close the dialog.

7. Click **OK** to close the Advanced Settings dialog and return to the Networks page.

To change an existing password for the Advanced Settings dialog:

1. From the **General** page, click the **Networks** tab.
2. Click the **Advanced** button.
3. Click the **Edit** button.
4. Enter the existing password in the Old Password text box.
5. Enter the new password in the New Password text box.
6. Enter the new password again in the Confirm Password text box.

7. Click **OK** to save the new password and close the dialog. Note that the Password button is not accessible.
8. Click **OK** to close the Advanced Settings dialog and return to the Networks page.

Profiles using Single Sign On Features

The Single Sign On options include Pre-Logon Connect and Persistent Connect (for use with MD5 and LEAP profiles only). These features allow you to make fast wireless network connections automatically using pre-configured profile information and user credentials every time you make that connection.

Creating a New Profile

To add a new profile, use the Profile Wizard sequence of dialogs to configure the profile contents. The following example uses all of the Profile Wizard dialogs, although some of the settings may not be required.

Note: If this is the first time you have created a profile, click the profile named **Default** in the Profiles List, click the **Edit** button and rename the default profile in the Profile Name field on the General page.

To create a new profile and connect to a network:

General Settings

1. From the **General** page, click the **Networks** tab.

2. Click the **Add** button. The General Settings dialog displays.
3. Enter a profile name in the **Profile Name** field.
4. Enter the network SSID, in the **Network Name (SSID)** field.
5. Click **Infrastructure** or **Ad hoc** for the operating mode.
6. Click **Password protect this profile** to set a password for the profile. The password is entered in the Password Settings dialog (step 16).
7. If you are using Cisco CCX, select the **Enable Cisco Compatible Extensions** option to enable Cisco CKIP data encryption on the Security Settings page. If you have checked the Cisco's "Mixed-Cell" box in the Advanced Setting, this option must also be checked.
8. Click **Next**.

Security Settings

9. Select **Open**, **Shared**, **WPA** or **WPA-PSK** in the Network Authentication options. Open, does not use any authentication method. Shared uses the WEP key as the authentication method.
10. Select either **None, WEP or CKIP** (if **Enable Cisco Compatible Extensions** is enabled on the General Settings page) for the data encryption.
11. If WEP is selected, select either **64** or **128**-bit for the Encryption Level.
12. Select the key index **1, 2, 3** or **4**.
13. Enter the required **pass phrase** or **hex key**.
14. Click the **802.1x Enabled** checkbox to enable the 802.1x security option.
15. Select the appropriate 802.1x Authentication Type set by your system IT administrator.
16. After selecting your authentication type, click the **Configure** button to open the **Settings** dialog. Enter the user name and password of the user you have created on the authentication server. The user name and password do not have to be the

same as name and password of your current Windows user login. The "Server Identity" can be use the default setting. The "Client Certificate" should be the one obtained from your RADIUS server or other certification server.

Note: For details about using use the User Credentials options, 'Prompt for Credentials Connection', 'Use Windows logon', and 'Save User Credentials' when using MD5, TTLS, LEAP and PEAP authentication refer to the Single Sign On options in the Advanced Settings system-wide network connection preferences

17. Click **Next**. The Advanced Settings dialog displays.

Advanced Settings

18. Refer to Advanced Settings for information.
19. Click **Next**.
20. Enter a password in the Password field. The Password Protection checkbox was checked on the General settings page,
21. Re-enter the same password in the Confirm New Password field.
22. Refer to Setting a Profile Password for instructions on how to add a password to a new or existing profile.

Connect to the Network

23. Click the **Back** button to change or verify the settings or click **Finish** when you have completed the profile settings and return to the Networks page.
24. Click the Advanced button to set the system-wide network connection preferences.
25. Select the new profile name shown in the Profiles List.

26. Click the **Connect** button to connect to the wireless network.
27. Click **OK** to close the Intel(R) PROSet for Wireless.

Importing and Exporting Profiles

Note: A password protected profile can be imported and exported, however, before editing the profile, the password must be entered. Refer to Setting a Profile Password for more information.

To import profiles:

1. From the General page, click the **Networks** tab.
2. Click the **Advanced** button.
3. Click the **Import/Export** button.
4. Click the **Import** button.
5. Locate the profile to import on your hard disk or enter the profile name in the File name field. The profile extension is .profile.
6. Click the **Import** to import the profile into the Profiles List.
7. Click **OK** twice to return to the Networks tab.
8. Click **OK** to close the Intel(R) PROSet for Wireless utility.

To export profiles:

1. From the General page, click the **Networks** tab.
2. Click the **Advanced** button.
3. Click the profiles to export from the export Profiles List.
4. Click the **Browse** button and select a directory to save the profiles in. Click **OK** to return to the previous dialog.
5. Click the **Export** button to start exporting the profiles.
6. Click **OK** twice to return to the Networks tab.
7. Click **OK** to close the Intel(R) PROSet for Wireless utility.

Setting a Profile Password

To set a password for an existing profile:

1. Select the profile from the Profiles List in the Networks page, and click the **Edit** button.
2. Click the **Password** tab.
3. Click the check box next to "Password protect this profile" to enable profile password.
4. Enter a ten character password in the Password field.
5. Enter the new password again in the Confirm New Password field.
6. Click **OK** to exit and return to the Networks tab.
7. Click **OK** to close and exit the Intel(R) PROSet for Wireless utility.

To password protect a new profile:

1. Select the profile from the Profiles List in the Networks page, and click the **Add** button.
2. Click the **Password** tab.
3. Click the check box next to "Password protect this profile" to enable profile password.
4. Enter a ten character password in the Password field.
5. Enter the new password again in the Confirm New Password field.
6. A message box displays that the new password was successfully applied. Click **OK** to close the message box. Note, if the new password is not successfully confirmed, click **OK** to close the message box and repeat step 4 and 5.
7. Click **OK** to exit and return to the Networks tab.
8. Click **OK** to close and exit the wireless Intel(R) PROSet for

Wireless utility.

Automatic Profile Distribution

The **Enable Auto-Import** feature allows a network administrator to distribute a profile automatically to computers connected to a network. The **Enable Auto-Import** option is located on the Advanced Settings page. Distribute a profile automatically the Enable Auto-Import must be selected then the profile can be copied to a specific directory on the host computer, from there it can be distributed to multiple computers. Once the profile is received by the remote computer it will automatically be available for use from the Profiles List. If a profile is sent with a password protected, the user will be prompted for the password before the profile can be used.

Automatically importing WLAN profiles is accomplished by monitoring the *import* folder on your hard disk for new profile files. Only profiles that have the **Enable Auto-Import** box checked on the Profile Wizard dialogs can be automatically imported. If a profile of the same name already exists in the Profiles List, a dialog is displayed from which you can either reject the import, or accept in which case the existing profile will be replaced. All imported profiles will be placed at the bottom of the Profiles List, and the profile file will be immediately deleted after the import whether the import was successful or not.

To import a profile into the Profiles List:

1. Select a profile to be edited from the Profiles List in the Networks page, and click the **Edit** button or click the **Add** button to create a new profile using the Profile Wizard.
2. Select the **Advanced** tab.
3. Select the **Enable Auto-Import** checkbox.
4. Click **OK** (Edit a profile) or **Finish** (Add a profile) to save the

setting and close the dialog.
5. Export the profile from the Profiles List. Refer to Importing and Exporting Profiles for details.
6. Copy the exported profile from its directory to the **Programs Files\Intel\PROSetWireless\PROSet\Import** directory. The profile is now ready to distribute to other computers.

Editing an Existing Profile

To edit an existing profile:

1. From the General page, click the **Networks** tab.
2. Select the profile to edit from the Profiles List.
3. Click the **Edit** button. The General page displays.
4. Click on the **General**, **Security**, **Advanced**, and **Password** tabs to make the necessary changes for the network profile settings:
5. Click **OK** on any of the pages to save all the settings and return to the Networks tab.
6. Click the new profile name shown in the Profiles List. Use the up and down arrows to position the priority of new profile in the priority list.
7. Click the **Advanced** button to set the network connection preferences.
8. Click the **Connect** button to connect to the network.
9. Click **OK** to close the Intel(R) PROSet for Wireless utility.

Note: If you are a restricted user you cannot edit common profiles. However, you can use the Properties button to view the profile contents. Common profiles can only be edited if you have Administrator privileges. Refer to Administrator Privileges and Restricted Users for more information.

Deleting a Profile

To delete a profile:

1. From the **General** page, click the **Networks** tab.
2. Click the profile to be deleted from the Profiles List.
3. Click the **Delete** button.
4. Click **Yes** to permanently delete the profile.

Note: You cannot delete all profiles from the Profiles List. There must always be one profile displayed in the list. If you are a restricted user, the Delete button is disabled if you select a Common profile. Common profiles can only be edited and deleted if you have Administrator privileges. Refer to Administrator Privileges and Restricted Users for more information.

Connecting to a Network without a Profile

To connect to an available network without a profile:

1. From the **General** page, click the **Networks** tab.
2. Click the **Scan** button.
3. Select the network profile name with **<no profile>** shown, and click the **Connect** button.
4. Click the **No, connect me directly without creating a profile** option. Note, you can click **Yes, create a profile for this network now** to create a profile to be used later.
5. Click **OK** to connect.

Connecting to a Network if a Blank SSID displays

If the wireless adapter receives a blank network name (SSID) from a stealth access point, both the blank SSID and <no profile> display in the available networks list. To associate with a stealth access point, a new profile must first be created before connection. After connection both the blank SSID and the associated SSID can be viewed in the available networks list.

To connect to an access point that transmits a blank network name (SSID) in the Available Networks list:

1. From the General page, click the **Networks** tab.
2. Click the **Scan** button.
3. Select the network name with a blank SSID and <no profile> shown in the Available Networks list.
4. Click the **Connect** button.
5. The Profile Wizard dialog displays. Enter a profile name and Network Name (SSID) and security settings if required. Click **Next** to save the profile settings and return to the Networks tab.
6. Click **Next**.
7. Click **Finish**.
8. Select the new profile from the Profiles List and click **Connect**.

Loading a Profile from the Task Tray

To load a profile from the Task Tray:

1. Right-click **Intel(R) PROSet for Wireless** icon in the task tray.
2. Select the Intel(R) PRO/Wireless 2200BG Network Connection.
3. Click **Select Profile** and select the profile to be launched.

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Security Overview: Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

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Encryption Overview

Security in the WLAN can be supplemented by enabling data encryption using WEP (Wireless Encryption Protocol). You can choose a 64 or 128 bit level encryption. Also, the data can then be encrypted with a key. Another parameter called the key index provides the option to create multiple keys for that profile. However, only one key can be used at a time. You can also choose to password protect an Intel(R) PROSet for Wireless profile to ensure privacy. The pass phrase is used to generate a WEP key automatically. You have the option of either using a pass phrase or entering a WEP key manually. Using 64-bit encryption, the pass phrase is 5 characters long and you can choose to enter any arbitrary and easy to remember phrase like Acme1 or enter 10 Hexadecimal numbers for the WEP key

corresponding to the network the user wants to connect to. For 128-bit encryption, the pass phrase is 13 characters long or you can enter a 26 hexadecimal numbers for the WEP key to get connected to the appropriate network.

WEP Encryption and Authentication

Wired Equivalent Privacy (WEP) encryption and shared authentication provides protection for your data on the network. WEP uses an encryption key to encrypt data before transmitting it. Only computers using the same encryption key can access the network or decrypt the encrypted data transmitted by other computers. Authentication provides an additional validation process from the adapter to the access point.

Supported authentication schemes are Open and Shared-Key authentication:

- Shared-Key authentication is supported using 64-bit and 128-bit WEP encryption keys.
- Open mode does not use an encryption authentication method to associate to a specific access point.

Network Keys

When Data Encryption (WEP, CKIP or TKIP) is enabled, a network key is used for encryption. A network key can be provided for you automatically (for example, it might be provided on your wireless network adapter, or enter it yourself and specify the key length (64-bits or 128-bit), key format (ASCII characters or hexadecimal digits), and key index (the location where a specific key is stored). The longer the key length, the more secure the key. Every time the length of a key is increased by one bit, the number of possible keys double. Under

802.11, a wireless station can be configured with up to four keys (the key index values are 1, 2, 3, and 4). When an access point or a wireless station transmits an encrypted message using a key that is stored in a specific key index, the transmitted message indicates the key index that was used to encrypt the message body. The receiving access point or wireless station can then retrieve the key that is stored at the key index and use it to decode the encrypted message body.

Encryption Static and Dynamic Key Types

802.1x uses two types of encryption keys, static and dynamic. Static encryption keys are changed manually and are more vulnerable. MD5 authentication only uses static encryption keys. Dynamic encryption keys are renewed automatically on a periodic basis. This makes the encryption key(s) more secure. To enable dynamic encryption keys, you must use 802.1x certificate-based authentication methods, such as TLS or TTLS or PEAP.

802.1x Authentication

802.1x features

- 802.1x supplicant protocol support
- Support for the Extensible Authentication Protocol (EAP) - RFC 2284
- Supported Authentication Methods:
  - MD5 - RFC 2284
  - EAP TLS Authentication Protocol - RFC 2716 and RFC 2246
  - EAP Tunneled TLS (TTLS)
  - Cisco LEAP
  - PEAP
- Supports Windows XP, 2000

802.1x Authentication Notes

- 802.1x authentication methods, include passwords certificates, and smart cards (plastic cards that hold data)
- 802.1x authentication option can only be used with Infrastructure operation mode
- Network Authentication modes are: EAP-TLS, EAP-TTLS, MD5 Challenge, LEAP (Cisco Compatible Extensions mode only), and PEAP (for WPA modes only)

Overview

802.1x authentication is independent of the 802.11 authentication process. The 802.1x standard provides a framework for various authentication and key-management protocols. There are different 802.1x authentication types, each providing a different approach to authentication but all employing the same 802.1x protocol and framework for communication between a client and an access point. In most protocols, upon the completion of the 802.1x authentication process, the supplicant receives a key that it uses for data encryption.

With 802.1x authentication, an authentication method is used between the client and a Remote Authentication Dial-In User Service (RADIUS) server connected to the access point. The authentication process uses credentials, such as a user's password that are not transmitted over the wireless network. Most 802.1x types support dynamic per-user, per-session keys to strengthen the static key security. 802.1x benefits from the use of an existing authentication protocol known as the Extensible Authentication Protocol (EAP). 802.1x authentication for wireless LANs has three main components: The authenticator (the access point), the supplicant (the client software), and the authentication server (a Remote Authentication Dial-In User Service server (RADIUS). 802.1x authentication security initiates an authorization request from the WLAN client to the access point, which authenticates the client to an Extensible Authentication Protocol (EAP)

compliant RADIUS server. This RADIUS server may authenticate either the user (via passwords or certificates) or the system (by MAC address). In theory, the wireless client is not allowed to join the networks until the transaction is complete. There are several authentication algorithms used for 802.1x; MD5-Challenge, EAP-TLS, EAP-TTLS, Protected EAP (PEAP), and EAP Cisco Wireless Light Extensible Authentication Protocol (LEAP). These are all methods for the WLAN client to identify itself to the RADIUS server. With RADIUS authentication, user identities are checked against databases. RADIUS constitutes a set of standards addressing Authentication, Authorization and Accounting (AAA). Radius includes a proxy process to validate clients in a multi-server environment. The IEEE 802.1x standard is for controlling and authenticating access to port-based 802.11 wireless and wired Ethernet networks. Port-based network access control is similar to a switched local area network (LAN) infrastructure that authenticates devices that are attached to a LAN port and prevent access to that port if the authentication process fails.

How 802.1x authentication works

A simplified description of the 802.1x authentication is:

1. A client sends a "request to access" message to an access point. The access point requests the identity of the client.
2. The client replies with its identity packet which is passed along to the authentication server.
3. The authentication server sends an "accept" packet to the access point.
4. The access point places the client port in the authorized state and data traffic is allowed to proceed.

Refer to Setting up the Client for WEP and MD5 authentication for details about setting up an 802.1x profile using the Intel(R) PROSet for Wireless utility.

What is a RADIUS?

RADIUS is the Remote Access Dial-In User Service, an Authorization, Authentication, and Accounting (AAA) client-server protocol for when a AAA dial-up client logs in or out of a Network Access Server. Typically, a RADIUS server is used by Internet Service Providers (ISP) to perform AAA tasks. AAA phases are described as follows:

- **Authentication phase:** Verifies a user name and password against a local database. After the credentials are verified, the authorization process begins.
- **Authorization phase:** Determines whether a request will be allowed access to a resource. An IP address is assigned for the Dial-Up client.
- **Accounting phase:** Collects information on resource usage for the purpose of trend analysis, auditing, session time billing, or cost allocation.

Wi-Fi Protected Access* (WPA)

Wi-Fi Protected Access (WPA) is a security enhancement that strongly increases the level of data protection and access control to a WLAN. WPA mode enforces 802.1x authentication and key-exchange and only works with dynamic encryption keys. To strengthen data encryption, WPA utilizes its Temporal Key Integrity Protocol (TKIP). TKIP provides important data encryption enhancements that include a per-packet key mixing function, a Message Integrity Check (MIC) named *Michael* an extended initialization vector (IV) with sequencing rules, and a also re-keying mechanism. Using these improvement enhancements, TKIP protects against WEP's known weaknesses.

PEAP

PEAP is a new Extensible Authentication Protocol (EAP) IEEE 802.1x authentication type designed to take advantage of server-side EAP-Transport Layer Security (EAP-TLS) and to support various authentication methods, including user's passwords and one-time passwords, and Generic Token Cards.

Cisco LEAP

Cisco LEAP (EAP Cisco Wireless) is a server and client 802.1x authentication via a user-supplied logon password. When a wireless access point communicates with a Cisco LEAP-enabled RADIUS (Cisco Secure Access Control Server (ACS) server), Cisco LEAP provides access control through mutual authentication between client wireless adapters and the wireless network and provides dynamic, individual user encryption keys to help protect the privacy of transmitted data.

Cisco Rogue AP security feature

The Cisco Rogue AP feature provides security protection from an introduction of a rogue access point that could mimic a legitimate access point on a network in order to extract information about user credentials and authentication protocols which could compromise security. This feature only works with Cisco's LEAP authentication. Standard 802.11 technology does not protect a network from the introduction of a rogue access point.

CKIP

Cisco Key Integrity Protocol (CKIP) is Cisco proprietary security

protocol for encryption
in 802.11 media. CKIP uses the following features to improve 802.11 security in infrastructure
mode:

- Key Permutation
- Message Integrity Check
- Message Sequence Number

Mixed-Cell

Some access points, for example Cisco 350 or Cisco 1200, support environments in which not all client stations support WEP encryption, this is called Mixed-Cell Mode. When these wireless network operate in “optional encryption” mode, client stations that join in WEP mode, send all messages encrypted, and stations, that join in using standard mode, send all messages unencrypted. These APs broadcast that the network is not using encryption, but allow clients to join using WEP mode. When “Mixed-Cell” is enabled in a profile, it allows you to connect to access points that are configured for “optional encryption.”

Note: Make sure to enable the Advanced Settings **Mixed-Cell (Requires Cisco CCX option)** when using **Enable Cisco Compatible Extensions** in a profile. A Cisco CCX enabled profile uses CKIP data encryption and 802.1x LEAP authentication**.**

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Setting up Connection Security: Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

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Security and Encryption

Setting up Data Encryption and Authentication

Wired Equivalent Privacy (WEP) encryption and shared authentication helps provide protection for your data on the network. WEP uses an encryption key to encrypt data before transmitting it. Only computers using the same encryption key can access the network or decrypt the

encrypted data transmitted by other computers. Authentication provides an additional validation process from the adapter to the access point. The WEP encryption algorithm is vulnerable to passive and active network attacks. TKIP and CKIP algorithms include enhancements to the WEP protocol that mitigate existing network attacks and address its shortcomings.

Open and Shared Key authentication

802.11 support two types of network authentication methods; Open System and Shared that use 64-bit and 128-bit WEP encryption. Open does not require an encryption authentication method to associate to a specific access point. Supported authentication schemes are Open and Shared authentication:

- Using **Open** authentication, any wireless station can request authentication. The station that needs to authenticate with another wireless station sends an authentication management frame that contains the identity of the sending station. The receiving station or AP will grant any request for authentication. Open authentication allows any device network access. If no encryption is enabled on the network, any device that knows the SSID of the access point can gain access to the network.
- Using **Shared** authentication, each wireless station is assumed to have received a secret shared key over a secure channel that is independent from the 802.11 wireless network communications channel. Shared key authentication requires that the client configure a static WEP key. The client access will be granted only if it passed a challenge based authentication.

Network Keys

When Data Encryption (AES, WEP, CKIP or TKIP) is enabled, a network key is used for encryption. A network key can be provided for you automatically (for example, it might be provided on your wireless

network adapter, or you can enter it yourself and specify the key the key length (64-bits or 128-bit), key format (ASCII characters or hexadecimal digits), and key index (the location where a specific key is stored). The longer the key length, the more secure the key. Every time the length of a key is increased by one bit, the number of possible keys double.

Under 802.11, a wireless station can be configured with up to four keys (the key index values are 1, 2, 3, and 4). When an access point or a wireless station transmits an encrypted message using a key that is stored in a specific key index, the transmitted message indicates the key index that was used to encrypt the message body. The receiving access point or wireless station can then retrieve the key that is stored at the key index and use it to decode the encrypted message body.

Encryption Static and Dynamic Key Types

802.1x uses two types of encryption keys, static and dynamic. Static encryption keys are changed manually and are more vulnerable. MD5 authentication only uses static encryption keys. Dynamic encryption keys are renewed automatically on a periodic basis. This makes the encryption key(s) more secure. To enable dynamic encryption keys, you must use 802.1x authentication methods, such as TLS, TTLS, PEAP or LEAP.

802.1x Authentication key points

802.1x authentication methods include passwords certificates, and smartcards (plastic
cards that hold data). 802.1x password synchronization capability feature: The "Use Windows login" option on the MD5, TLS, TTLS, and LEAP Credentials dialog allows the 802.1x credentials to match your Windows user name and password. 802.1x authentication option can only be used with Infrastructure operation mode.

- Network Authentication modes are: EAP-TLS, EAP-TTLS, MD5

Challenge, LEAP (for Cisco Compatible Extensions mode only), and PEAP (for WPA modes only)

- Single Sign On Options: MD5 and LEAP 802.1x profiles can use the following Single
  Sign On features:
  - Common Profiles and Persistent Connect profiles: To enable the Common profile select
    This profile can be used by all users (Common).
  - To enable the Persistent Connect feature select This profile will be used when no
    user is logged on (Persistent). These features are installed during the software
    installation process. If these features are select you must also enable Switch to
    common and persistent profile management in the Advanced Settings.

Encryption Overview

Security in the WLAN can be supplemented by enabling data encryption using WEP (Wireless Encryption Protocol). You can choose a 64 or 128 bit level encryption. Also, the data can then be encrypted with a key. Another parameter called the key index is provides the option to create multiple keys for that profile. However, only one key can be used at a time. You can also choose to password protect the profile to ensure privacy.

The pass phrase is used to generate a WEP key automatically. You have the option of either using a pass phrase or entering a WEP key manually. Using 64-bit encryption, the pass phrase is 5 characters long and you can choose to enter any arbitrary and easy to remember phrase like, Acme1, or enter 10 Hexadecimal characters for the WEP key that matches the network that the connects to. For 128-bit

encryption, the pass phrase is 13 characters long or you can enter a 26 hexadecimal character for the WEP key to get connected to the appropriate network.

Note: You must use the same encryption type, key index number, and WEP key as other devices on your wireless network.

How to Enable WEP Encryption

The following example describes how to edit an existing profile and apply WEP encryption.

Note: Before you begin, contact your system administrator for the network WEP pass phrase or Hex Key.

To enable WEP encryption:

1. From the **General** page, click the **Networks** tab.
2. Select the profile from the Profile List and click the **Edit** button.
3. Click the **Security** tab.
4. Select any Network Authentication mode (**Open** is recommended).
5. Select **WEP** Data Encryption.
6. Select **Set Manual Key**.
7. Select a key index number **1, 2, 3, or 4** (Default is 1)
8. Select **64-bit** or **128-bit** Encryption Level.
9. Select either of the following:

    - **Use pass phrase**: Click this option to enable. Enter a text phrase, up to five (using 64-bit) or 13 (using 128-bit) alphanumeric characters (0-9, a-z or A-Z), in the Pass phrase field.

- **Use hex Key**: Click this option to enable. Enter up to ten (using 64-bit) alphanumeric characters, 0-9, A-F, or twenty-six (using 128-bit) alphanumeric characters, 0-9, A-F in the Hex key field.

9. Click **OK** to save the profiles settings.

System Administrator Tasks

Note: The following information is intended for system administrators. Refer to Administrator Privileges and Restricted Users for more information

How to Obtain a Client Certificate

If you do not have any certificates for EAP-TLS, or EAP-TTLS you must get a client certificate to allow authentication. Typically you need to consult with your system network administrator for instructions on how to obtain a certificate on your network. Certificates can be managed from "Internet Settings", accessed from either Internet Explorer or the Windows Control Panel applet. Use the "Content" page of "Internet Settings".

Windows XP and 2000: When obtaining a client certificate, do not enable strong private key protection. If you enable strong private key protection for a certificate, you will need to enter an access password for the certificate each time this certificate is used. You must disable strong private key protection for the certificate if you are configuring the service for TLS/TTLS authentication. Otherwise the 802.1x service will fail authentication because there is no logged in user to whom it can display the prompt dialog.

Notes about Smart Cards

After installing a Smart Card, the certificate is automatically installed on your computer and can be select from the person certificate store and root certificate store.

Setting up the Client for TLS authentication

Step 1: Getting a certificate

To allow TLS authentication, you need a valid client (user) certificate in the local repository for the logged-in user's account. You also need a trusted CA certificate in the root store.

The following information provides two methods for getting a certificate;

- from a corporate certification authority implemented on a Windows 2000 Server
- using Internet Explorer's certificate import wizard to import a certificate from a file

Getting a certificate from a Windows 2000 CA:

1. Start Internet Explorer and browse to the Certificate Authority HTTP Service (use a URL such as http://yourdomainserver.yourdomain/certsrv with certsrv being the command that brings you to the certificate authority. You can also use the IP address of the server machine, such as"192.0.2.12/certsrv."
2. Logon to the CA with the name and password of the user account you created (above) on the authentication server. The name and password do not have to be the same as the Windows logon name and password of your current user.
3. On the Welcome page of the CA select Request a certificate

task and submit the form.
4. On the Choose Request Type page, select Advanced request, then click **Next**.
5. On the Advanced Certificate Requests page, select Submit a certificate request to this CA using a form, then click **Submit**.
6. On the Advanced Certificate Request page choose the User certificate template. Select "Mark keys as exportable", and click **Next**. Use the provided defaults shown.
7. On the Certificate Issued page select Install this certificate.

   Note: If this is the first certificate you have obtained, the CA will first ask you if it should install a trusted CA certificate in the root store. The dialog will not say this is a trusted CA certificate, but the name on the certificate shown will be that of the host of the CA. Click **yes**, you need this certificate for both TLS and TTLS.

8. If your certificate was successfully installed, you will see the message, "Your new certificate has been successfully installed."
9. To verify the installation, click **Internet Explorer > Tools > Internet Options > Content > Certificates**. The new certificate should be installed in "Personal" folder.

Importing a certificate from a file

1. Open Internet Properties (right-click on the Internet Explorer icon on the desktop and select Properties.
2. Click the **Certificates** button on the Content page. This will open the list of installed certificates.
3. Click the **Import** button under the list of certificates. This will start the Certificate Import Wizard. (Note: Steps 1 through 3 may also be accomplished by double-clicking the icon for the certificate.
4. Select the file and proceed to the Password page.
5. On the Password page specify your access password for the

file. Clear the Enable strong private key protection option.

6. On the Certificate store page select "Automatically select certificate store based on the type of certificate" (the certificate must be in the User accounts Personal store to be accessible in the Configure dialog of the Client; this will happen if ‘automatic’ is selected).
7. Proceed to "Completing the Certificate Import" and click the **Finish** button.

To configure a profiles using WPA authentication with AES or TKIP encryption using TLS authentication.

Step 2: Specifying the certificate used by Intel(R) PROSet for Wireless

Note: Obtain and install a client certificate, refer to **Step 1** or consult your system administrator.

1. From the **General** page, click the **Networks** tab.
2. Click the **Add** button.
3. Enter the profile and network (SSID) name.
4. Select **Infrastructure** for the operating mode.
5. Click **Next**.
6. Select **WPA** for the Network Authentication.
7. Select **AES** or **TKIP** as the Data Encryption.
8. Click the **802.1x Enabled** check box.
9. Set the authentication type to **TLS** to be used with this connection.
10. Click the **Configure** button to open the settings dialog.
11. Enter your user name in the **User Name** field.
12. Select the "**Certificate Issuer**" from the list. Select Any Trusted CA as the default.
    - Click the "**allow intermediate certificates**" check box to allow a number of unspecified certificates to be in the server certificate chain between the server certificate and

the specified CA. If unchecked, then the specified CA must have directly issued the server certificate.

13. Enter the **Server name**.
    - If you know the server name enter this name.
    - Select the appropriate option to match the server name exactly or specify the domain name.
14. Under the "Client certificate" option select either:

    - **Use my smartcard:** Select this option to use a local smartcard certificate.
    - **Use a certificate on my computer**:This option selects a client certificate from the Personal certificate store of the Windows logged-in user. This certificate will be used for client authentication. Click the **Select** button to open a list of installed certificates.

      Note about Certificates: The specified identity should match the field "Issued to" in the certificate and should be registered on the authentication server (i.e., RADIUS server) that is used by the authenticator. Your certificate must be "valid" with respect to the authentication server. This requirement depends on the authentication server and generally means that the authentication server must know the issuer of your certificate as a Certificate Authority. You should be logged in using the same username you used when the certificate was installed.

15. Select the certificate from the list and click **OK**. The client certificate information displays under "Client Certificate".
16. Click **Close**.
17. Click **Next**.

18. Click the **Finish** button to save profile settings.

Setting up the Client for WEP and MD5 authentication

To add WEP and MD5 authentication to a new profile:

Note: Before you begin, contact your system administrator for the username and password on the RADIUS server.

1. From the **General** page, click the **Networks** tab.
2. Click the **Add** button from the Profile List.
3. Enter the profile and network (SSID) name.
4. Select **Infrastructure** for the operating mode.
5. Click **Next**.
6. Select **Open** (recommended) Network Authentication.
7. Select **WEP** Data Encryption.
8. Select the key index **1, 2, 3** or **4**. (Default key is 1)
9. Select either **64** or **128**-bit for the Encryption Level.
10. Select either Use pass phrase or Use hex key and enter the **Pass phrase** or **key** in the text box.
11. Click the **802.1x Enabled** check box.
12. Select **MD5** as the 802.1x Authentication Type.
13. Select one of the following options:

    - **Prompt for Credentials on Connection:** Prompt for your user name and password each time you log on to the network.
    - **Use Windows Logon:** This option allows the 802.1x credentials to match your Windows user name and password. Before connection, the Credentials dialog displays prompting you for your Windows logon credentials.
    - **Save User Credentials:** Log on to the network

using your saved credentials. click **Configure** to open the credentials dialog. Enter the user name, domain, and password of the user account created on the authentication server. These credentials are saved for future use with this 802.1x profile. The user name and password do not have to be the same as the name and password of your Windows user log on. Click **OK** to save the credentials.

Note: If the 'Use Windows Logon' feature is grayed-out (not accessible), the Single Sign On feature has not been installed. To install the 'Use Windows Logon' feature refer to **Installing or Uninstalling the Single Sign On Feature** for installation instructions.

14. Click **Close** to save the settings.
15. Click **Next**.
16. **Common Profiles and Persistent Connect:** If required, to enable the Common profile feature select **This profile can be used by all users (Common)**. To enable the Persistent Connect feature select **This profile will be used when no user is logged on (Persistent)**. These features are installed during the software installation process. If these features are select you must also enable Switch to common and persistent profile management in the Advanced Settings.
17. Click **Finish** to save the profile settings.
18. Select the new profile at the bottom of the Profiles List. Use the up and down arrows to position the priority of new profile in the priority list.
19. Click **Connect** to connect to the selected wireless network.

    - If you did not select Use Windows logon (step 13) on the Security Settings dialog and also did not

configure user credentials, an Enter Credentials dialog will display when attempting to connect with this profile. Enter your Windows user name and password. Check the **Save User Credentials** check box to save the credentials for future use with this 802.1x profile.

20. Click **OK** to close the Intel(R) PROSet for Wireless.

Setting up the Client for WPA-PSK with AES or TKIP authentication

Use Wi-Fi Protected Access Pre Shared Key (WPA-PSK) mode if there is no authentication server being used. This mode does not use any 802.1x authentication protocol. It can be used with AES or TKIP data encryption. WPA-PSK requires configuration of a pre-shared key (PSK). A pass phrase or 64 hex characters for a Pre-Shared Key of length 256-bits must be entered. The data encryption key is derived from the PSK.

To configure a new profile using AES or TKIP encryption with WPA-PSK network authentication:

1. From the **General** page, click the **Networks** tab.
2. Click the **Add** button.
3. Enter the profile and network (SSID) name.
4. Select **Infrastructure** for the operating mode.
5. Click **Next**.
6. Select **WPA-PSK** for the Network Authentication.
7. Select **AES** or **TKIP** as the Data Encryption.
8. Select either of the following:
    - **Use pass phrase:** Select this option to enable. Enter a text phrase, up to 8 (using 64-bit) or 63 (using 128-bit)

alphanumeric characters (0-9, a-z or A-Z), in the Pass phrase field.
- **Use hex Key:** Select this option to enable. Enter up to 64 alphanumeric characters, 0-9, A-F in the key field.

9. Click **Next**.
10. Click **Finish** to save the profile settings.
11. Select the new profile at the bottom of the Profiles List. Use the up and down arrows to position the priority of new profile in the priority list.
12. Click **Connect** to connect to the selected wireless network.
13. Click **OK** to close the Intel(R) PROSet for Wireless.

Setting up the Client for WPA using AES or TKIP encryption and TLS authentication

Wi-Fi Protected Access (WPA) mode can be used with TLS, TTLS, or PEAP. This 802.1x TLS authentication protocol uses WEP or TKIP data encryption options. Wi-Fi Protected Access (WPA) mode binds with 802.1x authentication. The data encryption key is received from the 802.1x key exchange. To improve data encryption, Wi-Fi Protected Access utilizes its Temporal Key Integrity Protocol (TKIP). TKIP provides important data encryption enhancements including a re-keying method.

1. Obtain and install a client certificate, refer to Setting up the Client for TLS authentication or consult your system administrator.
2. From the **General** page, click the **Networks** tab.
3. Click the **Add** button.
4. Enter the profile and network (SSID) name.
5. Select **Infrastructure** for the operating mode.
6. Click **Next**.
7. Select **WPA** Network Authentication.

8. Select **AES or TKIP** Data Encryption.
9. Set the authentication type to **TLS** to be used with this connection.
10. Click the **Configure** button to open the settings dialog.
11. Enter your user name in the User Name field.
12. Select the "**Certificate Issuer**" from the list. Select Any Trusted CA as the default.
13. Click the "**allow intermediate certificates**" check box to allow a number of unspecified certificates to be in the server certificate chain between the server certificate and the specified CA. If unchecked, then the specified CA must have directly issued the server certificate.
14. Enter the Server name. If you know the server name enter this name. Select the appropriate option to match the server name exactly or specify the domain name.
15. Under the "Client certificate" option select either:

    - **Use my smartcard:** Select this option to use a local smartcard certificate.
    - **Use a certificate on my computer**:This option selects a client certificate from the Personal certificate store of the Windows logged-in user. This certificate will be used for client authentication. Click the **Select** button to open a list of installed certificates.

    Note about Certificates: The specified identity should match the field "Issued to" in the certificate and should be registered on the authentication server (i.e. RADIUS server) that is used by the authenticator. Your certificate must be "valid" with respect to the authentication server. This requirement depends on the authentication server and generally means that the authentication server must know the issuer of your certificate as a Certificate Authority. You should be logged in using the same

username you used when the certificate was installed.

16. Select the certificate from the list and click **OK**. The client certificate information displays under "Client Certificate".
17. Click **Close**.
18. Click **Next**.
19. Click **Finish** to save the profile settings.
20. Select the new profile at the bottom of the Profiles List. Use the up and down arrows to position the priority of new profile in the priority list.
21. Click **Connect** to connect to the selected wireless network.
22. Click **OK** to close the Intel(R) PROSet for Wireless.

Setting up the Client for WPA using AES or TKIP encryption and TTLS or PEAP authentication

TTLS authentication: These settings define the protocol and the credentials used to authenticate a user. In TTLS, the client uses EAP-TLS to validate the server and create a TLS-encrypted channel between the client and server. The client can use another authentication protocol, typically password-based protocols, such as MD5 Challenge over this encrypted channel to enable server validation. The challenge and response packets are sent over a non-exposed TLS encrypted channel.

PEAP authentication: PEAP settings are required for the authentication of the client to the authentication server. In PEAP, the client uses EAP-TLS to validate the server and create a TLS-encrypted channel between client and server. The client can use another EAP mechanism, such as Microsoft Challenge Authentication Protocol (MSCHAP) Version 2, over this encrypted channel to enable server validation. The challenge and response packets are sent over a non-exposed TLS encrypted channel.

The following example describes how to use WPA with AES or TKIP encryption using TTLS or PEAP authentication.

1. Obtain and install a client certificate, refer to Setting up the Client for TLS authentication or consult your system administrator.
2. From the **General** page, click the **Networks** tab.
3. Click the **Add** button.
4. Enter the profile and network (SSID) name.
5. Select **Infrastructure** for the operating mode.
6. Click **Next**.
7. Select **WPA** for the Network Authentication.
8. Select **AES or TKIP** as the Data Encryption.
9. Select **802.1x Enabled**.
10. Set the authentication type to **TTLS** or **PEAP** to be used with this connection.
11. Click the **Configure** button to open the settings dialog.
12. Select the **Certificate Issuer** from the list. Select Any Trusted CA as the default. Click the **allow intermediate certificates** check box to allow a number of unspecified certificates to be in the server certificate chain between the server certificate and the specified CA. If unchecked, then the specified CA must have directly issued the server certificate.
13. Enter the Server name.

    - If you know the server name enter this name.
    - Select the appropriate option to match the server name exactly or specify the domain name.

14. Authentication Protocol:
    - **PEAP:** Select **MS-CHAP-V2**. This parameter specifies the authentication protocol operating over the PEAP tunnel. The protocols are: MS-CHAP-V2 (Default), GTC, and TLS.
    - **TTLS:** Select **PAP**. This parameter specifies the

authentication protocol operating over the TTLS tunnel. The protocols are: PAP (Default), CHAP, MD5, MS-CHAP and MS-CHAP-V2.

15. Select one of the following options:

- **Prompt for Credentials on Connection:** Prompt for your user name and password each time you log on to the network.
- **Use Windows Logon:** This option allows the 802.1x credentials to match your Windows user name and password. Before connection, the Credentials dialog displays prompting you for your Windows logon credentials.
- **Save User Credentials:** Select this box to save your user name and password for future use when using an 802.1x authentication profile. Click **Configure** and enter the user name, domain, and password. Reenter the password in the Confirm Password text box and click **OK** to save the settings and close the dialog. This user name and domain must match the user name that is set in the authentication server by the system administrator prior to client's authentication. The user name is case-sensitive. This name specifies the identity supplied to the authenticator by the authentication protocol operating over the TLS tunnel. This user’s identity is securely transmitted to the server only after an encrypted channel has been verified and established. Re-enter the user password. If confirmed, displays the same password characters entered in the Password field.

Note: If the 'Use Windows Logon' feature is grayed-out (not accessible), the Single Sign On feature has not been installed. To install the 'Use Windows Logon' feature refer to **Installing or Uninstalling the Single Sign On Feature** for installation instructions.

16. **Use Client Certificate:** This option selects a client certificate from the Personal certificate store of the Windows logged-in user. This certificate will be used for client authentication. Click the Select button to open a list of installed certificates.

    Note about Certificates: The specified identity should match the field "Issued to" in the certificate and should be registered on the authentication server (i.e., RADIUS server) that is used by the authenticator. Your certificate must be "valid" with respect to the authentication server. This requirement depends on the authentication server and generally means that the authentication server must know the issuer of your certificate as a Certificate Authority. You should be logged in using the same username you used when the certificate was installed.

17. Select the certificate from the list and click **OK**. The client certificate information displays under "Client Certificate".
18. **Use credentials username as EAP identity:** Select this checkbox to use the 'roaming identity' as the credentials username. Clear this checkbox to use 'anonymous' (e.g. anonymous@myrealm) as the default roaming identity. The default setting is checked.
19. Click **Close**.
20. Click **Next**.
21. Select the new profile at the bottom of the Profiles List. Use the up and down arrows to position the priority of new profile in the priority list.

22. Click **Connect** to connect to the selected wireless network.

    - If you did not select Use Windows logon (step 15) on the Security Settings dialog and also did not configure user credentials, an Enter Credentials dialog will display when attempting to connect with this profile. Enter your Windows user name and password. Check the Save User Credentials check box to save the credentials for future use with this 802.1x profile.

25. Click **OK** to close the Intel(R) PROSet for Wireless.

Setting up the Client for CCX using CKIP encryption and LEAP authentication

Configuring LEAP using Intel(R) PROSet for Wireless

Note: A LEAP profile can only be configured using Intel(R) PROSet for Wireless.

An Intel(R) PROSet for Wireless CCX (v2.0) profile must be configured to connect to a specific ESS or Wireless LAN network. The profile settings include LEAP, CKIP and Rogue AP detection settings.

To configure a profile for CCX security settings:

1. From the **General** page, click the **Networks** tab.
2. Click the **Add** button.
3. Enter the profile and network (SSID) name.
4. Select **Infrastructure** for the operating mode.
5. Click the **Enable Cisco Compatible Extensions** check box to

enable CCX security. If you have checked the Cisco's "Mixed-Cell" box in the Advanced Setting, this option must also be checked**. Note:** The Network authentication and the Data Encryption now include the CCX security options: **Open**, **Shared** for 802.11 Authentication and **none, WEP, CKIP** for Data encryption.

6. Click **Next**.
7. Select **Open** in the Network Authentication options.
8. Select **CKIP** as the Data encryption.
9. Click the **802.1x Enabled** check box to enable the 802.1x security option.
10. Select **LEAP** 802.1x Authentication Type.
11. Click **Configure** to open the credentials dialog.
12. Select one of the following options:

    - **Prompt for Credentials on Connection:** Select this box if you want to enter your user name and password each time before you connect the wireless network. The user name and password must be first set in the authentication server by the system administrator. Go to step 13.
    - **Use Windows Logon:** This option allows the 802.1x credentials to match your Windows user name and password. The user name and password are not required. Go to step 13.
    - **Save User Credentials:** Select this check box to save your user name and password for future use when using an 802.1x authentication profile. Click **Configure** and enter the user name, domain, and password. Reenter the password in the Confirm Password text box and click **OK** to save the settings and close the dialog. This user name and domain must match the user name that is set in the authentication server by the system administrator prior to client's authentication. The user name is

case-sensitive. This name specifies the identity supplied to the authenticator by the authentication protocol operating over the TLS tunnel. This user's identity is securely transmitted to the server only after an encrypted channel has been verified and established. Re-enter the user password. If confirmed, displays the same password characters entered in the Password field.

Note: If the 'Use Windows Logon' feature is grayed-out (not accessible), the Single Sign On feature has not been installed. To install the 'Use Windows Logon' feature refer to **Installing or Uninstalling the Single Sign On Feature** for installation instructions.

13. Select the **Allow Fast Roaming (CCKM)** check box to enable the client wireless adapter for fast secure roaming.
14. Click **Close**.
15. Click **Next**.
16. **Common Profiles and Persistent Connect:** If required, to enable the Common profile feature select **This profile can be used by all users (Common)**. To enable the Persistent Connect feature select **This profile will be used when no user is logged on (Persistent)**. These features are installed during the software installation process. If these features are select you must also enable Switch to common and persistent profile management in the Advanced Settings.
17. Click **Finish** to save the profile settings.
18. Select the new profile at the bottom of the Profiles List. Use the up and down arrows to position the priority of new profile in the priority list.
19. Click **Connect** to connect to the selected wireless network.

- If you did not select Use Windows logon (step 12) on the Security Settings dialog and also did not configure user credentials, an Enter Credentials dialog will display when attempting to connect with this profile. Enter your Windows user name and password. Check the Save User Credentials check box to save the credentials for future use with this 802.1x profile.

20. Click **OK** to close the Intel(R) PROSet for Wireless.

CCX Access Point and Client Configurations

The access point provides settings to select different authentication types depending on the WLAN environment. The client sends an Authentication algorithm field during the 802.11 authentication handshake that takes place between the client and the AP during connection establishment. The Authentication algorithm values recognized by a CCX enabled AP is different for the different authentication types. For instance "Network-EAP" which denotes LEAP has a value of 0x80 while "Open" which is the 802.11 specified Open authentication and "Required EAP" which requires an EAP handshake exchange have values of 0x0.

Network-EAP only

AP: For CCX enabled networks using LEAP authentication only the authentication type is set with "Network-EAP" check box selected, and "Open" and "Required EAP" boxes unchecked. The AP is then configured to allow LEAP clients ONLY to authenticate and connect. In this case, the AP expects the 802.11 authentication algorithm to be set to 0x80 (LEAP), and rejects clients that attempt authentication with an Authentication algorithm value 0x0.

Client: In this case the client needs to send out an authentication

algorithm value of 0x80 else the 802.11 authentication handshake would fail. During boot, when the Wireless LAN driver is already loaded, but the Intel(R) PROSet for Wireless supplicant is still unloaded, the client sends 802.11 authentication with an Authentication algorithm value of 0x0. Once the Intel(R) PROSet for Wireless supplicant loads, and engages the LEAP profile, it sends 802.11 authentication with an Authentication algorithm value of 0x80.

Network-EAP, Open and Required EAP

AP: If Network-EAP, Open and Required EAP boxes are checked then it would accept both types of 802.11 authentication algorithm values 0x0 and 0x80. However, once the client is associated and authenticated the AP expects an EAP handshake to take place. For any reason if the EAP handshake does not take place quickly, the AP would not respond to the client for about 60 seconds.

Client: Here the client could send out an authentication algorithm value of 0x80 or 0x0. Both values are acceptable and the 802.11 authentication handshake would succeed. During boot, when the Wireless LAN driver is already loaded and the client sends 802.11 authentication with an Authentication algorithm value of 0x0. This is sufficient to get authenticated but the corresponding EAP or LEAP credentials need to be communicated to the AP to establish a connection.

Open and Required EAP only

AP: In the case where the AP is configured with Network-EAP unchecked, but Open and Required EAP checked, the AP will reject any client attempting to 802.11 authenticate using an authentication algorithm value of 0x80. The AP would accept any client using an authentication algorithm value of 0x0, and expects EAP handshake to commence soon after. In this case, the client uses MD5, TLS, LEAP or any other appropriate EAP method suitable for the specific network

configuration.

Client: The client in this case is required to send out an authentication algorithm value of 0x0. As mentioned before the sequence involves a repeat of the initial 802.11 authentication handshake. First, the Wireless LAN driver initiates authentication with a value of 0x0 and later the supplicant would repeat the process. The client sends an 802.11 authentication with Authentication algorithm value of 0x0 even after the supplicant loads and engages the LEAP profile.

Rogue AP

A LEAP profile ensures that the client implements the Rogue AP feature as required by CCX. The client makes note of access points that it failed to authenticate with and sends this information to the AP that allows it to authenticate and connect. Also, the supplicant sets the Authentication algorithm type to 0x80. There may be some network configurations implementing and Open and Required EAP only as described above. For this setup to work, the client must use an Authentication Algorithm value of 0x0, as opposed to the need to use 0x80 for Network-EAP only described above. A LEAP profile enables the client to support Network-EAP only and Open and Required EAP only.

Note: Please refer to Cisco Client extensions version 2.0 document available at www.cisco.com for more details.

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Connecting to a Network using Intel(R) PROSet for Wireless

Enabling Intel(R) PROSet for Wireless to

manage Your Wireless Connections

If you are using Windows XP as your wireless manager you must disable Windows XP before Intel(R) PROSet for Wireless can manage your wireless manager.

1. From the desktop, Click the **Start button > Control Panel.** Double-click **Network Connections**, right-click **Wireless Network Connection**, then click **Properties**.
2. In Wireless Network Connection Properties, Click the **Wireless Network** page.
3. Verify that the Use Windows to configure my wireless network settings check box is clear (unchecked).
4. Double-click the **Intel(R) PROSet for Wireless** icon in the desktop task tray.
5. If you have previously setup your profiles, click the **Networks** page. The Profiles List should display available networks to connect to. If no profiles have been established, refer to Creating a New Profile for more information.

Disabling Windows XP Wireless Manager

To disable Windows XP as your wireless manager from Windows:

1. Double-click the **Wireless Network Connection** icon in the desktop task tray.
2. Right-click **Wireless Network Connection** and click **Properties**.
3. Click on **Wireless Networks** tab on the Wireless Network Connection Properties.
4. Verify that the **Use Windows to configure my wireless network settings** box is not selected. If it is clear the check box.
5. Click **OK**. This confirms that the Intel(R) PROSet for Wireless

utility is configured to manage your network profiles.

Note: Click the Advanced button on the Networks tab and verify that the option **Notify when Windows XP Zero Config is enabled** is selected. This option prompts you when Windows XP starts to manage your network profiles.

Disabling Windows XP from Intel(R) PROSet for Wireless

To disable Windows XP while using Intel(R) PROSet for Wireless:

1. If Windows XP is enabled the Intel(R) PROSet for Wireless Networks page is disabled. The system task tray option **Select Profile** will also be disabled.
2. Click **Yes** if the Intel(R) Configuration Service dialog be displayed. If you click **No**, Windows is enabled as your wireless manager.

Note: If Intel(R) Configuration Service is enabled the Configuration Service dialog will display prompting you to disable or enable Windows XP as your wireless manager. The Configuration feature **Notify when Windows XP Zero Config is enabled** can be enabled in the Advanced button on the Networks tab. This option prompts you when Windows XP starts to manage your network profiles.

3. Click **Open Network Connection Properties**.
4. Clear the **Use Windows to configure my wireless network settings** checkbox on the Windows XP Wireless Networks tab.
5. Click **OK** to enable Intel(R) PROSet for Wireless.

Intel(R) PROSet for Wireless Tabs (Pages)

Intel(R) PROSet for Wireless utility provides the following tabs (pages):

- General Tab
- Networks Tab
- Adapter Tab
- Troubleshooting Tab

General Tab

The General page contains basic information about your connection. If you are associated to a network it will contain information such as SSID, profile name, speed, AP settings such as 802.11 band, channel and security mode. The Signal Quality section of the General page contains information on the quality of the wireless signal. It varies from poor to excellent depending on the surroundings and quality of the signal from the access point. The current status of the radio is also displayed in the Intel(R) PROSet for Wireless General page. Refer to Switching the Radio Off/On for details about how to switch the radio off and on. Click the **details** button on the General page to view detailed parameters of the access point and network adapter.

Network Tab

The Network page displays the available profiles in the Profiles List. Profiles can be arranged in order of network connection priority. You can connect to one network using the first profile in the Profiles List then automatically connect to another network using the next profile. This allows you to stay connected while roaming freely from one wireless network to another. Although you can assign multiple profiles

to a single network, you can only use one profile per connection. To add a new profile, use the Profile Wizard sequence of dialogs to configure the profile contents. The following sections discuss how to setup and configure a profile to connect to a network.

Adapter Tab

Use the Adapter page to:

- Set the adapter's power transmission level when using either infrastructure or ad hoc operating mode
- Set the ad hoc transmit channel

Power Settings: These settings allow you to adjust the adapter's power transmission level, between the computer's power source and the battery life for maximum performance.

- **Power Management:** Displays the current setting for maximum performance or battery life. Select a balance between power consumption and adapter performance. The wireless adapter power settings slider sets a balance between the computer's power source and the battery.

- **Transmission Power:** Displays the current transmission power level setting for the adapter using infrastructure or ad hoc mode. Setting the transmission power level enables you to expand or confine a coverage area in respect to other wireless devices that could be operating nearby. Reducing a coverage area in high traffic areas improves transmission quality by reducing the number of missed beacons and noise in that coverage area.

Ad Hoc Settings: This can be used to select the band and the channel on which the ad-hoc network is created. This setting will be

ignored while joining an existing network.

- **Band:** Displays 802.11b/g (2.4 GHz) band and frequency for the wireless adapter.
- **802.11b/g Channel:** Displays the current ad hoc transmit channel. The ad hoc channel selections are the same for 802.11b and 802.11g.

Troubleshooting

Use the Troubleshooting page to access statistical information for the current wireless connection. You can also enable and disable logging and view log files from this dialog.

- **Signal Quality and Strength display:** View the current signal quality and strength in percent values. Shows how the adapter is communicating with the currently associated access point.
- **Missed AP beacons:** Percent value for the number beacons missed by the adapter. The lower the number is, the better the signal is.
- **Transmit retries:** Percent value for the number of data packets that had to be retransmitted by the adapter. The lower the number is, the better the signal is.
- **Throughput:** Current throughput speed measured in mega-bits-per-second (Mbps).
- **Network Name (SSID):** Name of the network that the wireless adapter is connected to.
- **Profile Name:** Name of current profile being used.
- **Operating Mode:** Name of the operating mode being used; Infrastructure (AP) or Ad hoc.
- **Speed:** The rate of data transmission between the adapter and access point measured in mega-bits-per-second (Mbps). The transmit data rate can depend on how far the adapter is from the

access point. The adapter automatically sets the data rate.
    - 802.11g - 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54.
    - 802.11b - 1, 2, 5.5, or 11.
- **Channel (Frequency):** Displays the current channel and frequency being used.
- **Band:** Displays 802.11b or 802.11g depending on associated access point.

System Wide Advanced Settings

Use the system wide options to configure the wireless connections and profile management preferences. Use the import and export profiles button to access the into the Profiles list. The system wide Advanced Settings are global settings that affect all installed wireless adapters. To access the Advanced Settings click the **Advanced** button on the Networks page.

Advanced Setting Description

Name	Description
Auto-connection	**Connect to available network using profiles only**: (Default setting): Use the profiles in the Profiles List to connect to any available network. **Connect to any available network if no matching profile found**: Connect to any available network without using a profile from the Profiles List. **Connect to any network based on profiles only (Cisco mode):** Connect to

	any available network access point using profiles enabled for Cisco CCX (version 2) mode. This mode allows connection to access points that support multiple and blank network names (SSIDs).
Connection preference	To achieve the optimum transmit data rate it is important to identify the type of access point that the wireless adapter is connecting to. The Advanced Settings provide the mode selections to optimize your operating environment. **Connect to Infrastructure and ad hoc networks**: (Default Setting): Use the profiles in the Profiles List to connect to infrastructure and ad-hoc networks. **Connect to Infrastructure networks only**: Use the profiles to connect to infrastructure networks only. **Connect to ad hoc networks only**: Connect the wireless adapter to ad hoc networks only.
Infrastructure wireless mode selection	The following describes how the wireless preference modes operate using Infrastructure mode. The adapter can operate in three modes: • **Connect to 802.11g and 802.11b networks** (Default): The adapter will search for either 11g or 11b access points using data transmit rates of 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps. This connection defaults to

11g access points. The Available Networks list displays all 11b and 11g access points.

- **Connect to 802.11g network only**: The adapter will search for a 11g access point only using data transmit rates of 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps. The Available Networks list displays only 11g access points.
- **Connect to 802.11b network only**: The adapter will search for the best 11b and 11g access points using data rates of 1, 2, 5.5, or 11 Mbps. The Available Networks list displays any 11b and 11g access point.

Note: The wireless mode (Modulation type) options determine the discovered access points displayed in the Scan list.

Note: (*) see '11b/11g mixed environment protection protocol' below when using 11g and 11b mode.

11b/11g mixed environment protection protocol	The following section describes how to optimize performance in various environments. • **RTS/CTS enabled** (Default): Use RTS/CTS enabled to avoid collisions in mixed mode environments where the 11g and 11b clients cannot hear each other. • **CTS to self enabled**: Use CTS-to-self enable to improve performance in mixed mode environments where 11g and 11b clients are in close proximity and can hear each other.
Profile management	The following section covers profile management options using Windows XP and the Intel(R) PROSet for Wireless utility. **Display available networks when not associated:** If no networks are available that match a profile in the Profiles List, the Configuration Service dialog is displayed, listing the available networks. Check "Don’t show this again" to stop the dialog from displaying again, if the adapter becomes unassociated. The Configuration Service will continue to function and attempt to connect, using a profile from the Profiles List, or to an available network (depending if 'Connect to available network using profiles only' is selected) and no matching profile is found in the Profiles List. If the connection attempts are not successful then the adapter will remain unconnected.

Notify when disabling profile management features:

- **Check:** If Intel(R) PROSet for Wireless is currently managing your wireless adapter a message dialog displays "Windows XP is managing your profiles" if Windows XP Zero Configuration becomes enabled.
  - Select **yes**, Intel(R) PROSet for Wireless will manage the wireless adapter.
  - Select **No**, Windows XP will manage the wireless adapter.

  If any other wireless manager (not Windows XP wireless manager) becomes enabled the message dialog displays "Another wireless LAN utility is communicating with the Intel(R) PRO/Wireless LAN adapter. To avoid conflicts, Intel(R) PROSet for Wireless has temporarily disabled its Profile Management features."

- **Clear:** If Intel(R) PROSet is currently managing your wireless adapter you will not be notified in the event that Windows XP Zero Configuration or any other wireless manager becomes enabled.

  In the event that Windows XP Zero Configuration is enabled, and this box is cleared, or you answer no to the

above question, the Connect button on the Profile page cannot be used to connect to any available networks. The Scan button can be used to scan for available networks. However, the Connect button is non-functioning when used to connect to an available network. The following conditions also occur:

- Ad hoc mode is disabled. The Connect button in the ad hoc connect dialog is non-functioning.
- Task tray icon menu: Launching an ad hoc profile and applying a profile from the task tray menu is not available.

Notify when Windows XP Zero Config is enabled:

- **Check:** If the box is selected, when Intel(R) PROSet for Wireless launches, a message dialog displays "Windows XP is managing your profiles" indicating that Windows XP Zero Configuration is enabled and is managing your wireless adapter. You are prompted to answer the following question:

  Do you wish to disable Windows XP management and let Intel(R) PROSet manage your wireless network?

- Select **Yes**, if you want Intel(R) PROSet for Wireless to manage your wireless adapter.
- Select **No**, if you want Windows XP to manage your wireless adapter.

Clear: If the box is cleared, when Intel(R) PROSet for Wireless launches, you will not be notified in the event that Windows XP Zero Configuration wireless manager is enabled.

Disable Windows XP Zero Config service silently: Select this option to automatically disable Windows XP Zero Configuration Service if it becomes enabled. The default is to prompt the user before disabling.

Do not cache credentials: Select this check box to be prompted for credentials each time wireless connectivity (authentication, re-authentication) is established using 802.1x profiles with either the ‘Use Windows Logon' credentials or the ‘Prompt for Credentials on Connection’ option. The default setting is to cache credentials in memory so that you are only prompted the first time before connection instead of each time you connect or disconnect to the network during the Windows log on session.

Enable Profile Management Features:

	Select this option if you want Intel(R) PROSet for Wireless to manage your wireless adapter. Clear this box will disable Windows XP as your wireless network manager.
Advanced Security	**Notify on 802.1x Challenge Failure**: Select this box to display an error message dialog in the event of an 802.1x protocol failure. **Enable Mixed-Cell (Requires Cisco CCX options):** Select this box to allow the wireless LAN adapter to communicate with mixed cells. A mixed cell is a wireless network in which some devices use WEP and some do not. You must enable the **Enable Cisco Compatible Extensions** option in the Profile Wizard General Settings dialog for mixed cell support.
Single Sign On Feature Settings	**Switch to common and persistent profile management:** Select this feature to enable the Common and Persistent profile option in the Profile Wizard Advanced settings. In this mode only Common and Persistent profiles are displayed in the Profiles list. User Based profiles are not displayed. **Enable Pre-Logon Connect:** This feature allows your system to silently connect to an assigned wireless network using your Windows log on user name and password before logging on to Windows. Refer to Pre-Logon Connect for more information. This

	option cannot be enabled or disabled from this dialog, it only displays the current status selected during the installation process. Refer to Installing and Uninstalling the Single Sign On Feature for more information. **Enable Persistent Connect:** This feature can only be used with Common profiles. A Persistent Connect profile takes precedence over all other profiles in the Profiles list after a Windows log off session. This feature enables or disables a profile with the Persistent feature selected in the Profile Wizard. This option cannot be enabled or disabled from this dialog, it only displays the current status selected during the installation process. Refer to Installing and uninstalling Software.
Profiles	**Only connect with this profile:** Select this feature to specify which profile to use for connection to a wireless network. Selecting this feature disables profile switching. Choose a profile from the list of Common (if available) or User Based profiles.
Edit Button	The Edit button is used to enter the assigned password for the Advanced Settings options. This button is grayed out is there no password. The default setting is no password.

Password button	Use this feature to lock the system-wide options with a password so that even users with administrative privileges can not change the Advanced Settings options. The options can still be viewed after a password is applied and the OK, Edit, Cancel and Help buttons can be used. The default setting is no password. Refer to How to Password Protect the Advanced Settings for more information.
Import/Export Button	Import and export profiles to and from the Profiles List. Refer to import and export profiles for more information.
OK button	Save settings and return to the previous dialog.
Cancel button	Close dialog.
Help button	Displays the help information for this dialog.

Intel(R) PROSet for Wireless Configuration Service

The Configuration Service feature operates in background constantly scanning for available wireless networks not listed in the Profiles List. If no matching network profiles are found in the Profiles List a dialog automatically displays the available wireless network access points and computers (ad hoc mode) within range of the wireless adapter. The Configuration Service can also be used if there is more than one wireless adapter installed using 802.11b band.

Configuration Service key features:

- The Configuration Service is launched when you log on to your computer.
- No active profile switching will be performed. Once the adapter is associated with the access point, if a higher priority profile becomes available, no switching will occur.
- The Configuration Service is only available if Intel(R) PROSet for Wireless is installed.
- If a connection to an access point cannot be made using any of the profiles in the Profiles List, a dialog will display the available networks.
- If there are multiple profiles listed for an available network, a dialog box will list the profiles for you to choose from.
- If an available network is detected with WEP encryption and authentication, a dialog for setting up WEP encryption displays before the connection is made.

When the Connect button is selected on the Configuration Service dialog the following options display:

- **Connect to available network using profiles only:** In this mode the Configuration Service attempts to connect to a network access point using profiles from the Profiles List only. If no matching profile is found, a dialog appears that lists the available networks. You can also close this dialog without connecting by clicking the Cancel button. The adapter will remain unassociated, and the list of available networks will NOT be displayed again unless another available network is detected. This mode is set in the Advanced Setting options.
- **Connect to any available network if no matching profile found:** In this mode the Configuration Service attempts to connect to a network access point first using profiles from the Profiles List. If no matching profile is found, the Configuration Service automatically connects to any available network. This

mode is set in the Advanced Setting options.

Enabling Automatic Connection

The Configuration Service also monitors for the "resume status" after a laptop computer suspend event. When this occurs, the Configuration Service will re-enable the automatic connection service. These features can be enabled again after rebooting your computer or after a suspend and resume cycle.

Features affected when another profile management application is detected

For AAA Client:

Select OK, and the AAA Client application will manage the adapter. The current connection will continue with the affected Intel(R) PROSet for Wireless features show below. To avoid conflicts, the Intel(R) PROSet for Wireless profile management features have been temporarily disabled. To re-enable these features, first disable the other LAN utility and then either:

1. Re-enable from Intel(R) PROSet for Wireless Advanced Settings.
2. Resume after a computer suspend.
3. Reboot the computer.

Note: AAA Client Wireless Manager - If Intel(R) PROSet for Wireless detects another wireless AAA client manager, a notification dialog displays, if you choose "OK" on this dialog, the Intel(R) PROSet for Wireless profile management features are automatically disabled. The Advanced Setting "**Notify when disabling profile management features**" check box must be checked in order to display the notification dialog if Windows XP Zero Configuration in not enabled. The default setting is enabled (checked).

For Windows XP Zero Configuration:

- Select Yes, to disable Windows XP Zero Configuration. Intel(R) PROSet for Wireless will continue to manage the adapter.
- Select No, Windows XP will manage the adapter. The current connection will continue with the affected Intel(R) PROSet for Wireless features show below. You can also prevent the dialog from being displayed again, in which case Windows XP Zero Configuration will automatically manage the wireless adapter. The notification dialog can be re-enabled from the Advanced Settings options.

Affected Intel(R) PROSet for Wireless features:

- The Connect button on the Profile page is non-functioning.
- The Scan button can be used to scan for available networks, however, the Connect button is non-functioning when used to connect to an available network.
- Ad hoc mode is disabled. The Connect button in the ad hoc connect dialog is non-functioning.
- Task tray icon menu: Launching an ad hoc profile and applying a profile from the task tray menu is not available.

Note: If the buttons described above are used, the following message displays: "Another wireless LAN utility is communicating with the Intel(R) PRO/Wireless LAN adapter. To avoid conflicts, Intel(R) PROSet for Wireless has temporarily disabled its Profile Management features."

Scanning for Available Networks

A fast way to connect to a network is to use the **Scan** button to search for a network access point in range of your wireless adapter. When a network is found, you can instantly connect without a profile or create a new profile.

Note: Profiles with the Enable Auto-Import feature enabled will also be displayed in the Profiles List of available networks. Refer to Automatic Profile Distribution for more information.

To scan for available networks:

1. From the General page, select the wireless adapter on the left side pane.
2. Select the **Networks** page.
3. Click the **Scan** button.
4. The Available Networks dialog displays the names of the available networks. Click the **Refresh** button to refresh the list of available networks.
5. Select the network from the list, and click the **Connect** button.
6. Select the network profile name with **<no profile>** shown, and click the **Connect** button.
7. Click the **No, connect me directly without creating a profile** option. Note, you can click **Yes, create a profile for this**

network now to create a profile to be used later.

Note: If the selected network has 802.1x authentication, you must first create a profile using the Profile Wizard. However, if the network has no WEP security (Open), WEP 64 or 128-bit encryption, or WPA-PSK, you can enter the required security settings in the dialog that displays after clicking the Connect button. Then a one time connection without a profile can be made.

- **The selected network has WPA security settings:** If the selected network has 802.1x authentication security settings, after clicking the Connect button, the Profile Wizard Advanced Security page will display. From this dialog you can enter the 802.1x settings and connect to the network.
- **The selected network has no (Open) WEP security settings:** If the selected network has no security (Open). Click the Connect button to connect to the network.
- **The selected network has WEP or WPA-PSK security settings:** If the selected network has WEP encryption security settings, after clicking the Connect button, the Profile Wizard Advanced Security page will display. From this dialog you can enter the WEP security settings and connect to the network.

8. Click **OK** to connect to a network.

Connecting to a Network Using an Access

Point

An infrastructure network consists of one or more access points and one or more computers with wireless adapters installed. Each access point must have a wired connection to the Local Area Network (LAN).

You can connect to a network by first creating a new profile using the Profile Wizard, then selecting that profile to connect to the network access point using the Connect button. You can also connect to a network, by using the Scan button. Refer to Creating a New Profile for more information.

Connecting to a Peer-to-Peer (Ad Hoc) Network

Connect or Start an Ad Hoc Network
Start an Ad Hoc Network
Ending an Ad Hoc Session
Creating an Ad Hoc Profile Using the Profile Wizard

In peer-to-peer (ad hoc) mode, you can send and receive information to other computers in an ad hoc network. All wireless clients in the ad hoc network must use the same network name (SSID) and channel number. For a list of allowed 802.11b ad hoc channels, refer to the Adapter Settings for more information.

Note: While scanning with an ad hoc profile set to a specific transmit channel, if an ad hoc network is found on another channel, you will be connected using the new channel. The new channel number is displayed in the Adapter Settings.

Connect to an Ad Hoc Network

Note: For information about connecting to an ad hoc using a profile, refer to Create an Ad Hoc Profile using the Profile Wizard.

Connect to an ad hoc network using a profile

- Select an ad hoc profile from the Profiles List and click the **Connect** button. This method uses a pre-defined ad hoc profile created by the Profile Wizard. When connecting to an ad hoc network, the transmit channel established by the first computer is used. This channel may be different than the one selected when the ad hoc profile was created by the Profile Wizard.

Join an ad hoc network without a profile

- Join a one-time ad hoc session without a profile. This method does not use a pre-defined profile. To connect to any ad hoc network, click the **Scan** button to scan for any ad hoc networks, enter the password (SSID), then click the **Connect** button to connect. When joining an ad hoc network, the transmit channel established by the first computer is used.

Start an Ad Hoc Network

You can start an ad hoc network by using your computer as a wireless station. This method uses your computer's SSID to establish the ad hoc network for other users to connect to. When you are the originator of an ad hoc network, all other users must use the channel and SSID.

Ending an Ad Hoc Session

To end an ad hoc session, click the default profile in the Profiles List

and click the **Close** button.

Creating an Ad Hoc Profile Using the Profile Wizard

The following describes how to create a new ad hoc profile using the Profile Wizard and connect to an ad hoc network

General Settings

1. From the **General** page, click the **Networks** page.
2. Click the **Add** button. The General Settings dialog displays.
3. Enter a profile name in the **Profile Name** field.
4. Enter the network SSID, in the **Network Name (SSID)** field.
5. Click **Ad hoc** operating mode.
6. Click **Password protect this profile** to set a profile password.
7. Click **Next**.

Security Settings

8. Select either **None, WEP** for the data encryption.
9. If WEP is selected, select either **64** or **128**-bit for the Encryption Level.
10. Select the key index **1, 2, 3** or **4**.
11. Enter the required **pass phrase** or **hex key**.
12. If the Password Protection check box was checked on the General settings page, then
    click **Next** to display the Password page.

Password Protection Settings

13. Click the **Password protect this profile** check box.
14. Enter a password in the Password field.
15. Reenter the same password in the Confirm New Password field.
16. Click the **Back** button to change or verify the settings or click **Finish** when you have completed the profile settings and return

to the Networks page.

Connect to the Network

17. **Changing the default transmit channel from the Adapter page:** Unless the other computers in the ad hoc network use a different channel from the default channel, there is no need to change the default channel. If you want to change the default channel, click the **Adapter** page, and click **Configure** under Ad Hoc Channel Selection. Choose the operating band select a channel. Click **OK** to save the setting.
18. Select the **Networks** page
19. After creating the new profile, click the profile in the Profiles List. Profiles using ad hoc mode are indicated by a computer icon next to the profile name.
20. Click the **Connect** button to connect to the ad hoc network.

Switching the Radio On and Off

When your computer is switched on, if the radio is enabled it is constantly transmitting signals. In certain situations, such as landing or takeoff of an airplane, the radio signals may need to be turned off, if not these signals may cause interference. The following describes how to use your keyboard (if this option is available) and Intel(R) PROSet for Wireless to switch the radio on or off.

The radio can be enabled or disabled from your computer keyboard, the task tray wireless menu option and from Intel(R) PROSet for Wireless. The current status of the radio is displayed in the task tray wireless icon and on the General page.

Using the optional hardware radio on/off switch

The radio can be enabled or disabled from your keyboard, or from an external hardware switch if these options are available. Refer to your computer manufacturer for more information. Intel(R) PROSet for Wireless displays the current state of the radio on the General page if one of these options is installed.

Using Intel(R) PROSet for Wireless to switch the radio On or Off

The radio can be switched on or off from General page in Intel(R) PROSet for Wireless. The current state of the radio is displayed in the wireless adapter task tray menu option. The General page also displays the current state of the radio if the hardware option is installed.

How to Switch the radio On or Off

Note: When your laptop is switched on the radio is constantly transmitting signals. In certain situations, such as in a plane, signals from the radio may cause interference.

To switch the radio Off: From the **General** page click the **Off** button next to Switch Radio On/Off.

- The wireless adapter cannot connect with a network when the radio is off.
- Intel(R) PROSet for Wireless can be still be used to edit or add a profile when the radio is off.

To switch the radio On: From the **General** page click the **On** button next to Switch Radio On/Off.

When the radio is on, an attempt will be made to associate with the network access point using the last profile. If the adapter cannot connect to the access point, the Configuration Service will attempt to

find an available network. Refer to Configuration Service for more information.

Switching the radio on or off from the Task Tray menu option

Right-click the wireless icon in the task tray and select the wireless adapter being used. Depending on the previous state of the radio, select **Switch Radio Off** (radio is already ON, select to turn OFF) or **Switch Radio On** (radio is already OFF, select to turn ON).

This wireless status icon also displays in the task tray.

Radio switched off using task tray option

Location of icon in system tray (lower right corner of Windows desktop)

Disabling the Radio in Windows

The radio can be disabled (made non-functional) via the Windows operating system using Device Manager.

For Windows XP and 2000:

1. From your desktop, right-click **My Computer** and click **Properties**.

2. Click the **Hardware** page.
3. Click the **Device Manager** button.
4. Double-click **Network adapters.**
5. Right-click the installed wireless adapter in use.
6. Choose **Disable** from the pop-up menu.
7. Click **OK**.

Viewing Adapter Advanced Settings

The following advanced options are only available in the Windows Device Manager Advanced page if Intel(R) PROSet for Wireless is not installed. If PROSet for Wireless is installed the Advanced page displays the Open button. Selected this button to open PROSet for Wireless.

To access the Advanced options:

1. From your desktop, right-click **My Computer** and click **Properties**.
2. Click the **Hardware** page.
3. Click the **Device Manager** button.
4. Double-click **Network adapters.**
5. Right-click the name of the installed wireless adapter in use.
6. Select the Advanced page.

Advanced page option under Windows XP and 2000:

- **Ad Hoc Transmit Power** - Set 802.11b ad hoc output power level of the wireless adapter.
- **Mixed mode protection** - **RTS/CTS enabled:** (Default setting). Use this mode to avoid collisions in mixed mode environments where the 802.11g and 802.11b clients cannot hear each other. **CTS-to-self enabled:** This mode improves performance in

mixed mode environments where 802.11g and 802.11b clients are in close proximity and can hear each other. This option can also be set in Advanced Settings.

- **Power Management** - Set a balance between the computer's power source and the battery.
- **Wireless Mode** - Select the wireless mode (modulation type) for date rate. The default setting is "802.11g and 802.11b." This option uses both 11 Mbps and 54 Mbps date rate. Other options are, "802.11g only" and "802.11b only."

Single Sign On Feature

The Single Sign On feature 'Use Windows Logon' allows you to make fast wireless network connections using pre-configured profile information such as the server, domain, user name and password every time you make that connection. This feature allows 802.1x credentials to match your Windows log on user name and password and will synchronize user credentials when using 802.1x authentication types MD5, TTLS, PEAP, and LEAP. TLS authentication does not require a username and password. When using MD5, TTLS, PEAP, and LEAP the username and password fields are disabled on the authentication Credential dialog if Use Windows logon is enabled. Refer to Credentials Dialog for more information. Refer to Installing and Uninstalling Single Sign On Feature Set for more information.

Note: If Windows XP Wireless Zero Configuration Service is enabled, the Single Sign On feature is disabled. However you can enable the run-time Advanced Setting configuration option **Disable Windows XP Zero Config service without prompting** to automatically disable Windows XP Wireless Zero Configuration Service if it becomes active.

The Single Sign On feature set consists of the following features:

- Single Sign On Feature Set:
    - Use Windows Logon (Used with 802.1x MD5, TTLS, PEAP and LEAP authentication)
    - Persistent Connect
- Pre-Logon Connect

Pre-Logon Connect

This feature allows you to establish a wireless connection using your Windows Log on credentials (if required) before you log on to Windows. This feature can be enabled or disabled in the Advanced Settings or during the software installation process.

Pre-Logon Connect key points:

> **Note:** Refer to the Advanced Settings Pre-Logon Connect option for more information.

- Pre-Logon Connect is active only at Windows user Logon time (i.e. CTRL+ALT+DEL)
- Pre-Logon profiles are:
    - 802.1x MD5 and LEAP Profiles that use either the 'Use Windows Logon' or 'Save User Credentials' option
    - All non-802.1x (Open, WEP) Common or User based profiles
- A Pre-Logon profile will be applied at Windows user log on time

Using the Pre-Logon Connect Option

The following describes how the Pre-Logon Connect feature functions from system power-up. The following assumes that there is a saved profile with valid security settings marked with "Use Windows Logon"

or "Saved Credentials" that can be applied at the time of Windows logon.

1. Power-up your computer or from your keyboard press the Crtl+Alt+Del keys.
2. Enter your Windows Log On user name, password, and domain.
3. Click **OK**. The Pre-Logon profile Status dialog will display the progress of the network connection. After the wireless adapter is connected to the network access point the Status dialog will close and the Windows user log on dialog will display.

    - If the corresponding access point rejects your credentials during the Pre-Logon connect, the profile Credentials dialog will display prompting you for your user credentials. If you click **OK** after entering your credentials, the profile is applied and the Status dialog will display the progress of the connection status until you are logged on to Windows. You can also select **Cancel** on the Credentials dialog to try another profile.

Persistent Connect

A Persistent connection can be established only with Common profiles that are marked as persistent. A profile using the Persistent Connect feature allows your wireless adapter to maintain a continuous wireless connection after you log off from your current Windows session until the computer is turned off or a different user logs on. This feature allows you to reconnect automatically while logging off and on during a Windows session.

Persistent Connect key points:

> **Note:** Refer to the Advanced Settings Persistent Connect option for more information.

- Persistent Connect is active at the Logoff event and RESUME (after SUSPEND, STANDBY or HIBERNATE) event when no user is logged on to the system.
- Persistent profiles are:
  - All non-802.1x profiles
  - MD5 and LEAP 802.1x profiles using the Profile Wizard Common Profile Persistent feature
  - Persistent profile will be applied at system power up and after a user logs off

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Windows XP Welcome Screen and Fast User Switching

Windows XP Fast User Switching allows everyone to use a single computer as if it were their own. There is no need to log someone else off and have to decide whether to save another user's files. Instead Windows XP takes advantage of Terminal Services technology and runs each user session as a unique Terminal Services session, enabling each user's data to be entirely separated. (The additional memory overhead for each session is approximately 2 megabytes (MB) of RAM; however, this size does not account for any applications that may be running in the sessions. In order to run reliable multi-user sessions, a total of at least 128 MB of RAM is recommended.)

Fast user switching makes it easier for families to share a single computer. For example, if a mother uses the computer to work on finances and has to leave for a short period of time, her son can switch to his own account and play a game. The financial application is left running and open in the mother's account. All of this is done without logging off. Switching users is easy with the new Welcome screen easily customizable with pictures for each user who logs on to the computer.

Fast User Switching is enabled by default if you're using Windows XP Home Edition; Fast User Switching is also available on Windows XP Professional if you install it on a stand alone or workgroup-connected computer. If a computer running Windows XP Professional is added to a domain, then Fast User Switching option is not available.

Intel Administrator Tool Kit

The Intel(R) PROSet for Wireless Advanced Settings (System-Wide Options) can be remotely set and updated using a small file named swo.ini. The swo.ini is used to import System-Wide Options. It contains all of the System-Wide Options as settings, lists the purpose of each setting and the possible values for the settings. When the swo.ini is placed in the auto-import folder **Programs Files\Intel\PROSetWireless\PROSet\Import**, PROSet will automatically apply the settings from the swo.ini if any of the settings in the System-Wide Options are different from those of the swo.ini.

The swo.ini can also add, change, or remove the password from the System-Wide Options. If no password is set on the System-Wide Options when the swo.ini is imported, the settings will be applied from the swo.ini to the System-Wide Options including a password for the System-Wide Options if a password is included in the swo.ini. If there is a password on the System-Wide Options when the swo.ini is imported, the password in the swo.ini must match that of the System-Wide Options, otherwise no changes will be made**.** There are two fields in the swo.ini for passwords on the System-Wide Options: Old password and New password. The Old Password entry is used to match the current System-Wide Options password to allow for swo.ini changes. The New Password entry is used to add a password to the System-Wide Options when used by itself, or change the password of the System-Wide Options when used in conjunction with the Old Password entry.

There is a utility file named swo.exe which allows for the entry of an alphanumeric string which will be converted to an encrypted password when the Encrypt button is clicked. This encrypted password can be copied into either of the password entries of the swo.ini. Please see the contents of swo.ini for additional details on usage. The swo.ini and swo.exe files are located in the following path: <your drive letter> (e.g. **c:**) **\Drivers\PROSet\AdminKit**.

Common Profiles and User Based Profiles

There are two types of profiles that display in the Profiles list for connection to wireless networks:

- **Common Profiles:** A Common profile is accessible to all users of a wireless network. This profile can only be created and modified by a user with administrator privileges. Users with restricted user rights can only view the profile's contents in the Profiles list. A profile can be enabled as a Common profile in the Profile Wizard Advanced page under Advanced Profile Management. A Common profile can also be used with the Persistent Connect feature.
- **User Based Profiles:** These profiles are user created wireless profiles and are not accessible by other network users.

Administrator Privileges and Restricted Users

Your computer can be set up to allow or restrict users access to your computer. When using Common profiles some restrictions apply for non-administrator users.

- **Administrator privileges**: Administrators have complete and unrestricted access to the computer and domain. You must have Administrator privileges to create and modify Common profiles.
- **Restricted user**: Users can operate the computer but cannot install programs or change system settings. Restricted users cannot create or modify Common profiles.

Note: As shown below, when the Advanced Settings feature is enabled, it overrides the Restricted users right. Restricted users play a role only when this feature is unchecked.

Advanced Settings feature: **Switch to common and persistent profile management** (Checked)	Administrator users and Restricted users behave the same when this feature is checked (enabled). Profile Wizard: • **This profile can be used by all users (Common)** check box will be checked and disabled (cannot be unchecked) • **This profile will be used when no user is logged on (Persistent)** will be visible. The check box can be selected or cleared Network Page: • User Based profiles are not visible in the Profiles List • Edit, Add and Delete buttons are available for use with Common and Persistent profiles only

	• Connect button is not available for Persistent profiles but is available for Common profiles • Common and Persistent profiles can be prioritized in the Profile list	
Switch to common and persistent profile management (Unchecked)	**Administrators Users** Profile Wizard: • This profile can be used by all users (Common) check box is visible and can be selected and cleared • This profile will be used when no user is logged on (Persistent) is not visible Network Page: • Persistent profiles are not visible • Connect, Edit and Delete buttons are available for	**Restricted Users** Profile Wizard: • The (Common) check box is not accessible (grayed out) • The (Persistent Connect) check box is hidden • Buttons can only be used to view Common profiles contents • You can Edit all User Based profiles Network Page: • Persistent profiles are not visible • Add button can be used • Connect, Edit and Delete buttons are

	Common and User Based profiles • Common and Persistent profiles can be prioritized in the Profile list	available for User Based profiles • Connect and Properties button available for Common profiles • Common and Persistent profiles can be prioritized in the Profile list. Common profiles are also displayed.

Install and Uninstall the Intel(R) PROSet for Wireless Software

The first time the Intel(R) PROSet for Wireless software is installed, by default the Single Sign On Feature Set and the Pre-Logon Connect feature are not installed during the initial installation process. To install the Single Sign On Feature Set and Pre-Logon Connect feature use the Custom option during the installation process. The Single Sign On Feature Set can also be installed or uninstalled after Intel(R) PROSet for Wireless has been installed. Refer to Installing and Uninstalling Single Sign On Feature for instructions.

To install the Intel(R) PROSet for wireless software:

1. Insert the Installation CD in your CD drive.
2. Click **Install Software** on the Intel(R) PRO Network Connections screen.
3. Click **Next** on the Welcome to the InstallShield Wizard for Intel(R) PROSet for Wireless screen.
4. On the License Agreement screen, after reading the license agreement, select **I accept the terms in the license agreement** and click **Next**.
5. Select one of the following options and click **Next**.

    - **Typical:** This option installs the Intel(R) PROSet for Wireless utility without the Single Sign On Feature Set. Proceed to step 7.
    - **Custom:** This option allows you to install the Single Sign On Feature Set and choose which one of its options to install. Proceed to step 6.

6. Select one of the following features to install or uninstall:

    Single Sign On Feature Set: These features include Use Windows Logon, and Persistent Connect.

    - **Install:** Click **Single Sign On Feature Set**. Select This feature will be installed on local hard drive. Click **Next** and proceed to step 7. **Note:** Windows XP Fast Switching and the Welcome screen are disabled when the Single Sign On feature set options are installed.

    - **Uninstall:** Click **Single Sign On Feature Set**. Select **This feature will not be available**. A red x displays next to the option indicating that it will not be installed. Click **Next** and proceed to step 7. **Note:** Windows XP Fast Switching and the Welcome screen will be enabled when the Single Sign On feature set options are uninstalled.

    Pre-Logon Connect: This feature can be enabled or disabled in the Advanced Settings. **Note:** After installing this feature you must reboot the system.

    - **Install:** Click **Pre-Logon Connect**. Select This feature will be installed on local hard drive. Click **Next** and proceed to step 7. **Note:** Windows XP Fast Switching and the Welcome screen are disabled when the Single Sign On feature set options are installed.

    - Uninstall: Click **Pre-Logon Connect**. Select **This feature will not be available**. A red x displays next to the option indicating that it will not be installed. Click **Next** and proceed to step 7. **Note:** Windows XP Fast Switching and the Welcome screen will be enabled when the Single Sign On feature set options are uninstalled.

7. Click **Install**.
8. After the software is installed on your computer, click **Finish**. **Note:** If the **Pre-Logon Connect** feature was installed you must reboot the system.
9. Click **Close** to exit.

Installing and Uninstalling the Single Sign On Feature

The Single Sign On Feature Set and the Pre-Logon Connect feature are by default not installed during the initial software installation process. However, you can install or uninstall each of these features after Intel(R) PROSet for Wireless has been installed.

To install the Single Sign On Feature Set and the Pre-Logon feature after Intel(R) PROSet for Wireless has been installed:

1. Click **Start Settings >Control Panel > Add or Remove Programs >Intel(R) PROSet for Wireless**.
2. Select **Change**.
3. Click **Next** on the Welcome to the InstallShield Wizard for Intel(R) PROSet for Wireless screen.
4. Select **Modify** on the Program Maintenance screen and click **Next**.
5. To install or uninstall select one of the following options and click **Next**.

   Single Sign On Feature Set: These features include Use Windows Logon, and Persistent Connect.

   - **Install:** Click **Single Sign On Feature Set**. Select This feature will be installed on local hard drive. Click **Next** and proceed to step 6. **Note:** Windows XP Fast Switching and the Welcome screen are disabled when the Single Sign On feature set options are installed.

   - **Uninstall:** Click **Single Sign On Feature Set**.

Select **This feature will not be available**. A red x displays next to the option indicating that it will not be installed. Click **Next** and proceed to step 6. **Note:** Windows XP Fast Switching and the Welcome screen will be enabled when the Single Sign On feature set options are uninstalled.

Pre-Logon Connect: This feature can be enabled or disabled in the Advanced Settings. **Note:** After installing this feature you must reboot the system.

- **Install:** Click **Pre-Logon Connect**. Select This feature will be installed on local hard drive. Click **Next** and proceed to step 6. **Note:** Windows XP Fast Switching and the Welcome screen are disabled when the Single Sign On feature set options are
installed.

- **Uninstall:** Click **Pre-Logon Connect**. Select **This feature will not be available**. A red x displays next to the option indicating that it will not be installed. Click **Next** and proceed to step 6. **Note:** Windows XP Fast Switching and the Welcome screen will be enabled when the Single Sign On feature set options are uninstalled.

6. Click **Install**.
7. After the software is installed on your computer, click **Finish**. **Note:** If the **Pre-Logon Connect** feature was installed you must reboot the system.
8. Click **Close** to exit.

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Connecting to a Network using Intel(R) PROSet

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Wireless LAN Overview: Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

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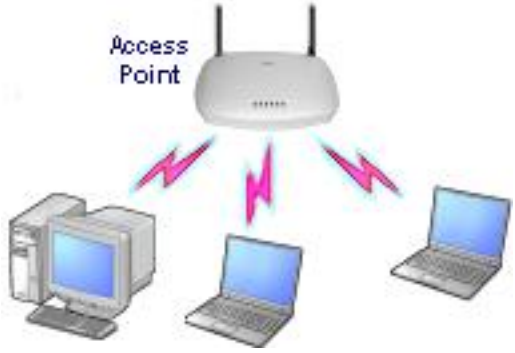
About Wireless LAN Technology

A wireless network connects computers without using network cables. Computers use radio communications to send data between each other. You can communicate directly with other wireless computers, or connect to an existing network through a wireless access point. When you set up your wireless adapter, you select the operating mode for the kind of wireless network you want. You can use your wireless adapter to connect to other similar wireless devices that comply with the 802.11 standard for wireless networking.

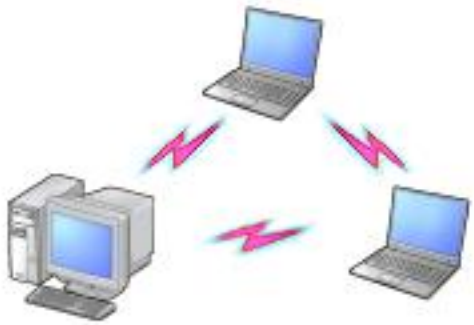
Choosing a Wireless LAN

Wireless LANs can operate with or without access points, depending on the number of users in the network. Infrastructure mode uses access points to allow wireless computers to send and receive information. Wireless computers transmit to the access point, the access point receives the information and rebroadcasts it to other computers. The access point can also connect to a wired network or

to the Internet. Multiple access points can work together to provide coverage over a wide area.



Peer-to-Peer mode, also called Ad Hoc mode, works without access points and allows wireless computers to send information directly to other wireless computers. Ad Hoc Mode is only supported in 802.11b and 802.11g networks. You can use Peer-to-Peer mode to network computers in a home or small office or to set up a temporary wireless network for a meeting.



Configuring a Wireless LAN

There are three basic components that must be configured for an 802.11 wireless LAN to operate properly:

- **Network Name:** Each wireless network uses a unique Network Name to identify the network. This name is called the Service Set Identifier (SSID). When you set up your wireless adapter,

you specify the SSID. If you want to connect to an existing network, you must use the name for that network. If you are setting up your own network you can make up your own name and use it on each computer. The name can be up to 32 characters long and contain letters and numbers.

- **Profiles:** When you set up your computer to access a wireless network, the wireless client manager creates a profile for the wireless settings that you specify. If you want to connect to another network, you can scan for existing networks and make a temporary connection, or create a new profile for that network. After you create profiles, your computer will automatically connect when you change locations.
- **Security:** The 802.11 wireless networks use encryption to help protect your data. Wired equivalent privacy (WEP) uses a 64-bit or 128-bit shared encryption key to scramble data. Before a computer transmits data, it scrambles the data using the secret encryption key. The receiving computer uses this same key to unscramble the data. If you are connecting to an existing network, use the encryption key provided by the administrator of the wireless network. If you are setting up your own network you can make up your own key and use it on each computer.
    - **Wi-Fi Protected Access (WPA)** is a security enhancement that strongly increases the level of data protection and access control to a WLAN. WPA mode enforces 802.1x authentication and key-exchange to strengthen data encryption. WPA utilizes its Temporal Key Integrity Protocol (TKIP). TKIP provides important data encryption enhancements that include a per-packet key mixing function, a message integrity check (MIC) named "Michael", an extended initialization vector (IV) with sequencing rules, and a also re-keying mechanism. Using these improvement enhancements, TKIP protects against WEP's known weaknesses.
    - **Cisco Client Extensions (CCX)** is a server and client 802.1x authentication via a user-supplied logon password. When a wireless access point communicates with a Cisco

LEAP-enabled RADIUS (Cisco Secure Access Control Server (ACS) server), Cisco LEAP provides access control through mutual authentication between client wireless adapters and the wireless network and provides dynamic, individual user encryption keys to help protect the privacy of transmitted data.

Identifying a Wireless Network

Depending on the size and components of a wireless LAN, there are many ways to identify a wireless LAN:

- **The Network Name or Service Set Identifier (SSID):** Identifies a wireless network. All wireless devices on the network must use the same SSID.
- **Extended Service Set Identifier (ESSID):** A special case of SSID used to identify a wireless network that includes access points.
- **Independent Basic Service Set Identifier (IBSSID):** A special case of SSID used to identify a network of wireless computers configured to communicate directly with one another without using an access point.
- **Basic Service Set Identifier (BSSID):** A unique identifier for each wireless device. The BSSID is the Ethernet MAC address of the device.
- **Broadcast SSID:** An access point can respond to computers sending probe packets with the broadcast SSID. If this feature is enabled on the access point, any wireless user can associate with the access point by using a blank (null) SSID.

Surveying the Site of Your Wireless LAN

Conducting a site survey for your wireless LAN is the most crucial step in the process of setting up a wireless network. It greatly reduces the amount of troubleshooting you will have to do once you have the

wireless LAN set up and ready for connection testing. To conduct a site survey, you will need the following tools:

- An access point (or laptop computer) that is set up to be the transmitter. It should be mounted near and at the same height as the designated location of your wireless LAN.
- A laptop that will act as the mobile receiver. It must contain your site survey software.
- An area or building map, which will be used to plot the strength of your signals.

Once you have the tools you need, you are ready to survey the inside of the building. Launch the site survey software on the mobile receiver laptop and carry it around in the intended wireless LAN area to test the signal strength. Be sure to also check the signal strength of each intended access point location. If you encounter problems while surveying the site, make sure your transmitter laptop is not located on a wall containing metal, such as an air-conditioning duct, which will interfere with the range of your signal. Simply move the transmitter and test the signal strength again. For users to have seamless coverage when moving from access point to access point, the signal levels at each point must overlap. There is software available that will seamlessly hand off changing signal levels from one access point to another.

Your building's infrastructure can sometimes interfere with the microwave signal, but finding the location and cause of the interference will allow you to figure out the best place to mount your access points for optimal area coverage. Microwave signals travel in all directions, which means there is one access point for a multi-floor building. However, the range is highly dependent on the material used to construct the flooring, especially metal materials. Once your signal strength is strong inside the building, you are ready to check the strength outside the building. To do so, simply carry the mobile receiver laptop as far down the street or around the building as you can go without losing significant signal strength. If possible, you

should be aware of the types of networks being used by the companies on the floors above and below you, so that you can work together in harmony. With wireless networks, security is very important and if you communicate with those around you, you are better prepared to select the right channels, as well as the best location for access points.

Factors Affecting Range

Although access points can transmit signals up to 60 feet away in an area with many walled barriers or as much as 500 feet away in a large open area, the range is affected by the following factors:

- Building materials, such as steel and drywall, can shorten the range of the radio signals.
- Physical layout of the area can interfere with the signals and cause them to be dropped.
- Electronic noise from cell phones, microwave ovens, or other devices on the same frequency can interfere with the transmission of the signals.
- Range is inversely proportional to data rate, so the faster that the signals are sent, the less distance they will travel.

Taking these factors into consideration when you survey the site for your WLAN is key to providing all of your users with undisturbed mobile connectivity. Using multiple access points will, of course, reduce the impact of these factors if your area has dividing walls throughout.

What is a Site Survey?

A site survey is an in-depth examination and analysis of a proposed wireless LAN site. The purpose of a site survey is to determine the

number of access points needed, the types of antennas needed, and the best placement for those access points and antennas. Although the goal of a site survey is simple, the means of arriving at that goal are not. Some of the steps involve taking measurements, but most involve experience, trial and error, and a little guesswork rather than numbers and figures. When to Perform a Site Survey Intel® recommends that you perform a site survey prior to installing a wireless LAN. Site surveys are especially important when:

- **You are installing a new site:** Evaluate the placement of the access points and antennas throughout the proposed site.
- **You are changing an existing site:** When modifying or extending an existing network structure, re-evaluate the placement of the access points and antennas. If you need a different level of coverage in some areas, you may need to move, replace, or supplement access points and antennas.
- **You are physically changing the site:** Remodeling may introduce new sources of interference, such as motors and metal structures within the coverage area of the access point, even if it does not directly affect the sites where the access points are located.

Elements of an Effective Site Survey

An effective site survey requires four elements. Failure to commit the appropriate time, money, and energy to accomplish a proper site survey in advance may result in greater expenditures of money and time later, when problems arise that require repeated adjustments to the wireless configuration. The three elements of an effective site survey are:

1. **Examine the network usage problems solved by the wireless LAN.**
   How many clients need a wireless LAN connection? What areas of the site require wireless LAN connectivity? How many hours

each day is wireless LAN connectivity required? Which locations are likely to generate the largest amount of data traffic? Where is future network expansion most likely?

2. **Study blueprints of the proposed wireless LAN site.**
   A site blueprint provides a map of the site as well as the location of objects, such as walls, partitions, and anything else that could affect the performance of a wireless LAN. Examining the site blueprint prior to conducting the physical walk-through helps you identify areas in which wireless equipment is likely to perform well and areas where it is not. Many obstructions are not readily visible and, in some cases, a room originally built for a specific purpose, such as a radiology lab, might have been converted into something completely different, such as a conference room. The blueprint may also show areas proposed for future building expansion. To prepare for the next step of the site survey, mark possible wireless device locations on the blueprint and refer to the marked blueprint during the physical walk-through and inventory.
3. **Conduct a physical walk-through and inventory.**
   The primary purpose of the physical walk-through is to document any items or materials near a proposed device location that may interfere with reception or transmission and affect network performance. Document stock and inventory levels, current environmental conditions and any materials that may interfere with the wireless LAN.

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Trademark and Disclaimers

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Troubleshooting: Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

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Troubleshooting

LAN Utility Conflict Message

Message dialog "Another wireless LAN utility is communicating with the Intel(R) PRO/Wireless LAN adapter. To avoid conflicts, Intel(R) PROSet for Wireless has temporarily disabled its Profile Management features" is displayed. Refer to Enabling Intel(R) PROSet for Wireless to manage Your Wireless Connections for information.

Using a Profile with an incorrect WEP Encryption Key

When connected to an access point using a profile with an incorrect WEP key encryption, the task tray icon and the General page will both indicate good signal strength and that you are associated with the AP. However, when you attempt to send data to the AP using this profile, because of the incorrect WEP key encryption, authentication cannot be established to acquire an IP address from the AP to allow data transfer.

Refer to the following WEP encryption and authentication settings.

Open Authentication with an incorrect WEP 64 or 128-bit encryption key:

- A profile with an incorrect WEP encryption key will allow the wireless adapter to associate

with the access point.
- No data transfer

Open Authentication with no WEP encryption:

- Allows association to an access point
- Data transfer is allowed

Shared Authentication:

- Associated to an AP always allows data transfer.

Problems with installation

Windows does not detect the wireless adapter:

1. Remove and re-install the adapter.
2. Uninstall and reinstall the adapter's drivers.

Users are dropped from the wireless network

Suggested causes and solutions:

- Find out if a person or workgroup moved or if the building has been rearranged.
- If two or more users are seated too close to each other, performance can suffer. Instruct your users to space themselves a small distance apart to keep receivers from being overloaded.
- Delivery trucks with very large metal sides can affect performance by reflecting destructive signals back into a building. If you have an installation that includes a shipping dock, check to see if the problem coincides with the arrival of large trucks.
- Personal “systems” can also interfere with your network. Wireless speakers, cordless earphones, some Bluetooth devices, and similar systems can be the source of an infrequent but hard to find the problem. Some systems do not conform to wireless regulations. Shut off suspect devices or remove them from the area.
- If possible, remove and reinstall your new software. Conflicts with other resident software packages are always a possibility, and they are not always the fault of the newest addition. Sometimes just starting over fixes the problem.
- Swap units around. Does your problem follow the changed units, or is it unique to a specific location? If it follows the product, the swapped unit could be damaged, or improperly configured. If the problem stays with the location, try to find out what is different about that particular room or area.

Range decreases as data rate increases

This is a normal condition. Range is inversely proportional to data rate: the faster the data, the shorter the range. This has to do with the modulation technology used. Very fast data rates require extremely complex signal waveforms, where even minor distortions can result in data

errors. Slower data rates are much more tolerant, and consequently will get through even in the presence of some amount of noise, interference, distortion and echo.

Signal doesn't pass through a short or thin wall

Range is highly dependent on the physical environment. In a line-of-sight location, with elevated and calibrated antennas, range predictions are quite accurate. This is not true in a “typical” office building, where the walls may be simple drywall (which is almost transparent to microwaves), or could be plaster with metal underneath. Most sites are somewhere between these two extremes, and consist of a mixture of surfaces. You can’t tell what is inside a wall by just looking at it, and we can’t tell you exactly what distance you will achieve. Consider published range information to be typical, average, common or usual. Do not expect it to be exact.

Signal strength drops when a cell phone is used in the area

Range also depends on the electronic environment. If other equipment that could cause interference is nearby, the range of your transceiver could vary widely, and could change suddenly when the other equipment activates. This is particularly true for 802.11b installations, which share their frequencies with microwave ovens, cordless phones, wireless hi-fi speakers, electronics toys and similar devices. Try to keep your system away from other transmitters, and from other sources of electrical noise, such as large motors, spot welders, and similar “electronically noisy” devices.

Range is shorter than it should be

Repeat some tests late in the evening, or on a weekend, when there may be less interference. However, some users leave their networks turned all the time so this test is not foolproof. By all means, try more than one channel. Your range problem may just be a nearby user whose system uses your present test channel.

Interference from fluorescent lights

If you mount an access point close to fluorescent light fixtures, the lamp glow appears constant, but inside the lamp tube, ionization appears and disappears 120 times a second. This can modulate or “chop” an incoming signal and interfere with reception.

When too much range is undesirable

Too much range is not necessarily a good thing. At first it would appear that you would want as much range as possible, but with the increase in range comes an increase in interference potential, as your unit hears not only your other units but also manages to hear the systems of other companies up and down the street. If you have a large installation, you will also wind up with more than one access point using the same channel. If a remote unit hears two or more access points, this will slow the network.

Help Prevent access to wireless networks from outside the building

Excess *transmit* range presents a special reverse problem. For example, putting an access point adjacent to a second floor bay window invites anyone with the right software on the street below to pick up and enjoy all network transmissions. We discuss some possible solutions to this problem further on.

Problems with Network Connectivity

If you cannot connect to the wireless network, try the following:

Check Network Settings

1. From the **General** page, check that the Network Name (SSID) and operating mode are correct. If the laptop is configured for ad hoc networking, make sure that the channel is correct.
2. To correct these settings, click the **Networks** tab.
3. Select the profile being used.
4. Click the **Edit** button and make the changes.

Check Security Settings

1. From the **General** page, check that the security settings are correct.
2. To correct the security settings, click the **Networks** tab.
3. Select the profile being used.
4. Click the **Edit** button.
5. Click the **Security** tab. Make sure that the settings for WEP encryption are correct.

Checking Adapter Statistics

Adapter Statistics

If the adapter is communicating with an access point (infrastructure mode) or other computers in peer-to-peer mode, click the **Statistics** button in the Troubleshooting tab to display the current information about how well the adapter is transmitting and receiving information.

Before calling Customer Support

Make a note of the following answers before calling customer support:

- From the **General** tab, view the adapter's connection details. Check that it is associated with an access point, and the quality and strength of the signal.
- From the **General** page, click the **Details** button and check what revision of software and hardware or other LAN software are you running?
- How many remote units do you have talking to each access point?
- What channels are you using, and how are they dispersed?
- How much coverage overlap is there between access points?
- How high above the floor are the access points mounted?

- What other electronic equipment is operating in the same band?
- What construction materials are used in wall and floors?

Transmit Data Rates and Access Points

To achieve the optimum transmit data rate it is important to identify the type of access point that the wireless adapter is connecting to. The Advanced Settings provide the mode selections to optimize your operating environment.

Infrastructure Mode

The following describes how the wireless preference modes operate using Infrastructure mode. The adapter can operate in three modes:

- **Connect to 802.11g and 802.11b**: This is the default setting. The adapter will search for either 11g or 11b access points using data transmit rates of 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps. This connection defaults to 11g access points. The Available Networks list displays all 11b and 11g access points.

- **Connect to 802.11g only**: The adapter will search for a 11g access point only using data transmit rates of 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps. The Available Networks list displays only 11g access points.

- **Connect to 802.11b only**: The adapter will search for the best 11b and 11g access points using data rates of 1, 2, 5.5, or 11 Mbps. The Available Networks list displays any 11b and 11g access point.

Access Point and Client Combinations

The following table shows compare the adapter wireless preference mode, and the transmit date rates using a specific type of access point. The wireless mode (Modulation type) options determine the discovered access points displayed in the Scan list (Available Networks dialog).

11b Access Point

Wireless Mode	Scan List	Connect	Transmit Data Rates
11g and 11b	Yes	Yes	1, 2, 5.5, or 11 Mbps
11b only	Yes	Yes	1, 2, 5.5, or 11 Mbps
11g only	No	No	None

11g (11g and 11b) Access Point

Wireless Mode	Scan List	Connect	Transmit Data Rates

11g and 11b	Yes	Yes	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps*.
11b only	Yes	Yes	1, 2, 5.5, or 11 Mbps
11g only	Yes	Yes	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps*.

11g (11g only mode) Access Point**

Wireless Mode	Scan List	Connect	Transmit Data Rates
11g and 11b	Yes	Yes	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps*.
11b only	No	No	None
11g only	Yes	Yes	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps*.

Note: (*) depends on the signal strength and quality. Use RTS/CTS (Default setting) to avoid collisions in mixed mode environments where the 11g and 11b clients cannot hear each other. Use CTS-to-self to improve performance in mixed mode environments where 11g and 11b clients are in close proximity and can hear each other.

Note: (**) Because 11b clients cannot connect to this access point mixed mode protection (RTS/CTS or CTS-to-self) is not used.

Ad Hoc Mode

The following summarizes how the modulation settings operate using ad hoc mode.

Ad Hoc Initiator	Ad Hoc Joiner	Action	Comments
11b-only	11b-only	Basic rates (1, 2, 5.5, or 11 Mbps)	11b-only
	11g-only	Down scale basic rates, turn on protection* (1, 2, 5.5, or 11 Mbps)	11b and 11g
	11b and 11g	Basic rates (1, 2, 5.5, or 11 Mbps)	11b and 11g
11g-only	11b-only	Does not apply to Intel(R) PRO/Wireless 2200BG adapter. For other cards - down scale basic rates, turn on protection* (1, 2, 5.5, or 11 Mbps)	11b and 11g
	11g-only	Basic rates (1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps)	11g-only
	11b and 11g	Upscale) basic rates (1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps)	11g-only
11b and 11g	11b-only	Basic rates, turn on protection* (1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps)	11b and 11g

	11g-only	Downscale basic rates, turn on protection* depends on initiator (1, 2, 5.5, or 11 Mbps)	11b and 11g
	11b and 11g	Basic rates, turn on protection* depends on initiator (1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps)	11b and 11g

Note: (*) See Viewing Adapter Advanced Settings in Windows - Use "RTS/CTS enable" (Default setting) to avoid collisions in mixed mode environments where the 11g and 11b clients cannot hear each other. Use "CTS-to-self enable" to improve performance in mixed mode environments where 11g and 11b clients are in close proximity and can hear each other.

Ad Hoc Transmit Rates Overview

The following describes how the wireless preference modes operate using Ad Hoc mode. The adapter can operate in three modes:

- **Connect to 802.11g and 802.11b:** mixed mode (default setting). The adapter will search for either 11g or 11b access points using data transmit rates of 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps. This connection defaults to 11g access points. The Available Networks list displays all 11b and 11g access points.
- **Connect to 802.11g only:** The adapter will search for a 11g access point only using data transmit rates of 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps. The Available Networks list displays only 11g access points.
- **Connect to 802.11b only:** The adapter will search for the best 11b and 11g access points using data rates of 1, 2, 5.5, or 11 Mbps. The Available Networks list displays any 11b and 11g access point.

When different modulation settings are used in ad hoc mode, they influence the computer in the following ways:

- It determines to which ad hoc network we are allowed to connect to.
- It determines whom we show in our scan list.

A station in an ad hoc network constantly adapts itself to the current situation in the ad hoc network as far as other stations capabilities are concerned. Updating of the supported transmit data rates is done in the following way:

Only the basic rates change. Supported rates of a station never change. At all times the basic rates advertised by stations in an ad hoc network should be the same, and should reflect the set of basic rates supported by every station in this ad hoc network. Since basic rates is the actual information used by a station to decide if it can join the ad hoc network then this is enough to determine if a station can or cannot connect to this ad hoc network.

Mixed Mode

Mixed mode stations (802.11g and 802.11b) are able to join any ad hoc network they hear.

Joining an ad hoc network

- Join an 11b ad hoc network only – keep the supported rates and update the basic rates to fit the ad hoc network you are joining. Protection (RTS/CTS or CTS-to-self) is on.
- Join an 11g ad hoc network only – keep the supported rates and up scale the basic rates advertised in the beacons. Note that this is not good because the station ceases being a “mixed mode” and become an 11g only station.
- Join an 11a and 11b ad hoc network only – keep the supported rates and update the basic rates to fit the ad hoc network you are joining.

Initiating an ad hoc network

When initiating a mixed mode ad hoc network the default rates for mixed mode is: 1, 2, 5.5, 11, 6, 12, 18, 24, 36, 48 and 54 Mbps with rates 1, 2 as basic. When other stations join in, the basic rates are down scaled if required. Protection is on when 11b station are joining.

11b only mode

Joining an ad hoc network

In this mode you can only join an ad hoc network that advertises only basic data rates of 1, 2, 5.5, or 11 Mbps. So, the list of potential ad hoc networks will include 11b and 11b and 11g, but not 11g. Supported rates remain unchanged, and basic rates are adapted to match those advertised by the ad hoc network which you are joining in the beacons.

Initiating an ad hoc network

When initiating an 11b only ad hoc network, the following rates 1, 2, 5.5 and 11 Mbps, with 1 and 2 as basic. As other stations join in they down scale their basic rates if required. Protection (RTS/CTS or CTS-to-self) is on.

11g only mode

Initiate an ad hoc network as an 11g only (1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps). Support joining and down scaling in the same way as in Mixed mode. When initiating such an ad hoc network the advertised rates are: 1, 2, 5.5, 6, 11, 12, 18, 24, 36, 48 and 54 with 1, 2, 5.5, 6, 11, 12 and 24 Mbps as basic.

11g only stations are able to join any ad hoc network they hear.

Joining an ad hoc network

The basic rates in this case are taken from the beacons.

- Join an 11b ad hoc network only – keep the supported rates and down scale the basic rates to fit the ad hoc network you are joining. Protection (RTS/CTS or CTS-to-self) is on.
- Join an 11g ad hoc network only – keep the supported rates and adopt the basic rates advertised in the beacons.
- Join an 11a and 11b ad hoc network only – keep the supported rates and update the

basic rates to fit the ad hoc network you are joining.

Initiating an ad hoc network

When initiating an 11g only ad hoc network the advertised rates are: 1, 2, 5.5, 6, 11, 12, 18, 24, 36, 48 and 54 Mbps with 1, 2, 5.5, 6, 11, 12 and 24 Mbps as basic.

When other stations join in, the basic rates are down scaled if required. Protection (RTS/CTS or CTS-to-self) is on when 11b station is joining.

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Specifications: Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

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Specifications

Form Factor	Mini PCI Type 3B
Dimensions	Width 2.34 in x Length 1.75 in x Height 0.20 in (59.45 mm x 44.45 mm x 5 mm)
Weight	0.7 oz. (12.90 g.)
Antenna Interface Connector	Hirose U.FL-R-SMT mates with cable connector U.FL-LP-066
Dual Diversity Antenna	On-board dual diversity switching
Connector Interface	124-pin SO-DIMM edge connector
Operating Temperature	0 to +70 degrees Celsius
Humidity	50 to 85% non-condensing

Type

Frequency band	2.400 - 2.472 GHz (US) 2.400 - 2.4835 GHz (Japan) 2.400 - 2.4835 GHz (Europe ETSI)

Frequency Modulation

Modulation	OFDM with BPSK, QPSK, 16QAM, 64QAM, DBPSK, DQPSK, CCK
Channels	Full 14 channel support
Data Rates	1, 2, 5.5, 6, 9, 11, 12, 24, 36, 48 and 54 Mbps
Indoor Range	100 ft (30 m) @ 11 Mbps / 300 ft (90 m) @ 1 Mbps

Outdoor Range	400 ft (120 m) @ 11 Mbps / 1500 ft (460 m) @ 1 Mbps

Power

Transmit Output Power	16 dBm (typical)
Adapter Power Consumption	
Transmit	1.45 W
Receive	0.85 W
Idle	60 mw
Disable	50 mw
Voltage	3.3 V

General

Operating Systems	Windows XP, 2000
Wi-Fi Alliance certification	Wi-Fi® certification for 802.11b and 802.11g
WLAN Standard	IEEE 802.11g and 802.11b
Architecture	Infrastructure or ad hoc (peer-to-peer)
Security	WPA, Cisco CCX v2.0, LEAP, PEAP, TKIP, EAP-TLS, EAP-TTLS, AES (128-bit), WEP 128-bit and 64-bit.
Product Safety	UL, C-UL, CB (IEC 60590)

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Glossary: Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

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Numerical **A** **B** **C** **D** **E** **F** **I** **K** **M** **O** **P** **R** **S**
T **U** **W**

Numerical

802.11: 802.11 refers to a family of specifications developed by the IEEE for wireless LAN technology. 802.11 specifies an over-the-air interface between a wireless client and a base station or between two wireless clients and provides 1 or 2 Mbps transmission in the 2.4 GHz band using either frequency hopping spread spectrum (FHSS) or direct sequence spread spectrum (DSSS).

802.11a: The 802.11a standard specifies a maximum data transfer rate of 54Mbps and an operating frequency of 5GHz. The 802.11a standard uses the Orthogonal Frequency Division Multiplexing (OFDM) transmission method. Additionally, the 802.11a standard supports 802.11 features such as WEP encryption for security.

802.11b: The 802.11b standard specifies a maximum data transfer rate of 11Mbps, an operating frequency of 2.4GHz, and WEP encryption for security. 802.11b networks are also referred to as Wi-Fi networks.

802.11g: The 802.11g standard specifies a maximum data transfer rate of 54Mbps, an operating frequency of 2.4GHz, and WEP

encryption for security. 802.11g networks are also referred to as Wi-Fi networks.

802.11x: 802.11x is the IEEE Standard for Port-Based Network Access Control. This is used in conjunction with EAP methods to provide access control to wired and wireless networks.

A

Access Point: A device that serves as a communications hub for wireless clients and provides a connection to a wired LAN.

Advanced Encryption Standard (AES): A federal information-processing standard, supporting 128-, 192-, and 256-bit keys.

B

Basic Service Set Identifier (BSSID): A unique identifier for each wireless client on a wireless network. The BSSID is the Ethernet MAC address of each adapter on the network.

Bit Rate: The total number of bits (ones and zeros) per second that a network connection can support. Note that this bit rate will vary, under software control, with different signal path conditions.

Bluetooth: An incompatible, very short-range lower speed communications system (PAN), developed first in Europe as a "cable replacement" for printers and similar peripheral connections. Its usage has expanded to include cordless earphones and similar devices. It uses the 2.4 GHz ISM band, and "co-exists" with 802.11b. Here the term, "co-exist" means that not all researchers agree on the amount of mutual interference generated when both systems operate in the same location.

Broadcast SSID: Used to allow an access point to respond to clients

on a wireless network by sending probes.

Allow Fast Roaming (CCKM): Select the Fast Roaming (Cisco Centralized Key Management
(CCKM)) check box to enable the client wireless adapter for fast secure roaming.

C

CCX: Cisco Compatible Extensions.

Cisco Centralized Key Management (CCKM): When a wireless LAN is configured for fast reassociation, a LEAP enabled client device can roam from one access point to another without involving the main server. Using Cisco Centralized Key Management (CCKM), an access point configured to provide Wireless Domain Services (WDS) takes the place of the RADIUS server and authenticates the client without perceptible delay in voice or other time-sensitive applications. The WDS access point maintains a cache of credentials for CCKM-capable client devices on the wireless LAN. When a CCKM-capable client roams from one access point to another, the client sends a reassociation request to the new access point, and the new access point relays the request to the WDS access point. The WDS access point forwards the client's credentials to the new access point, and the new access point sends the reassociation response to the client. Only two packets pass between the client and the new access point, greatly shortening the reassociation time. The client also uses the reassociation response to generate the unicast key.

D

Data Rate (Information Rate): Not all bits carry user information. Each group (packet) of bits contains headers, trailers, echo control, destination information, and other data required by the transmission protocol. It is important to understand the difference between bit rate

and data rate, since the overhead information may consume more than 40% of the total transmission. This difference is common to many such data systems, including Ethernet.

Direct-Sequence Spread Spectrum (DSSS) and Frequency-Hop Spread Spectrum (FHSS): Two incompatible technologies used in radio transmission.

Dynamic IP Address: An IP address that is automatically assigned to a client station in a TCP/IP network, typically by a DHCP server. Network devices that serve multiple users, such as servers and printers, are usually assigned static IP addresses.

E

Extensible Authentication Protocol (EAP): An IETF standard that establishes an authentication protocol for network access. Many authentication methods, including passwords, certificates, and smart cards, work within this framework.

EAP-TLS: A type of authentication method using the Extensible Authentication Protocol (EAP) and a security protocol called the Transport Layer Security (TLS). EAP-TLS uses certificates which use passwords. EAP-TLS authentication supports dynamic WEP key management.

EAP-TTLS: A type of authentication method using the Extensible Authentication Protocol (EAP) and Tunneled Transport Layer Security (TTLS). EAP-TTLS uses a combination of certificates and another method, such as passwords. It is more secure than MD5 authentication, which uses passwords, and less secure than EAP-TLS authentication, which exclusively uses certificates. EAP-TTLS authentication supports dynamic WEP key management.

Encryption: Scrambling data so that only the authorized recipient can

read it. Usually a key is needed to decrypt the data.

Extended Service Set IDentifier (ESSID): A type of unique identifier applied to both the AP and the wireless PC Card that is attached to each packet. This allows the AP to recognize each wireless client and its traffic.

F

Firewall: A firewall is a set of related programs, located at a network gateway server, that protects the resources of a network from users from other networks.

Frequencies: Strike a piano key and you generate a tone. Pick up the tone with a microphone and your tone turns in to a "vibrating" or "cycling" electronic signal. The rate of vibration depends on the key struck. In electronics we refer to this rate of vibration as the number of "cycles per second." The formal term for this value is Hertz. As we move up in rate, such as in the Broadcast Band, we can use Kilohertz (KHz) to represent 1,000 Hz, or Megahertz (MHz) to represent 1,000,000 Hz. Continuing much further upward, we finally reach 1,000,000,000 Hz, which we can fortunately shorten to a Gigahertz (GHz). These frequencies are the home of both 802.11a (5 GHz) and 802.11b (2.4 GHz).

I

Independent Basic Service Set Identifier (IBSSID): Used to identify a wireless network configured to allow each wireless client to communicate directly with each other without an access point.

Independent Network: A network that provides (usually temporarily) peer-to-peer connectivity without relying on a complete network infrastructure.

Infrastructure Network: A wireless network centered around an access point. In this environment, the access point not only provides communication with the wired network but also mediates wireless network traffic in the immediate neighborhood.

Institute of Electrical and Electronics Engineers (IEEE): An organization involved in setting computing and communications standards.

ISM Bands: A series of frequency bands, set aside by the FCC for Industrial, Scientific and Medical applications. Users of these bands operate equipment on a shared basis, meaning that they must expect, and accept interference from other legal users. Products manufactured for ISM Band use must be approved by the FCC, but the user does not have to be licensed. In addition to WLAN, ISM bands support cordless phones, microwave ovens, baby monitors, toys, ham radio transceivers, and other wireless services.

K

Kerberos: An authentication system enabling protected communication over an open network using a unique key called a ticket.

M

Media Access Control (MAC) Address: A hardwired address applied at the factory. It uniquely identifies network hardware, such as a wireless PC Card, on a LAN or WAN.

Microcell: A bounded physical space in which a number of wireless devices can communicate. Because it is possible to have overlapping cells as well as isolated cells, the boundaries of the cell are established by some rule or convention.

Microwave: Technically, the term describes any frequency above 1.0 GHz. Unfortunately the advertising industry has contorted this meaning considerably. In our discussion we will stick to the technical definition.

Multipath: The signal variation caused when radio signals take multiple paths from transmitter to receiver.

O

Orthogonal Frequency Division Multiplexing (OFDM): A modulation technique for transmitting large amounts of digital data over radio waves. 802.11a uses OFDM, as will 802.11g.

P

Peer-to-Peer Mode: A wireless network structure that allows wireless clients to communicate with each other without using an access point.

Personal Area Network (PAN): A personal area network, or PAN, is a networking scheme that enables computing devices such as PCs, laptop computers, handheld personal computers, printers and personal digital assistants (PDAs) to communicate with each other over short distances either with or without wires.

Preamble: A preliminary signal transmitted over a WLAN to control signal detection and clock synchronization.

R

Radio Frequency (RF) Terms (GHz, MHz, Hz): The international unit for measuring frequency is Hertz (Hz), which is equivalent to the older unit of cycles per second. One Mega-Hertz (MHz) is one million Hertz. One Giga-Hertz (GHz) is one billion Hertz. For reference: the standard

US electrical power frequency is 60 Hz, the AM broadcast radio frequency band is 0.55 -1.6 MHz, the FM broadcast radio frequency band is 88-108 MHz, and microwave ovens typically operate at 2.45 GHz.

Range: The distance over which a given system can communicate.

RC4: An encryption algorithm designed at RSA Laboratories; specifically, a stream cipher of pseudo-random bytes that is used in WEP encryption.

Remote Authentication Dial-In User Service (RADIUS): An authentication and accounting system that verifies users' credentials and grants access to requested resources.

Roaming: Movement of a wireless node between two microcells. Roaming usually occurs in infrastructure networks built around multiple access points.

S

Service Set Identifier (SSID): Used to identify clients on a wireless network.

Shared key: An encryption key known only to the receiver and sender of data.

Site Survey: A process where you set up one transceiver in a fixed location, and then use another unit to plot the field strength of the first unit’s transmitted signal. By moving the transmitter around, and repeating the plots, you can develop a plan as to the best locations for access points. You will also identify dead zones and other areas in need of special attention. This can be a long, slow process, but it beats ripping up an unsatisfactory installation and starting over. These tests require special software commands. Refer to your manual for

specific instructions. If you have a very large, or unusually complex installation situation, you might want to consider calling in professionals to do your survey. We are not permitted to suggest installer names, but you can check your yellow pages or similar sources for likely candidates.

Static IP Address: A permanent IP address that is assigned to a node in a TCP/IP network.

T

Transmission Control Protocol (TCP): A method (protocol) used with the IP (Internet Protocol) to send data in the form of message units between network devices over a LAN or WAN. The IP carries the delivery of the data (routing), and TCP keeps track of the individual units of data (called packets) that a message is divided into for delivery over the network.

Transmission Control Protocol/Internet Protocol (TCP/IP): The basic communication language or set of protocols for communications over a network (developed specifically for the Internet). TCP/IP defines a suite or group of protocols and not only TCP and IP.

Transceiver: A commonly used term that describes a combination transmitter and receiver. Both 802.11a and 802.11b devices would be properly described as data transceivers.

U

UNII Bands: Unlicensed National Information Infrastructure. In contrast to the ISM bands, these are a group of frequency bands set aside by the FCC for WLAN type communications only. Users must accept interference from other legal WLAN users, but the other sources of interference problems are, or legally should be, missing.

W

WEP64 and WEP128: Wired Equivalent Privacy, 64 bit and 128 bit (64 bit is sometimes referred to as 40 bit) encryption protocol. This is a low-level encryption technique designed to give the user about the same amount of privacy that he would expect from a LAN. It is extremely important to understand that WEP is not some CIA-proof supercode! It performs as intended, giving the user a simple level of data security and protection from casual electronic eavesdropping. Use of the 128 bit option at all possible times is recommended. Remember that 802.11 devices transmit (broadcast) in all directions, and that it is possible, with very complex software, to copy and decode WEP transmissions. The task is not trivial, but it is possible. If your data is extremely sensitive, you should consider some form of secondary protection, such as strong passwords and an additional level of encryption. Suitable software packages are available from reputable suppliers. Although not intended by the original architects, WEP also helps prevents unauthorized access to your system by an outsider. Hackers have been known to access systems from outside a building, and to then to access the Web for a leisurely session, all at the system owner’s expense.

Wide Area Network (WAN): A wide area network (WAN) is a voice, data, or video network that provides connections from one or more computers or networks within a business to one or more computers or networks that are external to such business.

Wireless: A microwave transceiver system.

Wireless LAN (WLAN): Wireless LAN is a type of local-area network that uses high-frequency radio waves rather than wires to communicate between nodes. WLAN is a flexible data communication system used as an alternative to, or an extension of a wired LAN.

Wireless Node: A user computer with a wireless network interface

card (adapter).

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Customer Support: Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

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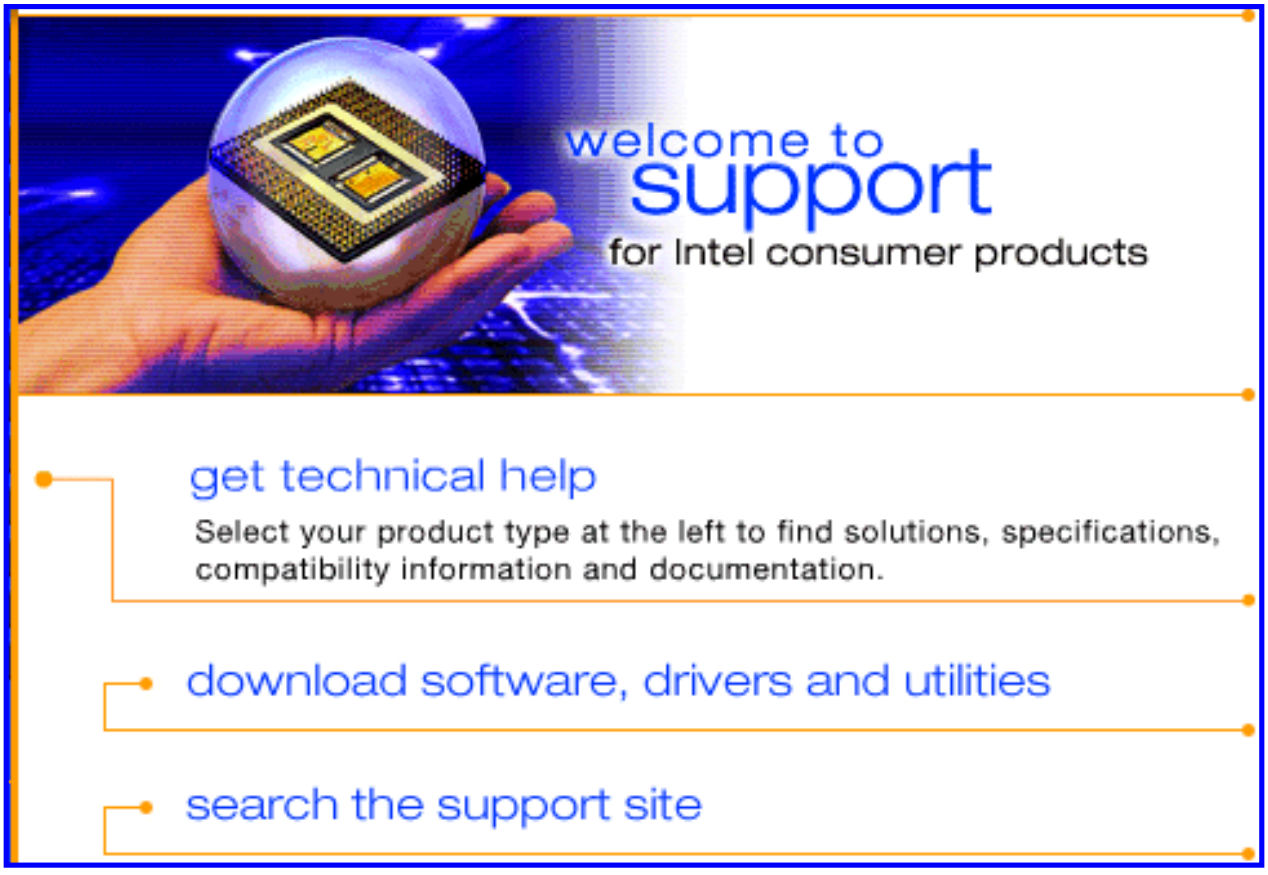

Intel support is available online or by telephone. Available services include the most up-to-date product information, installation instructions about specific products, and troubleshooting tips.

Online Support

Technical Support: http://support.intel.com

Network Product Support: http://www.intel.com/network

Corporate Web Site: http://www.intel.com

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Regulatory Information: Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

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Information for the user

Intel(R) PRO/Wireless 2200BG Network Connection adapter (model WM3B2200BG)

Safety Notices

The FCC with its action in ET Docket 96-8 has adopted a safety standard for human exposure to radio frequency (RF) electromagnetic energy emitted by FCC certified equipment. The Intel(R) PRO/Wireless 2200BG adapter meets the Human Exposure limits found in OET Bulletin 65, 2001, and ANSI/IEEE C95.1, 1992. Proper operation of this radio according to the instructions found in this manual will result in exposure substantially below the FCC's recommended limits.

The following safety precautions should be observed:

- Do not touch or move antenna while the unit is transmitting or

receiving.

- Do not hold any component containing the radio such that the antenna is very close or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Do not operate the radio or attempt to transmit data unless the antenna is connected; if not, the radio may be damaged.
- Use in specific environments:
  - The use of wireless devices in hazardous locations is limited by the constraints posed by the safety directors of such environments.
  - The use of wireless devices on airplanes is governed by the Federal Aviation Administration (FAA).
  - The use of wireless devices in hospitals is restricted to the limits set forth by each hospital.
- Antenna use:
  - In order to comply with FCC RF exposure limits, low gain integrated antennas should be located at a minimum distance of 20 cm (8 inches) or more from the body of all persons.
  - High-gain, wall-mount, or mast-mount antennas are designed to be professionally installed and should be located at a minimum distance of 30 cm (12 inches) or more from the body of all persons. Please contact your professional installer, VAR, or antenna manufacturer for proper installation requirements.
- Explosive Device Proximity Warning (see below)
- Antenna Warning (see below)
- Use on Aircraft Caution (see below)
- Other Wireless Devices (see below)
- Power Supply (Access Point) (see below)

Explosive Device Proximity Warning

 **Warning:** Do not operate a portable transmitter (such as a wireless network device) near unshielded blasting caps or in an

explosive environment unless the device has been modified to be qualified for such use.

Antenna Warnings

 **Warning:** To comply with the FCC and ANSI C95.1 RF exposure limits, it is recommended for the Intel(R) PRO/Wireless 2200BG adapter installed in a desktop or portable computer, that the antenna for this device be installed so as to provide a separation distance of al least 20 cm (8 inches) from all persons and that the antenna must not be co-located or operating in conjunction with any other antenna or radio transmitter. It is recommended that the user limit exposure time if the antenna is positioned closer than 20 cm (8 inches).

 **Warning:** The Intel(R) PRO/Wireless 2200BG product is not designed for use with high-gain directional antennas. Use of such antennas with these products is illegal.

Use On Aircraft Caution

 **Caution:** Regulations of the FCC and FAA prohibit airborne operation of radio-frequency wireless devices because their signals could interfere with critical aircraft instruments.

Other Wireless Devices

Safety Notices for Other Devices in the Wireless Network: Refer to the documentation supplied with wireless Ethernet adapters or other devices in the wireless network.

Local Restrictions on Radio Usage

 **Caution:** Due to the fact that the frequencies used by Intel(R)

PRO/Wireless 2200BG product device may not yet be harmonized in all countries. The Intel(R) PRO/Wireless 2200BG product is designed for use only in specific countries, and is not allowed to be operated in countries other than those of designated use. As a user of this product, you are responsible for ensuring that the product is used only in the countries for which it was intended and for verifying that it is configured with the correct selection of frequency and channel for the country of use. Any deviation from the permissible settings for the country of use is an infringement of national law and may be punished as such.

For country-specific information, see the additional compliance information supplied with the product.

Wireless interoperability

The Intel(R) PRO/Wireless 2200BG adapter is designed to be interoperable with any wireless LAN product that is based on direct sequence spread spectrum (DSSS) radio technology and to comply with the following standards:

- IEEE Std. 802.11b-1999. Standard on Wireless LAN.
- IEEE Std. 802.11g compliant. Standard on Wireless LAN.
- Wireless Fidelity (WiFi) certification, as defined by the WECA (Wireless Ethernet Compatibility Alliance).

The Intel(R) PRO/Wireless LAN 2200BG adapter and your health

The Intel(R) PRO/Wireless 2200BG adapter, like other radio devices, emits radio frequency electromagnetic energy. The level of energy emitted by this device, however, is less than the electromagnetic energy emitted by other wireless devices such as mobile phones. The Intel(R) PRO/Wireless 2200BG adapter wireless device operates within the guidelines found in radio frequency safety standards and recommendations. These standards and recommendations reflect the

consensus of the scientific community and result from deliberations of panels and committees of scientists who continually review and interpret the extensive research literature. In some situations or environments, the use of the Intel(R) PRO/Wireless 2200BG adapter wireless device may be restricted by the proprietor of the building or responsible representatives of the applicable organization. Examples of such situations include the following:

- Using the Intel(R) PRO/Wireless 2200BG adapter equipment on board airplanes, or
- Using the Intel(R) PRO/Wireless 2200BG adapter equipment in any other environment where the risk of interference with other devices or services is perceived or identified as being harmful.

If you are uncertain of the policy that applies to the use of wireless devices in a specific organization or environment (an airport, for example), you are encouraged to ask for authorization to use the Intel(R) PRO/Wireless 2200BG adapter wireless device before you turn it on.

Regulatory information

This device is intended for OEM integrators only. This device cannot be co-located with any other transmitter.

Information for the OEM Integrators: Please refer to the full Grant of equipment document for other restrictions.

The Intel(R) PRO/Wireless 2200BG adapter wireless network device must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. For country-specific approvals, see Radio

approvals. Intel Corporation is not responsible for any radio or television interference caused by unauthorized modification of the devices included with the Intel(R) PRO/Wireless 2200BG adapter kit, or the substitution or attachment of connecting cables and equipment other than that specified by Intel Corporation. The correction of interference caused by such unauthorized modification, substitution or attachment is the responsibility of the user. Intel Corporation and its authorized resellers or distributors are not liable for any damage or violation of government regulations that may arise from the user failing to comply with these guidelines.

NOTE—The Intel(R) PRO/Wireless 2200BG adapter transmits less than 100 mW, but more than 10 mW.

USA—Federal Communications Commission (FCC)

This device complies with Part 15 of the FCC Rules. Operation of the device is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference that may cause undesired operation.

NOTE—The radiated output power of the Intel(R) PRO/Wireless 2200BG adapter wireless network device is far below the FCC radio frequency exposure limits. Nevertheless, the Intel(R) PRO/Wireless 2200BG wireless network device should be used in such a manner that the potential for human contact during normal operation is minimized. To avoid the possibility of exceeding the FCC radio frequency exposure limits, you should keep a distance of at least 20 cm between you (or any other person in the vicinity) and the antenna that is built into the computer.

Interference statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If the equipment is not installed and used in accordance with the instructions, the equipment may cause harmful interference to radio communications. There is no guarantee, however, that such interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception (which can be determined by turning the equipment off and on), the user is encouraged to try to correct the interference by taking one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTE—The Intel(R) PRO/Wireless 2200BG adapter wireless network device must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. Any other installation or use will violate FCC Part 15 regulations.

U.S. Frequency Bands

2.400 - 2.4835 GHz

Canada—Industry Canada (IC)

This Class B digital apparatus complies with Canadian ICES-003, Issue 2, and RSS-210, Issue 4 (Dec. 2000).

Cet appariel numérique de la classe B est conforme à la norme NMB-003, No. 2, et CNR-210, No 4 (Dec 2000).

"To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject to licensing."

« Pour empêcher que cet appareil cause du brouillage au service faisant l'objet d'une licence, il doit être utilisé a l'intérieur et devrait être placé loin des fenêtres afinde fournir un écran de blindage maximal. Si le matériel (ou son antenne d'émission) est installé à l'extérieur, il doit faire l'objet d'une licence. »

Europe—EU Declaration of Conformity

Europe and Frequency Bands

2.400 - 2.4835 GHz (Europe ETSI)

This equipment complies with the essential requirements of the European Union directive 1999/5/EC.

Cet équipement est conforme aux principales exigences essentielles définies dans la Directive européenne RTTE 1999/5/CE.

Die Geräte erfüllen die grundlegenden Anforderungen der RTTE-Richtlinie 1999/5/EG.

Questa apparecchiatura è conforme ai requisiti essenziali della Direttiva Europea R&TTE 1999/5/CE.

Este equipo cumple los requisitos principales de la Directiva 1999/5/CE de la UE, "Equipos de Terminales de Radio y Telecomunicaciones".

Este equipamento cumpre os requisitos essenciais da Directiva 1999/5/CE do Parlamento Europeu e do Conselho (Directiva RTT).

O exoplismos autos plhroi tis basikes apaits ths koinotikhs odhgias EU R&TTE 1999/5/E.

Deze apparatuur voldoet aan de noodzakelijke vereisten van EU-richtlijn betreffende radioapparatuur en telecommunicatie-eindapparatuur 1999/5/EG.

Dette udstyr opfylder de Væsentlige krav i EU's direktiv 1999/5/EC om Radio- og teleterminaludstyr.

Dette utstyret er i overensstemmelse med hovedkravene i R&TTE-direktivet (1999/5/EC) fra EU.

Utrustningen uppfyller kraven för EU-direktivet 1999/5/EC om ansluten teleutrustning och ömsesidigt erkännande av utrustningens överensstämmelse (R&TTE).

Tämä laite vastaa EU:n radio- ja telepäätelaitedirektiivin (EU R&TTE Directive 1999/5/EC) vaatimuksia.

France

For Metropolitan departments, 2.400 - 2.4835 Ghz for indoor use.
2.400 -2.454 Ghz (channels 1 to 7) for outdoor use.

For Guadeloupe, Martinique, St Pierre et Miquelon, Mayotte: 2.400 - 2.4835 Ghz for indoor and outdoor use.

For Reunion, Guyane:
2.400 - 2.4835 Ghz for indoor use.
2.420 - 2.4835 Ghz for outdoor use (channels 5 to 13)

 *The wireless adapter transmits less than 100 mW, but more than 10 mW.*

France

Some areas of France have a restricted frequency band. The worst case maximum authorized power indoors is:

- 10 mW for the entire 2.4 GHz band (2400 MHz–2483.5 MHz)
- 100 mW for frequencies between 2446.5 MHz and 2483.5 MHz (NOTE—Channels 10 through 13 inclusive operate in the band 2446.6 MHz to 2483.5 MHz)

There are few possibilities for outdoor use: On private property or on the private property of public persons, use is subject to a preliminary authorization procedure by the Ministry of Defense, with maximum authorized power of 100 mW in the 2446.5–2483.5 MHz band. Use outdoors on public property is not permitted. In the departments listed below, for the entire 2.4 GHz band:

- Maximum authorized power indoors is 100 mW
- Maximum authorized power outdoors is 10 mW

Departments in which the use of the 2400–2483.5 MHz band is permitted with an EIRP of less than 100 mW indoors and less than 10 mW outdoors:

01	Ain Orientales	36	Indre	66	Pyrénées
02	Aisne	37	Indre et Loire	67	Bas Rhin
03	Allier	41	Loir et Cher	68	Haut Rhin
05	Hautes Alpes	42	Loire	70	Haute Saône
08	Ardennes	45	Loiret	71	Saône et Loire

09	Ariège	50	Manche	75	Paris
11	Aude	55	Meuse	82	Tarn et Garonne
12	Aveyron	58	Nièvre	84	Vaucluse
16	Charente	59	Nord	88	Vosges
24	Dordogne	60	Oise	89	Yonne
25	Doubs	61	Orne	90	Territoire de Belfort
26	Drôme	63	Puy du Dôme	94	Val de Marne
32	Gers	64	Pyrénées Atlantique		

This requirement is likely to change over time, allowing the use your wireless LAN card in more areas within France. Please check with ART for the latest information (www.art-telecom.fr)

Belgique
Dans le cas d'une utilisation privée, à l'extérieur d'un bâtiment, au-dessus d'un espace public, aucun enregistrement n'est nécessaire pour une distance de moins de 300m. Pour une distance supérieure à 300m un enregistrement auprès de l'IBPT est requise. Pour les enregistrements et licences, veuillez contacter l'IBPT.

Italia

For use in private premises: no restriction outdoor or indoor, 2.400 - 2.4835 Ghz

For use in public premises: no restriction outdoor or indoor, 2.400 - 2.4835 Ghz, but a general authorization has to be requested to the ministry of Post and telecommunicati.

Japan Frequency Bands

2.400 - 2.497 GHz (Japan)

Radio approvals

To determine whether you are allowed to use your wireless network device in a specific country, please check to see if the radio type number that is printed on the identification label of your device is listed in the manufacture OEM Regulatory Guidance document.

Underwriters Laboratories Inc. (UL) Regulatory Warning

For use in (or with) UL Listed personal computers or compatible.

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Trademark and Disclaimers

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Warranty: Intel(R) PRO/Wireless 2200BG Network Connection User's Guide

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OEM Hardware Warranty Information

Limited Hardware Warranty (1 year): Notwithstanding anything to the contrary, including any terms and conditions contained in the Intel CD-ROM or elsewhere, Intel warrants to the integrator/OEM that the adapter product delivered in this package will be free from defects in material and workmanship for one (1) year. This warranty does not cover the adapter product if it is damaged in the process of being installed or improperly used.

Trademark and Disclaimers