

Software Licensing and Market Power in the Age of the Virtualized Computer

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ABSTRACT

Hypervisor software harnesses the power of a single microprocessor (“CPU”) to provide the outward appearance of being several different computer systems (“virtual machines”) at once. Virtual machines run independently, and each can have its own operating system (“OS”). In a virtual machine, instructions that an OS would ordinarily send to the CPU are sent instead to the hypervisor. The hypervisor serves as a traffic controller and an interpreter, passing the instructions along to the CPU so that the system behaves as if the OS were running directly on the CPU.

By allowing Windows users to migrate more cheaply to non-Windows-based software applications and information appliances, hypervisor software represents a significant challenge to the “applications barrier to entry” that supports Microsoft’s OS monopoly. Microsoft now appears to be responding to this threat by developing its own hypervisor software to be included in forthcoming releases of its Windows server and client OSes, both of which will be licensed under the name Windows Vista.

Microsoft’s plan to include hypervisor software in Windows Vista already seems reminiscent of the Windows 98 OS/browser combination at the center of the 1998-2004 *Microsoft* antitrust litigation. The aptness of the analogy, however, will depend on the details of the plan’s ultimate implementation. As I have argued elsewhere, the *Microsoft* tying claim did not challenge the inclusion of any software code in Windows 98,¹ but

¹ Being a software product, Windows 98 does not actually include any code. “A software product is defined by reference to accompanying software and documentation, and consists essentially of the legal rights and technological capabilities necessary to install and run the software on a system according to the documentation; it does not include any of the software or documentation itself, in which the vendor retains copyright.” Andrew Chin, *Antitrust Analysis in Software Product Markets: A First Principles Approach*, 18 HARV. J. L. & TECH. 1, 26 (2004); cf. 17 U.S.C. § 202 (distinguishing ownership of a copy of a copyrighted work from ownership of the copyright in the work).

instead challenged four specific acts² from which a court could have properly inferred an understood tying condition that resulted in foreclosure and anticompetitive harm³ in a cognizable tied-product market.⁴ Similarly, while the mere addition of hypervisor software to the Windows OS does not raise antitrust concerns, Microsoft may choose to implement its virtualization technologies in such a way as to impose technological and/or legal restrictions on Windows users who prefer not to use those technologies.

While it is premature (at least before the release of Windows Vista) to condemn Microsoft's virtualization plans, antitrust enforcers should already be aware of the strategic significance of hypervisor technology to the OS market and the potential for the Windows virtualization rollout to injure competition in the markets for both OS and hypervisor software products. The purpose of this article is to identify some foreseeable, problematic approaches Microsoft might decide to take in implementing and marketing the Windows hypervisor and to provide some guidance in analyzing the antitrust concerns that would be raised as a consequence of Microsoft's decisions. In particular, this article explains how competition in the markets for hypervisor and operating system software products could be harmed by various marketing practices (e.g., the licensing of copyrighted software on a "per running instance" basis), and describes some remedies that might be tailored in response to these concerns.

² See Andrew Chin, *Decoding Microsoft: A First Principles Approach*, 40 WAKE FOREST L. REV. 1, 112-13 (2005).

³ See *id.* at 115-28.

⁴ See *id.* at 87-99.