The World-Wide Web as the Universal Interface to the NII[*]

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1 Introduction

In a time span of about five years, the World-Wide Web (WWW) [2] has become, next to electronic mail, the most popular Internet application. It has been a major contributor in turning the Internet from an obscure data network for scientists and computer programmers to a household word. The World-Wide Web allows to retrieve text and multimedia objects from servers located throughout the world, with objects connected by hypermedia links. This article aims to provide a snapshot of the World-Wide Web after about half a decade, speculating at the same time where this young medium might be improved and which directions it might take from a technical perspective. Particular attention will be paid to how WWW-derived technology might be used to allow non-specialists access to a wide variety of services.

WWW technologies have the potential to be the primary interface to the national information infrastructure, allowing every citizen to have access to information and communication resources

Any technology that is to serve as the primary interface to the NII has to allow information access at any time, from any location, at low cost, reliably, regardless of physical handicap, while respecting rights of privacy and information autonomy. Currently, the WWW is the only widely deployed technology that has the potential to satisfy these requirements, even though it currently falls short in many aspects. Strengths and limitations of WWW-related technologies are the subject of this note.

2 WWW Presentation

HTML as "lingua franca" of the web offers the advantage that it can not only be rendered on a video display, but also being spoken by text-to-speech engines or translated into Braille. This not only facilitates access for people with disabilities, but also makes web access by phone possible. Well-written HTML provides some information about structural properties of text, but has to fall short since it is called upon to deliver anything from interactive high-design on-line magazines (where it acts more like a simple user interface builder) to traditionally structured linear text. It is less clear how soon features which are not as commercially interesting, such as mathematics and multilingual text, will be widely available. Also, the increasing diversity of browser capabilities forces information providers to adapt their content to each individual browser type.

Tools are needed that allow a designer to create content, which is then automatically converted to both the "house style" and a "linear" style suitable for non-graphical rendition and content analysis. It remains to be seen whether stylesheets, currently being proposed, are going to be expressive enough to relieve the burden on HTML to serve as both structural and presentational markup. Support for additional meta headings to identify keywords, copyright owners and distinguish advertising from editorial content could be added easily.

The tendency to generate web pages dynamically, either on the server or through scripting languages executed at the client, greatly increases flexibility, but makes web indexing and caching difficult to impossible.

[*]Note: This article is based on [1].

Despite its rapid evolution, HTML allows for backward compability: newer browsers get a more exciting (and occasionally a more informative) presentation, but older, but users with less capable browsers get a large part of the actual information content. As browsers become embedded in special-purpose systems and less easy to upgrade to the next version, this graceful degradation of presentation will become ever more important.

3 WWW Interaction

The WWW model is rather limited: retrieve an object (text, audio or video) using the Hypertext Transfer Protocol (HTTP) and render it. Even with forms, the capabilities of a Web page are roughly that of a page-oriented mainframe terminal, with some graphics spice added. Some inherent capabilities of the web model are just being developed, in particular the ability to store and edit content on the server or annotate existing documents from within a browser. This could be quite useful for collaboration and for maintaining corporate information within intranets[1] and across fire walls, particularly once client authentication is better developed.

Client-side interaction is currently limited to filling out simple forms and clicking on buttons and bitmaps (so-called image maps). There are some efforts to provide more direct feedback to the user rather than having to fill out the whole form and then being told that some field is wrong or clicking on parts of a bit map without any feedback as to what, if anything, might happen. Client-side imagemaps store the coordinates of sensitive areas so that the browser can provide local feedback. Client-side scripts or applets can offer interactive help, correctness checks and richer user interfaces.

Any type of interactive games (often called "twitch" games) will likely bypass the web protocols completely, even though they might use it to locate services or partners to play with.

The web is "pull-only", that is, the browser has to explicitly check whether there is new content. There are some HTML extensions where the browser can be instructed to do this at preset intervals. Also, there are tools that gather a predefined set of pages for later (off-line) perusal, as well as services that regularly poll web pages for changes and then send electronic mail to the subscribers of this page. This works well only for pages that change infrequently and at predictable times. Having the server keep open the connection to the browser and pushing content ("server push") is another possibility being investigated, but incurs significant server overhead. An efficient, multi-destination hybrid between messaging (i.e., electronic mail) and WWW presentation is required.

4 Multimedia

The WWW currently has three methods to render audio and video: (1) transferring the whole file and displaying it with a helper application, (2) passing the data stream from the server to an application or (3) using a non-HTTP stream. The latter method is probably the most flexible, but standards for stream delivery (like RTP [3]) are only now taking root, with no accepted Internet standards for VCR-style controls. For acceptable quality, both means to adapt the media coding to the currently available bandwidth [4] as well as resource reservation [5] are needed. So-called plug-ins, browser extensions, allow multimedia data types to be part of web pages rather than appear as a separate window, but they often only support the most popular operating system platforms.

5 Collaboration

Web browsing is a solitary occupation. A visitor to a web page cannot see if there are other like-minded people reading the same page or interacting with the same 3D-world. There have been a number of proposals to create mutual awareness. For example, the *Virtual Places* [6] system allows web page visitors, represented by small image overlays on a custom browser, to communicate by typing and audio, with the ability to "guide" visitors from place to place. It is to be expected that reasonably soon, virtual reality modeling languages like VRML will be extended to allow audio-visual interaction with others. However, the traditional central-server model of web pages is not likely to scale well for large and heavily populated on-line "worlds". Also, systems that support both synchronous (simultaneous) and asynchronous (time offset) collaboration are still in their infancy.

[1] Intranets are networks within organizations that may or may not be connected to the Internet, but use some of the same technology and protocols.

6 Conclusion

In a few years, the WWW has evolved into the most prevalent network user interface, with a rich potential for additional capabilities beyond looking at static documents. Many of these capabilities are transitioning from research projects to standard features supported in commercial browsers, but in each case authoring and server support tools are required before they can become standard parts of the WWW experience. With these, both volume and niche applications that would have had to provide their own interface, ranging from configuring one's phone service to buying airline tickets or conducting financial transactions, can now build on a cross-platform technology and can concentrate on the domain-specific challenges.

References

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