LESSON E18_EN. WI-FI BASED WIRELESS INTERNET. INSTALLATION. USE.

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After studying this lesson, you will acquire the following knowledge:
- How to configure the AP, Wi-Fi card hosted in a laptop.
- How to put into service the AP, Wi-Fi card hosted in a laptop and WLAN.
- Wi-Fi troubleshooting.
- The use of the Wi-Fi and finding the Hotspots.
- Profitability elements of investing in WLANs.

CONTENT OF THE LESSON

LEARNING OBJECTIVES:

After learning this lesson, you will have the ability to:
- configure the AP, Wi-Fi card hosted in Laptop.
- put into service the AP, Wi-Fi card hosted in Laptop, WLAN.
- troubleshoot Wi-Fi WLANs,
- use and find Hotspots.
- evaluate the possibility of investing in your own LAN.

1. Wi-Fi WLAN. PUTTING INTO OPERATION. FIRST GUIDELINES.

3 types of elements must be connected:

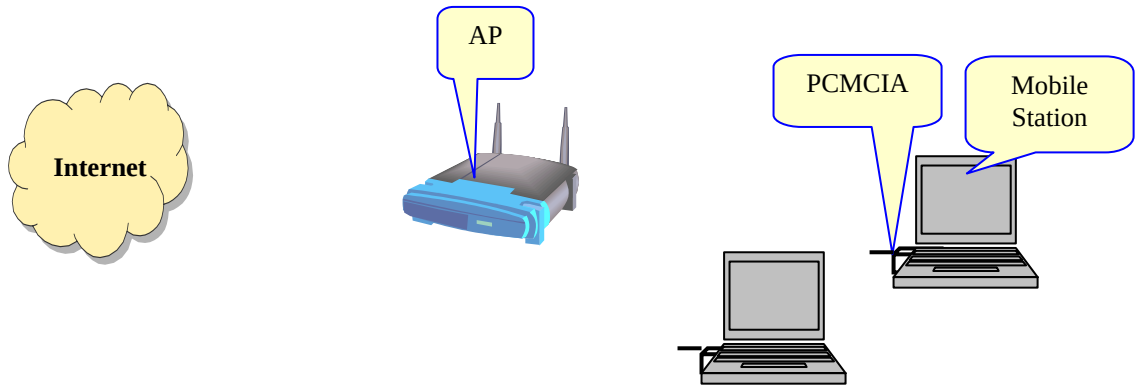

Fig. 1.1. 3 types of elements (also using other Building Blocks) must be connected: Internet, AP and Mobile Stations.

The putting into operation of the WLAN is really very simple and automatic.
The majority of producers deliver the **SET-UP WIZARD** (software program) and **Quick Installation Guide.**

The putting in operation of the Wi-Fi WLAN is systematized and is quite similar for many types of Wi-Fi WLANs.

The AP has a similar role to that of the gateway from the Ethernet. It also ensures the NAT (Network address Translation) and DHCP (Dynamic Host Configuration Protocol) of the WLAN.

Upon putting into operation, it is important to have an image about the three essential parts which must be taken into consideration, fig. 1.2.

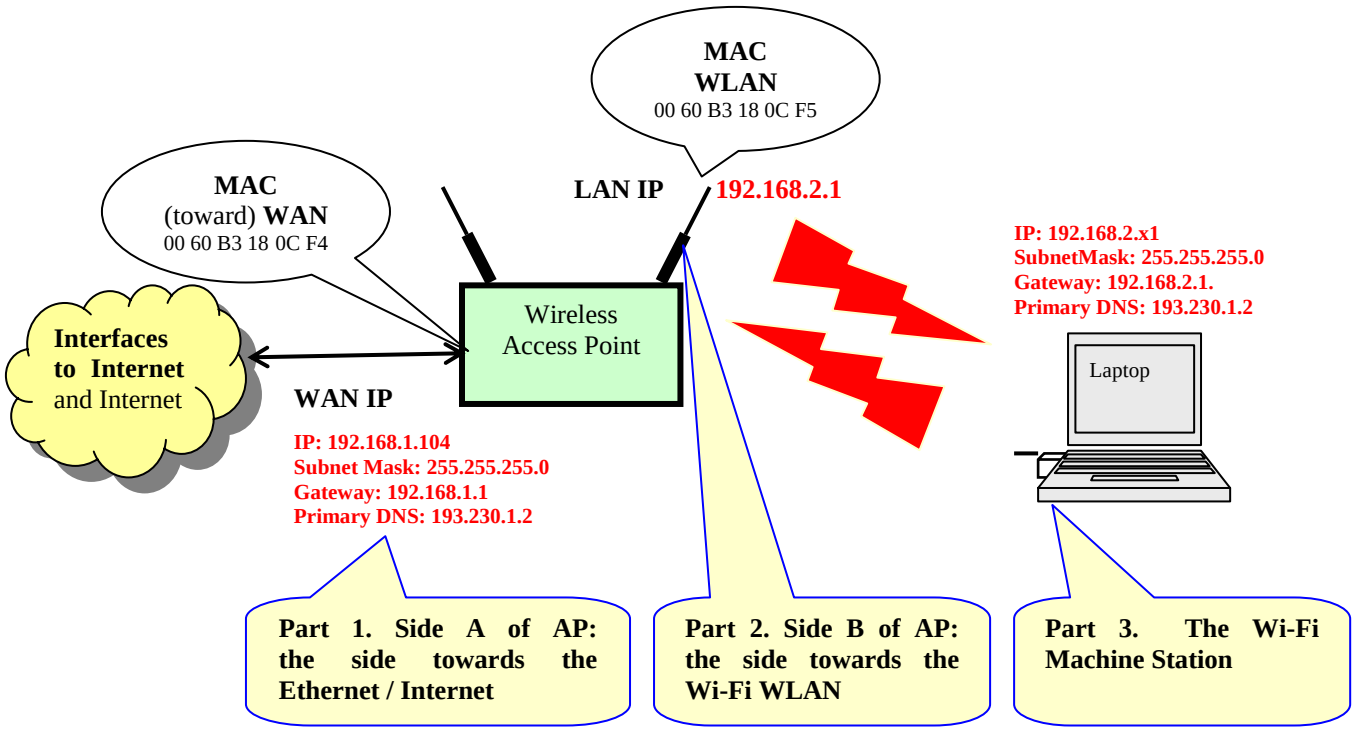

Fig.1.2.The parts of the Wi-Fi WLAN for putting into operation.

The putting into operation, respectively the configuration of Wi-Fi WLAN, is an exercise of the right configuration of the IP Addresses, the configuration of SSID, channel and WEP (Wired Equivalent Privacy) and of using the imposed MAC / Physical Addresses.

2. AP: THE CONFIGURATION (XP environment).

The Wizard and the helping machine.

The configuration is achieved through a helping PC or Laptop, Ethernet connected to AP and through using a Wizard / setup software, installed on the helping machine.

After setting the AP parameters, the parameters will be saved by the Wizard command: **Save Configuration.**

The principal menu of the Wizard is created in the form of a tree and permits the setting of [11.]:

- **The WAN interface** (the AP side and interface towards Internet WAN),
- **The WLAN radio interface** (the AP side and interface towards Wi-Fi WLAN), including the IP Address for the Wi-Fi port, the SSID, the channel, the WEP / encryption (if any),
- Possibly another LAN Interface (the AP wire interface, for APs which also accept wire clients).
- **The WEP Security configuration.**
- Advanced configurations: for example, the NAT (Network Address Translation), which may make the active Wi-Fi WLAN devices invisible for the Internet.
- Configuration of AP filters, in order to limit the access to the AP only to authorized users (including the list with authorized MACs / Physical addresses).
- Configuration of administrative tools: passwords, files for saving / restoring the AP configuration, working regime with the DZM “demilitarized zone” and other.
- Configuration of Special Applications: videoconference, VoIp, games, etc.

The basic results of the configuration, from an addressing point of view of, are illustrated, as an example, in fig. 2.1.

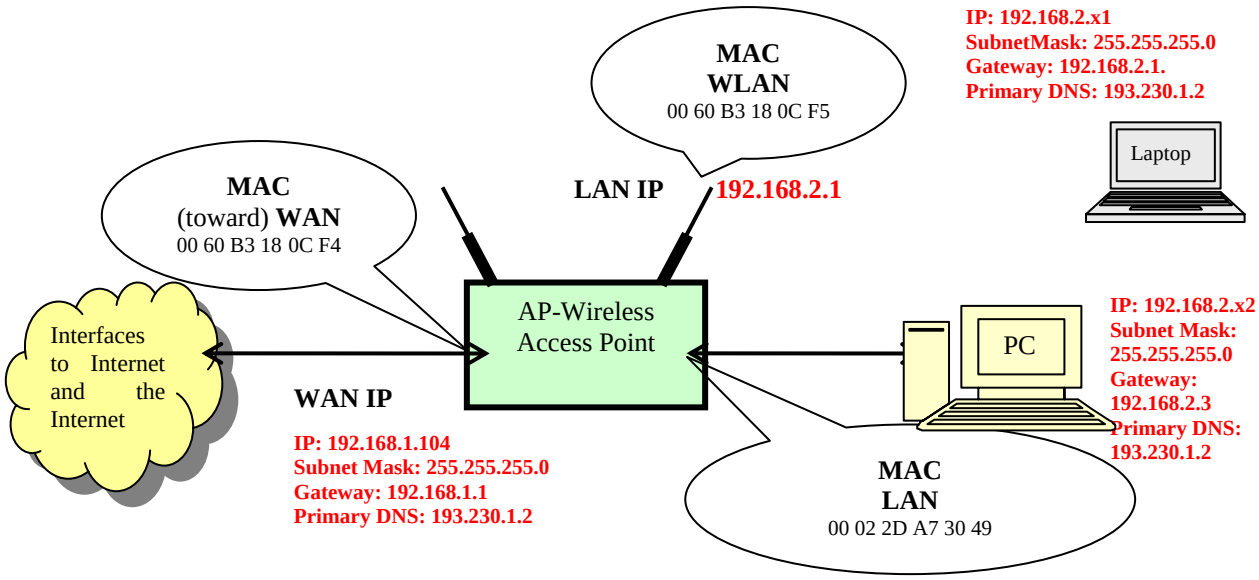

Fig.2.1.The sets of connecting Adresses. x2 may signify, for instance, 32.

What to configure? Sides of configuration.

The procedure of the AP - Access Point configuration takes into consideration the 2 distinct sides of the AP:

- A. The side towards the wire Ethernet / Internet,
- B. The side towards the Wi-Fi WLAN.

On the AP side A., towards the wire Ethernet / Internet, the following must be configured:
the classical quartet of TCP/IP parameters: IP Address, mask of subnet, IP Address of the Gateway of Interfaces at Internet, IP Addresses of DNS Servers.

On the AP side B, side towards the Wi-Fi WLAN, the following must be configured:
The IP Address of the Wi-Fi WLAN, which is the IP Address Gateway towards Internet, for the Machine Stations, the SSID, the channel, the WEP / encryption characteristics, filter characteristics (list of accepted Machine Stations based on MAC / Physical addresses) and other possible parameters.

The procedure of the AP configuration is quite similar for many systems (D-Link, Fujitsu Siemens, RangeLAN, Linksys Wap11, etc.). The putting into operation will be illustrated, for instance, for the Fujitsu Siemens Wi-Fi AP and Wi-Fi card [11.].

Normally, the following are delivered for the putting into operation:

- 1.) The AP- Access Point, the power supply for AP and the CD-rom with the installation AP Wizard.

- 2.) An Ethernet cable for connecting the AP to a helping PC or Laptop.

- 3.) The Wi-Fi interface for the Laptop: the PCMCIA card (Personal Computer Memory Card Association), which is used inside the special connector of the Laptop (some types of Laptops have an integrated Wi-Fi interface, so that supplementary cards are not necessary).
  The PCMCIA has the Wi-Fi antenna on the opposite side of the connector.
  If the Laptop does not have a free connector for the PCMCIA, a Wi-Fi Adapter may be used, connected through the USB.

- 4.) Software drivers for the Wi-Fi PCMCIA card operation and configuration. The Wizard for setting up and rendering operational the Wi-Fi PCMCIA card.

It must be emphasized that there are 2 Wizards: one for AP and one for the Wi-Fi PCMCIA card.

The following steps must be followed for putting AP into operation.

A. Ensuring a helping machine (PC or Laptop).
Making sure that the wired Ethernet LAN in which the AP will finally work is running correctly.
The user must have the possibility to connect a helping machine (PC or Laptop) to the wired Ethernet, for instance through a cable coming from a Hub or from a Switch, of the final wired LAN to which the AP will be connected.

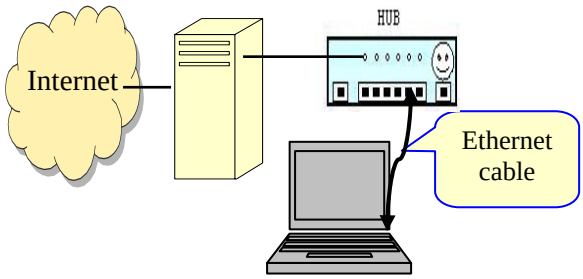

Fig.2.2. First step. The helping laptop is connected as normal partner to the net.

B. Ensuring the TCP/IP configuration of the helping PC (or Laptop), inside the wired Ethernet LAN, fig.2.2.., finally destined to the AP.

Testing the possibility of the helping machine being TCP / IP configured inside the local wired net to which the AP will finally be connected. This verification is achieved through the practical TCP / IP configuration of the helping machine, inside the local wired net, in which the AP will finally work.

This initial connection of the helping machine (PC or Laptop) to the Internet is necessary for collecting information about the final wired Ethernet network, in which the AP will work.
Firstly, this information consists in the classical quartet: IP Address, mask of subnet, IP Address of the Gateway of Interfaces at Internet, IP Addresses of DNS Servers.

In many systems, these parameters will be used, after the replacement of the helping machine, as the AP TCP /IP parameters of the AP side towards Internet.

C. Displaying the quartet of IP configuring parameters of the helping machine.
For this, the MS-DOS command is used:

C :\>**IPConfig /All (Enter)**

Notice the results: the IP Address given for the helping machine, the subnet mask, the IP Address of the Gateway port of the server, through which the helping machine is connected to the Internet, the IP Addresses of DNS servers.
The above quartet of types of TCP / IP parameters must be noted down, because they will be used for the AP configuration.

D. The installation of the Wizard (setup software), on the helping PC (or laptop), used for the configuration of the AP.

The Wizard (in many systems) automatically identifies the TCP / IP configuring parameters of the helping machine and uses these parameters to configure, with the same parameters, the AP (the helping machine being replaced by the AP).

The Wizard software (**AP Start-up tool)** is delivered on the CD-rom.

The supplier delivers a URL where the browser finds the Wizard. The URL address, indicated by the producer, must be introduced in the web address box of the browser of the Laptop. Starting from this address will lead to the launch of the Wizard.

The Wizard installs the software program **ConfigStarter.exe** (at Fujitsu Siemens) [11.], program which is used at the AP configuration. The **ConfigStarter.exe** also works as a Wizard.

C. Unplugging the devices.

D. Disconnect the helping machine from the local Ethernet and connect, through the configuring Ethernet cable, the helping machine to the AP (Ethernet connector, usually named WAN), fig.2.3.
The configuring Ethernet cable is a short cable (for instance of 2 metres), used for ensuring the connection between the helping machine and the AP, at the time of configuration.

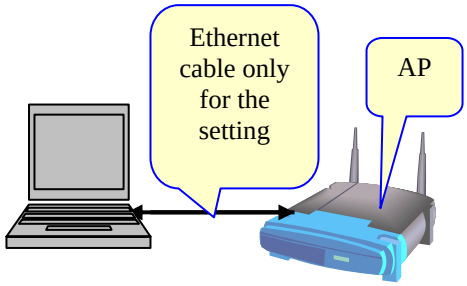

Fig.2.3. Second step. The helping Laptop is connected to AP. Configuration for the AP setting.

Later, another Ethernet cable (the normal Ethernet cable of the local LAN) will replace the configuring Ethernet cable and will connect the AP to the wired Ethernet and through the Ethernet towards Internet.

The connection of the helping Laptop to the Ethernet local LAN is replaced by the Ethernet connection of the helping Laptop to the AP.
This aspect is illustrated in fig.2.1.b.

Also, the configuring software is now already installed on the helping Laptop.

E. Powering the devices.

F. Starting the **ConfigStarter.exe** (installed by the Wizard) with the Internet Explorer browser, on the helping machine.
The **ConfigStarter.exe** is started by inputting the address indicated in the delivery material in the starting box of the Internent Explorer.

From this point on, the setting of the AP parameters will be achieved by the dialogue between the AP and the helping machine and by opening images and opening boxes on the screen of the helping machine.
The content of these boxes, on the display of the helping Machine, will be completed step by step at the configuration of AP.

The installed Wizard, **ConfigStarter.exe**, allows the step-by-step and interactive running of the **setup software** that accompanies the delivery of the AP.

AP Configuration Screens (practically a screen for one or more parameters) are used for the setting**.**

The new parameters may be introduced manually, from the keyboard.

A. The AP side towards the Internet.

On side A of the AP, towards the wired Ethernet (WAN port or on the WLAN side), the following AP parameters are set:
- Topology type : Access Point, Bridge between 2 Wi-Fi nets, Repeater, Client of Wi-Fi net,
- The quartet of TCP /IP parameters inside the wired Ethernet Lan,
- PPPoE – Point-to-Point Protocol over Ethernet.

Based on the leading of the **ConfigStarter.exe** Wizard, the configuration of the Wi-Fi AP is made from the point of view of 4 classical types of parameters:
- IP Address, on Internet side,
- Mask of subnet,
- The IP Address of the Gateway, by which the Wi-Fi AP connects to the Internet network,
- The IP Addresses of DNS Servers (which serve the respective Wi-Fi AP) from the Internet world.

As it can be seen, on the side towards the Internet, the Wi-Fi AP is installed as a normal Internet partner of the Ethernet LAN.

After the Wi-Fi AP configuration inside the wired helping Ethernet LAN, it may be tested on the Internet side with normal diagnosis tools, such as Ping (from the helping Laptop, etc.).

B. The AP side towards the Wi-Fi WLAN.

Without all the parameters being compulsory, on the WLAN side the following AP parameters are going to be set up:
- **SSID** – Service Set Identifier (compulsory).

The SSID is an alphanumeric string with up to 32 characters.
The AP and the Machine Stations associated at the respective AP must have the same SSID.
The SSID comes by default from the supplier and it is recommended to be changed.

- **Channel** (compulsory).

All the partners of a Wi-Fi WLAN work on the same channel.

The channels are presented in the following Tables [12.]:

802.11 b and g Carrier 2.4 GHz	The center of frequency of the channel, in GHz
Channel 1	2,412
Channel 2	2,417
Channel 3	2,422
Channel 4	2,427
Channel 5	2,432
Channel 6	2,437
Channel 7	2,422
Channel 8	2,447
Channel 9	2,452
Channel 10	2,457
Channel 11	2,462
Channel 12	2,467
Channel 13	2,472
Channel 14	2,477 (Japan)

802.11 a Carrier 5 GHz	The center of frequency of the channel, in GHz
Channel 36	5,180
Channel 40	5,200
Channel 44	5,220
Channel 48	5,240
Channel 52	5,260
Channel 56	5,280
Channel 60	5,300
Channel 64	5,320

In the AP, in accordance with IEEE 802.11 b and g, the channels are placed at a distance of 5 MHz.
But the spectrum of the Wi-Fi transmission is wider than 5 MHz, going towards 22 MHz.
Due to this aspect, 2 different neighbouring Wi-Fi systems must be separated by a minimum number of 4 to 5 channels (20 MHz to 25 MHz).
Based on this aspect, the possible configurations / channels of 3 different Wi-Fi Systems (WLANS), placed in the same site, may occupy only the channels: 1, 6, and 11.

The situation is better at the use of IIIE 802.11a, where the channels are disposed at distance of 20 MHz, so that all the channels may be used.
Big interferences and possible temporary denial of service are produced in the places where different APs work on the same channel. The roaming works in a very difficult manner in these cases and an AP may block other APs.

Some Wi-Fi systems (ORiNOCO) use automatic channel selection. They evaluate the level of interference, the bandwidth usage, the possible emmission in the neighbouring channel and apply the Auto Channel Select feature.

- **WEP keys**, (strongly recommended).

Without WEP (Wired Equivalent Privacy), practically all people may see your Data communication.
WEP is an encryption system. Additionally, it permits the authentication of the emitting machine.
WEP seems to have limitations and will be probably replaced with WPA (Wi-Fi protected Access).

- **Password** (log-in) (compulsory). It is necessary to have the possibility to enter the configuration software and make changes. It is not an aspect in relation to WEP. The password may be delivered by the supplier, as a default password.

- **IP Address of the AP as gateway on the WLAN side** (compulsory), (example of IP Address: **192.168.2.1** in fig.2.1.; the IP address of the AP antenna).

The supplier delivers a default IP Address.
At the putting into operation, the desired IP Address of the AP is introduced in the respective box of the **Configuration Screen**.
In some systems, the same IP Address is used for launching the browser from the Mobile station (the Laptop with Wi- Fi card), in order to renew the AP settings.

- The list of clients which have the association permission at the respective Wi-Fi net.
- Other.

Despite the fact that the MAC Address is set in the factory, there is also the possibility, upon the AP configuration, that even the MAC address could be modified [12.].

G. When the **ConfigStarter.exe** Wizard indicates, after the setting, that the configuration is finished, the configuring Ethernet cable is replaced and the normal wired Ethernet cable, which connects to the Internet, is plugged in the port marked WAN or Modem of the AP.

Part which refers to the entire WLAN:
H. The replacement at the AP (without powering) of the Ethernet cable used for the setting with the Ethernet cable of the local wire net.
I. Powering and using the Wi-Fi connection in the WLAN.

After:
- saving the respective parameters,
- plugging the real Ethernet connection to the wired Ethernet LAN. After the AP configuration, the Ethernet cable (used for configuring the AP based on using the helping machine) is replaced with the normal wired Ethernet cable of the respective place.
- the existence of an operational Mobile Station (configured as below),

the AP node (Basic Station) becomes operational and the system is working, for instance as in the following configuration, fig.2.4.:

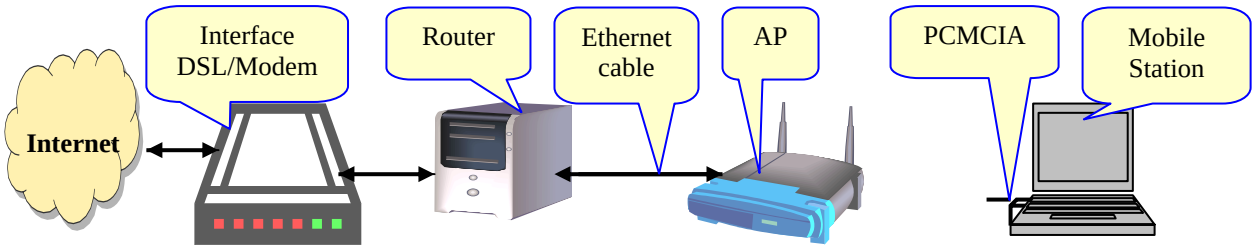

Fig. 2.4. Example of the final configuration.

Change of configuration.

The configuration may be wirelessly changed from the Mobile Station, by opening the Configuration Screen.
Some incidents may occur.
For instance, if you change the WEP of the AP and you do not immmediately change the WEP of the Mobile Station, the system will not work and the wireless connection will be lost.

Due to the above aspects, it is recommended that the change of configuration is achieved through the wired Ethernet connection of a helping machine to the WAN connector of the AP and running **Configuration Screen**.
In order to run the **Configuration Screen,** it is usually necessary to launch the browser from the retained IP Address for launching the **Configuration Screen.**

3. WI-FI CARD: THE CONFIGURATION.

The installation and configuration phases are the following:
A. The installation of the Wi-Fi software drivers on the laptop which will be connected to Wi-Fi.
B. Installing (without powering) the Wi-Fi PCMCIA card on the laptop which will be connected to Wi-Fi.
C. Powering the Laptop.
D. The configuration of the PCMCIA card, based on the Configuring Software, inside the respective Wi-FI WLAN.

1.) The use of the Wizard.
The Wi-Fi card configuration is achieved on the laptop which will host the Wi-Fi card and with the Wi-Fi card unplugged.

The Wi-Fi card configuration is achieved by using the Wireless LAN Wizard [11.] delivered on the CD and which must be installed on the Mobile Station (laptop).

The Wizard installs **Wireless LAN Wizard,** in the case of Fujitsu-Siemens [11.], the CD includes 2 parts:
- **Client Manager**
- **Wireless Network Settings**.

It must be emphasized that the supplier delivers:

- The Wizard for AP configuration and
- separately, the Wizard for Wi-Fi PCMCIA card configuration.

2.) Connecting the Wi-Fi PCMCIA card.
After installing the software drivers (Wizard), the Wi-Fi PCMCIA card must be inserted in the Laptop connector, fig.3.1...

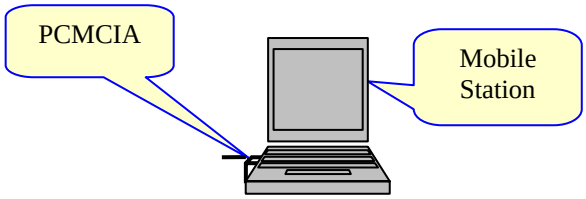

Fig. 3.1.The Mobile Station with PCMCIA

3.) The Wi-Fi card configuration.

After the Wireless **LAN Wizard** is installed [11.], the PCMCIA of the Mobile station is configured.
With the view of configuration, the Configuration Screens of the software installed by the Wizard are used.

What must be configured?

- The selection of the type of network regime: Peer to Peer, Base Station (compulsory),
- The setting of SSID (compulsory and the same with the AP SSID0),
- The setting of the quartet of classical TC/IP parameters necessary at the Mobile Station (for instance, as in fig. 3.1), (compulsory).
- The setting of security parameters: WEP keys, (compulsory if the AP is configured with WEP keys).
- Possible other parameters.

The flux of commands on the Laptop, in Windows XP, is: Start (of the XP screen)→ Settings → Control Panel → Network Connections→ click Wireless Network Connection → opens the window: Wireless Network Connection Status → click on Properties → the window is opened: Wireless Network Connection Properties, fig.3.3, [11.].

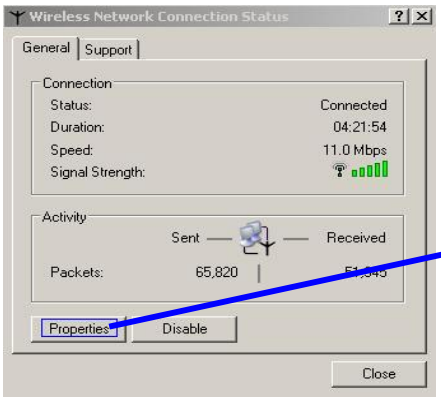

Fig.3.2. Example of Windows Wireless Network Connection Status [11.]

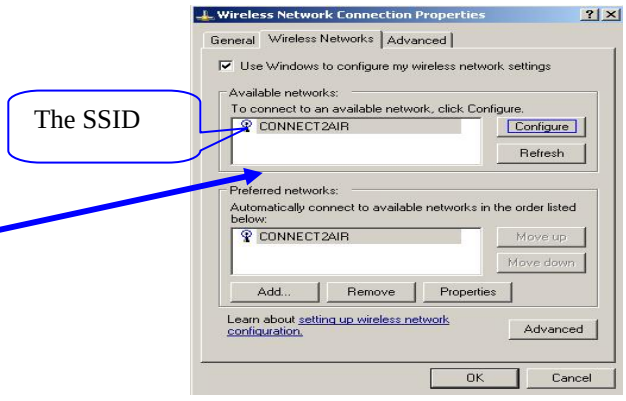

Fig.3.3. Example of Windows **Wireless Network Connection Properties** [11.]

From the **Wireless Network Connection Properties** → click on **Wireless Networks** → **Properties** (either **Add** or **Remove**, as desired) and it is possible to introduce the SSID (or to modify SSID).

- **Association: Network Name SSID**: CONNECT2AIR
- **WEP, Wireless Network Keys**: if it is the case: 1 to 4,
- **Network Authentication**; Open or Shared,

In the window **Wireless Network Connection Properties** → click on **General** → click on **Configure** → opens the window: **Connect 2AIR WLAN E-1100 PC-card Properties**→ click **Channel**→ select on the right side the number of the **Channel (1 to 13)**.

- **Channel:**1 to 13 (14)

By clicking OK, the window is closed.

The automatic setting of the quadruple IP parameters of the Wi-Fi card.
From **Wireless Network Connection Status** → click on **Properties** → opens the window: **Wireless Network Connection Properties**, fig.2.2, [11.] → select by clicking on the box **Internet Protocol (TCP/IP)** → click **Property** → opens the classical window **Internet Protocol (TCP/IP) Properties**→ click on: **Obtain an IP Address Automatically**.

Also, in the window **Internet Protocol (TCP/IP) Properties**→ click on **Obtain DNS Server Address Automatically**.

The TCP/IP parameters may also be set manually (by selecting inside the **Internet Protocol (TCP/IP) Properties**: **Use the following IP address**).

After the operations mentioned above, the Wi-Fi card is plugged in (with the laptop powered off).
The starting of the Wi-Fi card is automatic at the Laptop start.

The use, on the Laptop hosting the Wi-Fi card, of the software program installed by the Wizard, named **Wireless Client Manager**, allows different tests and the supervision of the Wi-Fi radio connection quality.

Testing the environment of the Wi-Fi card.
By right clicking, in the XP screen, on the icon **Wireless Radio Connection** (at the bottom of the XP screen), it is possible to find information about the existent Wi-Fi network.
Click on **Wireless Radio Connection**→ it opens a menu of options from which you select the regime **Launch Client Manager** → right click on **Launch Client Manager** → opens the window **Wireless Client Manager**.

The window: **Wireless Client Manager** supports the function **Client Manager** and achieves [11.]:

- **Card Diagnosis:** the diagnosis of the Wi-Fi card hardware,
- **Site Monitor** (the quality of communication, important information about connectivity, supporting the roaming procedures, etc.),
- **Link Test.**

The above regimes permit the testing of the connection of the Wi-Fi Card with AP, the supervision of the quality of communications with many neighbouring stations.

Now, the use of your Wi-Fi Laptop is simple: you must only open the web browser of your Laptop and (if the AP is connected to the Internet) the Laptop will be connected to the Internet.

4. Wi-Fi TROUBLESHOOTING.

1.) The essential troubleshooting aspects consist in the accomplishment of the right configuration of addresses, for instance, as it is illustrated in the important above fig. 2.1.
In case of trouble situations, the right settings must be verified.

Note: If the AP IP Address towards the Wi-Fi WLAN is, for instance, 192.168.2.1, then all Wi-Fi cards must have an IP Address using the same first decimal groups (the NETID of class C network), for instance : 192.168.2.x, where x has values from 2 to 254.

2.) Also, a special importance is held by the right installation of the drivers for Wi-Fi interfaces, including for the Wi-Fi card.

3.) The diagnosis aspects are presented on the Wizard CD (which also indicates the web sites for technical consultations).

The use of diagnosis indications.

At [11.], by clicking on the Wireless **network connection** (at the bottom of the XP screen) →opens **View Available Wireless Networks** and all the connections of the Laptop are visible.
Also, important information is offered by: **Wireless Network Connection Status**, **Details** and **Network Connection Details**.

4.) Connectivity supervision.

If the trouble consists in the fact that the Laptop hosting a configured Wi-Fi card does not have the possibility to access the Internet, the connectivity tests are necessary.
The Ping command may be given.

For the 0063onnectivity to the AP gateway:

C :\>**ping 192.168.2.1 (Enter)**

For the connectivity to DNS Servers:

C :\>**ping 193.230.1.2 (Enter)**

Also, Ping commands may be given from other PCs towards the laptop which hosts the Wi-Fi card.

The IPConfig MS-DOS command:

C :\>**IPConfig /All (Enter)**

offers important information for solving the troubles, for instance for the detection of incorrect settings of IP Addresses.

5.) Other causes and actions:
- Antenna position,
- Antenna distance to the wall (necessary to be placed at over 20 cm from the wall or other objects),
- Interferences. They determine the need of changing the channel,
- Increase of the distance between the AP and the noise generators (over 5m).

6.) The verification of the invalidation of communication conditions:
- if the selected regime has a security connection, then the WEP key of all devices (including Wi-Fi PCMCIA cards) must **be the same**, with **the same encryption length** : 40, 64, 128 (104), 152 bits,
- the SSID of the Wi-Fi card and of AP must **be the same,**
- it is recommended to test the system operation with the invalidation of the security means (WEP) and the invalidation of the filtering means (list of accepted MAC addresses),
- the correct powering,
- correct TCP IP parameters setting,
- other.

7.) Many Laptops (used as Wi-Fi Mobile Station) permit the clicking (right click) on the icon **Client Manger** (**Wireless Radio Connection**), icon placed in the bottom menu of the screen. It opens the window **Wireless Client Manager,** which includes menus. By selecting **Advanced,** this menu offers 3 possibilities**:**

- Card Diagnosis,
- Link Test
- Site Monitor.

Each of the above regimes opens its own windows, which offer important information about the functioning of the card.
For instance, from the **Link Test** window you may open: **Test Results**, **Test History**, and **Log Settings**.
The regime **Results** offers information, including about the **Test Station** and about **Test Partner,** such as: **Signal Noise Ratio**, **Signal Level**, **Noise Level** and other.

Also, you may use the regime **Wireless Network Connection** (icon placed at the bottom menu of the screen). The click on **Wireless Network Connection** → opens the window **Wireless Network Connection Status** → click on **Support** → click on **Details** → the quartet of classical TCP /IP parameters are presented on the display.

These parameters can also be accomplished with the MS-DOS command:

C :\> **IPConfig /All (Enter)**

The click on **Wireless Network Connection** → opens the window **Wireless Network Connection Status** → click on **Support** →by clicking on **Repair,** the automatic repair process is launched.

8.) From the Windows XP screen: click on **Start**→ opens **My Network Places**, which also offers a lot of information about the Wi-Fi operating status.

9.) **Wireless Network Connection Status** → click on **Properties** →window **Wireless Network Connection Properties**→click on **Configure** → window **connect2AIR WLAN E-110 PC Card Properties** → click **Troubleshoot**: the troubleshooting process led by the Wizard is launched.

5. USING THE Wi-Fi. FINDING HOTSPOTS.

Hotspots are the places where it is possible to connect the Laptop to the Internet. In the respective areas, APs connected to the Internet are present.

The APs HotSpots are normally present in many crowded places (airports, hotels, stations, restaurants, important streets, etc.).
Some APs (WLANs) accept free access, some paid access.

The method of finding a Hotspot includes:

A. The use of tools for finding hotspots, including the automatic scan / search achieved by the personal Wi-Fi Mobile Station,
B. The use of directories (for instance, searching the words *Wi-Fi Directory* or *Wi-Fi & Directory* on a search engine) or looking, for instance, at: www.wifi411.com; www.wi-fihotspotlist.com; for Europe: www.square7.com/hotspots; Wi-Fi Free Directory: www.wififreespot.com; www.wifinder.com; www.wifimaps.com; .
C. The navigation on the web to find the places of APs of a Hotspot (for example, www.starbucks.com, www.t-mobile.com/hotspot). Based on this search, through web navigation, it is possible to find the desired map of Hotspots.
D. The use of National Wi-Fi networks.
E. The search of Wi-Fi HotSpots with handsets, for instance at: http://wap.wi-fizone.org .
F. The use of the Wi-Fi Finder: devices such as Kensington Technology Group 33063. The Wi-Finder detects the radio presence of a Wi-Fi signal.

5.2. CONNECTING TO THE HOTSPOT.

In order to connect to the Hotspot, it is necessary to:
- use the name / SSID of the respective Hotspot.
- the Wi-Fi card of your Laptop must be (automatically) tuned to the frequency of the AP of the respective Hotspot,

In fact, the «tuning» consists in using the name / SSID of the Hotspot.

By attempting to be associated to a HotSpot, in the region of the respective HotSpot, the Laptop with Wi-Fi card scans the Wi-Fi channels. By finding the channel of the HotSpot channel, the Mobile Station (the laptop with a Wi-Fi card) receives the SSID and IP Address from the HotSpot AP.

6. PRACTICAL ACHIEVEMENT OF A MINI-ISP, BASED ON THE Wi-Fi. THE COSTS OF THE INVESTMENT.

One of the current trends consists in the creation of mini-ISPs or micro-ISPs which serve, each, a group of buildings or a small community.

A mini-ISP based on the administration of a WLAN, connected to the Internet, may become profitable in principle.
In principle, the owner of the mini-ISP may accomplish a free or low cost connection to high speed Internet.

The configuration is illustrated in the above fig. 2.3. A wired Ethernet LAN may also be additionally supported.

If a DSL connection is not possible, then the following may be used, for instance (with other costs than in the case of DSL use):
- an Internet connection, if the ISP of superior rank is below approx. 2000 m or
- a stationary radio connection with an Internet service Provider of superior rank or
- a connection with the 3G (or GPRS) network, in which case the schedule of the work must be specified,
- other solutions.

<u>The investment (The costs). Amortisation</u>.

The costs (only informative / estimated, for a time period and for a specific environment) [2], for the use of 15 users, may be estimated as follows:
- An ADSL subscription at about 60 Euro / month.
- A NIC- Network Interface Card 100 Euro,
- An AS – Access Point at about 200 Euro,
- A PC used as Unix Server, at about 500 Euro,
- Other materials 50 Euro.

Results:
Total costs of the investment: about 900 Euro

Total costs for functioning: about 50 Euro/ month.

For about 15 users, the costs of the investment per user may in principle be approximated at 60 Euro + 60 Euro (Access Interface at user) =120 Euro
Costs of functioning per user: 4 euro/ month.

If the investor looks for profit, based on the negotiation of a convenient tariff, the investment may be amortized very quickly.

The business seems to be profitable and many people achieve Internet services for a group of buildings or for a small community.

Key Point Summary Conclusions and Recommendations

A big advantage of Wi-Fi consists in the simple and quick mode of putting into operation.
The market and especially the suppliers offer many diagnosis and autodiagnosis tools (inside the normal delivery kit), which increase the Wi-Fi advantages.

Study Guide

ESSENTIAL QUESTIONS TO EVALUATE THE ACQUIRED KNOWLEDGE

1. How many IP Addresses intervene in a system with an AP and a Laptop hosting a Wi-Fi card?
2. How is it possible to test the connectivity of a laptop hosting a Wi-Fi card?
3. What are the actions when the connectivity is not accomplished?
4. What are the phases at the putting into service of an AP (of the type described in lesson [1.])?
5. Which are the principal elements which are configured at the AP?
6. Which are the principal elements which are configured at a Laptop with a Wi-Fi card?
7. What is achieved in the case of interferences?
8. What are the principal tools which serve at the configuration of the AP?
9. Which are the principal tools which serve at the configuration of a Wi-Fi card with Laptop?
10. What is a Hotspot and how can Hotspots be found?

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[SUP. 3.] www.dlink.com/products/?pid=304 , D-Link, with the presentation of a large range of products.
[SUP. 4.] www.cabletron.com/wireless , Cablerton Inc..
[SUP. 5.] www.proxim.com, Proxim.Inc .
[SUP. 6.] www.wifi-forum.com WiFi Forum

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SUPPLEMENTARY INDICATIONS ABOUT THE CONTENTS OF THE LESSON

It is recommended to also consult the documentations from: www.cisco.com; www.wi-fi.org; www.wifi-forum.com; www.wifi-forum.com; www.cnet.com; www.80211planet.com; www.bbexchange.com; 80211b.weblogger.com; www.pcmag.com; www.electronichouse.com; www.homeautiomationmag.com; www.practicallynetworked.com; www.extremeTech.com; www.nwfusion.com (Network World); www.searchnetworking.com; www.ieee802.org; www.wlana.org Wireless LAN Association; www.freenetworks.org; NYCWireless; http://www.getbestinfo.com/index.php?to_do=show_question&number=39&gclid=CKHkmeHVn4MCFRVNPgod9mQQ-w and other.

ANSWERS TO QUESTIONS

1. 3: the IP Address of the AP side towards the Ethernet, the IP Address of the AP side towards the WLAN, the IP address of the Wi-Fi card of the Laptop.
2. By sending the Ping commands towards the important net point (IP Addresses), such as: known Internet IP address, AP IP Address, DNS Addresses, etc.
3. The tests with ping and the verification of the setting of configuration (TCP/IP) at AP, Wi-Fi card and the conditions for the validation of communication.
4. The TCP/IP connecting of the helping laptop inside the existent Ethernet wire LAN, replacing the connection of the helping PC / laptop to the LAN with the connection of the helping PC/laptop to the AP, setting the parameters of the AP based on the Wizard installed on the helping machine.
5. The type of configuration, the TCP / IP on the AP Ethernet side, the IP Address for the WLAN, SSID, channel, and if necessary, WEP, filters, administrative settings.
6. The type of configuration, the TCP / IP, SSID, channel, if necessary WEP and other.
7. The increase of the distance, the change of channel, directional antennas and other.
8. The helping machine and the Wizard.
9. The Wizard and the AP.
10. The Hotspots are places where it is possible to connect the Laptop to the Internet. They may be found with directories, maps, web navigation and through scanning the Wi-Fi environment.

WORDS TO THE LEARNER: "***Do not wait for opportunities. Create them.***" (After Bernard Shaw)