LESSON E16_EN. INTERNET BASICS. MOBILE IP. THE CDMA MOBILE WIRELESS INTERNET PRACTICE. MOBILE IP.

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After studying this lesson, you will acquire the following knowledge:

- The comparative advantage of the iMode technology,
- The 3G advanced CDMA technology for the transmission of digitized voice and data and the impact of this technology on the IP environment and TCP /IP protocols technology.
- The practical installation and configuration of the machines interfaced through the CDMA / Zapp technologies and systems.
- The inventory of applications, Operating Systems and languages for the wireless mobile applications.

CONTENT OF THE LESSON

LEARNING OBJECTIVES:

After learning this lesson, you will have the ability to:

- use the CDMA technology, respectively the CDMA (Zapp) handsets and modem for interfacing your machine with the Internet,
- work in a number of essential, simple CDMA environments,
- design and configure architectures using CDMA Zapp components and wireless technology,
- use tests and diagnose tools, launched from the CDMA technology.
- achieve applications such as LANs and micro ISPs interfaced through the CDMA technologies,
- select the Operating Systems and software languages for the wireless mobile applications,
- compare different wireless technologies for Internet applications and to select the most advantageous and appropriate technology.

1. ELEMENTS OF THE iMODE.

The Japanese **i-mode**, a Mobile Cells Internet System launched in 1999, is more than a protocol.
It is a service in Japan for wireless access to the Internet, based on specific protocols.

Basically, the i-mode and WAP can not be directly compared because:

- on one hand, WAP is a suite of protocols and
- on the other hand, the i-mode is a service (including i-Mode specifications).

The i-mode launched by the mobile NTT, respectively NTT DoCoMo, has achieved an exceptional success.

The differences between the i-mode specifications and the WAP specifications include:

- i-Mode generates specific codes through the modifications of HTML pages at the source [2.1.],
- i-Mode functions with the same pages as the entire Internet (the HTML-WML conversions and vice versa are not necessary and not used),
- the hardware used by i-mode was especially developed for more compliance and improved usability (by comparison with the WAP rules application):
  - special screens are provided for the mobiles using i-mode. These screens are longer. They permit 12 lines of text, and, consequently, the display of more information.

- the use of the **cHTML** simple language, in comparison with the (intermediary) WML language, used by WAP,
- the possibility of generating HTML pages with the majority of facilities accepted by HTML and without severe limitations as in the case of the WML,
- permitting, as above, the design and display of complex images, use of colours, etc.,
- the immediate navigation in complex (with some exceptions) HTML environment,
- the i-mode does not use similar Servers as the WAP Bridge. The i-mode places wireless processing in Level 1 of the Internet Protocol (the concept of the Japanese wireless mobile cell network differs significantly in relation to the GSM).
- The i-mode may be considered **as more Internet-oriented.**

Other information about i-Mode at www.ntttdocomo.com/imodel/ [2.2.]

2. **CDMA** AN EXCEPTIONAL REVOLUTION APPLIED FOR WIRELESS IP.

2.1. CDMA MODE OF OPERATION

GSM uses FDM (Frequency Division Multiplexing) for the selection in frequency and TDM (Time Division Multiplexing) for the accomplishment of time sub-intervals for each client, within the same frequency channel.

CDMA – Code Division Multiple Access, described in the IS-95 International standard,
- does not divide the allocated frequency spectrum into channels,
- does not divide the time for serving different subscribers.

The separation between different transmissions is achieved based on the application of the **coding theory**.

Therefore, the essence of how the CDMA works lies in the selection of the signal:
- not by selection in frequency, not by selection in time, but by code selection.

"CDMA <**Code Division Multiple Access** > is a "spread spectrum" technology, which means that it spreads the information contained in a particular signal of interest over a much greater bandwidth than the original signal."[SUP 2.9.].
CDMA simultaneously uses the entire allocated spectrum.

CDMA uses CDM – code de-multiplexing, for the selection inside the frequency channel (the channel bandwidth in the CDMA system is of 1.25 MHz), based on the coding theory and procedures.

Basically, the CDMA signal:
- is difficult to interfere,
- is difficult to jam,
- is difficult to identify.

The air CDMA transmission seems impossible to be intercepted.
CDMA – Code Division Multiple Access simultaneously uses the entire allocated spectrum.

CDMA Standards

The principal CDMA standards are the following:

- Telecommunications Industry Association (TIA) as "IS-95" – July 1993, defines CDMA as Multiple Access Code Division..
- The IS-95 A (1993) is the basis of the 2G (generation) CDMA systems. It divides the radio spectrum into carriers with a wideband of 1,250 kHz (1.25 MHz).
- IS-95B: 2.5G combines IS-95A, ANSI-J-STD-008 and TSB-74 into a single document, which describes the 2.5.G (generation) CDMA .
- The cdmaOne is considered as one of the fastest growing 2G wireless technologies [SUP 9.].
- CDMA2000 1X is an ITU-(International Telecommunication Union) approved, IMT-2000 (3G) standard which presents **the first 3G technology** to be commercially deployed in the year 2000.

About the Spread Spectrum technology.
CDMA is a "spread spectrum" technology.
That means that CDMA works by transferring the information from its bandwidth to another bandwidth (at the output equipment-air), much greater than the original signal.

For instance, an input signal of 9.6 Kbps is spread at a transmitted rate of 1.23 Mbps.

The spread is achieved by splitting the bits (each bit is encoded in 128 sub-bits) of the original digital signal and emitting the resultant signal.

The resultant signal has a larger bandwidth (of about 1.23 Mbps) than the original data signal (in this example of only 9.6 Kbps).

The operation of CDMA.

Inside the CDMA technology, the bits emitted in the ether by a station are divided, each bit, into sub-bits.

Each station has its own code (code which may be changed dynamically), made of a chain of sub-bits (an established train of sub-bits). This code is used for the conversion of each bit **1** of Data.

Similarly, for the **0** status (bit of value 0), each station has its own code of sub-bits (an established train of sub-bits) into which the positions representing the status 0 are converted (normally, in CDMA, the binary number coding status 0 is the complement of the binary number coding status 1).

For instance, a station may present the bits 1 in the form: **11000101111100000**……,
and the positions representing status 0 in the form: **00111010000011111**…… .

The detecion of signal

At the reception, special (mathematical) algorithms, based on **the coding theory** and proprieties, achieve the right identification and the detection of the received codes.
Detecting procedures require a time synchronization which is ensured by the GPS – Global Positioning System.

Normally, CDMA operates in a band of 1.25 Mhz (GSM in only 0.2 MHz).
In a band of a 1.25 MHz width, the CDMA supports the biggest number of users, by comparison with other systems (GSM, etc).

The Speed offered by CDMA systems.

CDMA offers a high digital transfer rate, towards **2.5 Mbps.**
For instance:

- with the CDMA 1xEV-DO service (with the Zapp 1x EV-DO modem), it is possible to achieve: **2,5 Mbps,**
- and with the Zapp 110 Mobile Cell / handset, it is possible to achieve: **153 Kbps.**

Obviously, the throughput is below the above-mentioned value and is dependant upon the environment (number of users at the respective time, quality of transmission, influenced by the meteorological conditions, terrain configuration, radio powers of the Basic Station and of the mobile cell and other).

CDMA Advantages (for instance of the Zapp system) [SUP 2.9.], [SUP.2.10],[SUP.2.11].

- The CDMA transmissions seem to be quite impossible to be intercepted, offering a superior level of security and enhanced privacy. High quality (interferences free),
- High speed Data transfer, corresponding, depending on the type of equipment, including to **3G**,
- IP oriented Data Packets communication. The possibility (depending on the type of Mobile Cell) of the direct use of Internet browsers, including of **Microsoft Mobile Explorer 3.0.** .
- Simplified system planning, based on the use of the same frequency, in every sector of each geographical area cell (the hexagon of radio-emission considered area),
- Improved coverage characteristics, allowing the possibility of using fewer cell sites,
- Increased talk time for portables,
- The use of the "soft handoff" system, which permits the very smooth passage from one geographical cell to another. This transfer is achieved without being transfer time-consuming and without the user being temporarily (or totally) disconnected.
- **all the users emit in the entire broadband and are differentiated by an unique code.** By this facility, the following are accomplished:
  - it eliminates the necessity of a frequency reuse,
  - improved flexibility of the CDMA network implementation,
  - minimizing the inferences between users,
  - high efficiency in using the frequency spectrum. The capacity is 8 to 10 times greater than that of the GSM standard and in consequence, "more users can be served with the same resources "[7.],
- other advantages.

Example of CDMA architecture. Involvement of the Layers of Piles at each processing and communication stage.
In fig. 2.1. [2.8.],[2..13], an example of the CDMA architecture is presented (in this case Zapp), focused on using the IP environment and solving the compatibility with the TCP/IP protocols.

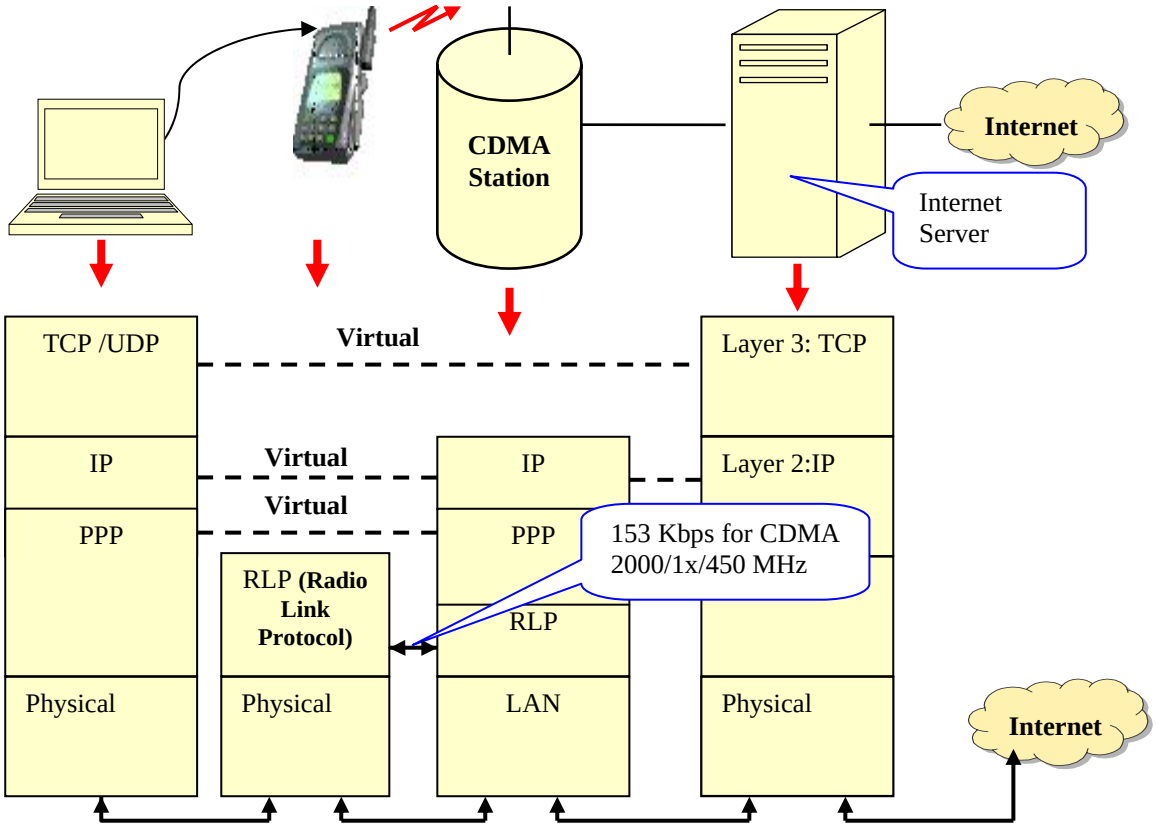

Fig. 2.1. The simplified piles structures and the distribution of layers inside a CDMA net [2.8],[2.13].
RLP signifies Radio Link Protocol.

In accordance with the image from the above fig. 2.1., the TCP /IP Data Packets are created by the operating system of the Computer (in this case a Laptop) and are transmitted (normally through a USB connection) to the CDMA Mobile Cell / handset.
Through the CDMA2000 1X / 450 MHz Protocol, the CDMA radio link achieves the conversions and the wireless connection to the CDMA Station and Network.
The CDMA Station receives the wireless message and sends the Data towards the Internet Server (or towards the Internet-oriented part of the equipment placed inside the CDMA Station). This part achieves the connection to the Internet space, in accordance with the TCP / IP communication model and protocols.

The TCP / IP Server requests the Data. The pages found in the Internet space are transferred on the same CDMA path toward the Laptop.

The CDMA (inside configurations such as Zapp) permits the use of IP Addresses inside the terminal machine (in the above case of the Laptop).
This aspect confers a high advantage to CDMA (Zapp systems) applications.

Note: The PC serial port permits a maximum transfer data speed of **115kbps.** The Zapp network has a speed of **153.6 Kbps** and in this situation it is recommended that the USB port be used for the laptop-Zapp connection, which permits possible increases in the data transfer speed.

There are many variations of applications, starting with a simple browser or e-mail client up to specialized applications.

3. THE PRACTICAL CDMA SYSTEMS. THE ZAPP SYSTEMS. (Zapp is a registered trademark of Telemobil S.A.)

Important and efficient CDMA (Code Division Multiple Access) System and services are offered, in Europe for instance, by the Zapp company – which is the Trademark ™ of Telemobil S.A.

The CDMA technology applied by Zapp follows the developments of the American company Qualcomm, which launched in 1995 the CDMA networks and services.

1.) Other CDMA services (Zapp).**Zapp services.** [SUP 10.], [8], [9], [10], [11], [12].

1.1) The use of MME- Microsoft Mobile Explorer 3.0
Certain CDMA Mobile Cells, such as those delivered by Zapp: **H-100 and Z-200**, offer the "Handset Only" services, consisting in the possibility of using both:

- a Modem and
- a MME Mobile Browser **(MME - Microsoft Mobile Explorer 3.0).**

It is very important that the MME, respectively the real, high speed navigation (browser), can be launched by pressing the WEB key (of the specified types of Zapp handsets): **WWW.**

The favourable aspect consists in the fact that the mobile device can, in this case, access the web pages directly (by passing through CDMA wireless connection) at the Internet hosts.

The communication is achieved by the embedded modem, similar to a classic browser (for instance, to the Internet Explorer).

The above systems support the connections of SSL type (Secure Socket Layer).
The SSL are approached in view of improving the level of security in the stationary parts of the communications (non-CDMA air wireless part of the system. The CDMA part has its own high level of security).

2.) Mobile e-mail.
It is possible to achieve mobile e-mail service. For instance, for the Zapp system, it is possible to use the following:

- the portal www.zappmobile.ro, which offers details about the e-mail service usage and
- e-mail facilities offered by this portal.

3.) CDMA Modems. "ZappModem" services.

CDMA (Zapp for instance) devices can be used as **modems** for different computer machines (Server, Laptop, PC, Handheld, Controller, etc.).
The Modem embedded in the CDMA device has two modes of functioning:

- **HSPSD = High Speed Packet Switched Data**.
  The speed access of up to 153 Kbps may be achieved only between the CDMA (Zapp) terminal and CDMA (Zapp) Platform. The operating system must be configured according to the Zapp installation manual (Zapp Modem Driver).

  The types of equipments which may be connected to the mobile phone for Internet access are: Desktop, Notebook, Pocket PC (PDA, Palmtop, Handheld).
  The connection between the equipments and the mobile phone may be achieved by serial cable, direct USB cable or serial cable + USB adapter.

  The PC serial port permits a maximum transfer data speed of 115 kbps. The Zapp network has a speed, for instance, of 153.6 Kbps (but with the new HDR-based modem technology, the download rate can go up to 2.4 Mbps); and in this situation, the use of the USB port is recommended, which may lead to the significant growth of the permitted data transfer speed. The USB permits up to about 12 Mbps).

- **CSD = Circuit Switched Data** (max: 14.4Kbps)

  The CDMA (Zapp) modem (the handset / Mobile Cell as terminal) may be connected to replace any other type of modem (fax-modem, data-modem) which is placed outside the Zapp platform.
  The maximal data transfer speed is of 14,4Kbps.

4.) Services resulted from connecting the CDMA (Zapp) modem (respectively the handset / Mobile Cell as terminal) to computers (Server, Laptop, PC, Handheld, Controller etc).

4.1.) - 2 types of connections:

4.1.1.)-**High Speed Access to the Zapp network (and, implicitly, through the Zapp network to the Internet),** for instance 153 kbps [but possibly also with HDR (High Data Rate) technology (download up to 2.4Mbps)];

The access service of the CDMA (Zapp) mobile network to the public Internet network through an allocated connection is similar to the respective connection of any ISP.

Zapp uses 2 permanent connections to the Internet and with sufficient bandwidth, so that there is no diminution of the data transfer speed.

4.1.2.)- **The Mobile Cell to Mobile Cell Connection**

A (CDMA) Zapp connection (PPP-Protocol) can participate, for instance, in the following connection scenarios:

4.1.2.1.)- **CDMA Mobile (Zapp) – to – CDMA Mobile (Zapp)Connection**
4.1.2.2.)- **CDMA Mobile (Zapp) to ISP – Internet Services Provider Connection**.

The machines (Server, Laptop, PC, Handheld, Controller, etc.) which use the CDMA (Zapp) modem may access ISPs by using the IP Addressing environment.

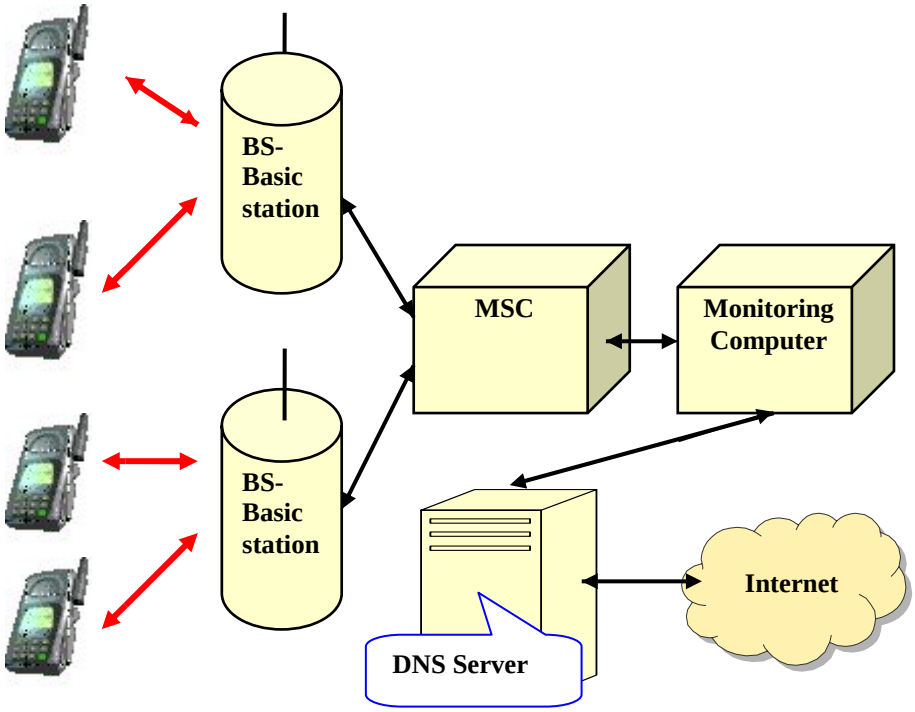

Fig. 3.1.CDMA. The CDMA architecture of connecting CDMA mobiles to the Internet

Security aspects.
If the air CDMA (Zapp) connections are very secure, the Internet connections are very insecure.

Following this aspect, in the parts of the CDMA transmission that is not connected to aerial transmission the message must be protected by adequate measures (SSL, SSH, IPsec, PPTP, L2TP and other).

4.1.2.3.)- **CDMA (Zapp) – Partner CDMA (Zapp) (Zapp Only) Connection**.
This is the case of a permanent connection between the CDMA (Zapp) network and the respective Server of a client.

4. PRACTICAL EQUIPMENTS FOR CDMA INTERNET APPLICATIONS.

4.1. ZAPP: Z110 (Zapp) Handset / Mobile Cell [SUP 10.], [8.], [9.], [10.], [11.], [12.].

1.) ZAPP: Z110 (Zapp) Mobile Cell [SUP 10.], [8], [9], [10], [11], [12].

The Z110 offers in addition to digital phone services, the important service of a **modem** for connecting computing machines (Laptops, Handhelds / PDA / Palm, other) to the Internet.

The principal performances of Z110 (Zapp) are:

- Emitting frequency: 453- 457.475 MHz.
- Reception frequency: 463- 467.475 MHz.
- Working with and transmitting the Switched Data Packets at a speed of 153,6 Kbps (Z110, Zapp, between the Mobile Cell and the Zapp Platform).

By using the Turbo facilities, the speed (bandwidth) may increase to about 300 Kbps.

In view of connecting to a Laptop, PC, etc., the speed of the modem of the Mobile Cell (Z110) may be set as follows (informatively):

- 19200 Kbps,
- 38400 Kbps,
- 57600 Kbps,
- 115200 Kbps
- 230400 Kbps.

(The download and upload speeds may be different in regard to the above speeds).

- The emitted power is continuously controlled and is about 7 to 10 times lower than that of the power emitted by GSM Mobile Cells.

2.) Important applications of the Z110 Zapp Mobile Cell (CDMA System).

- The installation Handbooks and Guidance may be found at the operator web sites, for instance at:
  - www.zappmobile.ro
- The set of manuals may be found at the address: http://www.zappmobile.ro/data

3.) The creation of the wireless direct connection of Laptops, PCs Handhelds / PDA to the Internet.

The Z110 Zapp Mobile Cell permits a high speed, IP based, connection of computers to the Internet.

The connection may be achieved to:

- VPN – Virtual Private Network Server, with the big advantage of ensuring the secrecy and confidentiality of the transmission of Data,
- ISP servers or host servers for Data transfer and Data accomplishment.

4.2. HOW TO CONNECT THE MACHINE (LAPTOP) TO THE INTERNET THROUGH THE ZAPP 110 ADVANCED HANDSET (OR SIMILAR ZAPP HANDSETS). [SUP 10.], [8.], [9.], [10.], [11.], [12].

1.) The installation.

The elements presented in the following fig.4. are necessary for the installation: 1.- the handset, 2.- the Laptop, 3.- the USB cable, especially constructed and delivered for the connection of the handset to the Laptop, 4.- The CD-rom with the software programs (drivers) which achieve the operation of the Laptop with the Handset as an adaptor to the Internet network.

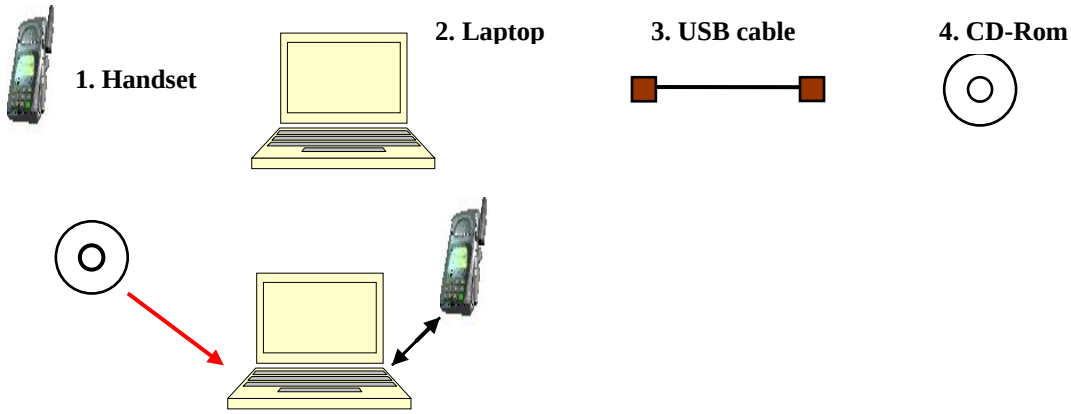

Fig. 4.1. Connecting the Laptop to the Internet through a CDMA handset
(The image of the handset is a general image of handsets, not of the Zapp 110).

For the installation, it is necessary that the software of the CD-rom (delivered by the supplier inside the handset kit) is installed on the Laptop.

The software program leads to the entire process of installation.

For the installation of the software program, it is necessary that the USB connector (of the USB cable) is not initially plugged in the corresponding USB connector of the Laptop.

At the time of the software installation, the program requires at a precise moment in time the plug-in of the USB cable already connected to the handset and the start-up of the handset at the precise speed.

At the time of installation, the software program creates an Icon on the Laptop display.
This Icon will be used for starting the connection.

Also, the software creates a special spiral Icon in the menu bar from the lower part of the display.
This is a dynamic Icon. When the connection between the Laptop and the stationary system is working, searching or transferring Data, the icon enters a circular motion, indicating the complete operation status.

2.) - How to use the connection of the Laptop (or other machine) to the Internet by using the Z110 Zapp Mobile Cell (handset with advanced Data communication possibilities).

In order to start the already installed wireless Data connection:
- unplug all the devices involved.
- plug the USB connectors of the USB cable in an appropriate manner in
  - the Z110 Mobile Cell (the position is indicated by the 2 guiding elements in the connector of the handset.)
  - the USB connector of the Laptop or Palmtop. The USB connector for the Laptop has its own guiding requirement: when plugging it in the LAPTOP connector, the image stamped on the USB connector must be on the top side of the USB connector. Take into consideration the fact that the USB image on the USB connector must be on the top part of the plugged connector.

Note that the Mobile Cell will be powered by the computer.

- Start the computer (Laptop, Palmtop, etc.),
- Start the Z110 Zapp or similar handset,
- On the computer screen, select the Zapp icon and double click on it. It will open the rectangle for the Zapp management of wireless connection.
- Click inside the opened rectangle on the Dial key. A new box / rectangle will appear, which indicates that the system is verifying the connection: password, username. After a short time, the rectangle disappears and on the bottom row menu, from the last bottom row of the Windows screen, a special Icon / image will appear which indicates:
- "The Zapp is connected".
- From this moment, the digital wireless connection is established and the Internet operations are possible, at high speed, including for navigation.

3.) Troubleshooting.
It would be preferable to treat the troubleshooting aspects based on the guide offered by the wireless operator (in this case, Zapp).

For this action, the Zapp menu regime related to troubleshooting will be opened on the Laptop (on the Laptop screen, inside the Zapp box).

The most frequent cause of troubleshooting consists in the inadequate selection, inside the handset, of the frequency of Data transfer.

The situation is solved quickly through the adaptation of the speed of the Mobile Cell.
The operation is achieved at the Mobile Cell:
- by entering the regime: Modem Speed,
- and selecting and setting one of the speeds:
  - 19200 Kbps,
  - 38400 Kbps,
  - 57600 Kbps,
  - 115200 Kbps,
  - 230400 Kbps,

usually depending on the geographical area: 115200 Kbps or 230400 Kbps.

5. APPLICATIONS OF THE ZAPP CDMA 1xEV-DO MODEM: Z010. [SUP 10.], [8], [9], [10], [11], [12].

1.) The CDMA Z010 Modem (Zapp) .
The applied technology is in accordance with the **CDMA 3G-1X / 450** specifications, respectively CDMA1xEV-DO.
These specifications and achievements lead to the following characteristics**:**

- Data speed transfer of up to 2.44 Mbps (Zapp),
- emission frequency : 450 MHz CDMA.
- Possibilities of using the Microsoft Explorer 3.0. web browser,
- Multiple revolutionary advantages.

2.) The creation of the wireless direct connection of Laptops, PCs Handhelds/ PDA to the Internet.

The Zapp CDMA 1xEV-DO modem: Z010 (CDMA System) permits high speed, IP based, Internet connection of computers.

The connection may be achieved to the:

a. VPN – Virtual Private Network Server, with the big advantage of ensuring the secrecy and confidentiality of the transmission of Data,
b. ISP server or host server for the accomplishment of Data.

The installation of the ZAPP Modem CDMA 1xEV-DO MODEM (for instance, Z010).

The installation is illustrated in numerous Zapp documents, such as in the Zapp: *Guide for the quick installation.*

The installation steps are led by the software on the CD-ROM delivered inside the Z010 kit.

The steps of installation for the systems working with Windows XP Operating System are mainly the following:

- Start the Laptop.
- Insert the CD-ROM (with the modem cable plugged in the Laptop, but the modem is not powered on).
- Follow the related instructions which appear on the display.
- Installing the drivers. In this phase, the software programs are installed.
- Turn off all the devices. Power / Start the modem,
- Follow the wizard instructions step by step.
- The laptop (or PC) signals that the installation was successful.

6. PRACTICAL APPLICATIONS. MINI / MICRO ISP, BASED ON THE USE OF Z010 / CDMA 1xEV-DO

In fig. 6.1. [10], 2 variants of the mini/micro ISPs and LANs served by 3G /CDMA 1xEV-DO (Zapp) are presented.

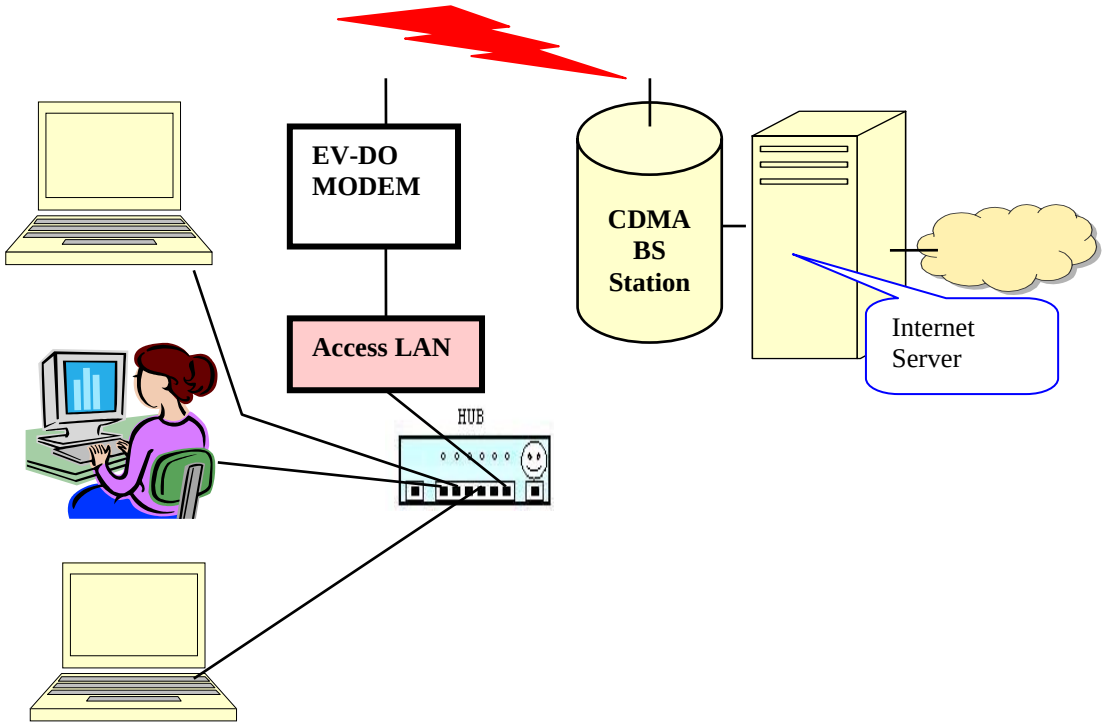

Fig. 6.1. The simple LAN and, possibly, a small ISP (including a Server) connected to the Internet by the CDMA, Zapp modem EV-DO [11].

The configuration illustrated in fig. 6.2. is achieved by using the CDMA modem which connects the LAN through a Wi-Fi, wireless Access Point.

For:

- small communities,
- communities which:
  - either do not have the possibility to be connected to DSL or Internet Radio Connections (for instance, due to costs or due to exceeding the specified length of cable) or to classic Internet Radio Connections,
  - or evaluate the more convenient prices for the use of 3G wireless technology.

The use of mini-ISP configurations as in fig. 6.1. and fig. 6.2. represents variants whose functioning period per day and costs may be taken into consideration, for the specified conditions and situations.

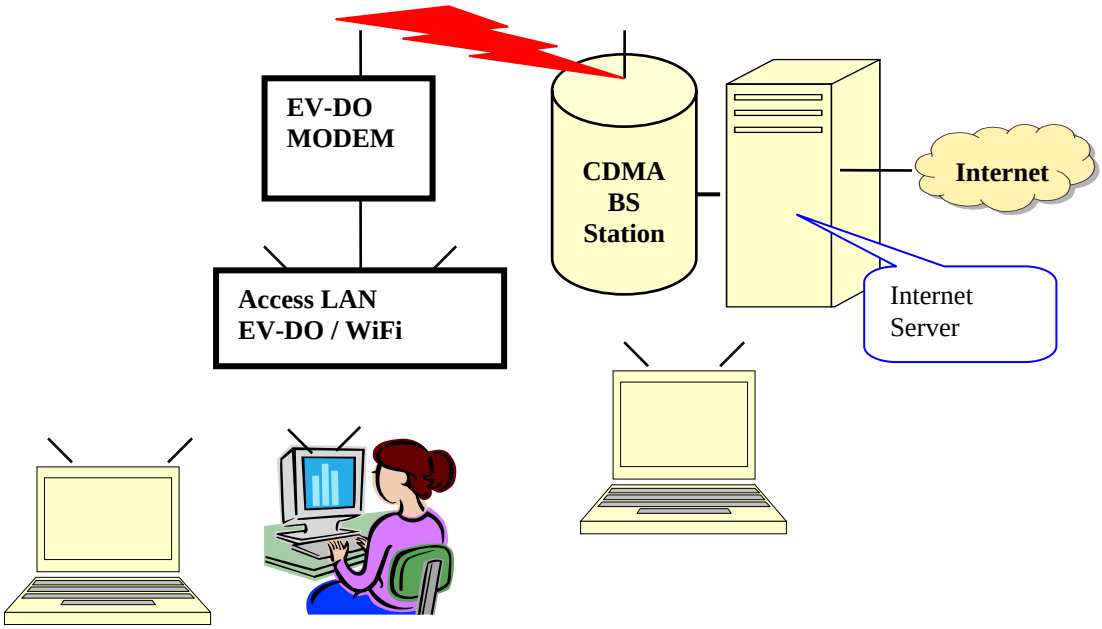

Fig. 6.2. The simple LAN and, possibly, a small ISP (including a Server) connected to the Internet by the EV-DO Zapp modem and using a wireless Wi-Fi Zapp modem EV-DO [11].

The differences between the 2 configurations consist in the fact that in the second one, the connections between the network partners are also achieved in a wireless manner through Wi-Fi. In the second configuration, the role of the Hub is taken by the Access point of the Wi-Fi network.

7. OPERATING SYSTEMS, SOFTWARE LANGUAGES FOR MOBILE CELLS.

7.1. THE OPERATING SYTEMS FOR MOBILES.

Especially for mobile devices, Microsoft ™ has launched the **MME - Microsoft Mobile Explorer 3.0.**
It is installed in mobile devices such as Handhelds / Palm / PDA, CDMA, mobile phones (Mobile Cells), such as those offered by Zapp **H-100 and Z-200.**

Symbian represents an Operating system applied to wireless mobile devices.

7.2. THE SOFTWARE LANGUAGES FOR MOBILES.

The software languages and software tools for the mobile Internet have evolved exponentially.

Starting with the WML-Wireless Mark-up Language, a language of the WAP 1.0 specifications, the new, advanced facilities were developed and presented in the WAP 2.0 version.

Important facilities are being offered for the new generations of mobiles. They present advanced software facilities.
The new devices work entirely with the HTML language and navigate, by using the Internet space, directly inside the web sites.

This is the case of the PDA, which has its own IP Address and navigates directly in the Internet space.

Between the languages (and platforms) for mobiles are the following:

- WML,
- WML Script (for libraries of functions),
- JSP (Java Script)
- XML,
- XHTML,
- Java Servlets (windows of applications in Java)

- J2ME (platform for CDMA based on Java),
- BREW (platform for CDMA based on C++) and other..

Important tools are developed by Nokia, Ericsson, Siemens and other entities, mainly for the development and testing of programs and of content in WML.

The Java languages, for instance the **J2ME (Java 2 Micro Edition)** software language developed by SUN Microsystems, are used for programming mobile wireless machines.

The WML drawbacks. Solutions . The use of XML and /or XHTML
1. The essential drawback of WML consists in the necessity **of rewriting the Internet's immense content, so it can be utilized by the Mobile use**.
Obviously, there are converters of the content from HTML into WML, but this conversion may be difficult to achieve considering the extremely big quantity of Data, especially because the WML supports only a subset of HTML.
2. Also, WML may illustrate only a poor part of the image facilities offered by HTML.

Following the above aspects, new languages may be used within the high speed wireless networks, such as:
XML (Extensible Markup Language) and **XHTML (Extensible Hypertext Markup Language).**

8. TOOLS FOR THE DEVELOPMENT AND TESTS OF THE MOBILE CONTENT.

More aspects, practical demonstrations about this topic are presented in handbook G.

The role of the tools consists in offering the conditions for the advanced and quasi-automatic generation and testing the content for mobile applications.

This content consists in programs in WML or in other languages.
Specific, advanced software tools are delivered by Nokia, Ericsson, Siemens and other.
Specific Software Tools for programming web pages for the new SmartPhones were developed.

Tools for the CDMA mobiles.

Symbian represents an important development and complex system created by the consortia formed by Nokia, Siemens, Sony, Motorola, Ericson, Panasonic and Samsung.
BREW
The Qualcomm Corporation, the first who applied the CDMA technology, has developed the **BREW (Binary Runtime Environment for Wireless)**.

The **Brew (Binary Runtime Environment for Wireless)** is a powerful software environment for advanced mobiles.
It may be used for the developments of programs for 3G and for other generations.

BREW has a GUI (Graphical Users Interface) and a Mobile Cell emulator.
BREW has a high portability, respectively it may be used for different (specified) mobiles.

9. MOBILE IP [16.].

When the aspects of the mobile IP are taken into consideration, the aspects of the stationary host IP Addresses seem to be very simple by comparison.
The IP addressing procedure becomes very complicated in the field of mobile communications because the IP addressing is virtual but, in reality, it is based on clearly IP-defined networks (in which the machine is involved statically).

The prefix of the IP Address defines the network in which the respective host is included.
Going out from an IP addressed network leads to the respective machine losing the possibility to use the prefix of the respective IP addressed network.

At the change of network, the routers, which have a fixed structure, do not have, in principle, the possibility to find the respective host (The routers direct to the NETID and the Host does not remain connected in the respective NETID).

For the mobile IP, if the host (mobile host) is moved inside another network, this means:

- either that the IP Address must be modified so as to correspond to the new network, aspect which represents a big difficulty,
- either the routers must try to find the host on the entire Internet, also a difficult issue.

The IP Mobile solution consists in:

- the host maintains the initial IP Address,
- the routers do not learn the specific route towards the host.

With these aspects in mind, a suggested solution consists in the use of 2 IP Addresses for the mobile machine:

A. the initial IP Address, which is maintained,
B. the secondary address, named care-of address, that is only a temporary address. The secondary IP Address is used when the machine visits a place which is other than the usual one.

The machine informs a HOME AGENT, respectively a router, about the new temporary IP Address and the HOME AGENT transfers all the messages to this temporary IP Address.
The process is called: "IP-in-IP encapsulation" [16] and permits the HOME AGENT to tunnel the Data Packets towards each temporary IP Address of the mobile machine.
By tunnelling, we understand a procedure by which the Data Packet is especially encapsulated in the high level protocol, in view of transmission.
Tunnelling is normally used for VPNs: Virtual Private Networks. Within the VPN, an important technology (the VPN technology) connects different sites, including remote sites, as they form a single private network.

Key Point Summary Conclusions and Recommendations

The CDMA technology has generated the 3G, advanced, high speed, wireless digital communication and data transmission technology, with performances which surpass the 2G and 2,5 Generations.
The Japanese iMode technology offers advantages especially generated by the direct work with HTML and small distance up to the IP.
CDMA 3G has accomplished, among other facilities, a greater IP orientation.
CDMA is easy to be installed and may generate important applications, following the high rate of transmission.

Study Guide

ESSENTIAL QUESTIONS FOR THE VERIFICATION OF THE ACQUIRED KNOWLEDGE

1. Please indicate the essential advantages of the iMode system and technology.
2. Please indicate several advantages of the CDMA technology.
3. Please describe shortly the mode of installation of the Internet connection through the CDMA handset.
4. Please describe shortly the phases of installation of the Internet connection by means of the EV-DO CDMA (Zapp) modem.
5. What are the speeds (bandwidth) which may be accomplished with Zapp 110?
6. What are the speeds (bandwidth) which may be accomplished with Zapp EV-DO?
7. Can the devices interfaced with the Internet through CDMA devices (of Zapp) work directly with the IP, for instance to apply tests such as IPConfig, Pig, Tracert?
8. How is the IP Address received within the CDMA system (Zapp)?
9. What are the different Operating Systems used for mobiles?
10. What are the essential software languages working with mobiles?

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WAP
[SUP 1.] www.wapforum.org/
[SUP 2.] www.zvon.org/
[SUP 3.] cellphones.about.com
[SUP 4.] www.palowireless.com
[SUP 5.] www.wirelessdevnet.com

CDMA
[SUP 6.] http://www.cdg.org/technology/index.asp About CDMA Technology (by CDMA Development Group) [3.2.7.]
[SUP 7.] http://www.cdg.org/resources/white_papers.asp CDMA White Papers
[SUP 8.] http://whatis.techtarget.com/definition/0,289893,sid9_gci525695,00.html About Frequency Hopping [SUP 9.]
[SUP 10.] http://www.cdg.org/technology/cdma_technology/white_papers/cdma_1x_security_overview.pdf CDMA 1X Security Overview

ZAPP < system >:
[SUP 10.] http://www.zappmobile.ro/data

QUALCOMM
[SUP 11.] http://www.qualcomm.com

OTHER
[SUP 12.] http://www.3gnewsroom.com/3g_news/feb_05/news_5528.shtml *'Complete 3G' strategy at 3GSM,*
February 13, 2005,
[SUP 13.] www.ctia.org Cellular Telecommunications & Association (International Association for the Wireless Telecommunications Industry),
[SUP 14.] www.gsmworld.com GSM association,
[SUP 15.] www.gsmconferences.com GSM Conferences
[SUP 16.] www.3gnewsroom.com/3g_news

SUPPLEMENTARY INDICATIONS ABOUT THE CONTENTS OF THE LESSON

It is recommended to also consult the documentations from: www.cisco.com; www.zappmobile.ro; www.wirelessdesignonline.com; www.3gnewsroom.com/3g_news and other.

ANSWERS TO QUESTIONS

1.
- the i-Mode generates specific codes through the modifications of HTML pages at the source [2.1.],
- i-Mode functions with the same pages as the entire Internet (the HTML-WML conversions and vice versa are not necessary and are not used),
- the possibility of generating HTML pages with the majority of facilities accepted by HTML,
- permitting, as above, the design and display of complex images, colours, etc.,
- the immediate navigation in complex (with some exceptions) HTML environments,
- the i-mode may be considered as more Internet-oriented, and others.

2. The CDMA technology may: simultaneously use a frequency spectrum for multiple users, placed in the same areas, ensure the high rate of Data; it has very high resistance to interferences, offers a high level of security, permits the energy saving (by comparison with other technologies) and the diminution of the emitted power.
3. The installation of software drivers from the Zapp CD and following the Wizard. The initial part of installing the software is achieved with the USB connector unplugged in the Laptop.
4. The installation of software drivers from the Zapp CD and following the Wizard. The initial part of installing the software is achieved with the USB connector unplugged in the Laptop.
5. 153 Kbps (bandwidth) and with the Turbo software of about 300 Kbps (with Zapp110)
6. 2,4 Mbps (bandwidth) with Zapp EV-DO.
7. Yes.
8. Through the DHCP.
9. Microsoft MME3- Microsoft Mobile Explorer 3.0, Symbian and other.
10. WML, XML, XHTML, Java Servlets, J2ME (platform for CDMA based on Java), BREW (platform for CDMA based on C++) and other.

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