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The **World Wide Web (WWW)**, commonly known as **the Web**, is an information system where documents and other web resources are identified by Uniform Resource Locators (URLs, such as *https://www.example.com/*), which may be interlinked by hypertext, and are accessible over the Internet. The resources of the WWW are transferred via the Hypertext Transfer Protocol (HTTP) and may be accessed by users by a software application called a *web browser* and are published by a software application called a *web server*.

Tim Berners-Lee's vision of a global hyperlinked information system became a possibility by the second half of the 1980s. By 1985, the global Internet began to proliferate in Europe and the Domain Name System (upon which the Uniform Resource Locator is built) came into being. In 1988 the first direct IP connection between Europe and North America was made and Berners-Lee began to openly discuss the possibility of a web-like system at CERN.

While working at CERN, Berners-Lee became frustrated with the inefficiencies and difficulties posed by finding information stored on different computers. On March 12, 1989, he submitted a memorandum, titled "Information Management: A Proposal", to the management at CERN for a system called "Mesh" that referenced ENQUIRE, a database and software project he had built in 1980, which used the term "web" and described a more elaborate information management system based on links embedded as text: "Imagine, then, the references in this document all being associated with the network address of the thing to which they referred, so that while reading this document, you could skip to them with a click of the mouse." Such a system, he explained, could be referred to using one of the existing meanings of the word *hypertext*, a term that he says was coined in the 1950s. There is no reason, the proposal continues, why such hypertext links could not encompass multimedia documents including graphics, speech and video, so that Berners-Lee goes on to use the term *hypermedia*.

With help from his colleague and fellow hypertext enthusiast Robert Cailliau he published a more formal proposal on 12 November 1990 to build a "Hypertext project" called "WorldWideWeb" (one word) as a "web" of "hypertext documents" to be viewed by "browsers" using a client-server architecture. At this point HTML and HTTP had already been in development for about two months and the first Web server was about a month from completing its first successful test. This proposal estimated that a read-only web

would be developed within three months and that it would take six months to achieve "the creation of new links and new material by readers, [so that] authorship becomes universal" as well as "the automatic notification of a reader when new material of interest to him/her has become available". While the read-only goal was met, accessible authorship of web content took longer to mature, with the wiki concept, WebDAV, blogs, Web 2.0 and RSS/Atom.

The proposal was modelled after the SGML reader Dynatext by Electronic Book Technology, a spin-off from the Institute for Research in Information and Scholarship at Brown University. The Dynatext system, licensed by CERN, was a key player in the extension of SGML ISO 8879:1986 to Hypermedia within HyTime, but it was considered too expensive and had an inappropriate licensing policy for use in the general high energy physics community, namely a fee for each document and each document alteration.<sup>[citation needed]</sup> A NeXT Computer was used by Berners-Lee as the world's first web server and also to write the first web browser in 1990. By Christmas 1990, Berners-Lee had built all the tools necessary for a working Web: the first web browser (WorldWideWeb, which was a web editor as well) and the first web server. The first web site, which described the project itself, was published on 20 December 1990.

The first web page may be lost, but Paul Jones of UNC-Chapel Hill in North Carolina announced in May 2013 that Berners-Lee gave him what he says is the oldest known web page during a visit to UNC in 1991. Jones stored it on a magneto-optical drive and on his NeXT computer. On 6 August 1991, Berners-Lee published a short summary of the World Wide Web project on the newsgroup *alt.hypertext*. This date is sometimes confused with the public availability of the first web servers, which had occurred months earlier. As another example of such confusion, several news media reported that the first photo on the Web was published by Berners-Lee in 1992, an image of the CERN house band Les Horribles Cernettes taken by Silvano de Gennaro; Gennaro has disclaimed this story, writing that media were "totally distorting our words for the sake of cheap sensationalism".

The first server outside Europe was installed in Dec 1991 at the Stanford Linear Accelerator Center (SLAC) in Palo Alto, California, to host the SPIRES-HEP database. The underlying concept of hypertext originated in previous projects from the 1960s, such as the Hypertext Editing System (HES) at Brown University, Ted Nelson's Project Xanadu, and Douglas Engelbart's oN-Line System (NLS). Both Nelson and Engelbart were in turn inspired by Vannevar Bush's microfilm-based *memex*, which was described in the 1945 essay "As We May Think".

Berners-Lee's breakthrough was to marry hypertext to the Internet. In his book *Weaving The Web*, he explains that he had repeatedly suggested to members of *both* technical communities that a marriage between the two technologies was possible. But, when no one took up his invitation, he finally assumed the project himself. In the process, he developed three essential technologies:

- a system of globally unique identifiers for resources on the Web and elsewhere, the universal document identifier (UDI), later known as uniform resource locator (URL) and uniform resource identifier (URI);
- the publishing language Hypertext Markup Language (HTML);
- the Hypertext Transfer Protocol (HTTP).

The World Wide Web had several differences from other hypertext systems available at the time. The Web required only unidirectional links rather than bidirectional ones, making it possible for someone to link to another resource without action by the owner of that resource. It also significantly reduced the difficulty of implementing web servers and browsers (in comparison to earlier systems), but in turn presented the chronic problem of *link rot*. Unlike predecessors such as HyperCard, the World Wide Web was non-proprietary, making it possible to develop servers and clients independently and to add extensions without licensing restrictions. On 30 April 1993, CERN announced that the World Wide Web would be free to anyone, with no fees due. Coming two months after the announcement that the server implementation of the Gopher protocol was no longer free to use, this produced a rapid shift away from Gopher and toward the Web. An early popular web browser was ViolaWWW for Unix and the X Window System.

Historians generally agree that a turning point for the Web began with the 1993 introduction of Mosaic, a graphical web browser developed at the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign (NCSA-UIUC). The development was led by Marc Andreessen, while funding came from the US High-Performance Computing and Communications Initiative and the High Performance Computing Act of 1991, one of several computing developments initiated by US Senator Al Gore. Prior to the release of Mosaic, graphics were not commonly mixed with text in web pages, and the Web was less popular than older protocols such as Gopher and Wide Area Information Servers (WAIS). Mosaic's graphical user interface allowed the Web to become by far the most popular protocol on the Internet. The World Wide Web Consortium (W3C) was founded by Tim Berners-Lee after he left the European Organization for Nuclear Research (CERN) in October 1994. It was founded at the Massachusetts Institute of Technology Laboratory for Computer Science (MIT/LCS) with support from the Defense Advanced Research Projects Agency (DARPA), which had

pioneered the Internet; a year later, a second site was founded at INRIA (a French national computer research lab) with support from the European Commission DG InfSo; and in 1996, a third continental site was created in Japan at Keio University. By the end of 1994, the total number of websites was still relatively small, but many notable websites were already active that foreshadowed or inspired today's most popular services.

Connected by the Internet, other websites were created around the world. This motivated international standards development for protocols and formatting. Berners-Lee continued to stay involved in guiding the development of web standards, such as the markup languages to compose web pages and he advocated his vision of a Semantic Web. The World Wide Web enabled the spread of information over the Internet through an easy-to-use and flexible format. It thus played an important role in popularising use of the Internet. Although the two terms are sometimes conflated in popular use, *World Wide Web* is not synonymous with *Internet*. The Web is an information space containing hyperlinked documents and other resources, identified by their URIs. It is implemented as both client and server software using Internet protocols such as TCP/IP and HTTP.

Berners-Lee was knighted in 2004 by Queen Elizabeth II for "services to the global development of the Internet". He never patented his invention.

The terms *Internet* and *World Wide Web* are often used without much distinction. However, the two terms do not mean the same thing. The Internet is a global system of interconnected computer networks. In contrast, the World Wide Web is a global collection of documents and other resources, linked by hyperlinks and URIs. Web resources are accessed using HTTP or HTTPS, which are application-level Internet protocols that use the Internet's transport protocols.

Viewing a web page on the World Wide Web normally begins either by typing the URL of the page into a web browser, or by following a hyperlink to that page or resource. The web browser then initiates a series of background communication messages to fetch and display the requested page. In the 1990s, using a browser to view web pages—and to move from one web page to another through hyperlinks—came to be known as 'browsing,' 'web surfing' (after channel surfing), or 'navigating the Web'. Early studies of this new behaviour investigated user patterns in using web browsers. One study, for example, found five user patterns: exploratory surfing, window surfing, evolved surfing, bounded navigation and targeted navigation.

The following example demonstrates the functioning of a web browser when accessing a page at the URL <http://www.example.org/home.html>. The browser resolves the server

name of the URL (www.example.org) into an Internet Protocol address using the globally distributed Domain Name System (DNS). This lookup returns an IP address such as *203.0.113.4* or *2001:db8:2e::7334*. The browser then requests the resource by sending an HTTP request across the Internet to the computer at that address. It requests service from a specific TCP port number that is well known for the HTTP service, so that the receiving host can distinguish an HTTP request from other network protocols it may be servicing.