

237. In other words, a middleware provider has the best of both worlds— competing with the underlying operating system while at the same time taking advantage of system services provided by the operating system. In particular:

- Compatibility is less of an issue for middleware because it can use the underlying services of the host operating system for running older applications, for providing services missing in the middleware layer, and for dealing with devices like video cards, sound cards, printers, scanners and CD-ROM drives.
- A middleware provider can be selective about which areas of functionality it offers. At first, it can restrict itself to a narrow set of functions, thereby reducing its development burden. Over time, however, the middleware provider can broaden the set of functionality it provides.
- Moore's Law works in favor of middleware. In the past, personal computers did not have sufficient resources to host the underlying operating system, middleware, and applications. With the fast processors and huge memories available today even on cheap machines, this is no longer an issue.

238. There have been many examples of middleware layers over the years, such as the X-Windows software initially developed at MIT, the Motif software from OSF, the Open GL graphics software developed by Silicon Graphics, the SAA initiative and CICS software developed by IBM, the Taligent frameworks developed jointly by Apple and IBM, the Appware initiative from Novell and IBM's Notes software of the 1990s. In some cases, these initiatives also promised to provide middleware that ran on multiple operating systems and, in so doing, supposedly offered developers more systems across which to leverage their efforts.

239. Microsoft has to compete with many of these middleware products in order to prevent its operating systems from being rendered irrelevant. Jim Manzi, then CEO of Lotus, was referring to this possibility when he remarked that middleware could

reduce Windows to “the visual equivalent of a C:\ prompt” (a reference to the fact that MS-DOS, which lacked a graphical user interface, is now obsolete).

240. I now will turn to three specific forms of middleware that exist today and provide significant competition to Windows: Java, Netscape’s Web browsing software, and IBM’s Lotus Notes/Domino software.

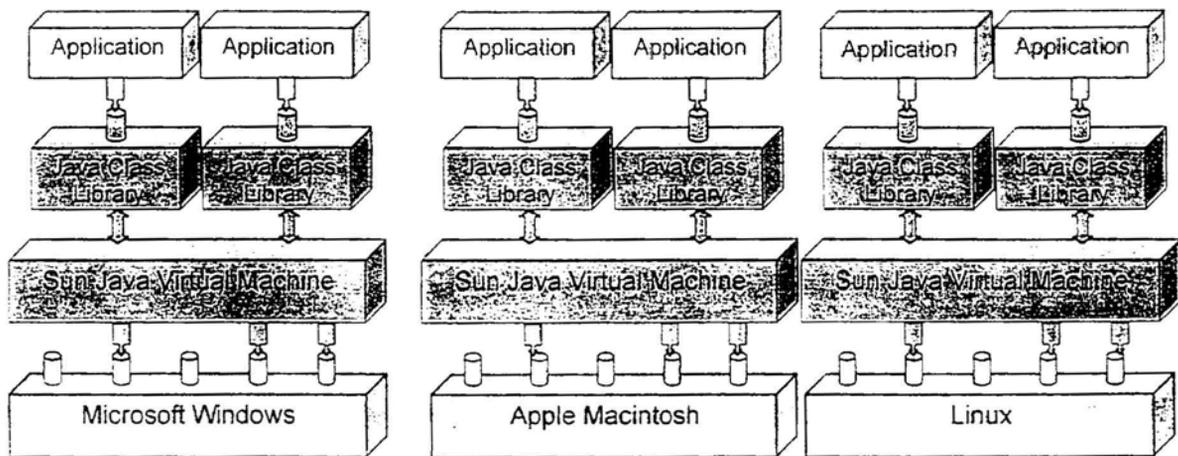
*1. Java*

241. Microsoft today faces serious competition from a middleware approach being heavily promoted by Sun. Sun has enlisted other large companies such as IBM, Oracle and Netscape in this effort. Sun’s approach revolves around the Java programming language and related technologies.

242. The term Java is often used to refer to three related but distinct concepts: (i) a software programming language that offers a number of advantages over C++ (from which it is derived), (ii) a set of services (the “virtual machine”) for programs compiled into a format called “Java bytecodes,” and (iii) a set of middleware programs written in the Java language, collectively called “Java class libraries.” Microsoft competes with Sun and others in software relating to all three uses of the term “Java.”

243. Although its marketing hype has exceeded its ability to deliver the necessary technology, Sun hopes to develop a middleware suite of programs written in the Java language that will run across *all* operating systems, rendering today’s operating systems less valuable. In other words, Sun’s stated strategy is to develop middleware technology that will provide all the system services that software developers need to create the kind of rich, full-featured software available for Windows today. If successful, software developers could write programs to run on Sun’s technology, and neither

Windows nor any other operating system would provide significant value to customers. In that scenario, the new Sun technology would become the one and only relevant computer platform, replacing Windows, the various versions of UNIX and the variety of other operating systems that exist today. Figure 3 below depicts this scenario.



**Figure 3: Sun's Java Middleware Layer Spans Multiple Operating Systems**

244. Given its control over the evolution of this virtual operating system, Sun will have the opportunity easily to replace any underlying operating system with an operating system licensed by it. In fact, this is Sun's stated goal in its development with IBM of an operating system called "JavaOS." The existence of Java OS shows that Sun intends to use middleware as a means to compete with, and ultimately replace, Windows as an operating system.

245. Sun intends to optimize its proprietary microprocessor architecture so that Java programs will work best on Sun microprocessors. Sun has also optimized Java technology so that it works best with Sun's existing SPARC microprocessors. Sun has

already begun implementing this strategy, which poses a major competitive threat to microprocessor vendors such as Intel, AMD and Cyrix. For example, Sun has optimized Java's floating point technology for SPARC, effectively eliminating access by Java developers to the superior floating point support in the Intel x86 architecture. We have also seen evidence that Sun is working on new types of microprocessors (dubbed "Java chips") designed for the express purpose of running Java programs quickly, or (like the new UltraJava chip) optimized for Java programs.

246. In other words, while Sun seeks to convey the impression that it is promoting some sort of "level playing field" with Java in which all companies have an equal opportunity to compete, the reality is that Sun—like other profit-driven commercial enterprises—is pursuing a Java strategy that will advance Sun's interests at the expense of competitors like Microsoft and Intel. Unlike Microsoft and Intel, Sun is vertically integrated, manufacturing and selling microprocessors, the operating systems and applications that run on those microprocessors and entire computers built on these products. If Sun's strategy is successful and its apparent goal is realized, Sun will control both the hardware and the software on which virtually all computing devices operate. There is nothing wrong with Sun harboring such ambitions, but the goals of Sun's Java efforts should be seen for what they are.

247. The financial rewards of Sun's strategy, if successful, would be great, which explains why there is no shortage of investment and engineering talent devoted to the task. Top executives at Sun, Oracle, Netscape and elsewhere have repeatedly made clear that they see Java technologies as a major competitive initiative against Windows.

For example, the chief executive officer of Sun, Scott McNealy, recently told *PC Week*, a leading computer industry publication, that Java “is absolutely displacing Windows.”

Mr. McNealy went on to explain:

Look how much more time you’re spending in the Java browser than you are on the Windows environment today. Look how much more time you’re doing HTML and Java applets vs. pure Windows Word and PowerPoint. So it’s all happening. You’d almost rather give up your Windows environment than your Java browser at this point. You’ve now started to basically cut over. That is an absolutely accurate statement of what is happening . . . .

(*PC Week Online*, September 18, 1998.)

248. Microsoft recognized the strategic threat posed by Sun’s Java middleware initiative and responded by developing and enhancing its own competing technologies, including Java-related technologies. Microsoft’s response to Sun’s efforts to displace Windows are described in detail in the testimony of my colleague, Bob Muglia. To summarize briefly:

- Microsoft has continued to work, as it always has, to enhance the platform capabilities of Windows. We have improved Windows’s support for HTML, including implementing open, publicly approved extensions (ratified by the W3C committee) for more dynamic and attractive information display. We have also improved the ability of developers to package software in components and distribute those components across the Internet for use in Web pages.
- Microsoft has developed the leading toolkit for Java software developers, called Microsoft Visual J++. Despite many Java developers’ bias toward Sun, Visual J++ is used by more Java developers than any other toolkit—a strong testament to its technical superiority.

- Microsoft has developed the world's finest "Java virtual machine," software that is necessary for Java programs to run. According to recent independent laboratory (*see* DX 2025) results, *Microsoft's Java virtual machine is more compatible with Java programs than any other Java virtual machine*, running Java programs better and faster than competing virtual machines from Sun, IBM and others.
- Microsoft has provided developers with the ability to write Java programs that make use of Java-related APIs *and* APIs that are native to Windows. This choice greatly benefits developers because the Java-related APIs are deficient in many respects and often cause software programs to run too slowly (as a great many developers have come to recognize). The choice provided by Microsoft gives developers the option of benefiting from the advantages of the Java programming language without sacrificing the benefits of leveraging Windows APIs. Microsoft has provided this option (and it is truly an option) as a genuine choice for the developer. Developers using Microsoft development tools, or writing to Java programs using other publishers' development tools, are free to use only the "middleware" APIs defined by Sun, if they so choose. And if they choose to use the Java APIs as defined by Sun, their programs will run better and faster on the Microsoft Java virtual machine in Windows than on any other platform.

249. I am familiar with Sun's lawsuit against Microsoft because I am the most senior business person at Microsoft with responsibility for Microsoft's defense of that case. I was also closely involved in the negotiations between Sun and Microsoft relating to the license agreement that is at issue in that lawsuit.

250. By its lawsuit, Sun seeks to limit Microsoft's ability to provide developers with Java technology that presents competition to the set of Java APIs endorsed by Sun. Significantly, however, Sun has not claimed (and could not claim in good faith) that

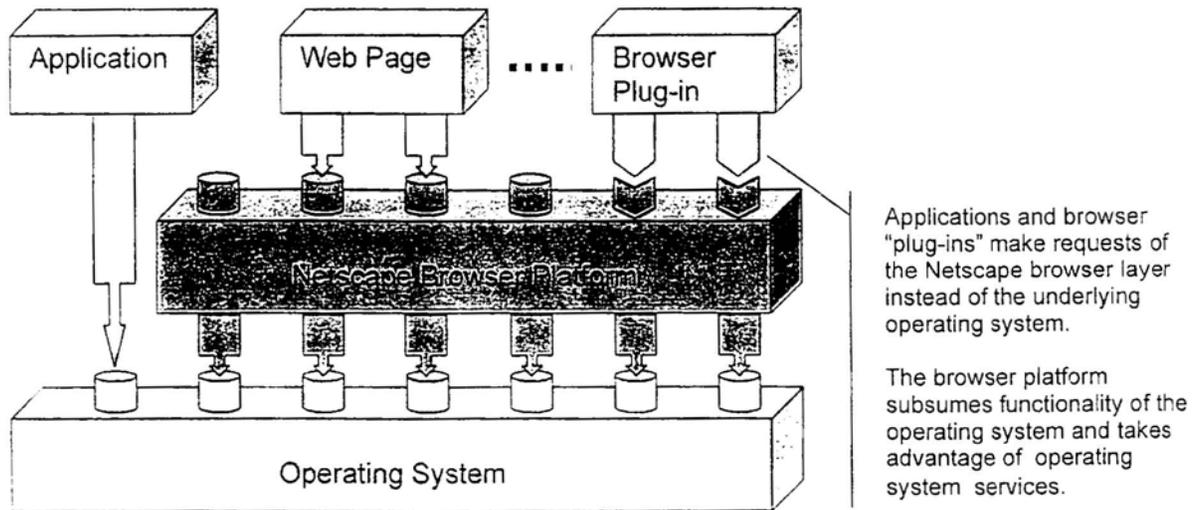
Microsoft should be prevented from offering developers technology that will enable them to create Java programs that make native calls to Windows APIs. Rather, the lawsuit in California concerns whether *the manner* in which Microsoft implemented these new capabilities for software developers complies with the Java license agreement between Sun and Microsoft. The resolution of that question requires a detailed understanding of highly technical aspects of the competing implementations of Java developed by Sun and Microsoft.

251. Despite the preliminary injunction entered on November 17, 1998, I continue to believe that Microsoft will prevail in the lawsuit once all the facts have been heard, enabling Microsoft to compete with Sun with fewer limitations. Microsoft is one of the only companies providing any competitive alternative to Sun in the Java space today. Many other leading computer companies, such as IBM, Netscape, Oracle, and Novell, have entered into agreements that appear to eliminate competition amongst themselves with regard to the platform capabilities of Java. Even the inventor of Java, Dr. Gosling, admitted in his testimony in this case that developers should be offered good programming tools that enable the development of Java programs specifically for Windows. In today's market, only Microsoft is providing tools specifically targeted at this important demand for the use of Java.

## *2. Netscape's Web Browsing Software*

252. Netscape's Web browsing software is another example of middleware: it provides both a user interface and an API set on which other programs can call, much like an operating system does. Netscape also has heavily promoted the fact that it has created versions of its Web browsing software that run on more than fifteen operating

system, including Windows 3.1, Windows 95, Windows 98, Windows NT, Apple's MacOS 8.x, IBM's OS/2, and many versions of UNIX.



**Figure 4: Netscape Browser is Middleware Competing with Underlying Operating Systems**

253. Netscape's publicly-stated objective has been to transform its Web browsing software into a full-featured platform that would eventually replace Windows. In fact, Marc Andreessen once stated that Navigator would reduce Windows to little more than a "poorly-debugged set of device drivers." Similarly, in sworn testimony to the United States Senate Judiciary Committee, dated March 3, 1998, James Barksdale of Netscape stated:

Netscape's browser posed a competitive threat to Microsoft's operating-system monopoly because it could provide some of the same functionality as the operating system. . . . In other words, the browser, with its powerful access to the rich content of the Web, could sit on top of Windows and make Windows less important.

The use of the browser as a substitute for Windows represented an important shift in computing.

254. Netscape's strategy won a large following in the financial community, driving Netscape's valuation into the billions of dollars overnight. Netscape's high stock price gave it the ability to fund aggressive acquisitions—buying both technology and experienced manpower. Since 1995, Netscape has spent over \$650 million in cash or stock in acquiring companies and technology. Competing with Windows was a technical and business strategy that Netscape openly embraced, and took advantage of in every way it could.

255. Although Netscape repeatedly proclaimed its intentions to create a full-fledged platform, Netscape's execution of this strategy has not been good. Several initiatives, such as its "Netscape One" set of system services, were abandoned after being announced with much fanfare. Unlike Microsoft, Netscape has not provided developers with componentized Web browsing software. Thus developers have generally been unable to make use of Netscape's software to display HTML, or handle the HTTP protocol, for example. It is well known that there has been widespread dissatisfaction within the developer community regarding Netscape's general indifference in dealing with software developers.

256. Netscape has more recently altered its tactics and aligned itself with Sun's Java middleware strategy. This has been reinforced and highlighted in the recent acquisition of Netscape by AOL, and alliance with Sun. Initial public announcements are that the AOL channel will be used to distribute Sun's Java technology, and Netscape will pool its browser development efforts with Sun, making their browser, and hence the AOL environment, more portable to non-Windows systems. The platform threat to Microsoft Windows has intensified.

**3. *IBM's Lotus Notes/Domino Software***

257. IBM is investing large resources in developing its Notes/Domino software as a common layer that spans multiple operating systems. IBM possesses the greatest concentration of computing-related resources in the world, thousands of skilled software developers, the world's largest consulting and support organization, and strategic relationships with essentially all of the world's large corporations. IBM is now integrating its Notes/Domino technologies with Sun's Java assets, further increasing the competitive threat presented by this software layer to Windows. IBM has made it very clear that it is willing to invest huge sums and stake its reputation on the success of this strategy.

**D. *Impending Competition***

**1. *Network Computers for Business***

258. In recent years, Sun, Oracle, Netscape, IBM and others have promoted a new computer architecture for desktop computers that relies on "thin clients." In this new architecture, information and application software resides on powerful "server" computers and is transmitted on an "as needed basis" to each individual's computer (the "client"). Advantages of the thin client computer architecture are said to include simplicity, lower cost of operation, easier manageability and improved security, primarily because information and application software is largely centralized on a few servers rather than dispersed among many clients. Such issues are particularly important to large corporate customers with thousands of computers deployed at multiple sites.

259. The “thin client” approaches from these companies rely on the client system having Web browsing software and Java running on a small, simple, proprietary operating system kernel. These companies call their client systems “network computers.” Network computers generally enable users to perform functions otherwise performed on personal computers.

260. Sun, IBM and others clearly conceive of the network computer as a direct competitor to Windows. Sun’s Scott McNealy has stated:

Ninety-five percent of corporate users should not have an operating system, a disk drive, a CD-ROM drive or a floppy. You don’t need Windows 95 or NT on your desktop. We’re arguing for a new corporate computing model.

(*Computer Reseller News*, January 29, 1996.) As Mr. McNealy bluntly told *The New York Times*, network computers are intended “to kill Microsoft—that’s the top priority for all of us.” (*The New York Times*, October 29, 1996). Sun’s network computer, which is built on Sun’s JavaOS operating system and SPARC microprocessor, is called the JavaStation. IBM’s network computer is called the Network Station. We have provided the Court with a short videotaped demonstration of several network computer devices. (See DX 2164.)

261. Microsoft has responded to the competition posed by network computers in two ways. Firstly, Microsoft has prioritized much of its ongoing Windows development efforts to address the shortcomings of Windows identified by proponents of network computers. For example, Microsoft is delivering on an initiative called “Zero Administration Windows,” which will make Windows computer systems (client and server) easier and less expensive to manage. This initiative provides the ability to automate the distribution and installation of software, and allows computer users easily to

406. Microsoft and many other companies are working hard to develop new technologies that will make computers vastly more useful and easier to use than they are today. I believe that the full potential of computers to enrich people's lives will best be realized if all competitors are permitted to innovate as rapidly as they can, and the marketplace, not government regulation, is permitted to determine what products are made available to consumers.

Dated: Redmond, Washington  
January 20, 1999



Paul Maritz