And Then There Were Nine:

The States v. Microsoft

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EXECUTIVE SUMMARY

Microsoft Corporation has been the subject of civil antitrust complaints since May 1998, when the U.S. Department of Justice (DOJ), twenty states and the District of Columbia filed suit under the Sherman Antitrust Act. Since then, the U.S. District Court before which Microsoft was originally tried rendered a guilty verdict that was reversed in part on appeal. Subsequent negotiations with the DOJ and nine states produced a settlement under which Microsoft would agree to remedies that would, among other things, make it easier for manufacturers of competing middleware products to substitute their products for similar products offered by Microsoft.

That settlement did not, however, satisfy the attorneys general of Massachusetts and of eight other states and of the District of Columbia, who have chosen to pursue a separate set of remedies. Considering the length and expense of the original case, along with the importance of the industry affected by it, it seems odd that these nine states would continue to press, as they are, for additional, more severe remedies.

The idea of pursuing a rational antitrust policy by the federal government alone is daunting enough. For each of the 50 states potentially to pursue its own policy toward a global corporation of the importance of Microsoft is to invite chaos. There is also the potential conflict between state and national interest. The states involved in the suit are home to some of Microsoft's largest competitors — in markets outside those addressed by the antitrust complaint. The sought-for remedies can be seen as little more than a wish list for these competitors. They attempt to grant IT behemoths such as Sun Microsystems, Oracle and AOL Time Warner (Netscape) market share through litigation that they couldn't achieve through competition and innovation.

In fact, the remedies are of dubious value even to these nine states. The nine states would permit Microsoft to manufacture a fully integrated version of its Windows operating system but would also require it to provide a stripped-down, or modular version, of the operating system from which original equipment manufacturers (OEMs) or end users could remove middleware code. When compared to the pending settlement, this provision adds nothing to benefit OEMs and end users, who would have the freedom and convenience to equip their computers with any number of possible replacement middleware components from Microsoft's competitors. Instead, the effect

of this proposed remedy would be to drive costs up for both Massachusetts software producers and consumers.

The expected costs to Massachusetts software producers over the three-year period of 2003-2005 would be $3 billion dollars. These include increased costs incurred from having to develop, test, market and support numerous new versions of their software. The developers would be forced to write these new versions because they would no longer be guaranteed full functionality of the Windows platform due to the fragmentation caused by the nine states' remedies. Those hardest hit would be small software firms in the state that are already operating close to the margin.

A portion of the new costs incurred by U.S. software developers would be passed along to Massachusetts consumers. Massachusetts citizens and universities would be forced to pay higher costs for their software. For the same three-year period of 2003-2005 the expected increase in costs for Massachusetts software consumers would be $625 million.

It is ironic that a state such as Massachusetts, which faces the prospect of billions of dollars in costs to producers and consumers, has its own Attorney General championing these very remedies.

INTRODUCTION

On May 18, 1998, the United States filed a civil antitrust complaint alleging that Microsoft restrained competition in the computer software industry in violation of Sections 1 and 2 of the Sherman Act, 15 U.S.C. 1-2.[1] On the same day, twenty states and the District of Columbia filed a similar, but not identical, complaint against Microsoft. The District Court consolidated the case at Microsoft's request. The case was brought before the United States District Court for the District of Columbia, which found that Microsoft violated both Sections 1 and 2 of the Sherman Act. Microsoft appealed the decision to the United States Court of Appeals for the District of Columbia, and the Court of Appeals agreed in part and reversed in part the decision of the District Court.

The Court of Appeals upheld the conclusion that Microsoft had been in violation of Section 2 of the Sherman Act with regard to its acts designed to protect its Windows operating system monopoly from competing companies' "middleware"[2] products. The Court of Appeals determined that, with regard to competing middleware, Microsoft engaged in the following:

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[1] Sherman Act Section 1 states, "Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among several States, or with foreign nations, is declared to be illegal. Every person who shall make any contract or engage in any combination or conspiracy hereby declared to be illegal shall be deemed guilty of a felony, and, on conviction thereof, shall be punished by fine not exceeding $10,000,000 if a corporation, or, if any other person, $350,000 or by imprisonment not exceeding three years, or by both said punishments, in discretion of the court." Sherman Act Section 2 states, "Every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce among the several States, or with foreign nations, shall deemed guilty of a felony, and, on conviction therefore shall be punished by fine not exceeding $10,000,000 if a corporation, or, if any other person, $350,000 or by imprisonment not exceeding three years, or by both said punishments, in discretion of the court."

[2] The definition of middleware in the nine states' alternative remedies is as follows, "…software, whether provided in the form of files installed on a computer or in the form of Web-Based Software, that operates directly or through other software within an Operating System or between an Operating System (whether or not on the same computer) and other software (whether or not on the same computer) by offering services via APIs or Communications Interfaces to such software, and could, if ported to or made Interoperable with multiple Operating Systems, enable software products written for that middleware to be run on multiple Operating System Products. Examples of Middleware within the meaning of this Final Judgment include without limitation Internet browsers, networking operating systems, e-mail client software, media creation, delivery and playback software, instant messaging software, voice recognition software, digital imaging software, the Java Virtual Machine, calendaring systems, Handheld Computing Device synchronization software, directories, and directory services and management software." Plaintiff's First Amended Proposed Final Judgment, March 2002, p. 24.

> (1) undertook a variety of restrictions on personal computer Original Equipment Manufacturers ("OEMs"); (2) integrated its Web browser into Windows in a non-removable way while excluding rivals; (3) engaged in restrictive and exclusionary dealings with Internet Access Providers, Independent Software Vendors and Apple Computer; and (4) attempted to mislead and threaten software developers in order to contain and subvert Java middleware technologies that threatened Microsoft's operating system monopoly.[3]

The Court of Appeals reversed and remanded the District Court's finding of a Section 1 violation. It also reversed the Court's decision that Microsoft had attempted to monopolize the Web browser market in violation of Section 2. In light of this, the Court of Appeals vacated the Final Judgment and remanded the case back to the District Court for new remedy proceedings. The District Court ordered a period of negotiations between the states and Microsoft on final remedies to begin on September 28, 2001 and end on November 2, 2001.

After lengthy negotiations, the Department of Justice (DOJ) and nine states have reached a remedies settlement with Microsoft in their antitrust case. However, nine other states and the District of Columbia have refused to settle and have put forth a set of alternative remedies.[4] It is beholden upon U.S. District Judge Colleen Kollar-Kotelly to decide if the DOJ's "settlement" is in the public interest or if the nine states' "alternative remedies" should serve as the prevailing set of remedies in this case.

One remedy being pursued in this case is of particular importance to Massachusetts producers and consumers. This remedy would unbundle Microsoft's middleware from Microsoft's Windows operating system.

Both the DOJ settlement and the states seek to promote competition in the middleware market, in the hope that competition in this market will lead to competition in the operating systems market.

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[3] United States District Court for the District of Columbia, Civil Action No. 98-1232 (CKK), Competitive Impact Statement, Section II.

[4] Of the twenty original states and the District of Columbia: South Carolina withdrew from the case in 1998, New Mexico reached a settlement independently in July of 2001, nine of the states (New York, Ohio, Illinois, Kentucky, Louisiana, Maryland, Michigan, North Carolina and Wisconsin) and Microsoft were able to reach agreement upon a Proposed Final Judgment and nine states (California, Connecticut, Florida, Iowa, Kansas, Massachusetts, Minnesota, Utah and West Virginia) and the District of Columbia have refused the DOJ settlement and have put forth their own set of more severe remedies.

The difference lies in what either would require Microsoft to do in order to promote this competition.

In the past, Microsoft restricted OEMs from including competing middleware products on their machines if they wished to also install a version of the Windows operating system. The Court of Appeals found this impeded competition in the middleware market.

The DOJ settlement attempts to remedy the problem by requiring Microsoft to include in Windows a mechanism, such as an Add/Remove utility, that would allow end users and OEMs to remove access to each Microsoft middleware product.[5] The settlement would allow OEMs to include competing middleware components, such as the RealOne media player or AOL instant messenger, instead of Microsoft middleware, while maintaining the integrity of the Windows platform. This allows programmers that access these middlewares' application programming interfaces (APIs) to continue doing so and to be able to invoke Windows' full functionality.

The remedy sought by the states treats the issue of middleware quite differently. Their remedy allows OEMs to acquire stripped down and lower priced versions of the Windows platform from Microsoft, with various Microsoft middleware components and their code removed.[6] The OEMs could either choose to leave out those components altogether or replace them with competing middleware products.

The prospect that OEMs would acquire Windows operating systems stripped of the Windows' middleware components would leave a software developer who relies on those components for its program with two options: either (1) purchase the components themselves and include them with the programs or (2) write a new version of their program to run on a version of Windows that has the competing middleware components as its default.

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[5] The DOJ settlement states that Microsoft shall: "Allow end users (via a mechanism readily accessible from the desktop or Start menu such as an Add/Remove icon) and OEMs (via standard pre-installation kits) to enable or remove access to each Microsoft Middleware Product or Non-Microsoft Middleware Product." U.S. vs. Microsoft Corporation, Second Revised Proposed Final Judgment, Section III.H.1.

[6] The paragraph preceding section 1 of the nine states' alternative remedy states, "To prevent further unlawful commingling of Internet Explorer with the Windows Operating System, and to prevent similar anticompetitive commingling of other rival middleware (such as multimedia viewing and/or listening software or electronic mail software), Microsoft must be required either to cease such commingling or to offer its operating system software on an unbundled basis."

This study seeks to estimate the costs that would be incurred by software producers and consumers nationwide, and in Massachusetts, if this remedy were imposed. Massachusetts citizens are among the most technologically savvy in the country with a disproportionate number of colleges and universities that purchase large quantities of IT products on a yearly basis. Massachusetts is also home to a thriving IT sector, consisting of thousands of small, medium and large high-tech entrepreneurs.[7] It is the effects on these groups as a result of the states' alternative remedies upon which this paper will focus. Before discussing the costs associated with the nine states' alternative remedies, it is useful to compare their remedies with the DOJ settlement.

[7] Massachusetts leads the nation with the highest number of high-tech companies as a percentage of total companies in the state. The Beacon Hill Institute, *State Competitiveness Report 2001*, December 2001 p. 95.

CRITERIA FOR AN EFFECTIVE ANTITRUST SETTLEMENT

Certain standards determine whether the remedy applied in an antitrust case meet the needs of the marketplace and public at large. If a settlement does not meet even one of these criteria then it has failed to effectively and legally honor the obligations and spirit of antitrust law.

Four standards that every antitrust remedy should meet are: 1) the remedy should be tailored to meet the needs of consumers, not to improve the position of competitors in the marketplace; 2) it should not inflict undue burdens on entities outside the scope of the antitrust case; 3) it should be designed to cover only the activities that have been found to be anticompetitive; and 4) it should be easy to enforce and not be of a regulatory nature. While the DOJ settlement can be shown to meet these standards, the remedies sought by the nine states do not.

Needs of Consumers, Not Competitors

The DOJ settlement ensures that Microsoft will be allowed to continue selling a single uniform operating system under the Windows name and that consumers will be able to rely on the availability of Windows when deciding which computers or software to buy. It also eliminates the possibility of repeating past exclusionary practices such as the restriction of promotion or distribution of competitors to Internet Explorer by Internet access providers.

The DOJ settlement also increases the choices of middleware products for consumers by requiring Microsoft to include a new more powerful Add/Remove utility to new versions of Windows. This would enable OEMs and consumers to disable Microsoft's middleware products such as Internet Explorer, Microsoft Messenger and Windows Media Player. Consumers would now be free to choose middleware components from a number of different companies at their own discretion. This is a reasonable approach to fostering competition in the middleware industry while maintaining the integrity of the Windows platform on which consumers and software developers depend.

The remedies sought by the states would, in contrast, require Microsoft to sell a hodgepodge of Windows versions at the request of OEMs. This policy does not take into account the technical advantages of an integrated unified Windows operating system. The resulting versions of

Windows would be supplemented with a patchwork of competitors' middleware, resulting in hybrid operating systems that would leave consumers with no recourse if they wanted to restore the original Windows operating system. This would effectively eliminate the efficient standard version of Windows.

Besides requiring Microsoft to sell stripped-down versions of Windows with the middleware code removed, the alternative remedies give direct benefits to some of Microsoft's biggest competitors. The alternative remedies resemble a wish list of Microsoft's largest competitors. Table 1 below is a partial list of the benefits that Microsoft's competitors stand to gain with the nine states' alternative remedies.

Table 1. Gains for Microsoft's Competitors with the Alternative Remedies

Competitor	**Specific Advantage Garnered from the Alternative Remedies**
AOL Time Warner	* AOL can give away its browser software or pay OEMs to add AOL and remove Internet Explorer.
	* Microsoft must increase the price of Windows if it includes Microsoft Messenger, but AOL can give away its Instant Messenger to attract new customers.
Oracle	* Oracle will get a huge leg up with its new e-mail servers because Microsoft would have to reveal how its Microsoft Exchange server replicates and communicates.
IBM	* IBM will be able to get Microsoft Office source code at the auction price enabling them to reduce the development time of their office suite for Linux.
Sun Microsystems	* Sun can look forward to guaranteed distribution of Java by virtue of Microsoft's being required to include a copy of it with every unit of Windows. * There will be less competition in the server operating systems market since Microsoft will be required to unbundle its enterprise management and directory services.
Apple	* Microsoft must continue to provide its Office suite for Macintosh regardless of its profitability.
RealNetworks	* Microsoft must increase the price of Windows if it includes Windows Media Player, but RealNetworks can give away RealPlayer to increase its market share. * RealNetworks can pay OEMs to replace Windows Media Player and make RealNetworks products the defaults for Windows.

The above companies are the same ones that have aggressively sought to broaden sanctions against Microsoft beyond the anticompetitive findings of the Court of Appeals.

No Undue Burdens on Outside Parties

By allowing OEMs to create different versions of Windows by removing Microsoft middleware, the alternative remedies put IT companies at a distinct disadvantage. The removal of Microsoft middleware by OEMs means that software developers can no longer take for granted that Windows' full functionality will be available to consumers. The resulting fragmentation of the Windows operating system burdens developers with extra costs to create, distribute and support their own version of the missing middleware component. These costs to developers, and ultimately to consumers, are considered in detail in the following sections.

Cover Only Activities Deemed to be Anticompetitive

The DOJ settlement addresses fairly all activities deemed anticompetitive by the U.S. Court of Appeals. The settlement insures that Microsoft cannot penalize OEMs who distribute software or components that compete with Microsoft's software, operating system or middleware. It regulates the agreements that Microsoft can enter into with OEMs. The settlement entitles OEMs to uniform licensing terms with latitude granted for volume discounts and marketing allowances. Table 2 below identifies the activities found to be anticompetitive and the section of the DOJ Second Revised Proposed Final Judgment that addresses them.

Table 2. U.S. Court of Appeals Rulings on Microsoft's Anticompetitive Behavior

Activities Deemed Anticompetitive by U.S. Court of Appeals	**Second Revised Proposed Final Judgment Section**
Commingling Internet Explorer and Windows code and illegally excluding it from its Add/Remove utility	III.H.1-3
Threatening to discontinue MS Office for Macintosh to force Apple to feature Internet Explorer	III.G.2
Prohibiting deletion of the Internet Explorer desktop icon	III.H.1-3
Restricting promotion of competing browsers and curtailing OEMs' ability to alter the initial boot sequence	III.C, III.G.1, III.H
Requiring software vendors to use Microsoft's Java Virtual Machine and Internet Explorer	III.F.2, III.G.1
Deceiving developers about its Java language	III.D
Restriction of competing web browsers by Internet Access Providers	III.A.1, III.C.1-2
*The complete texts of the DOJ settlement sections cited above appear in Appendix II.	

Table 2 reflects only the provisions that address U.S. Court of Appeals findings of anticompetitive behavior. The DOJ settlement also contains provisions that go beyond the scope of the U.S. Court of Appeals findings such as required licensing of intellectual property to competitors and required publishing of client/server protocol.

The alternative remedies address issues that are not only outside the scope of the Court's findings, but also outside the scope of the case entirely. Under these remedies, Microsoft would have to notify the states' attorneys sixty days before making any acquisition, investment or exclusive license. This is despite the fact that take-over related issues were never discussed at all during the case. Microsoft would also be required to give sixty days notice to any software developer regarding any action it plans to take that may affect the interaction between the developer's product and Windows. These provisions have no bearing on the Court's anticompetitive findings and in fact only serve to put Microsoft at a distinct competitive disadvantage in many instances.

Settlement Should Be Non-Regulatory

The DOJ settlement provides for a Technical Committee (TC) and Compliance Officer (CO) to be appointed to oversee Microsoft's adherence to the terms of the settlement. The TC will be made up of three members. Microsoft and the plaintiff states each will appoint a member, while the third member is to be appointed by the two previously appointed members. The settlement also requires Microsoft to appoint an internal CO, who would be an employee of Microsoft. The CO would be responsible for administering Microsoft's antitrust compliance program. At any time, a plaintiff state, the TC, the CO or a third party may submit complaints concerning Microsoft's compliance. It would then be beholden upon the plaintiff states to investigate and remedy the possible noncompliance by Microsoft.

The alternative remedies also call for this structure, but go one extra step and call for a Kafkaesque position called the Special Master (SM). In effect, the SM becomes the judge and jury. Section N.18.a of the Plaintiff Litigating States' First Amended Proposed Remedy states, "The Special Master has and shall exercise the power and authority to monitor Microsoft's compliance with this Final Judgment, including taking all acts and measures he or she deems necessary or proper for the efficient performance of the Special Master's duties and responsibilities as set forth in this final Judgment." The position of SM will bypass the litigating

states' authority and render sanctions itself, thus dragging the federal courts back into a prosecutorial or regulatory role. In addition, because any third party making complaints to the SM can remain anonymous it allows Microsoft's competitors to deluge the position with complaints and bring Microsoft's operations and innovations to a virtual standstill.

As seen in the preceding section, the DOJ settlement is superior to the alternative remedies on both its legal and technical merits. The following sections attempt to quantify the harm that would result from the imposition of the alternative remedies.

INCREASED COSTS DUE TO FRAGMENTATION OF THE WINDOWS OS

If software developers wish to have their programs run on different operating systems, such as Windows and Linux, they incur extra costs for developing different versions for the various operating systems. Even to port their software to a new-platform-equivalent version of Windows (ie. from Windows 95 to Windows 2000) requires an incremental cost in developing, debugging, selling and supporting their software. The remedy sought by the states will impose similar costs.

Without the guarantee of the Microsoft middleware default code, developers will have to write programs that will be able to run on a number of competing middleware products. Suppose a developer sells an application that invokes code from Microsoft Messenger in order to provide interactive support for end users. Now Dell or Compaq decide that they want Yahoo's or AOL's instant messenger as the default messenger on their machines, but still want Windows as their operating system. Under the alternative remedies, these OEMs can remove the Microsoft Messenger code from Windows. While the OEM may add instant messaging products from Yahoo or AOL on their computers before they sell it to the consumer, these alternative messaging products do not expose the same application interfaces as Microsoft's own middleware. OEMs have an incentive to remove Microsoft code because they will receive Windows at a reduced price (cost of Windows minus the unbundled cost of Microsoft Messenger), and they may also receive payment from Yahoo or AOL for putting them as the default instant messenger on all their machines.

The software developer whose application invoked Microsoft Messenger now also needs a version of his program that will run in harmony with AOL's or Yahoo's middleware. The larger the number of these Microsoft middleware components that OEMs remove and replace with competing components and the greater the number of competing components per middleware category, the larger the number of versions of Windows for which developers will have to program.

Referring to the alternative remedies' requirements, Howard Diamond, Chairman of Corporate Software & Technology in Norwood, Massachusetts said, "By some accounts, they [nine litigating states] would require Microsoft to produce over 1000 different versions of Windows.

For software developers, the testing of products for bugs and compatibility issues is one of the most expensive parts of product development."[8] Under the DOJ settlement, the OEMs would still be able to have Yahoo or AOL as their default messenger, and through the new more powerful Add/Remove feature in Windows, be able to remove access to Microsoft Messenger. However, under the DOJ settlement, the code would still be part of the operating system, so that developers could still access Microsoft Messenger's full functionality.

Below is a list of Microsoft middleware components whose code the nine states include as subject to removal under their alternative remedies:

- Internet browsers (Internet Explorer)
- E-mail client software (Outlook Express)
- Media creation, delivery and playback software (Windows Media Player)
- Instant messaging software (Microsoft Messenger)
- Voice recognition software
- Digital imaging software
- Directories
- Exchange
- Calendaring systems
- Systems and enterprise management software
- Office
- Handheld Computing Device synchronization software
- Directory services and management software
- Common Language Runtime component of the .Net framework[9]

These multiple versions of Windows will require software developers to incur extra costs to port their software to each version. It is these costs that developers and consumers, in Massachusetts and across the country, will have to absorb due to the alternative remedies.

[8] "Selected comments by Association for Competitive Technology members, on whether the proposed Microsoft settlement is 'in the public interest'", January 28, 2002, http://www.actonline.org.
[9] Plaintiff's First Amended Proposed Final Judgment, March 2002, Section P.22.x.i.

Porting Costs to a New Related Operating System

As discussed above, software developers will incur costs due to the fragmentation of the Windows OS due to the remedy that allows OEMS to remove Microsoft middleware code. Dr. Stan J. Liebowitz at the Management School of the University of Texas has gathered data relating to these costs.[10]

In 1999, Dr. Liebowitz surveyed software developers about costs incurred from porting their programs from one version of a platform to an upgraded version of the same platform. In his survey Dr. Liebowitz asked, "I am investigating what the costs of some proposed remedies might be. Do you have any idea how much additional effort is required to port a product to different flavors of an operating system? (Win 95 or 2000, various flavors of Unix say)."[11] Survey respondents gave what they believed to be their average expected costs, in various categories such as R&D, support and marketing, to port their product to a new version of an operating system.

The responses gleaned from survey respondents were then applied to estimates of operating cost categories as a share of total costs for software development firms contained in a study conducted by KPMG. The net result was an estimate of extra costs incurred by developers to port their programs to a full platform-equivalent version. This cost is equal to 6.46% of revenues. This estimate provides a starting point to the estimation of costs incurred by developers due to middleware unbinding. Once this industry-wide estimate of the cost incurred by developers to port their software to a new platform-equivalent version of an OS is calculated, inferences can be made as to the costs incurred as a result of writing for new middleware components as required under the nine states' alternative remedies.

Nathan Associates Inc., in conjunction with Microsoft, conducted an exhaustive survey of the U.S. Windows-related high-tech industry.[12] It identified over 230,000 high-tech entrepreneurs located in the U.S. These entrepreneurs focus on many activities, including but not limited to:

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[10] Stan J. Liebowitz, "Swiss Cheese Windows, Estimating Some Costs of the Nine State Remedy", The Association for Competitive Technology, February 21, 2002.
[11] Ibid, p. 12.
[12] Nathan Associates, Inc, "The New High-Tech Entrepreneurs, Bringing the Efficiency & Productivity of Personal Computing to U.S. Companies", 1998.

writing packaged and customized software; writing ActiveX, HTML, or Java-based applets; and designing, installing, supporting and managing networked computer or messaging systems. Nathan Associates Inc. and Market Decisions Corporation, a market research firm, surveyed these entrepreneurs and estimated the direct and indirect effects of the demand for services and products provided by these entrepreneurs. They estimated revenue for these firms at $94 billion in 1997.[13] They also estimated revenue for services and hardware. For the purpose of this study, however, the software revenue figure is the one that is applicable to the 6.46% of revenues cost estimate cited above.

To obtain an estimate of revenues for the years following the possible passage of the nine states' alternative remedies, 2003-2005, we applied growth rates of personal consumption expenditures on software from the Bureau of Economic Analysis to the Nathan Associates 1997 software revenue figure. Table 1 below shows these projections along with the projected incremental cost to the industry of porting its software to an additional full platform-equivalent version of an operating system.

Table 3. Costs Associated with Porting to a Related Operating System

	2003	2004	2005	Total
Total Revenue for U.S Software Firms ($billions, nominal)	$146.14	$157.50	$169.75	$473.40
Extra Cost as Percentage of Revenues	6.46%	6.46%	6.46%	6.46%
Cost to Port to Related Operating System ($bn)	$9.44	$10.17	$10.96	$30.58
The growth in personal consumption expenditure (PCE) on software for the years from 1997-2001 was applied to the Nathan Associates 1997 software revenue figure to obtain an estimate of software revenue through 2001. The average growth rate for the period 1997-2001, 7.8%, was then applied to the 2001 estimate to obtain projections for 2003-2005				

Given the estimates of the cost to the software industry of porting its software to a related version of an operating system, a comparison has to be made between these costs and those of porting to a version of Windows created by the removal of middleware code inherent in the nine states' alternative plan.

[13] Ibid, p.12.

SENSITIVITY ANALYSIS AND THE REMOVAL OF MIDDLEWARE COMPONENTS

No one, including the litigants in this case, can predict the exact chain of events that will occur if the alternative remedies are accepted and Microsoft is forced to offer modular versions of Windows from which OEMs can remove middleware code. Microsoft will surely incur extra costs, because at the very least they will have to be prepared to meet the demands of the alternative remedies if they should prevail. This involves unbinding their middleware components from their Windows operating system. This is not a trivial task. Much of the middleware code, such as Internet Explorer, is commingled with the Window's source code. This will impose an extra cost that will be borne by Microsoft and some may be passed along to consumers. Estimating this cost is difficult without intimate knowledge of Window's source code and the requirements needed to unbundle it.

OEMs may not choose to switch to competing middleware products or consumer demand may not allow them. Consumers may wish to stay with the status quo and make their feelings known through their spending decisions. OEMs that remove middleware code from Windows may find themselves losing market share. This is not the intent of the alternative remedies, however, and the aim of this paper is to estimate the costs to Massachusetts software producers and consumers of the remedies on the assumption that OEMs will, at least in some instances, act as the attorneys general hope

Their hope is that there will be robust competition in all middleware markets, with several companies competing in each category. Their hope is that, because developers may very well have to write code for many new middleware contingencies, new operating systems will emerge in competition with Windows. There will be many combinations of middleware APIs that developers will have to take into account. This is the very scenario that will impose substantial new costs on Massachusetts software producers and consumers in particular, and on U.S. software producers and consumers in general.

Nobody can know exactly how many leaders will come to the top of each middleware category and grab a share of the market. And there is no industry standard number of middleware components utilized by all software programs. Yet there is information on the ranges of these

variables. Therefore by making some informed assumptions about variable values and distributions, an expected value of the costs incurred by software developers to port their programs from one competing version of Windows to another can be obtained with a certain level of confidence. First, we will estimate the cost to the U.S. Windows software industry as a whole and then consequently for the Massachusetts software industry and Massachusetts consumers.

Monte Carlo Simulation

The exercise below is a Monte Carlo simulation. The procedure is to choose the distribution of future variables such as number of competing products in each middleware category, average number of middleware components utilized by software developers and the cost of porting to a competing version of Windows as a percentage of cost of porting to a related operating system. The next step is to randomly pick values for the future, based on the chosen distributions, compute the cost incurred by the software industry due to the nine states' alternative remedies and repeat the process many times. The result is a *distribution* of outcomes for the incurred cost, which allows one to compute, among other things, the expected (mean) amount of the incurred cost and the probabilities associated with different cost magnitudes.

In order to estimate the costs to developers of adapting to competing versions of Windows brought about the nine states' alternative remedies, we make the following assumptions:

1. The number of competing middleware products per category are allowed to vary between two and seven. With the following distributions: two components, 15%; three components, 15%; four components, 20%; five components, 30%; six components, 15%; and seven components, 5%.[14]

2. The number of middleware components utilized by the average developer in its software was allowed to vary between two and six with the following distribution: two components, 15%; three components, 20%; four components, 30%; five components, 20%; and six components, 15%.[15]

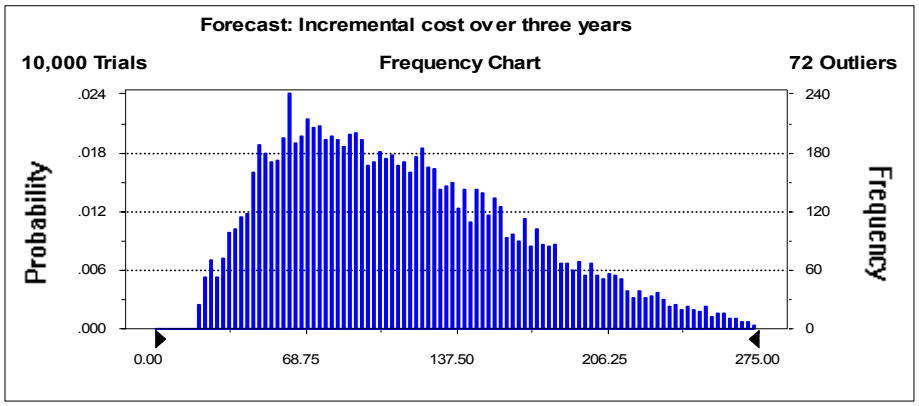
[14] The number of components can very dramatically by category. Some of the categories such as e-mail can have upwards of twenty competing products on the market. It is not likely, however, that twenty competing products would get a piece of the new stripped down Windows market. The assumed maximum number of seven components, and then only 5% of the time, is more in line with reality.

[15] The nine states' alternative remedies name twelve possible middleware components whose code is subject to removal by OEMs. It is hardly believable that a developer's program would call the API of all twelve of these components, but many programs would utilize multiple components so six was chosen as a

3. The cost of altering the code that writes to a new individual middleware component as a share of the cost of writing to a new related operating system (i.e. differing versions of Unix) was assumed to follow a triangular distribution – minimum of 15%, mode of 20% and maximum of 30%.[16]

The analysis was programmed using Crystal Ball, an add-in program for Microsoft Excel. The key variables were allowed to vary randomly within their distributions. The resulting incremental cost factor was applied to the total loss associated over the years 2003-2005 of writing for a related version of an operating system from Table 1, $30.58 billion.[17] Using this program, we obtained 10,000 computations of the incurred costs for U.S Windows software developers from the alternative remedies, each associated with one of the above-described scenarios. We then determined the frequency distribution of these incurred costs from which we were able to compute the expected incurred costs and the probability of different magnitudes of these costs. See Figure 1.[18]

Figure 1. Alternative Remedies' Cost Distribution



reasonable maximum and only allowed to occur 5% percent of the time. The distribution is skewed to a more modest amount of four components.

[16] This range of the extra costs associated with producing software for multiple middleware versions was arrived at by taking many factors into consideration and from interviews conducted by Dr. Stan Liebowitz for his article previously cited in this paper. Increases in research and development, sales & marketing and support all contribute to overall higher costs. Interviewees in the Liebowitz article cited costs between 70% to 200% for extra cost incurred for porting their software to a new version of windows, so the range of 15% to 30% is quite reasonable.

[17] An example would be if one of the random trials produced the following variable values: 2 competing middleware components per category, 4 middleware components accessed per program and incremental costs were 20% of the costs associated with writing for a related version of an operating system. This would yield 8 (2 components per category * 4 middleware components accessed) new middleware components and their APIs to write for each at 20% of the cost of writing for a related operating system. This is equal to 1.6 multiplied by $30.58 billion, which would put the estimated cost of the alternative remedies at $48.93 billion over the next three years.

[18] All these statistics from the Monte Carlo simulation can be viewed in Appendix I.

Specifically the simulation found that:

- For U.S. Windows software developers and world consumers the expected loss over the next three years incurred form the alternative remedies is $114.32 billion.
- There is a ten percent chance the loss could be as low as $48.76 billion.
- There is a ten percent chance the loss could be as high as $193.6 billion.

The next section will use the national estimates attained in the above simulation to derive the costs specific to Massachusetts.

MASSACHUSETTS COSTS

The average estimated extra costs calculated in the section above of $114.32 billion are for both U.S. Windows developers and the world consumer market. These costs will be split between U.S. developers and the consumers around the world to whom they sell their products. The first step in apportioning this amount to Massachusetts developers and consumers is deciding how much of the overall cost developers will absorb themselves. To attempt to maintain or even improve their current sales levels, developers will want to absorb as much of the costs as possible. With increased costs of this magnitude it is hard to imagine developers internalizing more than 60% of the overall cost increase. Therefore we will assume a 60-40 split between producers and consumers, with producers absorbing 60% of the overall cost increase and consumers paying for the other 40%. With this assumption we can now calculate the costs to be experienced by Massachusetts producers and consumers.

Massachusetts Producers

The overall expected cost figure of $114.32 billion is based on the sales figures in the Nathan Associates report, which were only for Windows high-tech entrepreneurs located in the United States. Producers will absorb 60% of the $114.32 billion, or $68.6 billion. To calculate the percentage of the total U.S. cost that will be absorbed by Massachusetts producers, we calculated the number of high-tech entrepreneur establishments located in Massachusetts as percentage of the U.S. total, the total sales of Massachusetts high-tech entrepreneurs as a percentage of the U.S. total and employment in Massachusetts high-tech establishments as a percentage of the total U.S. employment due to high-tech entrepreneurs.[19] The average of these three estimates was calculated to produce an estimate of 4.39% of the total cost absorbed by producers of Windows related software would be borne by developers located in Massachusetts. Massachusetts developers would see their costs rise by approximately $3 billion dollars over the three-year period of 2003-2005.

[19] The data for these calculations are from Table 1, "Direct Effects of the Demand for High-Tech Entrepreneurs" of the Nathan Associates report. The percentages were as follows: percentage of establishments located in Massachusetts, 3.93%; percentage of total sales attributable to Massachusetts developers, 4.50%; and percentage of total high-tech employment attributable to Massachusetts establishments, 4.73%.

With Massachusetts experiencing an economic slump, these alternative remedies are not the type of vehicle needed to spur economic growth. The high-tech sector is of particular importance to the state economy and to inflict these extra costs on it would be to worsen its economic woes. Attorney General Reilly should have accepted the DOJ settlement with Microsoft and allowed Massachusetts high-tech entrepreneurs to get on with their work as innovators and leaders in the national IT arena.

Massachusetts Consumers

Massachusetts has some of the savviest high-tech consumers in the country. Massachusetts is home to a large number of colleges and universities all of whom buy large numbers of software products. The alternative remedies will adversely affect these consumers. As stated above, U.S. producers of Windows' related software will absorb 60% of the expected extra cost of the $114.32 billion and the other 40%, or $45.73 billion, will be borne by the rest-of-the world Windows' software market. To apportion Massachusetts share of the $45.73 billion, we first calculate the split between the domestic and foreign markets. We estimate that the U.S. market represents 36% of the world software market.[20] Therefore the share of the loss attributable to U.S. consumers is equal to $16.46 billion multiplied by 60% markup, or $26.33 billion.[21]

To apportion Massachusetts consumers' share of the $26.33 billion in extra costs, we used data on the percentage of households with computers by state. Using these data, we find that Massachusetts consumers will bear 2.4%, or $625 million, of the extra costs because of the nine states' alternative remedies.[22] An antitrust settlement should first and foremost protect consumers. Attorney General Reilly fails to grasp this principle. Because of the remedies he endorses, Massachusetts software consumers will be forced to endure higher prices for the software they buy.

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[20] This estimate comes from combining U.S. personal expenditure data from 1997 on software from the Bureau of Economic Analysis which state Americans spent $75.16 billion on software in that year, and a world estimate of software sales of the same year of $135.4 billion from Jock O'Connell, "The Case of the Missing Software Exports," *Sacramento Bee*, August 15, 1999.

[21] This 60% markup figure is from, Liebowitz, Table 5 p. 27.

[22] Data used in this calculation are from National Telecommunications and Information Administration, *Falling Through the Net: Toward Digital Inclusion,* October 2002, Table I-A, Percent of Households with Computers, by State: 2000.

CONCLUSION

The alternative remedies put forth by Massachusetts Attorney General Tom Reilly and his eight counterparts are little more than a wish list for Microsoft's largest middleware competitors. They attempt to grant IT behemoths such as Sun Microsystems, Oracle and AOL Time Warner (Netscape) market share through litigation that they couldn't achieve through competition and innovation. The nine states' alternative remedies do this at the peril of consumers and small and medium IT companies, which would not be able to compete due to their increased costs under the alternative remedies.

These remedies would in effect, limit consumer choice and reduce competition. The alternative remedies violate basic principles of any antitrust judgment and will ultimately cost Massachusetts consumers and high-tech entrepreneurs hundreds of millions of dollars. It is ironic that a state such as Massachusetts that stands to lose so much under the nine states' alternative remedies has their own Attorney General championing those very remedies.

APPENDIX I

Forecast: Incremental cost over three years

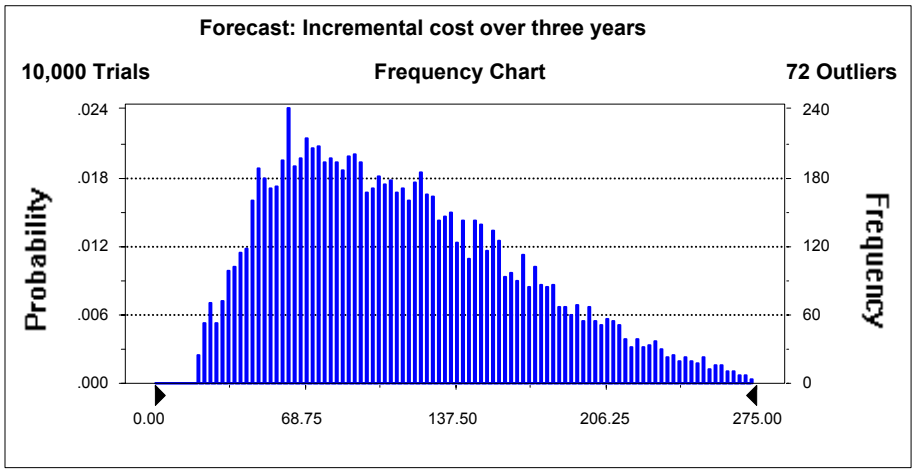
Summary:

Display Range is from 0.00 to 275.00

Entire Range is from 18.86 to 363.15

After 10,000 Trials, the Std. Error of the Mean is 0.56

Statistics:	**Value**
Trials	10000
Mean	114.32
Median	105.95
Mode	---
Standard Deviation	56.25
Variance	3,163.91
Skewness	0.71
Kurtosis	3.12
Coeff. of Variability	0.49
Range Minimum	18.86
Range Maximum	363.15
Range Width	344.29
Mean Std. Error	0.56



Forecast: Incremental cost over three years (cont'd)

Percentiles: In billions of dollars

Percentile	Value
0%	18.86
10%	48.76
20%	62.98
30%	76.52
40%	90.68
50%	105.95
60%	121.72
70%	139.74
80%	161.63
90%	193.60
100%	363.15

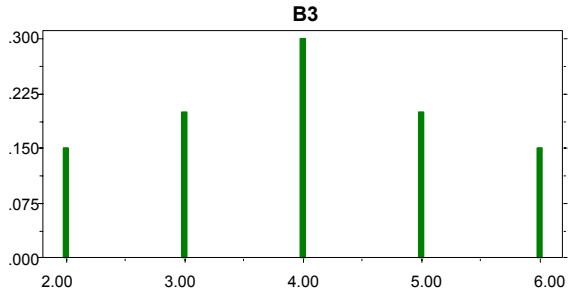
End of Forecast

Assumptions:

Assumption: Number of middleware categories called per average Windows-related program

Custom distribution with parameters:

Relative Prob.		
Single point	2.00	0.150000
Single point	3.00	0.200000
Single point	4.00	0.300000
Single point	5.00	0.200000
Single point	6.00	0.150000



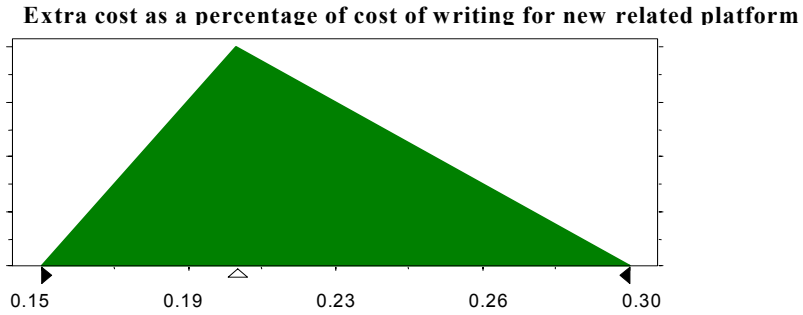
Total Relative Probability 1.000000

Mean value in simulation was 4.02

Assumption: Extra cost as a percentage of cost of writing for new related platform

Triangular distribution with parameters:

Minimum	0.15
Likeliest	0.20
Maximum	0.30

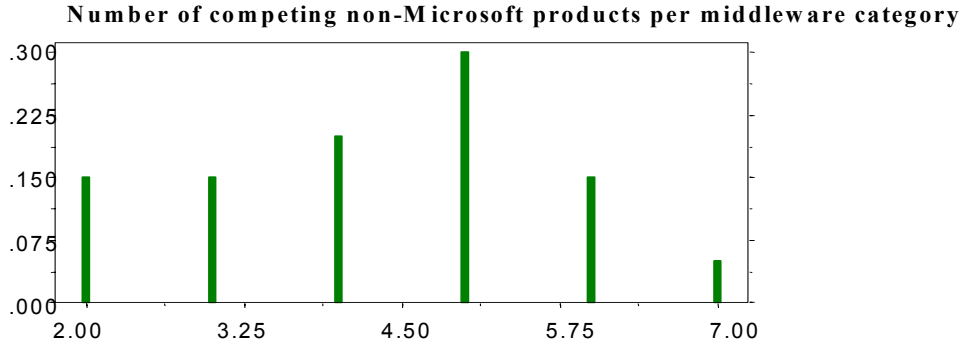


Selected range is from 0.15 to 0.30
Mean value in simulation was 0.22

Assumption: Number of competing non-Microsoft products per middleware category

Custom distribution with parameters:

		Relative Prob.
Single point	2.00	0.150000
Single point	3.00	0.150000
Single point	4.00	0.200000
Single point	5.00	0.300000
Single point	6.00	0.150000
Single point	7.00	0.050000



Total Relative Probability 1.000000
Mean value in simulation was 4.29

APPENDIX II

Activities Deemed Anticompetitive by U.S. Court of Appeals	**Second Revised Proposed Final Judgment Section**
Commingling Internet Explorer and Windows code and illegally excluding it from its Add/Remove utility	III.H.1-3
Threatening to discontinue MS Office for Macintosh to force Apple to feature Internet Explorer	III.G.2
Prohibiting deletion of the Internet Explorer desktop icon	III.H.1-3
Restricting promotion of competing browsers and curtailing OEMs' ability to alter the initial boot sequence	III.C, III.G.1, III.H
First-wave requirements for software vendors to use Microsoft's Java Virtual Machine and Internet Explorer	III.F.2, III.G.1
Deceiving developers about its Java language	III.D
Restriction of competing web browsers by Internet Access Providers	III.A.1, III.C.1-2

Section III.A.1

A. Microsoft shall not retaliate against an OEM by altering Microsoft's commercial relations with that OEM, or by withholding newly introduced forms of non-monetary Consideration (including but not limited to new versions of existing forms of non-monetary Consideration) from that OEM, because it is known to Microsoft that the OEM is or is contemplating:

1. developing, distributing, promoting, using, selling, or licensing any software that competes with Microsoft Platform Software or any product or service that distributes or promotes any Non-Microsoft Middleware;

Section III.C

C. Microsoft shall not restrict by agreement any OEM licensee from exercising any of the following options or alternatives:

1. Installing, and displaying icons, shortcuts, or menu entries for, any Non-Microsoft Middleware or any product or service (including but not limited to IAP products or services) that distributes, uses, promotes, or supports any Non-Microsoft Middleware, on the desktop or Start menu, or anywhere else in a Windows Operating System Product where a list of icons, shortcuts, or menu entries for applications are generally displayed, except that Microsoft may restrict an OEM from displaying icons, shortcuts and menu entries for any product in any list of such icons, shortcuts, or menu entries specified in the Windows documentation as being limited to products that provide particular types functionality, provided that the restrictions are non-discriminatory with respect to non-Microsoft and Microsoft products.

2. Distributing or promoting Non-Microsoft Middleware by installing and displaying on the desktop shortcuts of any size or shape so long as such shortcuts do not impair the functionality of the user interface.

3. Launching automatically, at the conclusion of the initial boot sequence or sub sequent boot sequences, or upon connections to or disconnections from the Internet, any Non-Microsoft Middleware if a Microsoft Middleware Product that provides similar functionality would otherwise be launched automatically at that time, provided that any such Non-Microsoft Middleware displays on the desktop no user interface or a user interface of similar size and shape to the user interface displayed by the corresponding Microsoft Middleware Product.

4. Offering users the option of launching other Operating Systems from the Basic Input/Output System or a non-Microsoft boot-loader or similar program that launches prior to the start of the Windows Operating System Product.

5. Presenting in the initial boot sequence its own IAP offer provided that the OEM complies with reasonable technical specifications established by Microsoft, including a requirement that the end user be returned to the initial boot sequence upon the conclusion of any such offer.

6. Exercising any of the options provided in Section III.H of this Final Judgment.

Section III.D

D. Starting at the earlier of the release of Service Pack 1 for Windows XP or 12 months after the submission of this Final Judgment to the Court, Microsoft shall disclose to ISVs, IHVs, IAPs, ICPs, and OEMs, for the sole purpose of interoperating with a Windows Operating System Product, via the Microsoft Developer Network ("MSDN") or similar mechanisms, the APIs and related Documentation that are used by Microsoft Middleware to interoperate with a Windows Operating System Product. For purposes of this Section III.D, the term APIs means the interfaces, including any associated callback interfaces, that Microsoft Middleware running on a Windows Operating System Product uses to call upon that Windows Operating System Product in order to obtain any services from that Windows Operating System Product. In the case of a new major version of Microsoft Middleware, the disclosures required by this Section III.D shall occur no later than the last major beta test release of that Microsoft Middleware. In the case of a new version of a Windows Operating System Product, the obligations imposed by this Section III.D shall occur in a Timely Manner.

Section III.F.2

2. Microsoft shall not enter into any agreement relating to a Windows Operating System Product that conditions the grant of any Consideration on an ISV's refraining from developing, using, distributing, or promoting any software that competes with Microsoft Platform Software or any software that runs on any software that competes with Microsoft Platform Software, except that Microsoft may enter into agreements that place limitations on an ISV's development, use, distribution or promotion of any such software if those limitations are reasonably necessary to and of reasonable scope and duration in

relation to a bona fide contractual obligation of the ISV to use, distribute or promote any Microsoft software or to develop software for, or in conjunction with, Microsoft.

Section III.G.1-2

G. Microsoft shall not enter into any agreement with:

1. any IAP, ICP, ISV, IHV or OEM that grants Consideration on the condition that such entity distributes, promotes, uses, or supports, exclusively or in a fixed percentage, any Microsoft Platform Software, except that Microsoft may enter into agreements in which such an entity agrees to distribute, promote, use or support Microsoft Platform Software in a fixed percentage whenever Microsoft in good faith obtains a representation that it is commercially practicable for the entity to provide equal or greater distribution, promotion, use or support for software that competes with Microsoft Platform Software, or

2. any IAP or ICP that grants placement on the desktop or elsewhere in any Windows Operating System Product to that IAP or ICP on the condition that the IAP or ICP refrain from distributing, promoting or using any software that competes with Microsoft Middleware.

Section III.H

H. Starting at the earlier of the release of Service Pack 1 for Windows XP or 12 months after the submission of this Final Judgment to the Court, Microsoft shall:

1. Allow end users (via a mechanism readily accessible from the desktop or Start menu such as an Add/Remove icon) and OEMs (via standard preinstallation kits) to enable or remove access to each Microsoft Middleware Product or Non-Microsoft Middleware Product by (a) displaying or removing icons, short-cuts, or menu entries on the desktop or Start menu, or anywhere else in a Windows Operating System Product where a list of icons, shortcuts, or menu entries for applications are generally displayed, except that Microsoft may restrict the display of icons, shortcuts, or menu entries for any product in any list of such icons, shortcuts, or menu entries specified in the Windows documentation as being limited to products that provide particular types of functionality, provided that the restrictions are non-discriminatory with respect to non-Microsoft and Microsoft products; and (b) enabling or disabling automatic invocations pursuant to Section III.C.3 of this Final Judgment that are used to launch Non-Microsoft Middleware Products or Microsoft Middleware Pro-ducts. The mechanism shall offer the end user a separate and unbiased choice with respect to enabling or removing access (as described in this subsection III.H.1) and altering default invocations (as described in the following subsection III.H.2) with regard to each such Microsoft Middleware Product or Non-Microsoft Middleware Product and may offer the end-user a separate and unbiased choice of enabling or removing access and altering default configurations as to all

Microsoft Middleware Products as a group or all Non-Microsoft Middleware Products as a group.

2. Allow end users (via an unbiased mechanism readily available from the desktop or Start menu), OEMs (via standard OEM preinstallation kits), and Non-Microsoft Middleware Products (via a mechanism which may, at Microsoft's option, require confirmation from the end user in an unbiased manner) to designate a Non-Microsoft Middleware Product to be invoked in place of that Microsoft Middleware Product (or vice versa) in any case where the Windows Operating System Product would otherwise launch the Microsoft Middleware Product in a separate Top-Level Window and display either (i) all of the user interface elements or (ii) the Trademark of the Microsoft Middleware Product. Notwithstanding the foregoing Section III.H.2, the Windows Operating System Product may invoke a Microsoft Middleware Product in any instance in which:

> (a) that Microsoft Middleware Product would be invoked solely for use in interoperating with a server maintained by Microsoft (outside the context of general Web browsing), or
>
> (b) that designated Non-Microsoft Middleware Product fails to implement a reasonable technical requirement *(e.g.*, a requirement to be able to host a particular ActiveX control) that is necessary for valid technical reasons to supply the end user with functionality consistent with a Windows Operating System Product, provided that the technical reasons are described in a reasonably prompt manner to any ISV that requests them.

4. Ensure that a Windows Operating System Product does not (a) automatically alter an OEM's configuration of icons, shortcuts or menu entries installed or displayed by the OEM pursuant to Section III.C of this Final Judgment without first seeking confirmation from the user and (b) seek such confirmation from the end user for an automatic (as opposed to user-initiated) alteration of the OEM's configuration until 14 days after the initial boot up of a new Personal Computer. Any such automatic alteration and confirmation shall be unbiased with respect to Microsoft Middleware Products and Non-Microsoft Middleware. Microsoft shall not alter the manner in which a Windows Operating System Product automatically alters an OEM's configuration of icons, shortcuts or menu entries other than in a new version of a Windows Operating System Product. Microsoft's obligations under this Section III.H as to any new Windows Operating System Product shall be determined based on the Microsoft Middleware Products which exist seven months prior to the last beta test version *(i.e.*, the one immediately preceding the first release candidate) of that Windows Operating System Product.

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