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USE OF THE INTERNET WITH THE WORLD WIDE WEB IN PHYSICS

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ABSTRACT

After a brief description of the Internet and the World Wide Web, we consider the applications to particle physics, the use of the 4th School Macintosh and the 4th School home page. A brief list of addresses and a glossary of technical terms are also given.

1. What is Internet

In any laboratory several computers may be connected together to form a Local Area Network (LAN), offering many advantages such as the sharing of resources (hard disks, printers, etc).

When two or more simple LANs are connected so that computer traffic is capable of moving from a computer (machine) on one physical network to a machine on another network, the resulting network is called an "internetwork".

Internetworking requires physical connections between LANs and network protocols capable of routing traffic across the internet. To the user of a network application, there appears to be no difference between a LAN and an internet.

The largest worldwide network is Internet (note the capital "I"; a generic internet has a lower–case "i"). Internet uses the TCP/IP protocol "suite" for general communications (see Appendix).

More than four million computers (more then one million in Europe) in over 100 countries are now permanently connected to Internet. It is not known exactly how many other users Internet has, but there are at least 30 millions. The number is incredibly growing and almost doubles every year. The number of users and of computers, as well as the amount of data available on Internet, appears to be growing exponentially with time.

Internet is quickly changing the way that we communicate through our computers.

All the smaller networks connected to Internet share common applications; the

most important being: Telnet, FTP, Mail, Archie, Gopher and WWW (see Appendix).

2. What is WWW

WWW stands for World Wide Web; it is the fastest growing application used in Internet. WWW is a multimedia system using the client/server technology. A client application allows a normal user to access the information contained in another computer connected to Internet. Every computer that "serves" information is called a *server*. The client application used to access the Web is called a WWW *browser*, from which one can use almost any Internet application without leaving the browser.

WWW was created in 1989 by a software programming group working at CERN (the European Organization for Particle Physics) in Geneva, Switzerland, with the intention of providing a simple way for particle physics laboratories around the world to exchange information. This group defined three protocols for WWW: (i) HTTP (HyperText Transfer Protocol) which defines the rules for exchanging the hypertext documents from a server to a browser; (ii) URL (Uniform Resource Locator) which describes a scheme to localize the documents on the net; (iii) HTML (HyperText Markup Language) which is the base language to define hypertext documents.

With WWW it is possible to read normal text or postscript files, to view pictures and animations, to listen to sound files, and to copy software for any type of computer. A normal WWW page is called a hypertext and contains normal black text, blue underlined text, pictures and buttons. The icons and the blue text are *pointers* leading to other files which can be held in any computer connected to Internet. The size of documents is no longer limited by the storage capacity of a local computer. Distribution is no longer limited to those users you can send your file to, but to those who point to your file. Every computer on Internet can distribute information to other computers. Some documents consist almost entirely of pointers to other documents.

In order to see a specific file, one simply has to move (on the monitor) the arrow icon of the mouse on top of the button or of the blue underlined word and click the mouse button. This "chasing" of pointers is called "surfing the net", "net surfing" or "web surfing".

Since all the information is just a mouse–click away, one can perform searches much faster than would be possible in a library. Moreover one has access to some of the largest libraries and museums in the world. The British Minister of Science said: "you have the largest library, art gallery and museum in your computer".

Browsers were and still are very important for the diffusion of WWW around the world. At present the two most important Web browsers are Mosaic^{TM} and Netscape^{TM}: Mosaic was the first WWW browser with full multimedia capability;

Netscape is now the most powerful.

3. Who uses the Net

The first users of Internet with WWW were particle physicists, most of whom participate in large experiments located in a small number of large international laboratories, such as CERN in Geneva, Switzerland. The network was first used as a means of communication and then to login to the computers of the main research centres. The Net is now used for many other purposes. One of these is as a virtual physics library, connecting to servers at CERN, SLAC, DESY and FERMILAB. Furthermore, many experiments have their own home pages, with pages containing information and illustrations relating to the experiment, physics analyses, results and publications. Reserved pages are used to provide information and check the behaviour of the experiments, data taking, shifts, progress of publications, etc. The reserved pages are usually the most important for an experimental team.

From particle physics WWW soon moved into all fields of research. There is now a major trend to equip all high schools with computers connected to the Net to provide access to libraries and art galleries, connections to other schools, E-Mail, videoconferences, etc.

However the largest recent development of Internet has come from outside the field of science, in particular from the field of commerce and entertainment. There are also large developments in newspapers and local civic activities.

Such widespread use of the Net is bound to change the way we operate and also to raise legal issues and cause social problems.

4. How to use a WWW browser

Here I will give a simple example on how to use a WWW browser, like Mosaic and Netscape. An icon toolbar at the top or at the end of the window is always shown inside the browser. This icon toolbar is important to help people; it contains a group of icons, of which the most important are, from left to right: **Back**, **Forward**, **Home**, **Reload** and **Open**. Clicking on **Back** or **Forward** takes you to the document seen before or after the one now on the screen. **Home** takes you directly to the Fourth School Home page. **Reload** is useful if you want to reload the document currently on the screen (if, for example, you stopped the transfer or the browser had problems finding the document). Clicking on **Open** can send you directly to a page of which you know the complete address (the URL). For example, to reach the CERN Home page you can click on **Open** and a box with *Open Location* or *URL to Open* will appear; then you type **http://www.cern.ch/**.

Another useful icon to use is the **Stop** icon in Netscape's icon toolbar and the globe icon at the top–right of the Mosaic window. When you encounter problems in reaching a document, but the browser persists in trying, the best thing to do is to

end the connection by clicking on **Stop** or on the globe icon.

In order to start surfing the net in our example, click on **Open** and at the prompt type **http://axoph1.cern.ch/ictp/ictp.html**. After a short time you will get into the Home page of the **Fourth School on Non–Accelerator Particle Astrophysics** (see Fig. 1). This home page shows part of the poster of the School and under it eight coloured icons followed by blue underlined words: *Lectures program*, *Poster*, *ICTP*, *SLAC Spires*, *CERN Preprint*, *PhysNEWS*, *INFN*, *MACRO*. These are topics of interest for the School: in Internet jargon they are interesting "places to visit".

For example, if you want to see the full program of lectures at the School click once on the blue underlined words *Lectures program*. You will get into a page with the updated program of lectures. If you want to return back to the Fourth School Home page click once on the **Back** icon with a left arrow inside it or on the **Home** icon (both are present at the top of every page). Alternatively click once at the end of the page on the icon called Home or on the blue underlined phrase *Go back to Home page*. The same procedures apply to the other eight topics displayed on the 4^{th} School Home page.

From the Home page, if you click on *SLAC Spires* you go to the High Energy Physics (HEP) Preprint database. It is a searchable database: you can ask for a list of publications of a particular person or experiment, or of all publications containing, within their title, a specific word or phrase, etc. For example, if you want to find the papers from the OPAL Experiment published in 1992, you have to go to the blue box after the text ⟨*This is a searchable index. Enter search keywords:*⟩ and type: *find cn opal and date 1992*. The database will find 23 papers and you can go through them to see the list of authors, the references, the full postscript files, etc. For example if you now click on the fourth paper in the *List of Authors* you will get a list of all the people involved in the OPAL collaboration when the paper was published. Using **Back** you can go back to the previous page, and using **Home** you can return to the School Home page.

You can reach the CERN Home page by clicking on the word *INFN*, on the School Home page, then clicking *HEP Sites* on the INFN Home page and on the HEP Sites Home page click on *CERN*.

It is more difficult to explain the many uses of a browser than it is to use it; I advise you to use it and if you have any problem send me an E-Mail by clicking on *Roberto Giacomelli* at the bottom of the School Home page or on the postcard icon to its left.

In every browser there are menus or icons that point to documents containing information about Internet and how best to navigate it.

5. Appendix

Some of the technical terms used in Internet and in World Wide Web are defined

Table 1. Some useful places to "visit".

http://www.ictp.trieste.it/	Internat. Centre for Theoretical Phys.
http://www-spires.slac.stanford.edu/find/hep	SLAC HEP Database
http://www.infn.it/	The INFNet World Wide Web
http://www.cern.ch/	CERN Welcome page
http://fnnews.fnal.gov/	FermiLab Home Page
http://www.aip.org/	American Institute of Physics
http://www-pdg.lbl.gov/contents_rpp.html	Review of Particle Physics
http://www-pdg.lbl.gov/	Particle Data Group
http://www.het.brown.edu/news/index.html	Physics News
http://babbage.sissa.it/	SISSA W3 server
http://http.hq.eso.org/eso-homepage.html	European Southern Observatory

below.

- **Application**: a program which directly does something for a human user. A network application, for example, may provide for file sharing, file transfer, remote login, etc.
- **Archie**: the application for finding files on Internet.
- **ASCII**: American Standard Code for Information Interchange, the code most computers use for representing characters (letters, numbers and symbols).
- **Browser**: a WWW browser is an application used for reading hypertext documents. It may allow the viewing of pictures or other multimedia data. The best–known browsers are Mosaic™ and Netscape™.
- **Client**: a computer that gets services from another computer, called a *server*. For example a computer Client prints to a remote printer, accesses remote files or allows login to a remote machine.
- **E-Mail**: Electronic-Mail: an application similar to normal mail, used to send messages to other people through a LAN or an internet. Basic E-Mail allows only ASCII text, but some E-Mail systems also allow the sending of binary files, sounds, pictures, etc.
- **File server**: a computer which makes files available to other computers through a network file system.
- **FTP**: File Transfer Protocol: the standard way to copy files over Internet. Many servers around the net keep freely redistributable software and information, which anyone can copy.

- **Gopher**: an Internet resource locator. Browsing through Gopher menus lets you find a wide variety of resources on many host computers by subject rather than by application and location.
- **Home page**: a top–level WWW page on a certain subject (for example an experiment).
- **internet** (small i): a generic network of computer networks.
- **Internet** (capital I): the largest world–wide network of computer networks.
- **LAN**: Local Area Network. A high speed computer network which operates over short distances.
- **Network**: a collection of individually–controlled computers, printers and other electronic devices interconnected so they can all communicate with each other. Networks also include the software used to communicate and the wires, cables connector modules and other hardware that make the physical connections.
- **Protocol**: set of procedural rules for information exchange over a communication medium. These rules govern the content, format, timing, sequencing and error control of messages exchanged in a network.
- **Protocol suite**: the sum of protocols used with a networking package.
- **Server**: any computer which makes available resources or data to other computers on the network.
- **TCP/IP**: Transmission Control Protocol/Internet Protocol. It refers to a group ("suite") of network and application protocols. TCP/IP is used to create heterogeneous LANs and to connect to Internet.
- **Telnet**: the standard Internet way to log into a remote computer or service. It is also useful for accessing various text–based services via TCP/IP.

INTERNATIONAL ATOMIC ENERGY AGENCY
AND
UNITED NATIONS EDUCATIONAL SCIENTIFIC
AND CULTURAL ORGANIZATION
INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS

FOURTH SCHOOL ON
NON–ACCELERATOR PARTICLE ASTROPHYSICS

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Browse the Lectures program.

View the Poster.

Visit the ICTP Home page.

Link to SLAC Spires.

Browse the CERN Preprint server.

Read the latest Physics news mantained in PhysNEWS.

Link to the INFN Home page.

Link to the MACRO experiment Home page.

- Read the presentation
- View the instructions

For questions and information contact me, Roberto Giacomelli.

Fig. 1. Home page of the Fourth ICTP School on Non Accelerator Particle Astrophysics.