Developing Your Website in HTML5

Google Inc. White Paper

November 28, 2012

Executive summary

HTML5 (HyperText Markup Language) is the next standard for HTML and XHTML. It aims to improve the markup language with support for the latest multimedia while keeping the language easily readable by people and consistently understood by computer devices, as well as by cross-platform mobile applications.

HTML5 plays an important role in website development. It introduces a number of new useful features and approaches, which will benefit website developers in four concrete ways:

1. With HTML5, website developers can create rich multimedia and graphics;
2. With HTML5, local storage allows access to a website when it is offline;
3. With HTML5, developing a website becomes easier;
4. With HTML5, web browsers become more secure.

Applying HTML5 does not directly ensure that website users will be converted and/or retained. However, the range of tools, which HTML5 offers, will definitely become instrumental in providing a memorable user experience. These tools can enable website developers to:

- Develop a website with functionality, speed, and performance of desktop applications,
- Increase usability and attractiveness of a website, and
- Enrich interaction of a website with its users.

There is no doubt that HTML5 will have a serious impact on the entire web in the future. First, HTML5 is a completely open standard with no royalties or certification processes required. Second, while HTML5 is still undergoing developments and changes, it is already:

- Supporting Safari, Opera, Google Chrome, and Firefox browsers; and
- Available on a multitude of platforms, which means that website developers can write the code once and use it across multiple platforms in many different markets.

Introduction

HTML5 (HyperText Markup Language) is a powerful markup language that can enable website developers to create visually attractive and highly interactive websites and applications (see figure 1).

Applying HTML5 does not directly ensure that website users will be converted and/or retained. However, the wide range of tools, which HTML5 offers, it will definitely become instrumental in providing a memorable user experience.

This paper is written for website developers and other professionals who are closely involved in web development in their work. The objective of the paper is to provide answers to the following questions about HTML5:

- What is HTML5?
- Why is HTML5 important?
- What is different about HTML5?
- What are the four key benefits when you develop your website in HTML5?

If you are not familiar with some technical terms, please refer to the Glossary on page 10.

What is HTML5?

HTML5 is the next standard for HTML and XHTML. It aims to improve the markup language with support for the latest multimedia while keeping the language easily readable by people and consistently understood by computer devices, as well as by cross-platform mobile applications.

HTML5 includes:

- The fifth revision of the HTML markup language,
- Cascade Style Sheets 3 (CSS3), and
- JavaScript applications.

Together, these technologies enable you to create complex applications that previously could be created only for desktop platforms.

Why is HTML5 Important?

HTML5 does not belong to a company or a specific browser. HTML5 is a completely open standard with no royalties or certification processes required. As it has been:

- Proposed by the Web Hypertext Application Technology Working Group (WHATWG),
- Founded by individuals of Apple, the Mozila Foundation and Opera Software,
- Forged by a consortium of technological leaders that includes Google, Microsoft, Apple, Mozilla, Facebook, IBM, HP, Adobe, and many others, and by a community of people interested in evolving the web.

It’s important to mention that while HTML5 is still undergoing developments and changes, it, however, is already:

- Supporting Safari, Opera, Google Chrome, and Firefox browsers;
- Available on a multitude of platforms, which means that you can develop the code once and use it across multiple platforms in many different markets.

HTML5 introduces many new useful features. The power of those features will enable you to:

- Develop websites with functionality, speed and performance of desktop applications,
- Increase usability and attractiveness of your websites,
- Enrich interaction with your websites users.

There is no doubt that HTML5 will have a serious impact on the entire web in the future.

“HTML5 is the future of the web, and developers who take advantage of the newest web technologies will be able to create a better user experience, better development tools and allow for rich applications,” says Google Developer Advocate Seth Ladd.

What is different about HTML5?

There are several new approaches in HTML5, where:

- - HTML5 has more descriptive markup elements;
- - HTML5 specifies scripting Application Programming Interfaces (APIs);
- - HTML5 handles errors in markup language.

HTML5 has more descriptive markup elements

HTML5 introduces replacements for common uses of generic block ( ) and inline () elements. For example:

<nav> (website navigation block),
<footer> (bottom of a web page or last lines of HTML code), or
<audio> and <video> instead of <object>.

Some elements from HTML4.01, including purely presentational elements such as <font> and , have been dropped.

Also, HTML5 syntax is no longer based on Standard Generalized Markup Language (SGML). It comes with a new introductory <!DOCTYPE html>, which triggers the standards-compliant rendering mode.

HTML5 specifies scripting Application Programming Interfaces (APIs)

Being built around web applications that can run on a browser and as a mobile application, HTML5 introduces a lot of new useful APIs for JavaScript and the Document Object Model (DOM).

Some of the new APIs and their brief description listed in Appendix 1 will give you an idea of how functionally capable your website may be, when it is developed in HTML5.

HTML5 handles errors in markup languages

The HTML5 specification does not just declare what browsers should do when they are processing well-formed markup language. For the first time, the specification also defines what browsers should do when they are dealing with badly formed documents.

An HTML5 (text/html) browser is flexible in handling incorrect syntax. With the intent that different compliant browsers produce the same result due to incorrect syntax, HTML5 is designed so that old browsers can safely ignore new HTML5 constructs.

What are the benefits when you develop your website in HTML5?

While you can enjoy many powerful benefits when you develop your website in HTML5, this paper will focus only on the four key benefits that enable you to develop a visually attractive and highly interactive website. The following benefits are:

1. With HTML5, you can create rich multimedia and graphics;
2. With HTML5, local storage allows access to a website when it is offline;
3. With HTML5, developing a website becomes easier;
4. With HTML5, web browsers become more secure.

With HTML5, you can create rich multimedia and graphics

Games, animations and visual effects play an important role in making a website visually attractive. With HTML5, the browser becomes one full-fledged platform for multimedia and graphics, so you will not have to rely on different platforms and extra plug-ins.

Some of the new important features of that platform are:

- **Media video and audio tags:** Media video and audio tags embed video and audio functions on a web page. They are fully programmable with JavaScript and are easy and flexible in usage through extensive access to media elements.

- **Canvas elements:** Canvas elements give an easy and straightforward way to draw graphics on a web page. For each canvas element you are able to use a "context", into which you can issue JavaScript commands and draw anything you want.
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- **APIs with drawing functionality:** While browsers can implement multiple canvas contexts, different APIs provide them with drawing functionality. For example, with the 2D canvas API, you can set the colours for rendering filled shapes and strokes; with canvas path you can draw custom shapes.

HTML5 multimedia and graphic techniques will let you create realistic compositions with artistic details like lightning, shadows, reflections and other textures for your website.

With HTML5, local storage allows access to a website when it is offline

"Data" and "Offline" are the two variables, which people usually do not associate together. Web developers have traditionally used cookies to store information on users' local machines and to allow a web page to read this information back at a later point.

While cookies are very useful for storing basic data, they are limited to no more than 20 cookies per web server and no more than 4KB of data per cookie (including both name and value).

In addition, a waist of resources happens when cookies are sent to the web server with an automatically loaded HyperText Transfer Protocol (HTTP) request.

With HTML5, a set of Local Storage APIs (Application cache, LocalStorage, SessionStorage, IndexedDB) let you create applications that work even when you are not connected. These APIs and File System allow you to:

- Store information on users' local machines,
- Check information at a later date,

- Access information at any point (even after the page has rendered) without an automatic HTTP request.

The APIs specification includes same-origin restrictions, which prevent websites from reading or changing data stored by other websites.

Users of a website will find it very helpful to have a working offline application reserve. Neither absence of Wi-Fi or 3G nor an intermittent or unreliable online connection will stop them from being productive or entertained.

Because HTML5 has more reliable storage options, including the ability to store client-side data temporarily in a real SQL database rather than to use cookies, there is a possibility to:

- Reload a web page that has been visited previously, even if users are temporarily offline;
- Download files greater then 1 GB in full or part for later offline viewing.

All developers want to create a very interactive and dynamic website that would promptly respond and allow users to enjoy its content. Loading speed plays a very important role in website performance and makes a website desirable for repeated visits and communication.

With HTML5, Offline APIs can also improve performance of loading time. They enable an application to:

- Quickly access locally stored data in the cache,
- Minimize the number of requests to the server,
- Make data persistent between a user session and page reloading.

With Offline APIs of HTML5, you can make your website respond faster to yours users' actions by:

- Caching pages that users are likely to click on, and
- Storing assets that users are likely to need in the next task or game level.

Even if you are not able to store assets beforehand, with new technologies, like Web Worker, you can run multiple processes in the background.

With HTML5, developing a website becomes easier

HTML5 offers the following qualitative advantages in developing a website:

- Code portability
- Single-Sourcing

Code portability

When developers create an application, they usually target Windows, Mac OS, Unix, Chrome OS, iOS, Android, BlackBerry OS, or Windows Mobile. Each of these platforms requires developers to master its Software Development Kit (SDK), tools and languages. Due to lack of time, developers choose to support only a couple of platforms, and so they miss potential users of other platforms.

HTML5 can simply let you target several devices with the least amount of effort. You can:

- Use the same technology stack across multiple platforms and devices, and

- Deploy an application faster and easily on a server by developing an application for a web browser than by developing native applications for a list of platforms.

Single-Sourcing

Whether the environment is a desktop runtime or on a browser, developers always come across a fragmentation issue.

With HTML5, a fragmentation is a relatively low barrier, because:

1) Browser producers make collaborative effort to minimize differences between modern browsers, and

2) The web has well-developed libraries, techniques and practices for handling differences between browsers.

With HTML5, you will have a single source technology stack that you can apply well for different browsers. You will not have to rewrite code from scratch and maintain separate code bases for devices on different platforms.

In addition, you can create applications for a single browser first, and then add layers of browser-specific tweaks expanding to reach the majority of devices.

With HTML5, web browsers become more secure

With HTML5, a modern browser and a user computer device on the client-side are designed to be more secure. A long list of the security features includes:

- Sandboxing,
- Multi-process architecture,
- Security features.

The sandbox aims to:

- Quarantine intrusted applications and data from the rest of the operating system; and
- Isolate application processes from other applications.

Web applications will be able to compute and perform tasks from a sandbox within the browser. However, it will be restricted from:

- Writing files on hard drives,
- Reading data from another web application or domain, and/or
- Writing data from another web application or domain.

While these operations will only be done through browsers, applications will only respond to communication requests by the browser. However, direct manipulation of binary data like music, images and video will still be possible with File System API.

Multi-process architecture makes the browser more secure, more stable, and better at garbage collection. Each application or tab of a website has:

- Its own rendering engine,
- A copy of global data structures, and

- An isolated process that is not shared, except under extreme load.

The separation of renders into low-privilege processes makes it difficult to develop a malware and take over the entire user account on the machine. Each application runs separately from other applications, so that when an application goes down, it cannot affect or interrupt tasks of other applications.

To protect their users, browser producers adopted the following **security features**:
- Safe Browsing API,
- Content Security Policy,
- Cross Site Scripting (XSS) filters.

Safe Browsing API checks URLs against Google's constantly updated blacklist of suspected malware pages, and warns users about clicking links to suspicious applications or websites.

Content Security Policy lets you define the resources that your website may use, and helps prevent intruders from randomly injecting scripts.

Cross Site Scripting (XSS) filters disable scripting on pages suspected of being a target of XSS attacks.

Conclusion

This paper introduced you to HTML5 and its four key benefits that you can enjoy when you develop your website. Those benefits are:
- With HTML5, you can create rich multimedia and graphics;
- With HTML5, local storage allows access to a website when it is offline;
- With HTML5, developing a website becomes easier;
- With HTML5, web browsers become more secure.

HTML5 is a promising developing tool for anyone who wants to develop a unique website with memorable user experience. Your website users will surely enjoy a lot of interesting features and a number of benefits which HTML5 has to offer.

Google Inc.
1600 Amphitheatre Parkway
Mountain View, CA 94043, USA
telephone: +1 650 253 0000
fax: +1 650 253 0001

Appendix 1

Some of the new HTML5 APIs and their brief description

- Application Cache API is a set of cached resources.
- DataTransfer API is used to expose the drag data store that underlies a drag-and-drop operation.
- History API provides a representation of the pages in the session history of browsing contexts.
- Clipboard API describes APIs for clipboard operations such as copy, cut and paste in web applications.
- Editing APIs define commands to edit HTML5 documents in programming.
- Web Messaging defines two mechanisms for communicating between browsing contexts in HTML documents.
- Web sockets API enables Web pages to use the WebSocket protocol for two-way communication with a remote host.
- Web storage API is used for persistent data storage of key-value pair data in Web clients.
- Web worker API allows developers to spawn background workers running scripts in parallel to their main page.

Glossary

Application programming interface (API): a specification used as an interface by software components to communicate with each other.

Canvas element: **a** part of HTML5 that allows dynamic, scriptable rendering of 2D shapes and bitmap images.

Cascading Style Sheets (CSS): a style sheet language used for describing presentation semantics (a look and a format) of a document written in a markup language.

Cross-platform mobile application: a software application designed to run on any smartphone, tablet computer and other mobile devices.

Desktop platforms: a software that provides a comprehensive computer user interface.

Document Object Model (DOM): an application programming interface (API) for HTML and XML documents to provides a structural representation of the document, enabling you to modify its content and visual presentation.

Generic block: a style of computer programming, in which algorithms are written in terms of *to-be-specified-later* types.

Hypertext Transfer Protocol (HTTP): an application protocol for distributed, collaborative, and hypermedia information systems.

JavaScript application: a scripting language implemented as part of a web browser in order to create enhanced user interfaces and dynamic websites.

Markup elements: individual semantic components that reflect typical usage of a website.

Markup language: a modern system for annotating a document in a way that is syntactically distinguishable from the text.

Sandbox: a computer securing virtual container in which untrusted programs can be safely run.

Scriptable rendering: a process of generating an image from a model or models in programming language, by means of computer programs.

Single sourcing: a practice that allows the same content to be used in different documents (deliverables) or in various formats.

Standard Generalized Markup Language (SGML): an ISO-standard technology for defining generalized markup languages for documents.

User interface: a space where interaction between humans and machines occurs.

Web browser: a software application for retrieving, presenting and traversing information resources on the World Wide Web.

2D Canvas Drawing API: a common programmatic interface to draw two-dimensional graphics on the Web.

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