

ITRAINONLINE MMTK WIRELESS CLIENT INSTALLATION HANDOUT

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Table of Contents

1. About this document.....	1
1.1 Copyright information.....	1
1.2 Degree of Difficulty.....	1
2. Introduction.....	2
3. Choosing wireless hardware.....	2
3.1 Hardware types.....	2
3.2 Wireless chipsets.....	3
3.3 Supported hardware.....	4
3.4 Unsupported hardware.....	4
3.5 Driver differences.....	4
4. Installing the wireless device.....	4
4.1 Preparing the installation.....	5
4.2 Inserting the card.....	5
4.3 Identifying the chipset.....	6
4.4 In Summary.....	11
5. Configuring the wireless device.....	11
5.1 Example 1: Ubuntu with Gnome.....	11
6. Choosing wireless hardware.....	14
7. Installation of the wireless device.....	14
8. Configuration of the wireless device.....	14
8.1 Step 1: Select network	15
8.2 Step 2: IP settings.....	16
9. Conclusions.....	17

1. About this document

These materials are part of the ItrainOnline Multimedia Training Kit (MMTK). The MMTK provides an integrated set of multimedia training materials and resources to support community media, community multimedia centres, telecentres, and other initiatives using information and communications technologies (ICTs) to empower communities and support development work.

1.1 Copyright information

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1.2 Degree of Difficulty

The degree of difficulty of this unit is Basic.

2. Introduction

This unit targets the installation of wireless clients for IEEE 802.11 networks. It consists of two separate parts depending on the Operating System. Linux is covered in Part A, while Microsoft Windows is described in the second part (B).

With independence of the chosen platform, the installation process can be described in three different phases: (1) choosing a wireless hardware, (2) installation and (3) configuration.

The document puts different focus depending on the operative system, as a result, in the Linux client section (Part A) we focus on the first two first phases and when discussing Windows (Part B), we mainly focus on configuration issues as choosing a hardware and installing it "should not" be problematic.

If you are interested in Linux, do not miss the Additional Resources document that includes many useful links.

PART A: LINUX CLIENT INSTALLATION

3. Choosing wireless hardware

One of the challenges of running Linux on a workstation (laptop or desktop) is that many hardware vendors only supply drivers for their hardware on the main proprietary operating systems. It is therefore often left to volunteer developers to get these pieces of hardware to work under Linux, and that often with little or no support from the hardware vendors. This mostly means that new hardware may not be supported in the first months after hitting the market, and in some cases, may not get supported at all. Also, getting specific pieces of hardware to function under Linux often requires somewhat more work than under Windows.

For these reasons it is advisable to spend some time researching what hardware is the best for your given version of Linux, and, depending on your Linux skills and experience, which hardware is supported by the graphical utilities that are shipped with your Linux distribution. Choosing wireless hardware for linux consists of a few steps.

3.1 Hardware types

Wireless client cards most often come in one of the following form factors:

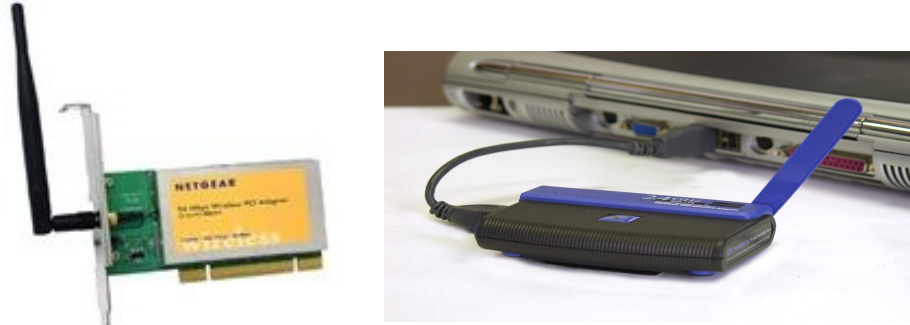


Image 1: a) PCI card b) USB

PCI cards

PCI cards are most often found built into desktop computers or servers. They require opening the computer case, and hence may be a little more difficult to install than other options.

USB adapters

USB adapters will function in most desktops and laptops (most modern computers support the USB plug standard). These adapters are small, do not require opening the computer, and are quite easy to plug in and remove. However, under Linux, not all USB adapters are supported, and most drivers start out by supporting PCMCIA and PCI before they add USB support.

PCMCIA or PC-Card

These are cards made specifically for laptops, which slot into PCMCIA slots often found on the sides of laptops. They take up little space once installed, and also require no opening of the computer. They will only work for laptops though.

Mini-PCI

Mini-PCI cards are essentially small form-factor PCI cards, that are often built into laptops. While it is possible to install these cards in some laptops, it will most likely void the warranty. Many modern laptops come with mini-PCI cards pre-installed. In terms of driver installation these are equivalent to PCI cards.

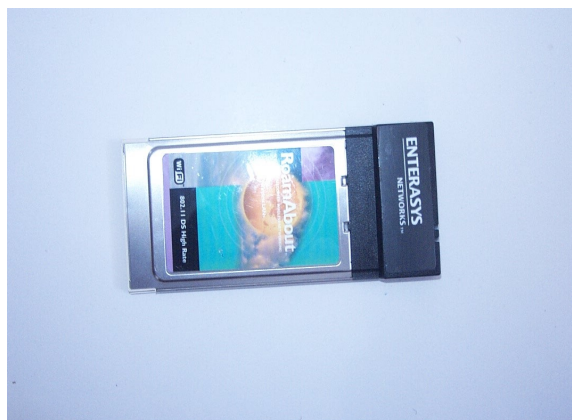


Image 2: A PCMCIA card

3.2 Wireless chipsets

While there are dozens, if not hundreds, of manufacturers that produce wireless hardware for computers, there are only about 10 companies that actually make the chipsets that these cards are built on. And since the Linux drivers most often are not developed by the manufacturers, each driver will generally work for a specific chipset, and therefore for a number of cards from different manufacturers. It is important to try and find out what chipset is in a specific card before buying it, as that has more to say about the Linux support than the actual manufacturers brand. For example, there are a number of companies that produce cards with the prism2 or prism 2.5 chipset in them, and these all work with the same drivers.

See *"Wireless devices and their chipsets and drivers"* in *Additional Resources* for more information.

Some of the most common chipsets include:

- Atheros (recommended driver: madwifi)
- Intel Pro/Wireless 2100 & 2200 (ipw2100/ipw2200 driver)
- Prism2/2.5/3 (hostap driver or wlan-ng driver)
- Orinoco (orinoco_cs)
- Broadcom (Currently no native Linux driver)

3.3 Supported hardware

Most Linux distributions have a list of supported hardware on their web-site. Some are very comprehensive, while others just show what hardware the distribution has been known to work with. If you have a choice of hardware, and know you will be running Linux on the computer, it is advisable to check these lists first. If your card(s) are not on the list, perhaps consider running a different distribution, or purchasing a different card. It might also be worth checking whether a different card based on the same chipset might be supported, as that would increase the chances of getting it to work.

Also using Google (www.google.com) to search for a specific card with a specific distribution will often show you whether there are known problems with that combination.

3.4 Unsupported hardware

If you end up with a card that is not supported by your distribution, there are a few options available. First of all, it is generally possible to compile drivers against the kernel version that your distribution is using, and load them as kernel modules. See individual driver websites for more information on this. Some manufacturers ship binary (non-Open Source) drivers for their hardware, and may be able to help you directly. Also there are 2 projects that are implementing a compatibility layer that lets Linux use the windows XP drivers that are supplied with almost all cards. The projects are, the Free ndiswrapper and the commercial *Driverloader* from *Linuxant*.

See *"Wireless drivers"* in *Additional Resources* for more information.

3.5 Driver differences

It is worth noting that not all drivers are created equal. While most, if not all, Linux drivers for wireless cards support the basic functionality of allowing you to connect to an Access Point with or without basic WEP encryption, there can be differences as to how they support more advanced functionality. This may be important if you are looking to do any of the following:

- Use the card in ad-hoc mode
- Use the your Linux box as a wireless access point
- Use advanced WPA and WPA2 encryption and authentication
- Use a wireless scanning tool to find existing wireless networks

Also some chipsets are supported by a number of drivers that each offer different feature sets, so it may be worth looking what else is out there, even if your card has basic support in your distribution of choice.

Here are a few example differences between drivers:

- linux-wlan-ng driver does not support wireless-tools, and is not supported by many wireless utilities
- orinoco_cs driver does not support scanning for networks unless patched and recompiled
- madwifi (Atheros chipset) is the only driver that supports multi band (802.11a/b/g) under Linux
- hostap and madwifi drivers have good support for running a wireless access point (802.11 Master mode)

4. Installing the wireless device

This section will give a brief introduction to installing a wireless driver under Linux.

4.1 Preparing the installation

Always search your distributions website for information on installing wireless in general and your particular hardware specifically before starting. In that way you may find out about specific issues and problems in advance. Also use Google or another search engine to search for the name of your card and distribution (i.e. "Linksys WPC54g Fedora Core" and also "Linksys WPC54g Fedora Core Problem").

If you find an official or unofficial guide for installing your wireless card under that specific distribution, use that and skip the rest of this chapter.

If possible, have the card inserted as you install the distribution, as many distributions have excellent hardware detection during install.

If the distribution is already installed see if there is a package called "wireless-tools" installed. You can check this by looking for the command iwconfig. Open a terminal window and type:

```
# which iwconfig
```

If you see the path to the program *iwconfig*, you have the package installed. If not, look for a package called "wireless-tools" using the package manager of your distribution.

Most modern distributions should have the package available, if not installed by default. If not, you need to install the wireless tools.

See "*Wireless tools*" in *Additional Resources* for more information.

4.2 Inserting the card

If the card is not yet inserted or plugged in, this is a good time to do that. Then we want to check if the card was automatically detected by your distribution. Do this by opening the default Network Manager interface that your distribution ships with. The following example is from Ubuntu "Warty Warthog" release, using the default Gnome Network Manager.

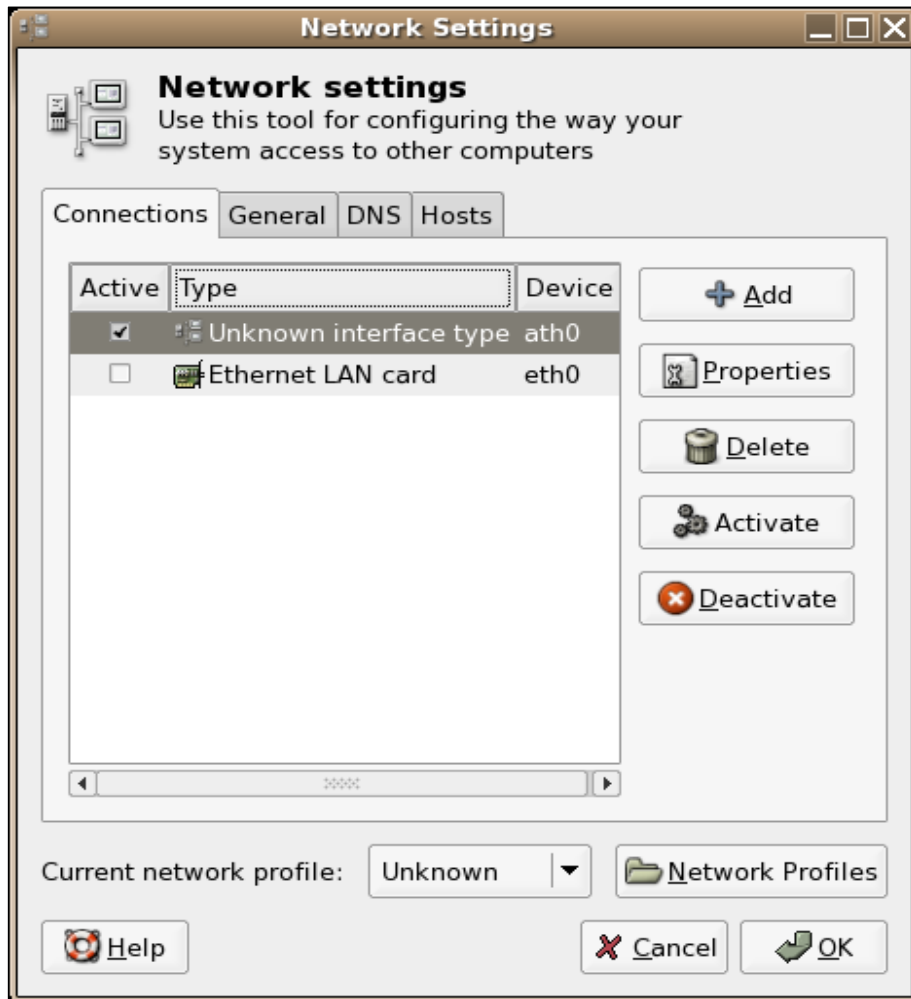


Image 3: Gnome Network Manager

At this point your card should be ready to use, and all wireless options can be set using your distributions graphical Network Manager. More information about how to configure your card in Section 4.

4.3 Identifying the chipset

If your card is not automatically identified by your distribution, you need to identify both the chipset and thereby the relevant driver. Some of the most important commands and tools for identifying the hardware are:

lspci

This command lists all PCI devices attached to the computer, and hence is useful for PCI and mini-PCI devices.

cardctl ident

The cardctl command is used to control PCMCIA devices in laptops. Together with the “ident” parameter it will return information about the hardware in the computers PCMCIA slots.

usbview

usbview is a graphical utility which is included (or packaged for easy installation) in many distributions. It gives a tree-style view of all USB devices attached to the computer.

hal-device-manager

This graphical utility replaces usbview in distributions which base their hardware support on HAL (Hardware Abstraction Layer) and dbus. It shows the same type of information, but all hardware attached to a computer, including USB, PCMCIA, PCI and mini-PCI devices.

dmesg

It is a command-line utility which prints the kernel's ring buffer, which contains messages generated by the kernel as it boots up and detects the various pieces of hardware attached to the computer.

Alternatively to using these commands you can search the Internet for information about wireless devices and their chipsets. See *"Wireless devices and their chipsets and drivers"* in *Additional Resources for more information*.

However, some manufacturers have been known to change chipsets without changing the model number of their cards, so this information may not always be accurate.

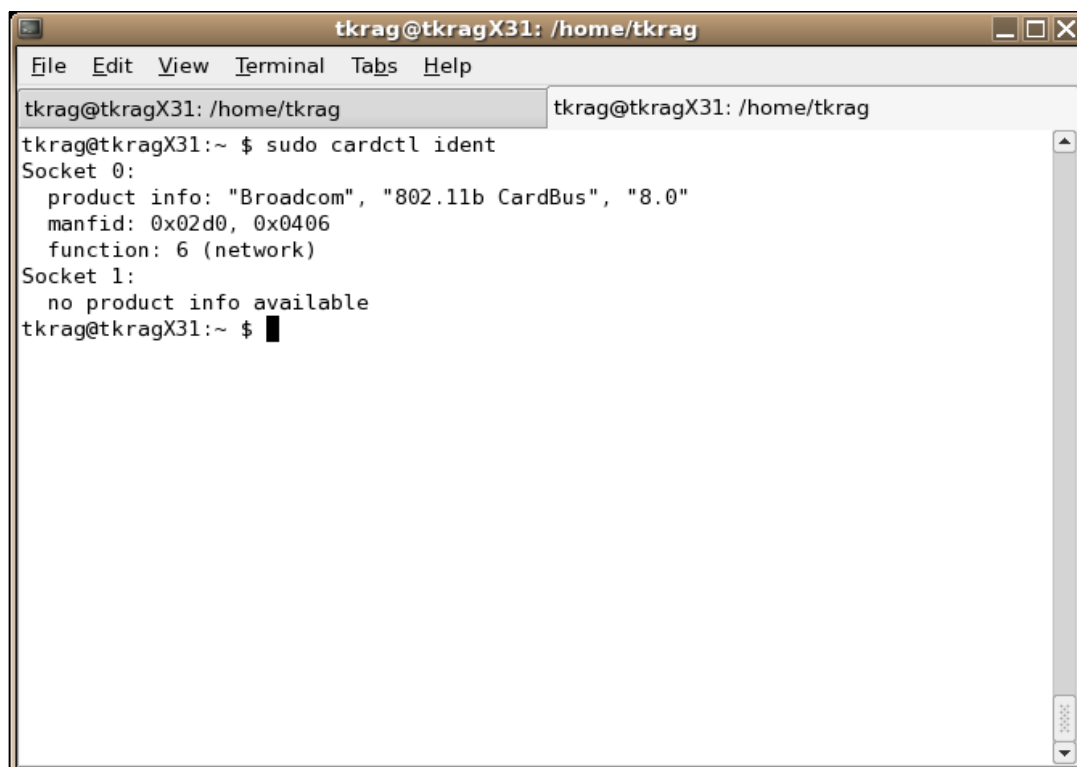
4.3.1 Example: Identify the chipset of a Linksys WPC54G on Ubuntu

The Linksys WPC54G is a wireless PCMCIA card using a chipset that is *not* automatically supported by Ubuntu, as there is currently no native Linux driver. In this example, we use an IBM Thinkpad x31 running the "Warty Warthog" Release of Ubuntu Linux.

After inserting the card into the PCMCIA slot, we try some of the commands mentioned above in order to correctly identify the chipset.

Command 1:

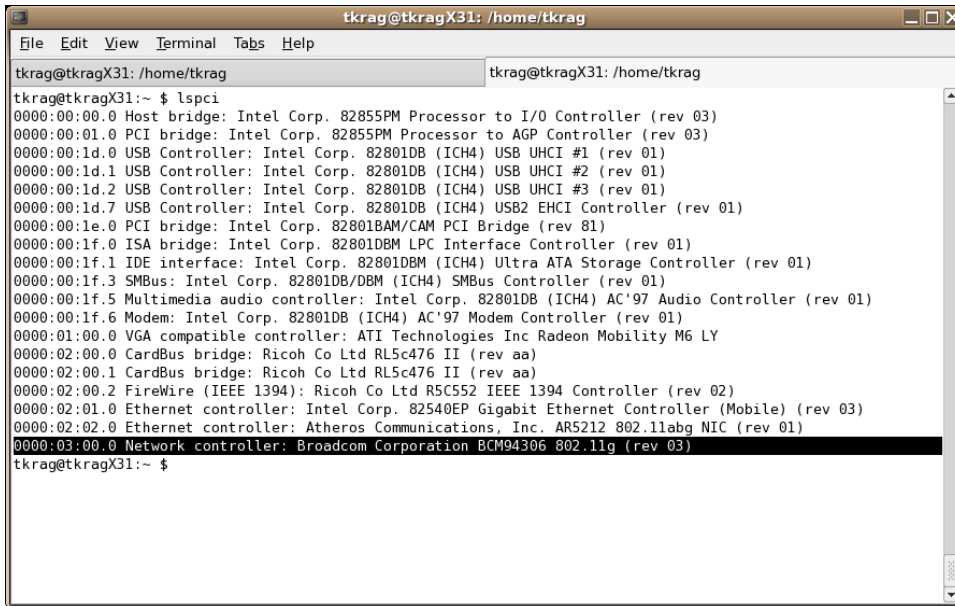
```
# sudo cardctl ident
```



```
tkrag@tkragX31: /home/tkrag
File Edit View Terminal Tabs Help
tkrag@tkragX31: /home/tkrag tkrag@tkragX31: /home/tkrag
tkrag@tkragX31:~ $ sudo cardctl ident
Socket 0:
  product info: "Broadcom", "802.11b CardBus", "8.0"
  manfid: 0x02d0, 0x0406
  function: 6 (network)
Socket 1:
  no product info available
tkrag@tkragX31:~ $
```

Image 4: `cardctl ident` shows what hardware is currently in the PCMCIA sockets of a laptop.

Command 2:
lspci



```
tkrag@tkragX31: /home/tkrag
tkrag@tkragX31:~$ lspci
0000:00:00.0 Host bridge: Intel Corp. 82855PM Processor to I/O Controller (rev 03)
0000:00:01.0 PCI bridge: Intel Corp. 82855PM Processor to AGP Controller (rev 03)
0000:00:1d.0 USB Controller: Intel Corp. 82801DB (ICH4) USB UHCI #1 (rev 01)
0000:00:1d.1 USB Controller: Intel Corp. 82801DB (ICH4) USB UHCI #2 (rev 01)
0000:00:1d.2 USB Controller: Intel Corp. 82801DB (ICH4) USB UHCI #3 (rev 01)
0000:00:1d.7 USB Controller: Intel Corp. 82801DB (ICH4) USB2 EHCI Controller (rev 01)
0000:00:1e.0 PCI bridge: Intel Corp. 82801BAM/CAM PCI Bridge (rev 81)
0000:00:1f.0 ISA bridge: Intel Corp. 82801DBM LPC Interface Controller (rev 01)
0000:00:1f.1 IDE interface: Intel Corp. 82801DBM (ICH4) Ultra ATA Storage Controller (rev 01)
0000:00:1f.3 SMBus: Intel Corp. 82801DB/DBM (ICH4) SMBus Controller (rev 01)
0000:00:1f.5 Multimedia audio controller: Intel Corp. 82801DB (ICH4) AC'97 Audio Controller (rev 01)
0000:00:1f.6 Modem: Intel Corp. 82801DB (ICH4) AC'97 Modem Controller (rev 01)
0000:01:00.0 VGA compatible controller: ATI Technologies Inc Radeon Mobility M6 LY
0000:02:00.0 CardBus bridge: Ricoh Co Ltd RL5c476 II (rev aa)
0000:02:00.1 CardBus bridge: Ricoh Co Ltd RL5c476 II (rev aa)
0000:02:00.2 FireWire (IEEE 1394): Ricoh Co Ltd R5C552 IEEE 1394 Controller (rev 02)
0000:02:01.0 Ethernet controller: Intel Corp. 82540EP Gigabit Ethernet Controller (Mobile) (rev 03)
0000:02:02.0 Ethernet controller: Atheros Communications, Inc. AR5212 802.11abg NIC (rev 01)
0000:03:00.0 Network controller: Broadcom Corporation BCM94306 802.11g (rev 03)
tkrag@tkragX31:~$
```

Image 5: *lspci* lists all PCI devices in a computer (including PCMCIA).

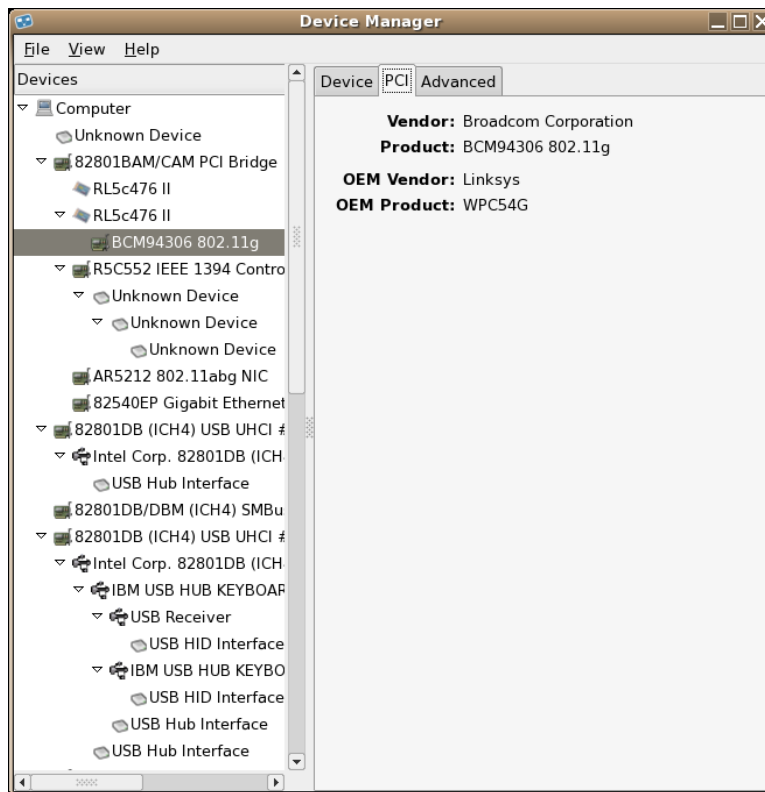


Image 6: The *hal-device-manager* gives a tree-style view of all hardware on the machine.

With this information it is trivial to identify the card as a *Broadcom chipset*.

A few searches on *Google* and we will know that that chipset *does not have a native driver under Linux*, and we must use the *ndiswrapper* utility to install the Windows driver. Searching for a *How-To* reveals a number of pages that describe how to install the card under various distributions.

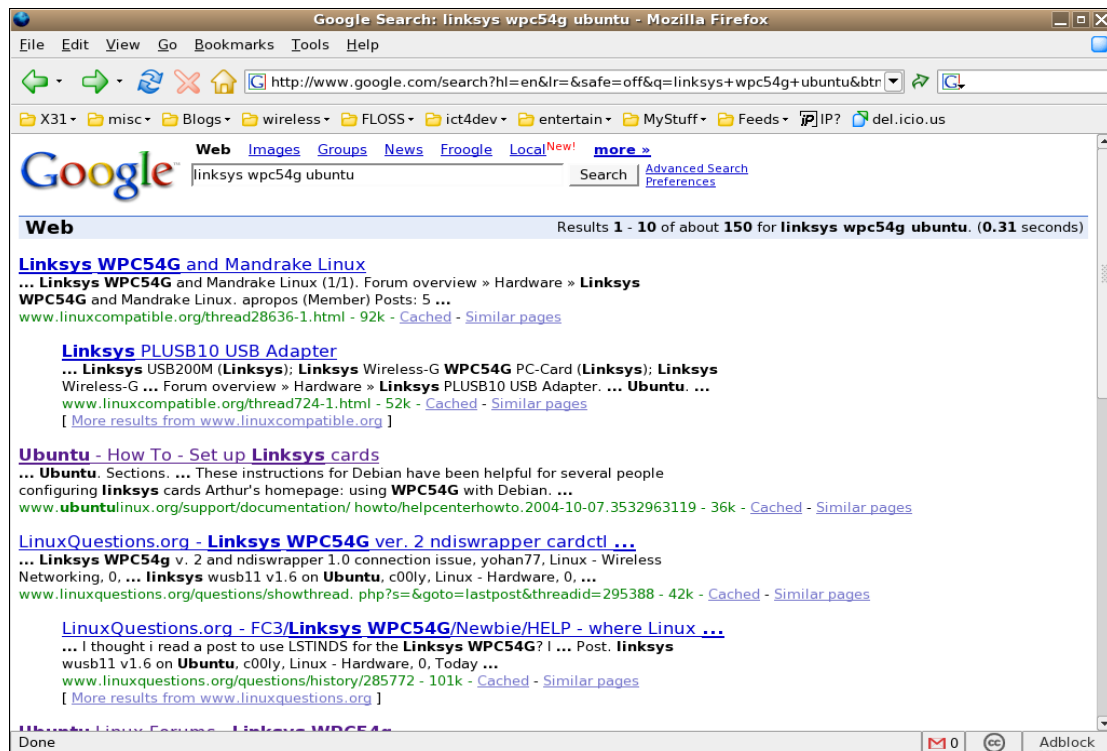


Image 7: Google is our best friend when trying to install hardware under Linux.

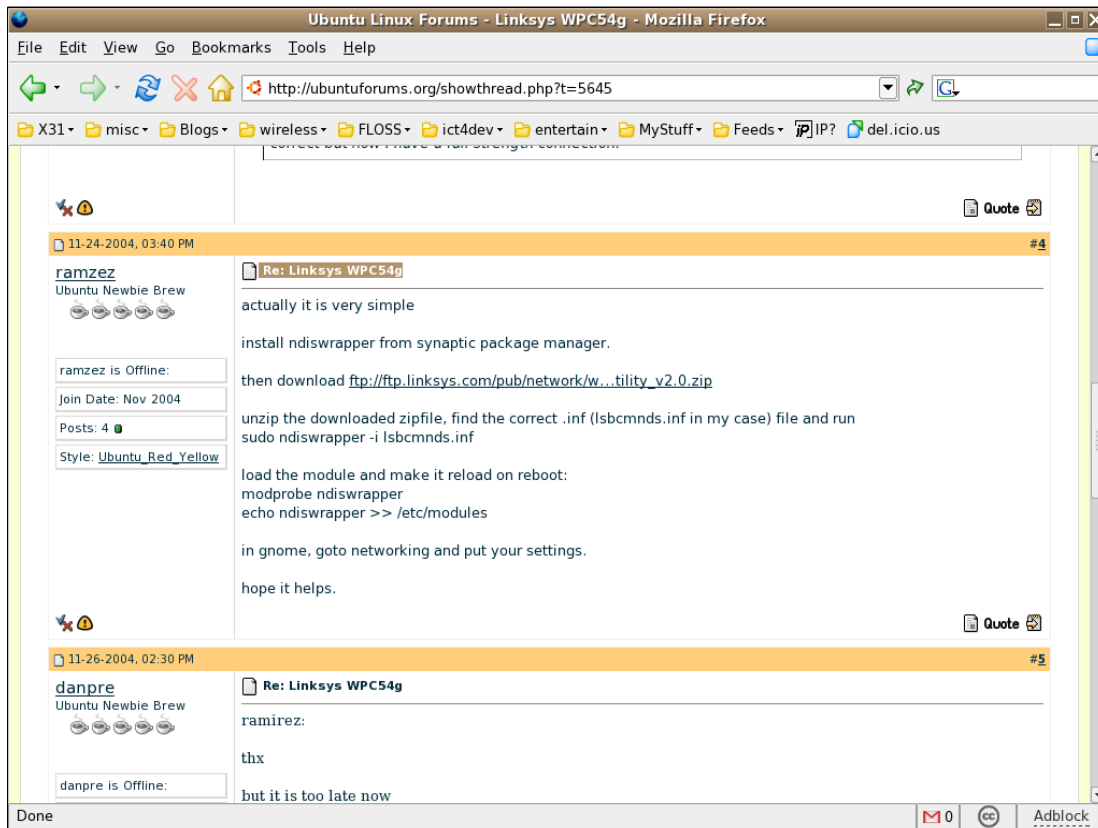


Image 8: In this case there was a nice howto for the Linksys card on the Ubuntu forums.

Actually this case is very simple and can be summarized as:

- # install ndiswrapper from synaptic package manager.
- # then download ftp://ftp.linksys.com/pub/network/wpc54g_v2_driver_utility_v2.0.zip
- # unzip the downloaded zip file, find the correct .inf (lsbcmnds.inf in my case) file and run
- # sudo ndiswrapper -i lsbcmnds.inf
- # load the module and make it reload on reboot:
- # modprobe ndiswrapper
- # echo ndiswrapper >> /etc/modules
- # in gnome, goto networking and put your settings.

This should be enough to get a wireless interface called wlan0 that can then be configured using the normal graphical networking tools.

5. Configuring the wireless device

Once the card is successfully installed, we need to set up the network so that it connects to the wireless access point of our choice and gets an IP address and so on.

The basic steps we need to go through for most networks are:

1. Setup ESSID (essid) (name of wireless network)
2. Choose DHCP or static IP address
3. Enable or Disable WEP Security Key
4. Activate network

5.1 Example 1: Ubuntu with Gnome

This section shows how to set up the wireless Interface under Ubuntu (Warty Warthog) running Gnome 2.08. The procedure should be the same for all modern Gnome-based distributions.

We need to start the Gnome Network Manager, which is the graphical utility that Gnome uses to setup Network information.

Go to: > Computer Menu > System Configuration > Networking

You will be asked for your password in order to proceed.

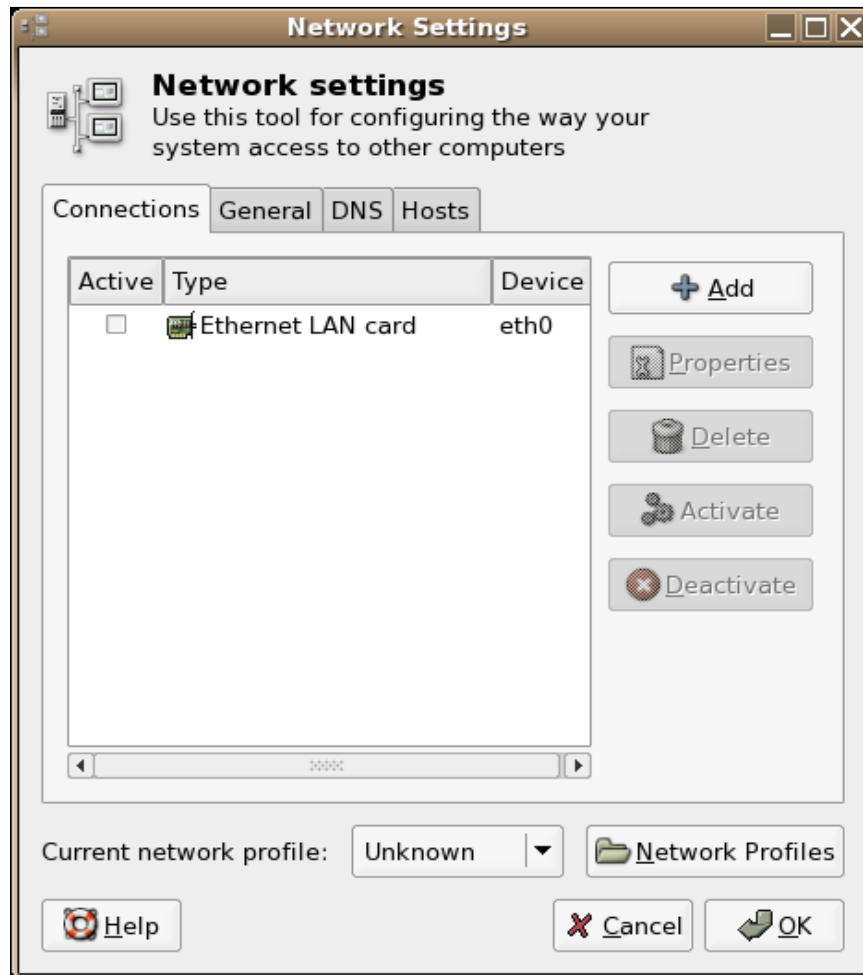


Image 9: The wireless network is not visible in the configuration tool

If your wireless network card was recognized during the install of the laptop, or automatically recognized by Ubuntu, there should already be an entry for the network interface in the menu. However, in this case, we have just installed the ndiswrapper and windows driver, and Ubuntu has not automatically recognized and installed the device.

Click on the **+ Add** button to start a wizard that helps you install the interface.

After filling in all the relevant information and completing the Wizard, the network interface will be included in the list, and you should have a connection to your wireless Access Point.

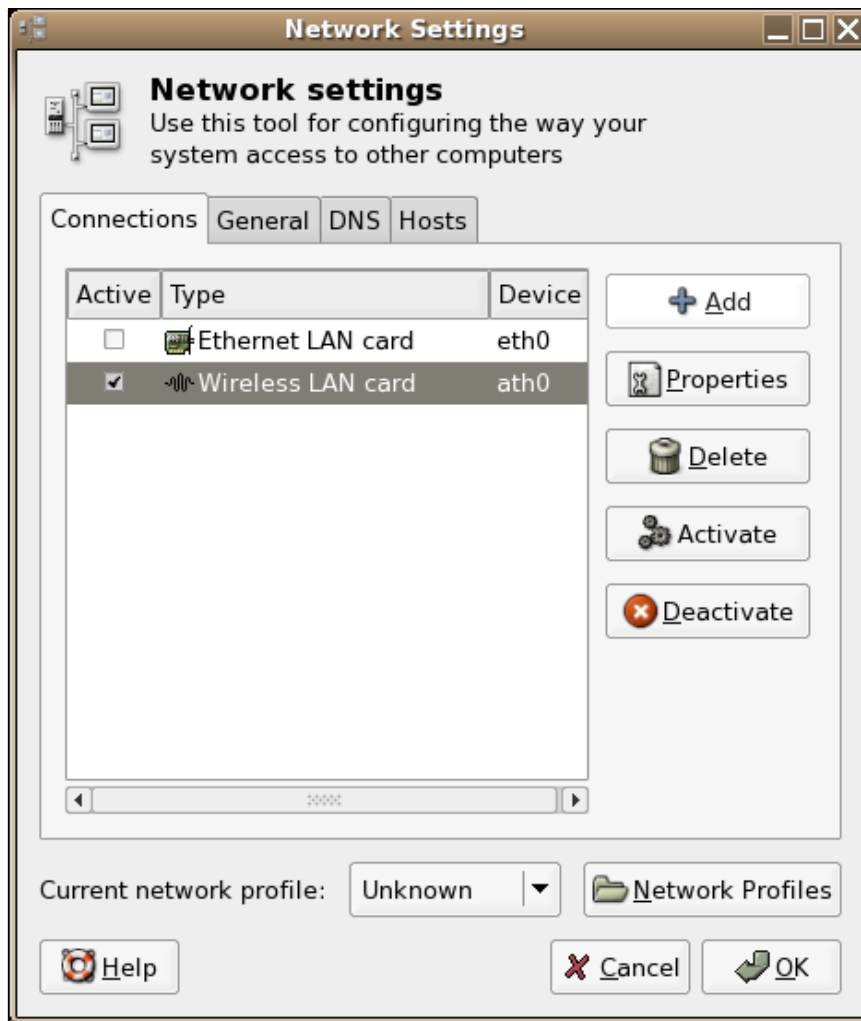


Image 10: The wireless interface has been added to the Gnome Network Manager

PART B: WINDOWS XP CLIENT INSTALLATION

Installation of wireless clients in Windows is a pretty straight forward process. Two things that can cause trouble though, are:

1. The wireless card normally comes with a Configuration Management Tool and so does Windows. If both software are activated there will be a conflict between them that can mess things up. Just choose one of them and disable the other one.
2. The built-in radio interface can on most new laptops be switched on/off. Make sure that the interface is switched ON when you start to configure the device.

6. Choosing wireless hardware

Selecting wireless hardware with support for Windows is not really a challenge. Any hardware will do here. You might want to check out the output power, sensibility and the possibility of attaching an external antenna when you purchase a card.

7. Installation of the wireless device

For those using Windows XP or Windows 2000, finding the necessary driver should be straightforward. However, for older Windows versions it may require a little bit more effort. See "Win98 Wireless Client Installation" as an example.

Windows XP has integrated tools for wireless networks, and most PCMCIA or USB wireless equipment will have the drivers available without external media required.

Plug in the PCMCIA card or USB dongle (internal PCI cards only apply to desktops and require tools to install). Windows XP will detect new software and install the most appropriate driver. If you already have wired Internet access, it may even download the most recent driver from the web.

In the case of specific cards of very new models, refer to manual driver installation in the document "Win98 Wireless Client Installation".

Install your wireless network adapter in Windows XP with SP2. This process includes installing the proper drivers for your wireless network adapter so it appears as a wireless connection in Network Connections.

8. Configuration of the wireless device

If not told something different, Windows XP will always choose to connect to the wireless network providing the best signal, but it will ask you to confirm before to connect to a non-encrypted network. When the client is within range of a wireless access point, a message saying "Wireless networks detected" will appear in the notification area of your taskbar.

A left click on the wireless icon in the taskbar (Image 11) will allow you to choose among the available wireless networks.

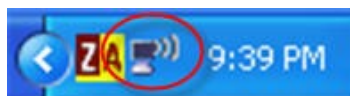


Image 11: Taskbar icon showing that there are available wireless networks.

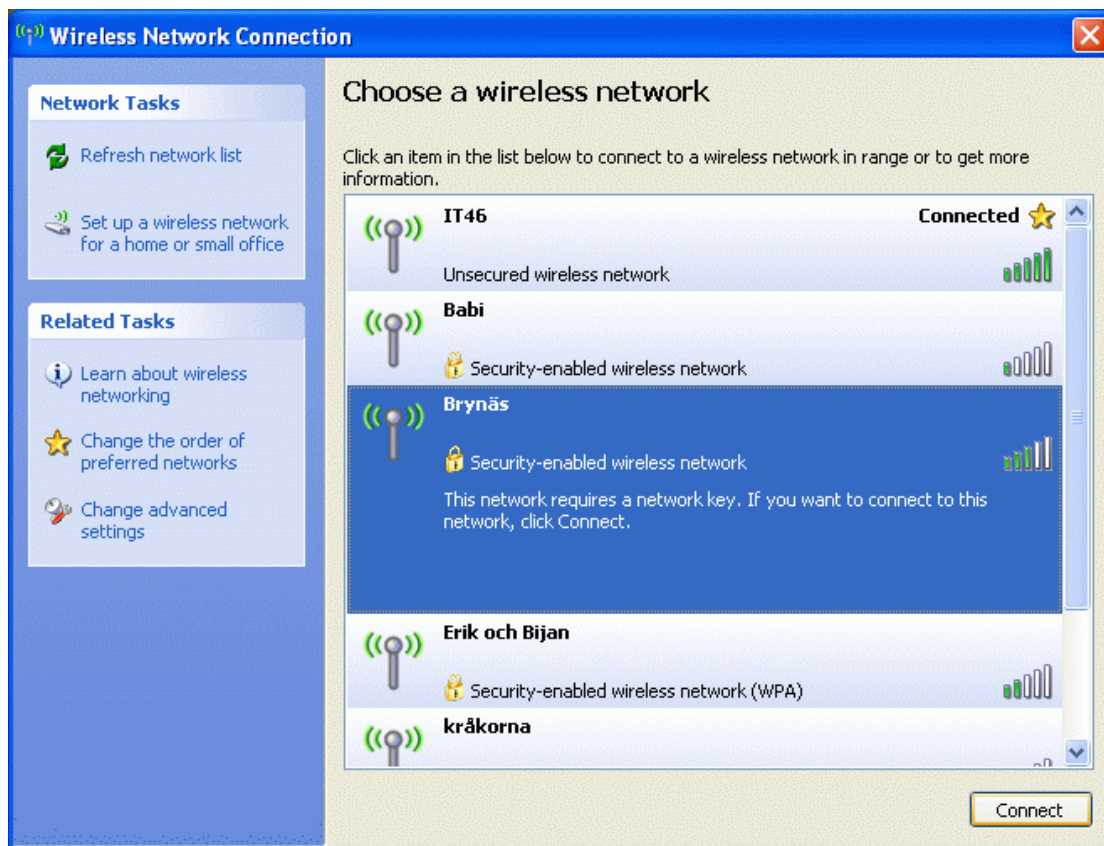


Image 12: A list of all available wireless networks. Encrypted networks are represented by a “golden lock”:

8.1 Step 1: Select network

You select a network by choosing the SSID of the network you would like to connect to. The SSID (Service Set ID) is the public name of the network. If more than one access point uses the same SSID it's called the Extended Service Set ID (ESSID).

If you choose to connect to a network that is not using encryption (WEP/WPA), simply select the SSID and acknowledge that you want to connect to a non protected network. Thereafter, the client will try to connect to the selected network.

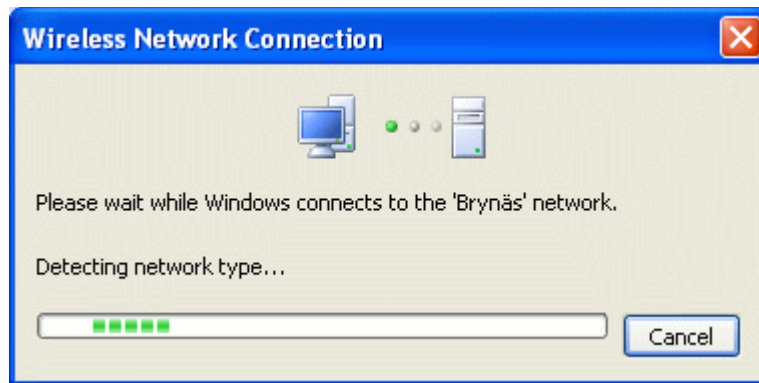


Image 13: Initiating connection to selected wireless network.

If your network is encrypted (configured in the access point) it requires an encryption key before you can connect to it. The encryption key must be the same one as you configured the access point to use.

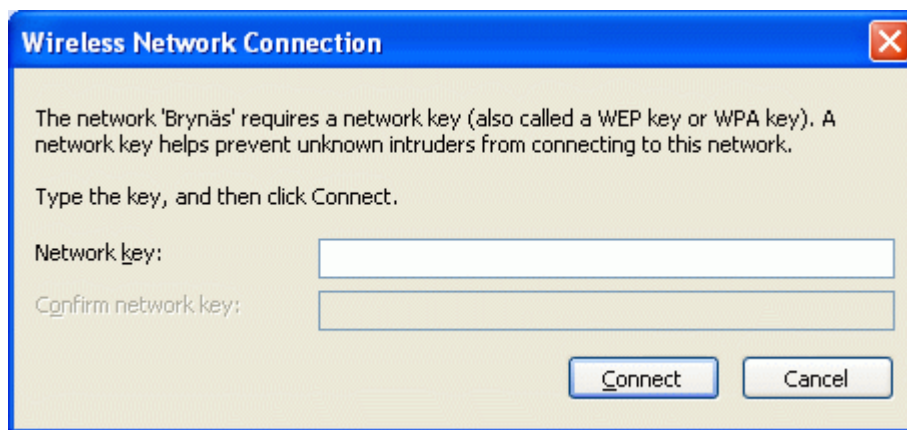


Image 14: For encrypted networks, an encryption key that is a shared secret between the access point and its clients is needed.

If the status message (displayed in the upper right corner of the frame that corresponds to the network you have selected) is Connected, you have succeeded to connect to the access point (see Image 12).

If the status message instead are *Authentication did not succeed*, do the following:

- Select Change the order of preferred networks (in the list of Related tasks)
- Select the tab Wireless Networks from the properties of your wireless network adapter and click on the name of your wireless network in Preferred networks. Then click Properties

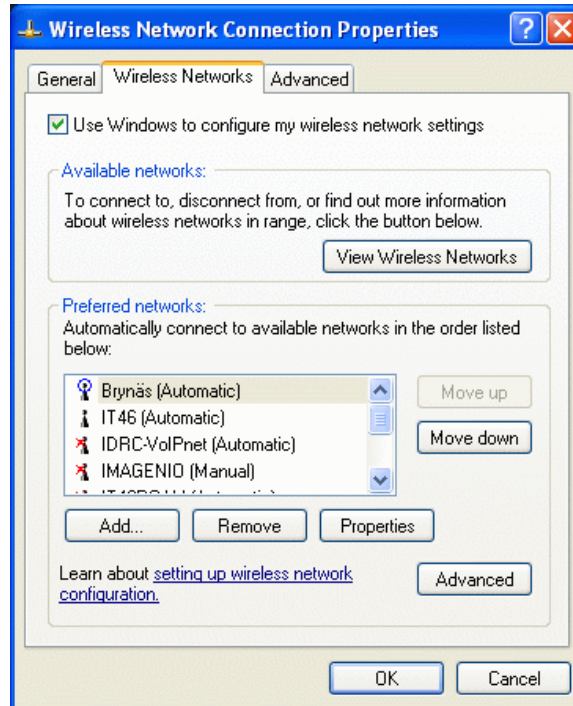


Image 15: Select the network that you manually want to configure.

- In Network Authentication, select Open (in the list of Related tasks)
- In Data encryption, select WEP
- In Network key (and Confirm Network Key), type the WEP encryption key (identical to the key you entered in the access point).
- In Key Index, select the index key index that corresponds to the encryption key memory position in the access point.
- Click OK to same changes (wireless network)
- Click OK to save changes (wireless network adapter)

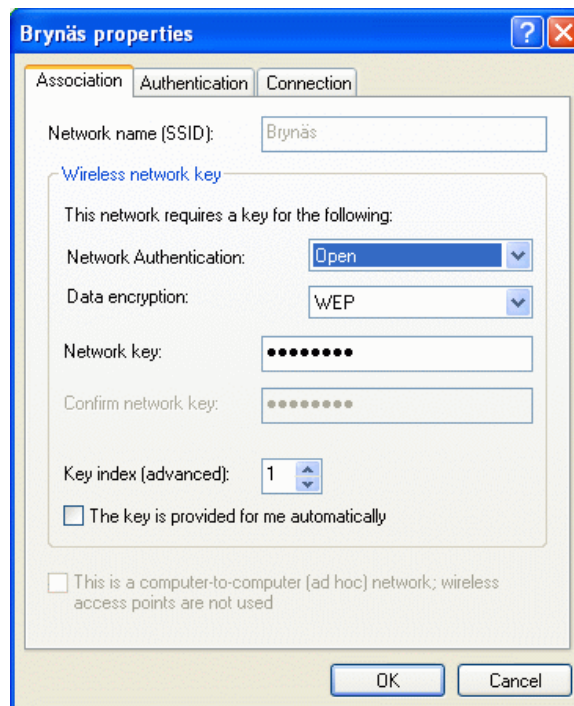


Image 16: Manual setting of WEP key

8.2 Step 2: IP settings

It is now time to set your TCP/IP settings. Depending on how you have configured the access point, you can obtain an IP address dynamically through DHCP or set a static IP address manually.

If the access point is configured for DHCP, you should already have an IP address. Check your IP settings from the command line

```
# ipconfig
```

If you have not got an IP address although the access points is supposed to give you one (by DHCP), try the following:

```
# ipconfig /release all
# ipconfig /renew
```

If you need to configure the TCP/IP parameters manually, ask your network administrator for the IP parameters to use. Then do the following:

Start > Control Panel > Network Connections

Right click on Wireless Network Connection and select Properties

Select the tab General and scroll down the menu until you find Internet Protocol (TCP/IP)

Select Properties

Fill in the IP parameters manually.

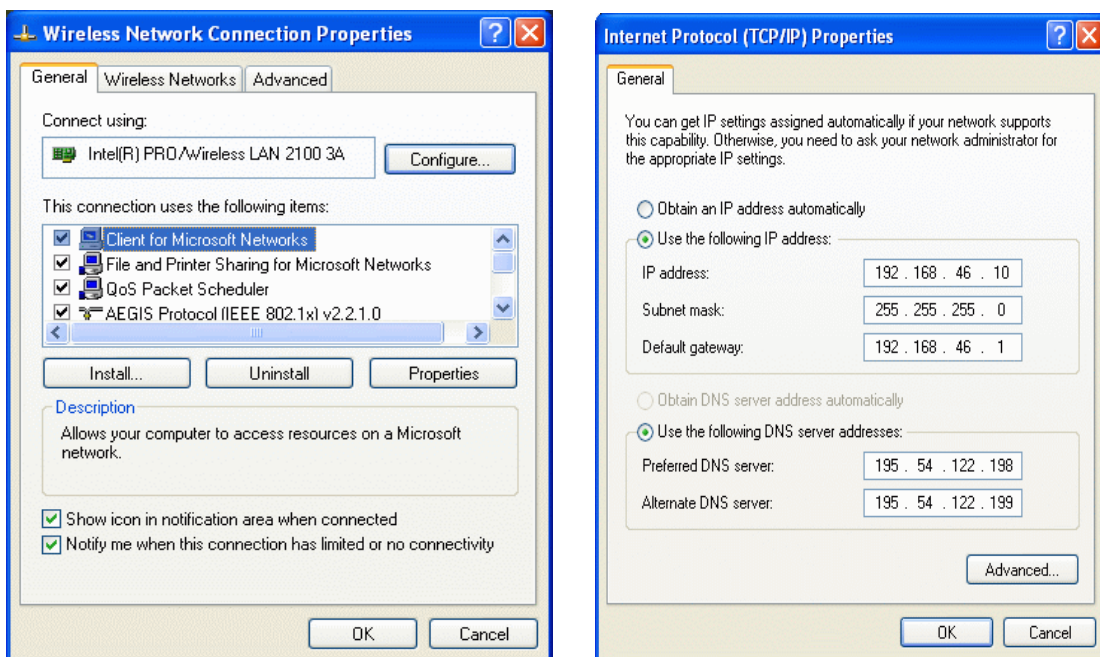


Image 17: a) Select Properties for Internet Protocol (TCP/IP) settings b) Set the IP parameters manually including the preferred DSN servers.

We recommend that you use the latest Service Pack for Windows XP. The wireless tools have been improved in SP2, especially concerning choice of network to connect to, and the firewall is on by default.

9. Conclusions

We can conclude that the main challenges of installing a wireless client is whether your product is supported (hardware and software) in the OS that you want to use. In Windows, this is hardly a problem as hardware vendors design the products to work together with Windows. For Linux distributions, it can sometimes be challenging if the wireless hardware is based on a new chipset and there are not current drivers available. If that is the case, just be patient and the Linux community will surely provide you with a solution in a few months time!

The five main issues to remember for this unit can be summarized as follows:

1. Your success in installing a wireless client for Linux very much depends on how well you did your pre-study about driver and chipset support.
2. Before you buy a wireless hardware client, make sure that it is supported by your distribution if you want to avoid problems.
3. Use the Internet (Google) to find out about others' experience when performing the same task.
4. Make sure that you know the radio and IP settings (SSID, WEP and IP settings) of the AP that you want to connect to.
5. Make sure that only one Configuration Management Tool is running when working with Windows as conflicts can occur.