

Interactive Information Dissemination: Web 2.0 and Beyond

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Abstract

The World Wide Web is relying on many technologies to build rich interfaces and applications which enable enhanced interactions and social networking. With the emergence of Web 2.0 technologies, it has become easy to seek information interactively and making appointments effectively. Whilst the underlying technologies in Web 2.0 applications like JavaScript, XML, ASP.Net, PHP/Perl, MySQL, etc., are not new, the creative combination of these technologies gave the web a live and full interactivity for dealing with data. AJAX applications have received wide-spread attention as a new way to develop highly interactive web applications. Mashups enables web users to generate web applications that combine content from multiple sources, and provide them as unique services that suit their information needs. This paper explores the interactive web technologies such as AJAX, Mashups, Web Feed, RSS, Atom, Enterprise 2.0 and Web 3.0.

Keywords: Web 2.0, AJAX, Mashups, Web Feed, RSS, Atom, Enterprise 2.0, Web 3.0.

1. Introduction

The World Wide Web is revolutionizing the way that the users access information and interact with each other on the web. New web technologies, applications and utilities have sprung up and grown into more and more integrated interactive environments. The term “Web 2.0” was coined by O’Reilly Media in 2004 and refers to web applications which provide for online participation, collaboration, social networking and interaction [1]. Traditional web is a collection of static pages. The creation of contents is a task performed by experts and it is not so easy to have personal web pages or post personal content to the web. Traditional web applications centered all processing around client-server architecture. The biggest drawback with this system is that all interactions must pass through the server, which requires data to be sent to the server, the server to respond, and the page to be

reloaded on the client with the response. Web 2.0 is more interactive than its predecessor and permit part page updates. Whilst the underlying technologies in Web 2.0 applications like JavaScript, XML, ASP.Net, PHP/Perl, MySQL, etc., are not new, the creative combination of these technologies gave the web a live and full interactivity for dealing with data. With powerful technologies such as AJAX, it has become easy to create dynamic and interactive pages that are built by taking information from different sources into one single page, according to the user interests. The most widely used technologies of Web 2.0 are scripting and Cascading Style Sheets (CSS). Examples of Web 2.0 applications include blogs, wikis and popular systems such as Google Maps, FaceBook, MySpace, etc. Such applications are built using techniques such as AJAX, Mashups, etc. This paper explores the major interactive web technologies such as AJAX, Mashups, Web Feeds, RSS, Atom, Enterprise 2.0, and Web 3.0.



2. AJAX

AJAX (Asynchronous JavaScript and XML) is a method of building interactive web applications that allows content on web pages to update immediately when a user performs an action without forcing the user to wait for a new page to load. This term was first introduced by Jesse James Garrett in February 2005 [2]. Ajax combines several programming tools including JavaScript, dynamic HTML (DHTML), Extensible Markup Language (XML), Cascading Style Sheets, the Document Object Model (DOM), and the Microsoft object, XMLHttpRequest. Instead of viewing a web application as a sequence of mostly static HTML pages that are loaded in response to user interaction, the web 2.0 applications made extensive use of JavaScript inside a browser to create highly interactive applications. This is achieved by decoupling user's interaction with the web application and the web application's interaction with the server. Without Ajax, submitting information back to the server involves submitting the entire page back to the server and refreshing the entire page in the browser. But with Ajax, the entire page doesn't need to be submitted. In JavaScript the browser can make a request in the background to the server. When the JavaScript web request finishes it returns data to the browser, sometimes as XML [see Figure 1]. The intent is to make web pages feel more responsive by exchanging small amounts of data with the server behind the scenes, so that the entire web page does not have to be reloaded each time the user requests a change. This is intended to increase the web page's interactivity, speed, functionality, and usability. Applications created with Ajax use an engine that acts as an intermediary between a user's browser and the server from which it is requesting

information. Instead of loading a traditional web page, the user's browser loads the Ajax engine, which displays the page the user sees. The engine continues to run in the background, using JavaScript to communicate with the Web browser. User input or clicking on the page sends a JavaScript call to the Ajax engine, which can respond instantly in many cases. If the engine needs additional data, it requests it from the server, usually using XML, while it is simultaneously updating the page. Data retrieved using the technique is commonly formatted using XML, as reflected in the naming of the XMLHttpRequest object from which Ajax is derived [3].

For example, Google Maps allows user to zoom in and out and scroll the map in four directions very much like a desktop application. A weather forecasting site could display local conditions on one side of the page without delay after a user types in a zip code. Gmail uses AJAX for spell-check, auto save, new email check and other functions. In Google suggest suggestions are provided in real time as the user types the search query. Yahoo's Flickr and instant search use AJAX. In Flickr the text-editing and tagging interface uses it.

AJAX has certain benefits over desktop-based ones. These include a lower cost of deployment, easier support, shorter development times, and no installation. Web pages usually require several applications to function. This can make it seem like a cumbersome operation where users have to wait for the separate applications to refresh before interacting with the complete page. Decreasing user delay, which is a direct result of Ajax techniques, could make the Internet even more popular and pervasive. Another advantage of Ajax is a decrease in bandwidth use. Bandwidth in web hosting refers

to the amount of data that can be communicated between user and server/website. Ajax also allows programmers to separate methods and formatting for specific information delivery functions on the Web. AJAX is based on open standards supported by many browsers and platforms.

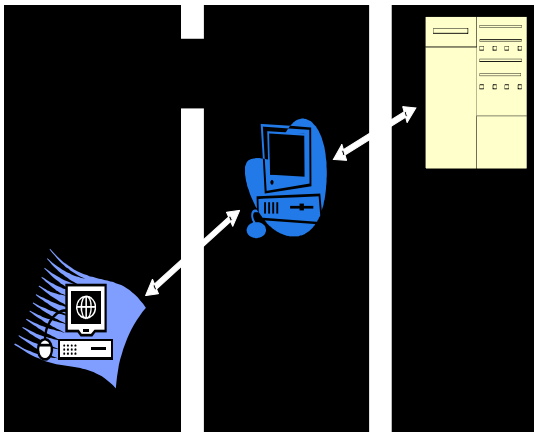


Figure 1 - AJAX Client-Server Architecture

While there are a number of advantages to using Ajax, there are also some disadvantages as well. Ajax relies on JavaScript, which is often implemented differently by different browsers or versions of a particular browser. Because of this, sites that use JavaScript may need to be tested in multiple browsers to check for compatibility issues. The page that is dynamically created will not automatically register with the history engine of the browser, so pressing the “back” button might allow them to get what they want. Since an AJAX application resides in a single page, there is sometimes no page to return to, or no page history to navigate resulting in unexpected outcomes for users [4]. While the URL fragment identifier has been useful in solving many of these problems, it is not a complete answer. Another area in which problems have occurred with Ajax is response time issues. When a whole page is

rendered, there is a short time in which the content on the page will be altered.

3. Mash-ups

A mashup is a web page or application that combines data and complementary elements from more than one source into an integrated experience [5]. Mashups draw upon content retrieved from external data sources to create entirely new and innovative services. The etymology of this term derives from its similar use in pop music, possibly from the practice of mixing two or more songs. Content used in mashups is typically sourced from a third party via a public interface or Application Programming Interfaces (API). Other methods of sourcing content for mashups include web feeds, web services and screen scraping. One of the big catalysts for the advent of mashups was Google’s introduction of its Google Maps. The first successful mash-up, Housing Map, used Google Maps with a list of available properties on the classifieds website Craigslist. These mashups are a coalescence of different data sources and APIs into an integrated end user experience [6]. Mashups are typically built using techniques like cutting and pasting snippets of Javascript, using feeds and XML to connect the various parts together, and even one-line Javascript inclusions that can pull in and integrate powerful external component, such as Google Maps or a YouTube video player, that originally required a massive investment from its creator. The emergence of photo hosting and social networking sites like Flickr with APIs that expose photo sharing has led to a variety of interesting mashups. Mashup designers can mash photos with other information that can be associated with the metadata. Search and shopping mashups have existed long before the term mashup was coined. Before the days of

Web APIs, comparative-shopping tools such as BizRate, PriceGrabber, and Google's Froogle used combinations of business-to-business technologies or screen-scraping to aggregate comparative price data. News sources have used syndication technologies like RSS and Atom to disseminate news feeds related to various topics. Syndication feed mashups can aggregate a user's feeds and present them over the web, creating a personalized newspaper that caters to the reader's particular interests.

4. Web Feed

A web feed is a data format used to provide end-users with frequently updated content such as blog entries, news headlines and podcasts. Content distributors syndicate a web feed, thereby allowing users to subscribe to it. Typically the feed comes from the same place as the website. However not all websites provide a feed. Sometimes third parties will read the website and create a feed for it by scraping it. News websites and blogs are common sources for web feeds, but feeds are also used to deliver structured information ranging from weather data to "top ten" lists of hit tunes to search results. Web feeds are designed to be machine-readable rather than human-readable, which tends to be a source of confusion when people first encounter web feeds. This means that web feeds can also be used to automatically transfer information from one website to another, without any human intervention. Making a collection of web feeds accessible in one spot is known as aggregation, which is performed by an Internet aggregator, such as Google Reader or Bloglines. In the typical scenario of using web feeds, a content provider publishes a feed link on their site which end users can register with aggregator program running on their own machines;

doing this is usually as simple as dragging the link from the web browser to the aggregator. When instructed, the aggregator asks all the servers in its feed list if they have new content; if so, the aggregator either makes a note of the new content or downloads it. Aggregators can be scheduled to check for new content periodically. The kinds of content delivered by a web feed are typically HTML or links to webpages and other kinds of digital media. Often when websites provide web feeds to notify users of content updates, they only include summaries in the web feed rather than the full content itself. More advanced methods of aggregating feeds are provided via WebTops that are based on AJAX coding techniques and XML components known as Web widgets. WebTops are personalized services which provide a roaming desktop that can host all of user's most common Web information such as emails, news, RSS/Atom feeds, Calendar, etc. Some modern web browsers incorporate aggregator features. Safari, Firefox, Internet Explorer 7.0, and many other web browsers allow receipts of feeds from the tool bar using Live Bookmarks, Favorites, and other techniques to integrate feed reading into a browser.



Figure 2 - Application of Web Feeds

A Feed Reader is required for using web feeds. This tool works like an automated e-mail program, but no e-mail address is needed. The user subscribes to a particular web feed, and thereafter receives updated

contents, every time updating takes place. When subscribing to a feed, users do not disclose their email address, so users are not increasing their exposure to threats associated with email: spam, viruses, phishing, and identity theft. If users want to stop receiving news, they do not have to send an “unsubscribe” request; users can simply remove the feed from their aggregator. The feed items are automatically “sorted” in the sense that each feed URL has its own sets of entries. Feed Readers may be online or offline. An offline web feed is downloaded to the user’s system. Feed readers are used in personalized home page services like iGoogle or My Yahoo or My MSN to put content such as news, weather and stock quotes appear on the user’s personal page. Content from other sites can also be added to that personalized page, again using feeds.

5. RSS

RSS (Really Simple Syndication or Rich Site Summary, or RDF (Resource Description Framework) Site Summary) is an XML-based content-syndication protocol that allows web sites to share their content with other applications [7]. RSS allows the user to aggregate information from many different Internet sources such as e-mail, web logs, Usenet groups, news feeds, etc. RSS works in conjunction with XML code, which continuously checks the contents of a website for updates. If updates are found, they are broadcast to all the subscribers of the website through a feed. In this context, syndication implies that a website that wants to distribute content creates an RSS document and registers the document with an RSS publisher. An RSS-enabled client can then check the publisher’s feed for new content and react to it in an appropriate manner. RSS has been adopted to syndicate a wide variety of content, ranging from

news articles and headlines, wiki pages, project updates, and even audiovisual data such as radio programs. An RSS document, which is called a feed or web feed contains either a summary of content from an associated web site or the full text. RSS makes it possible for people to keep up with their favourite web sites in an automated manner that’s easier than checking them manually. RSS feeds contain news headlines and content summaries. The content summaries contain just enough information without overwhelming the reader with superfluous details [8]. If the reader is interested and wants additional information they can click on the item in the feed, accessing the website which contains additional details. RSS content can be read using software called an RSS reader, feed reader or an aggregator. The user subscribes to a feed by entering the feed’s link into the reader or by clicking an RSS icon in a browser that initiates the subscription process. The reader checks the user’s subscribed feeds regularly for new content, downloading any updates that it finds. RSS readers aggregate multiple feeds, making it easy for individuals to quickly scan information contained within each feed. RSS is a great supplemental communication method that does not burden the publisher with maintaining lists or following strict privacy guidelines. Publishers no longer need to be concerned with spam, privacy policies, and age guidelines. According to feedster.com (a search and indexing engine for RSS feeds) more than sixteen million RSS feeds are available in the web including more than 75000 professionally published sources such as the BBC, CNN and The New York Times [9].

Many blogs are catalogued in an RSS feed, with each blog entry summarized as a feed item. This makes it easy for visitors to scan blog posts for items of interest. Articles are often placed into feeds to alert readers when new articles and content are

available. Many forums now have add-ons that allow participants to receive forum posts via RSS. The RSS feeds often will show the latest discussion topics; if users are interested they simply click to enter the forum to participate in the discussion. As the topic is updated they will see new entries in the RSS feed. Schools, clubs and organizations will often use feeds to communicate meeting times, places and events that might be occurring. The RSS feeds are often used to publicize events, notify the community of schedule changes or meeting agendas. Retail and online stores have begun using RSS feeds to deliver their latest specials and discounted offers. Some online retailers have taken this step further, allowing users to create their own feeds based on keywords or phrases. Companies or individuals interested in receiving headline news based on a specific brand or keyword can use RSS feeds to monitor news sources. Technical professionals in specific industries have also developed RSS feeds as way to market, promote or communicate within their specific industries. In many cases, this has expanded their reach and increased communication with current and prospective customers and clients. RSS feeds can be used by realtors to communicate the time and location for open houses, announce new property listings or promote decreased mortgage rates. Content feeds can also be used by universities to communicate sports scores or event schedules. Computer service professionals can create feeds to notify clients of potential security breaches, virus risks or outbreaks. Ultimately, RSS is molded to meet the communication needs of many sectors.

6. Atom

The name Atom applies to a pair of related standards. The Atom Syndication Format is an XML language

used for web feeds, while the Atom Publishing Protocol (APP or AtomPub) is a simple HTTP-based protocol for creating and updating web resources. Atom is a format quite similar to RSS. Atom is able to carry more complex information, and it is consistent across the syndication, storage, and editing of information. Atom is much more robust and feature rich than RSS. RSS requires descriptive fields such as title and link only in item breakdowns, Atom requires these things for both items and the full feed. Atom feeds provide an updated field, which means that any feeds that are modified have a timestamp associated with them. To provide a web feed, a site owner may use specialized software that publishes a list of recent articles or content in a standardized, machine-readable format. The feed can then be downloaded by web sites that syndicate content from the feed, or by feed reader programs that allow Internet users to subscribe to feeds and view their content. A feed contains entries, which may be headlines, full-text articles, excerpts, summaries, and/or links to content on a web site, along with various metadata. Web feeds are used by the weblog community to share the latest entries' headlines or their full text, and even attached multimedia files. These providers allow other websites to incorporate the weblog's syndicated headline or headline-and-short-summary feeds under various usage agreements. Atom and other web syndication formats are now used for many purposes, including journalism, marketing, bug-reports, or any other activity involving periodic updates or publications. Atom also provides a standardized way to export an entire blog, or parts of it, for backup or for importing into other blogging systems. Some websites let people choose between RSS or Atom formatted web feeds; others offer only RSS or only Atom. In particular, many blog and wiki sites offer their web

feeds in the Atom format. Client-side readers and aggregators may be designed as standalone programs or as extensions to existing programs like web browsers.

7. Enterprise 2.0

Enterprise 2.0 is the term for the technologies and business practices that liberate the workforce from the constraints of legacy communication and productivity tools like email. It provides business managers with access to the right information at the right time through a web of inter-connected applications, services and devices. The term was coined by Andrew McAfee of Harvard Business School in the Spring 2006. The Enterprise 2.0 term derives from Web 2.0 and is sometimes used to cover the introduction and implementation of social software within the enterprise, including those other than social software such as Rich Internet Applications (RIA), Software as Service (SaaS), and Web as a Platform (WaaS) and the social and organizational changes related to its use. Enterprise social software refers to social software used in enterprise (business) contexts. It includes social and networked modifications to company intranets and other classic software platforms used by large companies to organize their communication. In contrast to traditional enterprise software, which imposes structure prior to use, this generation of software tends to encourage use prior to providing structure. Enterprise 2.0 tools make it easier to share and organize information. Tagging and rating provide a straightforward way to find content and make judgments about what to look at. Blogs and wikis are natural collaboration and communication platforms. Social network tools help staff find the right individual or group of people. Enterprise 2.0 has the potential to provide knowledge and content management in a surprisingly cheap and easy fashion using Web-based tools.

Enterprise 2.0 takes the original concept of the web, using websites to feed content to visitors, and turns it upside down. Instead of a one-way conversation, Enterprise 2.0 lets implement a multiparty conversation to share information and manage knowledge inside and outside the organization using blogs and wikis, social networking and tagging, rating systems and the like. The link among these tools is the ability of the individuals involved to participate and to control the process while they work together, share information and create networks of people with similar interests. Enterprise 2.0 social networking capabilities can help organizations capture unstructured tacit knowledge as part of their Knowledge Management strategy.

8. Web 3.0

The World Wide Web is entering a new phase of evolution. During web 1.0 (traditional web) the focus was primarily on building the web, and making it accessible to users. The Web 1.0 is based on protocols such as HTTP, open standard markup languages such as HTML, Internet access through ISPs, web development platforms and tools, the creation of web sites, and the growth of key portals on the web. In those times, all client-side changes were the result of a server round-trip. Web 2.0 focuses on several major themes, including AJAX, Mashups social networking, lightweight collaboration, social bookmarking, media sharing, etc. While the innovations and practices of web 2.0 will continue to develop, they are not the final step in the evolution of the web [see Figure 3]. Web 3.0 is a term that is loosely used as a reference to the future of the web. Web 3.0 could mean many things, a web where the concept of website or webpage disappears, where data isn't owned but instead shared, where services show different views for the same web. Those services can be applications, devices or other, and have to be focused on context

and personalization, and both will be reached by using vertical search. Web 3.0 technologies may transform the web into a database, a move towards making content accessible by multiple non-browser applications, the leveraging of artificial intelligence technologies etc. The bandwidth will continue to improve to the point that loading web pages, even high definition video will be instantaneous. The virtual elimination of bandwidth restraints opens web developers to entirely new opportunities. Elements and experiences such as high definition graphics, 3-D animations and modeling, multi-player games and social networks, can all rise to new levels on an unlimited bandwidth Internet.

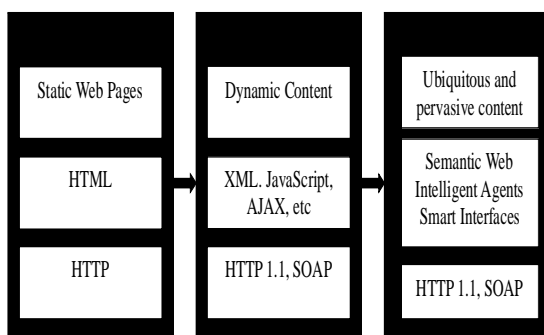


Figure 3 - Evolution of the Web from Web 1.0 to Web 3.0

Web 3.0 is something called the Semantic Web, a term coined by Tim Berners-Lee. The idea behind the Semantic Web is to provide data on the web in a universal format that can be interpreted by software agents. This makes all data easily searchable and ubiquitous. A universal format also allows the data to be presented in different formats and modalities [10]. Web 3.0 will lead to the blurring of that artificial wall between the web browser and the desktop, providing a full but secure integration with devices and services exposed by the operating system. The first step towards a web 3.0 is the emergence of 'The Data Web' as structured data records are published

to the web in reusable and remotely queryable formats, such as XML, RDF and microformats. The data web enables a new level of data integration and application interoperability, making data as openly accessible and linkable as web pages. In the data web phase, the focus is principally on making structured data available using RDF.

9. Conclusion

Web 2.0 brings interactive information dissemination and social networking. Web users are no longer satisfied with the traditional static html pages but want to create interactive, styled, rich text when creating comments, emails, and posts within social networking sites. Web 2.0 technologies transform a web user from a spectator to an active and interactive participant and allow a user to be active creator of content rather than passive consumer. It allows the user to share his thoughts on a particular piece. It has made it possible for the user to leave a comment and thus make his opinion known to the other users. Prior to the advent of Web 2.0, users mostly relied upon a single source of information. But now, one can get information from multiple sources. Web 2.0 has also made it possible to gather information interactively from various sources and personalize it according to the taste and preferences of individual users. The future web will be more interactive by pervasive and ubiquitous computing scenarios. Interactive access to information from the web will be as natural as looking at the time on our watch. Not only will the information be available for us to consult it, but sometimes it will also affect our environment without us even noticing. The future web will improve the quality of social interactions and the views, experiences, thoughts, comments of users will be easily exchanged.

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