

# **11Mbps Wireless Network**

# **PCI Adapter User Manual**

version 1.0

## **Manufacturer's Disclaimer Statement**

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## **Federal Communication Commission 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 and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that 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 one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into 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.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

**IMPORTANT NOTE:**

**FCC Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

**This device is intended only for OEM integrators under the following conditions:**

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

**End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users (for example : Access Point). The final end product must be labeled in a visible area with the following: "Contains TX FCC ID: O7J-GL2411MP-MP".

**Manual Information That Must be Included**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the users manual of the end product which integrate this module.

The users manual for OEM integrators must include the following information in a prominent location " IMPORTANT NOTE: To comply with FCC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

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## INTRODUCTION



**The 11Mbps Wireless Network Adapter** delivers reliable and high-speed wireless performance of 11Mbps

## Product Features

- Full 2.4GHz IEEE 802.11b standard and Wi-Fi compliant
- High-Speed data transfer rate of up to 11Mbps with automatic fallback under noisy environment or longer distance.
- Excellent distance coverage with reliable performance.
- Plug-and-Play setup and operation.
- Supports strong security of 802.1x, which is available in Windows XP, and WEP 128 bit security.
- Supports software upgrade for Wi-Fi Access Protected (WPA) security available in Q3 '03.
- Supports Ad-Hoc, Infrastructure and wireless roaming.
- Easy-to-use software client management utility for configuration.

## System Requirements

- Windows 98, 98SE, Millennium Edition (ME), 2000 and XP computers
- PC with Pentium III 600MHz system or above is recommended
- Equipped with at least one PCIbus socket or PCIbus adapter.
- One CD-ROM drive

# GETTING STARTED

## Getting To Know The 11Mbps Wireless Network PCI

### WIRELESS NETWORK PCI'S LEDs

- Power LED  
ON when the unit is powered up
- WLAN LED  
ON indicates WLAN connection; blink indicates wireless activity

## Setting Up The Wireless Network

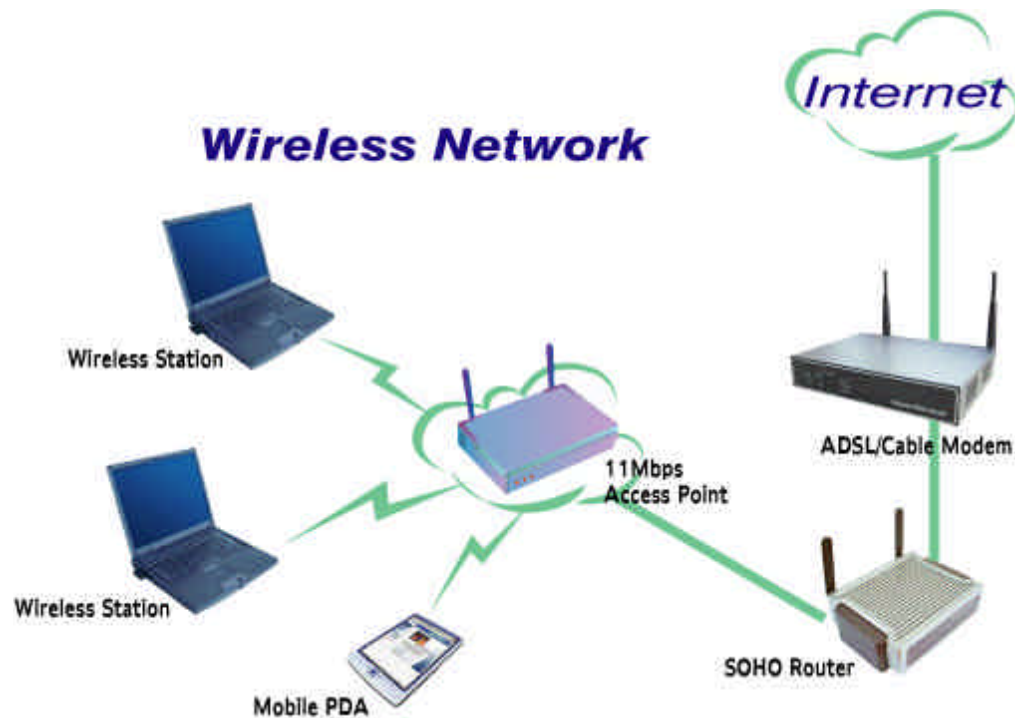
There two wireless network topologies that you can setup your wireless card with. One is called “**Ad-Hoc**”, and the other is “**Infrastructure**”. On an Ad-Hoc network, two or more computers each has at least one wireless network client device such as wireless PCI installed, establish point-to-point data communication with each other. While on an Infrastructure network, every wireless station communicates through Access Points.

### Setting Up Ad-Hoc Network



The idea of Ad-Hoc Network is rather simple. All the wireless station are set to use the same BSS ID and channel to establish communication linkage with each other to form a point-to-point network for data transmission and reception.

## Setting Up Infrastructure Network



In order to setup an Infrastructure of a wireless network such as the example shown above, you will need the following:

1. A broadband Internet connection.
2. ADSL or Cable modem provided by your ISP as part of the broadband connection installation.
3. A Router that connects to the ADSL/Cable modem for internet connection sharing.
4. An Access Point to connect with the Router to form a wireless infrastructure network.
5. Wireless clients equipped with wireless networking devices such as wireless PCI for wireless connection.

In this case, all the wireless clients and Access Point operate under the same channel with the same ESSID. The wireless clients are all connected to the Access Point for data transmission.

# Installing Your 11Mbps Wireless Network PCI

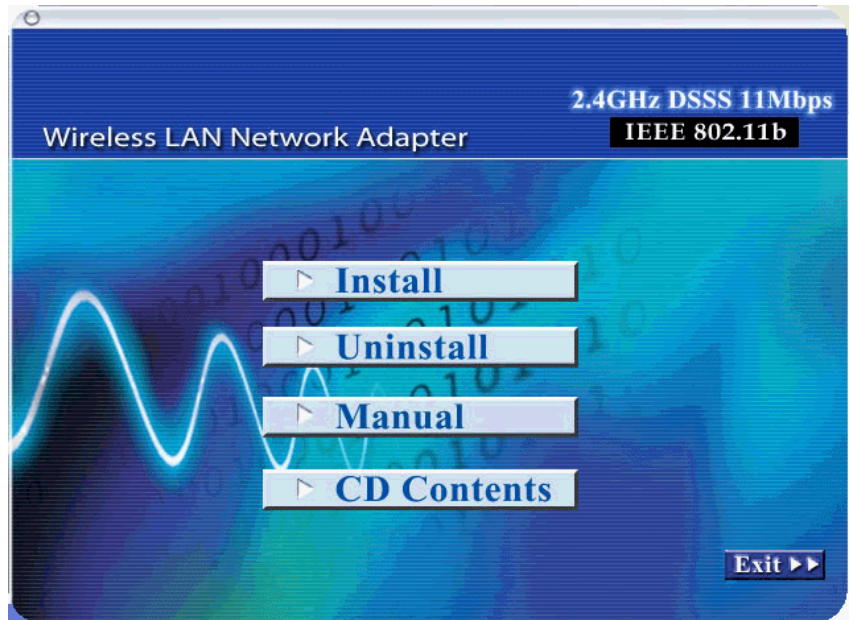
1

## Installing Utility Program

Make sure that the 11Mbps Wireless Network PCI is **NOT** inserted into the Cardbus slot.

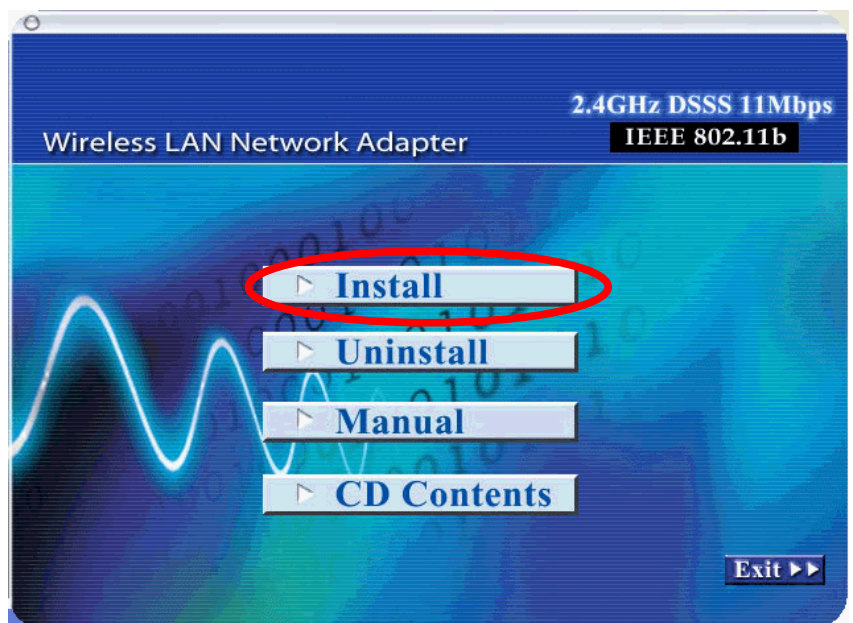


Turn on the computer. Insert the software CD into the CD-ROM Drive.



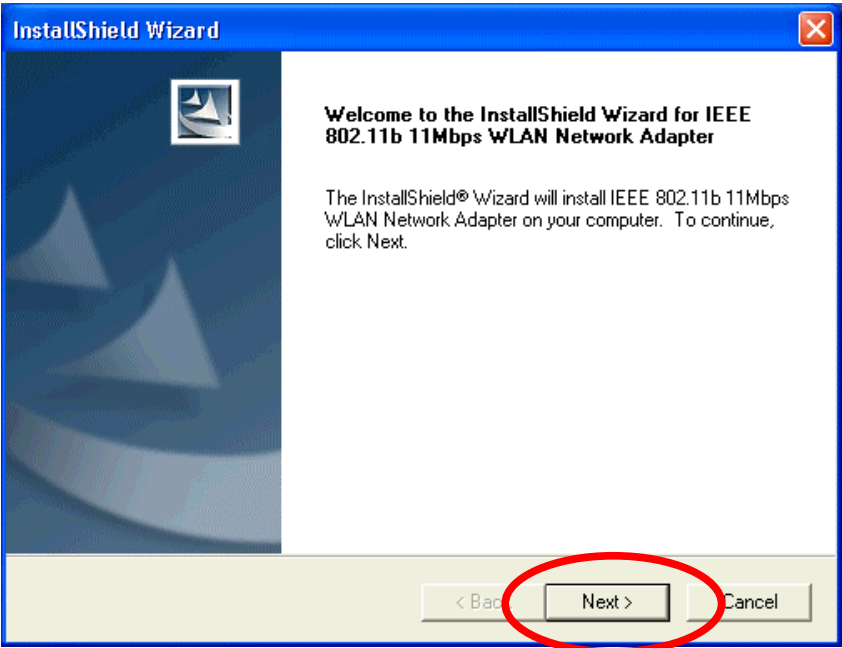
Please note that the installation screens in this quick guide are captured from WindowsXP. The other Windows systems will have similar screen for the installation procedure.

Click on "**Install**" button to start Utility installation.

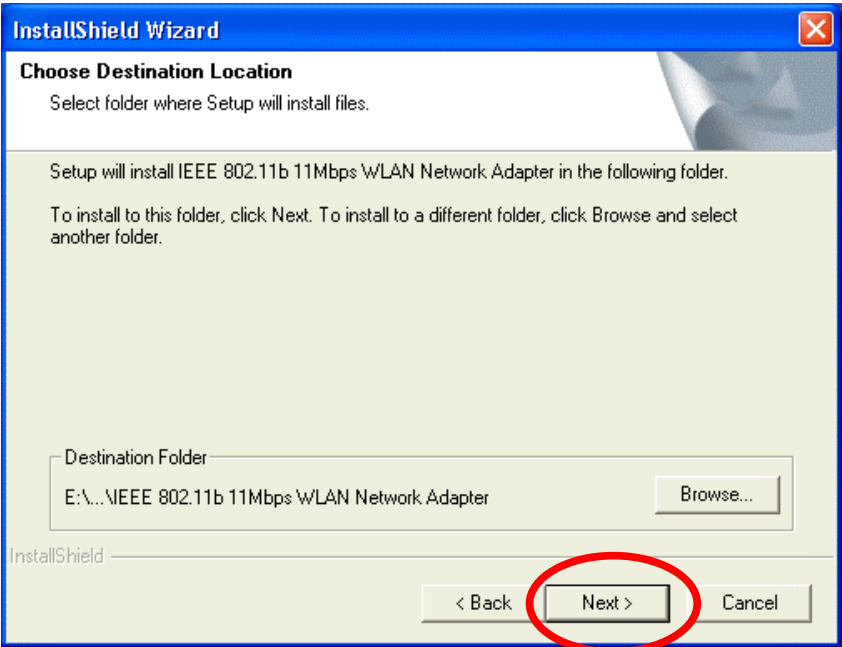




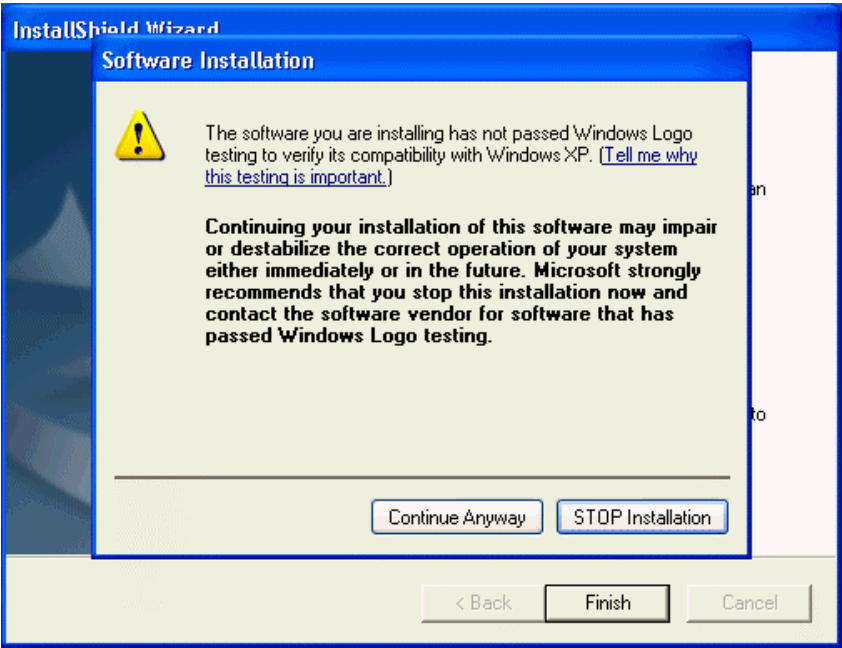
InstallShield Wizard starts. Click “Next” to continue.



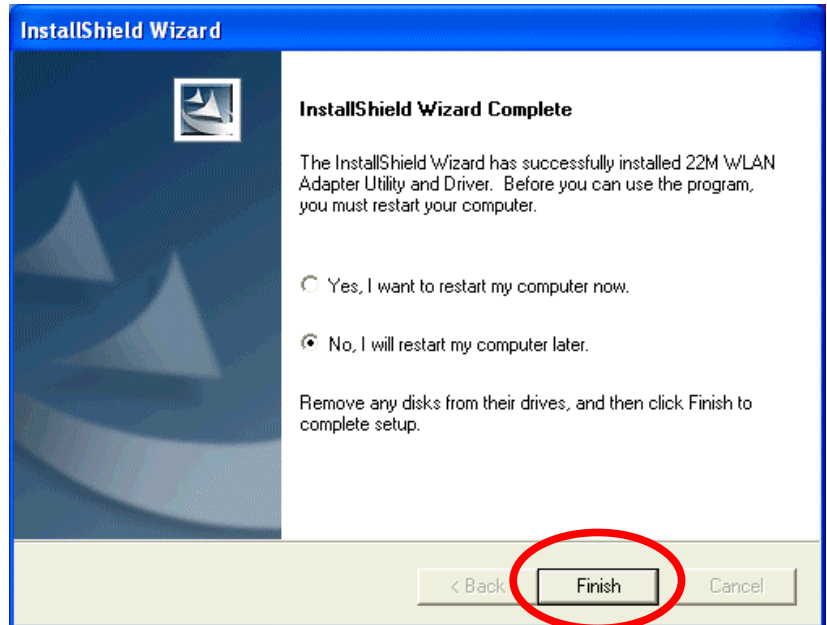
Click “Next” to install the program files in the default folder.



Installation of driver files, click “Continue Anyway” to continue.



Select the second option, and click **“Finish”** to complete the installation.



The Utility Icon appears in your desktop.



- Turn off your computer
- Insert the 11Mbps Wireless Network PCI into the CardBus slot in your notebook
- Turn on your computer
- Continue with **Driver Installation.**

2

### *Starts Up PCI for the First Time*

Select the second option and click **“Next”** to continue.



### Hardware Installation



The software you are installing for this hardware:  
IEEE 802.11b 11Mbps WLAN Network Adapter

has not passed Windows Logo testing to verify its compatibility with Windows XP. ([Tell me why this testing is important.](#))

**Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.**

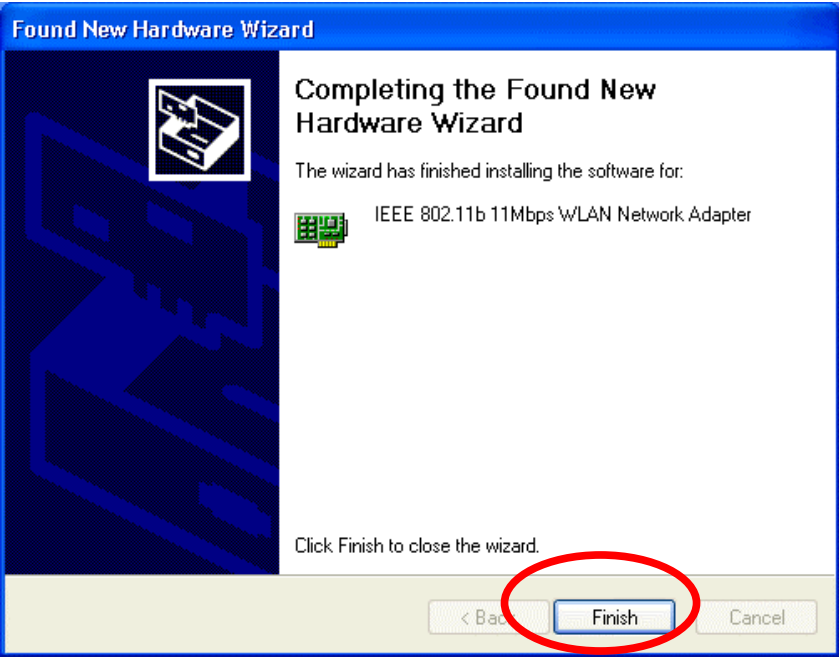
Continue Anyway

STOP Installation

click **“Continue Anyway”** to proceed.



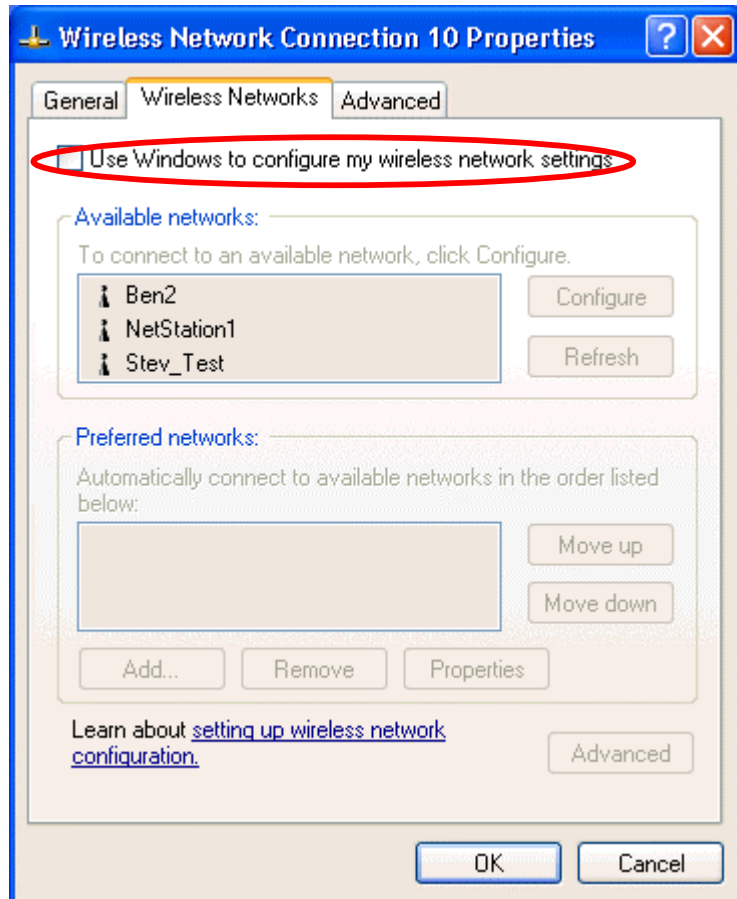
Click **Finish** to complete new hardware installation.



Simply, double-click the icon to launch the utility.



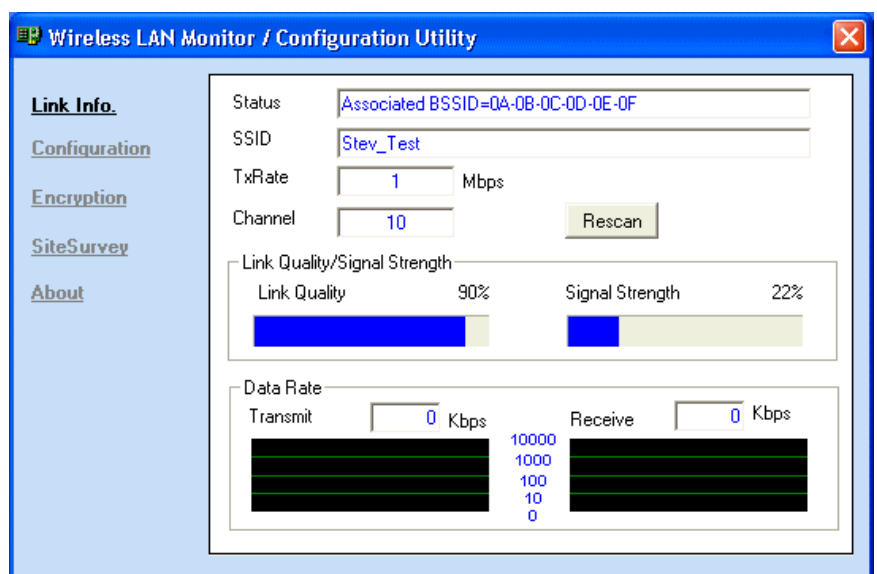
Click off the “Use Windows to ...” option to use the 11Mbps PCI utility.



Double-click on the utility icon in the system tray



again to launch the 11Mbps PCI Utility.



# CONFIGURING YOUR WIRELESS NETWORK PCI

## Link Info. Page

This is the default page when the utility starts up.

**Status:** Shows the BSSID associated, which can be used to identify the wireless network.

**SSID:** Shows current SSID, which must be the same for the wireless client and AP in order for communication to be established.

**TxRate:** Shows the current data rate used for transmitting.

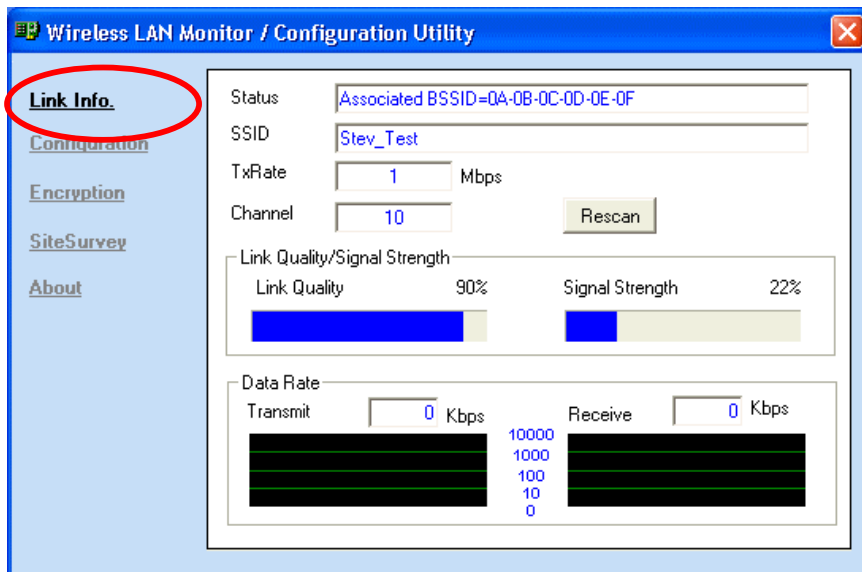
**Channel:** Shows the current channel for communication.

**Radio Off** button: When clicked, you disable the radio signal, and cut-off the wireless connection.

**Link Quality:** Shows the link quality of the 11Mbps wireless PCI with the Access Point when operating under Infrastructure mode.

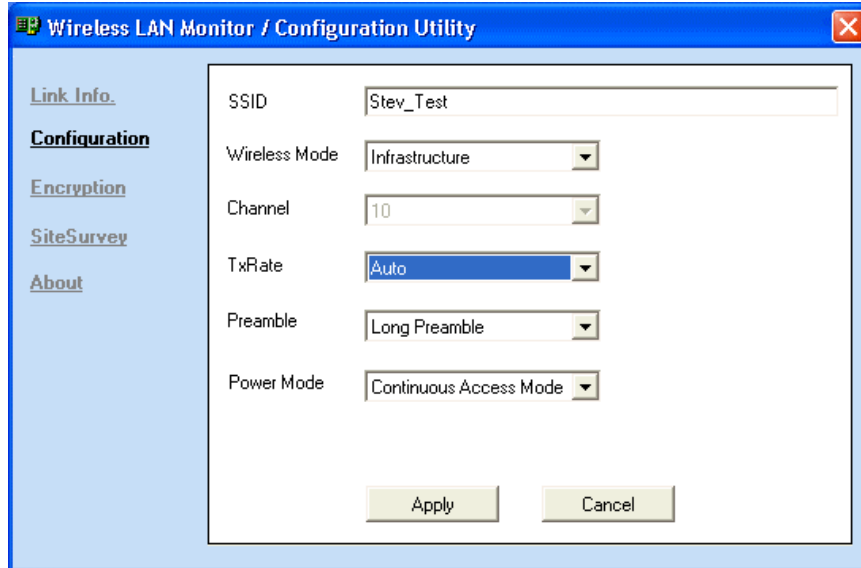
**Signal Strength:** Shows the wireless signal strength of the connection between the 11Mbps wireless PCI with the Access Point.

**Data Rate:** Shows the statistics of data transfer, and the calculation is based on the number of packets transmitted and received.



## Configuration Page

This is the page where you can change the basic settings of the Access Point with the minimum amount of effort to adjust a secure wireless network.



**SSID:** Service Set Identifier, which is a unique name shared among all clients and nodes in a wireless network. The SSID must be identical for each clients and nodes in the wireless network.

**BSS Type:** There are two types available for selection

- Infrastructure – to establish wireless communication with LAN and other wireless clients through the use the Access Points.
- Ad-Hoc – to establish point-to-point wireless communication directly with other wireless client devices such as wireless network PCI.

**Channel:** The value of channel that AP will operate in. You can select the channel range of 1 to 11 for North America (FCC) domain, 1 to 13 for European (ETSI) domain and 1 to 14 for Japanese domain.

**Tx Rate:** Select the data rate for data transmission.

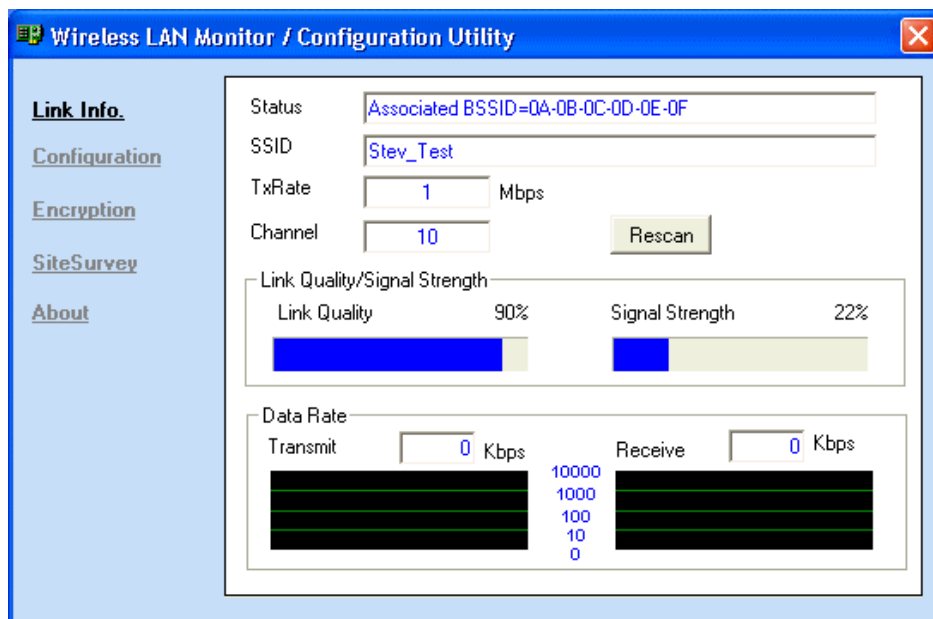
**Preamble:** Select **Long** or **Short** Preamble type. Preamble is a sequence of bits transmitted at 1Mbps that allows the PHY circuitry to reach steady-state demodulation and synchronization of bit clock and frame start. Two different preambles and headers are defined: the mandatory supported Long Preamble and header, which interoperates with the 1 Mbit/s and 2 Mbit/s DSSS specification (as described in IEEE Std 802.11), and an optional Short Preamble and header (as described in IEEE Std 802.11b). At the

receiver, the Preamble and header are processed to aid in demodulation and delivery of the PSDU. The Short Preamble and header may be used to minimize overhead and, thus, maximize the network data throughput. However, the Short Preamble is supported only from the IEEE 802.11b (High-Rate) standard and not from the original IEEE 802.11. That means that stations using Short-Preamble cannot communicate with stations implementing the original version of the protocol.

**Power Mode:** There are 3 modes to choose from

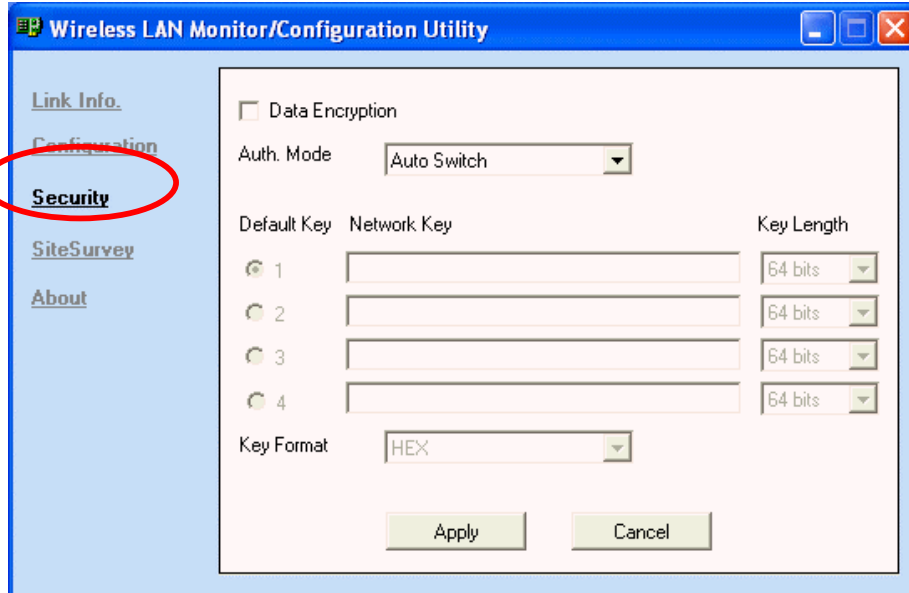
- Continuous Access Mode (default) – the PCI is constantly operating with full power and it consumes the most power
- Maximum Power Save – the PCI consumes the least power and only operates when there is wireless network activity.
- Power Save – the PCI consumes the moderate level of power.

For the changes made to any of the items above to be effective, click “**Apply**”. The screen will be changed back to **Link Info.** Page



## Security Page

This is the page where you configure Security settings of your 11Mbps wireless PCI.



**Data Encryption:** Click the box to enable Data Encryption feature.

**Aut. Mode:** There are three modes available to choose from.

- **Open Authentication** – the sender and receiver do not share secret Key for communication. Instead, each party generates its own key-pairs and ask the other party to accept it. The key is regenerated when the connection is established every time.
- **Shared Authentication** – the sender and receiver shares the common key for data communication, and the key is used for extended length of time.
- **Auto** – depend on the communication to establish, and automatically use the proper authentication mode.

The following will only be activated to allow for configuration when **Data Encryption** is enabled.

**Default Key:** select one of the 4 keys to use.

**Network Key:** enter values to these fields, either in HEX or ASCII formats. You only have to enter the key that you will use

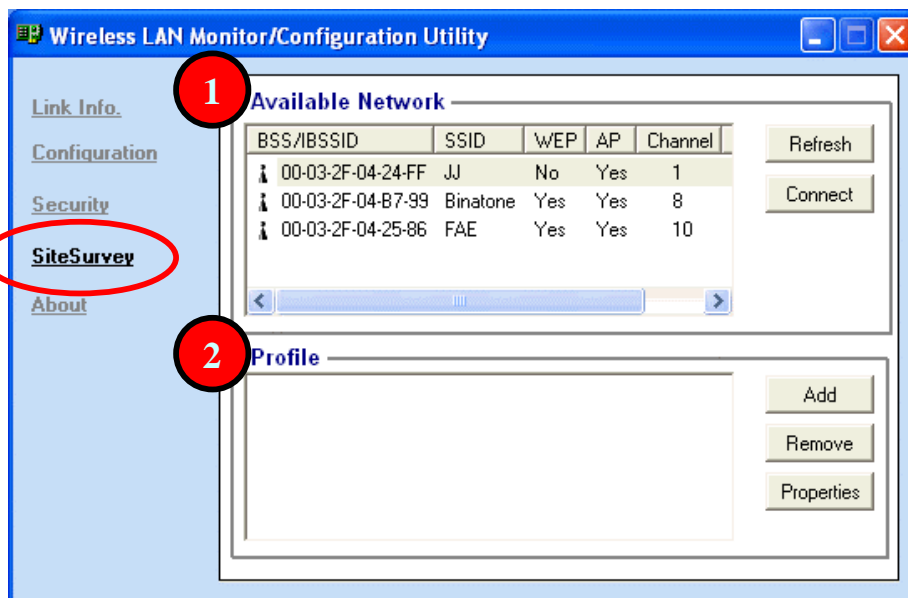
**Key Length:** select 64 or 128 bits as the length of the keys

**Key Format:** **ASCII** or **HEX** (Please refer to Appendix G: Glossary for details about these two formats).



## SiteSurvey Page

This page allows to utilize the SiteSurvey function to scan for the available wireless network (wireless clients and Access Points) and select one to establish wireless communication.



**1 Available Network** – displays the wireless networks (wireless clients and Access Points) that are in your signal range. Select any one of them and establish communication by simply mouse **double-click** or a single click on the “**Connect**” button.

Click “**Refresh**” button to start scanning for available network again.

**2 Profile** – You can create and manage the created profiles for Home, offices or public areas.

By double-clicking on one of the created profile, the setting will adapt to the configuration such as SSID, channel, and WEP settings saved by that particular profile.

Click to select any one of the profiles, and you can

Click on “**Remove**” button to remove the profile, or

Click on “**Properties**” button to view and change its settings. The Properties is very similar to that of adding profile.

Click “**Add**” to add a profile, and the following screen would appear.

**Add New Profile**

Profile Name

SSID

Wireless Mode

Channel

TxRate

Preamble

Power Mode

Data Encryption

Auth. Mode

Default Key Key Length

<input checked="" type="radio"/> 1	<input type="text"/>	<input type="text" value="64 bits"/>
<input type="radio"/> 2	<input type="text"/>	<input type="text" value="64 bits"/>
<input type="radio"/> 3	<input type="text"/>	<input type="text" value="64 bits"/>
<input type="radio"/> 4	<input type="text"/>	<input type="text" value="64 bits"/>

Key Format

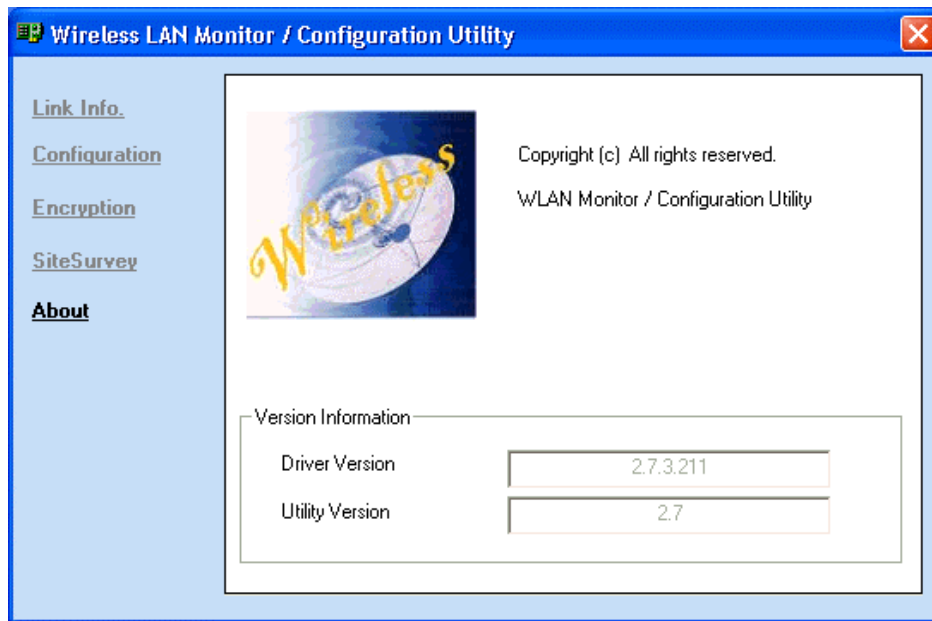
All the detail information about each settings and configuration item are described in previous Configuration and Security Page sessions. Please refer to those two sessions for more information.

When you finish enter the setting for this profile, click “**OK**” to add a new profile.

## About Page

This page displays some information about the 11mpbs PCI utility, which includes the version numbers for Driver, Firmware and Utility.

When there is new version of software available for upgrade, you will be able to identify by version numbers.



## APPENDIX A: TROUBLESHOOTING

This chapter provides solutions to frequently encountered problems that can occur during the installation and operation of the 11Mbps Wireless Network PCI. Please read through the following to solve your problems.

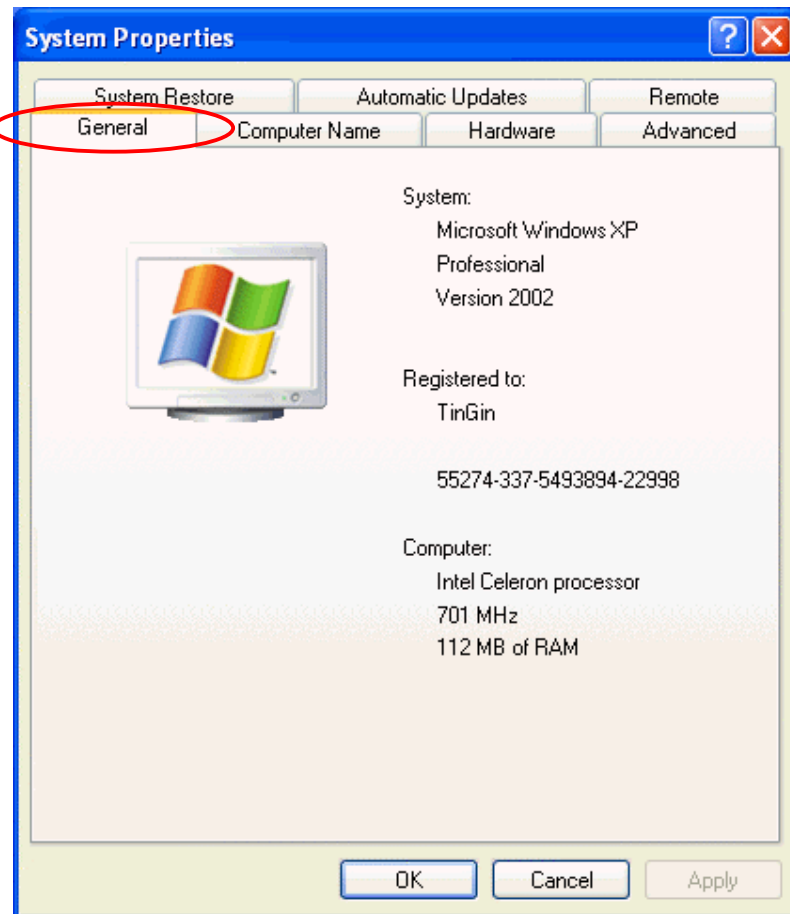
### 1. The wireless clients cannot access the network in the infrastructure mode.

- Check that the wireless network device is being installed and working properly.

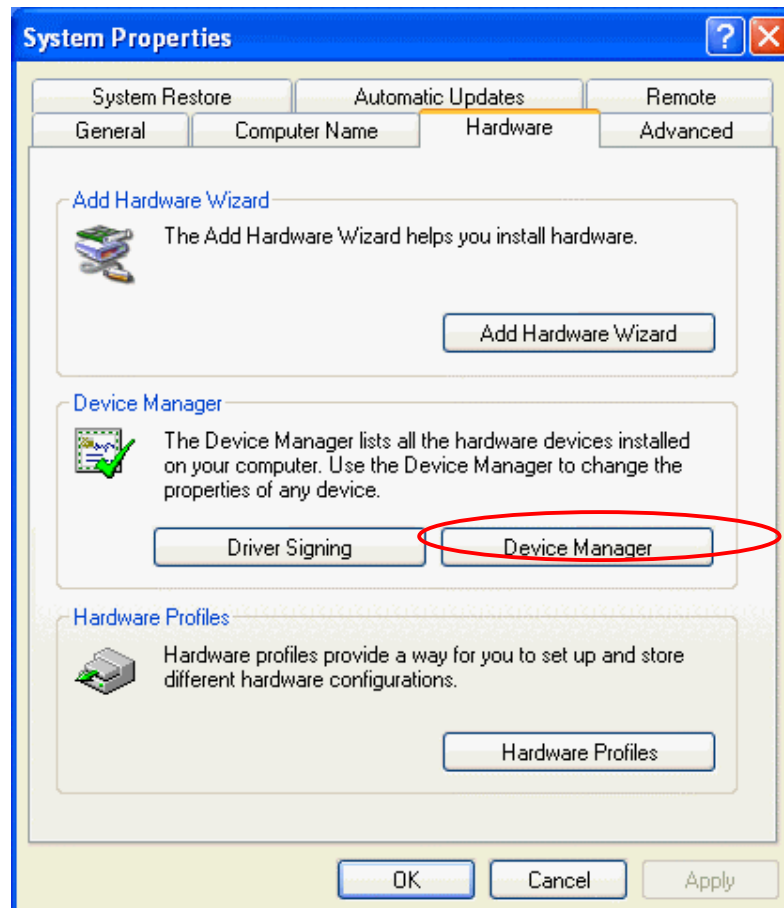
Go to “Start” >  
Right mouse click  
on “My Computer”  
> “Properties”



Go to "Hardware"



Go to "Device Manager"

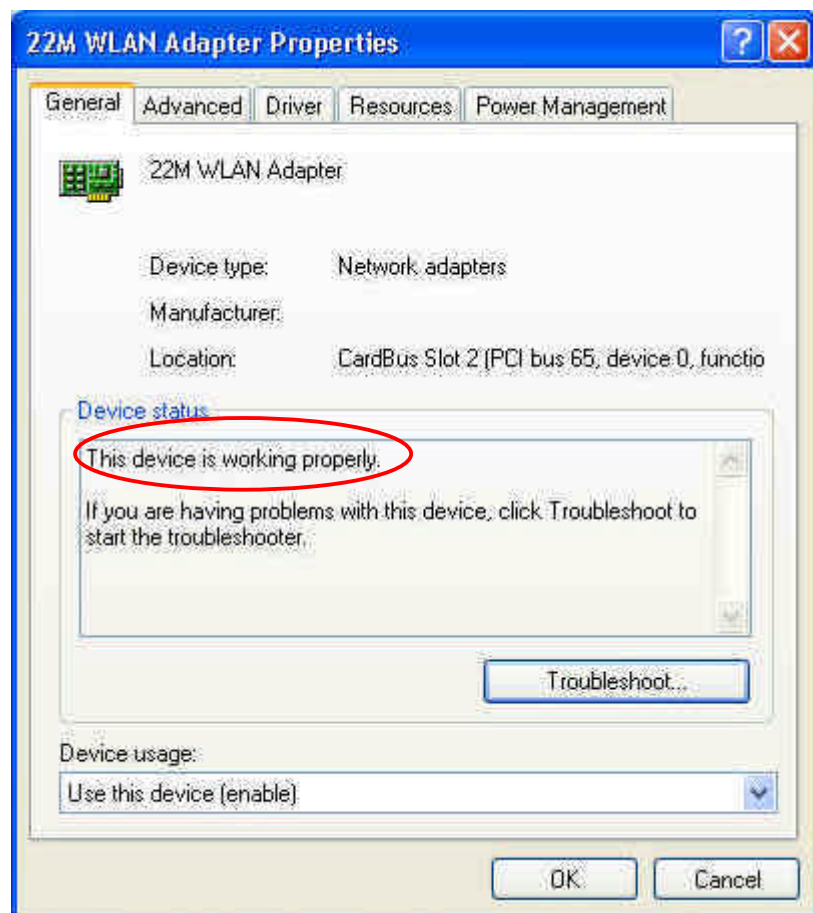


Right mouse click  
on the wireless  
network adapter.

Go to “Properties”



Check and make  
sure that the  
network adapter is  
working properly



**2. What is the difference between 11Mbps and 11Mbps wireless products?**

**What's the benefit of 11Mbps Wireless Access Point?**

The 11Mbps is made possible by the new modulation method called PBCC developed by TI, which is different from the current CCK modulation method for 11Mbps. The 11Mbps Wireless Access Point offers double data rate than that of 11Mbps with 20% more distance coverage. The 11Mbps wireless products also operate in the 2.4GHz ISM band and they are backward compatible with 11Mbps wireless products.

**3. What is Roaming?**

Roaming is the ability of portable computers, e.g., Packet PC and notebook, to have consistent and continuous data transmission/reception throughout an area covered by more than one Wireless Access Point. In order to achieve seamless connectivity, all the wireless clients and Access Points must be set to use the same SSID. When a user walked out of the coverage area of one AP into another, the wireless client network device will automatically reestablish connection with the new AP.

**4. What is a MAC Address?**

The Media Access Control (MAC) address is a unique number assigned by the manufacturer to any Ethernet networking devices, e.g. a network adapter, that allows the network to identify it at the hardware level. Unlike IP addresses, which can be changed or dynamically assigned by the network, the MAC address of a networking device is permanent.

**5. What is WEP?**

Wired Equivalent Privacy (WEP) is a type of data encryption mechanism described in the IEEE 802.11 standard. The 11Mbps Wireless Access Point supports 64/128/256 bit shared key for WEP.

**6. Would the information be transmitted securely in the air?**

WLAN offers two layers of protection for security. First layer is on the hardware level. As with Direct Sequence Spread Spectrum (DSSS) technology, it has the inherent security feature of scrambling. Second of all, on the software level, the security control is made possible by Wired Equivalent Privacy (WEP) for access control.

**7. What is ISM band?**

The FCC and their counterparts outside of the U.S. have set aside bandwidth for unlicensed use in the ISM (Industrial, Scientific and Medical) band. The 2.4GHz unlicensed ISM band is available worldwide, which presents the opportunity for the global market of 802.11b high speed wireless products.

**8. What is 4X mode?**

This is a proprietary wireless data transmission mode provided by TI, which enhances TI's 11Mbps PBCC speed to reach data throughput to over 12Mbps. Since it is not IEEE 802.11b standard wireless data mode, in order to allow 4X mode, both the receiving and transmitting parties must be using TI solution.



## APPENDIX B: NETWORKING BASIS

This chapter will help you learn the basics of home networking.

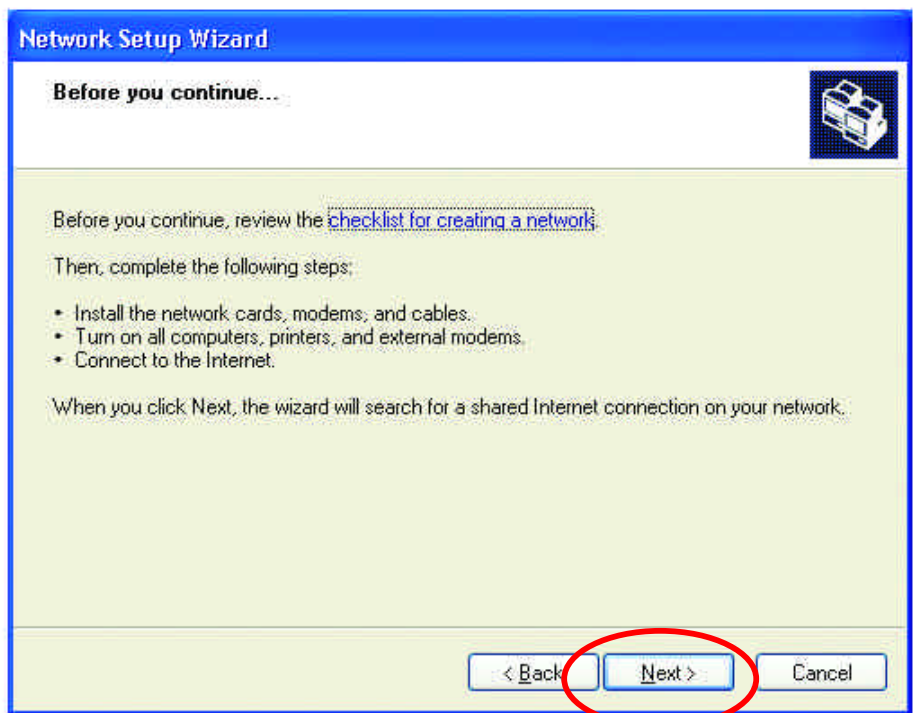
### Using the Windows XP Network Setup Wizard

Go to **Start menu >**  
**Control Panel >**  
**Network Connections**

In the menu on the left side of the window, select **“Set up a home or small office network”**

Click **“Next”** to proceed

Click **“Next”** to continue



Select the option that best describes how you connect your computer to the Internet.

In the case of using router in the network, choose the second option.

Click “Next” to continue.

**Network Setup Wizard**

**Select a connection method.**

Select the statement that best describes this computer:

- This computer connects directly to the Internet. The other computers on my network connect to the Internet through this computer.  
[View an example.](#)
- This computer connects to the Internet through another computer on my network or through a residential gateway.  
[View an example.](#)
- Other

Learn more about [home or small office network configurations.](#)

< Back   **Next >**   Cancel

1. Enter a short description for your computer.
2. Enter a name for your computer to be recognized among the network.
3. Click “Next” to continue.

**Network Setup Wizard**

**Give this computer a description and name.**

Computer description:   
Examples: Family Room Computer or Monica's Computer

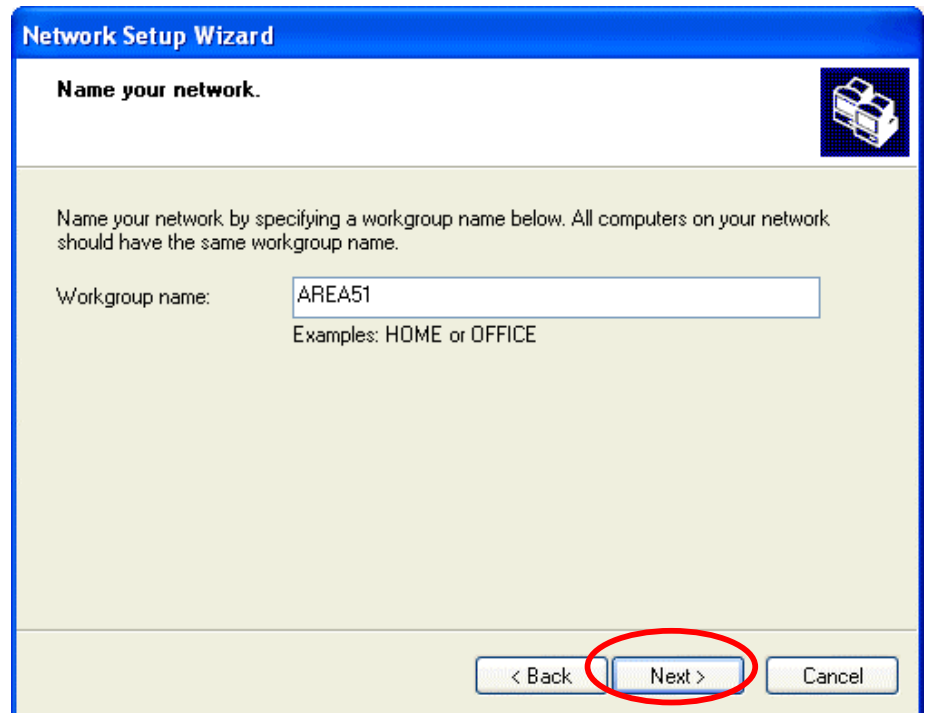
Computer name:   
Examples: FAMILY or MONICA

The current computer name is MM.

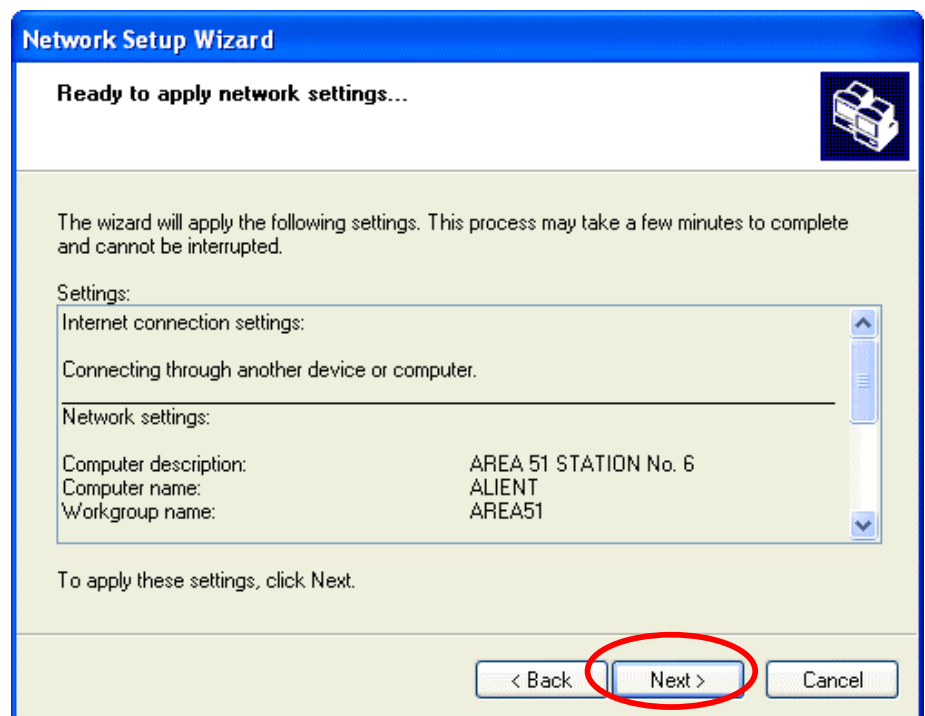
Learn more about [computer names and descriptions.](#)

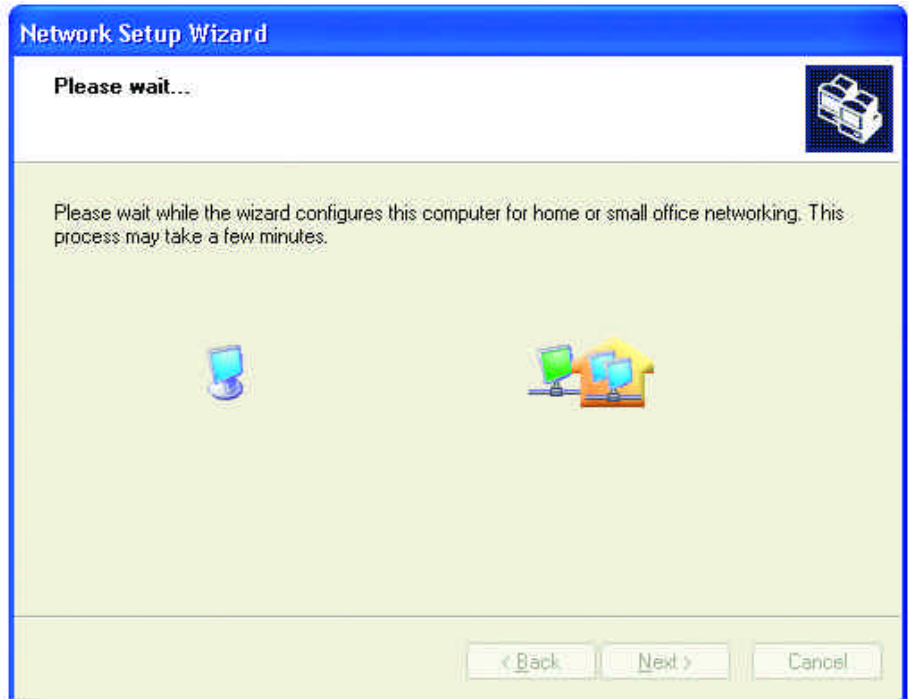
< Back   **Next >**   Cancel

Enter “**Workgroup name**” for your home network.  
Click “**Next**” to continue”



Click “**Next**” and wait for the wizard to apply the settings.

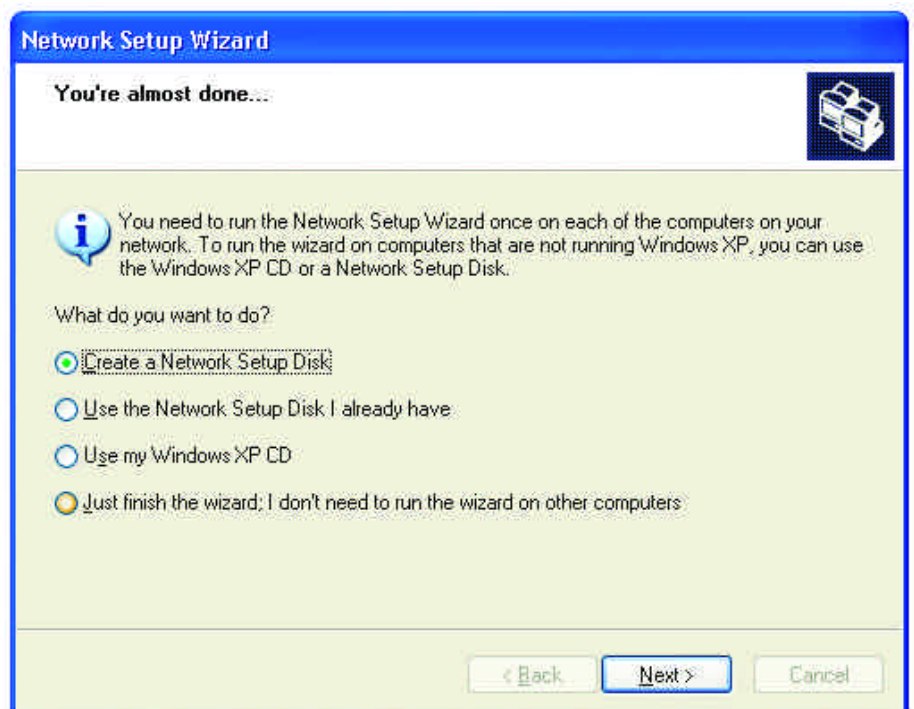




You may create a network setup disk which saves you the trouble of having to configure every PCs in your network.

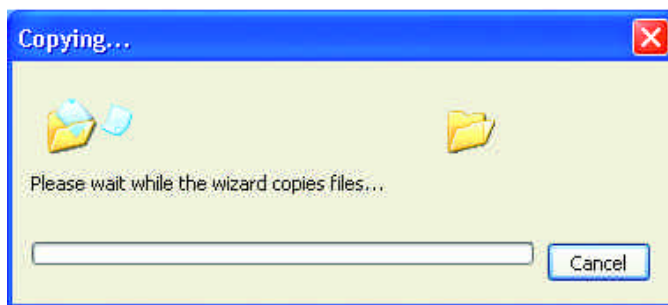
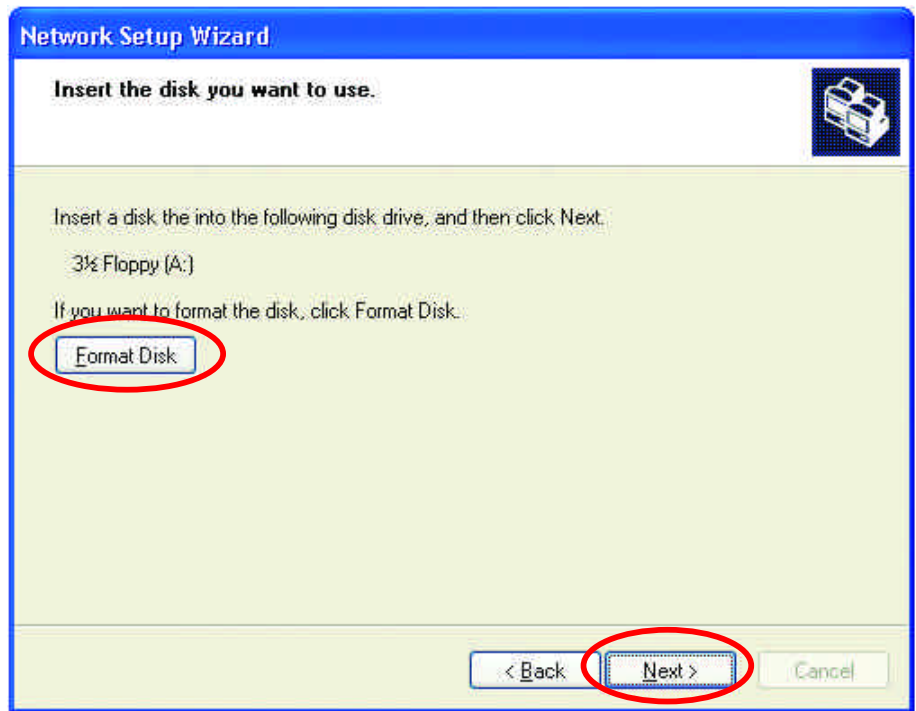
Select the first choice, and insert a floppy disk into your disk drive

Click “Next” to continue.

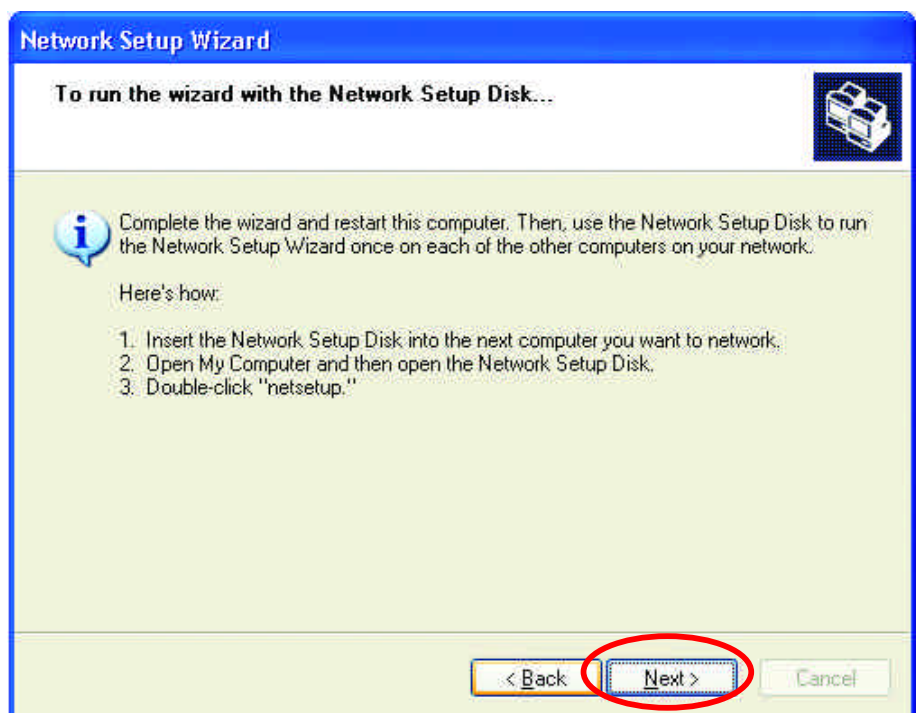


Click **“Format Disk”** if you wish to format the disk.

Click **“Next”** to copy the necessary files to the disk.

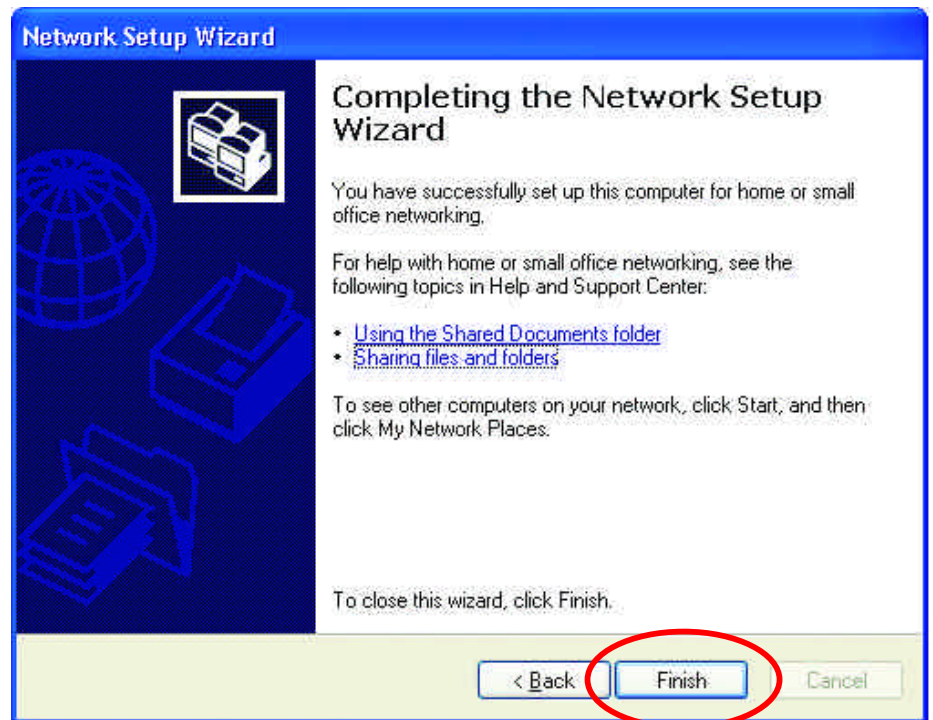


Click **“Next”** to continue with the Network Setup Wizard



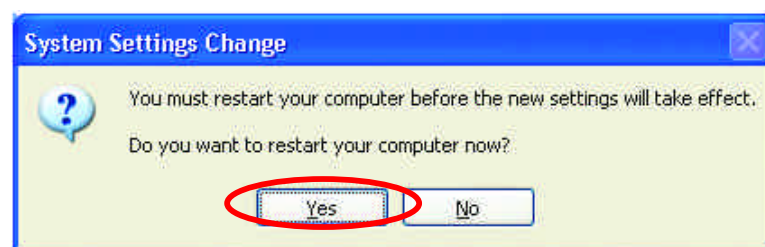
**!Note:** Now you may use the Network Setup Disk you just created in any PCs in your network that you wish to setup. Simply insert the Network Setup Disk into the disk drive of a PC, and open to browse the content of the disk with “My Computer” or “Windows File Manager”. Double-click and run the file “netsetup” for the program to handle the rest.

Click “**Finish**” to complete the Network Setup Wizard.



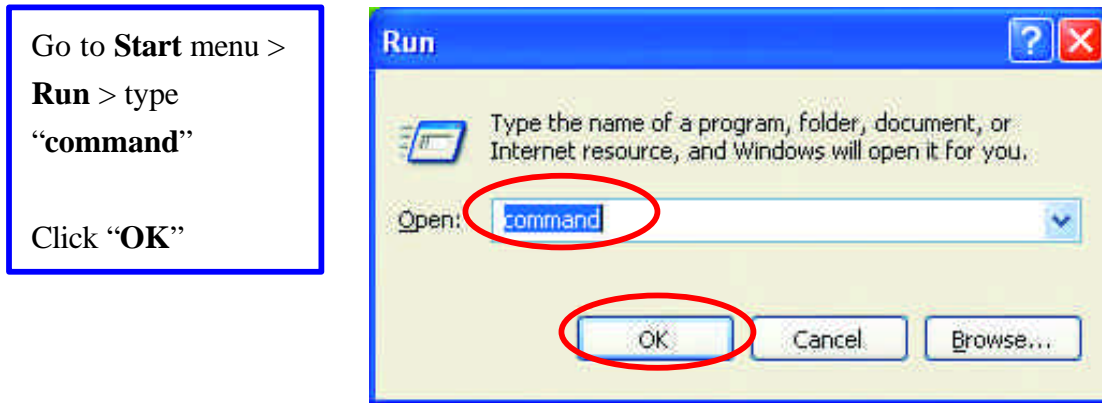
System will now have to restart in order for the new settings to be effective.

Click “**Yes**” to restart the computer



## Checking IP Address of Your Computer in Windows XP

Sometimes you will need to know the IP address of the computer that you are using. For example, when you want to make sure that your computer is in the same network domain as that of your Access Point for you can configure and access the AP.



When the command prompt window appears, type command “ipconfig /all” and press Enter. This command will display the IP addresses of all the network adapters in your computer.

```
C:\Documents and Settings\Administrator>ipconfig/all

Windows IP Configuration

Host Name . . . . . : test
Primary Dns Suffix . . . . . :
Node Type . . . . . : Unknown
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Wireless Network Connection 2:

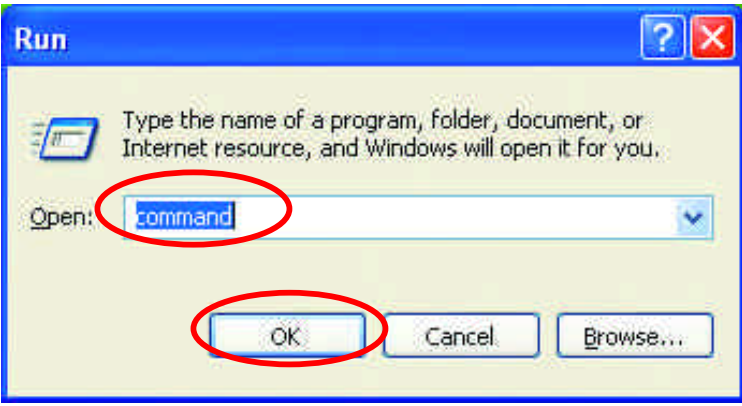
Connection-specific DNS Suffix . . . :
Description . . . . . : 22M WLAN Adapter
Physical Address. . . . . : 00-03-2F-0C-01-55
Dhcp Enabled. . . . . : No
IP Address. . . . . : 192.168.1.2
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . :

C:\Documents and Settings\Administrator>
```

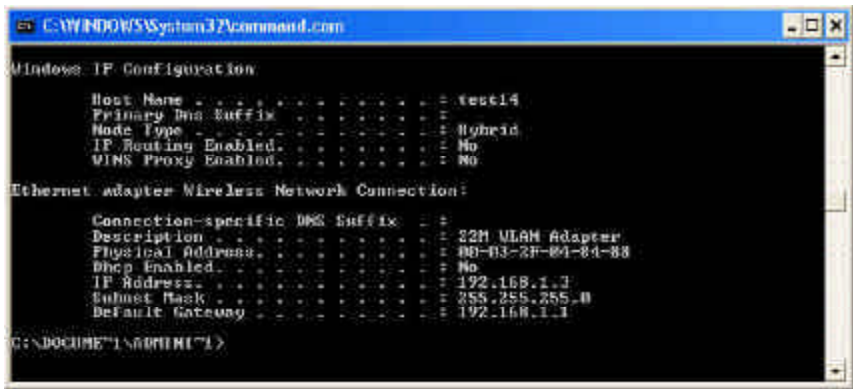
In this case, the IP address of your network adapter is 192.168.1.2, which means your Access Point must have an IP address of 192.168.1.xxx in order for you to be able to access it.

If the IP address is assigned by DHCP server on the network, there are chances you might have to release the IP and acquire it from DHCP server again. Here is how you do it.

Go to **Start** menu >  
**Run** > type  
"command"  
  
Click "**OK**"



Type command, "ipconfig /renew" in the command prompt window and press Enter. This command releases the current IP address and acquire it from the network, i.e. DHCP server, once more.



In this case, the IP address that we acquired is 192.168.1.3. However, it's often that the acquired IP address of the network adapter might would not be the same.

**!Note:** To renew IP under Windows 98 and Windows ME, you will have to go to the **Start** menu > **Run** > type **winipcfg** and click "**OK**". The Windows IP Configuration Menu window would appear, where you first click "release" button to release the current IP address, followed by clicking of "Renew" to acquire a new IP address from network.

If the above methods for IP renew fail, you will have to try and restart the computer, which will reinitializes the network adapter settings during startup including renewing IP address. If you still have problems getting an IP address after computer restarts, you will have to consult with your MIS in your office or call computer and network technicians.

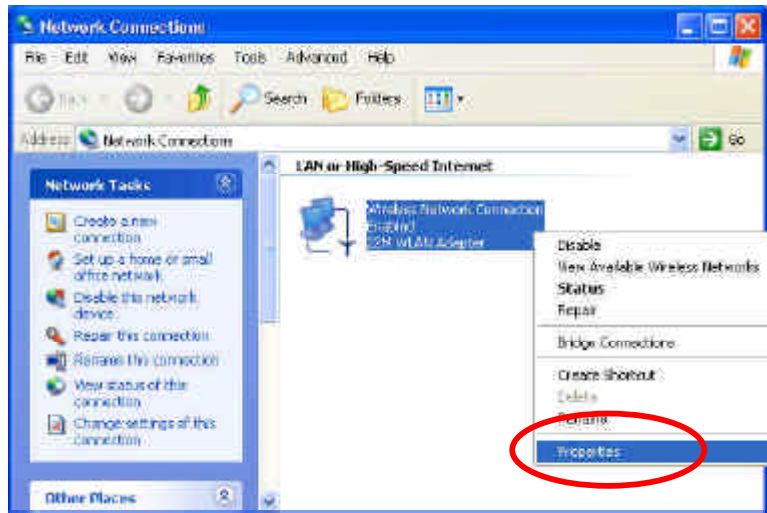


## Dynamic IP Address V.S. Static IP Address

By definition Dynamic IP addresses are the IP addresses that are being automatically assigned to a network device on the network. These Dynamically assigned IP addresses will expire and may be changed over time.

Static IP addresses are the IP addresses that users manually enter for each of the network adapters.

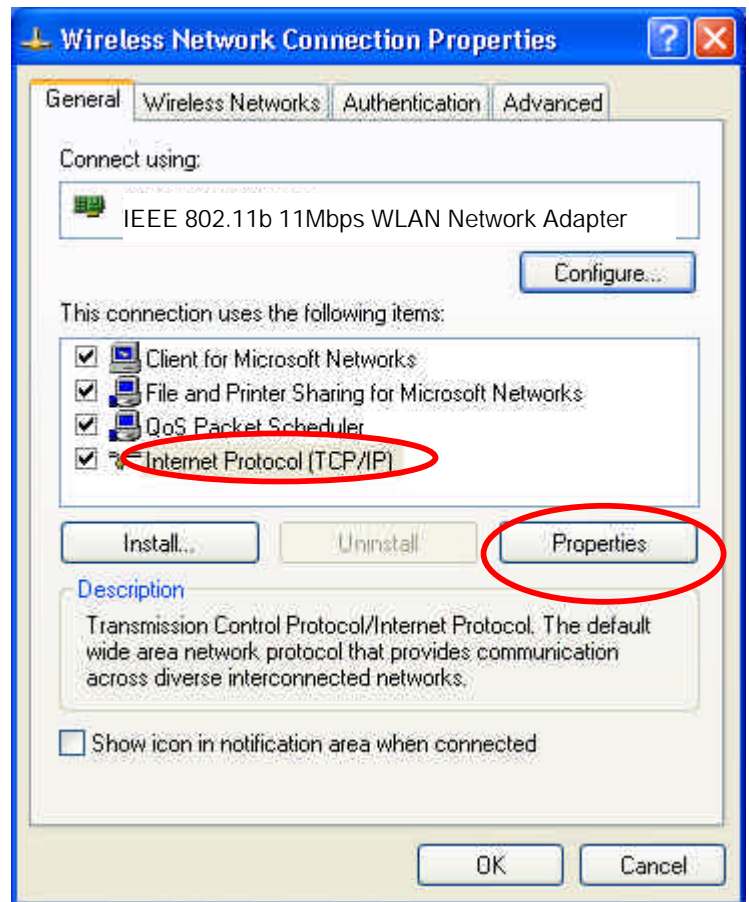
Go to **Start** menu > **Control Panel** > **Network Connections** > Right-click on the active **Local Area connection** > Select **“Properties”**



**!Note:** There might be two or more Local Area Connection to choose from. You must select the one that you will use to connect to the network.

The Local Area Connection Properties would appear.

Select “**Internet Protocol (TCP/IP)**” and Click “**Properties**” to continue.

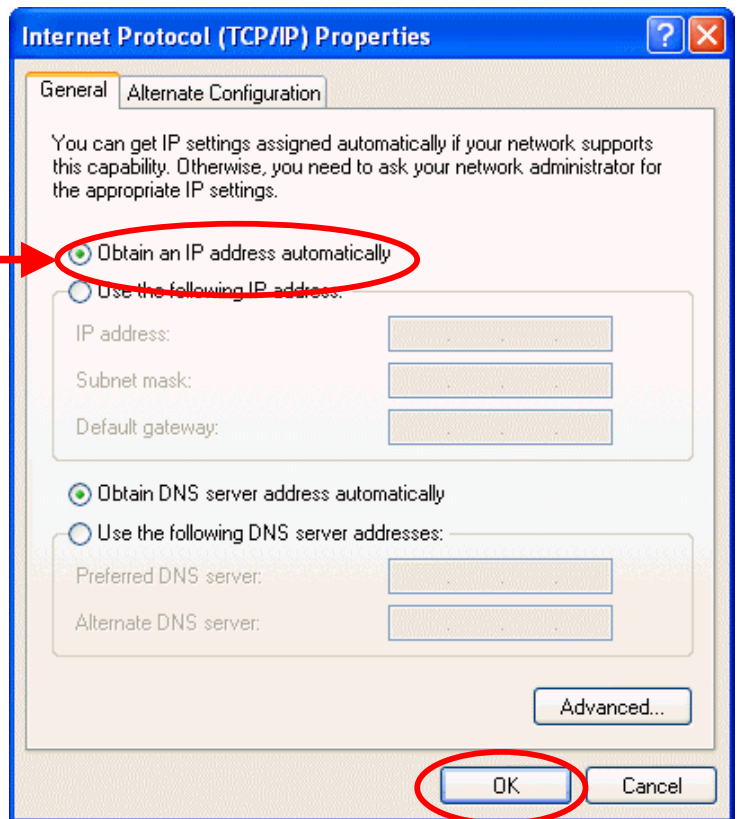


## Dynamically Assigned IP Address

The TCP/IP Properties window appears.

Select “**Obtain an IP address automatically**” if you are on a DHCP enabled network.

Click “**OK**” to close the window with the changes made



## Static IP Address

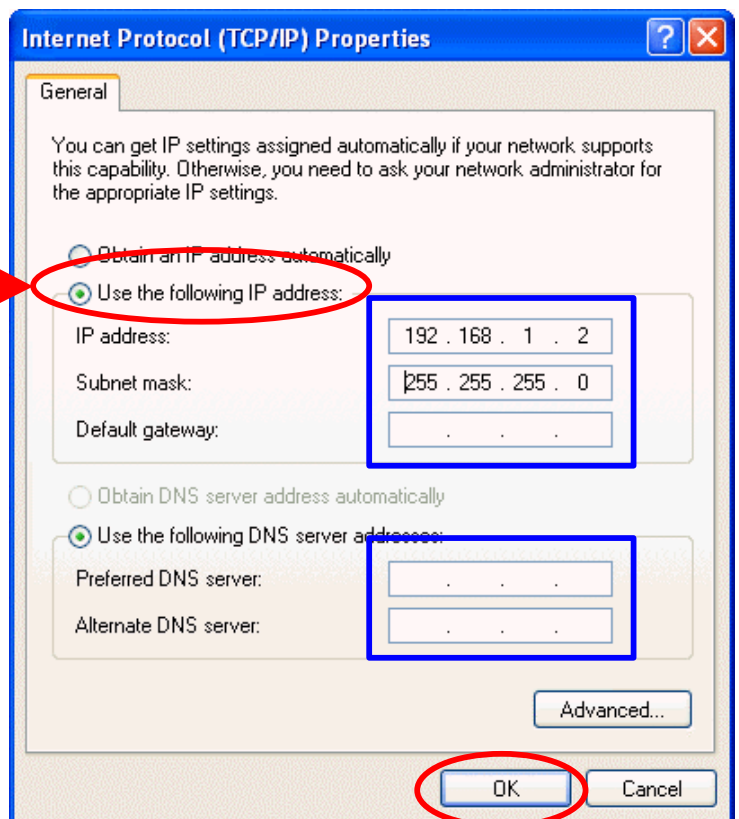
Select “**Use the following IP address**”

Enter the **IP address** and **subnet mask** fields.

Enter the IP address of the Router in the **Default gateway** field.

Enter the IP address of the Router in the **DNS server** field

Click “**Ok**” to close the window

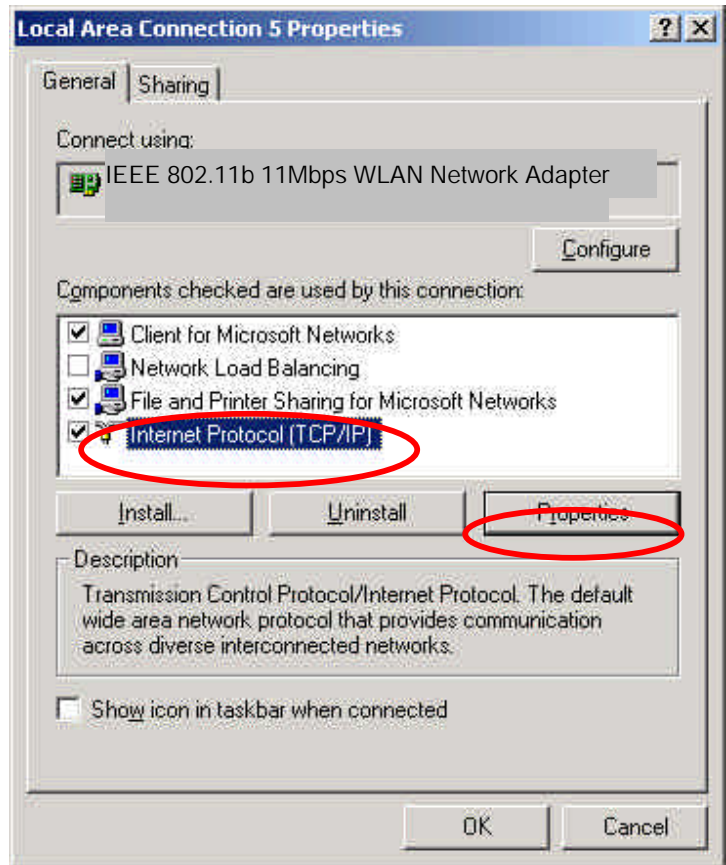


**!Note:** The IP address must be within the same range as the wireless route or Access Point.

## Wireless Network in Windows 2000

Go to **Start** menu > **Settings** > **Network and Dial-up Connections** > Double-click on the **Local Area Connection**

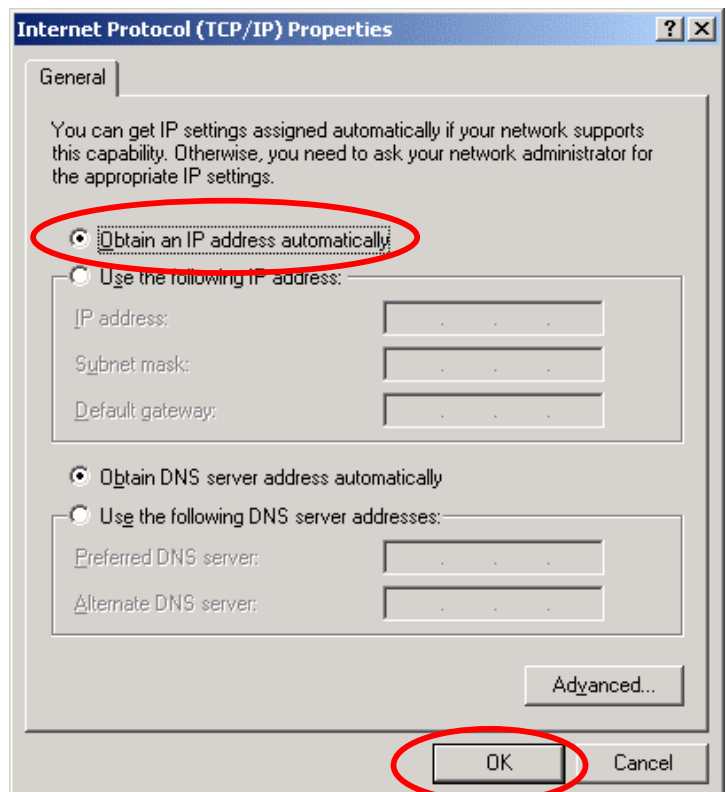
Select **“Internet Protocol (TCP/IP)”** and click **“Properties”**



The TCP/IP Properties window appears.

Select **“Obtain an IP address automatically”** if you are on a DHCP enabled network.

Click **“OK”** to close the window with the changes made



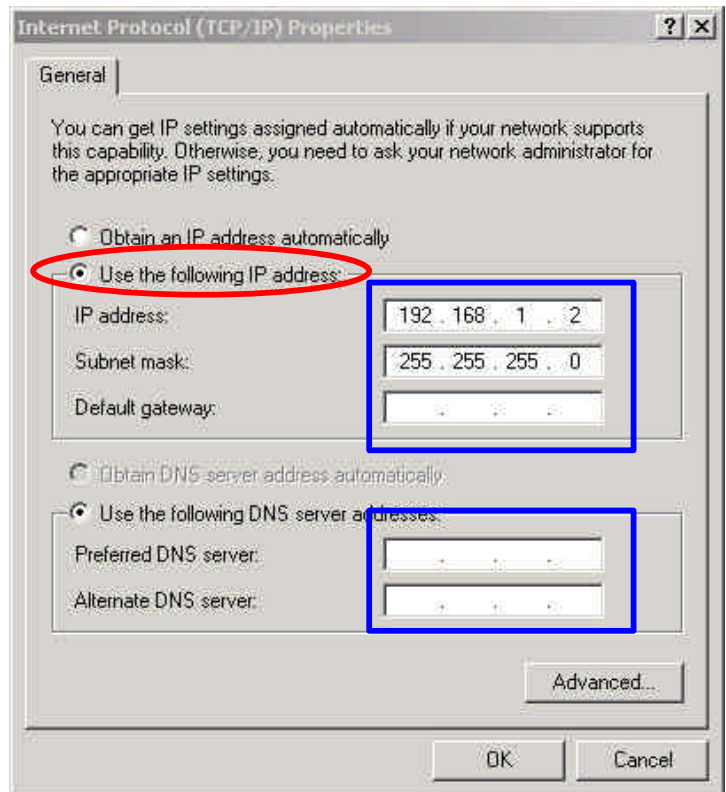
Select “**Use the following IP address**”

Enter the **IP address** and **subnet mask** fields.

Enter the IP address of the Router in the **Default gateway** field.

Enter the IP address of the Router in the **DNS server** field

Click “**Ok**” to close the window

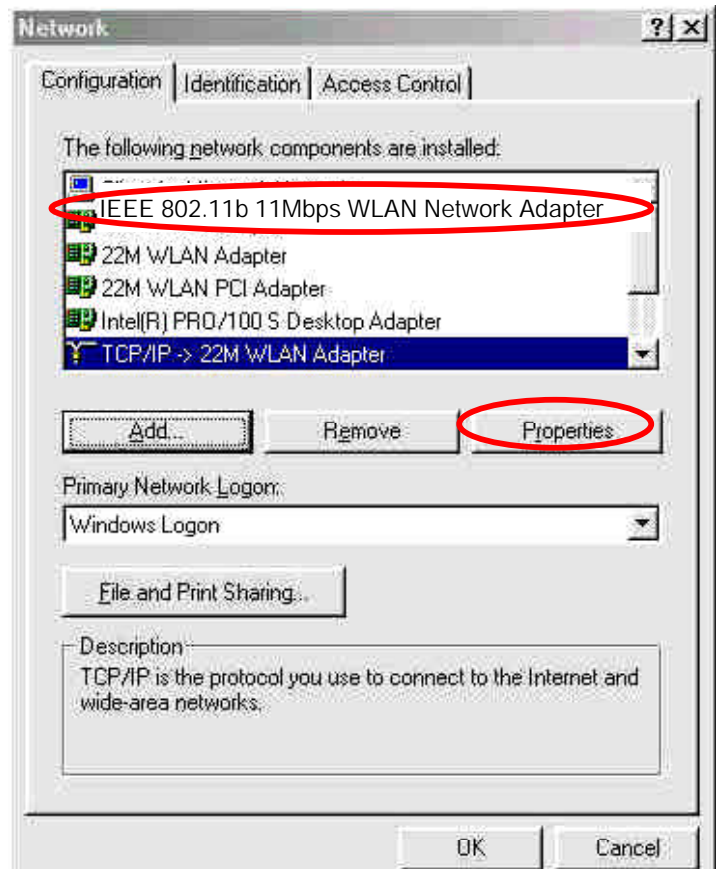


## Wireless Network In Windows 98 and Windows ME

Go to **Start** menu > **Settings** > **Control Panel** > Double-click on **Network**

Select **TCP/IP** of the network device

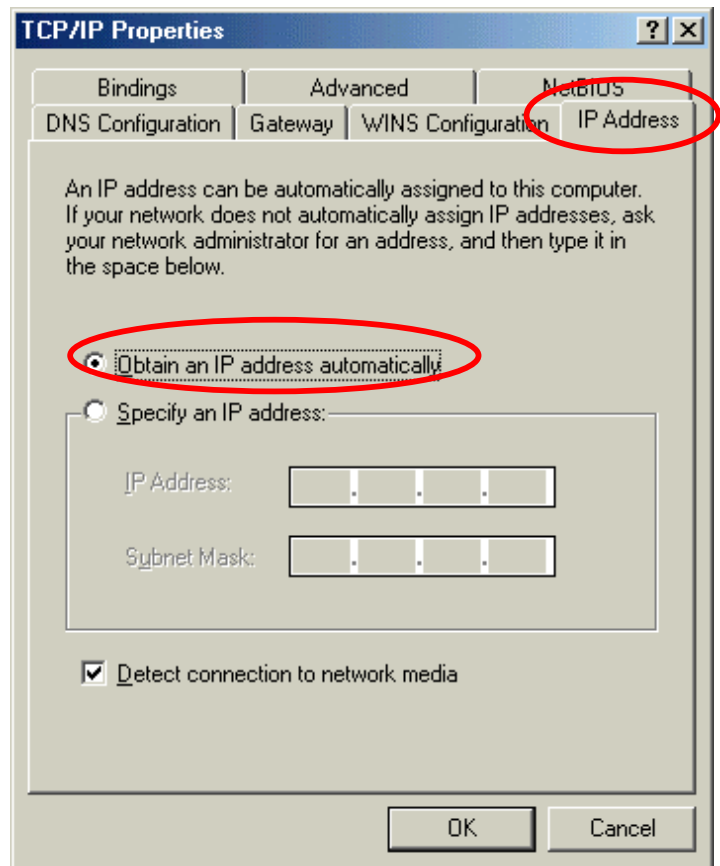
Click “**Properties**” to continue



The TCP/IP Properties window appears.

Select “**Obtain an IP address automatically**” if you are on a DHCP enabled network.

Click “**OK**” to close the window with the changes made

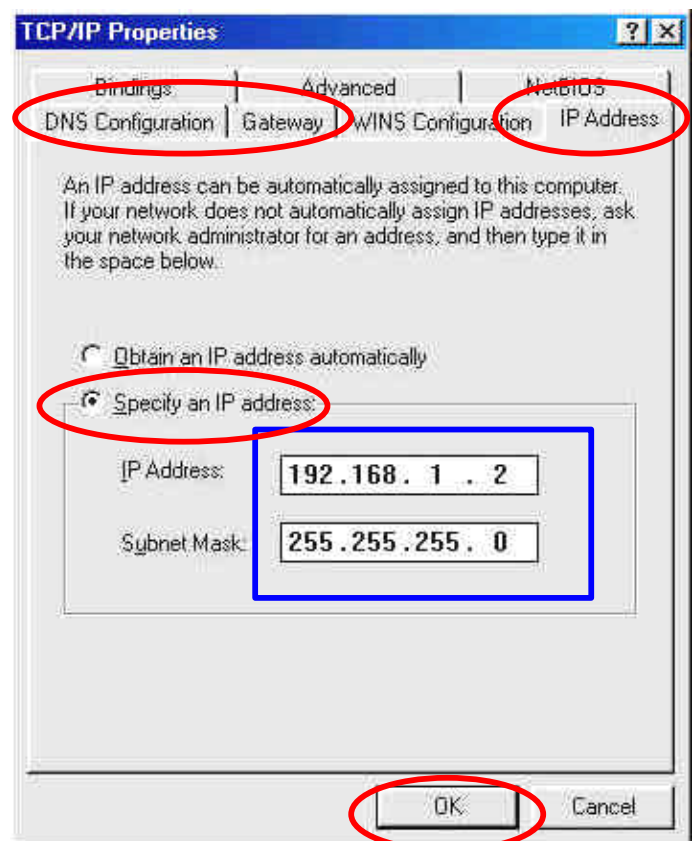


Select “**Specify an IP address**”

Enter the **IP address** and **subnet mask** fields.

In the **DNS Configuration** Tab Page, (1) enter the IP address of the Router in the **Default gateway** field.

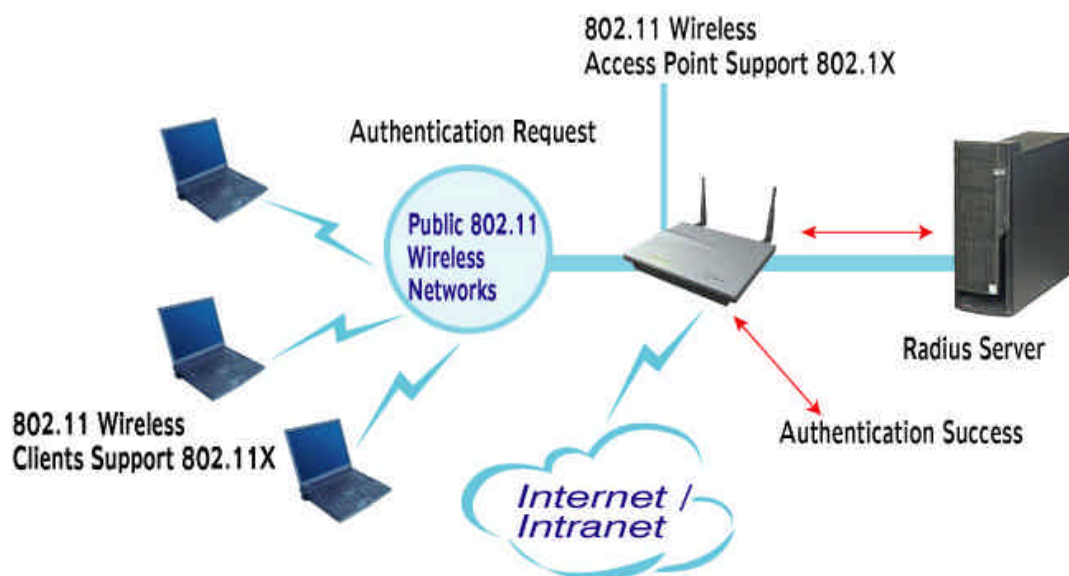
(2) Enter the IP address of the Router in the **DNS server** field



## APPENDIX C: 802.1x Authentication Setup

There are three essential components to the 802.1x infrastructure: (1) Supplicant, (2) Authenticator and (3) Server. The 802.1x security supports both MD5 and TLS Extensive Authentication Protocol (EAP). The 802.1x Authentication is a complement to the current WEP encryption used in wireless network. The current security weakness of WEP encryption is that there is no key management and no limitation for the duration of key lifetime. 802.1x Authentication offers key management, which includes key per user and key per session, and limits the lifetime of the keys to certain duration. Thus, key decryption by unauthorized attacker becomes extremely difficult, and the wireless network is safely secured. We will introduce the 802.1x Authentication infrastructure as a whole and going into details of the setup for each essential component in 802.1x authentication.

### 802.1x Authentication Infrastructure



The Infrastructure diagram showing above illustrates that a group of 802.11 wireless clients is trying to form a 802.11 wireless network with the Access Point in order to have access to the Internet/Intranet. In 802.1x authentication infrastructure, each of these wireless clients would have to be authenticated by the Radius server, which would grant the authorized client and notified the Access Point to open up a

communication port to be used for the granted client. There are 2 Extensive Authentication Protocol (EAP) methods supported: (1) MD5 and (2) TLS. MD5 authentication is simply a validation of existing user account and password that is stored in the server with what are keyed in by the user. Therefore, wireless client user will be prompted for account/password validation every time when he/she is trying to get connected. TLS authentication is a more complicated authentication, which involves using certificate that is issued by the Radius server, for authentication. TLS authentication is a more secure authentication, since not only the Radius server authenticates the wireless client, but also the client can validate the Radius server by the certificate that it issues. The authentication request from wireless clients and reply by the Radius Server and Access Point process can be briefed as follows:

1. The client sends an EAP start message to the Access Point
2. The Access Point replies with an EAP Request ID message
3. The client sends its Network Access Identifier (NAI) – its user name – to the Access Point in an EAP Respond message.
4. The Access Point forwards the NAI to the RADIUS server with a RADIUS Access Request message.
5. The RADIUS server responds to the client with its digital certificate.
6. The client validates the digital certificate, and replies its own digital certificate to the RADIUS server.
7. The RADIUS server validates client's digital certificate.
8. The client and RADIUS server derive encryption keys.
9. The RADIUS server sends the access point a RADIUS ACCEPT message, including the client's WEP key.
10. The Access Point sends the client an EAP Success message along with the broadcast key and key length, all encrypted with the client's WEP key.

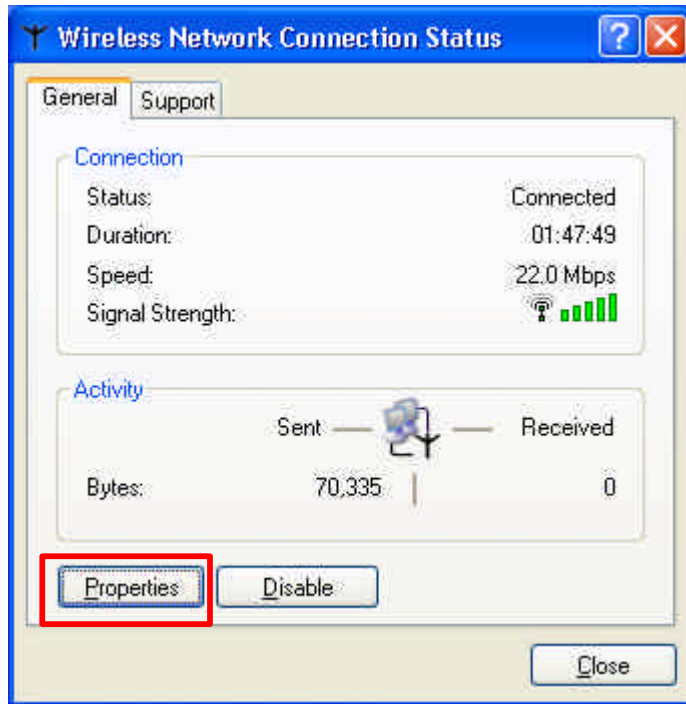
## **Supplicant: Wireless Network PCI**

Here is the setup for the Wireless Network PCI under Windows XP, which is the only Operating System that our driver supports for 802.1x. Microsoft is planning on supporting 802.1x security in all common Windows Operating System including Win98SE/ME/2000 by releasing Service Pack in 2003.

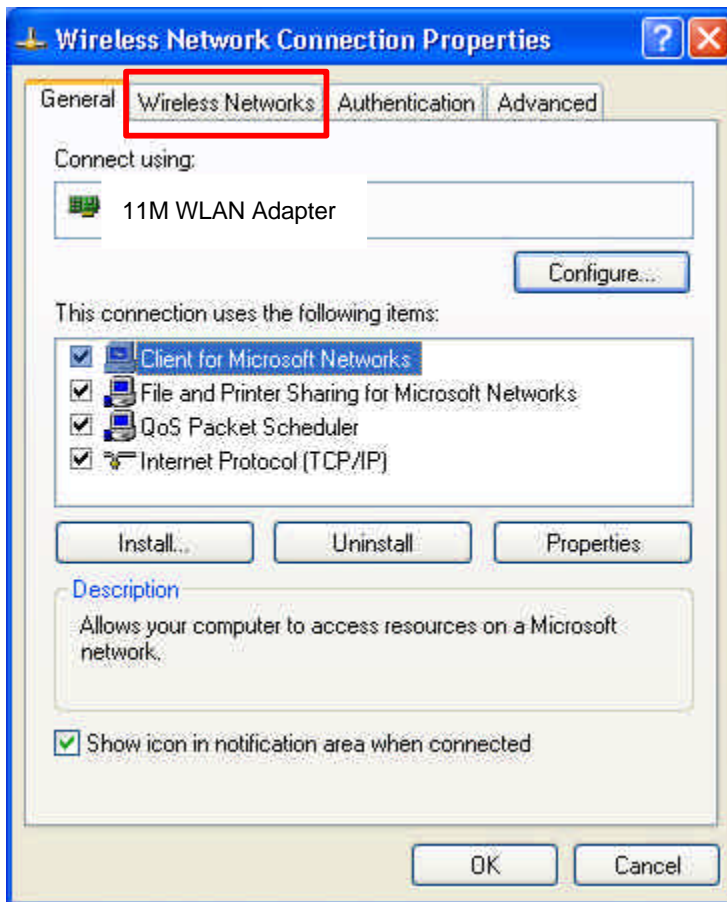
Please note that the setup illustration is based on our 11Mbps wireless PCI.



1. Go to **Start > Control Panel**
2. double-click on **“Network Connections”**
3. right-click on the Wireless Network Connection that you use with our 11Mbps wireless PCI.
4. Click **“Properties”** to open up the Properties setting window.

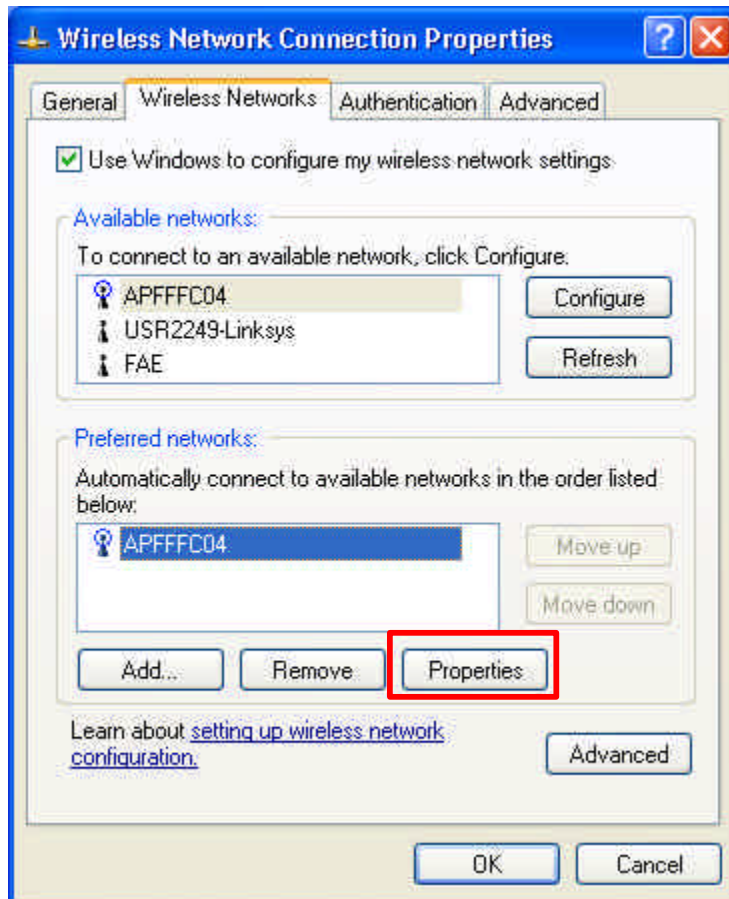


5. Click on the “**Wireless Network**” tab.



6. Click **“Properties”** of the available wireless network, which you wish to connect or configure.

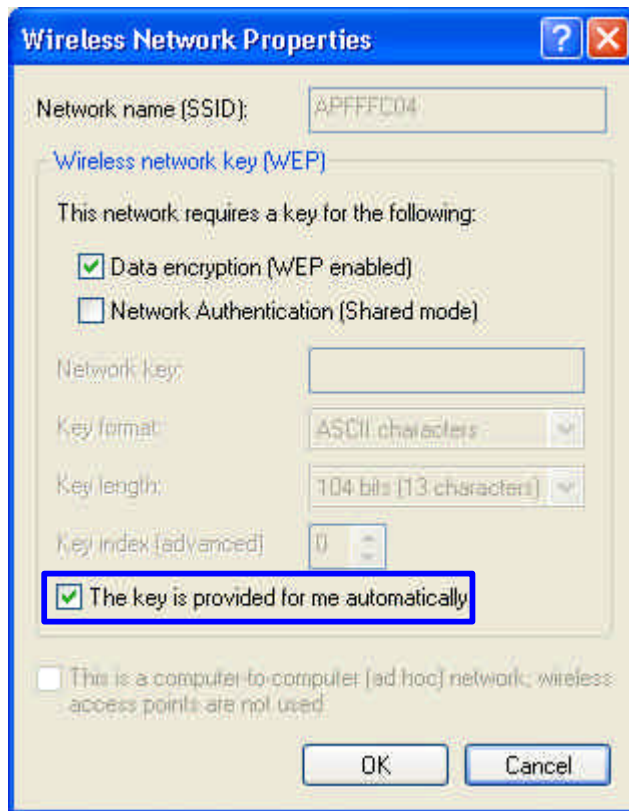
Please note that if you are going to change to a different 802.1x authentication EAP method, i.e. switch from using MD5 to TLS, , you must remove the current existing wireless network from your Preferred networks first, and add it in again.



To configure for using TLS authentication method, please follow steps 7 ~ 25.  
Please follow steps 26 ~ for using MD5 authentication method.

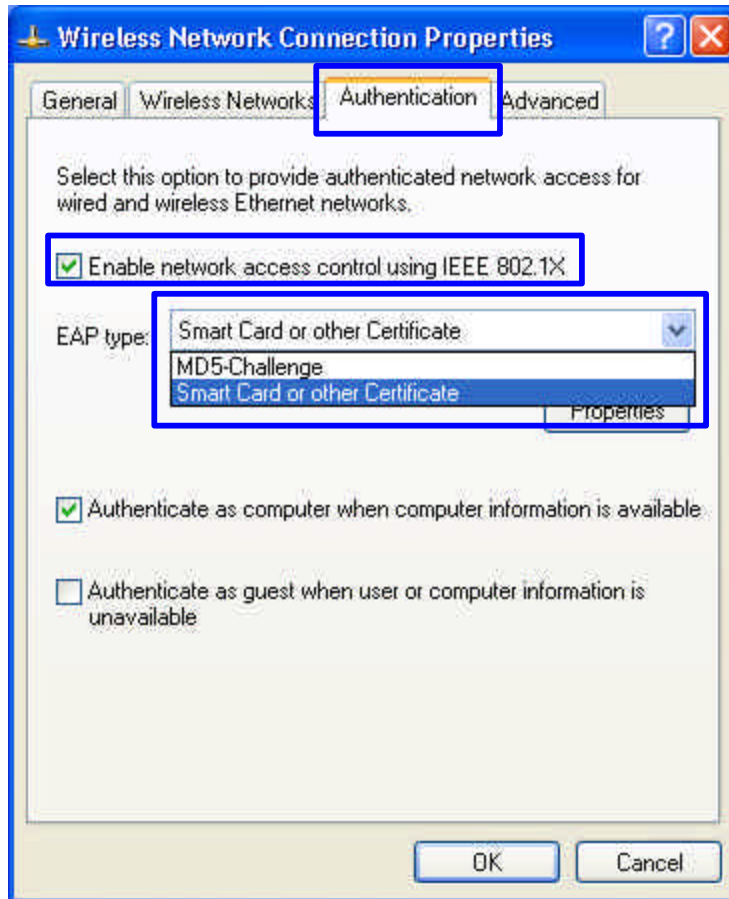
## TLS Authentication

7. Select “The key is provided for me automatically” option



8. Click “OK” to close the Wireless Network Properties window.

9. Click “**Authentication**” tab
10. Select “**Enable network access control using IEEE 802.1x**” option to enable 802.1x authentication.
11. Select “**Smart Card or other Certificate**” from the drop-down list box for EAP type.



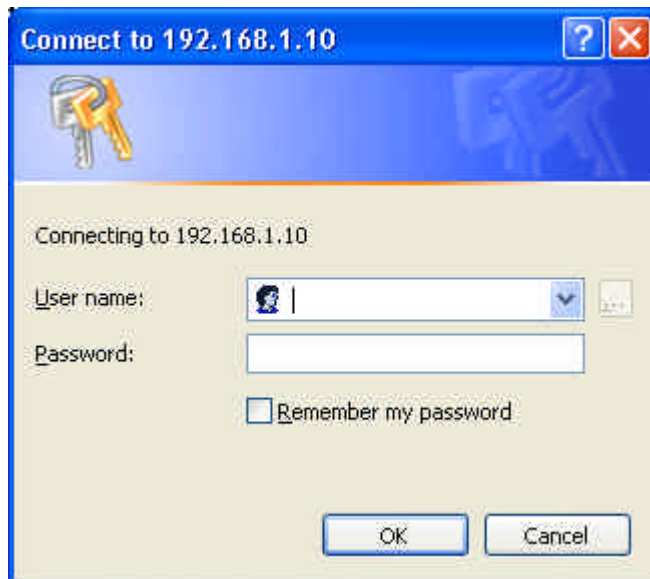
12. Click “**OK**” to close the Wireless Network Connection Properties window, thus make the changes effective.

The wireless client configuration in the zero-configuration utility provided in Windows XP is now completed for TLS configuration. Before you can enable IEEE 802.1x authentication and have wireless client authenticated by the Radius server, you have to download the certificate to your local computer first.

## TLS Authentication – Download Digital Certificate from Server

In most corporations, it requires internal IT or MIS staff's help to have the certificated downloaded to your local computer. One of the main reasons is that each corporation uses its own server systems, and you will need the assistance from your IT or MIS for account/password, CA server location and etc. The following illustration is based on obtaining a certificate from Windows 2000 Server which can act as a CA server, assuming you have a valid account/password to access the server.

13. Connect to the server and ask for access, and the server will prompt you to enter your user name and password.
14. Enter your **user name** and **password**, then click “**OK**” to continue.

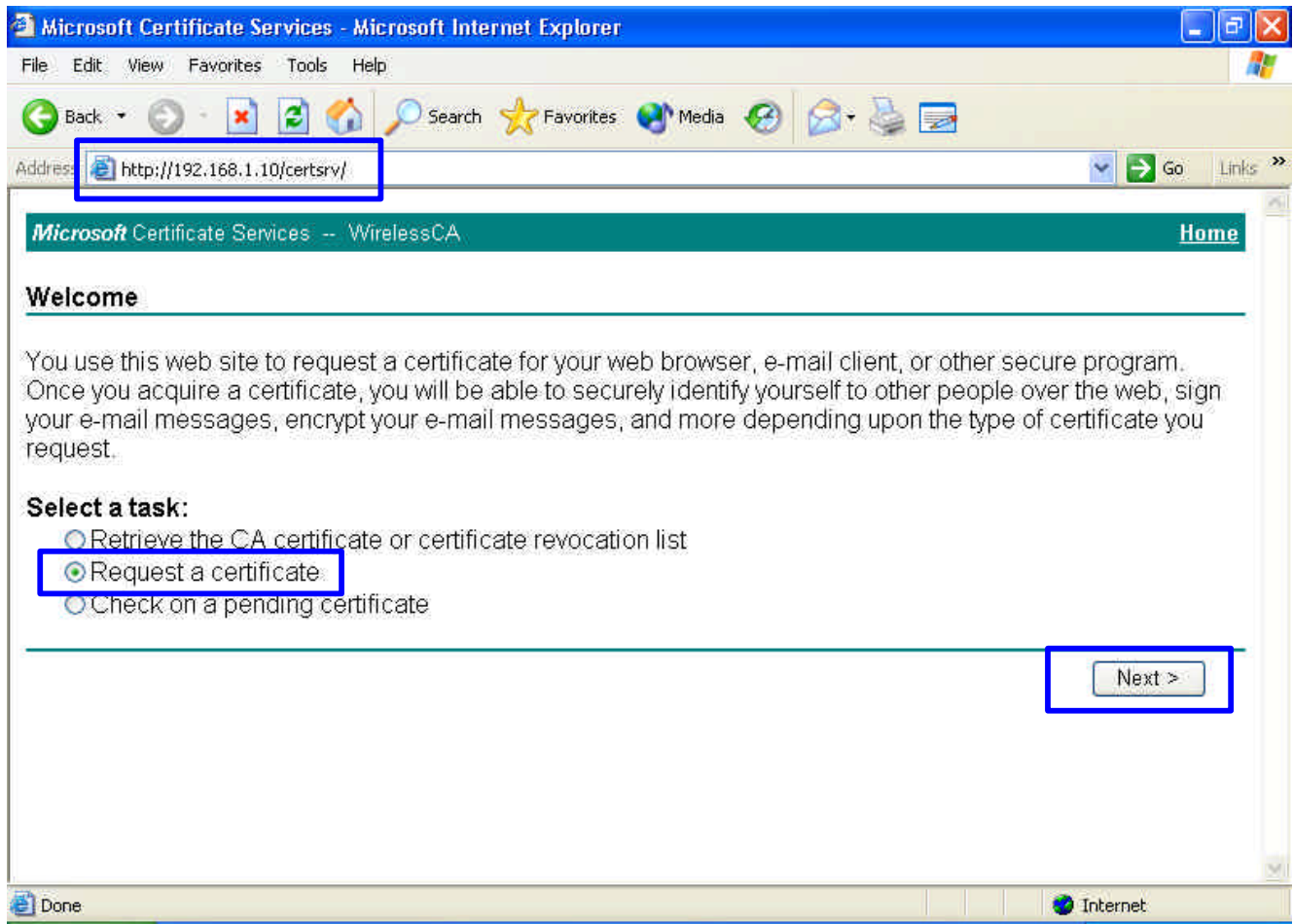


Please note that we use IP addresses for connection with the server for our illustration, and the IP of the server is 192.168.1.10.

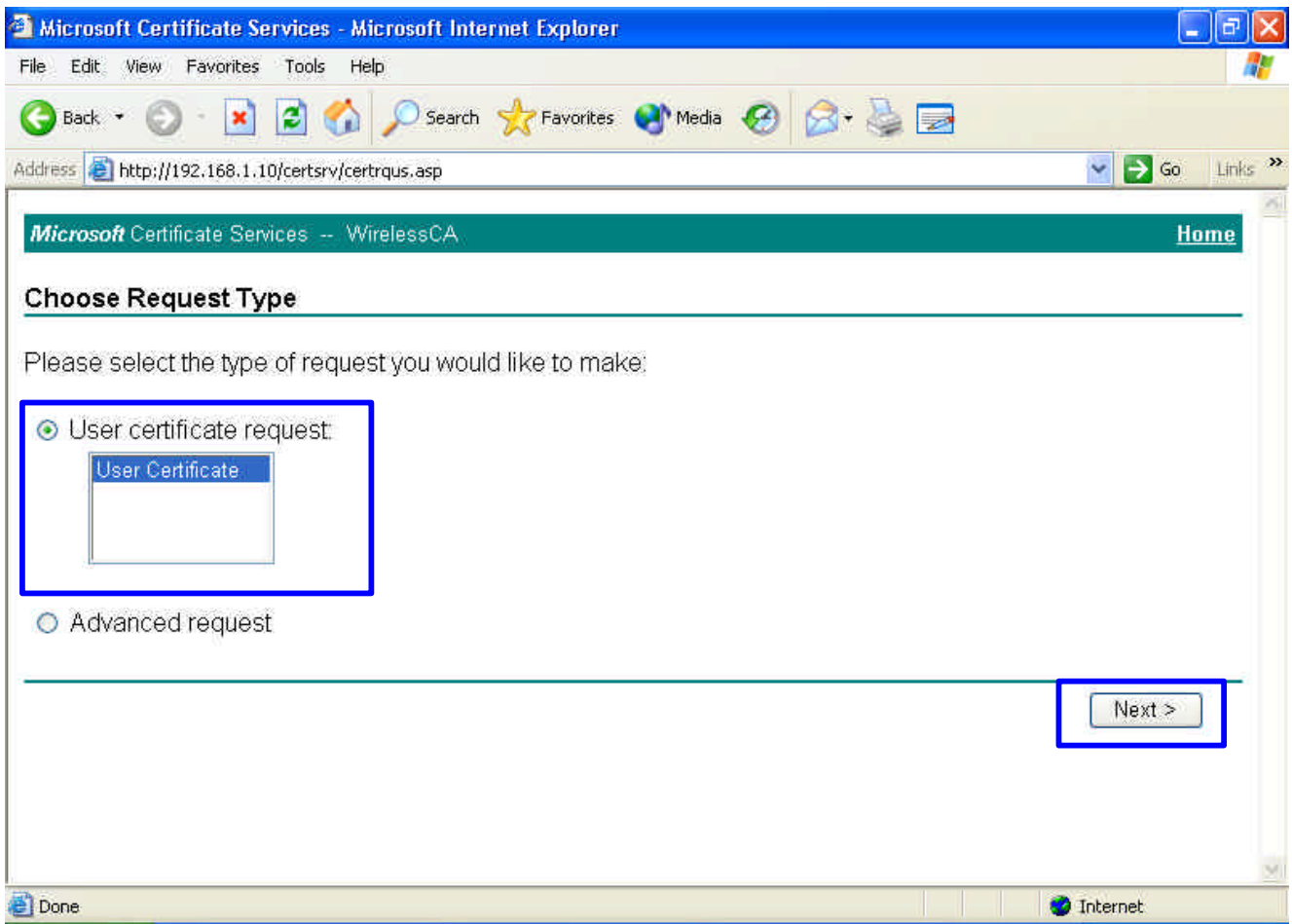
15. After successful login, open up your Internet Browser, and type the following in the address field.  
**http://192.168.1.10/certsrv**

This is how we connect to the Certificate Service installed in Windows 2000 server.

16. Now we are connected to the Certificate Service. Select **“Request a certificate”**, and click **“Next”** to continue.

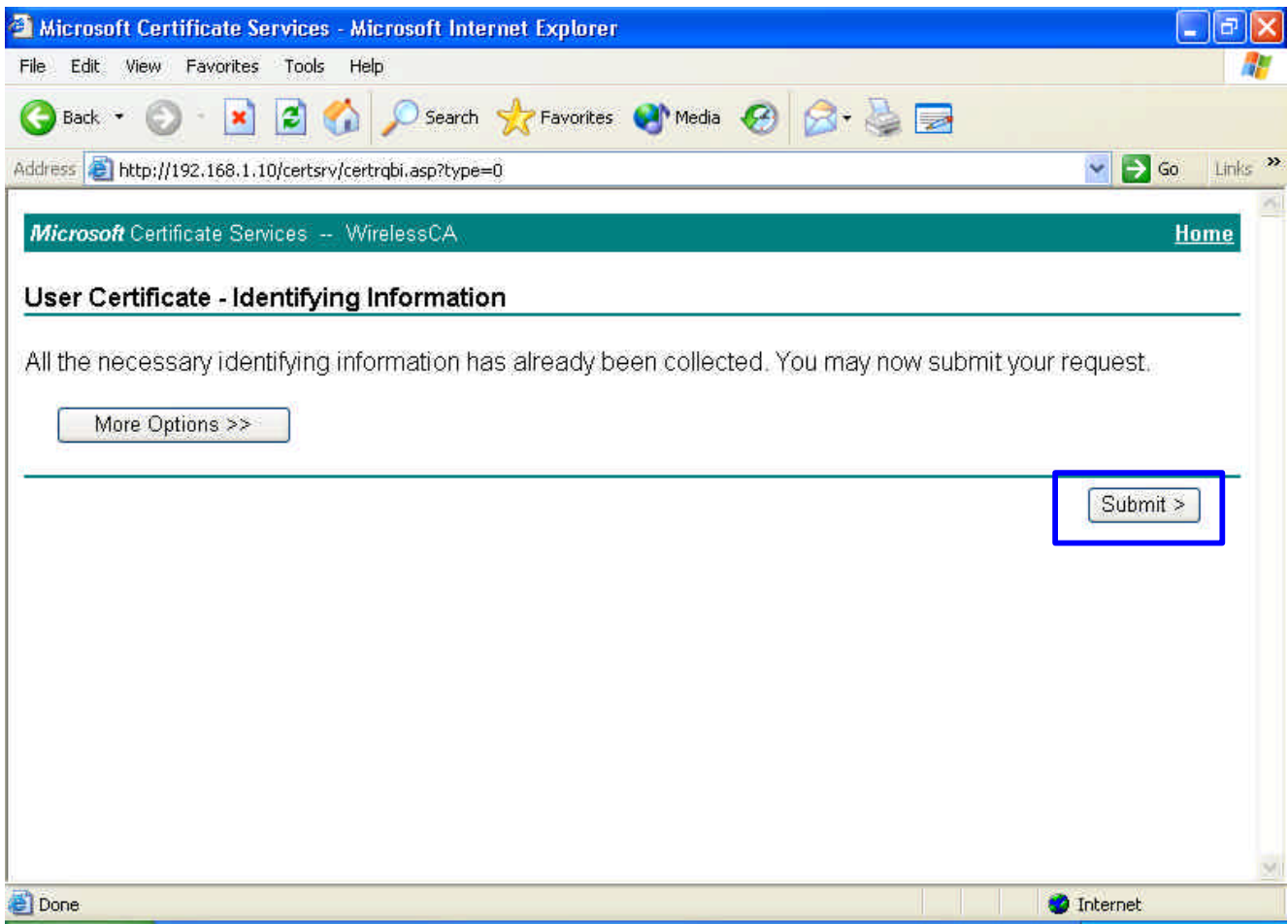


17. Select “**User Certificate request**”, and click “**Next**” to continue.





18. Click “**Submit >**” to continue.



19. The Certificate Service is now processing the certificate request.

