[redacted]

h SGML had been adopted
vell defined as a computer
k from many people who
ad to explain that the only
y it had historically been
nonstrate the World Wide
Web program reading an HTML file and putting it on the screen in a fraction of a second before people were convinced.

Some people were intrigued, but many never accepted my argument. Rather than enter into useless debate, I simply forged ahead with HTML and showed the Web as much as possible. Robert and I held a few colloquia open to anyone in our divisions. We also told people about it at coffee. Occasionally, a group of people getting ready to do an experiment would call to say they were discussing their documentation system, and ask if I could come over and give them my thoughts about it. I'd meet a group of maybe twenty and show them the Web, and perhaps they wouldn't use it then, but the next time through they'd know about it and a new server would quietly come into being.

Meanwhile, Robert and I kept putting information on the info.cern.ch server, constantly upgrading the basic guide to newcomers on how to get onto the Web, with specifications and pointers to available software.

I continued to try to get other organizations to turn their hypertext systems into Web clients. I found out about a powerful SGML tool called Grif, developed by a research group at the French lab INRIA, which ran on Unix machines and PCs. A company by the same name, Grif, had since been spun off in nearby Grenoble, and I was hopeful its leaders would entertain the idea of developing a Web browser that could also edit. They had a beautiful and sophisticated hypertext editor; it would do graphics, it would do text in multiple fonts, it would display the SGML structure and the formatted document in two separate windows, and allow changes to be made in either. It was a perfect match.



The only thing missing was that it didn't run on the Internet. Same story.

I tried to persuade the people at Grif to add the software needed for sending and receiving files over the Internet, so their editor could become a Web browser, too. I told them I would give them the software outright; they would just have to hook it in. But they said the only way they would do that was if we could get the European Commission to fund the development. They didn't want to risk taking the time. I was extremely frustrated. There was a growing group of people who were excited about the possibilities of the World Wide Web, and here we had the technology for a true hypertext browser/editor mostly developed, and we couldn't bridge the gap. Getting Commission funding would have put eighteen months into the loop immediately. This mindset, I thought, was disappointingly different from the more American entrepreneurial attitude of developing something in the garage for fun and worrying about funding it when it worked!

In March 1991, I released the *WorldWideWeb* program to a limited number of CERN people who had NeXT computers. This would at least allow them to write their own hypertext and make the Web information that Robert and I were putting on info.cern.ch available to them.

Word spread within the high-energy physics community, furthered by the cross-pollinating influence of travel. In May 1991 Paul Kunz arrived for a visit from the Stanford Linear Accelerator (SLAC) in Palo Alto. Like me, he was an early NeXT enthusiast, and he had come to CERN to work on some common NeXT programs. Since he had the right computer, he was in a position to use the Web directly, and he loved it.

When Paul returned to SLAC he shared the Web with Louise Addis, the librarian who oversaw all the material produced by SLAC. She saw it as a godsend for their rather sophisticated but mainframe-bound library system, and a way to make SLAC's substantial internal catalogue of online documents available to

Andreessen and Clark had realized that browsers would rapidly become a commodity. NCSA had licensed the Mosaic code to other startups, and Microsoft was developing its own browser. Netscape couldn't hope to make its living from the browser market. What it could do was get its browser out before the others. If it was rapidly and widely accepted, then the company would have a platform from which to launch other products for which it would charge money. It would also bring millions of people to Netscape's home page—the default first screen when Navigator was opened. There, Netscape could display ads from companies that would pay to reach a large viewership. The site also would instantly notify browsers of Netscape's other services, which the company would charge for. Netscape also would charge companies for a commercial grade of the browser, which was more powerful, and for setting up and supporting a company's Web server.

In taking this position, Netscape was wisely acknowledging that on the Web, it was more profitable to be a service company than a software company. Andreessen and Clark may not have been completely clear on this at the beginning, though, because people who downloaded the browser were told that they could use it free for only three months. After that they were expected to pay, or they would be in violation of the licensing agreement. I didn't know what reaction Netscape was getting to this. I assumed that some people paid, but many did not, and simply downloaded the next version of the software, which also turned out to be free. Netscape allowed this to happen for fear of losing fans to other browsers, and as time went on its appeal for payment was minimized.

This approach set the tone for the Web companies that would follow: Release beta versions for review, which put a nascent software program in the hands of hundreds of professional and amateur users, who would (for free) send suggestions for improvements; give away basic software to get customers on





board; distribute the software fast and cheap over the Internet; then try to make money from the millions of visitors through ads or services.

On December 16, 1994, a third day in an incredible week, CERN announced major news. After negotiating for several years, the CERN Council had unanimously approved the construction of the Large Hadron Collider, a new accelerator. It would be the next leap toward investigating the even smaller scales of matter. I would soon learn, however, that to accomplish such a mammoth undertaking CERN would impose stringent budget conditions across the organization. No program that wasn't central to high-energy physics could be supported. That meant that CERN, regretfully, could not continue to support Web development, or the consortium.

In a way, it was probably in everybody's best interests for it to opt out. CERN, at its heart, had always concentrated on high-energy physics, and had never developed great experience with industry or a general policy about working with it. But I felt that CERN deserved the credit for letting me develop the Web, and for maintaining such a tremendously creative environment. Continued involvement in the consortium would have cemented its place in the Web's ongoing history. I would rather have seen the organization get a pat on the back than go quietly into the night. For his part, Robert would remain very involved with the Web community, by continuing to organize the annual WWW Conference series.

CERN's resignation left the consortium without a European base, but the solution was at hand. I had already visited the Institut National de Recherche en Informatique et en Automatique (INRIA), France's National Institute for Research in Computer Science and Control, at its site near Versailles. It had world-recognized expertise in communications: their Grenoble site had developed the hypertext browser/editor spun off as Grif that I had been so enamored with. Furthermore, I found that Jean-François

Abramatic and Gilles Kahn, two INRIA directors, understood perfectly well what I needed. INRIA became cohost of the consortium. Later, in early 1996, we would arrange that Vincent Quint and Irene Vatton, who had continued to develop Grif, would join the consortium staff. They would further develop the software, renamed Amaya, replacing Arena as the consortium's flagship browser/editor.

The whirlwind of events that had taken place in a mere seventy-two hours was exciting yet daunting. The consortium had to get moving with a sense of urgency if it was going to stay ahead of the large forces that were gathering.

I had to wait only two months for confirmation that the Web had become a global juggernaut. In February 1995 the annual meeting of the G7, the world's seven wealthiest nations, was held in Brussels. The world's governments were rapidly becoming aware of the technology's influence, and Michael Dertouzos, LCS's director, was invited to join the U.S. delegation there. As Michael describes in his book *What Will Be*, the keynote speaker was Thabo Mbeki, deputy president of South Africa. Mbeki delivered a profound speech on how people should seize the new technology to empower themselves; to keep themselves informed about the truth of their own economic, political, and cultural circumstances; and to give themselves a voice that all the world could hear. I could not have written a better mission statement for the World Wide Web.



CHAPTER 9

# Competition and Consensus

History often takes dramatic turns on events that, at the time, seem ordinary. Microsoft wanted to license Netscape's browser, buy a share of the company, and take a seat on Netscape's board. In return, Netscape would be the browser on Microsoft's Windows 95, an entirely new operating system, which would launch Netscape into the huge personal computer industry. But Jim Clark and Netscape's new CEO, Jim Barksdale, who had been hired to raise money and make deals, were wary. The proposal fell through, and Microsoft redoubled its efforts to offer its own browser.

Other deals, however, did go through, further shaping the competitive landscape. In April, Compaq announced that its new line of personal computers would come with Navigator—the first time a browser would be bundled directly with hardware.

programmers—completely public. This *open source* policy meant that anyone promoting a new technology could create their own version of Navigator for it. It meant that any student doing research or simply a class project could create his or her own versions of specific parts of the browser, and regenerate Navigator with his or her own ideas built in. It meant that anyone who was infuriated by a Navigator bug that Netscape didn't fix could fix it themselves, and send the fix to Netscape if they wanted, for future versions. The open release would allow thousands of people to improve Netscape's products. Microsoft was bigger than Netscape, but Netscape was hoping the Web community was bigger than Microsoft.

The Netscape and Microsoft stories made for dramatic reading, so they were the constant focus of the press. But they were only a small part of the Web story. By its nature, the work at the consortium took a much lower profile, but it stuck to the evolving technology. The Web is built on technical specifications and smooth software coordination among computers, and no marketing battle is going to advance either cause.

By the end of 1998 the consortium had produced a dozen Recommendations. W3C's technical strength was broader. There were more than three hundred commercial and academic members worldwide, including hardware and software vendors, telecommunications companies, content providers, corporate users, and government and academic entities. Advisory Committee meetings had moved from meeting rooms to a large auditorium, with questions coming from attendees standing at microphones posted in the aisles.

The consortium has learned how to let the outside world put pressure on a member that may not be acting in an open manner. We produce Recommendations—not Standards or regulations—and we have no way to require anybody to abide by them. But journalists can look at a company's statements about openness





and compliance, then check its newest product to see if the company is delivering on those promises. Vendors are driven by buyers, and buyers are largely driven by the press, which can lay into anybody it feels is playing a game. The consortium, the press, and the user community all work as part of a cycle that helps the public make reasonable judgments about how honest a company is being with them.

One of the major technical advances to come from the consortium is a simpler language to supersede SGML, called XML—the Extensible Markup Language. Like SGML, XML is a base for defining languages like HTML. Dan Connolly, a Web architect from early days, had an understanding of the SGML tradition. Jon Bosak came from a tradition of SGML in ISO committees but saw that the Web needed something cleaner. They formed the nucleus of what had seemed such a remote hope when Dale Dougherty had muttered, "We can change it," in that Edinburgh pub.

The XML revolution that followed has been greeted with great enthusiasm, even by the SGML community, since it keeps the principles of SGML in place. When Tim Bray, editor of the XML specification, waved it at the attendees at the WWW6 conference in April 1997, he was greeted with applause—because the spec was thin enough to wave. XML has gone on to become one of the most widely known of W3C's activities, and has spawned books, conferences, and a nascent XML software industry.

The consortium has also developed its own set of advanced Web tools, which we use to test proposed technology as it is brought to the group. It tries to use its limited resources to develop at the leading edge where others have not yet ventured. We can't do this all the time, but we have some pretty good minds at work, and good links with all the major companies and universities.

In 1996 we negotiated the right to the Grif code from INRIA and renamed it "Amaya." It is designed completely around the idea of interactively editing and browsing hypertext, rather than

simply processing raw incoming HTML so it can be displayed on the user's screen. Amaya can display a document, show a map of its structure, allow the viewer to edit it, and save it straight back to the Web server it came from. It is a great tool for developing new features, and for showing how features from various text-editing programs can be combined into one superior browser/editor, which will help people work together. I switched from AOLpress to Amaya.

One Web server we use is Apache. When NCSA was developing Mosaic, they called me at one point and asked if I would mind if they made a server. My policy, of course, was that I wanted as many people as possible writing Web software, so I said, "Of course, go right ahead." What they meant, but left unsaid, was that they'd be writing another server that would be competing for "market share" with the server I had written. But NCSA's subsequent development slowed down, so a bunch of people from all over the Net got together to create "patches" for NCSA's server, and the result, Apache, became a server in its own right. It was maintained by a distributed group of people on the frontier of Web development, very much in the Internet style. Apache to this day has a huge number of users, and is a powerful and flexible server system—again, a tremendous testimony to the whole idea of open-source software.

We use Apache as our main server that is accessible to the public. We use our open source "Jigsaw" server for collaborative editing of all kinds of documents, from W3C Recommendations to our meeting minutes. Jigsaw is a Java-based server, originally written for the consortium by Anselm Baird-Smith, a slight, enthusiastic French wizard who can write code at lightning speed. Anselm wrote Jigsaw initially as background exercise to help him get used to Java and HTTP. In the two months before he actually joined the consortium staff he had already rewritten it four times. Jigsaw allows members and staff to read and write documents back and forth, and to keep track of all changes



behind the scenes. Jigsaw has had great success as a development and test platform among the Java and HTTP cognoscenti, because the server is so flexible.

Written into the consortium's constitution is the stipulation that all the software it produces in support of its work be available to the public. This is a way of promoting recommendations, discussion, and experimentation. It allows anyone to join in the testing of new protocols, and allows new companies to rapidly get into the swing of Web software creation. All anyone has to do is go to the consortium's site, www.w3.org, and download these tools for themselves.

The consortium's world does sometimes fill up with politics—industrial and governmental. Companies occasionally make technical statements for commercial reasons. Marketers tamper with the facts and confuse the public as they fence with the others in the field. But underneath, the consortium's members are still pursuing exciting technological advances. Engineers move from company to company, sometimes with projects their employers are abandoning due to lack of understanding, sometimes leaving a trail of claims to their ideas made by each place where they worked. The web of life continues to grow in all this activity. And despite commercial pressures, the technical ideas, the consortium's principles, and the social motivations behind them continue to hold center stage.