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APPENDIX N:

USERS MANUAL

NOKIA

Nokia C110/C111 Wireless LAN Card

User's guide

For your safety

Read these simple guidelines. Breaking the rules may be dangerous or illegal. Further detailed information is given in this user's guide.



Road safety comes first

Do not use the wireless LAN card while driving; park the vehicle first.



Interference

All wireless LAN cards may receive interference, which could affect performance.



Hospitals and aircrafts

Wireless LAN cards can cause interference. Ask for the staff's permission before using your wireless LAN card near medical equipment or in an aircraft.



Switch off when refuelling

Do not use the wireless LAN card at a refuelling point. Do not use near fuel or chemicals.



Switch off near blasting

Do not use the wireless LAN card where blasting is in progress. Observe restrictions, and follow any regulations or rules.



Use sensibly

Use only in the normal operating position.



Use qualified service

Only qualified service personnel must repair equipment.



Accessories

Use approved accessories only. Do not connect incompatible products.



Water resistance

Your wireless LAN card is NOT water-resistant. The wireless LAN card is not covered under warranty for damage by any liquid substance.



Make backup copies

Remember to make backup copies of all important data.



Connecting to other devices

When connecting to any other device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

DECLARATION OF CONFORMITY

We, NOKIA MOBILE PHONES Ltd declare under our sole responsibility that the products DTN-10 and DTN-11 are in conformity with the provisions of the following Council Directive: 1999/5/EC.

CE 0523 !

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Introduction

The Nokia C110 Wireless LAN Card and the Nokia C111 Wireless LAN Card are extended type II PC cards, offering a data transmission rate of up to 11 Mbit/s in a wireless local area network (LAN) environment. The Nokia C110 features two internal antennas for compact size. The Nokia C111 is equipped with internal antennas and two external antenna connectors.

The Nokia C110/C111 Wireless LAN Card:

- Complies with the IEEE 802.11b standard.
- Supports data rates of 1, 2, 5.5, and 11 Mbit/s.
- Operates at a frequency of 2.4 GHz using direct sequence spread spectrum (DSSS) radio technology.
- Supports the Windows® 95, Windows® 98, Windows® 2000, and Windows NT® 4.0 operating systems. For other supported operating systems, please check the Nokia Web site at *www.nokia.com*.

Nokia's wireless LAN cards enable you to connect wirelessly laptop computers, hand-held devices, desktop PCs, and other devices with a type II or III PC card slot to a wired local area network through an access point. Instead of cables, radio waves are used to transmit and receive data over the air. With the Nokia C110/C111 you can:

- set up an infrastructure network where wireless stations communicate with wired and wireless stations through an access point. You can wirelessly access your company database, e-mail, the Internet, and other network resources, for example.
- set up an ad hoc network where wireless stations send and receive data directly with each other. No access point is needed, and as long as the stations are within range, you can, for example, share and exchange files.

The Nokia C110/C111 comes with an integrated smart card reader. Vital information, such as security keys and personal network profiles that make user authentication reliable and moving between networks easy, can be stored on a smart card.

Wireless LAN

The wireless LAN cards described in this document are approved for use in a wireless local area network.

The wireless LAN card employs the data transmission capabilities of a wireless LAN in order to send and receive data, to browse the Internet, and to establish connections with other computers, for example.

Data connections can be made from most locations where your wireless LAN card operates. However, it is recommended that you move the wireless LAN card to a location where the strongest possible network signal can be obtained. When the signal is strong, data transmission is efficient.

The following factors may impair wireless connections:

Noise

Electronic appliances and equipment can cause radio interference. Also in areas where wireless LAN cards are prevalent, other wireless LAN cards can impair the wireless connection.

Roaming

As the wireless LAN card user moves from one access point coverage area to another, the signal strength of the channel drops. As a consequence, the network may hand the user over to a coverage area and frequency where the signal is stronger. Due to varying network traffic loads, roaming may also occur when the user is stationary.

Electrostatic discharge

A discharge of static electricity from a finger or a conductor may cause erroneous functions in electrical devices. The discharge may result in unstable software operation. Network connections may become unreliable, data may be corrupted, and the transmission halted. In this case, end the existing connection (if any), stop the wireless LAN card and remove it from the PC card slot. Then re-insert the wireless LAN card into the PC card slot and try connecting again.

Dead spots and dropouts

Dead spots are areas where radio signals cannot be received. Dropouts occur when the wireless LAN card user passes through an area where the radio signal is blocked or reduced by geographical or structural obstructions, such as concrete walls.

Signal impairment







Distance and obstacles can cause out-of-phase reflected signals that result in a loss of signal strength.

Low signal strength

Due to either distance or obstacles, the radio signal strength from an access point may not be strong or stable enough to provide a reliable wireless connection for communication. Therefore, to ensure the best possible communication, remember to consider the following points:

- Data connection works best when the wireless LAN card is in a stationary position.
- Do not place the wireless LAN card on a metal surface.

Important!

-  **Warning:** Do not use the wireless LAN card when the use of a wireless device is prohibited or when it may cause interference or danger. Note that the wireless LAN card may cause similar interference as a cellular device and must not be used in areas where the use of a cellular device is prohibited.
-  **Warning:** Be careful when moving your computer so that you do not cause damage to the protruding end of the inserted wireless LAN card.
-  **Warning:** In Europe, this equipment is intended to be used in the following EU Member States: Austria, Belgium, Denmark, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom. This equipment can also be used in Iceland, Norway, and Switzerland.
-  **Warning:** Use the wireless LAN card in the specified countries only. Using the wireless LAN card in any other country or with an incorrect country setting is prohibited and may be illegal.
-  **Warning:** This equipment operates at 2.4 - 2.4835 GHz. The use of this equipment is prohibited in France.
-  **Note:** Transmitted data is not encrypted by the wireless LAN card by default. For more information about security in data transmission, please visit www.nokia.com.


Security

Security issues should always be carefully considered to ensure the secure transmission of data in both wired and wireless LANs. In current wireless systems, for example, access points need to authenticate wireless stations to prevent unauthorised access to the network. Authentication is a service that confirms the identity of an entity, such as a user or a computer, or confirms the originality of a transmitted message.

The Nokia C110/C111 supports the Wired Equivalent Privacy (WEP) protocol to ensure security equivalent to that of a wired local area network. The WEP protocol utilises the RC4 algorithm with an up to 128-bit secret key, which encrypts data before it is transmitted over the radio waves. This provides protection against intruders and unauthorised access to the data. When the wireless stations in a wireless LAN wish to communicate using WEP, they must have the same secret key in possession.

The Nokia C110/C111 is equipped with an integrated smart card reader. Smart cards and smart card readers provide a tool for managing secure user authentication in a wireless LAN. Smart cards also provide an easy way for users to carry an authentication device with them. On a smart card users can store important information, such as security keys and network profiles. The smart card reader reads the data stored on the computer chip and sends it to


the network for processing. The smart card is protected by a PIN code; to access the contents of the smart card, you need to enter the correct PIN code.

 **Warning:** Keep all miniature smart cards out of small children's reach.


The WEP protocol and smart card make user authentication and authorisation reliable and secure, thereby protecting the network from unauthorised intruders.


Antennas


The Nokia C110/C111 Wireless LAN Card is equipped with two internal antennas for improved signal quality and coverage area. As with any other radio transmitting device, do not touch the antenna unnecessarily when the wireless LAN card is in use. Contact with the antenna affects the quality of the transmission and may cause the wireless LAN card to operate at a higher power level than otherwise needed.

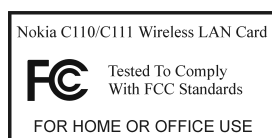
 **Note:** Make sure that the antenna is pointing towards the access point and placed in an open area. Do not cover the antenna.

The Nokia C111 has two antenna connectors for attaching external antennas for coverage area extension. The Nokia C111 can be used with up to two external antennas at the same time. Use only the supplied antennas or an approved external antenna. Unauthorised antennas, modifications, or attachments could damage the wireless LAN card and may violate regulations governing radio devices.

 **Warning:** Use only accessories approved by the wireless LAN card manufacturer for use with this particular wireless LAN card. The use of any other type of accessories will invalidate any approval or warranty applying to the wireless LAN card, and may be dangerous.

 **Caution:** When you disconnect the cable of any external antenna, grasp and pull the plug, not the cable.


 **Note:** For availability of approved accessories, please check with your dealer.



Caution: In order to comply with FCC RF exposure requirements for a mobile transmitter, a minimum separation distance of 20 cm must be maintained between the antenna and all persons during transmission.

Getting started

To access and to operate in a wireless LAN with the Nokia C110/C111 Wireless LAN Card, you need to specify a number of network settings. If wireless stations are to communicate with each other in the wireless LAN, the stations must share certain settings. You can leave most settings at their default value, or use the automatic option when applicable, unless, for example, the system administrator advises you to the contrary.

 **Note:** When you have changed certain settings, your computer may prompt you to restart it. Restart your computer to enable the new settings.

Different wireless LANs require different settings. All necessary settings are configured when you create a network *profile*. A profile is a collection of settings needed for connecting to a wireless LAN. With the Nokia C110/C111 you do not need to remember these settings by heart or configure them every time you use your wireless LAN card. You can easily switch between networks, for example, from headquarters to field office, simply by selecting the appropriate profile. Any of the settings can be changed by editing the existing profiles. See “Profiles” on page 19 for more information.

Three profiles with pre-defined settings are automatically created during software installation. *Quick Infrastructure* and *Quick Ad Hoc* profiles enable quick and easy access to a wireless LAN: you need not configure any network settings. The Quick Infrastructure profile is used for accessing public access zones or your corporate network. The Quick Ad Hoc profile is used for setting up a network where wireless stations communicate directly with each other without access points. When you activate either of these profiles, a list of available networks appears where you can select the network which offers the best signal strength and data rate for communication. The third pre-defined profile, *Wired LAN*, contains the original network settings needed for accessing the wired local area network. See “Using default profiles” on page 14 for more.

Basic settings

The minimum set of parameters to be configured are listed below.

 **Note:** All wireless stations within a wireless LAN must share the basic settings if the stations are to communicate with each other.

Country

You must always configure the country setting according to the country where you are currently using your wireless LAN card. Using the Nokia

C110/C111 Wireless LAN Card in any other country not specified, or with an incorrect country setting is prohibited and may be illegal.

The country setting can be configured on the General settings page.

Operating mode

The Nokia C110/C111 enables different types of communication in a wireless LAN. There are two operating modes to choose from: *infrastructure* and *ad hoc*.

Infrastructure

The infrastructure operating mode allows two kinds of communication:

- Wireless stations communicate with each other through an access point.
- Wireless stations communicate with a wired LAN station through an access point.

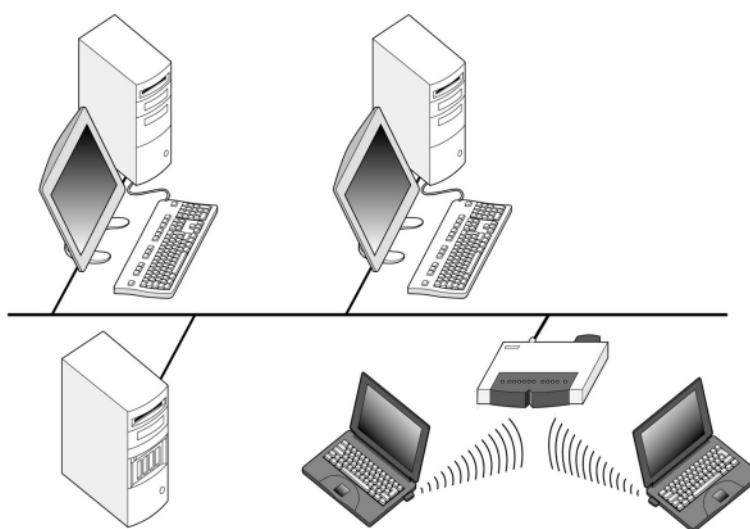


Figure 1 - Infrastructure networking

The advantage of the infrastructure operating mode is that you can have more control over network connections because they pass through an access point. A wireless station can access the services that are available for a regular wired LAN by using an access point.

Ad hoc

In the ad hoc operating mode, wireless stations communicate directly with each other; no access point is required. Simply insert the wireless LAN cards into the stations, make the necessary configurations, and start

communicating. Ad hoc networking is easy to set up, but communication is limited to stations that are within range.

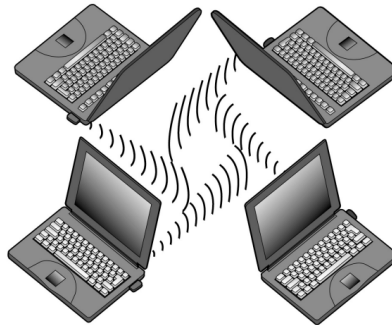


Figure 2 - Ad hoc networking

Select the desired operating mode when you are creating a new profile with the Profile Wizard. If you want to change the operating mode later, go to the Profiles page and click **Edit**.

Network name

The network name is the name of the wireless LAN to which the card can connect. It is usually programmed into an access point by a system administrator. You should ask the system administrator for the network name.

You can save more than one network name for each profile. If you enter more than one network name, the names must be separated from each other by a semicolon, for example: *Headquarters;Office4*.

Within a network, there may be subnetworks that all have different names, for example: *Office_wlan1*, *Office_wlan2*, *Office_wlan3*, etc. One profile can be used to connect the wireless LAN card to all the subnetworks. The network name may include a special character, a wildcard *, which can be used as a place holder for one or more letters or numbers. By using the wildcard, you can specify *Office_wlan** as the network name, and the wireless LAN card can be connected to any of the networks whose name starts with *Office_wlan*.

In the ad hoc operating mode, the users themselves give a name to the network.

i **Note:** The network name can consist of up to 32 alphanumeric characters. By default, the network name is case-sensitive. To change this property, go to the General settings page and select the **Advanced** tab. There you can clear the **Case-sensitive network names** check box.

If you want to change the network name later, go to the Profiles page and click **Edit**.

Channel

The Nokia C110/C111 operates in a frequency band of 2.4 GHz. You need to specify a radio frequency channel on which the wireless LAN card is used. The selection of available channels may vary from country to country, as certain countries have a limited number of channels that can be used.

You can select the **Automatic channel selection** option when you are creating a new profile with the Profile Wizard: you need not specify a channel, and you are automatically allocated an available channel. You can, however, also select the correct channel yourself. In that case, make sure that the wireless LAN card and the access point are using the same channel.

If you want to change the channel setting, go to the Profiles page and click **Edit**.

Connecting to a network

The Nokia C110/C111 Wireless LAN Card connects your computer automatically to the access point and network that offer the best quality for communications. If you move the computer to another location within the network and out of range of the access point, the roaming functionality will automatically connect your computer to another access point that belongs to the same network. As long as you remain within range of access points that belong to the same network, your computer will stay connected to the network.

Once you have installed the software for the Nokia C110/C111, you can connect to a wireless LAN.

- 1 Insert the wireless LAN card firmly into the PC card slot of the computer. See Figure 3.

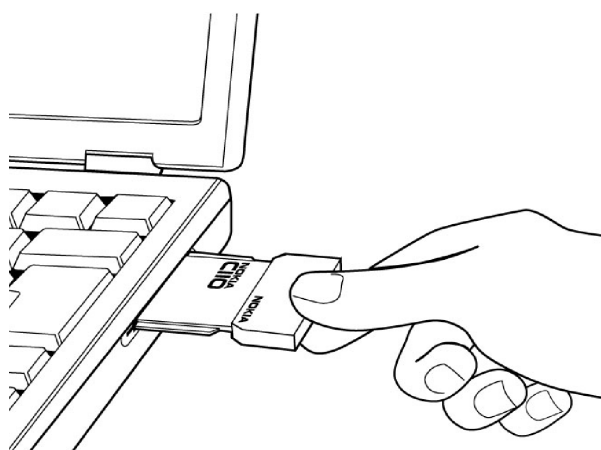


Figure 3 - Inserting the card



Caution: Note that the wireless LAN card is not inserted all the way into the PC card slot, but there is a gap between the protruding extension box and the computer. Do not use excess force when inserting the card.

- 2 Power on your computer.
- 3 If you are using a smart card, enter the PIN code and click **OK**.
- 4 Open the program by right-clicking the Nokia C110/C111 icon on the taskbar. A short-cut menu opens. Click **Manager window** or **Profiles**.
- 5 The Profiles page opens. Under **Profile selection**, select the profile you want to use with the wireless LAN in question. Click **Apply**. You may need to restart your computer. If you are about to connect to a new network and therefore need to create a new profile, or if you need to modify an existing profile, see “Creating new profiles” on page 20, or “Editing profiles” on page 22.

Setting up and joining an ad hoc network

Ad hoc networks allow wireless stations to communicate directly with each other without any access points. The stations can, for instance, share folders. One user creates the ad hoc network and other users then join the network. Only those stations that have the correct password can join the network.

To start an ad hoc network:

- 1 On the Profiles page, select the Quick Ad Hoc profile and click **Apply**.
- 2 Give the ad hoc network a name and a password. Click **Start**.

To join an ad hoc network:

- 1 On the Profiles page, select the Quick Ad Hoc profile and click **Apply**.
- 2 Select the network you want to join and click **Join**.



Note: When you select a profile for ad hoc networking, the system will ask you to restart your computer if your network settings need to be changed. Restart your computer and then either start a network or select the network you want to join.



Tip: Create your own profile for ad hoc networking with the Profile Wizard if you use the ad hoc operating mode frequently. This saves you from having to start a network each time and allows quicker access. See “Creating new profiles” on page 20 for more.

Using default profiles

Three default profiles are created during the installation: *Quick Infrastructure*, *Quick Ad Hoc*, and *Wired LAN* profiles. With these profiles you can easily and quickly establish a network connection: you get a list of available networks and can join one without having to change the network settings manually. The Wired LAN profile contains the original network settings needed for accessing the wired local area network. Note that these

profiles cannot be edited, deleted, or exported. The Wired LAN profile, however, can be updated to comply with the current wired LAN settings.

- 1 On the Profiles page, select the appropriate default profile, and click **Apply**. If your network settings need to be changed, the system will ask you to restart your computer. In that case, restart the computer.
- 2 A dialog box with a list of accessible networks opens. Select a desired network and click **OK**. The wireless LAN card will join the network.

Removing the card

You should always stop the wireless LAN card before removing it from the PC card slot of your computer. To stop the card:

- 1 Click **Start**. Select **Settings** and **Control Panel**. Double-click the **PC Card** icon to open the PC Card Properties dialog box.
- 2 Select **Nokia C110/C111 Wireless LAN Card** from the list and click **Stop**.
- 3 When the operating system prompts you, remove the wireless LAN card.
- 4 Click **OK** to exit the PC Card Properties dialog box.



Tip: A quicker way to stop the wireless LAN card is to click the **PC Card** icon on the taskbar and to select the option **Stop Nokia C110/C111 Wireless LAN Card**. Again, wait until the operating system prompts you to remove the card.



Caution: Closing the Monitor or the Manager window does not close the program. To exit the program you must stop the wireless LAN card.



Caution: Windows 98 operating system stops all PC cards when a new PC card is inserted into the computer. If you insert another PC card into your computer, make sure that you stop the Nokia C110/C111 and remove it from the PC card slot first.

Uninstalling the Nokia C110/C111

Windows 95, 98, 2000



Note: Before you start uninstalling the Nokia C110/C111, you must first stop the wireless LAN card and then remove it from the PC card slot of the computer. See “Removing the card” on page 15 for more.

- 1 Click **Start**, select **Programs** and **Nokia C110**. Click **Uninstall Nokia C110**.
- 2 A dialog box asks you to confirm whether you want to remove the program. Click **OK**.
- 3 The uninstallation starts. A dialog box informs you when the uninstallation has been completed. Click **Finish** and restart your computer.

Windows NT 4.0

- 1 Click **Start**, select **Programs** and **Nokia C110**. Click **Uninstall Nokia C110**.
- 2 A dialog box asks if you are sure you want to uninstall the program. Click **OK**.
- 3 In the Network dialog box, select **Nokia C110/C111 Wireless LAN Card** and click **Remove**.
- 4 Click **Close** to close the Network dialog box.
- 5 You are asked whether you want to restart your computer. Click **No**.
- 6 A dialog box informs you when the uninstallation has been completed. Click **Finish**.

Nokia C110/C111 features

Monitor window

The user interface of the Nokia C110/C111 consists of two types of windows: the *Monitor* window and the *Manager* window.

The Monitor window is a small window displaying information on the status of the network connection. When you are using the Nokia C110/C111, you can quickly check the Monitor window to see that you are still within the coverage area, for example, or that the wireless LAN card is connected to the network.

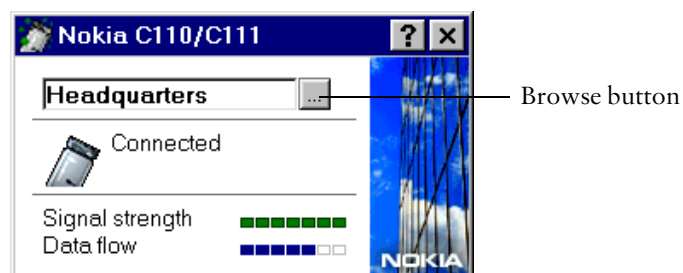






Figure 4 - Monitor window

When you insert the Nokia C110/C111 Wireless LAN Card into your computer, the Nokia C110 icon appears on the taskbar. Double-click the icon to open the Monitor window.

The Monitor window displays the name of the profile which is currently used, and information on the network connection. The following messages are displayed in the Monitor window according to the status of the connection.

- | | | |
|---|--------------------------------|--|
|  | CONNECTED | The wireless LAN card is connected to the network. |
|  | NOT CONNECTED | The connection could not be established. Make sure that you are within the coverage area, and all the settings are correct. |
|  | CONNECTION WEAK | A network connection has been established, but the connection is weak. Something may be either obstructing the connection (a concrete wall, for example) or the wireless station has moved too far away from the access point. |
|  | CONNECTED WITH SECURITY | WEP keys are used for securing data transmission. |



NO CARD

Either the wireless LAN card is not inserted or is not properly inserted.



ERROR

The Monitor window also has a signal strength indicator and a data flow indicator. The signal strength indicator shows the strength and quality of the radio signal between a wireless LAN card and an access point in the current location. Remember that the strength of the radio signal is affected by distance and obstacles, and that the computer needs to be within an access point coverage area (see “Wireless LAN” on page 6). The data flow indicator shows the relative speed at which data is transferred.

The browse button opens the Manager window on the Profiles page.

Manager window

In the Manager window, you can configure various settings for your wireless LAN card and get more detailed information on the status of the connection. You can access it either by clicking the browse button in the Monitor window (see Figure 4 on page 17), or by right-clicking the Nokia C110/C111

icon on the task bar and by selecting **Manager window** from the shortcut menu.

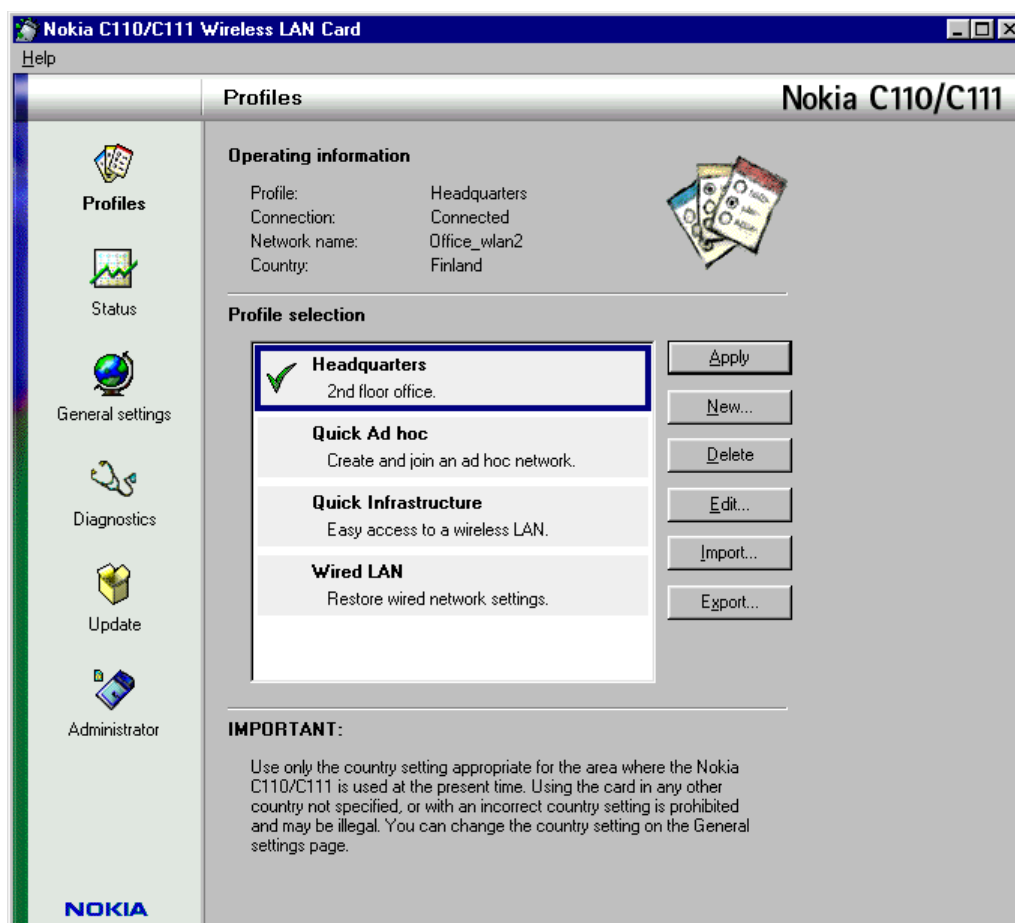


Figure 5 - Manager window

The Manager window consists of several *pages*: Profiles, Status, General settings, Diagnostics, and Update. The administrator page is used by system administrators. You can view the different pages by clicking the icons on the left icon bar.

Profiles


For the Nokia C110/C111 to operate in wireless local area networks, you need to configure certain settings for each network. For example, when you use the card in your office LAN, you need different settings compared to the LAN at an airport you are visiting. On the Profiles page you can configure the necessary settings and create network profiles for specific wireless LAN environments. A profile is a group of wireless LAN specific and Windows networking settings that you need for accessing wireless LANs. Profiles enable easy transfer from one network to another without having to remember all the different settings. On the Profiles page you can also modify


existing profiles and create new profiles. Profiles are stored to a hard disk or a smart card.

Selecting profiles

You need to select a network profile suitable for the wireless LAN in which you want your wireless LAN card to operate. When you insert the wireless LAN card into your computer, the card selects the profile last used as a default profile. If, however, you want to use another profile, you can either select it from the list of existing profiles or create a new one.

In the **Profile selection** area, there is a list of profiles from which you can select a profile with all necessary settings for a particular wireless LAN. If you have connected to a network previously, you can simply select the profile for that network and then click the **Apply** button. The profile which is currently active is indicated with a green check mark, while a profile which has been selected but has not yet been activated, has a frame around it. A profile which is used from a smart card is indicated with a small smart card symbol. The name of the active profile is displayed in the **Operating information** area. See Figure 5 on page 19.


 **Note:** When you select a different profile, you may be prompted to restart your computer.

 **Note:** You may need to change the proxy settings when you change profiles.


Creating new profiles

By creating different profiles for different wireless LANs, you can easily switch from one wireless LAN to another without having to memorise the network settings.

- 1 To create a new profile, click **New**. The Profile Wizard opens. This wizard will guide you through creating a new profile. To continue, click **Next**.

 **Note:** Most settings can be left at their default value, as in most cases these settings are sufficient to provide good quality communications. However, there are situations when you may need to change the default settings.

- 2 Type a name for the new profile. You can select the name yourself and it can consist of up to 30 alphanumeric characters. In the text box you can enter information which can help you in identifying the different profiles. This information can contain up to 108 characters. Click **Next**.


 **Tip:** When you create new profiles, make the name of the new profile as descriptive as possible. This enables a quick selection between different profiles. You can also add further details about the profile, for example the name or address of the place where the wireless LAN is located.

- 3 Select from the two available operating modes. In the *infrastructure* mode, computers can communicate with each other and with wired LAN stations through an access point. In the *ad hoc* mode, computers can send and receive data directly with each other. No access point is needed. See “Operating mode” on page 11 for more. Click **Next**.
- 4 Type the network name as defined by the system administrator, or select one from the list box. In the *ad hoc* operating mode, the users themselves name the wireless LAN. The network name can consist of up to 32 alphanumeric characters. By default, the network name is case-sensitive. To change this property, go to the General settings page and select the Advanced tab. There you can clear the **Case-sensitive network names** check box.

Select a channel for wireless communications. If you select the **Automatic channel selection** option, you need not specify a channel, and you are automatically allocated an available channel. You can, however, also select the right channel yourself. In that case, make sure that the wireless LAN card and the access point are using the same channel. Click **Next**.


- 5 Select the **Obtain an IP address from a DHCP server** box if you want the DHCP server to assign an IP address for the wireless LAN card automatically. Make sure the network has an DHCP server. Alternatively, the IP address, subnet mask, default gateway, and the advanced TCP/IP settings can also be specified and configured manually. Ask your system administrator for the correct values.

If you want your computer to log on to a specific domain, select the **Log on to domain** check box. You must have a user name and password for the domain.

-  **Note:** Make sure that you have the **Manage domain settings together with profiles** check box is selected (General settings page, **Advanced** tab). If this check box is not selected, the system cannot log you on to a domain.

In the **Workgroup** text box you can type a name of a workgroup if you want your computer to join one. With the Windows 95/98 operating systems you must always specify a workgroup name. Click **Next**.

- 6 The **Profile creation complete** window informs you when the creation of a new profile is completed. Click **Finish**.

-  **Note:** When you have created a new profile and want to use it for the first time, you may be prompted to restart your computer.

Deleting profiles

You can remove a profile from the list of profiles. Select a profile from the list and click **Delete**.


The default profiles which were automatically created during the installation (*Quick Infrastructure*, *Quick Ad Hoc*, and *Wired LAN*) cannot be deleted.

Profiles which are used from a smart card can only be deleted on the Administrator page by the system administrator, for example.

Editing profiles

You may want to edit an existing profile or create a new profile with similar settings to an old one.

- 1 On the Profiles page, select the profile from the list of profiles and click **Edit**.
- 2 Make the necessary changes and click **OK**. If you want to create an entirely new profile, click **Save As** and give the modified profile a new name.

 **Note:** The **Edit** dialog box consists of several tabs (General, Logon, Security, TCP/IP, Advanced), and from some of the tabs you can open a sub-window. On each tab you can change the existing settings, but the changes will take effect only when you click the **OK** or **Save As** button in the main Edit dialog box.

The Quick Infrastructure and Quick Ad Hoc profiles cannot be edited. The Wired LAN profile can be updated to comply with the current wired LAN settings.


You can leave most settings at their default values, as in most cases these settings are sufficient to provide good quality communications. However, there are situations when you may need to change the default settings. On the **General** tab you can edit the following properties:

DESCRIPTION	You can enter detailed information on the profile, such as the name or address of the place where the wireless LAN is located. This free text field is for information which can help you in identifying the different profiles.
OPERATING MODE	There are two available operating modes to choose from: In the <i>infrastructure</i> mode, computers can communicate with each other and with wired LAN stations through an access point. In the <i>ad hoc</i> mode, computers can send and receive data directly with each other. No access point is needed. See “Operating mode” on page 11 for more.
NETWORK NAME	The name of the wireless LAN as defined by the system administrator. In the ad hoc operating mode, the users themselves name the wireless LAN. Network name is case-sensitive and can contain up to 32 characters.

CHANNEL The radio frequency channel used for wireless communication. You can choose the Automatic channel selection option, or you can set the channel manually.

On the **Logon** tab, you can edit the following properties:

LOG ON TO DOMAIN If you select this option, your wireless LAN card automatically logs on to a specified domain before each use. You must have a user name and password for the domain.

 **Note:** Make sure you have the **Manage domain settings together with profiles** check box selected on General settings page/Advanced tab. If the check box is not selected, the system cannot log you on to a domain.

WORKGROUP The name of the workgroup if you want your computer to join one. In Windows 95/98, you must always specify a workgroup name.

On the **Security** tab, you can manage your shared WEP keys which are used for ensuring secure radio communication. For a more detailed description of WEP and how to create and manage different WEP keys, see “WEP security” on page 33.

USE WEP SECURITY WEP uses keys to protect the information transmitted in a wireless LAN. If this check box is not selected, the communication will not be protected against unauthorised persons.

USE PERSONAL WEP KEY Personal WEP keys are used for authenticating users in a wireless LAN. To create a personal WEP key, go to the General settings page and select the **Personal Keys** tab. See “Creating and editing personal keys” on page 34 for more.

Various network and radio settings can be edited on the **TCP/IP** and **Advanced** tabs:

OBTAIN AN IP ADDRESS FROM A DHCP SERVER An IP address for the wireless LAN card can be obtained automatically from a DHCP server. Make sure the network has an DHCP server. If needed, the IP address, subnet mask, default gateway, and the advanced TCP/IP settings can also be specified and configured manually.

AUTOMATIC CONFIGURATION

There are number of advanced radio settings (DTIM period, fragmentation threshold, listen interval, RTS threshold, etc.) to which you can specify a new value, if necessary.



Caution: Do not change the settings manually unless you are sure how each setting affects system performance. System performance may drop dramatically if automatic settings are not used.

ENABLE PCF

Certain multimedia applications (Voice over IP, videophone, etc.) require a guaranteed bandwidth: PCF (Point Coordination Function) allocates bandwidth for these applications when possible.



Note: You may need to restart your computer to enable the new settings.

Importing and exporting profiles

You can import a profile from a folder. Click the **Import** button, and select the source from which you want to import the profile. The system administrator can import a profile from a smart card.

Similarly, you can export a profile to a folder. Click **Export**, and select the folder where you want to save the profile.

The default profiles which were automatically created during the installation (*Quick Infrastructure*, *Quick Ad Hoc*, and *Wired LAN*) cannot be exported.

Status

On the Status page you can find general information on the current operation of the Nokia C110/C111 Wireless LAN Card and the network you are using.

General tab

The following properties are displayed on the **General** tab in the **Operating information** area:

PROFILE

Name of the profile currently in use.

CONNECTION	<p>Displays the current status of the wireless LAN connection.</p> <p><i>Connected</i> indicates that the card is connected to the network.</p> <p><i>Not connected</i> indicates that the card is not connected to the network.</p> <p><i>Connected with security</i> indicates that the system is using WEP keys.</p> <p><i>No card</i> indicates that no wireless LAN card has been inserted into the PC card slot of the computer.</p> <p><i>Connection weak</i> indicates that something is either obstructing the connection (a concrete wall, for example) or the computer has moved too far away from the access point.</p> <p><i>Authorization failed</i> indicates that you have possibly used a wrong WEP key, or that you have no access rights for the network.</p>
OPERATING MODE	<p>Type of network communication in use.</p> <p>In the <i>infrastructure</i> mode, computers can communicate with each other and with wired LAN stations through an access point. In the <i>ad hoc</i> mode, computers can send and receive data directly with each other. No access point is needed.</p>
NETWORK NAME	Name of the network to which the wireless LAN card is currently connected.
ACCESS POINT	Name of the access point to which the wireless LAN card is currently connected.
CHANNEL	Radio frequency channel on which the wireless LAN card is operating.
DATA RATE	Speed at which data is being transferred. Possible rates are 1, 2, 5.5, and 11 Mbit/s
MAC ADDRESS	Unique hardware address of the wireless LAN card.

The **Statistics** area shows the status of the current connection in graphics.

SIGNAL STRENGTH	Indicates the quality of the radio connection between the computer and the access point, or, in the <i>ad hoc</i> mode, between two computers.
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DATA FLOW

Indicates the relative speed of data transfer in the network.

Smart Card tab

The **Smart card information** area shows information on the smart card which is being used by the wireless LAN card: the name and status of the smart card, when the smart card was created and by whom, and an optional description of the smart card.

If you temporarily want to lock the smart card in order to deny access to it, click **Lock**. Those profiles which are used from the smart card will not be shown in the list of available profiles on the Profiles page. To access the smart card again, click **Unlock**, type your PIN code and click **OK**.

Your smart card has a default PIN code *0000*. For security reasons it is important that you change the PIN code. To change the PIN code, click **Change PIN Code** and type a new value for the PIN code. Click **OK**.

Keep the new code secret and in a safe place. If you enter an incorrect PIN code three times in a row, the smart card will be blocked and cannot be used. To change a disabled PIN code, you need a PUK (PIN Unblocking Key) code. The PUK is unique for each smart card and it cannot be changed. You can find the PUK code for your smart card from the sales package of the smart card.

Access Points/Stations tab

In the infrastructure operating mode, the **Access points in range** area shows which access points are currently in range and available. As the wireless LAN card user moves from one access point coverage area to another, the signal strength of the channel drops. Therefore the network may hand the user over to a coverage area and frequency where the signal is stronger.

In the ad hoc operating mode, the names of the other computers connected to the ad hoc network are displayed. Note that only the names of those computers which are using Nokia's wireless LAN card are shown. By double-clicking the entries, you can access those folders which are shared.

History tab

Here you can monitor the status of the network connection. The following events can be reported:

Card has been reset - Due to a temporary hardware or software failure the card may have lost the network connection for a while, but the card has reset itself.

Card found - The system has found the card.

Card not found - The system could not find the card.

Started network - An ad hoc network has been established successfully.

Failed to start network - An ad hoc network could not be established.

Joined network - The wireless LAN card has successfully joined the network and can start using its resources. The network can be either ad hoc or infrastructure.

Failed to join network - The issued command to join a network has not been successful.

Left network - The wireless LAN card has left the network which was previously used.

For detailed information on how to solve possible problems in connecting to a network, please see “Troubleshooting” on page 38.

General settings

On the General settings page you can set properties which are common for all profiles. These settings will remain unchanged even when you switch to using another profile.

General tab

Country selection

You must always configure the country setting according to the country where you are currently using your wireless LAN card. Select the correct country from the list of countries and click **Apply**.



Warning: Use only the country setting appropriate for the area where the wireless LAN card is used at the present time. Using the wireless LAN card in any other country not specified, or with an incorrect country setting is prohibited and may be illegal.

The Nokia C110/C111 operates in the license-free frequency band of 2.4 GHz, but local regulations may limit the use of radio equipment. Therefore, the selection of available channels varies according to the country where the wireless LAN card is used.

Power saving

Since a wireless LAN card has no direct wire connection of its own, it uses power from the host computer. The Nokia C110/C111 is equipped with a power saving option, which allows you to control the power consumption of your computer: you can prolong the life of the battery when needed.

If you select the **Enable power saving** check box, the wireless LAN card will be fully powered up only when sending or receiving data. The card wakes up from the power saving mode at regular intervals to check if there is any data for it at an access point, and wakes up immediately when there is any outgoing data.



Note: The speed of communication drops slightly when the power saving option is used.

Monitor window

By default, the Monitor window opens in the middle of the display area of your computer. If you want to move the Monitor window to a different place on the screen and want it to be displayed on that position the next time you open it, select the **Remember Monitor window position** check box. The next time you open the Monitor window, it will be in the same place where you had moved it.

Select **Always show Monitor window on top** if you want the Monitor window to remain visible even when you have other applications open.

When you insert the Nokia C110/C111 Wireless LAN Card into your computer, a small icon appears on the taskbar. By right-clicking this icon a shortcut menu opens, and you can access either the Monitor window or the Manager window. If, however, you want the Monitor window to open automatically each time the card is inserted, you can select the **Open Monitor window automatically** option.

If you select **Always show icon in taskbar**, the small Nokia C110/C111 icon on the taskbar will be displayed even when the card has not been inserted.

For the changes to take effect, click the **Apply** button. If you have made changes to the settings but then wish to restore the previous settings, click **Restore**.

Personal Keys tab

Personal WEP keys are used for authenticating the user in a network. Personal keys are not network specific, and are therefore not saved together with profiles. They are, however, saved in a file independently from profiles. The system administrator can store personal WEP keys on a smart card.

Personal keys can be used only with the infrastructure operating mode. Ad hoc networks use shared keys only. See “WEP security” on page 33 for more.

There are two types of personal keys, and the difference between the keys is the type of information which is used for authenticating the user:

USER-SPECIFIC	Uses an identifier which the users can create themselves.
STATION-SPECIFIC	Uses the MAC address of the wireless LAN card for identifying the user.

To create a new personal key:

- 1 Click **New**.
- 2 Give the personal key a name. You can also add a further description of the key, such as the name of the network where the key is used.

- 3 Select the type of key you want to create: *user-specific* or *station-specific*. If you choose a station-specific key, the MAC address of the wireless LAN card will be used as an identifier. If you choose a user-specific key, you can choose the identifier yourself.
- 4 Select the appropriate key length. Supported key lengths are 40, 56, 64, and 128 bits. Remember that the more bits there are in the key, the higher the level of security. Click **Generate**. The system generates your personal key.
- 5 Click **OK**.

Similarly, you can edit existing keys. You can also delete keys you do not need any more. Instead of creating a personal key yourself, you can import from a folder a key created by a system administrator. You can export and save personal keys in folders. The system administrator can also store personal keys on smart cards.

Note that on the **Personal Key** tab you cannot select a personal WEP key to be used. **To select a personal key to be used with a certain profile:**


- 1 Go to the Profiles page, select the profile you want to modify, click **Edit**, and select the **Security** tab.
- 2 Select **Use WEP security**, then select **Use personal WEP key**. Click **Select**.
- 3 A list of personal WEP keys is displayed. Select a personal key from the list and click **OK**.
- 4 Click **OK** to close the **Edit Profile** dialog box.

Advanced tab

When you create profiles, you are asked to specify whether you want the DHCP server to allocate an IP address for the wireless LAN card, and whether you want your computer to log on to a domain. By default, these settings are managed automatically as defined in each profile.

When the **Manage TCP/IP properties together with profiles** check box is cleared, profiles will be activated without TCP/IP settings. You can change the settings manually in the **Control Panel**.

Profiles will be activated without domain settings if the **Manage domain settings together with profiles** check box is cleared. You can change the settings manually in the **Control Panel**.

 **Note:** Both of these check boxes must be selected if you want the system to be able to log you on to a domain or allocate IP addresses.

By default, the network name is case-sensitive. To change this property, clear the **Case-sensitive network names** check box.

For the changes to take effect, click the **Apply** button. If you have made changes to the settings but have not saved them yet by clicking **Apply**, and if you then want to restore the original settings, click **Restore**.

Diagnostics

On the Diagnostics page you can run a series of fault diagnosis tests to ensure that the Nokia C110/C111 Wireless LAN Card and the software are operating correctly. If you encounter problems in accessing the wireless LAN, for example, the tests can help to identify the source of the problem.

The tests check that the software files have not been modified, that the settings configured both on the Profiles and General settings pages are valid and do not conflict, that the wireless LAN drivers have been installed correctly, and that the card does not have any hardware problems. If the card does not pass a test, you are given advice on how to proceed.

To start the fault diagnosis test, click **Start**. You can stop the test at any time by clicking **Stop**. The test results are displayed in the **Advice** area.

- The **Repair** button is activated if the software finds a fault which can be corrected automatically by the software.
- The **Help** button opens the troubleshooting section of the online help, where you can find information on how to solve possible problems.
- The **Support** button opens the online help where you get information on how to contact Nokia's technical support.

You are advised to run the diagnosis tests in a situation when the Monitor window, for example, reports a failure with the network connection, or when you have problems in accessing a network. A number of possible problem situations are covered in this guide under "Troubleshooting" on page 38.

Update

You can download the latest software version of the Nokia C110/C111 Wireless LAN Card from Nokia's customer support Web site. In order to be able to update your software, you first have to register to Nokia's customer database.

Registering to the customer database

You can register to Nokia's customer database electronically, simply by clicking the **Register** button. Your Web browser opens and you are taken directly to the Nokia Web site where you get further information on registration and where you find the registration form. You are asked to select a user name and a password. You need them when logging into the Web site where the updated software can be downloaded. Notice that you will not be able to download the software updates immediately after registering, as it takes a while for your user name and password to become valid.



Tip: Because it takes a while for your user account information to become valid, it is recommended that you register at your earliest convenience. This way you can get the software update as soon as you actually need it, instead of having to wait for the user account information to become valid.

Updating software

Once you have registered to Nokia's customer database and your user name and password are valid, you are entitled to download the latest software version for the Nokia C110/C111 from Nokia's Web site .

Click the **Update** button. Install the updated software version for your wireless LAN card. The installation is carried out in the same manner as the original installation from the CD-ROM.



Note: All the existing settings which you have configured on the Profiles and General settings pages - including your personal profiles - will remain unchanged even when the software has been updated.



Note: Make sure that your computer has enough battery power before you start to download the updated software.

Administrator

The Administrator page is meant for system administrators and is not installed as part of the typical installation procedure. On the Administrator page the system administrator can save important data on a smart card and can create installation disks, which then can be distributed to end users within a corporation, offering quick access to the networked resources.

Creating smart cards

The system administrator can store important information such as personal WEP keys and network profiles on a smart card. The administrator can then give users smart cards which contain the necessary network settings and encryption keys for quick network access. The user inserts the smart card into the Nokia C110/C111, inserts the wireless LAN card into a computer, and is then ready to access the wireless LAN.

Nokia's integrated smart card reader provides a highly reliable and efficient tool for managing user identities and user authentication in the wireless network. A smart card provides a tangible, reliable way to distribute network authentication keys to mobile users. WEP encryption together with the smart card functionality ensure a high level of security.

To store data on a smart card:

- 1 Slide the smart card into the smart card slot. Make sure that the metal contacts of the smart card are facing down and that the bevelled corner is on the right. See Figure 6 on page 36.
- 2 Insert the wireless LAN card in your computer and start the Nokia C110/C111 program. Go to the Administrator page. In the **Smart card** area click **Add/Remove**.
- 3 The Smart Card dialog box opens. Select the items on the left to be copied to the smart card. Click the arrow button pointing to the right. If you want to remove items from the smart card, select the desired items on the right and click the arrow button pointing to the left.
- 4 You can type additional information about the smart card in the **Smart card description** text box.
- 5 Click **OK** to save the selected items to the smart card.



Note: Profiles are copied to a smart card when the **Keep data after storing on smart card** check box is selected. If this check box is cleared, the selected profiles will be removed - instead of being copied - from the system to a smart card.

If you want to empty the contents of a smart card, click **Erase All**. Note that all items on a smart card will be removed. If you want the program to re-read the contents of a smart card, click **Reload**.

Creating installation disks

The system administrator can create INF based installation disks where selected settings can be copied to a disk.

The installation disk can be used for distributing profiles. All the desired settings and profiles can be copied to the installation disk, which then offers an end-user quick access to a wireless LAN. The end user does not have to configure the settings in order to be able to connect to a network.

To generate an installation disk:

- 1 On the Administrator page, in the **Installation disk** area, click **Create**.
- 2 The Installation disk dialog box opens. The **Profiles available** list contains the names of all the profiles found in the system registry. Select the profile you want to save on the installation disk and click **Add**.



Note: General settings are automatically copied to a disk, they do not have to be selected separately like profiles.

- 3 The name of the selected profile is added to the list on the right. If you want to remove a profile from the list, select it and click **Remove**. To start creating an installation list with the selected profiles, click **OK**.

The user inserts the Nokia C110/C111 into a computer, then inserts the installation disk into the disk drive, and the installation is carried out without the user having to configure any settings. When the installation has been completed, the user is ready to access the wireless LAN.

Security options

WEP security

To provide secure communication over the wireless LAN, the Nokia C110/C111 offers the WEP (Wired Equivalent Privacy) security feature. WEP uses the RC4 algorithm with an up to 128-bit key. The algorithm provides for security via two methods: authentication and encryption. Authentication is the means by which one wireless station is verified to have authorisation to communicate with a second station in a given coverage area. In the infrastructure mode, authentication is established between an access point and each wireless station. If a wireless station receives a packet which has not been scrambled with a correct key, the packet is discarded. Encrypted messages can be opened by other wireless LAN cards only if they all use the same encryption key.

The WEP feature offers a security level comparable to that of wired networks. The level of security is dependent on the length of the key: the more bits in the key, the longer it takes to decrypt the information sent and the higher the level of security. There are two types of WEP keys: *shared keys* and *personal keys*.

Shared keys

Shared WEP keys are shared by all wireless stations using the network or subnetwork; only stations which have the correct key can receive and decrypt data. Shared keys are usually created by system administrators, who distribute them to users. In the ad hoc operating mode, one of the users can create a shared key and then distribute it to the other users.

Shared keys are network specific, and each network can have up to 4 shared keys. The name of a shared key is the same as the name of the network.

Because the shared WEP keys are network specific and user-independent, they can be saved in a file together with profiles. Users can import from a file or a smart card profiles and shared keys which have been created by their system administrator.

Shared keys can be used as the only form of WEP security, or together with a personal key.

Personal keys

Personal keys are used for providing additional security for wireless connections. There are two types of personal keys, and the difference between the keys is the type of information which is used for authenticating the user:

USER-SPECIFIC	Uses an identifier which the users can create themselves.
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STATION-SPECIFIC Uses the MAC address of the wireless LAN card for identifying the user.

Unlike shared keys, personal keys are not network specific, and therefore cannot be saved together with profiles. They can, however, be separately saved in a file.



Note: Personal keys can be used only with the infrastructure operating mode. Ad hoc networks use shared keys only.

Creating and editing shared keys

Shared keys are usually created by a system administrator. In the ad hoc operating mode, the person who is starting the network has to generate a shared key and then distribute it to others.

- 1 On the Profiles page, select the profile you want to modify, click **Edit**.
- 2 Select the **Security** tab, then select **Use WEP security**. If you do not select this check box, WEP encrypted communication will be ignored. Click **New** if you want to generate a new shared key or **Edit** if you want to edit an existing one.
- 3 The Edit Shared Key dialog box opens. Type the name of the network where the key will be used, or select one from the list. The name of the network and the shared key must be the same.

For each wireless LAN network you may specify four shared keys. In the **Use as** list, select a slot for the key.

Select the appropriate key length. Supported key lengths are 40, 56, 64, and 128s. The more bits in the key, the higher the level of security. Click **Generate**. The system generates your shared key.

- 4 Click **OK**.


Importing and exporting shared keys

You can import shared WEP keys from a file or from a smart card, and export a shared key to a file. The system administrator can save shared WEP keys on a smart card.

- 1 On the Profiles page, select the profile you want to modify, click **Edit**, and select the **Security** tab.
- 2 Select **Use WEP security**, and click **Import** or **Export**.
- 3 Select the source from which you want to import or the destination to which you want to export the shared key. You can select a WEP key from a smart card only if the profile in question is also used from a smart card.

Creating and editing personal keys

Personal keys can be used only with the infrastructure operating mode.

 **Note:** You also have to set the personal key to the access point in order to be able to communicate with it.

- 1 On the General settings page, select the **Personal keys** tab. Click **New** if you want to generate a new personal key or **Edit** if you want to edit an existing one.
- 2 Give the personal key a name. You can also add a further description of the key, for example the name of the network where the key is used.
- 3 Select the type of key you want to create: *station-specific* or *user-specific*. If you choose a station-specific key, the MAC address of the wireless LAN card will be used as an identifier. If you select a user-specific key, you need to type in an identifier yourself.
- 4 Select the appropriate key length. Supported key lengths are 40, 56, 64, and 128 bits. Remember that the more bits there are in the key, the higher the level of security. Click **Generate**. The system generates your personal key.
- 5 Click **OK**.

Importing and exporting personal keys

You can import personal WEP keys from a file and save them to a file. The system administrator can import personal WEP keys from a smart card and export them to a smart card.

- 1 On the General settings page, select the **Personal keys** tab. Select the key you want to import or export and click **Import** or **Export** accordingly.
- 2 If you are importing a key, select the source from which you want to import it and click **Open**. If you are exporting a personal key, select the destination to which you want to save the key. Click **Save**.


Selecting a personal key

- 1 Go to the Profiles page, select the profile you want to modify, click **Edit**, and select the **Security** tab.
- 2 Select **Use WEP security**, then select **Use personal WEP key**. Click **Select**.
- 3 A list of personal WEP keys is displayed. Select a personal key from the list and click **OK**.
- 4 Click **OK** to close the Edit Profile dialog box.

Smart cards

A smart card is a miniature SIM-card sized plastic card with an embedded computer chip. Smart cards provide a means of storing vital information such as security keys or network profiles. Smart cards also provide an easy way for users to carry data with them. A smart card reader is needed to read the electronic data from the card: the Nokia C110/C111 is equipped with an integrated smart card reader.

The smart card is protected by a PIN code, which provides an additional tool for managing secure user authentication in a wireless LAN. Only a person who knows the PIN code can access the information stored on the smart card. Your smart card has a default PIN code 0000. For security reasons it is important that you change the PIN code. Keep the new code secret and in a safe place. If you enter an incorrect PIN code three times in a row, the smart card will be blocked and cannot be used. To change a disabled PIN code you need a PUK (PIN Unblocking Key) code. The PUK code is unique for each smart card and cannot be changed. You can find the PUK code from the sales package of your smart card.

 **Caution:** The smart card and its contacts can be damaged by scratches or bending, so be careful when you handle, insert, or remove the card.

The smart card which you receive from your system administrator, for example, can contain predefined network profiles which enable you to access the wireless LAN quickly and without having to configure any settings. The smart card may also contain WEP keys, which are used for authentication and encryption.

Inserting a smart card

- 1 Slide the smart card into the smart card slot of the wireless LAN card. Make sure that the metal contacts of the smart card are facing down and that the bevelled corner is on the right. See figure 6.

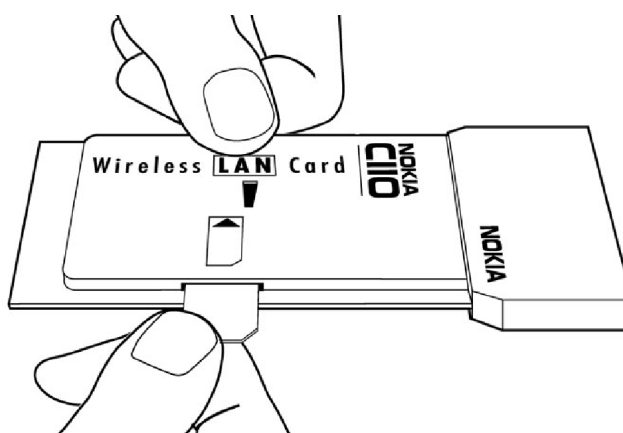




Figure 6 - Inserting a smart card

- 2 Insert the wireless LAN card in your computer.
- 3 Enter the PIN code of your smart card and click **OK**. You can now access the network or start the Nokia C110/C111 program.

 **Warning:** Keep all miniature smart cards out of small children's reach.

 **Tip:** If the smart card does not seem to work, make sure that you have not selected the station-specific WEP key option during the installation.

Changing the PIN code

- 1 On the Status page, select the **Smart Card** tab.
- 2 In the **Smart card locking** area, click **Change PIN Code**.
- 3 Type the new PIN code and then confirm it. Click **OK**.

Locking and unlocking a smart card

You may want to lock the smart card temporarily in order to, for example, deny access to it.

- 1 On the Status page, select the **Smart Card** tab.
- 2 In the **Smart card locking** area, click **Lock**. The smart card is now locked and cannot be opened without the correct PIN code.
- 3 To access the smart card again, click **Unlock**, type your PIN code and click **OK**.

Troubleshooting

If you encounter problems when installing and/or using the Nokia C110/C111 Wireless LAN Card, this chapter will assist you in finding out where the problem may lie. The chapter has been divided into sub-categories according to the type of problem.



Tip: When troubleshooting the wireless LAN card, a good starting point is to go through the following questions:

- 1 Was the installation successful?
- 2 Is the wireless LAN card connected to an access point? You can check the status of the network connection in the Monitor window.
- 3 Are the network settings, such as TCP/IP properties, correct? Check with your system administrator if necessary.
- 4 Are the wireless LAN settings (network name, operating mode, etc.) correct?
- 5 Are there any IRQ or other resource conflicts?

Installation

The installation program is interrupted.

Make sure you have enough power on your computer.

Make sure you have enough free disk space on your computer.

Check that you have closed all Windows programs before starting the installation, and that you have not inserted the wireless LAN card into your computer until prompted to do so in the installation program.

The wireless LAN card cannot be inserted into the PC card slot.

Check that the wireless LAN card is turned the right side up.

Check the PC card slot for any problems.

After inserting the wireless LAN card, it takes a while before the computer responds.

It is true that there might be a pause while the driver initialises the wireless LAN card. This is quite normal. Please wait until the next message box appears and tells you what to do. This should not take more than a few minutes.

Installation to a network drive fails.

You cannot install the Nokia C110/C111 Wireless LAN Card software onto a network drive. The software must always be installed on a local hard drive.

Network

The wireless LAN card seems to be working, but the network connection does not work.

Run the fault diagnosis tests on the Diagnosis page. If all tests are passed successfully, make sure that the network settings are correct. Ask your system administrator for advice.

If you have defined different profiles for different networks, you should also check that you have chosen the correct profile.

You can use *winnipcfg* in Windows 95/98 and *ipconfig* in Windows NT 4.0 to check that you have a correct IP address.

Network Neighborhood does not show any computers except the host itself.

Check that you have version 2.0 of Microsoft Winsock. If not, download it from the Microsoft Web site and run the installation program. In Windows NT it can take up to a couple of minutes for the computer to detect the rest of the network.

In Windows 95/98, Network Neighborhood does not show my computer name at all. Other computers cannot see my computer name in Network Neighborhood either.

Open the Network dialog box (click **Start, Settings, Control Panel, Network**) and click the **File and Print Sharing** button. Make sure that the **I want to be able to give others access to my files** check box is selected. Other users should now be able to see your computer in Network Neighborhood. If you share folders on your computer, other users can see them too.

In Windows 95, I cannot browse Network Neighborhood in the ad hoc operating mode.

Check that the Browse Master in Network Properties/File and Printer Sharing for Microsoft Networks is not disabled (should be enabled/automatic). Updating Network Neighborhood may take a while.

I cannot access the Internet.

Check that you use a routing protocol such as TCP/IP.

Make sure that the proxy settings in the Web browser are correct.

Also make sure that there is a connection from your network to the Internet.

Wireless LAN

The wireless LAN card is detected by the PC card controller, but the user interface is not displayed and there is no network connection.

Check that the Nokia C110/C111 Wireless LAN Card software is properly installed by running the fault diagnosis tests. If necessary, uninstall the software and then reinstall it.

The wireless LAN card cannot connect to an access point.

Check that the computer is within the coverage area of the access point. It must not be too far away or too close to the access point.

Make sure that the access point is powered on and connected to the wireless LAN.

Ensure that you have entered the correct network name. The access point and the wireless LAN card must have the same network name.

Check that you have access rights to the access point, and that the access point is connected to a network to which you have access rights.

The ad hoc operating mode does not work.

Make sure that all computers are on the same channel and have the same network name.

Make sure that all computers use the same network protocol, such as TCP/IP.

Make sure that you have given the right password if you are using WEP keys.

The wireless LAN card works but there is no network connection or it is very poor.

Check that the external antenna is properly connected and that no part of the cable is broken.

The wireless LAN card is working but the capacity is decreasing.

There might be interference from an outside source. Typical sources of electromagnetic interference at this frequency level are, for example, microwave ovens, access control systems, and cordless telephone systems.

The Quick Ad hoc profile does not work with the peer-to-peer mode of the Nokia C020/C021.

Quick Ad hoc is not compatible with peer-to-peer networking. Wireless stations can communicate, but TCP/IP addresses cannot be set automatically. Create a new ad hoc network profile with the Profile Wizard and set the TCP/IP address manually.

Resources

The wireless LAN card does not work and this is probably caused by another device installed.

Check that the wireless LAN card is not trying to use an I/O, IRQ, or memory address used by another device in your computer.

To check the status of resources:

Windows 95/98 Click Start - Settings - Control Panel - System - Device Manager - Network Adapters. If there is a conflict, a yellow symbol is shown in front of the name of the device.

Windows NT 4.0 Click Start - Programs - Administrative tools (Common) - Windows NT Diagnostics - Resources.

Hardware

I am not sure if the wireless LAN card is working.

Check in the Monitor window that the wireless LAN card is working. You can also check the Status page for the status of the connection.

There are no resource conflicts, but the wireless LAN card still does not work.

Check that the operating environment does not cause damage or interference to the wireless LAN card. Detailed information on the operating environment can be found in the chapter “Important safety information” on page 44.

Check that the wireless LAN card is properly inserted.

Run fault diagnosis tests on Diagnostics page.

You can try to determine whether the problem lies with the computer or the wireless LAN card by using the card in another available PC card slot, by installing the card in another computer, or by using another wireless LAN card in the first computer.

The wireless LAN card does not work in another PC card slot, but works in another computer.

Try to insert another PC card in the slot to determine if there is a compatibility problem between the Nokia C110/C111 Wireless LAN Card and the PC card slot, or if there is a general fault with the slot.

The smart card is not detected by the wireless LAN card.

Make sure you have the right type of smart card.

Make sure that the smart card is inserted correctly: the connectors on the smart card and the wireless LAN card must meet.



Note: You can find the latest troubleshooting information in the `readme.txt` file on the product CD-ROM. You can also find further information at www.nokia.com.

Card specifications

Physical specifications

TYPE	PC card (extended type II)
DIMENSIONS	116 mm x 54 mm x 5/10 mm
WEIGHT	43 g/45 g
STANDARDS	IEEE 802.11b
ANTENNAS	Integrated antennas (The Nokia C111 also has external antenna connectors.)
SECURITY	Wired equivalent privacy (WEP) with up to 128-bit secret key. For other security solutions, check the product CD-ROM.
SMART CARD SUPPORT	PC/SC compliant integrated smart card reader for security key (WEP) storage, profile storage, and other applications.
POWER CONSUMPTION (3.3 V/5 V)	Sleep: 10 mA/10 mA Receive: 240 mA/180 mA Transmit: 360 mA/310 mA
OPERATING TEMPERATURE	-5°C...+55°C

Radio specifications

CHANNELS	13 channels (depending on local regulations)
DATA RATE	Up to 11 Mbit/s
MODULATION TECHNIQUE	Direct sequence spread spectrum
OUTPUT POWER	35 mW (with the internal antennas)
RECEIVER SENSITIVITY	Min. -84 dBm
COVERAGE AREA	Outdoor: Max. 400 m radius Office environment: 20 m-100 m radius (depending on the building)

Important safety information

Traffic safety

Do not use the wireless LAN card while driving a vehicle. If using the wireless LAN card, park the vehicle first. Do not place the wireless LAN card on the passenger seat or where it can break loose in a collision or sudden stop.

Remember: road safety always comes first!

Operating environment

Remember to follow any special regulations in force in any area and always power off your wireless LAN card whenever it is forbidden to use it, or when it may cause interference or danger. Note that the wireless LAN card may cause similar interference as a cellular terminal and must not be used in areas where the use of a cellular terminal is prohibited.

When connecting the wireless LAN card or any accessory to another device, read its user's guide for detailed safety instructions. Do not connect incompatible products.

As with other mobile radio transmitting equipment, users are advised that for the satisfactory operation of the equipment and for the safety of personnel, it is recommended that the wireless LAN card should only be used in the normal operating position.

Electronic devices

Most modern electronic equipment is shielded from radio frequency (RF) signals. However, certain electronic equipment may not be shielded against the RF signals from your wireless LAN card.

Pacemakers

Pacemaker manufacturers recommend that a minimum separation of 20 cm (6 inches) be maintained between a wireless LAN card and a pacemaker to avoid potential interference with the pacemaker. These recommendations are consistent with the independent research by and recommendations of Wireless Technology Research. Persons with pacemakers should always keep the wireless LAN card more than 20 cm (6 inches) from their pacemaker when the wireless LAN card is powered on. If you have any reason to suspect that interference is taking place, power off your wireless LAN card immediately.

Hearing aids

Some digital wireless devices may interfere with some hearing aids. In the event of such interference, you may want to consult your service provider.

Other medical devices

Operation of any radio transmitting equipment, including wireless LAN cards, can cause interference. Ask for the staff's permission before using your wireless LAN card near medical equipment. Power off your wireless LAN card in health care facilities when any regulations posted in these areas instruct you to do so.

Vehicles

RF signals may affect improperly installed or inadequately shielded electronic systems in motor vehicles (e.g. electronic fuel injection systems, electronic anti-skid (anti-lock) braking systems, electronic speed control systems, air bag systems). Check with the manufacturer or its representative regarding your vehicle. You should also consult the manufacturer of any equipment that has been added to your vehicle.

Do not store or carry flammable liquids, gases, or explosive materials in the same compartment as the wireless LAN card, its parts, or accessories.

For vehicles equipped with an air bag, remember that an air bag inflates with great force. Do not place objects in the area over the air bag or in the air bag deployment area. If the in-vehicle wireless LAN card is improperly placed and the air bag inflates, serious injury could result.

Posted facilities

Power off your wireless LAN card in any facility where posted notices so require.

Potentially explosive atmospheres

Power off your wireless LAN card when located in any area with a potentially explosive atmosphere and obey all signs and instructions. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Users are advised to power off the wireless LAN card when at a refuelling point (service station). Users are reminded of the need to observe restrictions on the use of radio equipment in fuel depots (fuel storage and distribution areas), chemical plants, or where blasting operations are in progress.

Areas with a potentially explosive atmosphere are often but not always clearly marked. These include the area below deck on boats; chemical transfer or storage facilities; vehicles using liquefied petroleum gas (such as propane or butane); areas where the air contains chemicals or particles, such as grain, dust, or metal powders; and any other area where you would normally be advised to turn off your vehicle engine.

Wireless devices can cause interference. Ask for the staff's permission before using your wireless LAN card in an aircraft.

Failure to observe these instructions may be illegal and lead to legal action.

FCC Declaration of Conformity Statement

Name: Nokia C110 Wireless LAN Card and Nokia C111 Wireless LAN Card

Manufacturer: Nokia Internet Communications Inc.

313 Fairchild Drive

Mountain View, California 94043

USA

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.

Note: 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 or more 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.

Caution: Any changes or modifications not expressly approved by Nokia Internet Communications Inc. could void the user's authority to operate this device.



Care and maintenance

Your wireless LAN card is a product of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfill any warranty obligations and to enjoy this product for many years. When using your wireless LAN card or any accessory:

- Keep it and all its parts and accessories out of small children's reach.
- Keep it dry. Precipitation, humidity, and liquids contain minerals that will corrode electronic circuits.
- Do not use or store it in dusty, dirty areas.
- Do not store it in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store it in cold areas. When the wireless LAN card warms up (to its normal temperature), moisture can form inside the wireless LAN card, which may damage electronic circuit boards.
- Do not attempt to open it. Non-expert handling of the wireless LAN card may damage it.
- Do not drop, knock, or shake it. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean it. Wipe it with a soft, dry cloth.
- Do not paint it. Paint can prevent proper operation.
- Use only the supplied or an approved external antenna. Unauthorised antennas, modifications, or attachments could damage the wireless LAN card and may violate regulations governing radio frequency devices.
- If the wireless LAN card or any accessory is not working properly, contact your nearest Technical Assistance Center or your local Nokia dealer.

Glossary

Access point

Physical device that connects together wired and wireless networks.

Access zone

Office, campus, hotel, airport, etc. where wireless LAN connections are provided to employees, students, or visitors. Often specified as *public access zones* and *corporate* or *enterprise access zones*.

Ad hoc

One of the two operating modes that can be selected when using the Nokia C110/C111. With this configuration option users can set up a wireless network where wireless stations can send and receive data directly with each other without access points. This type of network is sometimes called *peer-to-peer network*.

Bandwidth

Size (in Hertz) of the operating or transmission channel of a system that a signal transmission occupies.

Beaconing

Process in which short messages containing the network name are sent by wireless stations or access points and broadcast ten times a second. A wireless station listens for these messages after powering up to either confirm it is on the correct channel or to move to another frequency channel if no messages are received or if the network name does not match.

Channel

A specified frequency band for the transmission and reception of signals.

Coverage area

Geographical area within which service from a radio communications facility can be received.

DHCP

Dynamic Host Configuration Protocol. A protocol which automatically issues IP addresses to devices on the network. The system administrator assigns a range of IP addresses to DHCP, and each client computer on the LAN has its own TCP/IP software configured to request an IP address from the DHCP server.

Direct sequence spread spectrum (DSSS)

Radio transmission technology that spreads the signal over a wide frequency band.

DTIM period

(1-1024, default 50). The Delivery Traffic Indication Message period indicates the number of beacon intervals between successive DTIMs. If all traffic indication messages are DTIMs, the period has the value 1.

Fragmentation threshold

This parameter defines a threshold above which the Radio Frequency packet will be split up, or fragmented.

Frequency hopping spread spectrum (FHSS)

Radio technology that operates by expanding a single message over a broad frequency range rather than a single, narrow band. The signal hops from one channel to another in a prearranged sequence.

FTP

File Transfer Protocol. A protocol that allows users to copy files between their local system and any system they can reach on the network.

Handover

Action of switching the user from one coverage area to another in order to secure the continuity of an established connection. If the signal strength of the channel drops, the network may hand the user over to such an area and frequency where the signal is stronger.

IP address

Internet Protocol address. A 32-bit number in dotted-decimal notation. Identifies the sender or the receiver of information sent in packets across the Internet.

Infrastructure

One of the two operating modes that can be selected when using the Nokia C110/C111. With this configuration option users can setup a network where wireless stations communicate with wired and wireless stations through an access point. Sometimes called StructureNet.

IRQ

Interrupt request. One of a set of possible hardware interrupts, identified by a number. The number determines which interrupt handler will be used.

Listen interval

(0-1024, default 20). The listen interval indicates to the access point how often a wireless station wakes to listen to beacon management frames.

Local area network (LAN)

Group of interconnected devices that share common processing and file management resources usually within a specific physical area, such as a building, floor, or office.

Wired LAN

A local area network in which cables are used to connect devices.

Wireless LAN

A local area network in which radio, microwave, or infrared links are used to connect devices instead of physical cables.

MAC

Media Access Control. A protocol that governs access to a shared transmission medium, such as a wireless LAN. In a local area network, *MAC address* is the computer's unique hardware address.

Memory address

Each memory location on a computer has its own memory address. All the information on a computer's memory can be located based on its memory address.

Network name

String of up to 32 alphanumeric characters comprising the name of the logical group to which the wireless station belongs.

Operating mode

Type of communication that has to be selected when using a wireless LAN card. The two operating modes available for the Nokia C110/C111 are *ad hoc* and *infrastructure*.

PCF

Point Coordination Function. The basic access method for 802.11 is the Distributed Coordination Function (DCF). PCF is an optional extension to DCF. PCF may be used to implement time-bounded services, like voice or video transmission.

PIN code

Personal Identity Number code. PIN code is a four-digit access code for protecting a smart card against unauthorised use.

Profile

Feature unique to the Nokia C110/C111. Profile is a collection of settings needed for connecting to a wireless LAN. You can easily switch between networks simply by selecting an appropriate profile.

PUK code

PIN Unblocking Key code. PUK is a four-digit code supplied with the smart card. The code is needed when you want to change a disabled PIN code.

Range

The distance that a radio signal travels from a radio transmitter before becoming too weak for a radio receiver to identify it.

Roaming

Moving from one access point to another without having to re-establish the connection.

RTS threshold

Request To Send threshold parameter, which controls for what size data packet the low level RF protocol issues an RTS packet.

Smart card

Small plastic card with an embedded integrated circuit. Provides a secure medium for storing and transporting information.

TCP/IP

Transmission Control Protocol/Internet Protocol. A protocol for interconnecting disparate networks to get data from one network device to another.

WEP

Wired Equivalent Privacy. A security feature using the RC4 algorithm that performs wireless data encryption. The WEP algorithm uses a 40-bit or 128-bit key.

Wireless LAN card

PC card conforming to the PC card type II specification. The card provides the functions necessary for sending and receiving data across the air.

Wireless station

Any device with a PC card slot, into which the wireless LAN card can be inserted in order to send and receive data.

Virtual private network (VPN)

Technology that provides secure remote access to a corporate network. A VPN contains the security components of user authentication and data encryption.

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