

A Novel Overview and Evolution of World Wide Web: Comparison from Web 1.0 to Web 3.0

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Abstract

The World Wide Web today is the promising reusable resource of web data for all kinds of domain. The web users, academicians, researchers, and developers are searching, gathering, and executing millions of web queries retrieving (download) and fetching (upload) the hypertext from the web. This is the universal leading information hub and it has excellent progress since its beginning. This paper explores the overview of background, evolution of the WWW and its comparative emerging trends from web 1.0 to web 4.0. Web 1.0 (Static) as a Web of Information Connections, Web 2.0 (Social) as a Web of People Connections, Web 3.0 (Semantic) as a Web of Knowledge Connections and Web 4.0 (WebOS) as a Web of Intelligence Connections are described as four generations of Web.

Keywords

Web, Web 1.0, Web 2.0, Web 3.0, Web 4.0, Static, Social, Semantic, Intelligence.

1. Introduction

In today's professional world of extreme competition on the e-business front, information exchange and efficient communication is the need of the day. The web is an increasingly important and excellent reusable resource in many aspects of human life: education, research, science and technology, e-government, e-commerce, e-health care, entertainment, and more. The web is an arrangement of interlinked, hypertext documents accessed via the Internet. With a web browser, a user views web page that may contain text, images, audio, and videos, flash navigation between them using hyperlinks and it also supports MIME (Multipurpose Internet Mail Extensions).

The World Wide Web ("WWW" or simply known as "Web") is a global information medium in which the web users can read and write by using computers/laptops/smart phones must be connected to the Web. The term is often used as a synonym for the Internet itself. Web is the largest reusable and re-transformable information hub. Web was created in 1989 by Tim Berners-Lee, working at CERN (Center for European Organization for Nuclear Research) in Geneva, Switzerland. Since, Berners-Lee has played an active role in guiding the development of web standards (such as the markup languages in which web pages are formulated and composed) [1]. The excellent progress has been made about the www, with its related technologies like web and open source in the past two decades. Web 1.0 as a Web of Information Connections, Web 2.0 as a Web of People Connections, Web 3.0 as a Web of Knowledge Connections and Web 4.0 as a Web of Intelligence Connections.

Web 1.0 (also called as "Static Web") is the first generation of the World Wide Web in this era web users could think that Netscape was the contender for the computers. According to Tim Berners-Lee, he could be considered as read-only web and also as a system of cognition [2]. Web 1.0 began as an information place for businesses to broadcast their sophisticated information to people. The early web provided a limited user interactions

or content contributions and particularly allowed to search the information and read it from browsers [3] (Heart of the Internet). Eg. Mosaic, Netscape, Opera, and Internet Explorer.

Web 2.0 (also known as "Social / Dynamic Web") was defined by Mr. Dale Dougherty in 2004 as a read and write web [4]. In this era of web users are come to realize that is not the software, it enables the web matters so much as the services that are delivered over the Internet. The web 2.0 technologies allow assembling and managing global hosting service providers with common interests in social networking interactions. Eg. Orkut, Facebook etc.

Web 3.0 (acknowledged as "Semantic Web") desires to decrease human efforts and decisions putdown to machines by providing machine-readable content on the web [5]. Semantic web is included two main stages:

- Semantic Technologies
- Social Computing Environment

The stage one represents open standards that can be applied on top of the web. The second stage allows human-machine co-operations and organizing a large number of the social web communities [6] and semantic search engines. Eg. Swoogle [7]

Web 4.0 ("WebOS") as a read-write-execution (r-w-x) concurrency web with intelligent interactions, but there is no exact definition for it. Web 4.0 is also known as Symbiotic Web [8] in which human mind and machines can interaction in WebOS [9].

The following pictorial representations will showcase of Figure 1: Visualization of Web, fig. 2, Transmission of Web [10] and fig. 3, Evolution of Web [11].

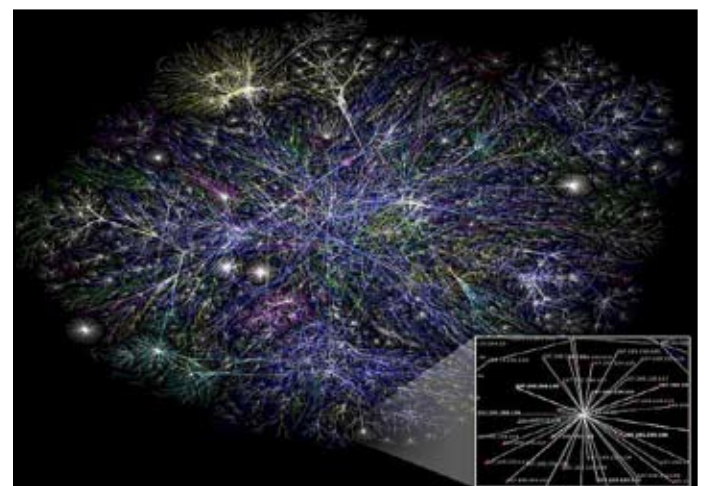


Fig. 1: Visualization of Web

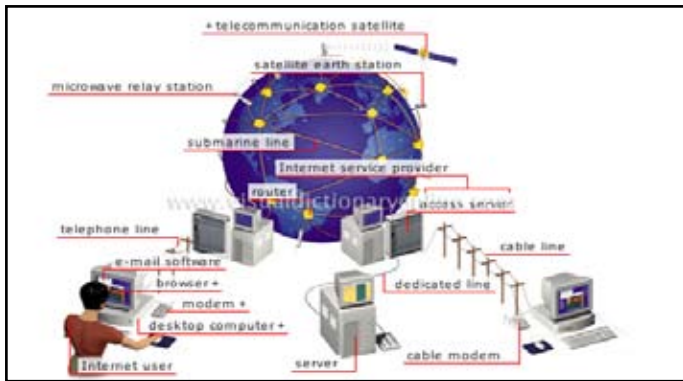


Fig. 2: Transmission of Web

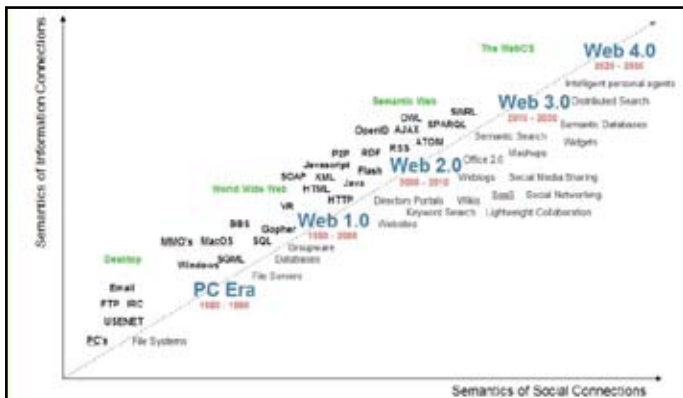


Fig. 3: Evolution of Web

II. Web 1.0

The Father of Internet, Tim Burners-Lee suggested and created a global hypertext space in any network permitted to access information would be referred by a single Universal Document Identifier (UDI). The goal behind the web was to create a common information space in which web users to communicate by sharing information [12]. In this context the web 1.0, a few website creators are created web pages / websites for a large number of readers for specific purpose or thing. As a result, netizens will get information by going directly to the particular web source (URL). The Web 1.0 is a process of interlinked, hypertext documents accessed via the Internet. The first implementation of the web represents the web 1.0, according to Burners-Lee, he could be considered as “read-only web.”

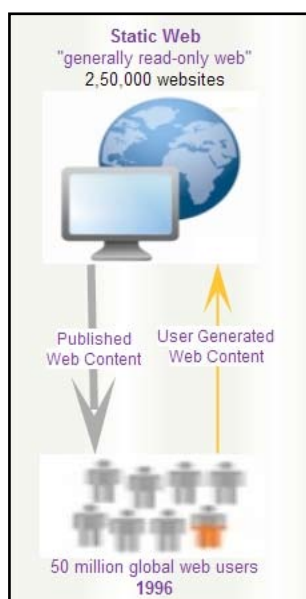


Fig. 4: Web 1.0 - Web of Information Connections

In other words, the early web allowed searching for information and read it. This is simply user interaction and content contribution. However, it is exactly what most website owners wanted. Their goal for a website was to host on web and on-line presence and makes their information available to anyone at any time [13]. Web 1.0 was static and to some extent “mono-directional”. Businesses could provide web catalogs or web brochures to present their productions using the web and netizens could read them and contacted with the businesses. The websites included static HTML pages that updated infrequently. These websites are not interactive and really as a brochure-ware. Users and visitors of the websites could only visit the web sites without any impacts or contributions and inter-linking their website taxonomy was too weak. The core protocols used for web 1.0 are HTTP, HTML and URI.

III. Web 2.0

The ability to contribute web content and interact with other web users has dramatically changed in the landscape of the World Wide Web in a short span of time. Web Technologies such as web logs (blogs), social book marking, wikis, podcasts, RSS feeds (and other forms of many-to-many publishing), social media software, Web APIs, and on-line web services such as eBay and Gmail provide enhancements over static websites. Stephen Fry (actor, author, and broadcaster) describes Web 2.0 as “An idea in people’s heads rather than a reality. Behind his idea that the reciprocity between the user and the provider is what’s emphasized. In other words, genuine interactivity, if you like, simply because people can upload as well as download” [14].

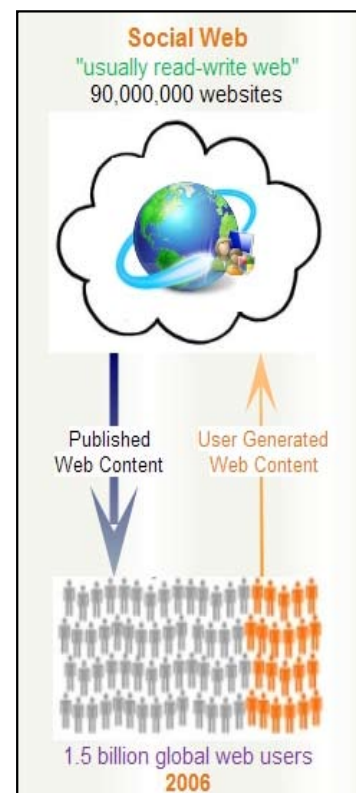


Fig. 5: Web 2.0 - Web of People Connections

Tim O'Reilly popularized web2.0 as an expression when he wrote a fairly coherent definition. Web 2.0 is definitely the next big thing in the WWW. It makes use of latest technologies and concepts in order to make the web user experience more interactive, useful and interconnecting. It has brought yet another way to interconnect with web world by means of collecting information and allowing

it to be shared affectively. It definitely has a bright future with so many Web 2.0 based websites coming up. It is a revolution in the field of computers science (academics) and information technology (industry) and will definitely accomplished future greater success.

According to some web sources, like Wikipedia, the free web encyclopedia, it is defined as web 2.0 is a term often applied to a perceived ongoing transition of the WWW from a collection of websites to a full-fledged computing platform serving web applications to end users. Ultimately web 2.0 services are expected to replace desktop computing applications for many purposes [15].

IV. Web 3.0

The basic idea of web 3.0 is to define structure of web data and links in order to improve more effective discovery, automation, integration, and reuse across various applications [16-17]. Web 3.0 tries to link, integrate, and analyze web data from various web datasets to obtain new information stream. It is able to improve web data management, support accessibility of mobile internet, simulate creativity and innovation, encourage factors of globalization phenomena, and enhance users satisfaction and help to organize collaboration in social web.

Web 3.0 is a term that has been coined to describe the evolution of Web usage and interaction it includes transforming the Web into a web database. Web 3.0 is an era in which it will upgrade the back-end of the Web, after a decade of focus on the front-end (Web 2.0 has mainly about AJAX, content with photo tagging, and other front-end tools with user experience innovations.) In which it provides us with a guarantee that indistinct web-versioning classification is keep on enhancing. By extending Tim Berners-Lee's explanations, the Web 3.0 would be something similar to a "read-write-execute (r-w-x)" web. Web 3.0 is defined as the creation of high-quality web content and web services produced and gifted individuals using web 2.0 technologies as web enabling platforms [18].

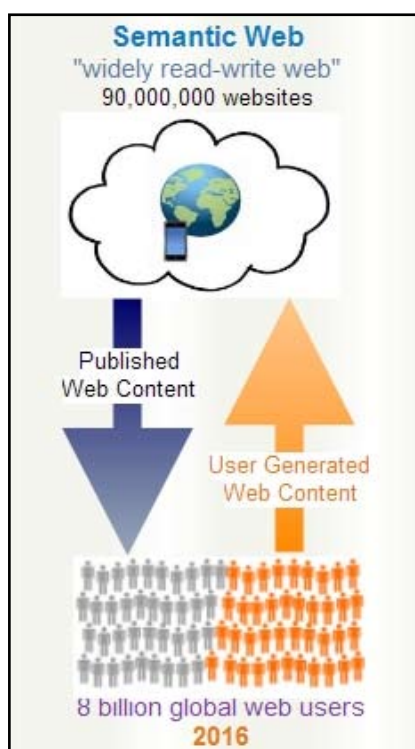


Fig. 6: Web 3.0 - Web of Knowledge Connections

Web 3.0 is a web where the concept of website or webpage disappears, where data isn't owned but as a substitute shared, where services show different views for the same web / the same web data. Those services can be applications (like browsers, virtual worlds or anything else), devices or other, and have to be focused on context and personalization, and both will be reached by using web search [19]. Tim Berners-Lee proposed a layered architecture for semantic web. He represented the following diagram, with many variations. Fig. 7, gives a classic representation of this diagram [20]. The layers of the semantic web architecture are briefly described as follows:

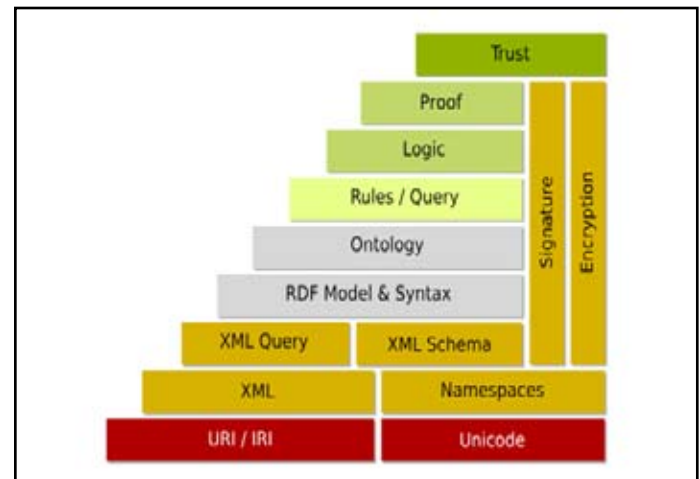


Fig. 7: Semantic Web Layered Architecture

A. Unicode and URI

Unicode is used to represent any character uniquely whatever character was written in any language and Uniform Resource Identifier (URI) are unique identifiers for resources of all types [21-22]. The functionality described as the provision of a unique identification mechanism within the language stack for the semantic web [23].

B. Extensible Markup Language

XML and its related XML standards, such as namespaces, vocabularies, and schemas are used to form a common means to structure data on the web without any communication between meanings of web data. XML is used as a base syntax for web technologies developed for the upper layers of the semantic web [24].

C. Resource Description Framework (RDF)

It is a simple data model used to URIs to identify web-based resources and describes relationships between the resources in terms of named properties and values. RDF supports interoperability at semantic level and to make logical inferences on metadata.

D. RDF Schema

It provides a predefined, basic type classification for RDF models. It describes classes and properties of the resources in the basic RDF model. RDF Schema also provides a simple reasoning framework to infer types of resources.

E. Ontology

The ontology layer described as properties and relationships between properties and different. Ontology can be defined as a collection of terms used to describe a specific domain with the ability of inference.

F. Logic and Proof

This layer is on top of the ontology structure to make new inferences by an automatic reasoning coordination. The agents are able to make deductions as to whether particular resources satisfy their requirements by using such the reasoning coordination [25].

G. Trust

The top layer of the stack addresses trust in order to provide assurances of quality of the information on the web and a degree of confidence in the resources are available.

Semantic web is not limited to publish web data on the web; it is about making hyper links to connect related web data. Berners-Lee introduced a set of rules have become known as the Linked Data Principles to publish and connect web data on the web in 2007 [25].

V. Web 4.0

Web 4.0 is still an underground idea in under- progress and there is no exact definition of how it could be defined. Some of the web sources mentioned Web 4.0 is known as Symbiotic Web.

The dream behind of the symbiotic web is interaction between humans and machines in symbiosis. It will be possible to build more powerful interfaces such as mind controlled interfaces using web 4.0. In simple words, machines would be intelligent on reading the contents of the web, and react in the form of executing and deciding what to execute first to load the websites fast with better-quality and performance and build more commanding user interfaces [26].

WebOS will be the read-write-execution concurrency web. It achieves a critical mass of participation in on-line networks that deliver global transparency, governance, distribution, participation, collaboration into key communities such as industry, political, social communities [27]. Web 4.0 or webOS will be such as a middleware in which will start functioning like an operating system [28]. The WebOS will be parallel to the human brain and implies a massive web of highly intelligent interactions [25].

Although there is no exact idea about web 4.0 and its technologies, but it is obvious that the web is moving towards using artificial intelligence to become as an intelligent web.

VI. Comparison

The Table 1 show comparative study of web.

Table 1: Comparison Between Web 1.0, Web 2.0 and Web 3.0

S.No	Web 1.0 (Static Web)	Web 2.0 (Social Web)	Web 3.0 (Semantic Web)
1.	1990 - 2000	2000-2010	2010-2020
2.	Tim Berners Lee	Tim O'Reilly	Tim Berners Lee
3.	Read Only Web	Read Write Web	Read Write and Execute
4.	Million of Users	Billion of Users	Trillion of Users
5.	Connect Information	Connect People	Connect Knowledge
6.	Ecosystem	Participation	Understanding Itself
7.	Information Sharing	User Interaction	User Engagement
8.	Hypertext/CGI Web	Community Web	Semantic Web (for machines)
9.	Companies Publish Content Eg.CNN-Media	People Publish Content Eg.Flickr, YouTube	People Build Applications Eg.Facebook, Google Maps
10.	Personal Web Sites	Web Blogs	Semantic Blogs: SemiBlog
11.	Content Management System (CMS)	Wikis, Wikipedia	Semantic Wikis: dbpedia, SemperWiki, Platypus,
12.	Search Engine: AltaVista, Google	Google Personalized App. drive, maps, haka	Semantic Search Engine: SWSE, Swoogle

VII. Conclusion

In this paper, we analyze and discussed an overview from the evolution of the web. Web 1.0, web 2.0, web 3.0 and web 4.0 are described as four generations of the World Wide Web. The web characteristics are graphically introduced, explained and compared. It is justified that web as a main center for information hub and has excellent progress since 1989 and it is moving towards using the artificial intelligent techniques with human intellectual communication and to be a very big and smart interactions in near future. The future work on this paper will focus on the fundamental and deeper exploration about the Semantic Web and Meta Web with heuristic techniques. The paper is expected to be a right information broacher or URL for those who are working, using and doing research in web and its related web technologies. We acknowledge the World Wide Web Consortium.

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