UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

UNITED STATES OF AMERICA, Plaintiff, v. MICROSOFT CORPORATION, Defendant.	Civil Action No. 98-1232 (TPJ)
STATE OF NEW YORK, ex rel. Attorney General ELIOT SPITZER, et al., Plaintiffs and Counterclaim-Defendants, v. MICROSOFT CORPORATION, Defendant and Counterclaim-Plaintiff.	Civil Action No. 98-1233 (TPJ)

Declaration of Carl Shapiro

April 28, 2000

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I. Qualifications and Scope of Testimony

I am Carl Shapiro, the Transamerica Professor of Business Strategy at the Haas School of Business at the University of California at Berkeley where I have taught for ten years. I also am Director of the Institute of Business and Economic Research at U.C. Berkeley. I have served as the Editor of the *Journal of Economic Perspectives,* a leading economics journal published by the American Economic Association. I am also a Senior Consultant with Charles River Associates, an economics consulting firm.

I am an economist who has been studying antitrust, innovation, and network industries for roughly twenty years. My recent book with Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy,* discusses competitive strategy in the information economy, emphasizing the pricing of information, the creation of multiple versions of information products such as software, the switching costs and lock-in associated with information technology, and network economics.

I have considerable experience in the application of economics for the purposes of enforcing the antitrust laws. I served during 1995 and 1996 as the Deputy Assistant Attorney General for Economics in the Antitrust Division of the Department of Justice. I have served on several occasions as an expert witness or consultant to the Antitrust Division or the Federal Trade Commission. Over the years I have also consulted or served as an expert witness on numerous antitrust matters for private companies in a range of industries, including several companies in the hardware and software business. My curriculum vitae is attached to this Declaration.

In this proceeding I have been asked by the Plaintiffs to offer an economic analysis of the likely effects of the Plaintiffs' proposed remedy on competition, innovation, and ultimately consumers.

II. General Approach to Remedy and Ultimate Goals

A. The Court's Findings and Remedy Objectives

The Court has found that Microsoft engaged in illegal and anti-competitive conduct to maintain its monopoly in the market for Intel-compatible PC operating systems ("operating systems").

(Conclusions of Law at 9, 21) The Court also has found that Microsoft attempted to monopolize the market for browsers. (Conclusions of Law at 24) Consistent with these findings, the three primary measures by which I am evaluating the proposed remedy are: (1) creating conditions conducive to entry into the market for operating systems (or expansion by small firms already in that market); (2) preventing Microsoft from using its monopoly over operating systems to gain control over adjacent markets, as it has attempted to do in browsers; (3) restoring competition in browsers. I also consider whether the proposed remedy is likely to create inefficiencies that might diminish the benefits it generates to competition and innovation.

Objective (1) is directly driven by the finding that Microsoft illegally maintained its monopoly and raised barriers to entry into the market for operating systems. Objective (2) flows from the fact that entry into the market for operating systems is more difficult if Microsoft, the monopolist in that market, also controls products complementary to its Windows monopoly, especially complementary products such as the browser that it views as strategic threats to its Windows monopoly. Objective (2) also follows from the finding that Microsoft used its operating systems monopoly to distort competition in browsers. Objective (3) follows from the finding that Microsoft has attempted to monopolize the browser market and has attained its current position in that market using anticompetitive means.[1]

Remedy is directed towards future competition and innovation, so all of my analysis is done on a forward-looking basis, even as it is informed by historical experience drawn from this and other markets. Microsoft has emphasized repeatedly that the computer industry is very fast moving and subject to ongoing technological change. I quite agree, and for just this reason I urge the Court to embrace a remedy that puts in place a *market structure* conducive to competition and innovation, so that consumers can rely as much as possible on market forces rather than court orders to serve their interests. Likewise, in this fast-moving industry any conduct provisions imposed by the Court should be broad enough to prevent Microsoft from engaging in a number of *categories* of anticompetitive tactics in the future, precisely because the specific tactics that Microsoft might employ in the future are hard to predict today in the face of changing products

and technology. So, for example, several of the provisions of the proposed remedy apply to the category of "middleware," not just to the specific types of middleware that were featured in this case, such as the browser or the Java Virtual Machine.

Finally, I take as a working principle that the remedy should operate in a dual manner: first, to prevent a recurrence in the future of conduct by Microsoft akin to its past anti-competitive behavior, and second to affirmatively bolster competition, which Microsoft has stifled.

B. Enabling Competition to Windows

Given the goal of enabling, but not compelling, competition to Windows in the market for operating systems, it is important to identify, as best we can, the likely sources of such competition in the foreseeable future, both to make sure that Microsoft cannot blockade operating systems rivals, and to inform any remedial provisions designed positively to foster operating system competition.

Following the traditional steps used by antitrust economists, I consider first the *current* competitors in operating systems, and then inquire into barriers to entry and the most likely sources of entry into the operating systems market.

As the Court found, *current* competition in operating systems is virtually non-existent. In addition to Apple, the most promising alternative to Windows today is the Linux operating system. Linux, while increasingly popular as a *server* operating system, has limited popularity on the desktop for two primary reasons: (1) Linux still is regarded as overly difficult to use for many consumers, and (2) many of the most popular applications on Windows, including especially Microsoft Office, are not available on the Linux platform.[2] In other words, Linux suffers from the applications barrier to entry emphasized by the Court in its Findings. And the

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[1] As of April 2000, Microsoft's Internet Explorer had achieved a browser market share of at least 69%. See RX23 and the Declaration of Rebecca Henderson.

[2] Microsoft has stated that "Linux as a desktop operating system makes no sense. A user would end up with a system that has fewer applications, is more complex to use and manage, and is less intuitive." See "Linux Makes No Sense at the Desktop," p. 4 of "Linux Myths," available at www.microsoft.com/NTServer/nts/news/msnw/LinuxMyths.asp.

ability of Linux to challenge Windows is limited by the fact that Microsoft controls Office, making the barrier to entry even higher than it would be if Office were owned separately from Windows.

Moving from actual to potential competitors, and looking farther into the future, challenges to the Windows monopoly may come from various directions, some of which we surely cannot anticipate today. But we can illustrate the principle of "enabling entry" by looking at two examples of possible challenges that can currently be seen on the horizon.[3]

One promising entry path into the market for operating systems is via cross-platform middleware. If such middleware becomes widely used, more and more applications may be written to that middleware, making it far easier for new operating systems to run many popular applications. I do not believe it is possible to identify today with any confidence the specific middleware that will play this role in the next several years. Therefore, the remedy chosen by the Court should broadly prevent Microsoft from blocking the emergence or widespread distribution of middleware. Establishing an entity with strong middleware assets and broad distribution that is independent of Windows will clearly help support this mode of entry.

Another promising route by which entry could occur into operating systems, especially in the corporate setting (as opposed to residential users), is through the increased use of "thin clients" or "network computers" working in conjunction with servers. Microsoft has pointed to such client/server architectures as a potential threat to Windows. (Direct Testimony of Richard Schmalensee at ¶151-153.) Under this approach, network computers running non-Microsoft operating systems would be linked to servers, many of which run versions of the UNIX operating system. Although the network computer has failed to live up to its promise so far, network computers could displace at least some PCs if they ran the applications desired by businesses. And such applications could run in whole or in part on servers, placing less burden on the client

[3] The fact that we cannot confidently predict today the most significant modes of entry in the future supports the structural relief proposed by the plaintiffs, which will serve to create a strong new entity (the Applications Company) with the economic *incentives* to promote or support entry into the market for operating systems, from whatever source such entry arises.

computer. All of this suggests that entry into operating systems will be encouraged if applications are made available to run both on servers and on the thin clients themselves.[4]

Another way in which entry into the market for operating systems may occur is that operating systems for *handheld devices* could be modified to become substitutes for desktop operating systems. Microsoft also has noted this source of potential competition in the desktop operating systems market. (Direct Testimony of Richard Schmalensee at ¶154-156.) Again, this type of entry will be promoted if key applications are made available to run on these "thin" operating systems outside Microsoft's control.

Consistent with the Court's findings regarding barriers to entry into the market for operating systems, the key to success for all of these possible entrants is their ability to run many popular applications currently available on desktop machines running Windows. As I discuss below, splitting off Microsoft's Applications Business from its Operating Systems Business will create incentives for the resulting Applications Company to make important applications such as Office available to run on rival operating systems, thereby significantly lowering barriers to entry.

C. Lessons about Entry from Other Markets with Network Effects

We can learn a great deal about entry barriers in network markets, and how they are overcome, from historical experience in other markets with network effects in which dominant firms have been successfully challenged. Consider the following examples:

- Nintendo vs. Atari in Video Games: Atari was the dominant firm in video games during the early 1980s. Nintendo displaced Atari as the dominant firm by the late 1980s. Nintendo based its challenge on its strengths in two complementary products: games designed originally for arcades (rather than home machines) and the provision of video game systems in Japan.[5]

- Microsoft Word vs. WordPerfect in Word Processing Software: WordPerfect was the leading supplier of word processing software for personal computers during

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[4] See the Declaration of Rebecca Henderson for a further discussion of how the availability of applications on servers would promote entry in to the market for operating systems.

[5] Some years ago I studied competition in the video game market during the 1980s as part of my work on behalf of Atari Corporation in its antitrust case against Nintendo.

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George Mason Law Review 523 at 544-45 for this description of the battle between Western Union and American Express.

> the provision of programming tools and leadership in object-oriented programming.[9]

The common lesson from these and other such episodes is this: While network monopolies can be very strong, they are most vulnerable to attack by firms with a strong position in the provision of a widely-used *complementary product*. In the current case involving Microsoft, this principle implies that the strongest threat to Windows is likely to come from a company with a strong position in widely-used applications software for PCs, middleware that runs on Windows, hardware for PCs, and/or operating systems for devices other than PCs. Indeed, the liability phase of this case focused on the threat posed to the Windows monopoly by one extremely popular complementary middleware product running on Windows, namely the Netscape browser. What distinguishes the Windows story of ongoing monopoly from the examples above of successful entry is that Microsoft engaged in anti-competitive conduct to fend off the threat posed by Netscape, the dominant browser company circa 1995-96.

Microsoft is keenly aware of the principle that companies providing these complementary products tend to pose the most immediate threat to their Windows monopoly. Indeed, Microsoft has long recognized that the best way to avoid or defuse challenges to its desktop dominance is by controlling more and more functionality surrounding its desktop operating system and to limit the development and popularity of non-Microsoft middleware.[10]

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[9] I studied competition in the market for database software as part of my work in the early 1990s on behalf of Borland in connection with its acquisition of Ashton-Tate.

[10] Findings ¶68 ("Microsoft was apprehensive that the APIs exposed by middleware technologies would attract so much developer interest, and would become so numerous and varied, that there would arise a substantial and growing number of full-featured applications that relied largely, or even wholly, on middleware APIs. The applications relying largely on middleware APIs would potentially be relatively easy to port from one operating system to another. The applications relying exclusively on middleware APIs would run, as written, on any operating system hosting the requisite middleware. So the more popular middleware became and the more APIs it exposed, the more the positive feedback loop that sustains the applications barrier to entry would dissipate. Microsoft was concerned with middleware as a category of software; each type of middleware contributed to the threat posed by the entire category.") Conclusions at 9 ("In this case, Microsoft early on recognized middleware as the Trojan horse that, once having, in effect, infiltrated the applications barrier, could enable rival operating systems to enter the market for Intel-compatible PC operating systems unimpeded. Simply put, middleware threatened to

It follows that the Court can greatly facilitate entry and competition in operating systems by creating an independent company with a strong set of widely-used Windows applications, middleware, and other complements to Windows. The Applications Company will be most impressive in these respects, with its unmatched complex of Windows applications. Put differently, the Applications Company will possess assets sufficient to threaten the Windows monopoly, the earlier threat from Netscape and Sun having been eliminated through anti-competitive means. In addition, the Court can enable entry into operating systems by preventing Microsoft from using its Windows monopoly to gain control of other complementary products, especially server operating systems, "thin" operating systems, and middleware for the Windows operating system.

D. Evaluation of the Economic Effects of Plaintiffs' Proposed Remedy

With these economic principles in mind, I turn now to an evaluation of the likely economic effects of the Plaintiffs' proposed remedy. I emphasize the role played by the various provisions of the proposed remedy in lowering the barriers to entry into the market for operating systems. I also consider whether the proposed remedy will inhibit pro-competitive conduct or integration.

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demolish Microsoft's coveted monopoly power. Alerted to the threat, Microsoft strove over a period of approximately four years to prevent middleware technologies from fostering the development of enough full-featured, cross-platform applications to erode the applications barrier. In pursuit of this goal, Microsoft sought to convince developers to concentrate on Windows-specific APIs and ignore interfaces exposed by the two incarnations of middleware that posed the greatest threat, namely, Netscape's Navigator Web browser and Sun's implementation of the Java technology. Microsoft's campaign succeeded in preventing - for several years, and perhaps permanently - Navigator and Java from fulfilling their potential to open the market for Intel-compatible PC operating systems to competition on the merits.") Findings ¶409 ("Microsoft also engaged in a concerted series of actions designed to protect the applications barrier to entry, and hence its monopoly power, from a variety of middleware threats, including Netscape's Web browser and Sun's implementation of Java. Many of these actions have harmed consumers in ways that are immediate and easily discernible. They have also caused less direct, but nevertheless serious and far-reaching, consumer harm by distorting competition.") See also Findings ¶411 ("It is clear, however, that Microsoft has retarded, and perhaps altogether extinguished, the process by which these two middleware technologies [Netscape's Navigator and Sun's Java] could have facilitated the introduction of competition into

Although the proposed remedy must be evaluated as a package, for the purposes of exposition I first discuss the reorganization and then the conduct provisions.

III. Proposed Reorganization -- §1, §2

The proposed remedy (§1, §2) calls for a reorganization of Microsoft into two separate companies, an Applications Company containing the Applications Business and an Operating Systems Company containing the Operating Systems Business. The key economic features of the proposed reorganization are that each company be operated independently of the other, and that the two companies continue to develop, distribute, license and sell their products independently.

My analysis of the proposed reorganization focuses on how the economic incentives of these two companies will *differ* from the economic incentives facing a combined company controlling both applications and operating systems. Based on these altered incentives, and on the limitations under which the two companies will operate (§2(b)), we can use economic principles to make some general predictions about how the proposed reorganization will affect competition and innovation. I also consider legitimate ways in which the two companies may need to cooperate to offer improved products at lower prices, and whether the limitations imposed upon them in §2(b) of the proposed remedy will prevent them from achieving such pro-competitive ends.

A. Lower Entry Barriers into Operating Systems

The overarching economic effect of the reorganization is to create a strong company, the Applications Company, that will have the ability and incentive to make its offerings more "cross-platform." For example, the Applications Company will have a greater incentive to make Microsoft Office available to run on non-Windows platforms, and to enhance the value of Microsoft's Visual Studio suite of developer tools for ISVs seeking to develop programs for non-Windows operating systems. The improved availability of the Application Company's products as complements to rival platforms will thus help those actual and potential rivals to Windows to overcome the applications barrier to entry that currently protects the Windows monopoly.

The Applications Company unquestionably will have greater incentives to facilitate entry and expansion by rivals to Windows by virtue of its independence from the Operating Systems Company. Currently, Microsoft considers the loss of revenues and profits from its Windows monopoly when considering whether its Applications Business should cooperate in various ways with actual and potential rivals to Windows. After the reorganization, the Applications Company will no longer have any incentive to protect the monopoly profits associated with Windows. Therefore, to the extent that the Applications Business can facilitate or frustrate entry into the operating systems market, such entry will be easier and more likely as a result of the reorganization.[11]

Indeed, after the reorganization, the Applications Company will positively *benefit* from the improved quality and lower price of operating systems that can be expected to result from lower entry barriers into the market for operating systems. This follows from a well-known economic principle: the supplier of one product (here, Office) benefits if a complementary product (here, Windows) is improved or made less expensive as a result of enhanced competition for the complementary product.

As a tangible example of the pro-competitive effects of the reorganization, I expect that an independent Applications Company today would have an incentive to port at least some aspects of Office to Linux. Corel has already ported its Perfect Office suite to Linux. There is already a sizeable installed base of Linux users. The Applications Company could begin by porting over those aspects of Office that are easiest to port and/or have the greatest demand on Linux, e.g., Excel and Word. And the Applications Company could offer Linux users file compatibility between Office on Linux and Office for Windows, a very valuable feature indeed given the size of the installed base of Office users.

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[11] GX 514 gives one example of how Office has been used by Microsoft to protect the Windows monopoly by favoring Internet Explorer in Microsoft's battle with Netscape. This 1997 e-mail by Paul Maritz explains that he told the Office group "that they will target their XL and Access publishing features only at IE4, this was hard decision for them (based on IE's current market share)" but was done to promote the major goal of getting browser share up to 50% or more.

Another example of how the Applications Company will have incentives to facilitate entry by rivals to Windows relates to Microsoft's popular Visual Studio suite of programming tools, which includes Microsoft's Java development tools, Visual J^{++}. My understanding is that these tools are familiar to, and widely used by, developers writing to the Windows platform. An independent Applications Company will have a greater incentive than does Microsoft today to make these tools more valuable for developers writing to rival platforms or to cross-platform middleware.

As a final example of how entry barriers will be lowered by the reorganization (and one that is especially fitting given Microsoft's antitrust violations found by the Court), the Applications Company will have a greater incentive than does Microsoft today to make its browser work well with operating systems other than Windows. So, the reorganization will help promote the original promise first offered by Netscape Navigator, namely cross-platform browsing functionality offered by a firm that is financially independent of Windows.

B. Lessons from the Relationship Between Intel and Microsoft

I believe we can learn a great deal from the relationship between Intel and Microsoft about how competition is engendered through the healthy tension that exists between two companies that are dominant in their respective complementary products.[12] One can think of the reorganization as creating a relationship between the Applications Company (with Office) and the Operating Systems Company (with Windows) comparable to that which has existed for a number of years between Microsoft (with Windows) and Intel (with its microprocessors such as the Pentium). Therefore, lessons from the Intel/Microsoft relationship should be very valuable in understanding how the proposed reorganization will affect competition.

The key point is that Intel has repeatedly taken actions to strengthen operating systems that hold out the promise of one day becoming an alternative to Windows. The most significant example is Intel's strong support for Linux. More specifically, Intel Capital, the group within Intel that

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[12] I consulted and testified for Intel during 1998 and 1999 in the antitrust case brought by the Federal Trade Commission against Intel regarding Intel's intellectual property practices. I am

invests in technology complementary to Intel's microprocessor products, has made significant investments in Red Hat Software, Inc., TurboLinux, Inc, and VA Linux Systems, Inc.[13] All of these companies market versions of the Linux operating system. Following the mission statement for Intel Capital, these investments were made to "create and expand new markets for [14] In addition to investing in Linux companies, Intel also writes software drivers for Linux.[15]

Beyond Linux, Intel is supporting a broad array of operating systems on its new 64-bit family of microprocessors, known as IA-64 chips. Intel is working with: HP to enable HP-UX as an operating system on IA-64 chips; a number of companies through the Trillian Project to ensure that Linux is available on IA-64 chips; Novell to assist in the writing of a new operating system (Modesto) on IA-64 chips; IBM and Santa Cruz Operation to create an enterprise-class UNIX operating system on IA-64 chips; and Microsoft for the Windows 2000 operating system on IA-64 chips.[16] In other words, Intel is following its own self interest in working with multiple operating systems. In similar fashion, the Applications Company will have incentives to be "platform neutral" following the reorganization, rather than favoring the Windows platform.

We see the same tendency on Microsoft's part to do an "end run" around Intel, i.e., to cooperate with Intel's rivals and thus encourage competition in microprocessors and reduce Microsoft's

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not currently doing any work on behalf of Intel, and am not relying in this Declaration on any confidential Intel information.

[13] See Intel Capital Investments as of April 1, 2000 as listed on http://www.intel.com/capital/portfolio/cspt.htm (downloaded 26 April 2000). Intel's investments include owning 5% of Red Hat Software at the time Red Hat went public (See Form S-1 for Red Hat Software filed June 4, 1999), owning 10.4% of VA Linux Systems, Inc. at the time VA Linux went public (See Form S-1 for VA Linux Systems filed October 8, 1999), and an undisclosed investment in the private company TurboLinux.

[14] See http://www.intel.com/capital/about/goals.htm downloaded 26 April 2000.

[15] For example, see Intel Press release "Intel announces new Linux driver for its family of 10/100 megabit-per-second network adapters and LAN on motherboard products" dated March 15, 2000, available at http://www.intel.com/network/tech_bulletins/lin_pro100.htm.

[16] See "The Intel IA-64 Processor Family: A Multi-Operating System Architecture" for a description of these projects, available at http://developer.intel.com/software/idap/media/pdf/esp/IA-64_OSWP_Rev2.pdf.

reliance on Intel chips. More specifically, Microsoft has repeatedly provided support for technologies competitive to the Intel Architecture. For example, Windows NT was written to run on Digital's Alpha processor soon after the release of Windows NT Advanced Server 3.1.[17] Microsoft expressed its continued support for the Alpha architecture in 1998, with its Alliance for Enterprise Computing with Digital. This support included concurrent releases of Microsoft server-based products for Alpha and Intel systems, as well as the development of a complete set of Microsoft C++, Visual Basic, and Visual Studio tools on Alpha-based systems.[18] Microsoft also has provided support for AMD microprocessors. For example, in designing its DirectX 6.0 software development kit, Microsoft "optimized implementations of the geometry and lighting pipeline for Pentium II, MMX instructions, and the new AMD 3Dnow! Instruction set."[19] In fact, Microsoft recognized that it had an incentive to support AMD's new instruction set even though this would likely be adverse to Intel's interests.[20]

A final key lesson from the Intel/Microsoft relationship is that Intel, based on its strong market position and technical skills, can play a special *leadership* role in promoting new technologies that can at least potentially threaten Microsoft. In network markets, where consumer confidence can be self-fulfilling and endorsements by industry leaders are so valuable, credible leaders can play a critical role in breaking down entry barriers. I am very hopeful that the Applications Company will, like Intel, be strong enough to play such a leadership role and help overcome the chicken and egg problem faced by potential entrants into the market for operating systems. In fact, Intel and the Applications Company may choose to *team up* in various ways to help promote Linux, or some other partial or complete substitute for Windows.

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[17] See "A Brief History of the Windows NT Operating System" available at http://www.microsoft.com/PressPass/features/1998/winntfs.htm.

[18] See Microsoft Press Release "Digital and Microsoft Announce Expanded Alliance to Accelerate Adoption of Windows NT Across the Enterprise" dated January 28, 1998, available at http://www.microsoft.com/PressPass/press/1998/jan98/digallpr.asp.

[19] See "A Look at DirectX 6.0, Fahrenheit, and the Future of Microsoft's Multimedia API's" released September 4, 1998, available at http://msdn.microsoft.com/library/Welcome/dsmsdn/msdn_torborg.htm.

[20] See GX 290, in which Jim Alchin says he would like to support AMD's new instruction set for its K6 processor even while noting that Intel will be opposed to such support.

C. Added Competition in Browsers

The proposed reorganization also will lead to somewhat greater competition in the browser market, by creating two companies immediately capable of offering browsing functionality. The Operating Systems Company can continue to offer the browsing functionality already included in Windows (so long as it does not violate the anti-binding provision, §3(g)), and is free to develop its own browsing software in the future. The Applications Company will own Internet Explorer itself, and will have incentives to improve Internet Explorer and to support cross-platform capabilities so that Internet Explorer will work well on multiple operating systems.

D. Costs of Reorganization

The benefits from the reorganization to competition in operating systems and in browsers can in principle be weighed against the costs of reorganization, which come in two general forms: (1) one-time costs associated with implementing the reorganization, and (2) possible ongoing costs resulting from the separation of Microsoft into two business entities.

I focus here on any ongoing costs, especially costs that might cause a reduction in the rate of innovation or an increase in the cost of developing software.[21] In classic economic terms, we can ask whether there are significant and genuine efficiencies associated with the integration of the Operating Systems Business and the Applications Business within a single company. For the reasons described immediately below, there are good reasons to believe that the collaboration necessary between those developing operating systems and those developing applications to achieve pro-competitive ends can take place across corporate boundaries, so the reorganization will not significantly impede the development of either applications or operating systems.

First, one can ask whether development of *applications* at the Applications Company will be impeded by separating applications development from the development of operating systems. This does not appear to be a major issue, since Microsoft has indicated repeatedly that the

[21] I would expect the one-time reorganization costs to be modest in comparison with the market value of Microsoft or the magnitude of commerce involved in the operating systems market.

Windows platform is "open" and that Microsoft provides the information necessary for ISVs to develop innovative applications on the Windows platform.[22]

Conversely, one can ask whether the development of *operating systems* will be impeded by the separation of operating systems and applications. Again, Microsoft has stated that its operating systems development teams are fully capable of incorporating suggestions from ISVs into their development process for Windows.[23] This gives me some assurance that the most important

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[22] Bill Gates has written that "Windows is a piece of intellectual property whose 'facilities' are totally open to partners and competitors alike. Windows programming interfaces are published free of charge, so millions of independent software developers can make use of its built-in facilities (e.g., the user interface) in the applications they design." See "Compete, Don't Delete," *The Economist*, June 13, 1998, p. 19. Microsoft also states: "Microsoft does not simply disclose Windows APIs to third party software developers. Rather, it actively 'evangelizes' the Windows APIs to software developers. In fact, Microsoft devotes about $100 million per year and 2,000 employees (nearly 10% of the Microsoft workforce) to developer support. No other computer company provides anything like this level of support to the developer community. As part of this developer support, Microsoft offers a free, dedicated Web Site where developers can access information, technical support and Software Development Kits. These tools and support all help developers create software that can run on the Windows platform. Microsoft takes the extra step to have dedicated staff designated to help developers quickly absorb and utilize new technologies, and other resources such as seminars, training sessions and speakers to communicate the information needed to develop the most innovative software." See "Competition in the Software Industry," January 1998, p. 10, available at www.microsoft.com/PressPass/doj/1-98whitepaper.htm.

[23] Microsoft's economics expert, Richard Schmalensee, has testified that Microsoft "talks to [independent] developers about what features they would like in view [new] versions." (Trial Testimony of Richard Schmalensee, June 22, 1999, p.m. Session at 59) Michael Devlin, the President of Rational Software Corporation, a Windows ISV, testified at trial (Direct Testimony of Michael T. Devlin, at ¶17) that "Microsoft often seeks input from ISVs and other sectors of the software and computer industry when it develops new APIs."

Microsoft also states that: "Microsoft runs an elaborate program – far and away the most extensive in the industry – to solicit input from the computer industry about the development of Windows APIs. (Traditionally, third party software developers played little role in the development of operating systems; their contribution essentially being limited to testing for bugs.) Microsoft solicits input and feedback from other software developers from the earliest stages of the development process. The Win32 APIs, which are the basis for Windows 95 and Windows NT, provide a good example. Windows NT, the first operating system to implement the Win32 APIs, was released in 1993. But Microsoft had provided initial specifications for the Win32 APIs to 25 third party software developers three years earlier, in November 1990, and obtained valuable feedback from them in a series of meetings that followed. During 1991

input from applications developers to those writing new versions of operating systems or fixing bugs in operating systems can take place across corporate boundaries.

Moving from product development to pricing, there is a theoretical concern that Microsoft today has an incentive to set a lower price for Windows and Office together than will the Operating Systems Company and the Applications Company setting those prices independently immediately following the reorganization.[24] For the reasons articulated above, as a theoretical matter this concern is very likely outweighed by the lowering of entry barriers into operating systems that the reorganization will cause, especially when one considers non-price as well as price considerations, specifically the innovation that will be stimulated by the reorganization.[25] In any event, companies selling complementary products commonly find ways to solve the "complementary monopolies" problem when necessary, and I expect as well the Operating Systems Company and the Applications Company would be able to overcome this problem if it proved to be commercially significant.

For all of these reasons, I am confident that any costs to consumers associated with the proposed reorganization plan will easily be outweighed by its pro-competitive benefits.

IV. Interim Conduct Remedies -- §3

The proposed conduct remedies will lower entry barriers into the market for operating systems until the reorganization of Microsoft has been accomplished and the Applications Business has

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Microsoft provided updates to the Win32 APIs to more than 300 third party software developers. By January 1992, the Win32 APIs were posted on CompuServe, America Online and the Internet, and in March 1992 the Win32 APIs were published by Microsoft Press. By the time Windows NT was commercially released in 1993, the Win32 APIs were the most thoroughly reviewed set of APIs in history, ensuring quality and increasing the likelihood that the APIs would be widely used. Updates of the APIs continued through the release of Windows 95 and to date." See "Competition in the Software Industry," January 1998, p. 9, available at www.microsoft.com/PressPass/doj/1-98whitepaper.htm.

[24] This theoretical possibility is known as the "complementary monopolies" problem, or as the problem of "double marginalization."

[25] So, for example, consumers stand to benefit as a cheaper operating system, namely Linux, becomes more attractive.

had some time, namely three years, to help enable competitors to Windows. These interim conduct remedies thus serve two related purposes: (1) to force Microsoft to halt anti-competitive conduct of the type that the Court has already found until the reorganization takes place; and (2) to expressly prohibit the Operations System Company from resuming such activity during the delicate period following the reorganization when it is especially vital that there be no artificial entry barriers into the market for operating systems.

A. No Exclusionary Contracts -- §3(a), §3(d), §3(e), 3(h)

Microsoft has employed a wide range of contracts that to a varying degree are "exclusive," in the sense that they prohibit companies dealing with Microsoft from also dealing with Microsoft's rivals, or provide financial disincentives to doing so. As the Court has found, these contracts have had a significant exclusionary impact.[26] As the trial record shows, exclusivity has taken many forms, and Microsoft has applied pressure to a wide range of companies, including OEMs, ISVs, IAPs, and ICPs, as well as Apple and Intel.

Examples of the behavior that the Court found include: (1) Exclusionary agreements with the most important distribution channels for browsers;[27] (2) Conditioning ISV access to key

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[26] Findings ¶410 ("…by enticing firms into exclusivity arrangements with valuable inducements that only Microsoft could offer and that the firms reasonably believed they could not do without, Microsoft forced those consumers who otherwise would have elected Navigator as their browser to either pay a substantial price (in the forms of downloading, installation, confusion, degraded system performance, and diminished memory capacity) or content themselves with Internet Explorer.") See also Findings ¶296 (concluding that the "marked increase" in the proportion of AOL subscribers using AOL software that included Internet Explorer (from 34% to 92%) "resulted in no small part from AOL's efforts to convert its existing subscribers to the newest version of its client software" following agreements entered into between AOL and Microsoft), and Findings ¶309 (stating that Internet Explorer's weighted average share of shipments of browsing software by ISPs who agreed to make Internet Explorer their default browser was 94% by the end of 1997, compared to 14% share for ISPs who made no such agreement).

[27] Findings ¶¶230-38 and Conclusions at 11 ("Microsoft used incentives and threats to induce especially important OEMs to design their distributional, promotional and technical efforts to favor Internet Explorer to the exclusion of Navigator.") and Findings ¶143 and Conclusions at 10. ("The core of this strategy was ensuring that the firms comprising the most effective channels for the generation of browser usage would devote their distributional and promotional efforts to Internet Explorer rather than Navigator. Recognizing that pre-installation by OEMs and

technical information on exclusive use of Microsoft technology through "First Wave" agreements;[28] (3) Exclusive agreements with ICPs in exchange for coveted placement on the "Channel Bar;"[29] and (4) Conditioning continued development of the Mac Office Suite on Apple's making Internet Explorer the default browser in Mac OS software releases.[30]

Exclusivity in network industries can be especially pernicious, given the importance of complements and the self-fulfilling aspects of expectations: consumers can easily lose confidence in a new product that is denied access to critical complements, and this loss of confidence can then become self-fulfilling, creating a vicious cycle of decline or disrupting a virtuous cycle of increasing adoptions.[31] Netscape's browser faced this threat as a consequence

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bundling with the proprietary software of IAPs led more directly and efficiently to browser usage than any other practices in the industry, Microsoft devoted major efforts to usurping those two channels.")

[28] Findings at ¶¶401-02 and Conclusions at 19 ("…Microsoft impelled ISVs, which are dependent upon Microsoft for technical information and certifications relating to Windows, to use and distribute Microsoft's version of the Windows JVM rather than any Sun-compliant version.") and Findings ¶¶339-40 (stating that Microsoft promised "preferential support, in the form of early Windows 98 and Windows NT betas, other technical information, and the right to use certain Microsoft seals of approval, to important ISVs that agree to certain conditions. One of these conditions is that the ISVs use Internet Explorer as the default browsing software for any software they develop with a hypertext-based user interface. Another condition is that the ISVs use Microsoft's 'HTML Help,' which is accessible only with Internet Explorer, to implement their applications' help systems. By exchanging its vital support for the agreement of leading ISVs to make Internet Explorer the default browsing software on which their products rely, Microsoft has ensured that many of the most popular Web-centric applications will rely on browsing technologies found only in Windows and has increased the likelihood that the millions of consumers using these products will use Internet Explorer rather than Navigator.")

[29] Findings ¶¶311-36.

[30] Findings ¶351, quoting Apple's Technology Agreement with Microsoft ("While Apple may bundle browsers other than Internet Explorer with such Mac OS system software releases, Apple will make Internet Explorer for Macintosh the default selection in the choice of all included internet browsers (i.e., when the user invokes the "Browse the Internet" or equivalent icon, the Mac OS will launch Internet Explorer for Macintosh).")

[31] For a further discussion of how exclusive agreements can raise entry barriers in network industries, see Carl Shapiro, "Exclusivity in Network Industries," 7 George Mason Law Review 673; David A. Balto, "Networks and Exclusivity" Antitrust Analysis to Promote Network Competition," 7 George Mason Law Review 523, and Carl Shapiro, "Antitrust in Network

of Microsoft's strategy to deny Navigator access to OEMs and IAPs. The economic implication is that an effective remedy should assure new entrants into the market for operating systems of access to complements (OEMs, ISVs, IAPs, and IHVs) by including a broad ban on exclusive dealing by Microsoft. The need for a ban on exclusionary contracts is accentuated because Microsoft has already established a pattern of employing exclusionary tactics to blockade rival software that threatens its Windows monopoly.

The specific provisions in the proposed order relating to exclusive dealing all serve to insure that complements are indeed available to those offering Platform Software that is competitive with Windows. These complements include distribution through OEMs, preserved by preventing Microsoft from striking exclusive relationships with OEMs, as well as applications software, preserved by preventing Microsoft from striking exclusive relationships with ISVs.

Nothing in the proposed order prevents Microsoft from competing on the merits to make it attractive for OEMs, ISVs, IHVs, IAPs, or other companies doing business with Microsoft to support, use, or promote Microsoft software, or to develop complements to Microsoft software. Nor is Microsoft enjoined from making investments in ISVs in order to provide them with the resources to develop software that works well with Microsoft's software. The purpose of these provisions is simply to prevent Microsoft from denying rival Platform Software access to complements.

1. OEMs -- §3(a)

With respect to OEM relations, §3(a)(i) prevents Microsoft from providing financial incentives that discourage any OEM's action to "use, distribute, promote, license, develop, produce or sell any product or service that competes with any Microsoft product or service." Clearly, this provision is closely linked to the anti-competitive conduct in which Microsoft has already engaged. Microsoft has proven that it can apply enormous pressure to OEMs, including IBM, a very large and strong OEM, to prevent OEMs from supporting rival software.

Industries," Antitrust Division, U.S. Department of Justice, March 1996, available at usdoj.gov/atr/public/speeches/shapir.mar.

The requirement of §3(a)(ii) that Microsoft offer uniform terms for Windows to the top 20 OEMs, i.e., the requirement of "transparent pricing," prevents Microsoft from punishing a large OEM for supporting rival software. This provision should improve the enforcement of the "no retaliation" rule embodied directly in §3(a).

2. ISVs and IHVs -- §3(d), §3(h)

Section 3(d) of the proposed remedy prohibits Microsoft from providing financial incentives that discourage an ISV from developing or supporting software that either is competitive to Microsoft software or works with non-Microsoft platform software. This provision will prevent Microsoft from making promising software or hardware unavailable to work with rival Platform Software, and thus will prevent Microsoft from continuing to raise entry barriers into the market for operating systems.

Section 3(h) of the proposed remedy prohibits Microsoft from inducing any actual or potential Platform Software competitor to refrain from offering software competitive with Microsoft platform software. This provision operates together with Section 3(d) to prevent Microsoft from using its significant resources to pay a potential competitor to refrain from challenging Microsoft's Platform Software.

The proposed order permits Microsoft to offer financial incentives for ISVs or IHVs to develop software or hardware that works with Microsoft's Platform Software, e.g., by helping to fund independent development efforts or by taking minority ownership stakes in software or hardware development houses. Such investments can easily be pro-competitive, so long as the ISV or IHV retains the right to make products that work with non-Microsoft Platform Software.

3. General Prohibition on Exclusive Dealing -- §3(e)

Microsoft has employed exclusionary contracts with a range of companies besides OEMs and ISVs, including IAPs, ICPs, and Apple. Section 3(e) of the proposed remedy, which is a general ban on exclusive dealing, will prevent Microsoft from interfering with the availability of complements for non-Microsoft Platform Software. Since Microsoft has dealings with a wide range of companies, and since it is difficult to predict precisely which trading partners Microsoft might otherwise seek to tie up under exclusive arrangements in the next several years, a general

ban on exclusionary contracts will serve to lower entry barriers more effectively than would more limited provisions directed at specific categories of trading partners.

B. Disclosure of Interface Information -- §3(b)

Interfaces typically play a critical role in industries subject to network effects. Challengers often seek to interconnect with the dominant network to achieve compatibility as a way of overcoming barriers to entry based on network effects. For example, interconnection has long been important to the survival of smaller firms in transportation and communications networks, from railroads to telephones to the Internet. In the software industry, Borland sought to make its Quattro Pro spreadsheet software compatible with the then-dominant Lotus 1-2-3 spreadsheet software during the 1980s, and Microsoft made it as easy as possible for WordPerfect users to transfer their WordPerfect files and training to Microsoft Word when Microsoft was attacking WordPerfect's strong position in the market for word processing software.[32]

Interface information about Windows[33] is extremely valuable to a wide range of ISVs, IHVs, and OEMs. As a result, Microsoft can exert a great deal of influence over the success or failure of products that are complementary to Windows by virtue of its control over such interface information. Indeed, the Court has found that Microsoft strategically withheld interface information to stave off competition from platform software that Microsoft regarded as a threat to Windows.[34]

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[32] For an extended discussion of compatibility, interconnection, and interfaces in network markets, see Chapters 7, 8, and 9 in *Information Rules.*

[33] See the proposed order for a more precise definition of "APIs," "Communications Interfaces," and "Technical Information." From an economic (rather than technical) perspective, interface information encompasses all information used by Microsoft's own applications and middleware to interoperate with Windows. The operative economic principle is that ISVs, IHVs, and OEMs should be placed on equal footing to Microsoft's own developers for the purposes of developing, licensing, and supporting products that interoperate with Windows.

[34] Microsoft delayed release of the 'Remote Network Access' API in Windows 95 to Netscape for three months while trying to convince Netscape to limit the APIs exposed to software developers. Findings ¶91 ("Despite Netscape's persistence, Microsoft did not release the API to Netscape until late October, i.e., as Allard had warned, more than three months later. The delay in turn forced Netscape to postpone the release of its Windows 95 browser until substantially

To prevent Microsoft from disadvantaging rival platform software, the proposed remedy requires Microsoft to disclose to ISVs, IHVs, and OEMs the information they need to interoperate effectively with Windows. The operative principle is equality of disclosure between Microsoft's own developers of middleware and applications, on the one hand, and outside companies seeking that information on the other hand.

This disclosure requirement directly addresses the Court's core concern about barriers to entry by non-Microsoft Platform Software in two ways, which I now discuss in turn.

1. Enabling Non-Microsoft Software to Work Efficiently with Windows

Mandatory disclosure of interface information will prevent Microsoft from disadvantaging rival software by denying it the ability to interoperate as effectively with Windows as does Microsoft software. As noted above, delay or denial of interface information is one method Microsoft has employed to discourage the widespread adoption of non-Microsoft middleware, and thus raise entry barriers into the market for operating systems.

2. Preventing Microsoft from Anti-Competitively Controlling Complements

Mandatory disclosure of interface information also will prevent Microsoft from using its Windows monopoly power to gain control of complementary applications and middleware. Such anti-competitive conduct not only raises entry barriers, but denies consumers choice of complementary products and stifles innovation surrounding the Windows platform.

Two especially important software products today that are complementary to the Windows operating system on personal computers are operating systems on handheld devices and operating systems on servers. As many observers have noted, and as Microsoft has pointed out, ongoing hardware improvements, along with the increased networking of computers, combined with the increased use of wireless technologies, are greatly expanding the possibilities for both handheld devices and client-server architectures. Thus, PCs running Windows are increasingly communicating with servers and handheld devices.

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after the release of Windows 95 (and Internet Explorer) in August 1995. As a result, Netscape was excluded from most of the holiday selling season.")

As a result of these shifts in the technology of computing and communications, Microsoft can greatly advantage its own operating systems for servers (Windows 2000 Server) and for handheld devices (Windows CE) by introducing proprietary links between Windows on the desktop and Windows for servers or Windows for handheld devices.[35] In this context, and looking forward to competition over the next several years, the disclosure by Microsoft of interface information called for specifically in §3(b)(iii) of the proposed remedy is vital to prevent Microsoft from using the power associated with its Windows monopoly on the PC to gain control over two critical adjacent software products: operating systems for servers and/or operating systems for handheld devices. Indeed, a good case can be made that the most significant threat to Windows in the next several years will come from client/server architectures. Making sure that Microsoft cannot subvert this threat using undisclosed proprietary interfaces is thus central to an effective remedy in this case. Provision 3(b)(iii) in particular will operate to prevent such anti-competitive conduct by Microsoft.

3. Feasibility and Enforcement of Mandatory Disclosure

As I noted above, Microsoft has clearly stated that its APIs are "open," i.e., disclosed to ISVs, and Microsoft has well-established procedures for the release of APIs and the provision of associated technical support to ISVs. Therefore, Microsoft will not need to construct a new business regime to implement API disclosure, and mandatory disclosure of APIs should not impose any significant burden on Microsoft.

Having said this, I do not expect a regime of mandatory disclosure of interface information to be free of disputes and difficulties, especially since timeliness and completeness of Microsoft's disclosures are very important to ISVs. There is a very real and practical danger that Microsoft will strategically delay disclosure, or disclose only part of the information needed by ISVs. For just this reason, I regard the secure facility provided for in §3(b) of the proposed remedy as very helpful for the purposes of insuring the Microsoft meets its disclosure obligations.

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[35] For more information on Microsoft's incentives to use its Windows monopoly to prevent threats emerging from software running on servers and handheld devices, see the Declaration of Rebecca Henderson. Microsoft's recent tactics regarding Kerberos, which are described by

C. OEM Flexibility in Product Configuration -- §3(a)(iii)

Microsoft has used its monopoly power to control the boot sequence and the user interface offered by OEMs. These restrictions have made it more difficult for rival middleware to gain presence on the desktop and thus compete more effectively with Microsoft middleware. The Court has found that these restrictions go beyond the protections afforded to Microsoft as a result of its Windows copyright.[36]

By insuring that OEMs have much greater flexibility to configure their products than Microsoft has permitted them in the past, §3(a)(iii) of the proposed remedy will stop Microsoft from blocking or impeding the OEM distribution channel for non-Microsoft software. The result will surely be greater choice for consumers in terms of the look and feel of their computers, and greater opportunity for innovative software to reach consumers and thus face a market test undistorted by the exercise of Microsoft's monopoly power.

D. No Performance Degradation for Rival Middleware -- §3(c)

Microsoft has demonstrated its ability and incentive to hinder the adoption of rival middleware through a variety of exclusionary tactics such as it employed against Netscape's browser. Once Microsoft is enjoined from employing the tactics it has already used, Microsoft will have an incentive to switch to new, substitute tactics having the same effect. One such tactic is to intentionally degrade the performance of rival middleware interoperating with Windows.[37]

Section 3(c) of the proposed remedy will make it more difficult for Microsoft to evade the proposed remedy by degrading the performance of rival middleware. Given the danger that Microsoft might repeat this conduct, but recognizing that some such degradation may be difficult

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Professor Henderson, are an excellent example of how Microsoft is able to use Windows proprietary interfaces strategically.

[36] Conclusions at 13 ("Microsoft has presented no evidence that the contractual (or the technological) restrictions it placed on OEMs' ability to alter Windows derive from any of the enumerated rights explicitly granted to a copyright holder under the Copyright Act.")

[37] Microsoft recognized that one tactic that would favor Internet Explorer over Netscape Navigator would be to make using Navigator a "jolting" experience for Windows users.

or impossible to avoid as Microsoft improves its operating systems, the effectiveness of the remedy is enhanced, without hindering innovation by Microsoft, by requiring Microsoft to notify the supplier of any middleware for which Microsoft knowingly degrades the performance, for Microsoft to explain its reasons for the degradation, and for Microsoft to identify any ways known to Microsoft for the middleware supplier to mitigate the degradation.

E. Contractual Tying and Binding -- §3(f), §3(g)

1. Ban on Contractual Tying -- §3(f)

Microsoft has anti-competitively tied middleware to Windows by contract, both to defend its Windows monopoly and in an attempt to monopolize the market for browsers. (Findings of Fact ¶158-60) Section 3(f) of the proposed remedy prohibits such tying, and thus forces Microsoft's products to compete directly on the merits with rival software products. This provision should enhance OEM and consumer choice of software, and encourage innovation in software categories complementary to Windows.

2. Restrictions on Binding Middleware to Operating Systems -- §3(g)

There has been a great deal of talk about "technological tying" in this case. Microsoft has argued strenuously that its right to improve its operating system should not be compromised. Holding aside the specifics of how Microsoft added browser functionality to Windows, I accept the proposition that innovation often takes place in the computer industry through the integration of various capabilities or functions into a single piece of hardware or software. However, if such integrated capabilities are indeed beneficial to consumers, there is no need to *force* users to adopt all of the functions offered in an bundled product.

I believe that §3(g) strikes an excellent balance between the consumer benefits that can arise when Microsoft adds functionality to its operating system and the benefits that consumers enjoy when new and improved software is developed independently of Microsoft, especially if that software may serve a role in eroding Microsoft's monopoly position. By allowing OEMs to choose whether to make Microsoft's Middleware Products or rival software directly available to end users, OEMs will have the incentive to experiment to best serve consumers' interests. If a particular piece of Microsoft software is superior to rival offerings, OEMs will simply load on their machines a version of Windows that includes End-User Access to that software. If some

consumers prefer the Microsoft software and others do not, OEMs can configure their machines to suit the tastes of their customers, or allow customers to configure their own machines using add-remove utilities. And if the non-Microsoft software is clearly superior, OEMs will presumably insist that Microsoft provide them a version of Windows in which End-User Access to the Microsoft software can be removed, and offer End-User Access to the superior, non-Microsoft product. This is competition at work.

I understand that requiring Microsoft to offer a version of Windows in which all means of End-User access to middleware can be readily removed by OEMs and by end users will not impose any significant costs on Microsoft or prevent Microsoft from adding new capabilities to its Operating System Products.[38]

In my opinion, §3(g) will clearly promote innovation. It should be evident that this provision will increase the incentives of ISVs to develop middleware, knowing that OEMs will have an incentive to adopt their middleware if it offers superior performance to Microsoft's competitive Middleware Product. At the same time, Microsoft will have an even stronger incentive to innovate if it is forced to compete to provide new functionality to users. Plus, Microsoft is not prohibited from making improvements by integrating more capabilities into the operating system if that integration serves consumer interests. Ultimately, Microsoft will be pushed to make better software because it will be forced to compete to win consumer adoptions of its Middleware Products. Provision §3(g) is pro-competition and pro-innovation.

F. Licensing of Legacy Code -- §4(i)

Microsoft has asserted that it must continue to innovate to compete effectively against its own installed base. (Direct Testimony of Richard Schmalensee, ¶60) To date, competition between Microsoft and its own installed base of Windows has been modest at best since most Microsoft Windows sales are for new machines.[39] Clearly, buyers of a new PC require an operating system

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[38] See the Declaration of Edward W. Felten.

[39] Findings ¶10 ("The largest part of its MS-DOS and Windows sales, however, consists of licensing the products to manufacturers of PCs (known as 'original equipment manufacturers' or 'OEMs'), such as the IBM PC Company and the Compaq Computer Corporation ('Compaq').

for that machine, and Windows licenses do not permit the user to transfer the O/S from a previous machine.[40] We also observe that Microsoft raises the price and/or reduces the availability of previous versions of Windows when a new version is released.[41]

Through this pricing and distribution strategy, Microsoft can be assured that the functions it offers in its latest release of Windows are widely used and distributed, whether or not consumers prefer the newest version of Windows with those features to a prior version of Windows, perhaps used in conjunction with rival middleware that Microsoft is attempting to displace.

Section 3(i) of the proposed remedy requires Microsoft to continue licensing the predecessor version of Windows (without raising the royalty rate) when a major new version is released. This provision will give OEMs, and thus consumers, the choice of using the predecessor version, perhaps in conjunction with rival middleware, or the newest Microsoft operating system.

This provision will encourage innovation in two ways.

First, §3(i) will encourage software developers to create middleware that is complementary to Windows: the return to such development activities is increased by the assurance that the current version of Windows will continue to be available for OEMs and consumers to load onto new PCs for at least three years, and even after Microsoft introduces a major new operating system release that incorporates some of the functionality offered by the software developer. As a bonus, these

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An OEM typically installs a copy of Windows onto one of its PCs before selling the package to a consumer under a single price.") See Direct Testimony of Frederick R. Warren-Boulton at n. 7, citing Appendix B to Microsoft's Responses to Interrogatories, March 23, 1998 ("In 1997, 87.6% of all copies of the Microsoft's [sic] Windows 95 operating system product were installed by OEMs, while 7.3% were sold through retail channels as upgrades. Windows 95 is available at retail only as an upgrade from a Microsoft licensed operating system.")

[40] Findings at ¶57 ("The license for one of Microsoft's operating system products prohibits the user from transferring the operating system to another machine, so there is no legal secondary market in Microsoft operating systems.")

[41] Findings at ¶62 ("…Microsoft raised the price that it charged OEMs for Windows 95, with trivial exceptions, to the same level as the price it charged for Windows 98 just prior to releasing the newer product.") and Findings at ¶57 ("Microsoft takes pains to ensure that the versions of its operating system that OEMs pre-install on new PC systems are the most current. It does this, in

enhanced incentives to develop middleware will tend to lower the entry barriers into the market for operating systems and make it more likely that successful cross-platform middleware will emerge in the years ahead.

Second, §3(i) also will encourage innovation by *Microsoft*, since Microsoft will have to add valuable new functionality to support an increase in the price of Windows: unless the new release of Windows offers new functions that consumer truly value, consumers will simply pick the predecessor version of Windows at the prevailing price. Effectively, Microsoft has enhanced incentives to improve its Windows product to compete against its own predecessor version.

Finally, this legacy code provision should make it more difficult for Microsoft to use its Windows monopoly power to gain control over adjacent markets: if a new version of Windows favors Microsoft's complementary products, OEMs and consumers will at least have the choice to use the predecessor version, perhaps in conjunction with non-Microsoft complementary products.[42]

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part, by increasing the price to OEMs of older versions of Windows when the newer versions are released.")

[42] For example, consumer choice would be enhanced, and Microsoft's opportunities for using its desktop monopoly power to gain control over server operating systems using Windows 2000 would be diminished, if Microsoft were required to continue to license Windows NT 4.0 for three years after the release of Windows 2000.

V. Conclusions

The remedy entered by the Court in this matter will have a major influence on the nature of competition and the path of innovation in the information technology sector of the economy. In my opinion, the primary objective of the remedy should be to lower entry barriers into the market for PC operating systems and thus start to remedy the harm to competition caused by Microsoft's anti-competitive conduct. As explained above, there are strong reasons to believe – based on economic principles and based on the experience of this and other industries – that the proposed reorganization of Microsoft into separate applications and operating systems businesses will lower entry barriers, encourage competition and promote innovation.

I declare under penalty of perjury that the foregoing is true and correct. Executed on April 28, 2000 in Washington, DC

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Carl Shapiro