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INTRODUCTION

1.1.- Origin of Internet

We find the origin of Internet in an antique net of communications created by the Defence Department of the United States. ARPA, the Advanced Research Projects Agency of this Department, developed ARPANET, a communications system that started in 1969, and whose basic principles are the same that Internet has at this moment. Clearly, this net was absolutely private and nobody could have access to it freely. During the seventies and the early eighties, the technology used in ARPANET was made public progressively, and many organisms of other countries started to develop its own communications nets.

At the early eighties, the ARPANET was divided in two dimensions, the own ARPANET and MILNET, a net that was integrated in the Data Net of Defence of the United States. The administrators of ARPANET got since then that the net continued being private, creating restricted accesses and letting some *gateways* to other nets (as for example, CSNet) by its scientific or technological interest.

One of the nets used as a support for ARPANET, and finally was the spinal column of Internet, was NSFNET, the Net of the National Science Foundation. However, in 1990 ARPANET passed away. In 1991 the Commercial Internet eXchange Association turned up, Inc., an association of organisms and enterprises that is in charge of the administration of ARPANET. In 1992 the Internet Society started to work; this is the organism that rules the net of nets nowadays. In this year, the Nuclear Research European Centre (CERN), one of the institutions that has worked more so that Internet can be what is today, set in motion the World Wide Web (WWW). This was the step that gave cause for the *boom* of Internet, supported by all the enterprises and institutions that started to see the new horizon very clearly. Despite that the net, till then, has had a didactic and scientific content, started to be sold and to turn into a universal way of information spreading.

1.2.- Internet and the WWW

Some time ago, the communication among computers was limited to the text systems only, and to not very much attractive terminal screens. Computers sent and received text chains and at most, could paint the letters and numbers with colours. The WWW is able to transmit not only the information, but also a graphic environment for any user making easy the data consulting. The WWW is not really a net, but an ensemble of programs and conventions that facilitate the movement through the nets that work as Internet.

The great advantage that the WWW present are the hyperlinks, thanks to them, the navigation and the search for information are turned into a children's game. When one watches a document WWW, the text appearing in the screen, contains words in other colour and to highlight the key words. These words are associated to other net document through an URL (Uniform Resource Locator). This URL is the only and unrepeatable name of this document, and is formed by the server's name where it is located, the address in the server and the document's name. The user, that receives a document WWW, must use a program called navigator or explorer. This program is able to read the labels that contain the documents and to turn this information into a graphic format.

On the other hand, to maintain the net order, it's necessary that each computer is correctly identified. The names that each equipment receives, depend on an organism called IANA (Internet Assigned Numbers Authority). It's called like that because the names are really a group of four numbers, as for example 197.245.76.32.

A name like that doesn't result descriptive enough for the users, and for this reason there are also names more understandable that use combinations of letters. These words separately by points correspond to a domain, that's to say, to physical regions of the net. Generally each country has a principal domain (the one from Spain is "es"), but besides there are several principal domains defined for Internet (org - organisations and associations; net – net resources; gov - governments; com - enterprises, etc.).

2.- COMPUTER NETS

Some years ago the most used way to share information among computers was to record the files in discs. These could be read later from other computer. In this way, a document created by a person in his own computer could be printed and corrected in other computer.

They advanced when the first nets of computers. Many computers could transfer information among them. This made work quicker in the offices or research centres.

Nowadays, every large enterprise has computers connected to the Net. In this way a branch office in Barcelona can have access to the data of a branch office in Madrid, for example.

The cash machine consult the information of a bank account through a computer net that joins every cash machine of the country.

There are two sort of nets:

? **Local Area Network (LAN)**: They are nets that join near computers, in the same room or building. They are characterised by its quickness in the data transference and are relatively easy to install.

? **Wide Area Network (WAN)**: They are communications wires that join local nets separated by large distances. They are slower than the Local Nets, and they can only be installed by enterprises specialised in telecommunications.

So that a computer can be connected to a Local Net, you need to have a "Net card". It is used to send and to receive the information between the computer and the net. The card is a small electronic circuit as a book that is introduced in the box of the computer. A net wire has to be connected to this card to join physically net and computer.

3.- INTERNET WORKING

Internet responds to the architecture customer-server. This doesn't mean that it is a relationship only between two computers. At the moment that we use some services that Internet offers, a complicated system of applications and machines start to work so that the operation can work rightly.

3.1.- System customer/server

One of the principal functions of the net is to share resources. Generally this resources sharing is made by different programs with different machines. One of the programs, called **server**, provides a resource in particular and the other program, called **customer**, uses it. It's usual to employ the word server to refer to the own computer that runs the server program and the same with the word customer.

What is good in this system is that the programs customer and server mustn't be run compulsory in the same machine. Every Internet service make use of this relation customer/server. Learning how to navigate by Internet means learning to use every customer program available. For this reason, in order to use an Internet service, we have to understand:

1. How to run a customer program for this service.
2. How to tell the customer program which server has to be used.
3. Which instructions can be used with each customer.

3.2.- HOSTS

The **host** is a word very used in computer science, overall in relation to the computer nets. In Internet we name **host** to any computer connected to the net.

3.3.- IP Addresses and Domains

Every computer connected to Internet is identified through an **IP address**. This consists of 4 numbers among 0 and 255 both inclusive and separated by points.

For example an IP address could be **155.210.13.45**.

Two different computers with the same address are not allowed to exist in the net, because if it's so, the information required by one of the computers didn't know where to go. Each number of the IP address indicates a sub-net of Internet. There are 4 numbers in the address, what means, which are deep levels in the hierarchic distribution of Internet.

In the previous example, the first number, 155, indicates the sub-net of the first level where our computer is. In this sub-net there can be till "sub-sub-nets". En this case, our computer would be in the "sub-sub-net" 210. And so on till the third level. The fourth level doesn't represent a sub-net, but it indicates a concrete computer.

To sum up, the first three numbers indicate the net, our computer belongs to, and the last one is used to make the difference among our computer and the others that are in the same net.

This hierarchic distribution of Internet lets send and receive quickly packets of information between two computers connected in any part of the World and from any sub-net they belong to.

A user of Internet, doesn't need to know any IP addresses. Computers handle them in their communications through the Protocol *TCP/IP*¹ (*Transmission Control Protocol (TCP) and Internet Protocol (IP)*) in an invisible way for the user. However, we need to name the computers in any way, so that we can choose which one to ask for information. This is got through the **Names of Domain**.

The names of domain are the translation for the people of the IP addresses, which are only useful for the computers. For example, **conlared.com** is a domain. As you can see, domains are separate words by

¹ A protocol is an ensemble of rules established between two devices to let them communicate.

points instead of numbers in case of IP addresses. These words can give us an idea of the computer we are referring to.

Not every computer connected to Internet has a domain. The computers that can have it, receive many information requests, that's to say, the server computers. On the other hand, computers customer, the ones that make consults by Internet, don't need a domain because no user of the Net is going to ask them for information.

The number of words in the domain is not fixed. It can be two, three, four, etc. Normally they are only two. The last word of the domain **represents in EE.UU.** which organisation the computer has we're referring to:

Com	Enterprises (Companies)
Edu	Education Institutions, mainly Universities
Org	Non governmental organisations
Gov	Entities of the Government
Mil	Military Installations

In other countries, that were joint to Internet later, they have established another nomenclature. The last word indicates the country:

Es	Spain
Fr	France
Uk	United Kingdom
It	Italy
Jp	Japan
Au	Australia
Ar	Argentina
Mx	Mexico

Recently new domains have been approved, some of them are:

biz	Business
Name	Personal
Coop	Co-operatives
Museum	Museums

Therefore, only with the last word of the domain, we can know where the computer we refer to, is located.

Through the “**Domain Names Servers (DNS)**” Internet is able to find out the IP address of a computer from its domain.

3.4.- How do we transfer the information in Internet?

When one transfers information from a computer to another (for example a file), this is not transmitted in one go, but it is divided in small packets. In this way, only a person uses the net during a period of time. What is usual it is that information packets go by the net wires though they come from different computers and the destinies are also different. These packets are formed by the actual information that has to be transmitted and by some other data, as the computer addresses.

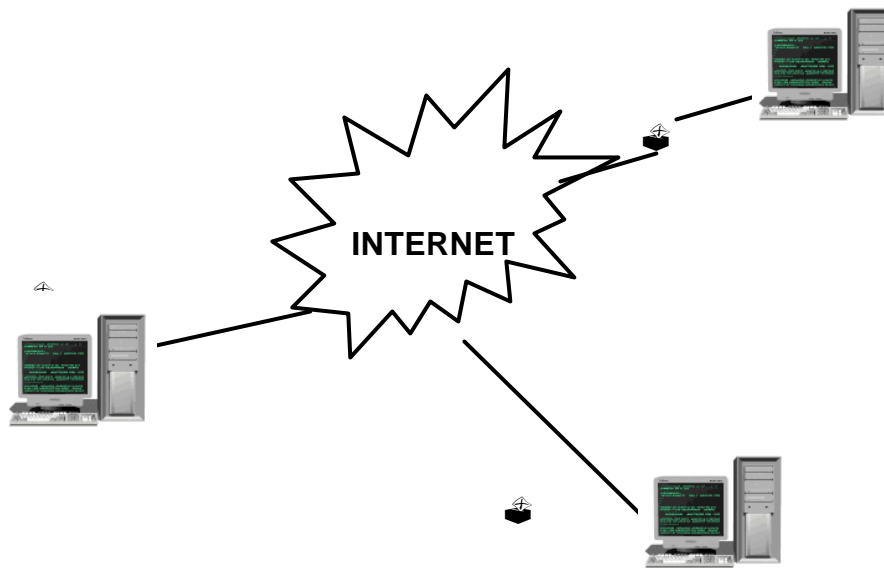
An ensemble of computers called routers, whose principal mission is to readdress the received information packets in order to arrive at the destiny, connects the different parts of Internet.

The **Internet Protocol** is in charge of labelling each information packet with the right address IP. Every program or application of Internet needs to know the number IP of the computer to communicate with. We have already seen that it's not necessary for the user to know this number IP, because it can be referred to the remote computer by its name.

The other necessary ingredient, so that two computers can talk between them, is the **Transmission Control Protocol**. This is in charge of dividing the information in packets of an appropriate size, of numbering these packets so that they can be united in the right order and of adding necessary information for the transfer and decoding of the packet and to detect possible mistakes of transfer.

3.5.- Net Connection

Personal computers have access to Internet through the telephone line. We can take advantage of the line we have at home. Normally this telephone line has a connector in the wall that is usually plugged to the telephone. In order to plug our computer to this connector, we must have a modem that has a telephone line. This machine is used so that the computer can be in telephone connection with another computers.



To be able to have the connection with Internet we need 4 things: a computer, a modem, a program that makes the phone call and another program to navigate around the net (if we want to send an e-mail, we need the corresponding customer program).

4.- INTERNET SERVICES

The possibilities that Internet offer are called **services**. Every service is a way of taking advantage of the Net independent of the others. One person could be specialised in the handling of one of these services without being necessary to know anything of the others. However, it's convenient to know everything that can be offered by Internet, in order to work with the most interesting ones.

Nowadays, the most used services in Internet are: **E-mail, World Wide Web, FTP, Adds groups, IRC** and **Telephone Services**.

✍ The **E-mail** let us send written letters with the computer to other people that have access to the Net. The letters are gathered in Internet till the moment requested. It's in this moment when they are sent to the destiny computer so that they can be read. The e-mail is nearly instantaneous, different from the ordinary mail, and besides very cheap. We can keep in touch with any person of the World that has connection to Internet.

✍ The **World Wide Web**, o **WWW** abbreviated, it was invented at the end of the 80s in the CERN, the Physic Laboratory of particles more important in the World, situated in Switzerland. It is about a distribution system of information as a magazine. In the Net there are gathered web pages, that are pages with text and photographs or graphics.

Those that are connected to Internet, can ask for the access to those pages and immediately these are in the screen of the computer. This visualisation system revolutionised the development of Internet. From the invention of the WWW, many people started to connect to the Net from their domiciles, as an entertainment.

Internet received a great boost till the point that nowadays when we speak about Internet, we are referring to the WWW.

✍ The **FTP (File Transfer Protocol)** lets us send data files by Internet. It is not already necessary to keep the information in diskettes to use it in the other computer. With this service, many enterprises have been able to send their products to people of the world without spending money on thousand of diskettes or sends. Many people make use of this service, for example, to release their computerised creations to the world.

✍ The **News Groups** are the most appropriate service to discuss about technical subjects. It's based on the E-mail Service. The messages that we send to the News Groups are public and any person can send us a response. This service is of a great utility to resolve difficult doubts, whose answers are known only by few people in the world.

- ✍ The service **IRC (Internet Relay Chat)** lets us have a conversation with one or some people through texts. Everything we write in the keyboard, it is on the screens of those who take part in the conversation. It also lets you the sending of images or another sort of file while speaking.
- ✍ The **Telephone services** are the last applications appeared for Internet. They let us establish a connection with voice between two people connected to Internet from any part of the world without having to pay the cost of an international call. Some of these services incorporate not only voice but also image. This is called **Videoconference**. Internet has another services less used because they are old-fashioned or because they have very technical applications. **Telnet** is an example.

With **Telnet** we can take the control of a computer connected to the Net at a distance. It's very useful to work with large computers in enterprises or institutions, in which many users have access at the same time to a central computer of a great power.

5.- WORLD WIDE WEB

The **Project World Wide Web** was born as an answer to the necessity that the international scientific community had new distribution systems of information. This was one of the objectives that *Tim Berners-Lee had in mind* (British engineer) when in 1989 he presented to the **CERN** the original proposal for the project World Wide Web. The CERN is the European Physics Laboratory of Particles, situated in Geneva.

The **WWW** (also called like this) was thought as a way of information distribution between investigator equipment in different regions, concretely, for the physics community of high energies linked to the CERN. It was pretended that the available resources in electronic form, that were in different computers connected to the net, were accessible for every investigator from their own terminal in a simple and clear way without learning several programs. Besides it

should be possible the jump among the next information elements. Every resource should be integrated in a hypertext net managed by computers.

The first versions of WWW (for internal use of the CERN) were ready in 1991. That year also, the system was opened to Internet and, since then, to have access to the World Wide Web, it's not required more than a terminal connected to Internet.

In this way, the system offers us hypertexts. The words underlined and the images in a box are links that take us to another nodes. In order to do it, it's enough to place the mouse above them and to push the button. Let's remember that the information server of arrival can be another hypertext or also a not hypertext server integrated in the net: a server gopher, a news group, a search for a data basis *Wais*, etc.

The success of the World Wide Web (something like the "world spider's web") has been spectacular. Nowadays it's calculated to be more than 1.100 millions of web pages.

5.1.- Architecture of the World Wide Web

The WWW responds to a model "*customer-server*". It's about a paradigm of work division in which the tasks are divided among the number of customers that make requests of services according to a protocol, and a number of servers that answer to these requirements. In the web customers ask for hypertexts to the servers. To develop a system of this sort it has been necessary:

- ✍ A new protocol that lets hypertexts, that's to say, from a node origin to another destiny, can be text, images, voice, animations, video, etc. This protocol is called (*HiperText Transfer Protocol*) and it's the language talked by the servers.
- ✍ To invent a new language to represent hypertexts that will include information about the representation structure and format and, especially, will indicate the origin and destinies of the hypertexts. This language is the **HTML** (*HyperText Markup Language*).

- ✍ To think up a way of code instructions for the hipertext from one object to the other in the Internet (something vital due to the previous chaos).
- ✍ To develop applications customer for all sort of platforms and to resolve the problem of how to have access to the information gathered and available through the different protocols (FTP, HTTP, WAIS...) and that they represent multiform information (text, images, animations, etc.). With this aim some customers appear, among them we can mention **NETSCAPE Navigator y Microsoft EXPLORER**.

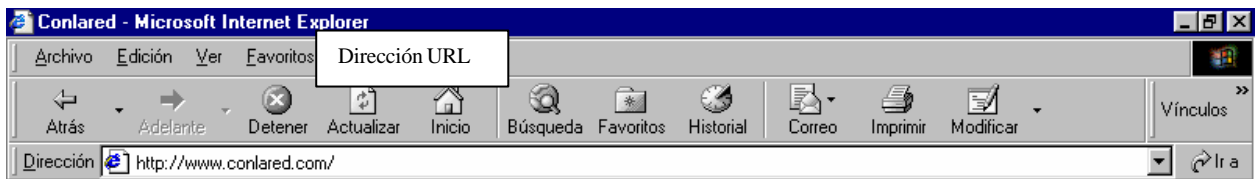
The efficiency of the HTTP makes possible the transmission of multimedia objects and the execution of hypertexts very quickly. The following image shows a web page with its corresponding address HTTP.



5.2.- URL

The URL (*Uniform Resource Locator*) are “locators” of addresses in the net, that connect the service with the server. They are the essential tool of the Web, because they let us the location and the connection with any server and Internet resource.

An example of URL



5.2.1.- Structure of the identifiers URL

The structure of a URL typical is:

protocol://address of the server/route of access

In this structure the "://" is only the separator between the protocol and the address of the server. The address of the server can be also the address IP and the name of the domain. If the route of access has subdirectories, these must be separated with "/".

An example could be **http://www.conlared.com/** that connect us with the principal page (there is no access route) of the Web server (by the protocol http) of conlared (by **www.conlared.com**).

As a **protocol** we can use the followings:

≈ **http**: It's used when searching for a web page. An example can be:

http://www.larioja.org/bor

It identifies the web page of the Official Bulletin from La Rioja of the server larioja.org.

It's very important to respect the capital and the small letters in the URL, because the exact name is indispensable in many operative systems.

- ✍ **mailto:** To send a private message or e-mail. The structure is slightly different because we must write the address e-mail of the destiny in the part address of the server. Examples:

mailto:fundarco@fundarco.org

It identifies the address of the e-mail of Fundarco.

- ✍ **ftp** : To transfer files. The structure of the URL varies depending on the way of access (anonymous or not). Example:

ftp://ftp.microsoft.com

6.- The history of Internet in milestones

1962

J.C.R. Licklider writes an essay about the concept of Net, where everybody is interconnected and can have access to programs and data from any place of the planet. In October of this year, Licklider is the first Director of ARPA, that is called: IPTO Information Processing Techniques Office.

1963

A committee industry-government develops the code ASCII, pronounced "Asky", by American Standard Code for Information Interchange and it is the first universal standard for computers. This is an important step because it lets any machine interchange data.

1964

Simultaneously, as it occurs in developments of the human survival, the search for a solution of the problem of the Strategic Security in Occident converge to works of the [MIT](#), la [Rand Corporation](#) and the [National Physics Laboratory of Great Britain](#). Paul Baran, Donald Davies, Leonard Kleinrock, are the leaders of this convergence process, being Baran one of the first in publishing in Data Communications Networks his conclusions simultaneously with the publication of the Kleinrock's thesis about the theory of waiting lines.

1966

The English inventor Donald Davies launches his idea of routing of "packets" (commonly called route) and interests the NPL, National Physics Laboratory of England, in the construction of a computers net in order to prove the validity of his revolutionary idea.

1967

In a conference of every expert of ARPA announced by Larry Roberts, Wesley Clark suggested that the net was administrated by tools called IMP, 'Interface Message Processors' located in front of the big computers, dando lugar a los "ruteadores" actuales.

The system of “packets” is set and the speed develops from 2.400 bps to 50.000 bps.

1968

At the [Californian University in Los Angeles, UCLA](#), the computer ILLIAC IV, the biggest computer in the world at that moment, is connected to ARPANET and that way, the scientists connected in a distant way can consult the databases located in that central computer.

1969

Frank Heart coordinates a group of programmers for the software de los IMP's that were going to act as routers of computers Honeywell DDP- 516.

After that, 4 places are selected and in each one of them, a communication programme between the computer and the IMP's is created. The first RFC is sent from UCLA on 7 April, Request for Comment, that would represent the beginning of the deep intellectual heritage of Internet: the RFC's.

The same group develops the first protocol NCP (Network Control Protocol), in their RFC number 10.

1970

The expanding process has started and it will be a constant feature of Internet: a new nodo for month.

1972

Ray Tomlinson writes the first programme of e-mail, Tomlinson is also the creator of the convention [user@host](#). The symbol @ is arbitrary chosen among the no alphabetical symbols of the keyboard.

Bell Labs, from [Bell laboratories](#), develops “C” language.

1978

The appearance of the first small computers with a real potential for communication via modem to telephonic disc services starts the boost of Internet since a new joint of industrial niches: software and modems.

Vint Cerf continues his view of Internet creating the International Cooperation Board.

1979

It has began the net of “newsgroups”. This is a clear example of application customer-server in which, the users connects by a telephonic disc with a server of newsgroups requiring him to send them the last messages about determined groups.

1981

More than 200 computers of [CSNET, Computer Science NET](#), Net of Computer Sciences are connected, and BITNET is added, another net that includes the transference of files by e-mail, instead of making it by protocol FTP, Files Transmission Protocol, created by ARPA.

The “definitive” protocol TCP/IP is created and it is known by the RFC number 801.

In Berkeley, Bill Joy includes the TCP/IP in UNIX operative system UNIX.

1983

In January, ARPANET makes of the TCP/IP its standard and DOD, Defence Department decides to divide DARPANET in two parts: one public ARPANET and the other one, MILNET or classified Military Net.

As the amount of nodos has increased and the labels of nodos and “hosts” are more complicated, Jon Postel and Paul Mockapetris from USC/ISI and Craig Partridge from BBN develop the Domain Name System (DNS), recommending the use of the present system of addressing [user@host.domain](#).

1984

William Gibson uses the term cyberspace in his novel “Neuromancer”.

DNS enters in Internet, with the new domains “gov”, “mil”, “edu”, “org”, “net” and “com”. The domain named “int” to identify international entities is not used at this moment. The code of two letters to identify countries has started.

NSF propose to establish free access to supercomputers of the Net for all the American Scientist Community.

1985

At the end of 1985, the amount of computers connected over Internet had reached the number of 2.000.

Año 1986

The protocol TCP/IP is available in workstations and in PCs Ethernet is universally accepted, and it is one of the expanding engines of Internet.

The moral and ethical reaction starts, it has born the “Internet ethic” or “netiquette”. For example, the bad use of public resources that Internet offers in a free and open way and certain groups that treat about sex and drugs, are not well considered.

1987

NSF starts implementing “backbone” of high speed T1 by connecting their supercenters. The idea has such success that they start thinking in instrument a version T3.

The number of “hosts” exceeds 8.000 and the intellectual heritage nowadays reach 1.000 RFC’s.

They have started to thinks even in a protocol to administrate the “routers”.

1988

The "worm" Morris affects to 6.000 of the 60.000 computers in the net. A committee of emergence has been created: [Computer Emergency Response Team \(CERT\)](#), managed by Mellon University to face all these problems.

1989

The amount of hosts increases from 80.000 in January to 130.000 in July and to 160.000 in November! From this positive inflection point starts the boom of Internet phenomenon.

Australia, Germany, Israel, Italy, Japan, Mexico, Holland, New Zealand and United Kingdom are jointed to Internet.

The speed grows: NSFNET reaches T3 (45 Mbps). LAN, , Local Area Networks, reach 100 Mbps.

Telephonic companies start working in their own WAN, Wide Area Networks, with technology of packets of higher speed.

In Switzerland, in [CERN](#), Tim Berners-Lee creates the concepts "Hypertext" that would be used with different operative systems, and it would born World Wide Web.

1990

ARPANET is formally closed. In 20 years the network has growth from 4 to 300.000 hosts. The added countries are Argentina, Austria, Belgium, Brazil, Chile, Greece, India, Ireland, SouthCorea, Spain and Switzerland.

Internet famous resources appear, such as ARCHIE, Gopher and WAIS.

It has started a "Gold era" of computer intelligence pointed to develop Internet. For example, human knowledge is gathered in the Gophers of universities. In Internet appears some institutions such as the Library of the Congress of U.S.A., the National Library of Medicine (U.S.A.), Dow Jones and Dialog.

More cybernetic "worms" appear.

1991

The NSFNET backbone increases to T3, at 44 Mbps. The total traffic exceeds the quintillion of bytes or 10 trillions of packets monthly. More than 100 countries are interconnected with 600.000 computers and with approximately 5.000 separated nets.

1992

The [Internet Society ISOC](#), is born with Vint Cerf and Bob Kahn among its founders, validating the era of the inter-nets and its role in the life of the people of the developed countries.

The number of computers connected increases to 1.000.000 and of the nets to 7.500. For the first time the net transports audio and video.

Web comes into play and Internet explodes as a supernova. What was duplicated yearly, nowadays is duplicated three-monthly and “Internet Culture” starts to be designed.

Questionnaire

1. Which of these definitions is the right one?

LAN: net that joins near computers, in the same room or building. It's very quick in the data transference and relative easy to install.

LAN: Communications wires that join local nets separated by large distances.

2. ¿What is an IP address?

Identification number of the computer once is connected to the net

3. ¿Which are the functions of the protocol TCP (**Transmission Control Protocol**)?

This is in charge of dividing the information in packets of a right size, numbering these packets so that they can return to joint in the right order and adding some necessary information for the transmission and later decoder of the packet and of detecting possible transmission mistakes

4. Where was the WWW born?

In Europe