

Caught in the Web

CERN World-Wide Web pioneer Robert Cailliau (standing) explains a point to Geoff Heaford of the UK Engineering and Physical Sciences Research Council as delegates at the CERN World-Wide Web Days take their first hesitant steps in Cyberspace. Hands-on experience was an important element of the event (60 workstations were generously loaned to CERN by Apple, DEC, Hewlett Packard, IBM, Olivetti and Silicon Graphics). (Photo CERN HI 21 3 95/24)

The World-Wide Web may have taken the Internet by storm, but many people would be surprised to learn that it owes its existence to CERN. Around half the world's particle physicists come to CERN for their experiments, and the Web is the result of their need to share information quickly and easily on a global scale.

Six years after Tim Berners-Lee's inspired idea to marry hypertext to the Internet in 1989, CERN is handing over future Web development to the World-Wide Web Consortium, run by the French National Institute for Research in Computer Science and Control, INRIA, and the Laboratory for Computer Science of the Massachusetts Institute of Technology, MIT, leaving itself free to concentrate on physics.

The Laboratory marked this transition with a conference designed to give a taste of what the Web can do, whilst firmly stamping it with the label "Made in CERN".

Over 200 European journalists and educationalists came to CERN on 8 - 9 March for the World-Wide Web Days, resulting in wide media coverage. The conference was opened by UK Science Minister David Hunt who stressed the importance of fundamental research in generating new ideas.

"Who could have guessed 10 years ago", he said, "that particle physics research would lead to a communication system which would allow every school to have the biggest library in the world in a single computer?"

In his introduction, the Minister also pointed out that "CERN and other basic research laboratories help to break new technological ground and sow the seeds of what will become mainstream manufacturing in the future."



Web? Internet? What's the difference?

Learning the jargon is often the hardest part of coming to grips with any new invention, so CERN put it at the top of the agenda. Jacques Altaber, who helped introduce the Internet to CERN in the early 1980s, explained that without the Internet, the Web couldn't exist. The Internet began as a US Defense Department research project in the 1970s and has grown into a global network-of-networks linking some three million computers in over 100 countries. Its strength is that it is user-driven and evolves in a democratic and Darwinistic fashion. Good network products thrive, whilst poor ones wither. The Web, a relative newcomer, is to the Internet what mammals were to the post-Cretaceous Earth, sweeping all else before it.

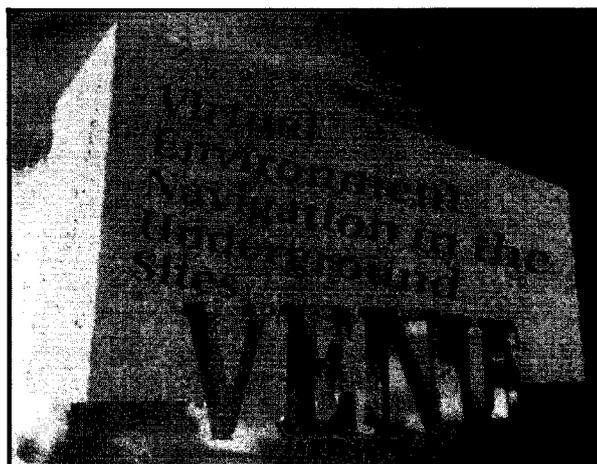
The Web has replaced complex commands with a simple mouse-click, making Internet access available to everyone. From its 1989 origins as a tool for physicists, it has taken a remarkably short time to develop into today's global phenomenon. The benchmark browser was developed at CERN for the NeXTStep operating system in 1991. At the same time, a line mode browser written at CERN brought the Web to users in particle physics laboratories the world over.

But it was when the US National Center for Supercomputing Applications, NCSA, released the Mosaic browsers in 1993 that things really took off. Web traffic now drives the Internet's expansion, and has grown to the equivalent of the entire works of Shakespeare every second. Significantly, one of the Web's most comprehensive directories lists over twice as many servers in entertain-

The VENUS homepage is just one of the things you will find on a Web visit to CERN. From physics papers to press releases, many of the Laboratory's activities are represented. VENUS offers a virtual reality voyage around the particle detectors of tomorrow. By giving engineers the impression that they are really there, virtual reality helps them to design these huge devices.

ment and business as in science and computing, clear evidence that the Web has outgrown its academic origins.

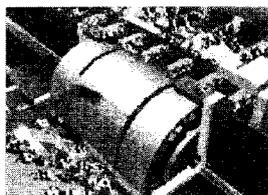
A tour of Web highlights by co-developer Robert Cailliau displayed some of the questions that CERN is passing on to INRIA and MIT. The tour demonstrated the Web's multimedia nature, taking in text, pictures, film clips and music. But with a system that makes transferring all this around the world so easy, how can copyright be protected? A visit to the Paris Métro server to find the quickest route from Gaité to Pigalle illustrated the Web's interactive capabilities, but if these are ever to be used for electronic shopping, how can security be ensured? The Web carries news fast. Help lines for the recent Kobe earthquake were available via the City's homepage before they made it into newspapers, but how do you know where to look for the information you need?



"her weapons were her CrystalEyes... and VENUS was her name"

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Getting connected

Finding sliproads to the information superhighway is easy, but choosing the right one is not so simple. It depends on whether you just want to browse, or whether you wish to publish your own material on the Web. Either way, it helps to live in the US, according to Bruce Elliott of Swiss Internet provider Prolink. America's liberal telecommunications market makes it much cheaper to use the Web there than in Europe.

For those with aspirations to publish on the Web, a rented connection is not enough. A popular server needs permanent connectivity and high bandwidth to cope with demand for the information it holds. Børre Ludvigsen is someone who should know. Since setting up his famous

"Home on the Web", Ludvigsen has become something of a Cyberspace celebrity. If we are not careful, he believes, the Web could turn out to be just more TV.

Current commercial networks are already becoming very imbalanced with bandwidth into people's homes often sufficient to download a Hollywood movie in a matter of minutes, whilst allowing the viewer just enough bandwidth out of his home to choose which film to watch. Ludvigsen's message to budding Web publishers, as opposed to those

who are content simply to browse, is buy the bandwidth, don't rent it.

Using the Web

Many pioneering Web users came to the conference to explain why they are on the Web, and the benefits it has brought.

Evidence that the Web has achieved its initial goals was provided by the L3 collaboration at CERN's LEP e⁺e⁻ collider. L3 has completely revised its working

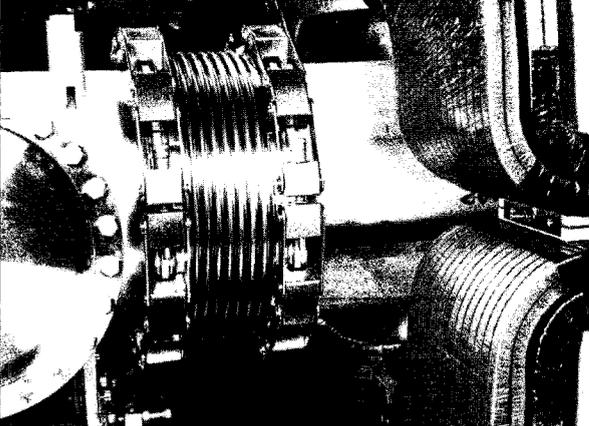


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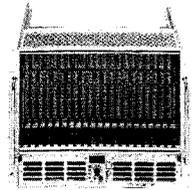
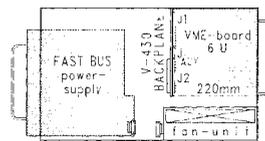
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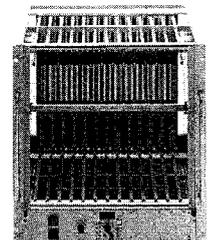
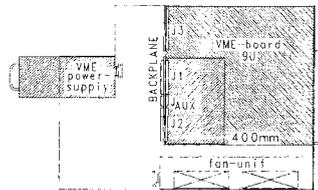
Output modules: -2 V - 50/100/150 A. +5V/-5,2 V - 75/150/200/300 A. +12 V/-12 V - 10/25/40 A. +15/-15 V - 10 A/25 A/35 A. Other voltage/current outputs on request.

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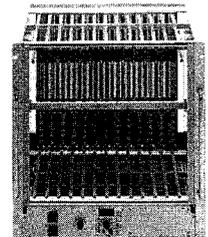
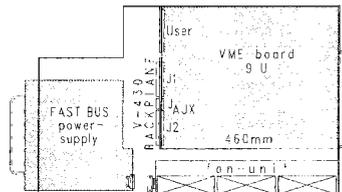


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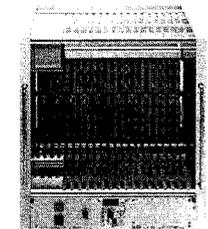
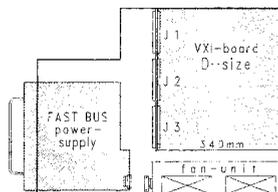
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Web Words

WWW, W3, the Web: alternative names for the World-Wide Web

Internet: a world-wide communications network

Browser: a programme allowing mouse-click access to the Web

Homepage: The 'gateway' page presented by a browser when it is activated. A signpost to other pages on the Web, possibly including other homepages.

Server: a computer holding accessible information

Hypertext: a way of linking related pieces of information on a computer

HTML: HyperText Mark-up Language, the language in which Web documents are structured

HTTP: HyperText Transfer Protocol, the rules governing communication between browsers and servers

URL: Uniform Resource Locator, an address used by browsers to locate a server, "http://www.cern.ch" is the URL for CERN's Web server

practices, exploiting the Web to the full. The collaboration's Web site provides information about L3 for collaboration members and general enquirers alike. L3 publications and analyses are no longer circulated around the world by mail for approval and discussion, but simply posted on the Web, speeding up the process considerably.

Moving away from academia, the Swiss company Lightning Instrumentation SA installed a server only eight months ago, but it already generates 15% of their export turnover, and was set up for less than the cost of a single advertising campaign. The Web is fast becoming an indispensable tool for small exporting companies, allowing them to open a cheap and effective shop window to the world. According to Lightning, presentation is the key to success; Web pages have to look good, and they must be listed in appropriate directories.

Policing the net

Internet law is developing into a major field of study. Pierre Trudel of the University of Montreal sees three potential zones of conflict; right of network access, circulation of information, and contractual obligation. But Trotter Hardy from the William and Mary Law School in Virginia, believes that many existing US laws governing these issues apply equally well to the Internet. Both agree that the problems arise from the Internet's disregard for national boundaries, and suggest that self-regulation is the way forward. Hardy predicts that "Cyberspace geography" will replace physical geography in Internet law, and cases will be heard in virtual courts.

CERN says farewell

The conference was brought to a close on a cautionary note by David Williams, head of CERN's computing and networks (CN) division. The Web was invented at CERN because the Laboratory had the need, the expertise, and the necessary bandwidth to make it work. It has taken off on the other side of the Atlantic because ordinary people can afford to use it there. A leased line in Europe costs up to 90 times its equivalent in the US, whilst individuals in America can plug in to the Internet for around half the price of their European counterparts. Food for thought in the run up to European telecommunications deregulation in 1998.

As the Laboratory bids farewell to the Web, Williams underlined the fact that fundamental physics made it happen at CERN: "Let us be grateful for our breakthrough", he said, "and hope that Europe is able to turn a happy, but not fortuitous, discovery at CERN into something that benefits the whole of the economy which supports our fundamental research."

by James Gillies