



# LevelOne

User Manual



WNC-0601

**300M N\_Max Wireless PCI Card**

V1.0.0

# Safety

## FCC WARNING

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.

To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. (Example - use only shielded interface cables when connecting to computer or peripheral devices).

## FCC Radiation Exposure Statement

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

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.

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

## CE Marking Warning

Digital Data Communications, declares that this product (Model-no. WNC-0601) is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

The CE-Declaration of Conformity can be downloaded at:

<http://www.level1.com/>



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# 1. Introduction

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Congratulations on your purchase of LevelOne 300M *N\_Max* Wireless PCI Card.

This manual helps to get familiar with the LevelOne *N\_Max* Wireless LAN PCI Card. This manual contains detailed instructions in operation of this product. Please keep this manual for future reference.

With a Wireless LAN PCI Card, a laptop computer or a station can communicate with another computer in a wireless way. Easy-to-use utilities are bundled with Wireless LAN PCI Card for configuration, monitoring, and diagnosis purposes.

Wireless LAN PCI Card can wirelessly transmit and receive data, with the Wireless LAN PCI Card, you can locate your Notebook PC or station wherever you want without wires and cables.

Wireless LAN PCI Card provides users with an access to real-time information anywhere in their organization. The mobility provides productivity and service, which are not available under wired networks. The Wireless LAN PCI Card configuration is easy to change from peer-to-peer networks, suitable for a small number of users, to full infrastructure networks of thousands of users that allow roaming around a broad area.

## 1.1 User Manual Overview

|                                 |  |
|---------------------------------|--|
| <b>Introduction</b>             | Describes 300M <i>N_Max</i> Wireless PCI Card.   |
| <b>Unpacking and Setup</b>      | Helps user to get started with the basic installation of the 300M <i>N_Max</i> Wireless PCI Card.                    |
| <b>Hardware Installation</b>    | Describes the LED indicators of the 300M <i>N_Max</i> Wireless PCI Card.   |
| <b>Software Installation</b>    | Tells how to setup the driver and the utility setting.   |
| <b>Technical Specifications</b> | Lists the technical (general, physical and environmental) specifications of the 300M <i>N_Max</i> Wireless PCI Card. |

## 2. Unpacking and Setup

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This chapter provides the package contents and setup information for the 300M *N*\_Max Wireless PCI Card.

### 2.1 Features

- Extended and high-speed wireless connectivity with 802.11n wireless technology
- Hardware Push Button for Wi-Fi Protected Setup
- Backward compliant with IEEE802.11g and 11b standards
- Operates on the 2.4GHz frequency band
- Supports 64/128-bit WEP ,WPA and WPA2 encryption for high level security
- Supports Window 2000/XP/Vista

### 2.2 Package Contents

Open the box of the 300M *N*\_Max Wireless PCI Card and carefully unpack it. The box should contain the following items:

- WNC-0601 300M *N*\_Max Wireless PCI Card
- Quick Installation Guide
- CD Manual/Driver/Utility

If any item is found missing or damaged, please contact your local reseller for replacement.

### 2.3 Setup

The setup of the Wireless PCI Card can be performed using the following steps:

- Visually inspect the PCI Card and make sure that it is fully plugged in to the PCI slot.
- Make sure that there is a well environment that there is no much intrusion to have a better connection.

## 3. Hardware Installation

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### 3.1 Installation Procedure for PCI Card

You should install the supplied software BEFORE inserting the Wireless PCI Card when using Windows 2000, XP, or Vista.



#### Note

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The following installation was operated under Windows XP. (Procedures are similar for Windows 2000, and Vista.)

If you have installed the Wireless PCI Card driver & utility before, please uninstall the old version first.

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### 3.2 LED Indicator

The Wireless PCI Card has Link and PWR LED.

| LED  | Status      | Description   |
|------|-------------|---|
| PWR  | On          | Indicates the power is on.  |
|      | Off         | Indicates the power is off  |
| LINK | On/Flashing | Indicates the power is on, and the 802.11b/g/n radio is enabled.<br>Flashing indicates wireless network activity. |
|      | Off         | Indicates the power is off, or the 802.11b/g/n radio is disabled  |

### **3.3 Check the installation**

The LEDs of the Wireless PCI Card are clearly visible and the status of the network link can be seen instantly:

1. Once the device is plugged to the station's PCI slot, the PWR LED of the Wireless PCI Card will light up indicating a normal status with power.
2. While the Wireless PCI Card linked up and transmitting data to the Access Point or to other Wireless LAN station, the LINK LED will start alternate blinking.

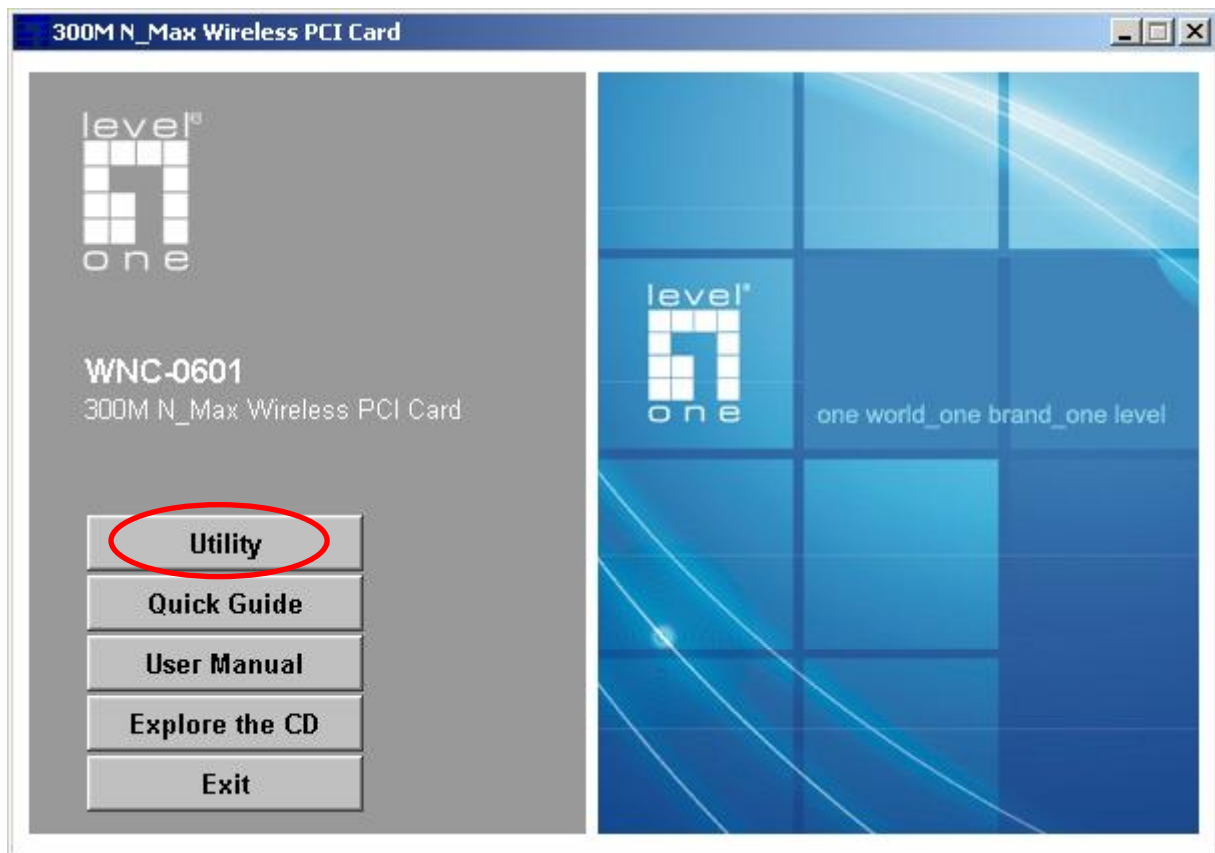
## 4. Software Installation

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This section will lead you to install the driver and utility of the 300M *N\_Max* Wireless PCI Card.

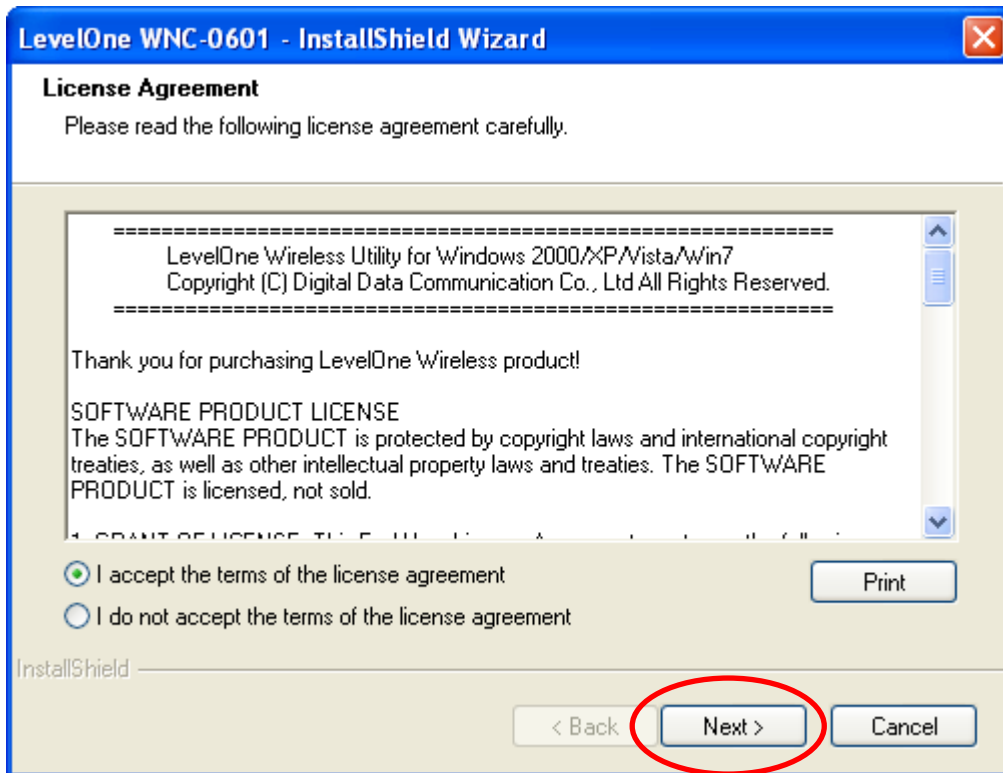
### 4.1 Windows XP Utility Installation

1. Insert the 300M *N\_Max* Wireless PCI Card into the PCI slot, the following screen will prompt, click “**Next**” to continue.
2. Auto-run screen will appear. Alternatively, open a file browser and double click on the autorun.exe file located in the CD directory.
3. Click “**Utility**” to install the driver and utility and the install wizard will begin installing the software. Follow the install wizard instructions to complete the installation.

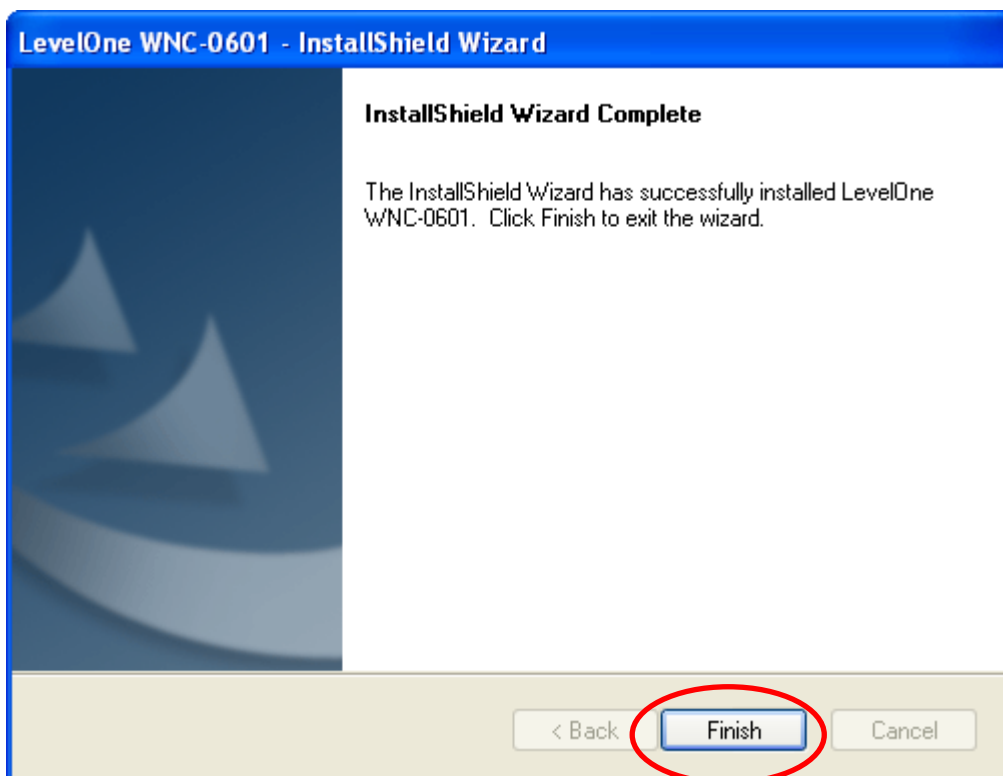


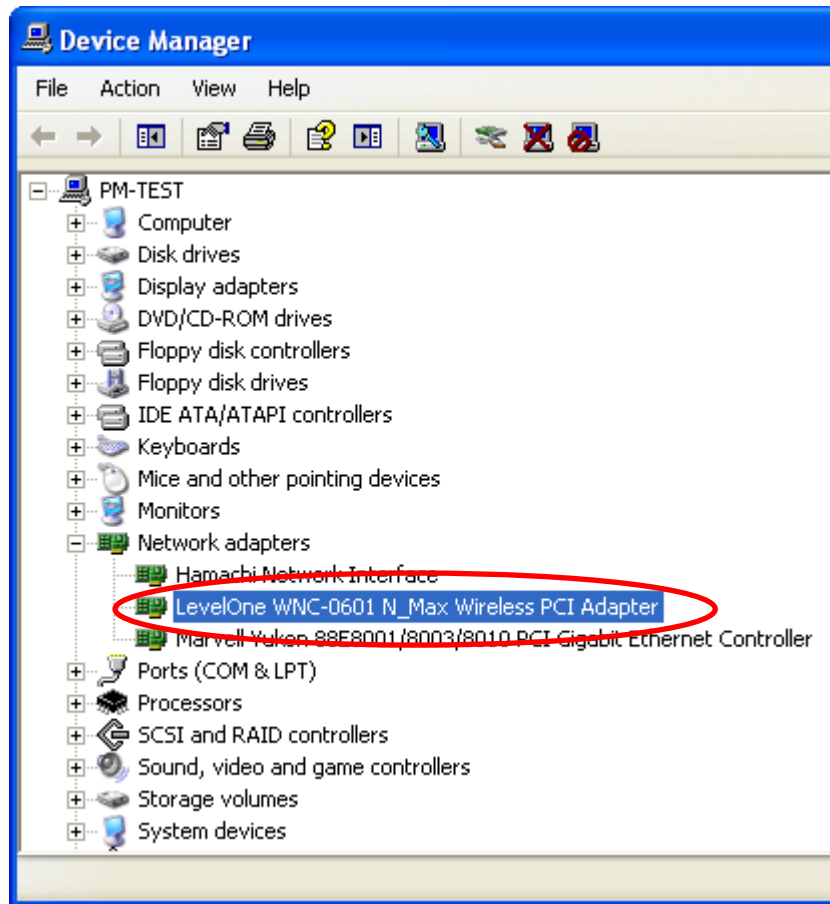
4. Follow the Install Shield Wizard Instructions. Click “**Next**” to continue and follow the on-screen instruction to finish it.





5. The software installation has now completed.





The installation program will help you to setup the Wireless LAN utility. **Be noted that the Windows XP has its own Wireless Utility; you can either use the utility of Windows XP or the provided utility.**

When the Wireless LAN utility is installed properly, you will see the icon on the Windows task bar. The user can configure the wireless settings using the Wireless PCI Card Configuration Utility. Double-click the utility icon that appears in the taskbar



When the icon in the toolbar represents in full blue color then the signal strength has an excellent performance with the AP, if it represents in half blue color then the signal strength has a fair performance with the AP, and if the icon represents in low blue, then the signal strength has a worst performance with the wireless station.



Excellent Wireless Signal Strength



Adequate Wireless Signal Strength



Low Wireless Signal Strength



Wireless Card inactive

# 5. Wireless Utility Configuration (For Windows XP and Vista)

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## 5.1 Profile

The Profile List keeps a record of your favorite wireless settings at home, office, and other public hot-spots. You can save multiple profiles, and activate the correct one at your preference. The following Figure shows the basic profile section.



**Profile Name:** Profile Name: Name of profile, preset to PROF\* (\* indicate 1, 2, 3...).

**SSID:** The access point or Ad-hoc name.

**Network Type:** Indicates the networks type, including infrastructure and Ad-Hoc.

**Authentication:** Indicates the authentication mode used.

**Encryption:** Indicates the encryption Type used.

**Use 802.1x:** Shows if the 802.1x feature is used or not.

**Tx Power:** Transmitting power, the amount of power used by a radio transceiver to send the signal out.

**Channel:** Channel in use for Ad-Hoc mode.

**Power Save Mode:** Choose from CAM (Constantly Awake Mode) or Power Saving Mode.

**RTS Threshold:** Users can adjust the RTS threshold number by sliding the bar or keying in the value directly.

**Fragment Threshold:** The user can adjust the Fragment threshold number by sliding the bar or key in the value directly.

**Add/Edit Profile:** The user can add and edit the selected AP to the Profile setting. It will bring up a profile page and save the user's setting to a new profile.

**Delete Profile:** The user can delete the selected AP from profile page.

**Activate Profile:** The user can activate the selected AP from profile page.

### System Config.:

The screenshot shows a 'System Config' dialog box. The title bar includes 'System Config', 'Auth. \Encry.', and '802.11x'. The main area contains the following settings:

- Profile Name >> PROF1
- SSID >> MeetingRoom
- Network Type >> Infrastructure
- Tx Power >> Auto
- Preamble >> Auto
- Power Save Mode >> CAM (selected), PSM
- RTS Threshold:  0 [slider] 2347 [text box: 2347]
- Fragment Threshold:  256 [slider] 2346 [text box: 2346]
- Diagnosis Capable

Buttons: OK, Cancel

**Profile Name:** The user can choose any name for this profile, or use the default name defined by system.

**SSID:** The user can key in the intended SSID name or select one of the available APs from the drop-down list.

**Power Save Mode:** Choose CAM (Constantly Awake Mode) or Power Saving Mode.

**Network Type:** There are two types, infrastructure and 802.11 Ad-hoc mode. Under Ad-hoc mode, user can also choose the preamble type. The available preamble type includes auto and long. In addition, the channel field will be available for setup in Ad-hoc mode.

**RTS Threshold:** User can adjust the RTS threshold number by sliding the bar, or key in the value directly. The default value is 2347.

**Fragment Threshold:** User can adjust the Fragment threshold number by sliding the bar or key in the value directly. The default value is 2346.

**Channel:** Only available for setting under Ad-hoc mode. Users can choose the channel frequency to start their Ad-hoc network.

### Auth. \ Encry.:

**Authentication Type:** There are 7 types of authentication modes which are open, Shared, LEAP, WPA and WPA-PSK, WPA2 and WPA2-PSK.

**Encryption Type:** For open and shared authentication mode, the selection of available encryption type are None and WEP. For WPA, WPA2, WPA-PSK and WPA2-PSK authentication mode, both TKIP and AES encryption is available.

**WPA Pre-shared Key:** This is the key shared between the AP and STA. For WPA-PSK and WPA2-PSK authentication mode, this field must be filled with a key between 8 and 32 characters in length.

**WEP Key:** Only valid when using WEP encryption algorithms. The key must be identical to the AP's key. There are several formats to enter the keys.

1. Hexadecimal - 40bits : 10 Hex characters.
2. Hexadecimal - 128bits : 26Hex characters.
3. ASCII - 40bits : 5 ASCII characters.
4. ASCII - 128bits : 13 ASCII characters.

**802.1x Setting:** 802.1x is used for authentication of the "WPA" and "WPA2" certificate by the server.

## Authentication type:

1. **PEAP:** Protect Extensible Authentication Protocol. PEAP transport securely authenticates data by using tunneling between PEAP clients and an authentication server. PEAP can authenticate wireless LAN clients using only server-side certificates, thus simplifying the implementation and administration of a secure wireless LAN.
2. **TLS/Smart Card:** Transport Layer Security. Provides for certificate-based and mutual authentication of the client and the network. It relies on client-side and server-side certificates to perform authentication and can be used to dynamically generate user-based and session-based WEP keys to secure subsequent communications between the WLAN client and the access point.

**Session Resumption:** The user can choose "Disable" and "Enable".

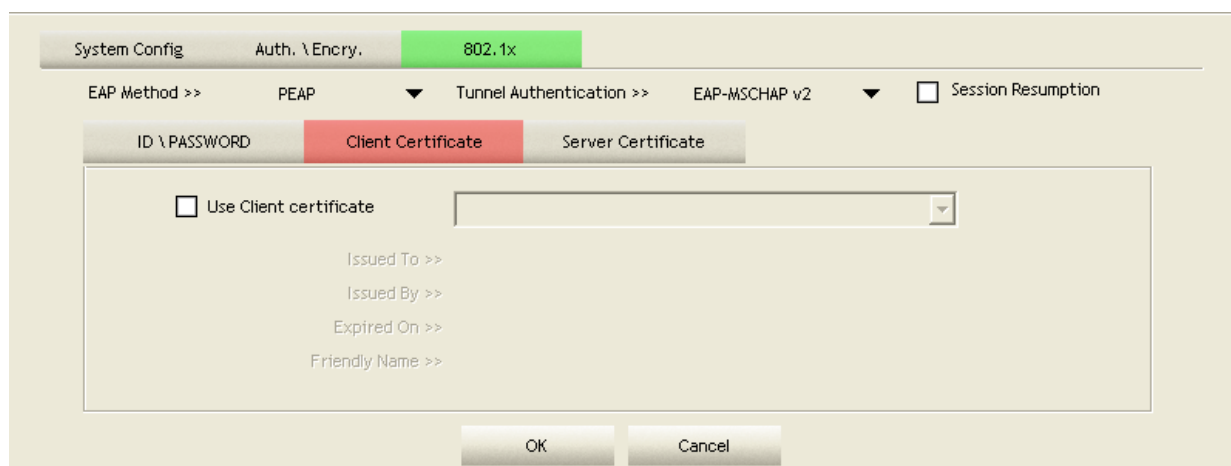
**Tunnel Authentication:** Tunnel protocol, List information include "EAP-MSCHAP v2" and "EAP-TLS/Smart card".

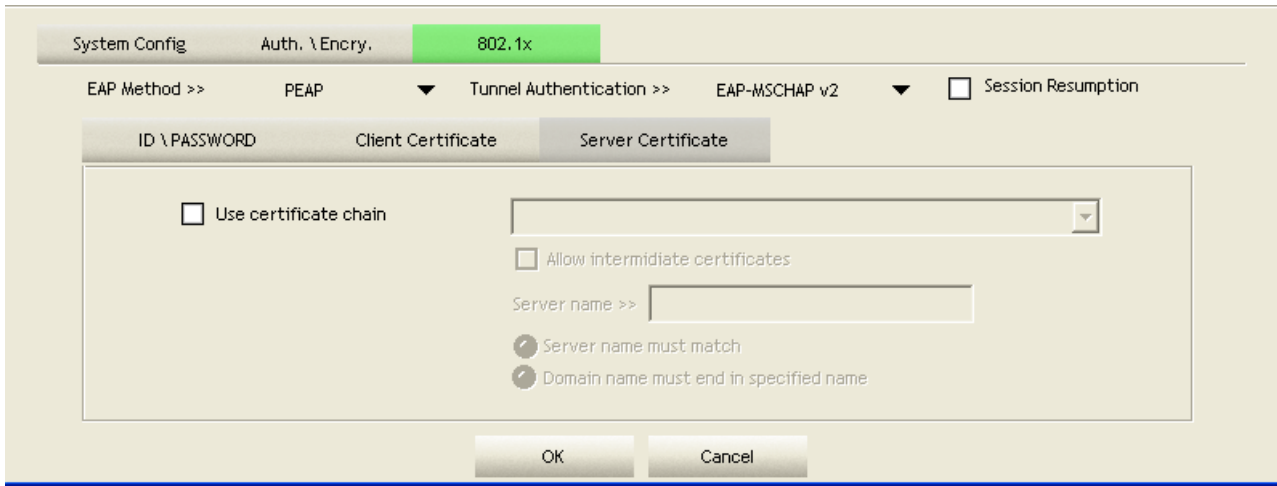
## ID \ PASSWORD:

**Authentication ID/Password:** The identity, password and domain name for server.

**Tunnel ID/Password:** Identity and Password for the server.

**Client Certification/Server Certification:** Depending on the EAP in use, only the server or both the server and client may be authenticated and require a certificate. Server certificates identify a server, usually an authentication or RADIUS server to clients. Most EAPs require a certificate issued by a root authority or a trusted commercial Certificate Authority.





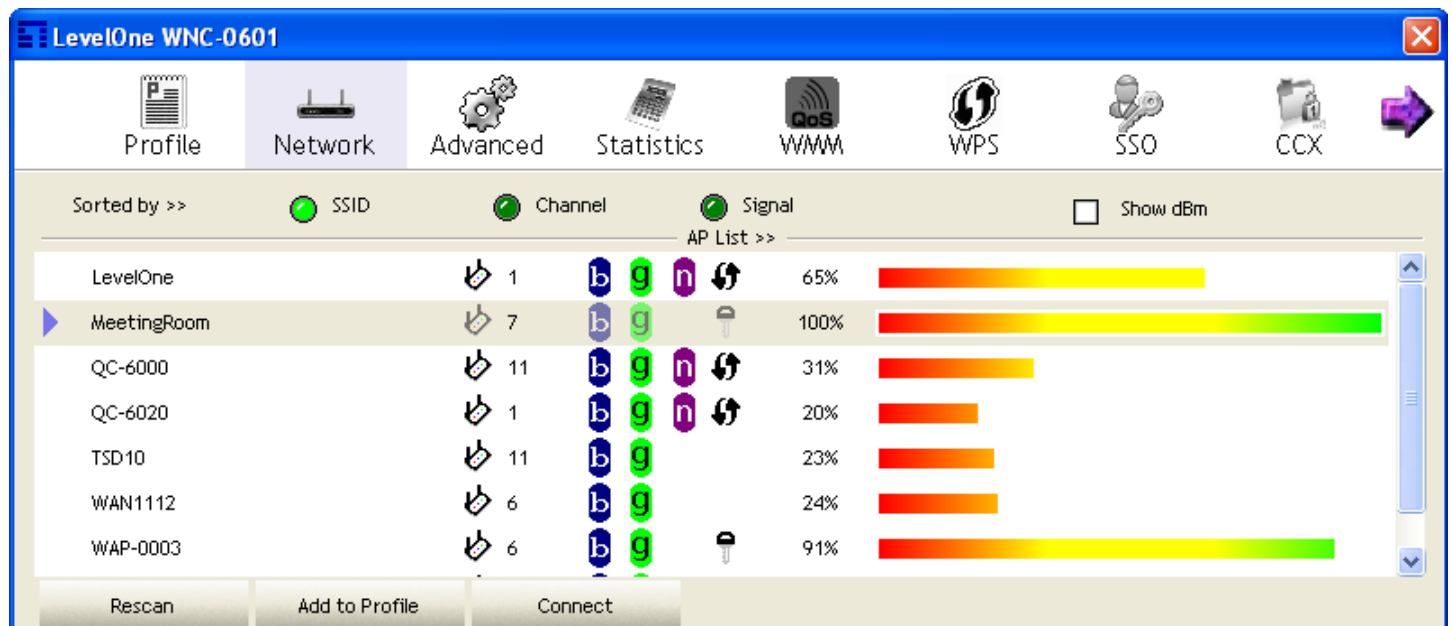
**Use certification chain:** Place a check in this to enable the certificate use. Select the Certification Authority from the drop-down list.

**Server name:** Enter the server name if not selected from the existing drop-down list above.



## 5.2 Network

The network setting page allows you to set and save different wireless settings. You can activate the suitable profile according to the environment where the wireless connection is used.










**Sort by:** Indicate that the AP list is sorted by SSID, Channel or Signal.


**Show dBm:** Show the dBm strength of the received signal.

**Rescan:** Issues a rescan command to the wireless NIC to update information on the surrounding wireless network.

**Add to Profile:** Add the selected AP to the Profile setting. It will bring up a profile page and save the user's setting to a new profile.

The Profile page is displayed for configuration:

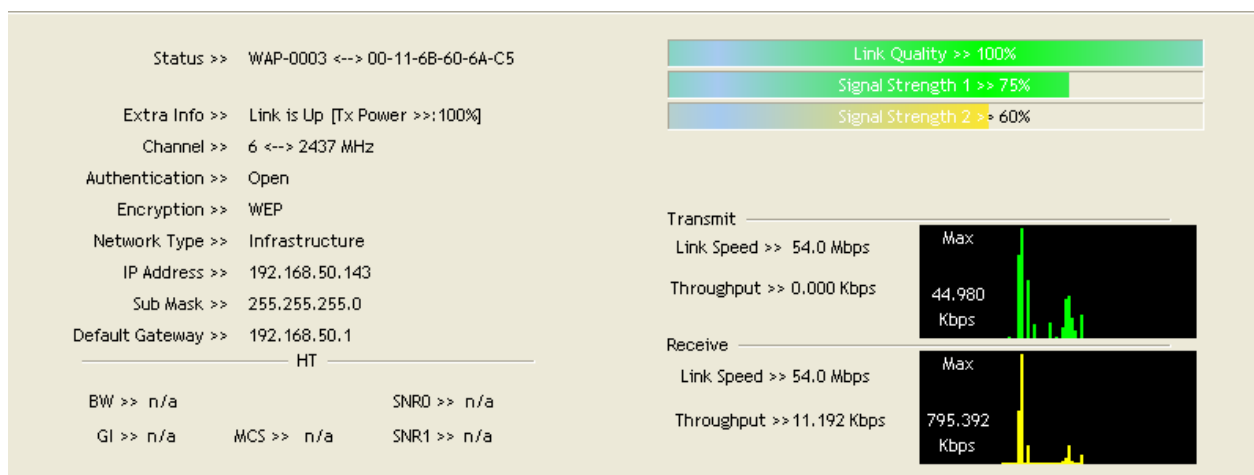
| Icon Indications  |  |
|---|--|
| Icons   | Description                              |
|  | Connection is successful                 |
|  | Network type is infrastructure mode      |
|  | Network type is ad-hoc mode              |
|  | Wireless network is security-enabled     |
|  | The network supports 802.11b connections |
|  | The network supports 802.11g connections |
|  | The network supports 802.11n connections |

You can press the  button on the bottom right corner to display the network status, as shown below.



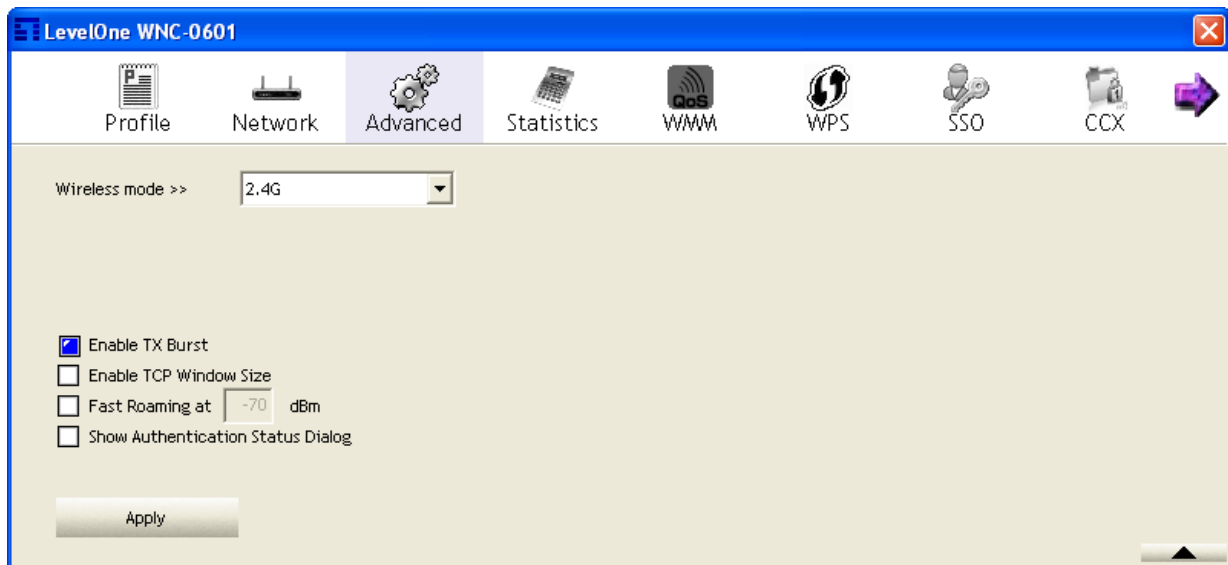
### Note

**The maximum transmit link speed of this wireless PCI Card is 150 Mbps and the maximum receive link speed is 300 Mbps.**



## 5.3 Advanced

The Advanced page allows you to configure extended features for the wireless network.



The displayed items on this page can be described as follows:

**Wireless Mode:** Select 2.4G as the wireless mode.

**Enable TX Burst:** Enable the option to accelerate the data transmit rate.

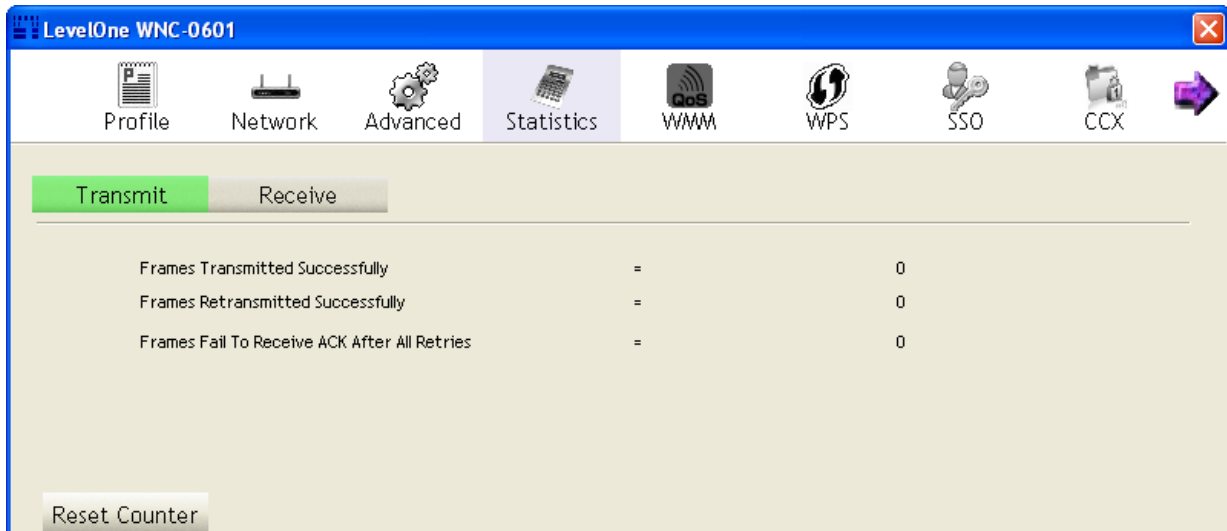
**Enable TCP Window Size:** Adjust TCP window size automatically for better performance.

**Fast Roaming:** Enable fast roaming at the specified receive power threshold.

**Enable CCX (Cisco Compatible Extensions):** Enable this option if the network supports Cisco Compatible Extensions.

## 5.4 Statistics

The statistics page displays the connected-related statistics with detail counter information.



**Frames Transmitted Successfully:** Frames successfully sent.

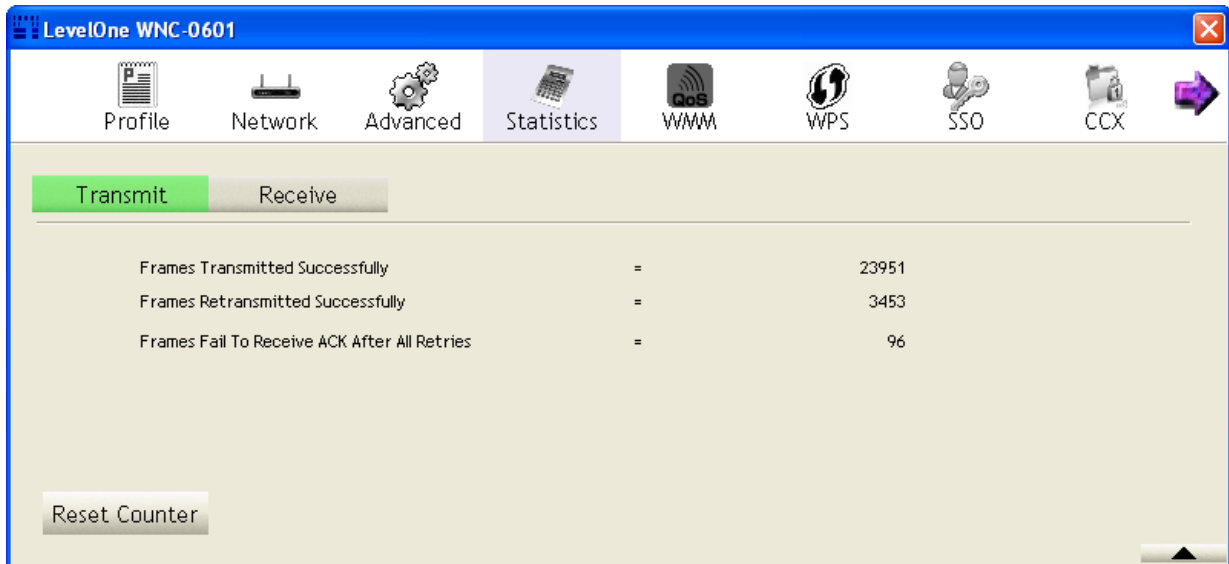
**Frames Retransmitted Successfully:** Successfully retransmitted frames numbers.

**Frames Fail To Receive ACK After All Retries:** Frames failed transmit after hitting retry limit.

**RTS Frames Successfully Receive CTS:** Successfully receive CTS after sending RTS frame.

**RTS Frames Fail To Receive CTS:** Failed to receive CTS after sending RTS.

**Reset counters:** Reset counters to zero.



**Frames Received Successfully:** The number of frames successfully received.

**Frames Received With CRC Error:** The number of frames received with a CRC error.

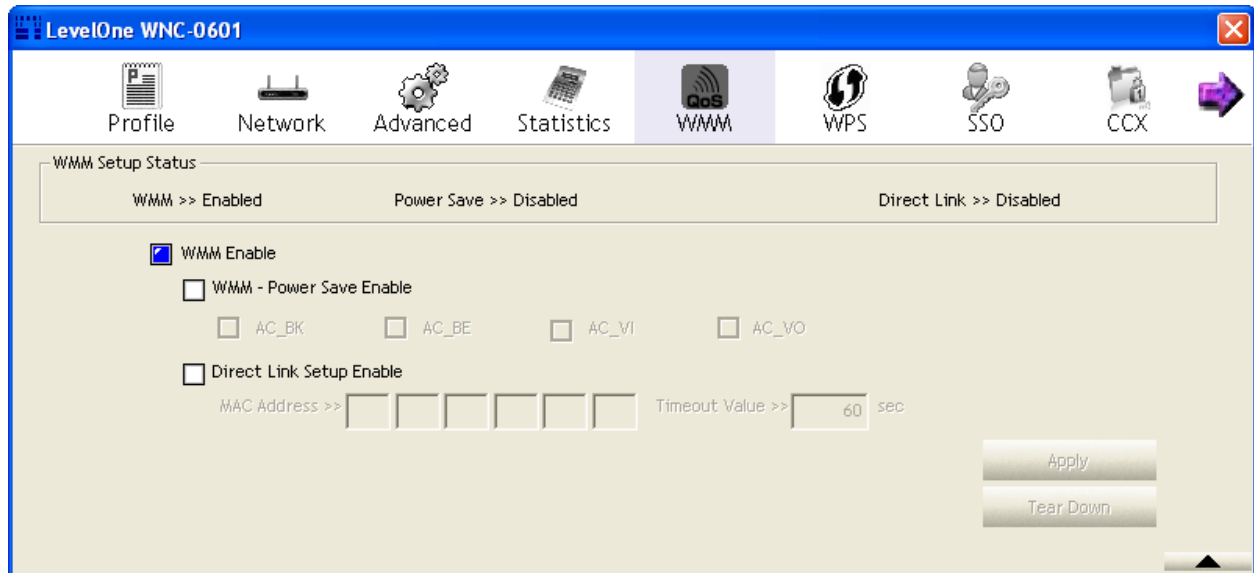
**Frames Dropped Due To Out-of-Resource:** The number of frames dropped due to a resource issue.

**Duplicate Frames Received:** The number of duplicate frames received.

**Reset counters:** Reset counters to zero.

## 5.5 WMM

Wi-Fi Multimedia (WMM), also known as Wireless Multimedia Extensions (WME), is a Wi-Fi Alliance interoperability certification. It provides basic Quality of Service (QoS) features for IEEE 802.11 wireless networks.



**WMM Enable:** Enable WMM function.

**WMM - Power Save Enable:** Enable the power save mode. Please select which ACs you want to enable.

**AC\_BK:** Background / low priority

**AC\_BE:** Best effort

**AC\_VI:** Video first

**AC\_VO:** Voice first

**Direct Link Setup Enable:** Enable DLS (Direct Link Setup) function.

**MAC Address:** Fill in the blanks of Direct Link with MAC Address of STA. The STA must conform to these two conditions:

1. Connect with an AP that supports DLS features.
2. Ensure that DLS is enabled.

**Timeout Value:** The Timeout Value indicates the time in seconds before it disconnects automatically. The value is an integer. The integer must be between 0~65535. A zero value specifies that it stays connected. The default Timeout Value is 60 seconds.

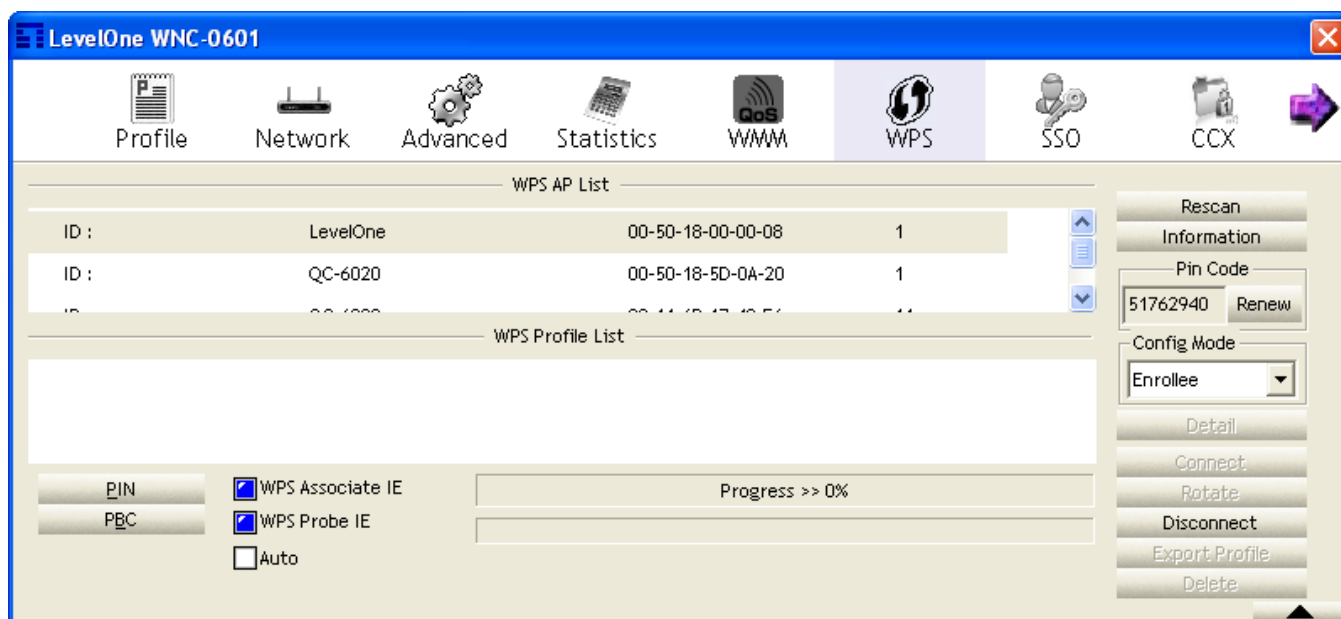
**Apply:** The AP that supports DLS features the user filled in will be applied.

**Tear Down:** Select the device that you want to remove from DLS table and click this button.

## 5.6 WPS

Wi-Fi Protected Setup (WPS) is based on PIN (Personal Identification Number) entry authentication to provide strong WPA/WPA2 encryption keys to client devices. With a PIN, users can enter a code generated by the client device to connect to the network.

**Enrollee:** An enrollee is the device being added to the network. If the Wireless PCI Card is set as an enrollee, click the Rescan button on the utility WPS setup page to search for WPS-enabled access points near you. All access points found will be displayed in the WPS AP List. Select an access point on the list and click the Connect button to activate the connection. You can also click the Information button to see the detailed information about the selected access point.



**Registrar:** A registrar is the network enrollment center. If the Wireless PCI Card is set as a registrar, click the Rescan button on the utility WPS setup page to search for WPS-enabled wireless devices near you. All enrollees found will be displayed in the WPS Profile List. Select an enrollee on the list and click the Connect button to activate the connection.

1. When an access point or a WPS enrollee is connected, you can click Disconnect to disconnect from the connected device, or select another WPS-enabled wireless access point or enrollee, and then click Connect to establish connection.
2. You can also click the "Rotate" button to select the next access point or enrollee in the list and establish a connection.
3. To delete an access point from the list, click Delete.

## WPS Setup - PIN Configuration

The WPS PIN (Personal Identification Number) setup is more secure. All WPS-compatible devices have their own PIN number.

1. When the Wireless PCI Card is set as an enrollee, the PIN number of your Wireless PCI Card is an eight-digit number located at the upper-right position of configuration utility. Remember this number and input it to your wireless access point as the WPS PIN code. Please also refer to the user manual of your wireless access point for instructions about WPS setup.
2. Click PIN button and wait for few seconds to one minute. If a wireless access point with correct PIN code is found, you will be connected to that access point.



### Note

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**You may have to click PIN for few more times to try again. If you still cannot connect to an access point this way, please make sure the PIN code you provided to access point is correct.**

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3. When the Wireless PCI Card is set as a registrar, input the enrollee's PIN number to the Pin Code box located in the upper-right position of configuration utility.
4. Click PIN button and wait for few seconds to one minute. If a WPS enrollee with correct PIN code is found, it will be connected to the Wireless PCI Card.

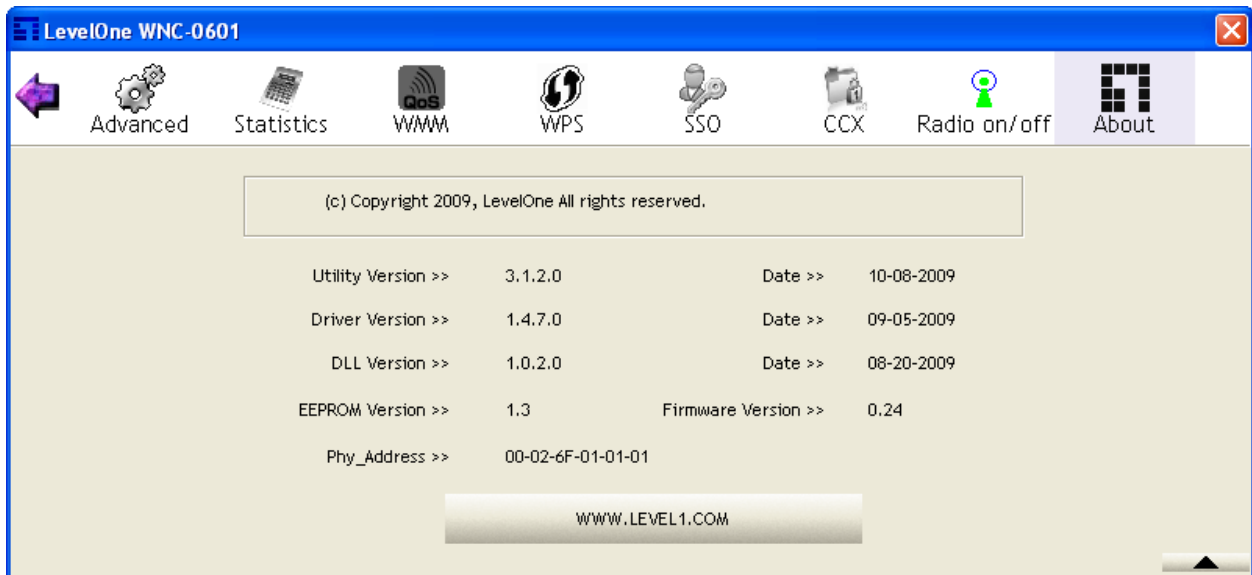


## 5.7 Radio Setting

Press the Radio On/Off icon to disable or enable the radio signal connection.

## 5.8 About

This page displays the information of version numbers, configuration utility, firmware and other information regarding this wireless PCI Card. Click the [www.level1.com](http://www.level1.com) button to visit the LevelOne website for other information.



## 6. Network Planning

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LevelOne WNC-0601 300M N\_Max Wireless PCI Card supports a stand-alone wireless network configuration, as well as an integrated configuration with Ethernet LANs.

The wireless PCI Card can be configured as:

**Ad hoc** - for small peer-to-peer networks with other wireless devices

**Infrastructure** -for a wireless extension to an existing wired LAN through an access point

### Network Topologies Ad Hoc Wireless LAN

An ad hoc wireless LAN consists of a group of computers, each equipped with a wireless adapter, connected via radio signals as an independent wireless LAN.

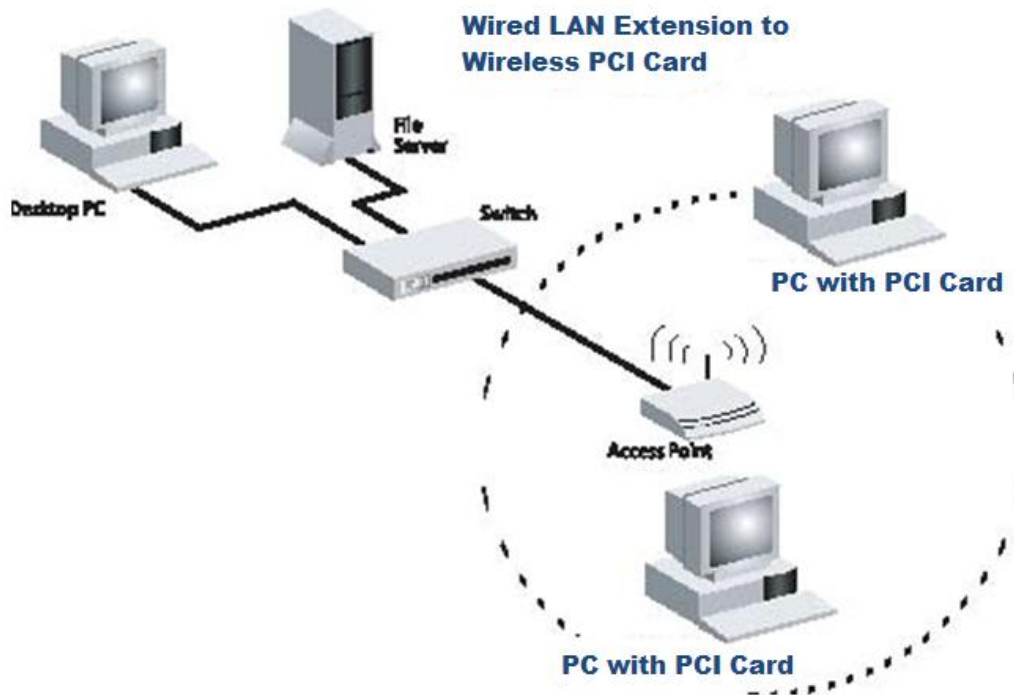
Computers in a specific ad hoc wireless LAN must be configured to the same radio channel.

An ad hoc wireless LAN can be used for a small branch office or SOHO operation.



### Infrastructure Wireless LAN

LevelOne WNC-0601 can also provide access to a wired LAN for wireless workstations. An integrated wired and wireless LAN is called an Infrastructure configuration. A Basic Service Set (BSS) consists of a group of wireless PC users, and an access point that is directly connected to the wired LAN. Each wireless PC in this BSS can communicate with to any computer in its wireless group via a radio link, or access other computers or network resources in the wired LAN infrastructure via an access point.



The infrastructure configuration not only extends the accessibility of wireless PCs to the wired LAN, but also increases the effective wireless transmission range for wireless PCs by passing their signal through one or more access points.

A wireless infrastructure can be used for access to a central database, or for connection between mobile workers, as shown in the following figure.

# 7. Technical Specifications

## HARDWARE SPECIFICATIONS

|                    |   |
|--------------------|---|
| Standard           | IEEE802.11b, IEEE802.11g, 802.11n (2.0) |
| Physical Interface | PCI 2.2 slot                            |
| Operating Voltage  | 3.3V                                    |
| LED Status         | Link Activity                           |
| RF Connector       | SMA Female-Reverse                      |
| Antenna            | 2dBi Dipole Antenna (2.4GHz)            |
| PCB dimension      | 120mm * 63mm                            |

## RF SPECIFICATION

| Frequency Band                | 2.400 ~ 2.484 GHz   |             |                      |             |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
|-------------------------------|---|-------------|----------------------|-------------|-----------|----------------------|--|----------------------|--|-------------|-------------|-------------|-------------|---|-----|------|-----|----|---|----|----|------|----|---|------|------|------|----|---|----|----|------|----|---|----|----|------|----|---|----|-----|------|-----|---|------|-------|----|-----|---|----|-----|------|-------|
| Modulation Technology         | <ul style="list-style-type: none"> <li>● OFDM: BPSK, QPSK, 16-QAM, 64-QAM</li> <li>● DBPSK, DQPSK, CCK</li> </ul>   |             |                      |             |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| Operating Channels            | 11 for North America, 14 for Japan, 13 for Europe   |             |                      |             |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| Wireless Setting              | <ul style="list-style-type: none"> <li>● Wireless Mode – 11b/ 11g /11n</li> <li>● Channel Selection (Setting varies by Country)</li> <li>● Channel Bandwidth (Auto, 20Mhz, 40Mhz)</li> <li>● Transmission Rate<br/>-11g: Best. 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1 in Mbps</li> </ul> <table border="1" data-bbox="386 1249 1375 1729"> <thead> <tr> <th rowspan="2">MCS index</th> <th colspan="2">Guard Interval 800ns</th> <th colspan="2">Guard Interval 400ns</th> </tr> <tr> <th>20MHz(Mbps)</th> <th>40MHz(Mbps)</th> <th>20MHz(Mbps)</th> <th>40MHz(Mbps)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>6.5</td> <td>13.5</td> <td>7.2</td> <td>15</td> </tr> <tr> <td>1</td> <td>13</td> <td>27</td> <td>14.4</td> <td>30</td> </tr> <tr> <td>2</td> <td>19.5</td> <td>40.5</td> <td>21.7</td> <td>45</td> </tr> <tr> <td>3</td> <td>26</td> <td>54</td> <td>28.9</td> <td>60</td> </tr> <tr> <td>4</td> <td>39</td> <td>81</td> <td>43.3</td> <td>90</td> </tr> <tr> <td>5</td> <td>52</td> <td>108</td> <td>57.8</td> <td>120</td> </tr> <tr> <td>6</td> <td>58.5</td> <td>121.5</td> <td>65</td> <td>135</td> </tr> <tr> <td>7</td> <td>65</td> <td>135</td> <td>72.2</td> <td>157.5</td> </tr> </tbody> </table> |             |                      |             | MCS index | Guard Interval 800ns |  | Guard Interval 400ns |  | 20MHz(Mbps) | 40MHz(Mbps) | 20MHz(Mbps) | 40MHz(Mbps) | 0 | 6.5 | 13.5 | 7.2 | 15 | 1 | 13 | 27 | 14.4 | 30 | 2 | 19.5 | 40.5 | 21.7 | 45 | 3 | 26 | 54 | 28.9 | 60 | 4 | 39 | 81 | 43.3 | 90 | 5 | 52 | 108 | 57.8 | 120 | 6 | 58.5 | 121.5 | 65 | 135 | 7 | 65 | 135 | 72.2 | 157.5 |
| MCS index                     | Guard Interval 800ns  |             | Guard Interval 400ns |             |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
|                               | 20MHz(Mbps)   | 40MHz(Mbps) | 20MHz(Mbps)          | 40MHz(Mbps) |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| 0                             | 6.5   | 13.5        | 7.2                  | 15          |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| 1                             | 13  | 27          | 14.4                 | 30          |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| 2                             | 19.5  | 40.5        | 21.7                 | 45          |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| 3                             | 26  | 54          | 28.9                 | 60          |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| 4                             | 39  | 81          | 43.3                 | 90          |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| 5                             | 52  | 108         | 57.8                 | 120         |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| 6                             | 58.5  | 121.5       | 65                   | 135         |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| 7                             | 65  | 135         | 72.2                 | 157.5       |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |
| Receive Sensitivity (Typical) | <ul style="list-style-type: none"> <li>● 2.412~2.472G(IEEE802.11b) (1Rx)<br/>-91dBm @ 1Mbps<br/>-87dBm @ 11Mbps</li> <li>● 2.412~2.472G(IEEE802.11g) (2Rx)<br/>-90dBm @ 6Mbps<br/>-75dBm @ 54Mbps</li> <li>● 2.412~2.472G(IEEE802.11N) (2Rx)<br/>-88 dBm MCS 8</li> </ul>   |             |                      |             |           |                      |  |                      |  |             |             |             |             |   |     |      |     |    |   |    |    |      |    |   |      |      |      |    |   |    |    |      |    |   |    |    |      |    |   |    |     |      |     |   |      |       |    |     |   |    |     |      |       |

|                           |  |
|---------------------------|--|
|                           | -65 dBm MCS 15   |
| Available transmit power  | <ul style="list-style-type: none"> <li>● 2.412~2.472G(IEEE802.11b)<br/>18dBm @1~11Mbps</li> <li>● 2.412~2.472G(IEEE802.11g)<br/>15 dBm @6Mbps<br/>14 dBm @54Mbps</li> <li>● 2.412~2.472G(IEEE802.11N)<br/>15dBm</li> </ul> |
| Regulation Certifications | FCC Part 15, ETSI 300/328/CE   |