

CURIOSITY-DRIVEN RESEARCH

THE WEB

- UK scientist Tim Berners-Lee invents the Web while working at CERN, which is partly funded by the UK
- More than £540 m is spent online in 2004
- The Web dramatically improves global communication and collaboration

What is it

When we talk about the Internet we speak of the network itself – the infrastructure, the millions of computers communicating with one another and distributed all over the globe. To access this network, to view the information it contains, we use the World Wide Web. The Web allows the vast quantities of information stored on computers around the world to be searched and viewed as easily as pages in a magazine. Prior to the invention of the Web, the Internet and all the information on it was the preserve of the military and academics. This information, though plentiful, was not easily accessible – it could only be seen by downloading individual files onto the user's computer. The Web allows users all over the world easy and uncomplicated access to a world of knowledge.

While the Internet wasn't so much invented as built, a natural progression of the increasing number of computers in the 1960s and 1970s, the World Wide Web was created by one man: Tim Berners-Lee. The key to the World Wide Web are lines of computer code, which can produce links between information held on millions of different computers all over the world. These hyperlinks between distant computers form a web-like structure, hence the name. Every page that exists on the Web has its own unique address and the hyperlinks allow the users to view these pages and hop between them, known as "surfing the Net". These links provide an intuitive way to search through pages of information, allowing the user to jump between sites devoted to everything from news to government projects, home shopping, auctions and beyond.

Originally conceived as a means of transferring and searching through the vast quantities of scientific data produced by the giant European labs, the World Wide Web has developed into a true tool of the people. It remains a valuable tool for scientists, but it also extends into every field of commerce and reaches into every country. The Web has given people the ability to share knowledge across borders and across continents, to trade with distant customers as easily as they trade with their neighbours. The World Wide Web has changed the world, making it smaller by the ease of access to knowledge while making it bigger by showing just how much is out there.



The science

The first real computer network was constructed in 1969. It allowed the transfer of files between users and introduced "packet switching". This enabled multiple systems to communicate with each other through a single communication link by assembling data into "packets" and sending them down the wires. The technology was robust but not versatile and by the early 1980s others had devised a new means of networking. The Internet, as it became known, was used predominantly by academics and the military and, with its continuing growth,

was becoming cumbersome and difficult to use; its sheer size meant that it was difficult to organize and find information.

Berners-Lee, while working at the European synchrotron CERN, invented the system that solved this problem. In 1989 he wrote the two key pieces of code that allowed the Internet to prosper: the hypertext markup language (HTML) and the uniform resource locator (URL). HTML is a means of embedding codes into a simple text file so as to define the structure of the document and include links to other documents on the network. This file can then be read by other machines which can recreate the original page, including the links to other pages. It is these "hyperlinks" which are the strands of the web. They allow pages to be linked no matter where the actual data are stored. A URL is a simple means of specifying the location of a page or document in one title which includes a computer name, a file path and a protocol with which to retrieve the file from that machine. These allow the rapid transfer of files, forming the basis of the first Web browser – Berners-Lee's own WorldWideWeb.

Web timeline

1969	The first computer network, ARPANET, is constructed.
1980	Tim Berners-Lee, while employed at CERN, writes a routine to make searching his computer easier. He invents the terms URL and HTML.
1989	Berners-Lee invents the World Wide Web, allowing scientists and military personnel all over the world to communicate information quickly and effectively.
1991	Internet usage reaches 600 000 people.
1992	The Mosaic Web browser is invented, which using hyperlinks can present webpages as if they are pages from a magazine.
1993	World Wide Web accounts for only 1% of Internet traffic.
1994	The Internet is introduced into homes through the web-in-a-box product.
1995	eBay and Amazon are launched.
1996	40 million users of the Internet
1998	100 million people online.
1999	150 million people online.
2001	550 trillion documents accessible on the Web contained within 1 trillion webpages.
2004	More than £540 m spent online in one year.
TODAY	The UK works to develop the DATAGRID (see side column), regarded as the precursor to the next-generation Internet.

What is CERN?

CERN is the European Organization for Nuclear Research, the world's largest particle-physics centre. Physicists come to explore what matter is made of and the forces that hold it together. It exists primarily to provide them with the necessary tools. These are accelerators, which accelerate particles to almost the speed of light and detectors to make the particles visible.

Founded in 1954, the laboratory was one of Europe's first joint ventures and now includes 20 member states.

Distributed computing

Complex problems can be analysed by computers across the world that would otherwise be idle. Programs similar to screensavers can be downloaded to use the computer's power to analyse chunks of data while the owner is not using the machine. The computer transmits the data back to the originator via the Web. Scientists at Oxford University have been using the technique to aid the search for a cure for cancer. The more computers involved, the quicker the analysis.

Protecting from attack

In 2003 computer-security company MessageLabs reported that the sobig virus copied itself more than 1 million times in 24 hours. Virus protection and detection is now a booming industry.

Future developments

The UK is to be a major contributor to a Europe-wide initiative to develop and implement an advanced global-computing network designed to analyse, process and distribute massive amounts of data far in excess of that capable by current World Wide Web standards. Known as the DATAGRID and regarded as the precursor to the next-generation Internet, it will revolutionize our ability to access and manipulate vast amounts of information.

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