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Who Won the Mosaic War?

Remember the Mosaic War? It was the hot topic of techie conversation a few years ago. The term hearkens back to the kinder and simpler era of Web antiquity (circa, 1994!). Like “navigator/browser,” “helper app” and “X-windows,” the term signifies a bygone era—the Web-gilded age every software developer believed they had a chance at market dominance and Web surfing was a favorite pastime. It might be useful at this point to see if we can identify winners and losers in this Mosaic War of old, especially if we could then anticipate the outcome of remaining hostilities. But first we wander down memory lane.

The Web was conceived by Tim Berners-Lee and his colleagues at CERN (now called the European Laboratory for Particle Physics) in 1989 as a shared information space supporting collaborative work. Berners-Lee defined HTTP and HTML at that time. As a proof of concept prototype, he developed the first Web client navigator-browser in

1990 for the NeXTStep platform. Nicola Pellow developed the first cross-platform Web browser in 1991 while Berners-Lee and Bernd Pollerman developed

the first server application—a phone book database. By 1992, the interest in the Web was sufficient to produce four additional browsers—Erwise, Midas, and Viola for X Windows, and Cello for Windows.

The following year, Marc Andreessen of the National Center for Supercomputer Application (NCSA) wrote Mosaic for X Windows which soon became the browser standard against which

all others would be compared. Andreessen went on to cofound Netscape Communications in 1994 whose current browser, Netscape Navigator, succeeded Mosaic as the next de facto standard Web browser. That’s when the Mosaic War started; aggressive and imaginative developers were trying to out-Mosaic Mosaic. The feverish pace of development was something to behold. Within months, literally dozens of new start-up companies appeared. By 1994 it appeared as if browser vendors would proliferate like wire coat hangers.

Fast forward to 1995 (see sidebar)—a turning point in the Mosaic War. By year’s end, Mosaic is basically out of the picture (see Figure 1) as a navigator/browser. It went from over 90% of the browser market to under 5% in just over two years. So the first major fatality in the Mosaic War was, ironically enough, Mosaic itself. Meanwhile, Netscape displaced Mosaic as the de facto standard within the same time frame and became the new de facto browser standard. By the end of 1995, spirited developers worldwide

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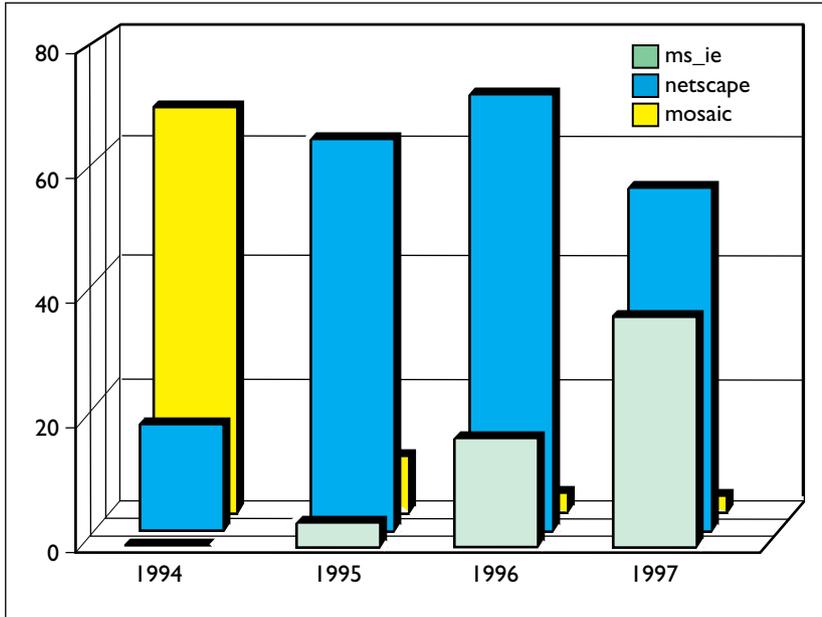
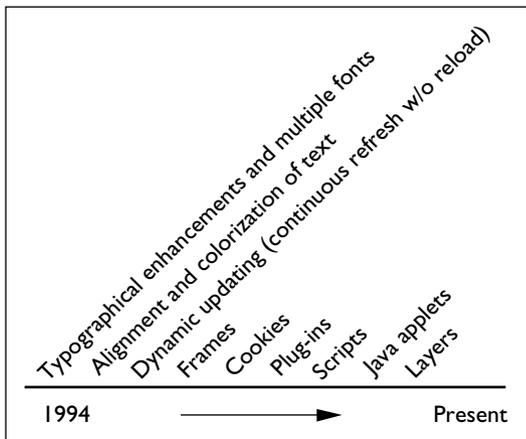


Figure 1. Browser by name and year

attempted to capture the half of the browser market that wasn't already Netscape's. By this time the Mosaic War became known as the "browser war" for obvious reasons.

So, in the end, Mosaic went the same way as Cello, Viola, Erwise, and Midas before it. These Web fatalities confirmed that the Web was highly unfor-

Table 1. Netscape extensions to browserdom, 1994 to present



giving of technology deficiencies. On the other hand, the big winner of the Mosaic War was clearly Netscape. Netscape's dominance was the result of a constant stream of innovations—much to the chagrin of the World Wide Web Consortium (www.w3c.org) and the Internet Engineering Task Force (www.ietf.org) which preferred to introduce innovations in an orderly and deliberative manner through their RFC's and standards committees. In any event, some of Netscape's more popular innovations appear in the Table 1.

Armed with imposing innovations from 1995–1997, Netscape appeared to be the clear victor in the browser war as well. However, two external factors changed

Netscape's future. First, the dominance of Windows as the OS of choice for the overwhelming majority of Web users (see Figure 2) provided a strong disincentive to developers of client-side software for other OS environments. As Windows rapidly became the dominant OS, Netscape's commitment to multiplatform development (approximately 20 platforms) became increasingly uneconomical. While the expenses of Web client development are basically constant across platforms, the potential revenue streams vary with the size of the customer bases (that is, the Windows market is approximately 20 times the size of the Mac and Unix markets, and hence potentially 20 times the revenue). The commitment to multiplatform development really hurt Netscape's overall competitiveness, since their main rival, Microsoft's Internet Explorer, chose to focus their development effort primarily on a single-platform.

The second major event that challenged Netscape's hegemony in the browser arena was Microsoft's combined marketing strategy to both provide Internet Explorer without charge, and bundle it with Windows OS. Not surprisingly, Netscape found that it is difficult to compete with products both seamlessly integrated into the OS and also free. This situation was not overlooked by the Department of Justice who recently brought an antitrust case to the U.S. Court of Appeals claiming Microsoft has used its OS dominance to achieve a monopoly in the browser market. Netscape has

since unbundled its browser, Navigator 5.x, from its groupware suite, Communicator, and has agreed to release and license the source code of Navigator to interested developers in a disparate attempt to keep their code alive.

Figures 1 and 2, taken together, show that Internet Explorer is doing to Netscape what Netscape did to Mosaic. There is an important difference, however. Netscape unseated Mosaic primarily through innovation, whereas Microsoft's successes are primarily due to its dominance of the OS market and its unrivaled marketing prowess (I assume few would claim mar-

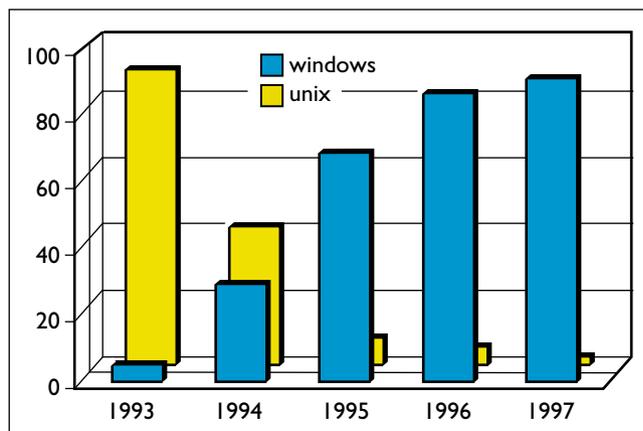


Figure 2. Primary platform—market share by year

trying to outflank each other on choices between Windows API vs. Swing Set interfaces, Visual Basic vs. Java scripting languages, dynamic HTML vs. pure HTML with Java document stan-

the true test of mastery over all things digital, because it will extend dominion beyond the general-purpose computing desktops to the special-purpose embedded applications around which our

BY THE TIME THE WINNERS OF THE DESKTOP WAR ARE identified, the embedded applications war will be in full swing.

quis, background sound, table colors and stationary backgrounds are strong representatives of IE innovation.). Failing intervention by the Federal Trade Commission, or successful antitrust litigation against Microsoft from the Department of Justice, it appears that history will repeat itself in the most recent incarnation of the browser war. It seems all but inevitable.

So what's next? The end of the browser war coincides with the beginning of the "desktop war." The stage is set: Goliath Microsoft will do battle with the Davids of client-side software development over compatibility with the full range of Windows applications. The war is heating up as I write, the major players

dards, Secure Sockets Layer vs. Java security model, ActiveX vs. CORBA middleware, and so forth. This fight is going to get nasty before its over (sometime around the turn of the millennium, I suspect). We're talking trench warfare here with digital nerve gas.

But the previous wars will pale in comparison to the ultimate bloodbath, over "embedded applications" in which the forces of good and evil will fight for supremacy over our thin Web clients: PDA's, televisions, appliances, automobiles, phones, games, smart cards and digital jewelry (that's right, Sun has already created a prototype of a Java ring (see www.javasoft.com). The embedded apps war will be

life is based. This topic is so new that developers are just now beginning to define their positions. By the time the winners of the desktop war are identified, the embedded applications war will be in full swing.

So, let's return to our original question: "Who Won the Mosaic War?" The answer is Netscape. However, as we've seen, this is a shallow victory for Netscape as it struggles to hang onto its leadership position in the client-side browser area. As the dust settles on the browser war, the apparent victor is Microsoft's Internet Explorer. However, like the Mosaic War, the outcome of the browser war may not have much strategic impact, because of its narrow scope. In terms of impact,

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the effect of the desktop war will be far more important. While Microsoft remains in the leadership position, the absence of widely accepted standards makes it possible for real innovation to surface. Smart money will probably bet on Microsoft to emerge victorious.

But even the desktop war won't by itself have the most effect on the world of network-

ing. That honor will go to the big war, the no holds barred, winner-take-all embedded applications war which will be fought over our televisions, air conditioners, and security systems. The embedded applications war will be the Bosnia of the Internet software development community and could easily lead to digital "ethnic cleansing" as developers scramble among chaos

for survivability. Unlike previous wars, the embedded applications war will be about lifestyle computing—control over the digital appliances we take for granted. I'll repeat what I said in 1995. These are exciting times! **C**

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Where Were You in Late 1995?

Well, among other things I was writing articles and columns on the Mosaic War. At that time, Windows 95 had just been released, and Microsoft's Internet Explorer remained in beta. Here are some of my past observations about a possible Microsoft "Web Monopoly." (For online references, see www.acm.org/~hbl/col-edit/cyberonautica/jan-feb96/pcai961.html and www1.acm.org:82/~hbl/publications/mosaic-wars/os2-mag.html.)

According to the most recent (at that time) Web user surveys, the client side of the Web changed from an almost exclusively Unix environment to a primarily Windows environment in just 18 months. The percentage of survey respondents who used Unix went from 88% in late 1993, to 44% in late 1994, to 9% by April, 1995. At the same time, the percentage of users who used Mosaic as a client navigator/browser went from 97% to 58% to 3%.

At that time, the distribution of host operating systems was 9% Unix, 26% Macintosh, and 52% Windows. Also at that time, the distribution of Web clients went roughly as follows (numbers are % of total):

IBM WebExplorer	1	NetCruiser	4
MacWeb	1	NCSA Mosaic for Unix	4
AIR_Mosaic(16bit)	2	PRODIGY-WB	27
Lynx	2	NCSA Mosaic	3
		Netscape	54

The question I asked is whether these numbers were worrisome.

There were some obvious trends identified in this data. For one, the OS prominence of Windows shows that the use of the Web was now in the hands of the hoi polloi. The high priests of Webdom who conceived of, and implemented, the Web represented an ever-shrinking fraction of its overall use.

Second, the domination of Windows in the enormous SOHO market gave it unparalleled advantage over other browser and OS vendors. I predicted that by mid-1996 it would be extremely difficult to compete in the Web browser arena because of the overwhelming control exercised by two products: Netscape and Microsoft's Internet Explorer, despite bravura performance from a variety of browser developers.

I predicted by 1997 it might be hard for even Netscape to retain market dominance. I suggested that it remains to be seen whether Netscape could leverage superior technology into a strong enough marketing position to withstand any attempt by Microsoft's to control the Web client markets as it had done with PC operating systems. I saw in the recent Department of Justice prosecutions of Microsoft a certain *deja vu*.

As I said in back in 1995: "This will be an interesting year for the Web."