# Boot the computers in 5$^{th}$ generation with WEB 2.0

*It was all about the hardware till 4$^{th}$ generation. Now the responsibility is more on Software to take computers to next generation. We have lived in this phase longer than earlier generations. The Era of publishing and posting is over and we are entering into the Participation Era. WEB 2.0 is here to help achieve that. Google has Ajaxified all services and exhibited the potential to world. But it is simply not about the technology; it is more about the intent where we see the road ahead. Tech experts have contributed their perception of web 2.0 in Internet computing.* This *white paper attempts to present my cognition that web 2.0 is the only way to take mankind to 5$^{th}$ generation of computing.*

## TOPICS

## 1. Development So far…

Lets have a peek into the history and see how Computer generations have evolved.

**First Generation** (1946-1956) Vacuum Tubes

When you are dealing with computers you need switches, which are either set to ON (=1) or OFF (=0). After the Second World War, the developers of computers turned to vacuum tubes to serve as ON/OFF switches to allow computation in binary code. Lee de Forest's vacuum tubes were first used for building radios.

**Second Generation** (1956-1964) Transistor

To have vacuum tubes handle ones and zeros makes for very bulky computers that needed to be cooled, and were difficult to maintain. A big step forward in computer technology was replacing the vacuum tubes with transistors.

**Third Generation** (1964-1970) Integrated Circuit

Hundreds or thousands of components such as transistors, diodes, and capacitors were hand-soldered together with wires. This was not only time-consuming but unreliable as well. Jack Kilby and Robert Noyce, independently developed the integrated circuit (IC) where the components and connections were edged directly onto the semi-conductor material.

**Fourth Generation** (1970-today) Microprocessor

Though integrated circuits were another big step forward in computer development, the chips had the key weakness that they were hardwired for specific jobs. It was Hoff who designed the first microprocessor (Intel 4004), The invention of microprocessors leads to the development of desktop computers.

## 2. Sub-phases of fourth generation

More than 30 years ago it started with Intel 4004 processor. Since then we had seen the processor speed doubling almost every 18 months. Now we get the P4 processor with 3 Ghz and 64 bit computing is putting its roots. Variety of Dual core processors will soon throttle the processing limits. But is this processor speed alone that will take human kind to next generation?

For more than three decades we had been living in fourth generation. This is the longest of generations we have ever lived. Was that the features of fifth generation were over estimated? Are these un-achievable? Even after good progress in microprocessors why are we very far from Fifth generation.

The point is, it is simply not about hardware this time. Hardware and Software combined only can achieve the Fifth generation. And how does software help achieving that? These are stages in which software can translate our experience. This at later stage is capable of taking decision for us.

> **Fifth Generation**
> Computing devices will be available based on these features.
>
> - Artificial Intelligence
> - Learn From Experiences
> - Take Human decisions
> - Natural Interaction language

- Store data/collect information
- Publish it
- Communicate to other
- Participate in cause
- Re-use participation experience
- Let Software take decision based on participation experience.

As we started the computing we stored office data in different forms to collect some meaningful information out of that so that we can take some intelligent decisions.

This information became very useful to variety of people and we started publishing initially by traditional means of print media and now we use electronic media.

Based on the published information we started expressing our views and communication channel opened for improvement.

Through electronic means participants exchange the views (debate, challenge, appreciate) across the globe in few seconds.

Based on electronic means of participation we are able to arrive at better decision, which gives more profit, revenue & business.

Replicating this automatic decision making electronically by re-using participation information is just beginning of fifth generation of computing.
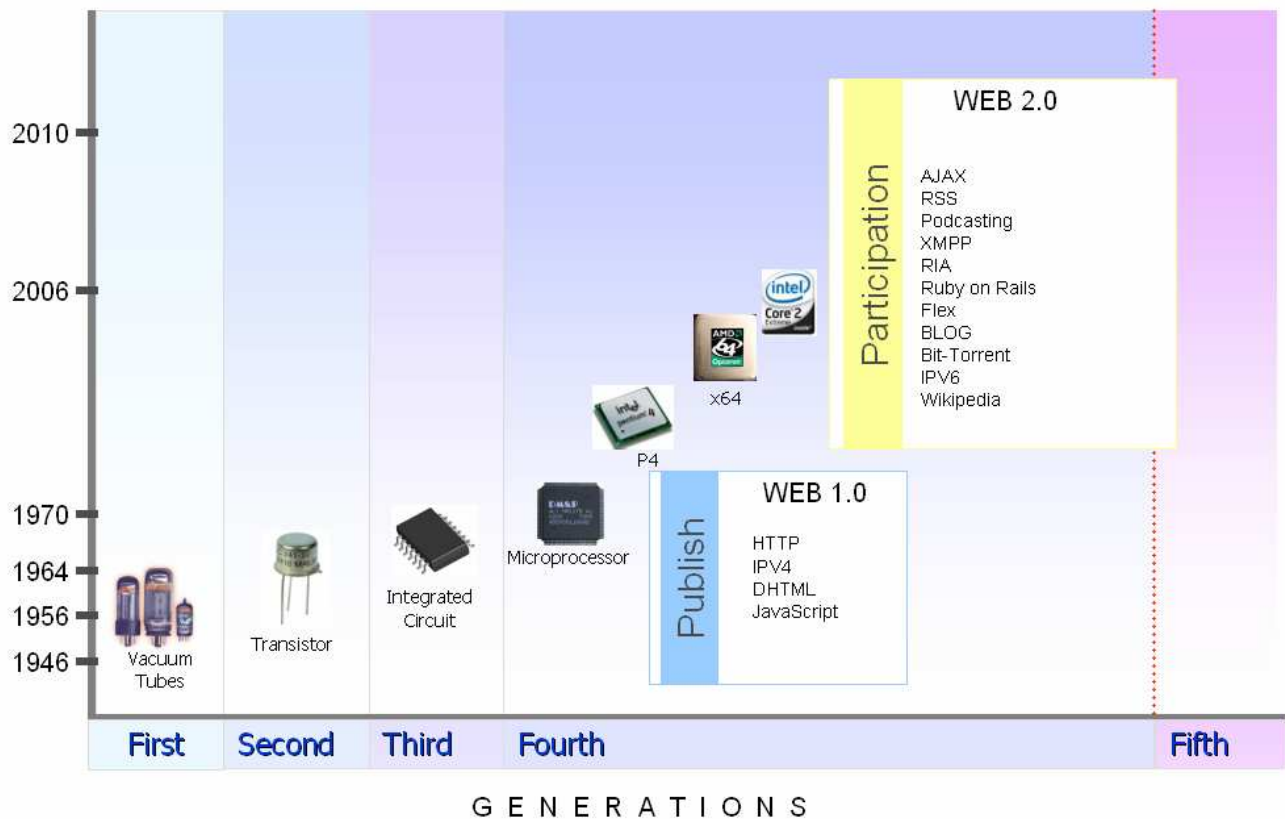
Enormous amount of Experience across the globe is getting archived centrally for taking better decisions. So far it is we who take these decisions, soon favorable decision will be taken by machine for us.
Web 1.0 Model starts with the invention of HTTP and other Internet protocols like IPV4, POP, SMTP and Telnet. Web 1.0 justifies the stage where information is being posted and published. DHTML and JavaScript are fair enough to perform this.

### 3. Crossing the border to be in Fifth Generation

There is more information being archived than made accessible, reasons being there are still digital rights issues necessary to resolve. The day digital rights are liberalized, this mammoth size information will be utilized for taking decisions.

There are plenty of new services coming everyday to support web 2.0 participation paradigm. Soon in few years this participation data will get converted in Experience. This appropriate experience collected for different conditions will become input for making automatic intelligent decision-making.

Web 2.0 technologies may not be used as 5th generation software. They will definitely evolve and provide seeds to 5th Generation technologies. Web 2.0 can be the software gap, which was missing in fourth generation to collect and re-use those experiences.

## 4. What is WEB 2.0

Tim O'Reilly originally keyed 'Web 2.0' term for presenting and projecting the growth of Web. World witnessed the dot com burst during the years 2000 and 2003. Far from having "crashed", the web was more important than ever, with exciting new applications and sites popping up with surprising regularity. What's more, the companies that had survived the collapse seemed to have some things in common. Could it be that the dot-com collapse marked some kind of turning point for the web, such phenomenon of web progress can be titled as "Web 2.0".

**Tim O'Reilly**

Tim O'Reilly is the founder and CEO of O'Reilly Media, thought by many to be the best computer book publisher in the world.

Lets look into the evolution of web, considering the technology breakthrough in these services.

| Web 1.0 | | Web 2.0 |
|---|---|---|
| DoubleClick | ➡ | Google AdSense |
| Ofoto | ➡ | Flickr |
| Akamai | ➡ | BitTorrent |
| mp3.com | ➡ | Napster |
| Britannica Online | ➡ | Wikipedia |
| Personal websites | ➡ | blogging |
| evite | ➡ | upcoming.org and EVDB |
| domain name speculation | ➡ | search engine optimization |
| page views | ➡ | cost per click |
| screen scraping | ➡ | web services |
| publishing | ➡ | participation |
| content management systems | ➡ | wikis |
| directories (taxonomy) | ➡ | tagging ("folksonomy") |
| stickiness | ➡ | syndication |

Following are list of few services, which are re-defining the user experience using the Web 2.0 techniques. You can find technology behind these services along with the details about the site in description.

http://www.wikipedia.org

Wikipedia started as open encyclopedia. Millions of users contribute information everyday. They not only contribute the latest updated information but also validate the existing information. Result is Wikipedia is considered reliable source of information as accurate as is Britannica Encyclopedia.

Google is limited to being the fastest relevant search engine. Google have pioneered the WEB 2.0 by introducing various technologies across its services.

   http://www.gmail.com

GMail provides more than 2GB of space to store the mails. Imagine searching such huge space for some keywords. Architecture and algorithm is key to provide this kind of service. Google holds Peta bytes of file system, which is used for various Google services. Extensive use of AJAX and other Web 2.0 technologies is done to give delighting user experience. Just try this, go to compose mail option in Gmail and see how the drop down comes with matching contacts when you press few keys in to or cc address box. Secret is this drop down is brought to you by making database request from central Gmail server in friction of seconds. This is what is called Web 2.0 experience.

   http://pages.google.com

Creating the web pages and maintaining them is always been cumbersome. Google gives page creator service to do page editing and publishing without any hassles. It is just like working with any word processor and that too online. Embedded frames and complex UI components work seamlessly to help you format and publish the information.

   http://maps.google.com

Google did the breakthrough by introducing scrollable maps with search results overlay objects. Nobody has ever attempted to provide the map of whole globe with no clicks. Just set your zoom level and browsing mode and you can scroll through the whole globe using the arrow keys. Asynchronous JavaScript requests go behind to bring new slice of image and updates the screen in milliseconds. It also gives precise longitude and latitude with satellite and hybrid type images.

   http://www.blogger.com

It is all about your personal thoughts and views. You can log your articles with dates and they simply get organized in chronological order.  No need to worry about publishing and web space requirement. You can have private Blog accessible to few. You can anonymously Blog and people will know you by your thoughts. You can post photographs and other media files. It is been observed that lot of legal cases has been settled through the secret information collected through Blogs. Participation is pampering the world economy.

http://www.google.com/analytics

Google Analytics tells you everything you want to know about how your visitors found you and how they interact with your site. You'll be able to focus your marketing resources on campaigns and initiatives that deliver ROI, and improve your site to convert more visitors. This service makes extensive use of latest Adobe flex technology with flash output. The result is very rich reports and graphs for you to take timely decisions for website performance.

http://www.frappr.com

Frappr is perfect example of re-using the web technology to give new type of services.  Frappr uses Google maps to project its own community data in very interesting way. You can build your own community group here and invite people across the globe to pin their location on world map with photographs and comments. Frappr have received appreciable response in short span of time from existing and new communities.

http://www.google.com/adsense
http://adworks.google.com

Google AdSense service is to display relevant Google ads on subscriber website's content pages and earn money. AdSense technology indexes the pages where relevant ad needs to be shown. These ads are presented when the user visits the subscriber's site through dynamic JavaScript code. Google AdWords is complimenting service to AdSense. Here vendors can choose the subscriber's sites or parameters where their ads should be presented to get maximum business. This is the very intelligent way to get perfect customer for your products. The same AdSense technology works along with GMail to show you relevant ads based on your mail contents without affecting your privacy.
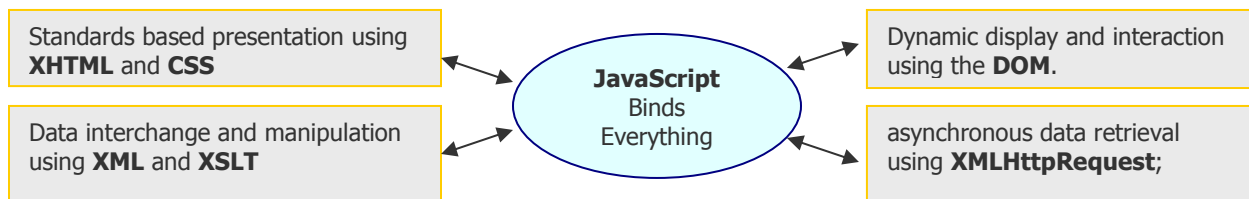
## 5. Empowering the participation Age.

Every online article is published with comment or feedback facility. There are people commenting on comments. They are debating, challenging, and appreciating the viewpoints. Online Forums help resolve issues and that same forum becomes archive of resolved issues. People are addicted to Blog everyday. They invite their friends and family members to comment about their viewpoint. People share experiences by uploading photographs online. Flickr is the newest service[1] with best way to store search, sort and share photos. Sun Java Enterprise Studio suggests developing software collaboratively, that's why they have bundled XMPP based messenger within the IDE. P2P tools like Napster, Gnutella or Bittorrent stretching the file sharing mechanisms to last limits. The whole philosophy of Web 2.0 is Participation and not simply posting or publishing. The quality of information improves with participation that gives a very un-imaginable decision making power to user.

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[1] One of the distinct features of Flickr is classification of images. It uses technique of Folksonomy where photos are classified using the Tags.

## 6. Technologies

There won't be one Technology responsible for Web 2.0 Implementation. There are going to be variety of technologies involved in developing rich user interface experiences. These are few of them, which are worth mentioning.

**AJAX:** AJAX stands for Asynchronous JavaScript and XML. This is not a technology in itself but it is an approach to using number of technologies together. These technologies can be HTML, XML, XSLT, XHTML, CSS, JavaScript, DOM model and the important of all XMLHttpRequestObject. Combined these technologies in AJAX model can create web interface with incremental updates without reloading the entire browser page. This makes application faster and responsive to user action.

| | | |
|---|---|---|
| Standards based presentation using **XHTML** and **CSS** | **JavaScript** Binds Everything | Dynamic display and interaction using the **DOM**. |
| Data interchange and manipulation using **XML** and **XSLT** | | asynchronous data retrieval using **XMLHttpRequest**; |

The code below slightly touches on JavaScript code implementation if any AJAX application.

Create the XMLHttpRequest object.
```
XMLHttpRequest request = new XMLHttpRequest();
```

Assign the call back function when server is ready to respond
```
request.onreadystatechange = nameOfTheFunction
```

Do the GET http request to URL and true means I am not waiting for response now.
```
request.open('GET', 'http://www.example.org/some.file', true)
```

**These are the areas where AJAX can improve the user experience**
- ❑ Verifying if USERID already exists
- ❑ Dynamic Drop downs.
- ❑ Background file upload.
- ❑ HTTP Chat
- ❑ Master Detail form.
- ❑ Updating the list
- ❑ Scrollable large images
- ❑ Auto updating Cricket Score board

Following diagram explains the difference between classic synchronous web application model and Asynchronous AJAX application model.
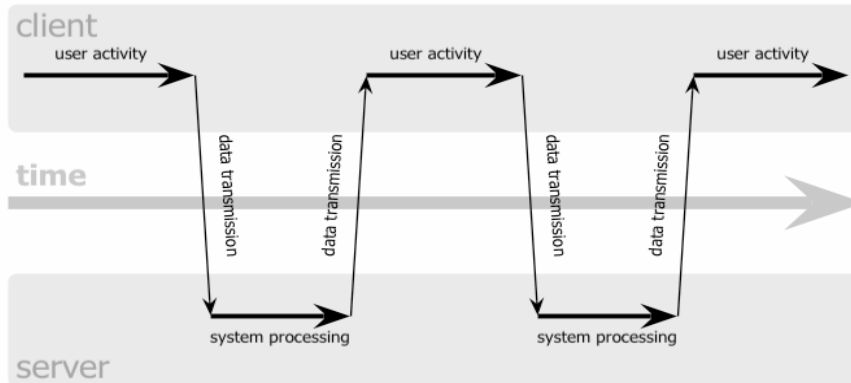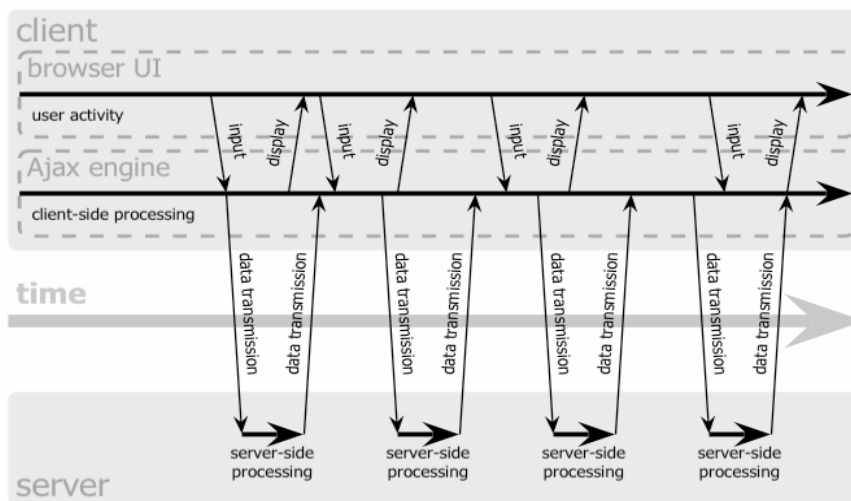


In synchronous model user have to submit the page for activity, where as in AJAX model the activity responses are updated in page without submission.

AJAX has evolved in last one year and stabilized on the compatibility issues across browser. You don't need to take care of compatibility issues for browser platforms. Re-usable AJAX frameworks simplify the long JavaScript code to few statements and also take care of browser compatibility.

Frameworks available:
- Prototype
- Dojo
- DWR
- Google Web Toolkit

**Flex:** Flex is Adobe product, which is competing the AJAX.
One who have created internet application for multiple browser will know what are the compatibility issues script writer goes through while programming for Internet Explorer, Mozilla and Safari (Mac). Considering Macromedia flash is available on more than 98% platform and there are 466+ million flash users on Internet. Flash becomes idea choice for presentation layer formatting and validation. Combined with Flex it gives full programming capability like AJAX. Flex is presentation-tier solution for delivering enterprise Rich Internet Applications. The Flex product line delivers a standards-based programming methodology and runtime services for developing and deploying the presentation tier of applications that combine the richness of the desktop with the reach of the web: Rich Internet Applications.

**Ruby on Rails:**
Rails is a full-stack framework for developing database-backed web applications according to the Model-View-Control pattern. From the Ajax in the view, to the request and response in the controller, to the domain model wrapping the database, Rails gives you a pure-Ruby development environment. To go live, all you need to add is a database and a web server.
Ruby on Rails framework supports faster, Simpler and development of web application in minimum steps. Framework is suitable to any small to large-scale enterprise. Rails framework work with good number of web servers and databases.

> **Ruby** is a reflective, object-oriented programming language. Its main implementation is Free software distributed under an open-source license. Ruby was created by created by Yukihiro "Matz" Matsumoto,

**RSS:** Really Simple Syndication
RSS is a format for syndicating news and the content of news-like sites, including major news sites like Wired, news-oriented community sites like Slashdot, and personal weblogs. But it's not just for news. Pretty much anything that can be broken down into discrete items can be syndicated via RSS. Sites that are compatible with RSS provide the feeds. Feed is a URL, which returns the xml type data in RSS format. RSS client tools can interpret this XML data. Sites capable of giving RSS output have links with these icons.

**XMPP**: **<xmpp/>** Extensible Messaging and Presence Protocol is the IETF's formalization of the base XML streaming protocols for instant messaging and presence developed within the Jabber community starting in 1999. Jabber was built to cater as Instant Messenger to Open Source Community. Today with various improvements and extensions XMPP is become de-facto standard for instant messaging. XMPP protocol is also embedded in Sun Enterprise Studio is an IDE which empowers the developer to co-ordinate and communicate other members on the same project. Google's Chat is also based on XMPP protocol. The best part is you even use this chat application by logging in to the GMail service from the browser. Google has created HTTP AJAX Bridge from browser to XMPP server.

**Podcasting:**

Podcasting is the method of distributing multimedia files, such as audio programs or music videos, over the Internet using the RSS syndication formats, for playback on mobile devices and personal computers. The word is coined from broadcasting and iPod. 'Adam curry' is a broadcasting and Internet personality. He realized the potential of offline audio broadcasting on iPod device using RSS mechanism of syndication. Client tool like ITunes or iPodder can be used to subscribe to RSS feeds for podcast. As and when there is new Podcast available by the site. This gets automatically downloaded on pc very much like Push technology. Concept is so powerful that agencies like BBC who have traditional means of news broadcasting found this technology very useful. It is very easy to find Podcast almost on any topic. There are plenty of Audio and Video cast available as a Tutorial, News, City tour etc. Few of my favorite are 'This week in Tech (TWIT)', Java posse, Ajaxian, This week in Palm, Go Digital.

**BitTorrent:**

BitTorrent is the name of a peer-to-peer (P2P) file distribution and file sharing protocol. Programmer Bram Cohen created BitTorrent protocol and compliant application. BitTorrent is designed to distribute large amounts of data widely without incurring the corresponding consumption in costly server and bandwidth resources. These days Huge Linux Distributions in the form of CD and DVD images are available for download with BitTorrent. There are plenty of tools based on BitTorrent protocol. Each Tool based on BitTorrent protocol does sophisticated calculation for upload and download of computer files. BitTorrent is the first P2P protocol getting momentum in legal distribution of Digital Media. Beginning this summer, Warner Bros. will allow people to legally download and view its titles by using BitTorrent file-sharing technology.

## 7. Conclusion

Some people believe Web 2.0 is marketing gimmick but if you see the statistics and facts developing in last 3 years this is the clear direction where every successful web application is moving. Web 2.0 is derived out of the experience of companies who had good business model and sustained through the bubble burst period. Web 2.0 is the pattern derived out of these companies for successful business. Every Web applications developed before 2003 have potential to be migrated to web 2.0 paradigm. Web 2.0 is the opportunity to learn from the patterns framed by successful companies.

Business models are changing. In last 20 years everybody looked Microsoft model of packaging the software and selling that. We are witnessing a paradigm shift where value moves in Software as a Service. In this age even if somebody gets access to Google or Amazon software, success of these companies just cannot be replicated. Their value is over unique hard-to-recreate data sources that get richer as more people use them. Success of these companies is not the result of simply software or technology but it is also the state of the art architecture, infrastructure and processes, which have fine-tuned during these years.

Concept of "release early and release often", has been changed into, "the perpetual beta," in which the product is developed in the open, with new features slipstreamed in on a monthly, weekly, or even daily basis.  It is revealed that Flickr deploys new builds upto every half hour. Resultant you see the Beta logo on these sites for years. User is treated like co-developer in this development cycle.

This shift from posting to Participation will generate huge intelligence database. Keyboard and mouse will not remain the only input devices. Faster processor speeds will make Voice Recognition technology acceptable on all the devices. Browser[2] will not be only Internet interaction point. Overall these changes will be the bootstrap instruction to computing and that day we'll boot our Computers in Fifth Generation.

2 iTunes, Bittorrent, Google Earth are not browsers but they provide the service through Internet.

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