

# 1 The Revolution Of Web

## **Objective:**

This chapter covers basic concepts related to web, including the history of the web, the different stages of evolution of web etc.

## 1.1 Basic Terms:

There was a time when scholars and scientists used to travel miles in order to reach the public library which was the only repository of knowledge. The younger generation is smart enough to ask the question “Why don’t they Google it?” This is the 21<sup>st</sup> century we are talking about. The world today revolves around the web. But the dark side of this truth is that very few of us know what exactly is going on in the world of World Wide Web. So, let us try to understand the background of the web.

Following are some of the fundamental terms associated with the web:

### **World Wide Web:**

The World Wide Web (abbreviated as WWW or W3, commonly known as the Web) is a system of interlinked hypertext documents that are accessed via the Internet. With a web browser, one can view web pages that may contain text, images, videos, and other multimedia and navigate between them via hyperlinks.

### **Hyperlink:**

A hyperlink is the most basic building block of the World Wide Web. It is a link from one document, image, word, or web page, to another on the web.

### **Hypertext:**

In 1965, the term ‘hypertext’ was coined by Ted Nelson to denote a complex, changing and indeterminate file structure. Hypertext is defined as any block of content that includes hyperlinks to other documents, images, or multimedia content.

### **Hypertext Transfer Protocol:**

Hypertext Transfer Protocol, popularly abbreviated as HTTP, is the language that computers use to communicate hypertext documents over the Internet.

**Uniform Resource Locator:**

Uniform Resource Locator, popularly abbreviated as URL, is the global address of documents and other resources on the World Wide Web.

**Hypertext Markup Language:**

HTML is the abbreviated form of Hypertext Markup Language. It is a language used to create electronic documents, especially pages on the World Wide Web that contain connections called hyperlinks to other pages.

Every web page you see on the Internet contains HTML code that displays text / images in an easy to read format. Without HTML, a browser will not have any layout for the page and hence would display only plain text without formatting.

**Web Browser:**

A web browser (commonly referred to as a browser) is a software application for retrieving, presenting and traversing information resources on the World Wide Web.

**Web Server:**

A web server is any Internet server that responds to HTTP requests to deliver content and services. It can be either hardware or software.

**Internet:**

The internet is a single worldwide computer network that interconnects other computer networks on which end-user services, such as Web sites or data archives, are located. Thus, it enables the exchange of data and other information.

In response to the launch of Sputnik, the U.S. Defense Department established Advanced Research Projects Agency (ARPA), which eventually focused on computer networking and communication technology. So, ARPANET was originally an experiment conducted to determine how the US military could maintain communication in case of a possible nuclear strike. But later, ARPANET became a civilian experiment that connected university mainframe computers for academic purposes. The original ARPANET grew into the Internet. The internet was based on the idea that there would be multiple independent networks of rather arbitrary design, beginning with the ARPANET as the pioneering packet switching network. Today, the internet has grown into a storehouse of trillions of personal, government, and commercial computers that are connected together by cables and wireless signals.

**Web application:**

A web application is any application which resides on a server, but is meant to be used by humans. Web applications use web pages as the presentation layer. User interactivity (Graphic User Interface) is done through web pages, but the data is stored and (mostly) manipulated on the server.

Web pages can be static, dynamic or active:

**Static web pages –**

Static web pages contain the same pre-built content each time the page is loaded. Standard HTML pages are static web pages. They contain HTML code, which defines the structure and content of the web page. Each time an HTML page is loaded, it looks the same. You can find if a page is static or dynamic by looking at the page's file extension in the URL. If it is ".htm" or ".html," the page is probably static.

**Dynamic web pages –**

Dynamic implies changing or lively. A server-side dynamic web page is a web page whose construction is controlled by an application server, processing server-side scripts. Web pages, such as PHP, ASP and JSP pages are dynamic web pages. These pages contain «server-side» code, which allows the server to generate unique content each time the page is loaded. For example, the server may display the current time and date on the web page. Many dynamic pages use server-side code to access database and generate content from information stored in the database. Websites that generate web pages from database information are often called database-driven websites. If the file extension is ".php", ".asp" or ".jsp" then the page is most likely dynamic.

**Active pages –**

Active pages are more dynamic than "dynamic" web pages. Internal interaction takes place at the client-side itself and is not dependent on server for interaction.

**Web services:**

Web Services are server-based applications which may be accessed over the web via HTTP, but is meant primarily for interaction with other programs. Web services are application components or "libraries" which can be used by other applications. Once a web service is deployed, other applications can discover and invoke the deployed service.

**Note:**

People commonly think that Internet and 'WWW' are the same. But these are two different technologies that are partially related to each other.

The internet is a network of networks that connects millions of computers together globally, forming a network in which any computer can communicate with any other computer as long as they are connected to the Internet. The WWW is a way of accessing information over the medium of the Internet.

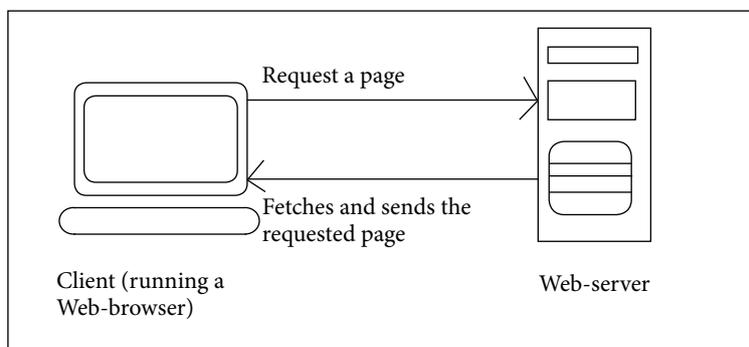
## 1.2 How it all happened

World Wide Web (WWW) was invented by Tim Berners-Lee, a British Computer scientist, in 1990. Prior to the invention of WWW, there came out a queue of technical inventions that eventually led to the invention of WWW.

In 1945, Vannevar Bush wrote in "Atlantic Monthly" about a memory extension called "Memex" which was a photo-electrical-mechanical device that linked documents on microfiche. In 1962, Doug Engelbart devised NLS i.e. an "online System" for browsing and editing information. In the process, he invented the computer mouse. And in 1965, Ted Nelson coined the term hypertext for a complex, changing, indeterminate file structure.

Tim Berners-Lee at CERN in Switzerland wrote software project called ENQUIRE. It was a simple hypertext program that had some of the same ideas as that of web and Semantic Web but was different in several important ways. Combining the work of Vannevar Bush, Ted Nelson and Doug Engelbart, Tim Berners-Lee wrote the Hypertext Transfer Protocol (HTTP). He also implemented a scheme for locating the documents. According to the scheme, every document was assigned a Universal Resource Locator, or URL that served as their address. By the end of 1990 Berners-Lee had written the first browser, or client program, for retrieving and viewing documents known as the www. The immediate two outcomes by Tim Berners-Lee, following the www, was the web server software and HTML. Placing all these components at the right place, in 1991, he made his www browser and web server software available on the Internet. This, in short, is the history of the 'www'.

## 1.2 Working of a Web server



**Figure 1.1:** Working of a web server

Let's take up a short example in order to understand the working of a web server. Assume that you want to visit Bookboon.com. So you type the URL corresponding to Bookboon.com in the address bar and press Enter key. No matter where in the world the requested page is, it pops up in front of you, on the screen, in fraction of seconds. This activity performed is a basic way to realize the working of a web. Explaining it in a sentence, one can say that the action is initiated by the client machine running a web browser by requesting a page. The server locates the page and sends it back to the client. Thus, responding to a request. Refer to figure 1.1.

## 1.4 Evolution of Web

Whenever I try to explain Semantic Web to my colleagues the first question that I get is – “Then, what is web 1.0?” Very few of us are aware of the evolutionary hierarchy. The web has gone through tremendous changes before getting the current form. Initially, let us try to understand the evolution of the web.

### Web 1.0

The initial form of web was Web 1.0. Web 1.0 was invented by Tim Berners-Lee. It was a read-only platform. Under the Web 1.0 philosophy, companies develop software applications that users can download but they can't see how the application works. For example, Netscape Navigator was a proprietary Web browser of the Web 1.0 era.

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Assume an online-dictionary. The purpose of it is to provide us with the meaning of a plethora of words. It has static data. The user can only use it to read but cannot contribute to it. This is the best example of Web 1.0. The drawback of Web 1.0 is that it represented a one-way communication where the users cannot contribute to the web. This forced the world to switch to Web 2.0.

## Web 2.0

The traditional Web 1.0 has recently undergone a transformation to become Web 2.0 where the focus is set on folksonomies and collective intelligence. Everything that is famous today in the world of web is Web 2.0. Starting from Facebook till YouTube, everything is Web 2.0. So in short, one can call the current web as Web 2.0. In Web 2.0, the users not only read information from the internet, but also provide information to the web through the internet to share with others. For example, in Facebook you are allowed to write your views, upload photographs and so on. The second generation of the World Wide Web is focused on the ability of people to collaborate and share information online. Web 2.0 is an interactive web. Hence it's called as the Read/Write web.

The characteristics of Web 2.0 are as follows:

- Ability to share views: Web users can contribute to Web 2.0. For example, using an online form, a visitor can add information to Amazon's pages that future visitors will be able to read.
- Using Web pages to link with people: Social networking sites like Facebook and MySpace are popular because they make it easy for users to find each other and keep in touch.
- Fast and efficient ways to share content: YouTube is the perfect example. A YouTube member can create a video and upload it to the site for others to view it.
- New ways to get information: We have countless number of news websites to find information. For example, Wikipedia gives detailed information about almost everything in the world.
- Expanding access to the Internet: Nowadays people access internet not only through computer, but also through mobiles, tablets etc.

Common characteristics of Web 2.0 applications:

- The content is influenced by the user.
- The contents are often generated by the user.
- Applications use the web as a platform.
- Popular trends of the current generation, including Facebook, Twitter, YouTube etc. are leveraged in Web 2.0.
- They include emerging web technologies including Ruby on Rails, RSS, API etc.
- Shareable and editable frameworks in the form of user-oriented to create your own APIs.

In current web, the data is presented in such a manner that it is only readable by human and not understandable by machine. So, experts suggested switching over to Web 3.0 in order to make contents machine understandable.

**Widgets:**

Widgets are small applications which people can insert into web pages by copying and embedding the widget's code into a web page's code. They can be games, news feeds, video players, etc. Some Internet prognosticators believe that Web 3.0 will let users combine widgets together to make mash-ups by just clicking and dragging a couple of icons into a box on a web page. For example, if you want an application that shows you where news stories are happening then just combine news feed icon with a Google Earth icon and Web 3.0 will do the rest.

**Web 3.0**

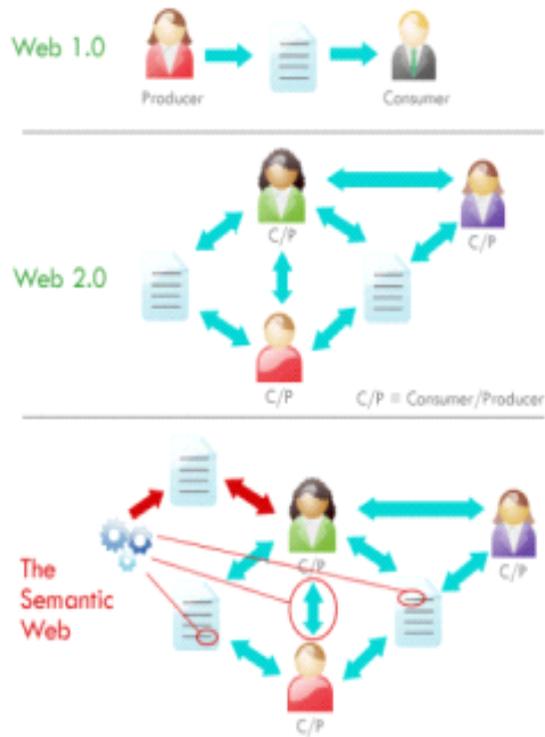
Web 3.0 is a Read, Write and Execute web. Web 3.0 is popularly called as the Semantic Web. Some even presume Web 3.0 as a combination of Web 2.0 and Semantic Web. The www has drastically improved access to digitally stored information. However, content in the www has so far only been machine-readable but not machine-understandable. Information in the www is mostly represented in natural language; the available documents are only fully understandable by human beings. The Semantic Web is based on the content-oriented description of digital documents with standardized vocabularies that provide machine understandable semantics. It is the “executable” phase of World Wide Web with dynamic applications, interactive services, and “machine-to-machine” interaction. Web 3.0 is a Semantic Web which refers to the future. In Web 3.0, computers can interpret information like humans and intelligently generate and distribute useful content tailored to the needs of users.

Web 3.0 can be characterized as follows:

- It has linked data or hyper-data, where data objects are linked to other data objects (similar to how web pages are linked today)
- It has large hyper-data datasets such as DBpedia (a community effort to extract structured information from Wikipedia and make the information available on the Web)
- A query language for hyper-data capable of treating the entire web as a single data center, called SPARQL is needed.
- It is the so-called “Internet of Things” where billions of non-human entities (including houses, cars and appliances) generate and publish their own hyper-data.

If semantics is the study of meaning, think of Web 3.0 as the meaningful web. Very broadly, things on the Internet will be described with descriptor languages, so that computers can understand what they are. Computers will be able to make use of data residing inside web pages. So when you're searching for something, a person, a restaurant, a hotel, the machine goes into its vast network of meaningful linked data, creates connections for you, and suggests useful links that your human mind could never have come up with. At warp speed!

The Web lasagna ends up looking more like this :



**Figure 1.2:** Comparing the Webs  
Image source: Fredrik Martin

**Conclusion:**

Have you ever wondered how Google pulls out information? Is the web really intelligent enough to communicate our demands with it? As far as the current scenario is concerned the answer is a big – No. It is this, disability of the web that is being overcome in the next generation web i.e. Web 3.0. Unlike Web 2.0 which focuses on people, Web 3.0 focuses on machines. In short, to explain in just one sentence, web is being made intelligent in order to understand the user demands and serve them better.