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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

NETFLIX, INC., Plaintiff, v. BROADCOM INC., VMWARE LLC, Defendants.	Case No. 5:24-cv-09324-PCP **AMENDED COMPLAINT FOR PATENT INFRINGEMENT** **JURY TRIAL DEMANDED**

Plaintiff, Netflix, Inc. ("Plaintiff" or "Netflix") hereby asserts the following claims for Patent Infringement against Defendants Broadcom Inc. ("Broadcom") and VMware LLC ("VMware"), and alleges as follows:

NATURE OF THE ACTION

1. This is a civil action for patent infringement arising under the patent laws of the United States, 35 U.S.C. § 1, et seq.

2. Defendants Broadcom and VMware, jointly and severally, have directly infringed and continue to infringe, have induced and continue to induce, and have contributed to and continue to contribute to infringement of one or more claims of U.S. Patent Nos. 7,779,424 (the "'424 Patent), 7,797,707 (the "'707 Patent"), 8,799,891 (the "'891 Patent"), 8,185,893 (the "'893 Patent") and 8,863,122 (the "'122 Patent") (collectively the "Asserted Patents") through their development, use, and commercialization of the '424, '707, '891, '893, and '122 Accused Products, as defined below.

3. Netflix is the owner of the Asserted Patents, which were duly and legally issued by the United States Patent and Trademark Office ("USPTO"). For each of the Asserted Patents, Netflix owns all substantial rights to sue for infringement in its own name, including for past, present, and future damages, and injunctive relief.

4. Netflix seeks monetary damages as redress for Broadcom's and VMware's infringement.

THE PARTIES

5. Netflix is a Delaware corporation with its principal place of business located at 121 Albright Way, Los Gatos, California 95032.

6. Netflix was founded in Scotts Valley, California in 1997 and is an innovative video on-demand streaming services company and one of the world's leading entertainment services bringing TV series, films, games, and live content to 278 million members in over 190 countries.

7. Broadcom is a corporation organized under the laws of the State of Delaware with regular and established places of business in this Judicial District, including offices in Palo Alto, Petaluma, and San Jose.

8. Broadcom's organizational history involves a complex web of mergers and

acquisitions. In brief, in 1999, Hewlett-Packard's Semiconductor Products Group spun off as Agilent Technologies, which later formed Avago Technologies. Avago merged with and acquired multiple companies between 2005 to 2015. Then, in 2015, Avago announced it would buy Broadcom but adopt the Broadcom name because of its broader name recognition.[1] Broadcom today comprises an amalgamation of companies, including Brocade Communications Systems, CA Technologies, Symantec Enterprise Security, and Avago, among many others.[2] Broadcom is known to sell off its acquired companies for parts in a strategy summed up as: "Buy. Chop up. Sell off. Raise prices. Rinse. Repeat."[3]

9. On May 26, 2022, Broadcom and VMware entered into an Agreement and Plan of Merger (the "Merger Agreement"), and on November 22, 2023, Broadcom merged with or acquired VMware Inc. for $69 billion in a "transformational" transaction.[4]

10. The series of transactions and agreements executed between Broadcom and VMware Inc. that ultimately resulted in Broadcom's merger and/or acquisition of VMware Inc. is complex, perhaps intentionally so.

11. At the end of the transaction, VMware Inc. was renamed VMware LLC, and VMware products were thereafter sold under the brand name "VMware by Broadcom."[5] VMware Inc. and VMware LLC are collectively referred to herein as "VMware."

12. VMware has a principal place of business in this District, at 3401 Hillview Avenue, Palo Alto, California, 94304.

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[1] "Avago Technologies to Acquire Broadcom for $37 Billion," Broadcom.com (May 28, 2015), https://investors.broadcom.com/news-releases/news-release-details/avago-technologies-acquire-broadcom-37-billion.

[2] "Company History," Broadcom.com, https://www.broadcom.com/company/about-us/company-history.

[3] Joff Wild, "Five big patent talking points raised by Broadcom's proposed buy-out of Qualcomm," IAM (November 9, 2017), https://www.lexology.com/library/detail.aspx?g=925c5af8-43a7-480f-af7c-7dc896541c28.

[4] "Broadcom Inc. Announces Fourth Quarter and Fiscal Year 2023 Financial Results and Quarterly Dividend," Broadcom.com (December 7, 2023), https://investors.broadcom.com/news-releases/news-release-details/broadcom-inc-announces-fourth-quarter-and-fiscal-year-2023.

[5] VMware.com, https://www.vmware.com/; VMware LLC Securities and Exchange Commission Form 8-K, (November 22, 2023), http://edgar.secdatabase.com/1558/119312523282097/filing-main.htm.

JURISDICTION AND VENUE

13. Netflix brings this civil action for patent infringement under the Patent Laws of the United States, 35 U.S.C. § 1 et. seq., including 35 U.S.C. §§ 271, 281-285.

14. This Court has subject matter jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338.

15. This Court has personal jurisdiction over Broadcom and VMware because they maintain their principal places of business in this District and engage in continuous and systematic business activities within this District.

16. Venue is proper in this District pursuant to at least 28 U.S.C. § 1400(b) because Broadcom and VMware maintain their principal places of business in this District, reside in this District, and have committed acts of patent infringement in this District.

BACKGROUND

17. This Complaint asserts causes of action for infringement of the ’424 Patent, the ’707 Patent, the ’891 Patent, the ’893 Patent, and the ’122 Patent, (collectively, the “Asserted Patents”).

18. The ’424 Patent is entitled “System and Method for Attributing to a Corresponding Virtual Machine CPU Usage of an Isolated Driver Domain in which a Shared Resource’s Device Driver Resides.” Ludmila Cherkasova and Robert D. Gardner are identified on the face of the ’424 Patent as the inventors. On August 17, 2010, the USPTO duly and legally issued the ’424 Patent from Application No. 11/070,674, filed on March 2, 2005. A true and correct copy is attached as Exhibit A. Netflix is the current owner by assignment of all rights, title, and interest in and under the ’424 Patent, including the right to sue and obtain damages for past, current, and future infringement. Netflix has standing to sue for infringement of the ’424 Patent.

19. The ’707 Patent is entitled “System and method for attributing to a corresponding virtual machine CPU usage of a domain in which a shared resource’s device driver resides.” Ludmila Cherkasova and Robert D. Gardner are identified on the face of the ’707 Patent as the inventors. On September 14, 2010, the USPTO duly and legally issued the ’707 Patent from Application No. 11/070,605, filed on March 2, 2005. A true and correct copy is attached as Exhibit B. Netflix is the

current owner by assignment of all rights, title, and interest in and under the ’707 Patent, including the right to sue and obtain damages for past, current, and future infringement. Netflix has standing to sue for infringement of the ’707 Patent.

20. The ’891 Patent is entitled “System and method for attributing CPU usage of a virtual machine monitor to a corresponding virtual machine.” Ludmila Cherkasova and Robert D. Gardner are identified on the face of the ’891 Patent as the inventors. On August 5, 2014, the USPTO duly and legally issued the ’891 Patent from Application No. 11/070,602, filed on March 2, 2005. A true and correct copy is attached as Exhibit C. Netflix is the current owner by assignment of all rights, title, and interest in and under the ’891 Patent, including the right to sue and obtain damages for past, current, and future infringement. Netflix has standing to sue for infringement of the ’891 Patent.

21. The ’893 Patent is entitled “Starting up at least one virtual machine in a physical machine by a load balancer.” Chris D. Hyser and Bret A. McKee are identified on the face of the ’893 Patent as the inventors. On May 22, 2012, the USPTO duly and legally issued the ’893 Patent from Application No. 11/588,635, filed on October 27, 2006. A true and correct copy is attached as Exhibit D. Netflix is the current owner by assignment of all rights, title, and interest in and under the ’893 Patent, including the right to sue and obtain damages for past, current, and future infringement. Netflix has standing to sue for infringement of the ’893 Patent.

22. The ’122 Patent is entitled “Starting up at least one virtual machine in a physical machine by a load balancer.” Paul Bouchier, Scott E. Garee, and Bryan J. Jacquot are identified on the face of the ’122 Patent as the inventors. On October 14, 2014, the USPTO duly and legally issued the ’122 Patent from Application No. 13/383,506, filed on July 31, 2009. A true and correct copy is attached as Exhibit E. Netflix is the current owner by assignment of all rights, title, and interest in and under the ’122 Patent, including the right to sue and obtain damages for past, current, and future infringement. Netflix has standing to sue for infringement of the ’122 Patent.

The ’424 Patent

23. The ’424 Patent is generally directed to improvements to virtual machine technology

and to an improved method of determining a share of CPU resources used by each virtual machine.[6] As the '424 Patent explains, "virtual machine technology allows different customers to share and utilize the same machine resources."[7] Unlike memory, which is typically statically allocated during VM deployment, and network and storage bandwidth usage, which can be accounted for by directly observing traffic in and out of a particular VM, "measuring the CPU usage by a particular VM 10 is not a straightforward task."[8] In other words, a more accurate understanding of the resources being used by each individual virtual machine is essential to a well-functioning virtual machine environment and provides a technical improvement to the virtual machine architecture. However, then-existing monitoring systems failed to accurately measure the CPU usage of a virtual machine, at least because they only considered the amount of CPU allocated by the scheduler for execution of a particular VM over time and failed to "reveal the 'true' usage of the CPU by different VMs."[9]

24. The '424 Patent explains that VMs communicate with driver domains—for example, the VMs may communicate access requests to a driver domain for shared resources.[10] But communication between the VMs and the driver domain, as well as processing the access requests themselves, also require CPU usage.[11] Then-existing systems did not accurately measure the CPU usage of a virtual machine because those systems failed to account for this actual CPU utilization of the driver domain in both communicating and servicing the requests of each virtual machine for access to a resource.[12] The innovation of the '424 Patent addresses the inaccuracies in the prior art of tracking CPU usage of VMs. The patent describes a unique way of accounting for the CPU utilization, specifically, observing communication from virtual machines to driver domains to accurately attribute CPU utilization of the driver domains to the corresponding virtual machines responsible for the resource requests.[13] In this way, the '424 Patent accurately tracks the CPU

[6] *See* '424 Patent, 1:25-30.
[7] *Id.*, 8:43-47.
[8] *Id.*, 7:35-49.
[9] *Id.*, 3:54-60.
[10] *Id.*, 3:60-62.
[11] *Id.*, 3:62-64.
[12] '424 Patent, 3:58-4:2.
[13] *Id.*, 4:20-36.

utilization attributable to each VM.

25. As another example, the '424 Patent explains that "virtualization of input/output (I/O) devices results in an I/O model where the data transfer process involves additional system components, such as an isolated driver domain in which device drivers for the I/O resources reside. Hence, the CPU usage when the isolated driver domain handles the I/O data on behalf of a particular VM should be charged to the corresponding VM. However, simply monitoring the CPU utilization allocated by the scheduler to the corresponding VM fails to account for the CPU utilization of the isolated driver domain in handling the I/O data on behalf of such corresponding VM. Thus, the traditional technique of determining CPU utilization of each VM does not fully capture the CPU utilization attributable to a VM, as it fails to account for the corresponding isolated driver domain CPU utilization that is performed for each VM."[14]

26. More accurately attributing CPU utilization to each VM improves the operation of virtual machines. For example, by having a more accurate CPU utilization, the VM architecture can better (and earlier) adapt to changing conditions, thus creating a more reactive and efficient system that is less prone to overload and capacity issues.[15] Other examples of improvements created by having a more accurate account of CPU utilization include assisting with admission control of new VMs, support for VMs migration, and quality of service ("QoS") provisioning of VMs.[16] The '424 Patent therefore addresses a specific technical problem, existing in then-existing methods, of accurately measuring CPU utilization attributable to each VM, providing an improvement to virtual machine technology.

27. The '424 Patent claims specific, novel techniques for solving these technical problems and improving the technological systems and methods themselves. For example, Claim 1 recites:

> A method comprising:
>
> observing communication from plurality of paravirtualized

[14] *Id.*, 4:5-19.

[15] *See, e.g., id.*, 8:52-58.

[16] *Id.*, 8:37-42.

> virtual machines (VMs) to driver domains that are isolated from the plurality of VMs, the communication comprising at least one resource request from the plurality of VMs to the driver domains, comprising observing communication from said plurality of VMs requesting access to a shared resource that is accessible by the plurality of VMs, wherein a device driver for said shared resource is arranged in said driver domains; and
>
> determining, based on said communication between the plurality of VMs and the plurality of driver domains, CPU utilization of said plurality of driver domains attributable to the plurality of VMs, including determining a share of CPU execution attributed to each of the VMs during a predetermined time interval.

28. In one aspect, the patent explains that the method claimed "can be used . . . for assistance in a whole variety of management tasks, such as: a) support of policy-based resource allocation; b) admission control of new VMs; c) support for VMs migration; and d) quality of service ("QoS") provisioning of VMs.[17] The '424 Patent explains that managing and adapting a virtual IT infrastructure presents a challenging task and that migrating VMs may "improv[e] the overall performance of the underlying infrastructure" and ensure that VMs have access to sufficient physical node capacity.[18] Thus, "accurate monitoring infrastructure for reporting resource usage of different VMs becomes desirable" and the specific methods claimed in the '424 Patent, which are technical improvements over the prior art, enable improvements to the performance of the virtual machine architectures themselves.[19] As recited, the claimed solution involves "determining . . . CPU utilization of [a] plurality of driver domains attributable to the plurality of VMs," where the determination is based specifically on "communication from plurality of paravirtualized virtual machines (VMs) to driver domains that are isolated from the plurality of VMs," where the

[17] *Id.*, 8:37-42.

[18] *Id.*, 8:52-58.

[19] *Id.*, 8:52-61.

communication includes "at least one resource request from the plurality of VMs to the driver domains," and "a device driver for said shared resource is arranged in [the] driver domains." Each independent method claim of the '424 Patent, including Claims 1, 6, and 12, recites an ordered and unconventional combination of features that provides particular, concrete technical improvements to a technical problem relating to accurately measuring CPU utilization and technical improvements to the underlying VM architecture itself, and does so using an unconventional technical solution for tracking CPU usage of VMs. Specifically, and for example, the independent method claims recite determining, for each VM, the amount of CPU utilization of the isolated driver domain attributable to a particular VM.[20]

29. The '424 Patent includes two additional independent method claims in Claims 6 and 12. Each independent claim recites unique limitations not found in the others. Additionally, the dependent claims of the '424 Patent, including for example Claims 2, 4-5, and 7-11, recite additional and specific methods for measuring CPU utilization and determining, for each VM, the amount of CPU utilization of the isolated driver domain attributable to a particular VM, and thus provide improvements to virtual machine architectures themselves.

30. For example, Claims 2 and 9 of the '424 Patent recites "observing communication through a virtual machine monitor (VMM)" and Claim 10 recites the "determining" of Claim 6 is "determining, by a virtual machine monitor (VMM), said CPU utilization of each VM." "A VMM is a layer of software that runs on a host platform and provides an abstraction of a complete computer system to higher-level software . . . that virtualizes the available resources of a computer and multiplexes them among one or more guest OSs on the computer system."[21] A VMM is able to "aid[] in subdividing the ample resources of a modem computer and creating the illusion of multiple virtual machines each running a separate OS instance," because of its positioning between the VMs and the host platform.[22] Therefore, while then-existing monitoring systems only reported "the amount of CPU allocated by the scheduler for execution of a particular VM over time" and "fail[e]d

[20] '424 Patent, 14:66-15:2.

[21] *Id.*, 1:52-58.

[22] *See id.*, 1:61-64, 4:45-61.

to reveal the 'true' usage of the CPU that is attributable to different VMs, embodiments of the claimed inventions of the '424 Patent are directed to, for example, logic in the VMM for "observing communications, such as requests for accessing shared resources, that flow from the VM through the VMM to the isolated driver domain" to provide "more accurate accounting of the full CPU utilization of each VM."[23] That is, the VMM performing the steps of the "observing" and "determining" limitations is an unconventional technical solution that addresses the inaccuracies in the prior art for tracking CPU usage of VMs.

31. As an additional example, Claim 11 recites a specific method for "determining" limitations of Claim 6, involving "determining CPU utilization of said driver domain attributable to a first of said VMs as the CPU utilization of said driver domain performed for processing a resource access request for said first of said VMs." The '424 Patent states that attributing the CPU utilization to the VM access request "provides a monitoring system that enables more accurate accounting of the CPU used by different guest VMs"[24], and thus provides improvements to the virtual machine architectures themselves.

32. Additionally, Claims 4 and 7 recite specific methods for the "observing communication" limitations by "observing memory page exchanges." As the '424 Patent explains, memory page exchanges are more efficient than alternative methods for copying data between domains.[25] These claims "actively exploit[] this [memory page exchange] feature to observe I/O communications between the guest domains (i.e., the VMs 31) and the privileged management domain 30" to achieve a technical solution to a technical problem.[26] In doing so, these dependent claims are also directed to specific methods for measuring CPU utilization.

33. Claims 5 and 8 recite additional specific methods for the "observing communication" limitations by "observing data copying." By further specifying a type of communication between the plurality of VMs and the driver domains, the claims provide an additional and particular way to

[23] *Id.*, 2:63-67, 8:19-25.

[24] *Id.*, 13:2-8.

[25] *See* '424 Patent, 16:31-44.

[26] *Id.*, 11:67-12:3.

improve the accurate determination of CPU usage among the VMs.[27]

34. As explained above, the claims of the '424 Patent recite specific limitations, alone and as an ordered combination, that improve performance of then-existing virtual machines systems and were not well-understood, routine, or conventional at the time of invention.

35. The above examples and the disclosures set forth in the attached and incorporated in the '424 Patent demonstrate that the claimed invention is not abstract and is directed to improvements in the technology of virtual machine architectures itself.

36. Pursuant to 35 U.S.C. § 282, the '424 Patent is presumed valid and patent eligible.

The '707 Patent

37. The '707 Patent is generally directed to improvements to virtual machine technology and to an improved method of determining a share of CPU resources used by each virtual machine.[28] The '707 Patent explains "virtual machine technology allows different customers to share and utilize the same machine resources."[29] Unlike memory, which is typically statically allocated during VM deployment, and network and storage bandwidth usage, which can be accounted for by directly observing traffic in and out of a particular VM, "measuring the CPU usage by a particular VM 10 is not a straightforward task."[30] In other words, a more accurate understanding of the resources being used by each individual virtual machine is essential to a well-functioning virtual machine environment, and provides a technical improvement to the virtual machine architecture. Before the '707 Patent, then-existing monitoring systems failed to accurately measure the CPU usage of a virtual machine, at least because they only considered the amount of CPU allocated by the scheduler for execution of a particular VM over time and failed to "reveal the 'true' usage of the CPU by different VMs." [31] For example, and with more specificity, the '707 Patent explains that device drivers for shared resources may be located in a privileged management domain.[32] "A privileged

[27] *Id.*

[28] *See* '707 Patent, 1:26-27.

[29] *Id.*, 8:20-24.

[30] *Id.*, 7:16-30.

[31] *Id.*, 3:49-56.

[32] *Id.*, 3:56-58.

management domain refers to a domain that manages the creation and/or termination of other guest domains and may manage other parameters, such as CPU scheduling parameters, resource allocation policies, etc."[33]

38. The '707 Patent explains that VMs communicate with the privileged management domains—for example, the VMs may communicate access requests to the privileged management domain for the shared resources.[34] But communication between the VMs and the privileged management domain, as well as processing the access requests, both themselves require CPU usage.[35] Then-existing systems did not accurately measure the CPU usage of a virtual machine because those systems failed to account for this actual CPU utilization of the privileged management domain in both communicating and servicing the requests of each virtual machine for access to a resource.[36] The innovation of the '707 Patent addresses the inaccuracies in the prior art of tracking CPU usage of VMs. The patent describes a unique way of accounting for the CPU utilization, specifically, observing communication from virtual machines to privileged management domains to accurately attribute CPU utilization of the privileged management domains to the corresponding virtual machines responsible for the resource requests.[37] In this way, the '707 Patent accurately tracks the CPU utilization attributable to each VM.

39. As another example, the '707 Patent explains that "virtualization of input/output (I/O) devices results in an I/O model where the data transfer process involves additional system components, such as the privileged management domain in which device drivers for the I/O resources reside. Hence, the CPU usage when the privileged management domain handles the I/O data on behalf of a particular VM should be charged to the corresponding VM. However, simply monitoring the CPU utilization allocated by the scheduler to the corresponding VM fails to account for the CPU utilization of the privileged management domain in handling the I/O data on behalf of such corresponding VM. Thus, the traditional technique of determining CPU utilization of each VM

[33] *Id.*, 3:41-44.

[34] *Id.*, 3:58-60.

[35] *See* '707 Patent, 3:60-67.

[36] *Id.*

[37] *Id.*, 4:20-37.

does not fully capture the CPU utilization attributable to a VM, as it fails to account for the corresponding privileged management domain CPU utilization that is performed for each VM."[38]

40. More accurately attributing CPU utilization to each VM improves the operation of virtual machine architecture. For example, by having a more accurate CPU utilization, the VM architecture can better (and earlier) assess and adapt to changing conditions, thus creating a more reactive and efficient system that is less prone to overload and capacity issues. Other examples of improvements created by having a more accurate account of CPU utilization include assisting with admission control of new VMs, support for VMs migration, and quality of service ("QoS") provisioning of VMs.[39] The '707 Patent therefore addresses a specific technical problem, existing in then-existing methods, of accurately measuring CPU utilization attributable to each VM, providing an improvement to virtual machine technology.

41. The '707 Patent claims specific, novel techniques for solving these technical problems and improving the technological systems and methods themselves. For example, Claim 1 recites:

> A method comprising:
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> observing, in a computer, communication from a virtual machine (VM) to a domain in which a device driver for a shared resource resides, wherein the domain is separate from a virtual machine monitor (VMM);
>
> determining, in the computer and based on said communication, CPU utilization of said domain attributable to said VM;
>
> determining, for the VM, CPU utilization allocated by a scheduler to the VM; and
>
> determining, for the VM, total CPU utilization attributable to the VM by summing the determined CPU utilization allocated to the

[38] *Id.*, 4:4-19.

[39] *Id.*, 8:14-19.

VM by the scheduler and the determined CPU utilization of the domain attributable to the VM.

42. In one aspect, the patent explains that the method claimed can be used in a "whole variety of management tasks, such as: a) support of policy-based resource allocation; b) admission control of new VMs; c) support for VMs migration; and d) quality of service ('QoS') provisioning of VMs."[40] The '707 Patent explains that managing and adapting a virtual IT infrastructure presents a challenging task and that migrating VMs may "improv[e] the overall performance of the underlying infrastructure" and ensure that VMs have access to sufficient physical node capacity.[41] Thus, "accurate monitoring infrastructure for reporting resource usage of different VMs becomes desirable" and the specific methods claimed in the '707 Patent, which are technical improvements over the prior art, enable improvements to the performance of the virtual machine architecture.[42] As recited, the claimed solution involves "determining, in the computer and based on said communication, CPU utilization of said domain attributable to said VM," where the determination is based specifically on "communication from a virtual machine (VM) to a domain in which a device driver for a shared resource resides, wherein the domain is separate from a virtual machine monitor (VMM)." Each independent method claim of the '707 Patent, including Claims 1, 15, 22, 26, and 27, recites an ordered and unconventional combination of features that provides particular, concrete technical improvements to a technical problem relating to accurately measuring CPU utilization, and thus provide improvements to virtual machine architectures, and does so using an unconventional technical solution for tracking CPU usage of VMs. Specifically, and for example, the independent method claims recite determining, for each VM, the amount of CPU utilization of a domain attributable to a particular VM.[43]

43. The '707 Patent includes four additional independent method claims in Claims 15, 22, 26, and 27. Each independent claim recites unique limitations not found in the others. Additionally, the dependent claims of the '707 Patent, including for example Claims 3, 9-10, and

[40] *Id.*, 8:15-19.

[41] *Id.*, 8:29-35.

[42] *Id.*, 8:29-38.

[43] *See* '707 Patent, 11:6-8.

17-18, recite additional and specific methods for measuring CPU utilization and determining, for each VM, the amount of CPU utilization of the privileged management domain attributable to a particular VM, and thus provide improvements to the virtual machine architectures.

44. For example, Claim 3 of the '707 Patent recites "observing communication from said VM that is intercepted by the VMM." "A VMM is a layer of software that runs on a host platform and provides an abstraction of a complete computer system to higher-level software . . . that virtualizes the available resources of a computer and multiplexes them among one or more guest Oss on the computer system."[44] A VMM is able to "aid[] in subdividing the ample resources of a modem computer and creating the illusion of multiple virtual machines each running a separate OS instance," because of its positioning between the VMs and the host platform.[45] Therefore, while then-existing monitoring systems only reported "the amount of CPU allocated by the scheduler for execution of a particular VM over time," embodiments of the claimed inventions of the '707 Patent are directed to, for example, logic in the VMM for "observing communications, such as requests for accessing shared resources, that flow from the VM through the VMM to the privileged management domain" to provide "more accurate accounting of the full CPU utilization of each VM."[46] That is, the VMM performing the steps of the "observing" and "determining" limitations is an unconventional technical solution to address the inaccuracies in the prior art for tracking CPU usage of VMs, and thus provides improvements to virtual machine architectures.

45. As an additional example, Claims 9 and 17 recite specific methods for the "observing communication" limitations by "observing memory page exchanges." As the '707 Patent explains, memory page exchanges are more efficient than alternative methods for copying data between domains. [47] These claims "actively exploit[] this [memory page exchange] feature to observe I/O communications between the guest domains and the IDDs" to achieve a technical solution to a technical problem and thus provide improvements to virtual machine architectures. In doing so, these dependent claims are also directed to specific methods for measuring CPU utilization.

[44] *Id.*, 1:52-58.

[45] *Id.*, 1:61-64, 4:46-64.

[46] *Id.*, 2:63-67, 5:11-16.

[47] *Id.*, 15:28-42.

46. Claims 10 and 18 recite additional specific methods for the "observing communication" limitations by "observing data copying." Like Claims 9 and 17 discussed above, these claims further specify a type of communication between the plurality of VMs and the driver domains and provide an additional and particular way to improve the accurate determination of CPU usage among the VMs.[48]

47. As explained above, the claims of the '707 Patent recite specific limitations, alone and as an ordered combination, that improve performance of then-existing virtual machines systems and were not well-understood, routine, or conventional at the time of invention.

48. The above examples and the disclosures set forth in the attached and incorporated '707 Patent demonstrate that the claimed invention is not abstract and is directed to improvements in the technology of virtual machine architectures.

49. Pursuant to 35 U.S.C. § 282, the '707 Patent is presumed valid and patent eligible.

The '891 Patent

50. The '891 Patent is generally directed to improvements to virtual machine technology and to an improved method of determining a share of CPU resources used by each virtual machine.[49] The '891 Patent explains "virtual machine technology allows different customers to share and utilize the same machine resources."[50] Unlike memory, which is typically statically allocated during VM deployment, and network and storage bandwidth usage, which can be accounted for by directly observing traffic in and out of a particular VM, "measuring the CPU usage by a particular VM 10 is not a straightforward task."[51] In other words, a more accurate understanding of the resources being used by each individual virtual machine is essential to a well-functioning virtual machine environment, and provides a technical improvement to the virtual machine architecture. However, then-existing monitoring systems failed to accurately measure the CPU usage of a virtual machine, at least because they only considered the amount of CPU allocated by the scheduler for execution

[48] *See* '707 Patent, 15:28-42.

[49] *See* '891 Patent, 1:24-25.

[50] *Id.*, 8:20-24.

[51] *Id.*, 7:35-49.

of a particular VM over time and failed to "reveal the 'true' usage of the CPU by different VMs."[52] The '891 Patent explains "the CPU utilization of the VMM [virtual machine monitor] in servicing the requests of each VM (requesting to access a resource) are not attributed to the corresponding VMs in this technique."[53] For example, virtualization of input/output (I/O) devices results in an I/O model where the data transfer process involves additional system components, such as the VMM. Hence, the CPU usage when the VMM handles the I/O data on behalf of a particular VM should be charged to the corresponding VM. Then-existing systems that simply monitored the CPU utilization allocated by the scheduler to the corresponding VM failed to account for the actual CPU utilization of the VMM in both communication of and handling the I/O data on behalf of such corresponding VM. Thus, the traditional technique of determining CPU utilization of each VM does not fully capture the CPU utilization attributable to a VM, as it fails to account for the corresponding VMM CPU utilization that is performed for each VM.[54] The innovation of the '891 Patent addresses the inaccuracies in the prior art of tracking CPU usage of VMs. In particular, the '891 Patent describes a unique way of accounting for the CPU utilization, specifically, attributing CPU usage of a resource to a corresponding VM that caused such CPU usage by the VMM.[55] In this way, the '891 Patent accurately tracks the CPU utilization attributable to each VM.

51. As another example, the '891 Patent explains that "virtualization of input/output (I/O) devices results in an I/O model where the data transfer process involves additional system components, such as the VMM. Hence, the CPU usage when the VMM handles the I/O data on behalf of a particular VM should be charged to the corresponding VM. However, simply monitoring the CPU utilization allocated by the scheduler to the corresponding VM fails to account for the CPU utilization of the VMM in handling the I/O data on behalf of such corresponding VM. Thus, the traditional technique of determining CPU utilization of each VM does not fully capture the CPU utilization attributable to a VM, as it fails to account for the corresponding VMM CPU utilization

[52] *Id.*, 3:36-40.

[53] *Id.*, 3:40-43.

[54] *Id.*

[55] *Id.*, 1:25-28.

that is performed for each VM."[56]

52. Having more accurate CPU utilization attributable to each VM improves the operation of virtual machine architectures. For example, by having a more accurate CPU utilization, the VM architecture can better (and earlier) assess and adapt to changing conditions, thus creating a more reactive and efficient system that is less prone to overload and capacity issues. Other examples of improvements created by having a more accurate account of CPU utilization include assisting with admission control of new VMs, support for VMs migration, and quality of service ("QoS") provisioning of VMs.[57] The '891 Patent therefore addresses a specific technical problem, existing in then-existing methods, of accurately measuring CPU utilization attributable to a VM.

53. The '891 Patent claims specific, novel techniques for solving these technical problems and improving the technological systems and methods themselves. For example, Claim 1 recites:

> A method comprising:
>
> observing communication from a given virtual machine (VM) of a plurality of VMs, to a virtual machine monitor (VMM), by observing communication from said VM that is requesting access to a resource, as an access request for said VM by said VMM; and
>
> determining, based on said communication, utilization of the CPU by said VMM specifically attributable to said VM, and not attributable to any other of the plurality of VMs, wherein the utilization of the CPU by said VMM is the utilization of the CPU by said VMM performed for processing said access request for said VM by said VMM.

54. In one aspect, the patent explains that the method claimed "can be used, [for] example[], for assistance in billing and/or for a whole variety of management tasks, such as: a) support of policy-based resource allocation; b) admission control of new VMs; c) support for VMs

[56] *Id.*, 3:45-57.

[57] *Id.*, 6:57-61.

migration; and d) quality of service ('QoS') provisioning of VMs."[58] The '891 Patent explains that managing and adapting a virtual IT infrastructure presents a challenging task and that migrating VMs may "improv[e] the overall performance of the underlying infrastructure" and ensure that VMs have access to sufficient physical node capacity.[59] Thus, "accurate monitoring infrastructure for reporting resource usage of different VMs becomes desirable" and the specific methods claimed in the '891 Patent, which are technical improvements over the prior art, enable improvements to the performance of the virtual machine architectures.[60] As recited, the claimed solution involves "determining, based on said communication, utilization of the CPU by said VMM specifically attributable to said VM, and not attributable to any other of the plurality of VMs, wherein the utilization of the CPU by said VMM is the utilization of the CPU by said VMM performed for processing said access request for said VM by said VMM," where the "said communication" includes "communication from said VM that is requesting access to a resource, as an access request for said VM by said VMM." Each independent method claim of '891 Patent, including Claims 1, 13, and 18, recites an ordered and unconventional combination of features that provides particular, concrete technical improvements to a technical problem relating to accurately measuring CPU utilization and technical improvements to the underlying VM architecture, and does so using an unconventional technical solution for tracking CPU usage of VMs. Specifically, and for example, the independent method claims recite determining, for each VM, the amount of CPU utilization of the VMM attributable to a particular VM and thus provide improvements to virtual machine architectures.[61]

55. The '891 Patent includes two additional independent method claims in Claims 6 and 12. Each independent claim recites unique limitations not found in the others. Additionally, the dependent claims of the '891 Patent, including for example Claims 3 and 10-12, recite additional and specific methods for measuring CPU utilization and determining, for each VM, the amount of CPU utilization of the isolated driver domain attributable to a particular VM, and thus provide

[58] *Id.*

[59] *Id.*, 7:4-11.

[60] *Id.*, 7:4-13.

[61] *Id.*, 12:31-34.

improvements to virtual machine architectures.

56. For example, Claim 3 of the '891 Patent recites "observing communication from said VM that is intercepted by said VMM." Claim 12 recites specific methods for both "observing and "determining" steps including "observing communication from each of the plurality of VMs to the VMM; and determining, for each of said VMs, based on said communication, CPU utilization of said VMM attributable to such VM." "A VMM is a layer of software that runs on a host platform and provides an abstraction of a complete computer system to higher-level software . . . that virtualizes the available resources of a computer and multiplexes them among one or more guest Oss on the computer system."[62] A VMM is able to "aid[] in subdividing the ample resources of a modern computer and creating the illusion of multiple virtual machines each running a separate OS instance," because of its positioning between the VMs and the host platform.[63] Therefore, while then-existing monitoring systems only reported "the amount of CPU allocated by the scheduler for execution of a particular VM over time," embodiments of the claimed inventions of the '891 Patent are directed to, for example, communications between the VM and VMM, which may be intercepted by the VMM and "used in certain embodiments for determining the amount of VMM CPU utilization that is attributable to the corresponding VM" to provide "more accurate accounting of the full CPU utilization of each VM."[64] That is, the claimed steps of the "observing" and "determining" limitations are unconventional technical solutions to address the inaccuracies in the prior art for tracking CPU usage of VMs and thus provide improvements to virtual machine architectures.

57. Additionally, Claim 10 recites specific methods for the "observing communication" limitations by "observing memory page exchanges between said VM and said VMM." By further specifying a type of communication between the plurality of VMs and the driver domains, the claims provide an additional way to improve the accurate determination of CPU usage among the VMs. Also, as the '891 Patent explains, memory page exchanges are more efficient than alternative

[62] *Id.*, 1:50-56.

[63] *Id.*, 1:61-64, 3:58-4:18.

[64] *Id.*, 3:36-40, 6:41-47.

methods for copying data between domains.[65] This claim "actively exploit[s] this [memory page exchange] feature to observe I/O communications between the guest domains and the XEN™ VMM 32" to achieve a technical solution to a technical problem.[66] In doing so, this dependent claim is also directed to a specific method for measuring CPU utilization.

58. Claim 11 recites additional specific methods for the "observing communication" limitations by "observing data copying between said VM and said VMM." Like Claim 10 discussed above, this claim further specifies a type of communication between the plurality of VMs and the driver domains and provides an additional and particular way to improve the accurate determination of CPU usage among the VMs.

59. As explained above, the claims of the '891 Patent recite specific limitations, alone and as an ordered combination, that improved performance of then-existing virtual machines systems and were not well-understood, routine, or conventional at the time of invention.

60. The above examples and the disclosures set forth in the attached and incorporated '891 Patent demonstrate that the claimed invention is not abstract and is directed to improvements in the technology of virtual machine architectures itself.

61. Pursuant to 35 U.S.C. § 282, the '891 Patent is presumed valid and patent eligible.

The '893 Patent

62. The '893 Patent is generally directed to improvements to virtual machine technology, specifically in migrating virtual machines among underlying physical machines in specific layouts depending on performance of physical machines and in optimizing the use and management of virtual machines.[67]

63. Before the '893 Patent, then-existing load balancing techniques would merely plan ahead for the worst-case loading scenario by planning in advance for a sufficient number of servers to be provided.[68] However, the then-existing techniques left servers idle during periods of low demand, resulting in significant overall power consumption in large networks, and also failed to

[65] *See* '891 Patent, 13:43-55.

[66] *Id.*, 9:45-48.

[67] '893 Patent, 1:31-38, 6:14-19.

[68] *Id.*, 1:15-21.

account for changes in conditions in the physical machines that may benefit from virtual machines migrating between or among physical machines.[69] Additionally, then-existing techniques for determining the optimal placement for virtual machines (referred to as the "placement problem") required a large computation time, especially for large systems with many physical and virtual machines.[70] One of the innovations of the '893 Patent is avoiding excess power consumption and improving the operational efficiency of computer networks using virtual machines in a novel way that improves over the prior art. The patent describes using a load balancer to distribute requests to active virtual machines and starting up additional virtual machines as the loading of the active virtual machines becomes heavy.[71] The '893 Patent therefore addresses a specific technical problem, existing in prior methods, of virtual machine optimization and power consumption by minimizing the need for idle servers during period of low demand.[72]

64. In another aspect, the '893 Patent offers technical improvements by accounting for changes in conditions in the physical machines that may benefit from virtual machines migrating between or among physical machines.[73] As discussed above, previous techniques merely concerned balancing the load evenly and ensuring no one server is overloaded.[74] The '893 Patent claims use a load balancer that not only considers distributing the load, but factors in conditions in the underlying physical machines or servers.[75] Because not all physical machines have the same properties, power, use, or efficiency, the '893 Patent recognizes the importance of accounting for the conditions of the physical machines and migrates virtual machines among them accordingly.[76] The '893 Patent allows for a placement controller to account for the conditions of the physical machines and to use a policy or indicators to determine the appropriate layout for the virtual machines, for example, a target quality-of-service level to be provided, loading criteria (which specify some target loading level on

[69] *Id.*, 1:23-27, 6:14-19.
[70] *Id.*, 6:20-25.
[71] *Id.*
[72] *Id.*, 5:57-6:13.
[73] '893 Patent, 6:14-19.
[74] *Id.*, 1:14-16.
[75] *Id.*, 6:14-19.
[76] *Id.*,

a physical resource or machine), balancing criteria (which specify that load on physical machines should be balanced when possible), cooling criteria (which specify temperatures in physical machines that should not be exceeded), or power criteria (which specify that power consumption should be reduced where possible).[77]

65. The '893 Patent claims specific, novel techniques for solving these technical problems and improving the technological systems and methods themselves. For example, Claim 16 recites:

> A method for use in a system having plural physical machines that contain active virtual machines, comprising:
>
> receiving, at a load balancer, a request from a client;
>
> in response to the request, determining whether at least one additional virtual machine should be started up;
>
> in response to determining that at least one additional virtual machine should be started up, the load balancer sending at least one command to start up the at least one additional virtual machine in at least one of the physical machines;
>
> determining, by the load balancer, whether a workload loading of the active virtual machines and the at least one additional virtual machine has fallen below a threshold;
>
> in response to determining that the workload loading has fallen below the threshold, disabling a particular one of the active virtual machines and the at least one additional virtual machine;
>
> a placement controller selecting placement of the active virtual machines and the at least one additional virtual machines on the physical machines to achieve a predefined policy;
>
> computing, by the placement controller, indicators associated with corresponding plural different layouts of the active virtual

[77] *Id.*, 4:19-31.

machines and the at least one additional virtual machine on the physical machines, where the indicators provide information regarding performances of the corresponding layouts, and wherein each of the indicators is computed based on parameters associated with a corresponding one of the plural layouts;

comparing, by the placement controller, the indicators; and

selecting, by the placement controller, one of the plural layouts based on the comparing.

66. In one aspect, the patent explains that the placement controller selects one of the plural different layouts through the use of a "cost function," which takes into account resource loading criteria, balancing criteria, cooling criteria, and power criteria. [78] As recited, the claimed solution involves the placement controller computing indicators associated with different layouts and selecting one of the layouts based on the computed indicators. Each independent method claim of '893 Patent, including Claims 1 and 16, recites an ordered and unconventional combination of features that provide particular, concrete technical improvements to a technical problem relating to the "placement problem" by optimizing the placement of virtual machines and reducing power consumption by minimizing the need for idle servers during period of low demand, and does so using an unconventional technical solution.[79] Specifically, and for example, the independent method claims recite selecting placement of virtual machines based on indicators providing information regarding performances of the corresponding layouts and thus provide improvements to virtual machine architectures.

67. The improvements contemplated by the '893 Patent are captured by the claims themselves. For example, independent Claims 1 and 16 comprise "a placement controller" for "modifying placement of the active virtual machines on the physical machines," and "selecting placement of the active virtual machines and the at least one additional virtual machines on the physical machines to achieve a predefined policy." This placement controller provides technical

[78] *Id.*, 6:37-53.

[79] '893 Patent, 5:57-6:13.

improvements by accounting for changes in conditions in the physical machines that may benefit from virtual machines migrating between or among physical machines.

68. Each independent claim recites unique limitations not found in the others. For example, independent Claim 16 recites "computing, by the placement controller, indicators associated with corresponding plural different layouts of the active virtual machines and the at least one additional virtual machine on the physical machines, where the indicators provide information regarding performances of the corresponding layouts, and wherein each of the indicators is computed based on parameters associated with a corresponding one of the plural layouts." The '893 Patent states the claimed "parameters relat[e] to resource utilization, cooling costs, power consumption, balancing, and so forth, for a given layout of virtual machines" and "can be measured or estimated."[80] These various parameters demand an unconventional or unbalanced layout of virtual machines.

69. Additionally, the dependent claims of the '893 Patent, including for example Claims 5 and 8, recite additional and specific methods for optimizing the placement of virtual machines and accounting for changing "conditions in physical machines that may benefit from virtual machines migrating between or among physical machines."[81] For example, Claim 5 of the '893 Patent recites "the placement controller modifying placement of the active virtual machines and the at least one additional virtual machine on the physical machines in response to a changing condition." Claim 8 recites "disabling the particular virtual machine is performed under control of the placement controller that manages placement of virtual machines on physical machines." As the '893 Patent explains, a "determination of whether a virtual machine can handle new workload is based on a comparison of the existing load condition of the virtual machine with some predefined threshold. The load condition can refer to loading of any particular resource (CPU, memory, I/O device) of a physical machine, or the percentage of the overall physical machine consumed by the particular virtual machine."[82] Additionally, the "placement controller 154 is able to determine an efficient

[80] *Id.*, 6:62-7:13.

[81] *Id.*, 6:14-19.

[82] *Id.*, 5:23-30.

placement of the virtual machines on corresponding physical machines based on predefined criteria."[83]

70. Like the '893 Patent's claims, VMware's own infringing product, Distributed Resource Scheduler ("DRS"), relies on a VM DRS score and uses that score to move VMs to the physical machines that provide the highest VM DRS score. VMware also states that doing so provides better performance for VM workloads.[84]

71. The marketing for VMware's own infringing DRS reinforces the inventiveness of the '893 Patent. VMware explains that its old vSphere release relied on a utilization baseline and threshold range to determine when to use virtual machines.[85] Its new DRS score takes into account a "VM happiness" metric, which incorporates factors from the physical machines (i.e., cluster sizing, host utilization, workload characteristics, and compute and network resources).[86] Further, VMware's automated approach to balancing VMs in its infringing DRS product provides a more granular approach for balancing workloads.[87] In other words, VMware admits that the claims of the '893 Patent provide an improvement to the technology.

72. As explained above, the claims of the '893 Patent recite specific limitations, alone and as an ordered combination, that improve performance of then-existing virtual machines systems and were not well-understood, routine, or conventional at the time of invention.

73. The above examples and the disclosures set forth in the attached and incorporated '893 Patent demonstrate that the claimed invention is not abstract and is directed to improvements in the technology of virtual machine architectures.

74. Pursuant to 35 U.S.C. § 282, the '893 Patent is presumed valid and patent eligible.

The '122 Patent

[83] *Id.*, 6:14-19.

[84] Niels Hagoort, "vSphere 7 – Improved DRS," VMware.com (March 25, 2020), https://blogs.vmware.com/vsphere/2020/03/vsphere-7-improved-drs.html.

[85] *Id.*

[86] *Id.*; Niels Hagoort, "vSphere 7 – A Closer Look at the VM DRS Score," VMware.com (May 21, 2020), https://blogs.vmware.com/vsphere/2020/05/vsphere-7-a-closer-look-at-the-vm-drs-score.html.

[87] *Id.*

75. The '122 Patent is generally directed to improvements to virtual machine technology and, specifically in establishing a network interface between a host computer and remote virtual machines to enable direct remote control of virtual machines, as well as in using a universal interface to facilitate such control.[88] Before the '122 Patent, remote users of a remote management system could only control the physical hardware of the server, but not the associated virtual machines.[89] Further, a single computer may host multiple virtual machines that are designed by different entities and as a result, often have different interfaces.[90] The innovation of the '122 Patent addresses the challenges of remotely managing multiple virtual machines by, for example, enabling users to remotely control multiple virtual machines via a specific method including graphical user interface. The '122 Patent describes integrating virtual machines with server processing logic, enabling a user to power on, power off, restart, and perform various other actions on each virtual machine from a universal interface.[91] For example, the claimed method may allow a user to select buttons, "thereby causing the remote computer . . . to 'power off' the VM," or may allow a user to remotely reset the virtual machines or remotely select particular virtual machines for various operations.[92] The '122 Patent explains the novel way that it enables such direct control: "The user is enabled in this way by integrating virtual machines (VMs) with service processing logic stored on the same hardware devices as the VMs. By integrating service processing logic with the VMs, a service processing logic may be used to control the VMs."[93] Integrating the VMs in this way was a novel implementation that facilitates such direct control, thus providing an improvement over then-existing virtual machines. Allowing direct control over a specific virtual machine (or multiple specific virtual machines), and the control occurring remotely from the physical server itself, further provides for a more tailored and flexible network of virtual machines and servers, thereby improving performance of the remote and host systems, as well as the virtual machine architecture.

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[88] *See* '122 Patent, 2:24-26.

[89] *See id.*, 4:4-7.

[90] *See id.*, 1:16-20.

[91] *Id.*, 2:25-33.

[92] *Id.*, 4:58-5:11.

[93] *Id.*, 2:28-33.

76. Further, the ’122 Patent claims a universal interface generated from a host computer. In this way, the ’122 Patent streamlines the remote interaction with and direct control over virtual machines, including in circumstances where different virtual machines are designed by different entities and have different interfaces.[94] These claimed methods conserve network resources via a single graphical user interface, reduce or eliminate development efforts, and also allow improve management over the network, which improves the virtual machine architecture itself. The ’122 Patent therefore addresses specific problems, existing in then-existing methods, of managing and controlling virtual machines in a safe, secure, and reliable manner.

77. The ’122 Patent claims specific, novel techniques for solving these technical problems and improving the technological systems and methods themselves. For example, Claim 10 recites:

> A method, comprising:
>
> providing a first graphical user interface (GUI) from a host computer to a remote computer, the first GUI displaying on the remote computer a list of a plurality of virtual machines and to enable a user of the remote computer to select one of the virtual machines from the list as well as an action to be performed on the selected virtual machine, the selected action to be performed on the selected virtual machine independent of the other of the plurality of virtual machines;
>
> receiving user input from the remote computer via the first GUI, the user input including a selection of a virtual machine and an action to be performed on the selected virtual machine;
>
> in accordance with the user input, performing the action using the host computer on the selected virtual machine; and
>
> generating a second GUI to enable the user of the remote computer to select a virtual machine from the plurality of virtual

[94] ’122 Patent, 1:18-20.

machines to which a hardware peripheral device accessible to the remote computer is to be mapped;

wherein said action is selected from the group consisting of starting, stopping, re-booting and shutting down.

78. In one aspect, the patent explains that user may utilize a graphical user interface (GUI) on a remote computer to make selections "regarding how to control and manage one or more VMs" and this input is provided to the service processing logic, which performs the user's requested action.[95] Additionally, the claimed solution also allows a user of a remote computer to install software from a CD onto the VM, as "the service processing logic 210 is able to map the CD/DVD drive 50 to the server.[96] The recited solution further advantageously allows mapping of a hardware peripheral device: "[b]y mapping the CD/DVD drive 50 to the server 106 to create a virtualized CD/DVD drive on the server 106, and further by mapping the virtualized CD/DVD drive to a VM 312, the VM 312 is given access to the contents of any CD or DVD that may be inserted into the CD/DVD drive 50 on the remote computer 102. Embodiments are not limited to CD/DVD drives, however, and any of a variety of peripherals coupled to the remote computer 102 may be mapped to any VM on the server 106."[97] The independent method Claim 10 of '122 Patent recites an ordered and unconventional combination of features that provides particular, concrete technical improvements to a technical problem relating to managing and controlling multiple virtual machines, and does so using an unconventional technical solution. Specifically, and for example, improving the remote management and control of virtual machines and allowing hardware peripheral devices to be mapped to a server and thus provide improvements to virtual machine architectures.

79. Additionally, the dependent claims of the '122 Patent, including for example Claim 11, recite additional and specific methods for managing and controlling virtual machines.

80. For example, Claim 11 of the '122 Patent recites "providing images associated with

[95] *See id.*, 6:60-7:14.

[96] *Id.*, 8:25-30.

[97] *Id.*, 8:42-50.

a virtual machine from the host computer to the remote computer." The '122 Patent explains that users of the invention claimed in the '122 Patent are given "the option of viewing either the desktop (i.e., remote console) of the server 106 or the desktop of one of the VMs 312, 314."[98] The '122 Patent claims improve on the prior art by specifying the images provided are associated with a VM, which is consumes fewer network resources than then-existing implementations. Additionally, the claimed invention improves on the prior art by improving security and reducing loads on client device by eliminating the need for an additional client on the remote computer and/or server.

81. As explained above, the claims of the '122 Patent recite specific limitations, alone and as an ordered combination, that improved performance of then-existing virtual machines systems and were not well-understood, routine, or conventional at the time of invention.

82. The above examples and the disclosures set forth in the attached and incorporated '122 Patent demonstrate that the claimed invention is not abstract and is directed to improvements in the technology of virtual machine architectures.

83. Pursuant to 35 U.S.C. § 282, the '122 Patent is presumed valid and patent eligible.

DEFENDANTS' INFRINGEMENT AND LIABILITY

84. When it merged with VMware, Broadcom told its investors that VMware "pioneered the concept of virtualization."[99] However, as explained herein, VMware did so by leveraging the technological innovations of others.

85. On information and belief, Broadcom stands in VMware's shoes or shares liability for all infringement, both before and after the Merger Agreement.

86. On information and belief, any and all knowledge of the Asserted Patents and knowledge of infringement thereof held by VMware shall also be deemed held by Broadcom as a result of the Merger Agreement.

87. For example, pursuant to the Merger Agreement, VMware, Inc.'s operations, knowledge, products, product marketing/instructions, and employees merged into Broadcom.

[98] *Id.*, 7:45-48.

[99] Broadcom (AVGO) Q2 2022 Earnings Call Transcript, Motley Fool Transcribing, Fool.com (May 26, 2022), available at https://www.fool.com/earnings/call-transcripts/2022/06/02/broadcom-ltd-avgo-q2-2022-earnings-call-transcript/.

Broadcom described the "anticipated synergies and economies of scale expected from the integration of the VMware business . . . includ[ing] cost savings, operating efficiencies and other strategic benefits projected to be achieved as a result of the VMware Merger."[100] Broadcom described the challenges of the VMware Merger as "integrating the VMware workforce," "integrating operations," "integrating corporate, information technology, finance and administrative infrastructures," and "integrating financial forecasting and controls, procedures and reporting cycles."[101] In its IRS filings, Broadcom refers to the Transaction as the "Broadcom/VMware Combination."[102]

88. As part of the due diligence typically conducted during the merger and acquisition of a technology company like VMware, Broadcom would have analyzed the risks and opportunities associated with any patents and products owned by VMware. These risks would have included any opportunities to assert VMware's patents or any risks VMware's patents would be found invalid. Such an analysis would have included a review of the prosecution history for VMware's patents. During its due diligence of VMware, Broadcom analyzed the risks and opportunities associated with patents and products owned or developed by VMware. As part of that analysis, Broadcom reviewed the prosecution history for VMware's patents, including those patents that referenced the Asserted Patents or patent publications of the Asserted Patents during the prosecution of the patents. Thus, Broadcom itself was aware of the Asserted Patents.

89. As another example, on information and belief, VMware employees who had knowledge of the Asserted Patents while at VMware are now employed by Broadcom, such as, for example, VMware Inc.'s former Director of Intellectual Property. Another employee, served as Senior Intellectual Property Counsel at VMware from August 2013 to November 2023, and then became the Senior Counsel, Intellectual Property and Licensing, at Broadcom. He assumed the position on November 2023 and remained in that position for six months. On information and belief,

[100] Broadcom SEC Form 10-Q for quarter ending on August 4, 2024, available at https://investors.broadcom.com/static-files/b32ea83a-0ca4-4f37-bd83-715a82ad795a at 12.

[101] Broadcom SEC Form 10-K for fiscal year ending on October 29, 2023, available at https://investors.broadcom.com/static-files/2b98b262-4fbb-4731-b3dd-88f6ca187002 at 17-18.

[102] Broadcom SEC Form 8937 filed on December 21, 2023, available at https://investors.broadcom.com/static-files/7720c4c1-c940-4d9d-800c-66819bfdc7a0 at 2.

he spent that time transitioning the knowledge he gained about VMware's patents and other intellectual property to his new colleagues at Broadcom.

90. Accordingly, on information and belief, Broadcom and VMware are jointly and severally liable for infringement of all the Asserted Patents, including past and future damages, as set forth in detail herein.

FIRST CLAIM FOR RELIEF

Infringement of U.S. Patent No. 7,779,424 (the "'424 Patent")

Against Broadcom and VMware

91. Netflix incorporates by reference paragraph nos. 1-90.

92. Broadcom and VMware, jointly and severally, have infringed, and continue to infringe, at least Claims 1-19 of the '424 Patent, either literally or under the doctrine of equivalents, by making, using, selling, and/or offering for sale within the United States and/or importing into the United States products that are covered by at least Claims 1-19 of the '424 Patent. These products include, but are not limited to VMware vSphere Foundation, VMware Cloud Foundation, VMware Cloud on AWS, Azure VMware Solution, Google Cloud VMware Engine, Oracle Cloud VMware Solution, IBM Cloud for VMware Solutions, Alibaba Cloud VMware Service, as well as any other vSphere-based products and/or services (collectively, the "'424 Accused Products").

93. Claim 1 of the '424 Patent recites:

> A method comprising:
>
> observing communication from plurality of paravirtualized virtual machines (VMs) to driver domains that are isolated from the plurality of VMs, the communication comprising at least one resource request from the plurality of VMs to the driver domains, comprising observing communication from said plurality of VMs requesting access to a shared resource that is accessible by the plurality of VMs, wherein a device driver for said shared resource is arranged in said driver domains; and
>
> determining, based on said communication between the

plurality of VMs and the plurality of driver domains, CPU utilization of said plurality of driver domains attributable to the plurality of VMs, including determining a share of CPU execution attributed to each of the VMs during a predetermined time interval.

94. The '424 Accused Products perform a method comprising "observing communication from plurality of paravirtualized virtual machines (VMs) to driver domains that are isolated from the plurality of VMs, the communication comprising at least one resource request from the plurality of VMs to the driver domains, comprising observing communication from said plurality of VMs requesting access to a shared resource that is accessible by the plurality of VMs, wherein a device driver for said shared resource is arranged in said driver domains."

95. Broadcom and VMware's vSphere products allow VMs to share CPU, storage, and networking resources. For example, vSphere is described by Broadcom and VMware as a "virtualization platform, which transforms data centers into aggregated computing infrastructures that include CPU, storage, and networking resources."[103]

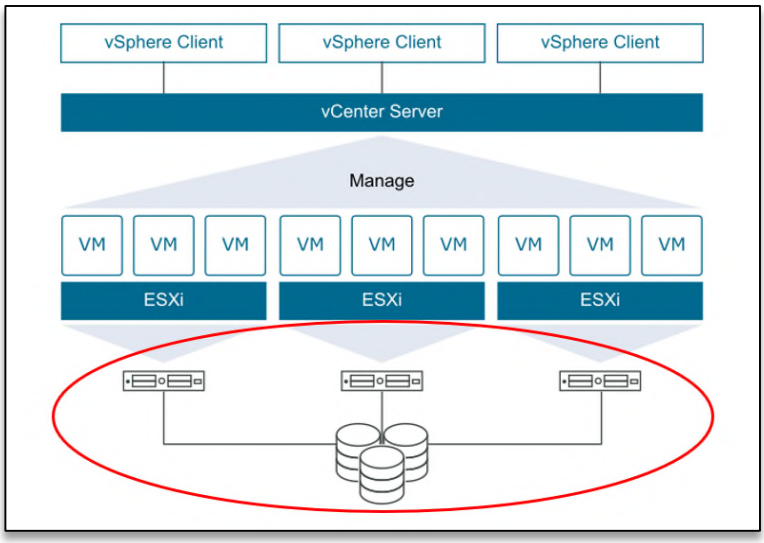

Figure 1. Annotated vSphere architecture diagram with the shared CPU, storage, and networking resources circled in red.

96. Broadcom and VMware describe that "the two core components of vSphere are ESXi

[103] "VMware vSphere Documentation," VMware.com (captured December 4, 2022), available at https://web.archive.org/web/20221204141132/https://docs.vmware.com/en/VMware-vSphere/index.html.

and vCenter Server."[104] ESXi creates and runs virtual machines while vCenter Server allows for managing multiple "hosts"—individual computers running ESXi—and pooling resources between those hosts.[105] As shown, each host runs an instance of ESXi which in turn runs multiple VMs. VCenter Server manages the multiple instances of ESXi and interacts with the vSphere Client.

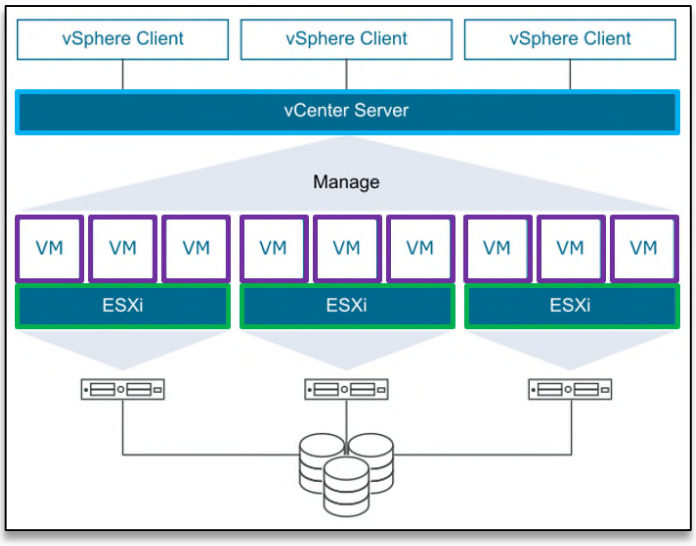

Figure 2. Annotated vSphere architecture diagram with ESXi instances in green, vCenter Server in blue, and individual VMs in purple.

97. With respect to "paravirtualized" VMs, "VMware Paravirtual controllers," used for running paravirtualized virtual machines, have been a "supported feature" of vSphere since ESXi version 4 (which released on May 21, 2009).[106]

Table 5-2. Supported Features for Virtual Machine Compatibility

Feature	ESXi 6.5 and later	ESXi 6.0 and later	ESXi 5.5 and later	ESXi 5.1 and later	ESXi 5.0 and later	ESX/ESXi 4.x and later	ESX/ESXi 3.5 and later
. . .							
VMware Paravirtual controllers	Y	Y	Y	Y	Y	Y	N

Figure 3. Excerpted and annotated Table 5-2 from vSphere Virtual Machine Administration document.

[remainder of page intentionally left blank]

[104] *Id.*

[105] *Id.*

[106] "VMware ESXi Release and Build Number History," Virten.net (copyright 2023), https://www.virten.net/vmware/esxi-release-build-number-history/#esxi4.0.

98. Within ESXi is an "underlying operating system, called VMkernel."[107] VMkernel provides "[r]esource scheduling" functionality for ESXi. VMkernel interfaces with hardware to deliver the shared CPU, storage, and network resources from the host to specific virtual machines.[108]

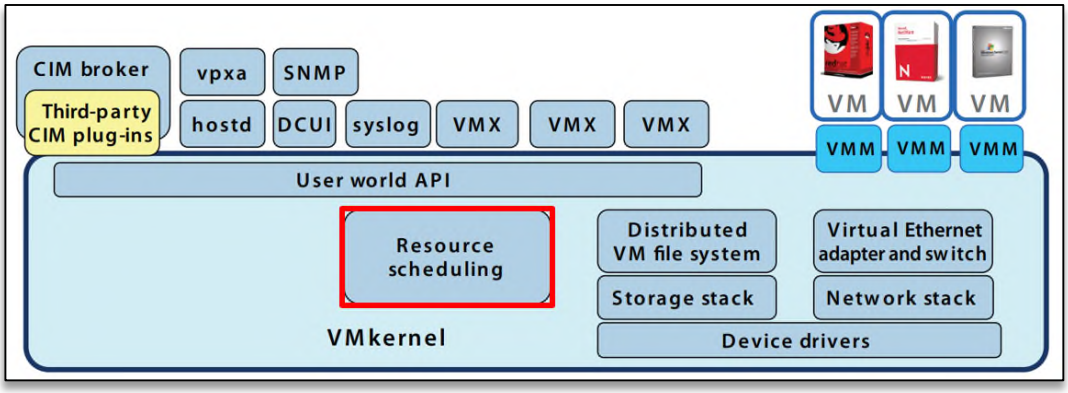

Figure 4. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper with "Resource Scheduling" highlighted in red.

99. Each virtual machine communicates with the VMkernel through a process running on top of the VMkernel called a virtual machine monitor ("VMM"). This communication includes VM requests for host resources—indeed, VMkernel "has control of all hardware devices on the [host], and manages resources for the applications."[109]

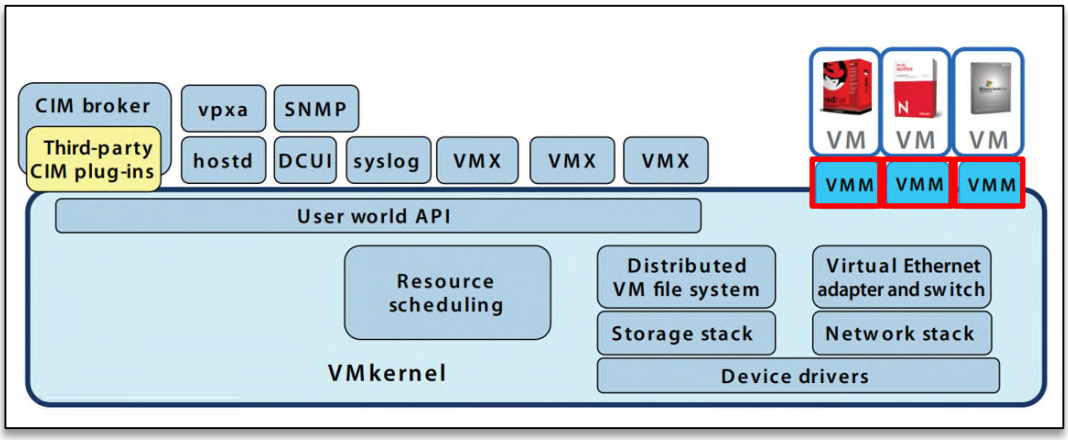

Figure 5. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper with VMMs highlighted in red.

100. The VMMs isolate the virtual machines from the VMkernel.

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[107] "The Architecture of VMware ESXi," VMware.com (captured December 9, 2008), available at https://web.archive.org/web/20081209120933/http://www.vmware.com/files/pdf/ESXi_architecture.pdf.

[108] *Id.*

[109] *Id.*

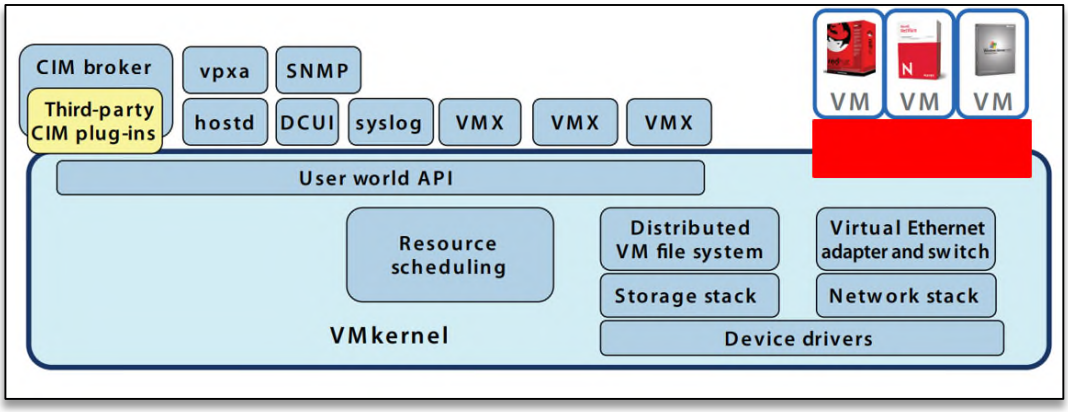

Figure 6. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper with VMMs covered in a red box to show isolation of VMs from the VMkernel.

101. The VMkernel includes the device drivers for the shared resources.

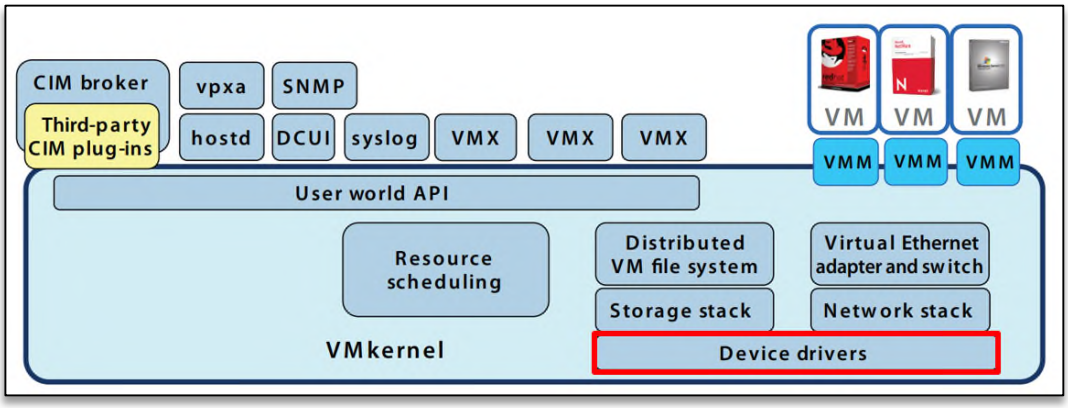

Figure 7. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper showing location of device drivers in the VMkernel using red highlighting.

102. The "Common Information Model (CIM) system" is another process that runs on top of VMkernel.[110] This system is described as "enabl[ing] a framework for agentless, standards-based monitoring of hardware resources for ESXi."[111] The CIM system consist of "a CIM object manager, often called a CIM broker, and a set of CIM providers."[112] Specifically, "VMware [] writes providers that implement monitoring of server hardware, ESX/ESXi storage infrastructure, and virtualization-specific resources" and "these providers run inside the ESXi system."[113]

103. The '424 Accused Products also perform the step of "determining CPU utilization of each VM based on said observed communication between the plurality of VMs and the plurality of

[110] *Id.*

[111] *Id.*

[112] *Id.*

[113] *Id.*

driver domains, wherein said determining includes determining CPU utilization of said driver domain attributable to each of said VMs, including determining a share of CPU execution attributable to said each VM during a predetermined time interval."

104. For example, vSphere includes a "statistics subsystem [which] collects data on the resource usage of inventory objects."[114] The product literature explains:

105. [H]osts use data counters to query for statistics. A data counter is a unit of information relevant to a given inventory object or device. Each counter collects data for a different statistic in a metric group. For example, the disk metric group includes separate data counters to collect data for disk read rate, disk write rate, and disk usage. Statistics for each counter are rolled up ***after a specified collection interval***.[115]

106. vSphere monitors CPU usage of virtual machines. For example, the CPU panel displays "server-wide statistics as well as statistics for . . . virtual machine CPU utilization."[116] One of these statistics, %USED, reflects the percentage of physical CPU core cycles used and may be calculated for specific virtual machines.[117]

107. %USED is calculated using the following formula:

108. $\%USED = \%RUN + \%SYS - \%OVRLP$

109. In this formula, %RUN is the percentage of total time scheduled but does not account for system time.

110. %SYS is the "[p]ercentage of time spent in the ESXi VMkernel on behalf of the . . . virtual machine . . . to process interrupts and to perform other system activities."

111. %OVRLP is the "[p]ercentage of system time spent during scheduling of a resource pool, virtual machine, or world on behalf of a different resource pool, virtual machine, or world while the resource pool, virtual machine, or world was scheduled." For example, "if virtual machine A is being scheduled and a network packet for virtual machine B is processed by the ESXi

[114] "vSphere Monitoring and Performance," VMware.com (copyright 2010-2021), https://docs.vmware.com/en/VMware-vSphere/7.0/vsphere-esxi-vcenter-server-703-monitoring-performance-guide.pdf.

[115] *Id.*

[116] *Id.*

[117] *Id.*

VMkernel, the time spent appears as %OVRLP for virtual machine A and %SYS for virtual machine B." Accordingly, the '424 Accused Products perform all steps of Claim 1 of the '424 Patent.

DIRECT INFRINGEMENT

112. Broadcom and VMware, jointly and severally, have directly infringed, and Broadcom and VMware continue to infringe, the '424 Patent in multiple ways.

Broadcom and VMware directly infringe the '424 Patent at least when they perform the claimed methods of the '424 Patent, in violation of at least 35 U.S.C. § 271(a), by providing the '424 Accused Products as a service.

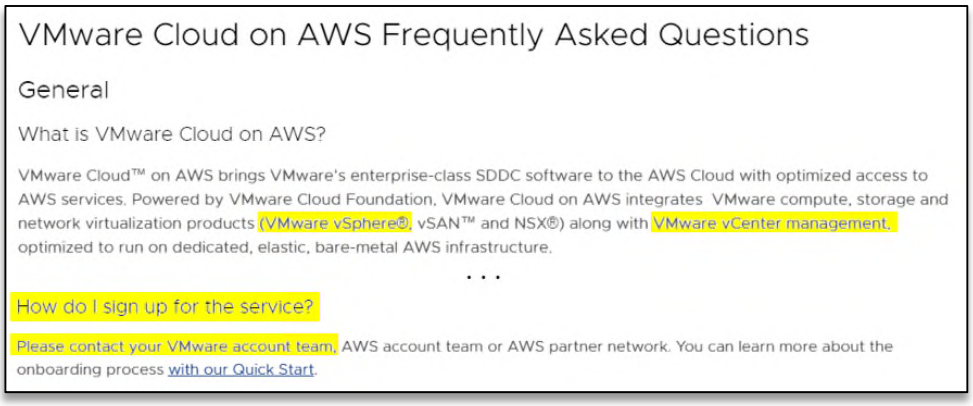

Figure 8. Annotated screenshot from VMware Cloud Tech Zone FAQ page explaining the VMware Cloud on AWS Service and how to sign up.

113. When a customer signs up for and uses a vSphere cloud-based service (*e.g.*, VMware Cloud on AWS), Broadcom and VMware perform the claimed methods as detailed above by controlling and maintaining responsibility for the infringing functionality.

114. Broadcom and VMware also condition the benefit of the '424 Accused Products on Broadcom and VMware's partners performing the infringing functionality and Broadcom and VMware's control of the manner and timing of said performance. For example, Broadcom and VMware maintain a "Shared Responsibility Model" that is "common among the different VMware Cloud Providers" and "defines distinct roles and responsibilities between the VMware Cloud Infrastructure Services provider and an organization consuming the service."[118] As shown below, Broadcom and VMware maintain responsibility for the "vSphere Lifecycle." As further

[118] "VMware Cloud Well-Architected Framework for VMware Cloud on AWS," VMware.com (copyright 2023), https://docs.vmware.com/en/VMware-Cloud-Well-Architected-Framework/services/vmcwaf-aws.pdf.

confirmation, when describing the AWS implementation, Broadcom and VMware describe one of the goals of the shared responsibility model as being to "[p]rotect VMware-managed objects" including "management appliances" and "hosts."[119] The "management appliances" and "hosts" execute code performing the steps of Claim 1 described above.

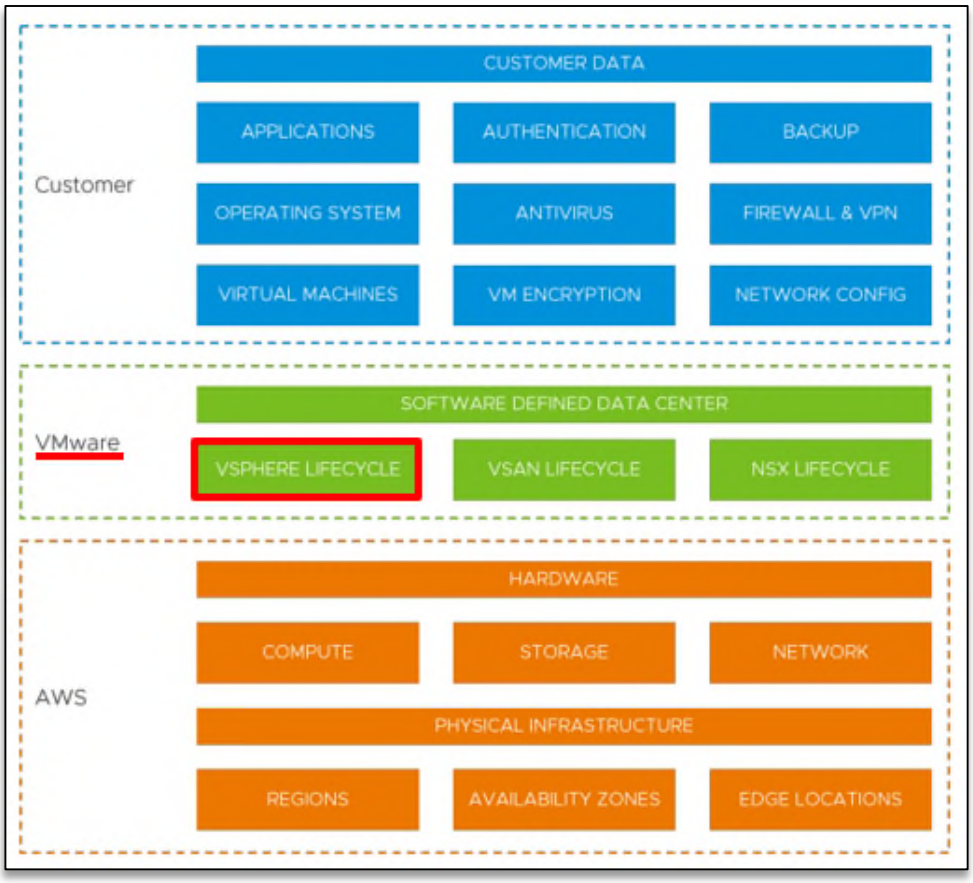

Figure 9. Annotated diagram from the "VMware Cloud Well-Architected Framework for VMware Cloud on AWS" document splitting responsibility between the customer, Broadcom, and AWS and showing vSphere as a responsibility of VMware highlighted in red.

115. Broadcom and VMware also directly infringe by using the claimed method to demonstrate, test, install, and configure the '424 Accused Products for their customers. For example, Broadcom and VMware directly infringe by using the '424 Accused Products for demonstrating via VMware Hands-on Labs, *infra*.

INDIRECT INFRINGEMENT: INDUCEMENT

116. Broadcom and VMware had knowledge of the '424 Patent and had knowledge of, or

[119] "VMware Cloud on AWS: vCenter Architecture," VMware.com (copyright 2005-2024), https://vmc.techzone.vmware.com/vmc-arch/docs/compute/vmc-aws-vcenter-architecture#sec27179-sub1.

were willfully blind, as to Broadcom's and VMware's infringement of the '424 Patent.

117. VMware had actual knowledge of the '424 Patent since at least August 3, 2012, when the '424 Patent was cited by an examiner at the United States Patent and Trademark Office ("USPTO") during a rejection of VMware's application that ultimately issued as U.S. Patent No. 8,650,564.

118. Moreover, VMware cited to the application that issued as the '424 Patent (U.S. Patent App. No. 2006/0200821A1, the "'821 Pub") in Information Disclosure Statements filed on August 17, 2016 (during prosecution of VMware Inc's U.S. Patent No. 9,513,950) and both on September 7, 2016 and October 24, 2016 (during prosecution of VMware Inc's U.S. Patent No. 10,761,895). These IDSs were filed after the '821 Pub had already issued as the '424 Patent, on August 17, 2010.

119. VMware was reminded of the '424 Patent on multiple occasions when the USPTO identified the '821 Pub during prosecution of VMware's patent applications. For example, the '821 Pub was relied upon in non-final rejections on April 11, 2016 and June 30, 2017 and a final rejection on October 6, 2016 and January 10, 2018; argued over by VMware in responses to those rejections, which were filed on July 11, 2016; December 22, 2016; and May 10, 2018; and discussed during an examiner interview on April 12, 2018; all of which occurred during prosecution of the application that issued to VMware as U.S. Patent No. 11,010,197. Similarly, the '821 Pub was identified in a rejection on August 7, 2019 during prosecution of the patent that issued to VMware as U.S. Patent No. 10,628,330.

120. VMware also abandoned applications in which the '821 Pub was cited. U.S. App. No. 12/126,705 was abandoned after the USPTO substantively relied upon the '821 Pub when rejecting VMware's application over multiple rejections issued between April 11, 2016 and January 10, 2018. In U.S. App. No. 13/865,026, the '821 Pub was cited as prior art pertinent to VMware's application on April 12, 2018.

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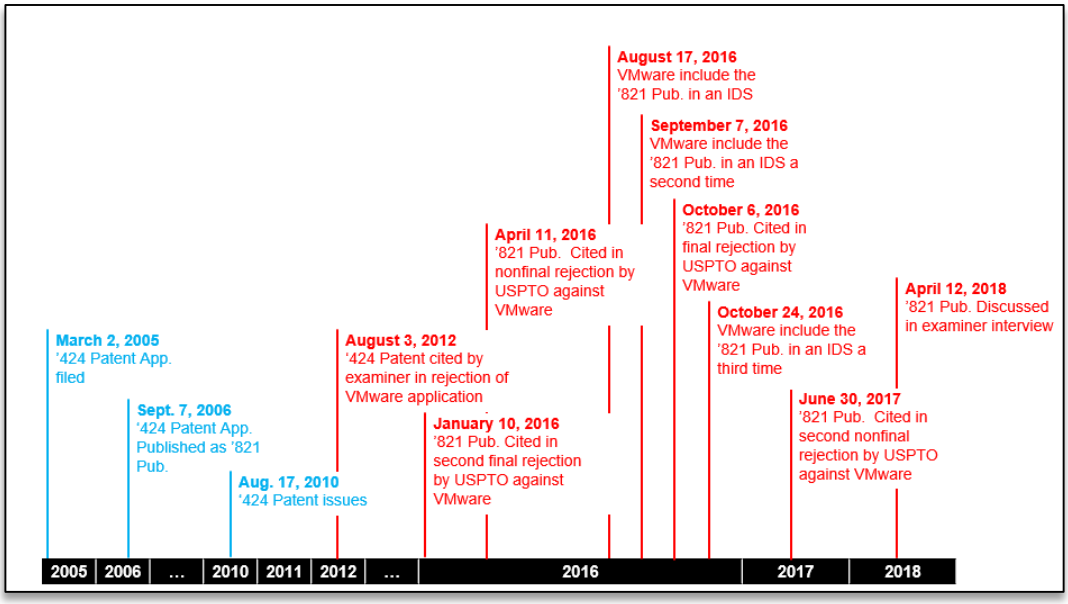

Figure 10. Timeline showing Broadcom's knowledge of the '424 Patent with activities related to '424 Patent in blue and activities related to Broadcom's knowledge of the '424 Patent in red.

121. Thus, VMware had knowledge of the '424 Patent since 2012.

122. VMware also identified US Patent Nos. 8,650,564, 9,513,950, 10,628,330, 10,761,895, and 11,010,197 ("the '424 Overlapping Patents") as being practiced by the VMware Horizon Cloud.[120] is integrated with VMware vSphere, one of the '424 Accused Product.[121] During prosecution of the '424 Overlapping Patents, either VMware or the patent examiner identified the '424 Patent itself or the patent publication for the '424 Patent as a reference. Thus, VMware would have known that the VMware Horizon product and the integrated VMware vSphere product infringed the '424 Patent and/or at least would have been willfully blind as to the likelihood of infringement.

123. Thus, VMware had knowledge of infringement of the '424 Patent or was willfully blind to its infringement of the '424 Patent by the '424 Accused Products prior to filing of the Original Complaint ("Original Complaint").

124. VMware's knowledge—including its knowledge of the Asserted Patents—can be imputed to Broadcom as Broadcom stands in VMware's shoes by virtue of the Transaction.

125. Further, VMware's knowledge can be imputed to Broadcom because VMware's

[120] "VMware Patents," VMware.com (captured May 31, 2022), available at https://web.archive.org/web/20220531103333/https://www.vmware.com/download/patents.html.
[121] "VMware Horizon and VDI: Key Differences Explained," Nakivo.com (October 6, 2023), available at https://www.nakivo.com/blog/key-differences-between-vmware-horizon-and-vdi/.

employees merged with, were acquired by, and went to work for Broadcom, including employees with knowledge of the prosecution histories of the VMware's patents. For example, the Senior Intellectual Property Counsel for VMware from August 2013 to November 2023 worked for Broadcom in the same role. As Senior IP Counsel for VMware, this person would have overseen and been responsible for VMware's patent portfolio and their prosecution and brings this knowledge to Broadcom.

126. Broadcom also has its own direct knowledge of the Asserted Patents.

127. Broadcom would have engaged in an extensive review of VMware's patents, including their prosecution histories, as part of the detailed due diligence necessary for the Broadcom-VMware merger, *i.e.*, before November 2023. For example, Broadcom's 2023 annual report states that Broadcom focuses its "research and development resources to . . . leverage our extensive portfolio of U.S. and other patents, and other intellectual property" because its "success depends in part upon [its] ability to protect [its] IP," including its patents.[122] Hock Tan, CEO of Broadcom, stated pre-merger that "VMware will complement Broadcom's more than 60-year focus on innovation, intellectual property, and R&D know-how."[123]

128. During its due diligence of VMware, Broadcom analyzed the risks and opportunities associated with the '424 Patent and any products owned by VMware that practice the '424 Patent. This analysis included a review of the prosecution history of the '424 Overlapping Patents and an analysis of any risk products that practiced the '424 Patent infringed patents identified in the prosecution history for the '424 Patent.

129. Thus, Broadcom had knowledge of infringement or was willfully blind as to the likelihood of its infringement of the '424 Patent prior to the filing of the Original Complaint.

130. On December 27, 2024, the original Complaint in this action was filed. The service of the Original Complaint provided an additional source of knowledge of the '424 Patent to Broadcom and VMware. Broadcom and VMware also received additional knowledge and notice of

[122] Broadcom SEC Form 10-K for fiscal year ending on October 29, 2023, available at https://investors.broadcom.com/static-files/2b98b262-4fbb-4731-b3dd-88f6ca187002.

[123] "Keeping customers at the center of everything," Broadcom.com (February 08, 2023),https://www.broadcom.com/blog/keeping-customers-at-the-center-of-everything.

their infringement of the '424 Patent when the Original Complaint was served.

131. Broadcom and VMware, jointly and severally, have actively induced infringement of at least Claim 1 of the '424 Patent in violation of at least 35 U.S.C. § 271(b). Users of the '424 Accused Products directly infringe at least Claim 1 of the '424 Patent when they use the '424 Accused Products in the ordinary, customary, and intended way. Broadcom and VMware's inducement includes, without limitation and with specific intent to encourage the infringement, knowingly inducing consumers to use the '424 Accused Products within the United States in the ordinary, customary, and intended way by, directly or through intermediaries, supplying the '424 Accused Products to consumers within the United States and instructing and encouraging such customers to use the '424 Accused Products in the ordinary, customary, and intended way, which Broadcom and VMware know or should know infringes at least Claim 1 of the '424 Patent.

132. For example, in some cases, Broadcom and VMware sell the '424 Accused Products to their customers as software for installation on customer computer(s). Whenever customers install the '424 Accused Products and run a virtual machine, at least Claim 1 of the '424 Patent is performed. In at least this way, the customers of Broadcom and VMware directly infringe the '424 Patent ***while*** Broadcom and VMware know of the '424 Patent, or should know that these activities infringe the '424 Patent, and specifically intends and instructs for their customers to infringe. Broadcom and VMware have provided and continue to provide these instructions to infringe despite knowing of the '424 Patent and knowing or being willfully blind to the fact these activities infringe the '424 Patent.

133. By way of example, Broadcom and VMware's instructions to their customers to infringe are made at least through their creation and distribution of marketing, promotional, and instructional materials. The promotional and product literature for the Accused Products is designed to instruct, encourage, enable, and facilitate the user of the '424 Accused Products to use the '424 Accused Products in a manner that directly infringes the '424 Patent. And Broadcom and VMware provide instructions, support, and technical assistance to their customers in support of committing the infringement.

134. One nonlimiting example of Broadcom and VMware's inducement includes at least

VMware Hands-on Labs for vSphere-based products.

135. On the official VMware YouTube page, Broadcom and VMware explain that VMware Hands-On Labs "delivers a real virtualized infrastructure in the cloud powered by VMware" to let customers "try out products from the convenience of [their] browser."[124] Broadcom and VMware further explain that "each self-paced lab is guided with a manual and built in modules so you can take all or just part of a lab and come and go from labs as often as you like."[125]

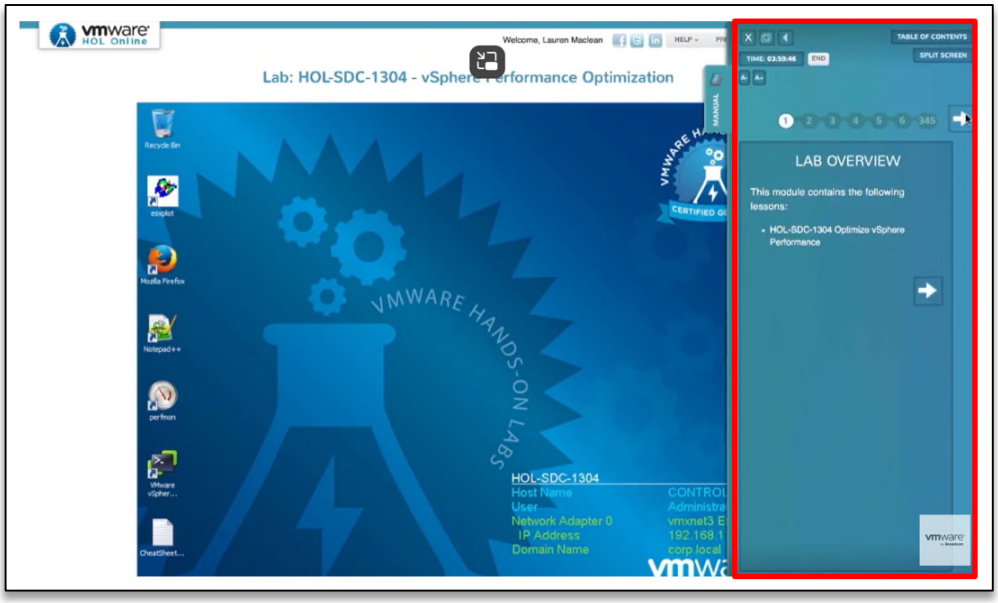

Figure 11. Screenshot from VMware YouTube video titled "What are VMware Hands-on Labs?," showing VMware Hands-on Lab Environment highlighted with in-lab manual highlighted in red.

136. Broadcom and VMware offer VMware Hands-on Labs directly related to use of the vSphere functionality that infringes the '424 Patent. For example, Broadcom and VMware offer a VMware Hands-on Lab on "vSphere Performance Optimization."

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[124] "What are VMware Hands-on Labs," VMware YouTube Channel, YouTube.com (June 25, 2014), https://www.youtube.com/watch?v=XggYeVsK_R0, 0:25-32.

[125] *Id.*, 0:34-42.

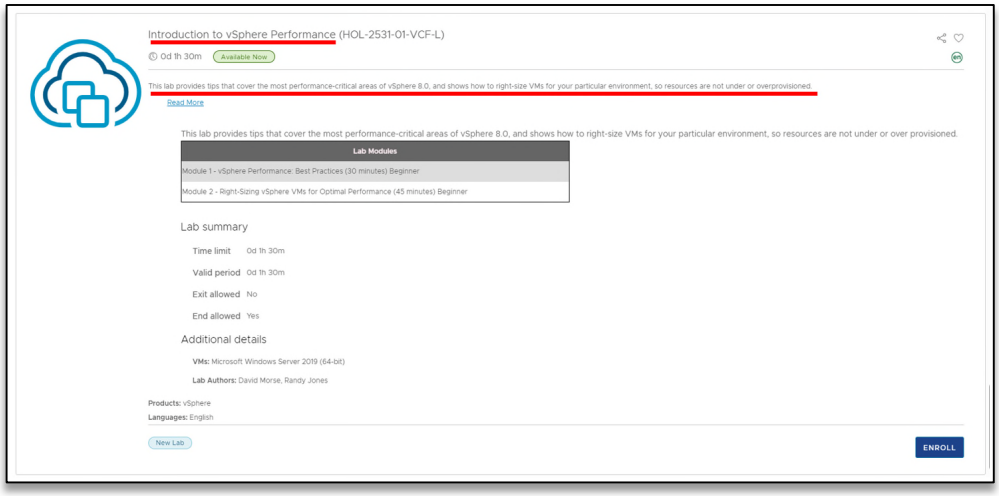


Figure 12. VMware Hands-on Lab course catalog entry showing Hands-on Lab titled "Introduction to vSphere Performance."[126]

Figure 13. VMware Hands-on Lab course showing manual discussing instructions specific to CPU Performance in vSphere.

137. Broadcom and VMware thus encourage their customers to infringe the '424 Patent at least by instructing customers on how to infringe by providing "manuals and built in modules" in proximity to "actual VMware products" for customers to practice infringing conduct through the VMware Hands-on Labs.

[remainder of page intentionally left blank]

[126] "Catalog," VMware Hands-on Labs, https://labs.hol.vmware.com/HOL/catalog.

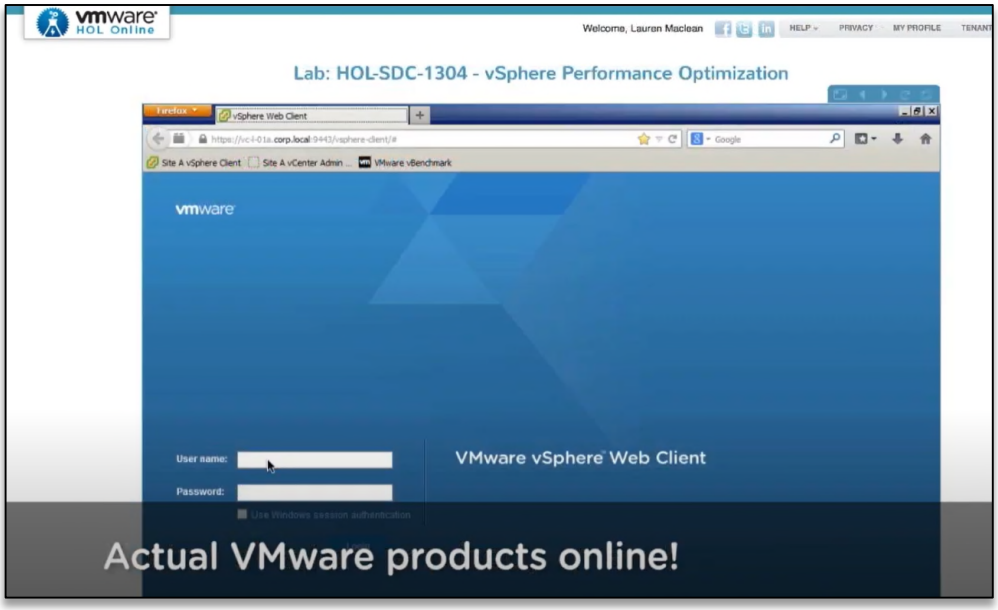


Figure 14. Screenshot from VMware YouTube video titled "What are VMware Hands-on Labs?"

138. Besides the VMware Hand-on Labs example discussed above, Broadcom and VMware publicly share numerous instructions, troubleshooting manuals, and product documentations through Broadcom's support portal (https://support.broadcom.com/) and at https://docs.vmware.com/en/VMware-vSphere/index.html.

139. Like the Hands-on Labs discussed above, these support documents also provide step-by-step instructions explaining how to use the '424 Accused Products in an infringing manner.

140. Thus, Broadcom and VMware have induced their customers to infringe the '424 Patent. Broadcom and VMware's knowing inducement of their customers to infringe has caused and continues to cause damage to Netflix, and Netflix is entitled to recover damages sustained as a result of Broadcom and VMware's wrongful acts in an amount subject to proof at trial.

INDIRECT INFRINGEMENT: CONTRIBUTORY INFRINGEMENT

141. As detailed above, Broadcom and VMware had knowledge of the '424 Patent and had knowledge, or were willfully blind, as to Broadcom's and VMware's infringement of the '424 Patent.

142. Broadcom and VMware have actively contributed to infringement of at least Claim 1 of the '424 Patent in violation of at least 35 U.S.C. § 271(c). Broadcom and VMware sell the '424 Accused Products, which are software specially made or especially adapted to practice the method claimed in at least Claim 1 of the '424 Patent.

143. The infringing components of the ’424 Accused Products have no substantial function or use other than to practice the invention claimed in at least Claim 1 of the ’424 Patent at least because infringement of the claimed method is performed automatically when customers start a virtual machine using the ’424 Accused Products installed on a computer system.

144. The ’424 Accused Products include material components of the claimed method recited in at least Claim 1 of the ’424 Patent and are not a staple article or commodity of commerce, including because they are specifically configured to infringe according to at least Claim 1 of the ’424 Patent (*see, e.g.*, ¶¶ 91-115).

145. Broadcom and VMware’s contributory infringements include, without limitation, making, offering to sell, and/or selling within the United States, and/or importing into the United States, the ’424 Accused Products, which each include one or more components for use in practicing at least Claim 1 of the ’424 Patent, knowing the component to be especially made or especially adapted for use in an infringement of at least Claim 1 of the ’424 Patent (*see, e.g.*, ¶¶ 91-143), and not a staple article or commodity of commerce suitable for substantial non-infringing use.

WILLFUL INFRINGEMENT

146. As detailed above, Broadcom and VMware had knowledge of the ’424 Patent and had knowledge, or were willfully blind, as to Broadcom’s and VMware’s infringement of the ’424 Patent.

147. Broadcom and VMware’s infringement of the ’424 Patent has been and is willful and deliberate.

148. As discussed above, VMware had actual knowledge of the ’424 Patent since August 3, 2012. VMware’s knowledge is imputed to Broadcom by virtue of the Transaction and for the reasons set forth above.

149. Broadcom also obtained its own direct knowledge of the ’424 Patent through pre-merger due diligence and by acquiring VMware employees with knowledge, *supra*.

150. As discussed above, Broadcom knew or should have known that its actions infringe and actively induce infringement of the ’424 Patent.

151. As discussed above, Broadcom specifically intended that both itself and/or its

customers infringe the '424 Patent.

152. Further, VMware marked accused functionality with patents whose prosecution contains citations to or objections based on the Asserted Patents. That is, many of VMware's patent applications that contain citations to or rejections based on the Asserted Patents, were later, after issuance, used to mark infringing functionality. Broadcom appears to have removed VMware's virtual marking URL but, upon information and belief, Broadcom did so to review VMware's virtual marking and can be imputed with knowledge thereof. Thus, Broadcom understands that the Asserted Patents cited in VMware's prosecution histories overlap with the functionality in the '424 Accused Products or is willfully blind to that fact. Given the close relationship between the subject of the Patents-in-Suit and the '424 Accused Products, including that VMware marked accused functionality with patents that were objected to during prosecution based on the Asserted Patents, Broadcom knew or should have known of the substantial risk of infringement through use of their products.

153. Broadcom and VMware's willfulness is further evidenced by VMware's demonstrated culture of knowingly using patented technology.[127] Copying other people's patents is circumstantial evidence of willful infringement and it appears the Accused Products are copies of the Asserted Patents. Further, VMware's former CEO, who served in that role for ten (10) years, from October 2013 to December 2023, allegedly testified in deposition that VMware has a culture of copying.[128] Upon information and belief, Broadcom continues VMware's culture of copying today.

154. Broadcom and VMware's willfulness is further evidenced by VMware's culture of willful blindness toward patents, including intentionally not reviewing third-party patents when any rational actor would understand—based on, for example, the application rejections in VMware's patent applications—that a substantial risk of infringement exists.[129] Upon information and belief, Broadcom continues that culture today.

[127] *See, e.g.*, *Cirba Inc. (d/b/a Densify) v. VMware, Inc.*, Case No. 1:19-cv-00742-GBW ("*Cirba*"), ECF 1528; 1:19-cv-00742-GBW ECF 1848.

[128] *Cirba*, 1:19-cv-00742-GBW ECF 1529, 1531.

[129] *See, e.g.*, *Cirba*, ECF Nos. 1529, ECF 1531, ECF 1848.

155. In fact, two separate juries have found VMware committed willful infringement, in part, because of VMware's culture of copying and refusing to review third-party patents during a time period relevant to this matter.[130] Indeed, the Accused Product in those matters is the same Accused Product here, demonstrating a pattern and practice of copying and willful blindness as to infringement when it comes to the Accused Product, vSphere, during the time at-issue here. Upon information and belief, Broadcom continues the pattern and practice of willful infringement today.

156. Thus, Broadcom and VMware have willfully infringed the '424 Patent. Broadcom and VMware's knowing and willful infringement has caused and continues to cause damage to Netflix, and Netflix is entitled to recover damages sustained as a result of Broadcom and VMware's wrongful acts in an amount subject to proof at trial.

SECOND CLAIM FOR RELIEF

Infringement of U.S. Patent No. 7,797,707 (the "'707 Patent")

Against Broadcom and VMware

157. Netflix incorporates by reference paragraph nos. 1-156, *supra*.

158. Broadcom and VMware have infringed, and continue to infringe, at least Claims 1-28 of the '707 Patent, either literally or under the doctrine of equivalents, by making, using, selling, and/or offering for sale within the United States and/or importing into the United States products that are covered by at least Claims 1-28 of the '707 Patent. These products include, but are not limited to VMware vSphere Foundation, VMware Cloud Foundation, VMware Cloud on AWS, Azure VMware Solution, Google Cloud VMware Engine, Oracle Cloud VMware Solution, IBM Cloud for VMware Solutions, Alibaba Cloud VMware Service, as well as any other vSphere-based products and/or services (collectively, the "'707 Accused Products").

159. Claim 1 of the '707 Patent recites:

> A method comprising:
>
> observing, in a computer, communication from a virtual machine (VM) to a domain in which a device driver for a shared

[130] *Cirba Inc. (d/b/a Densify) v. VMware, Inc.*, Case No. 1:19-cv-00742-GBW, ECF Nos. 577, 1785.

resource resides, wherein the domain is separate from a virtual machine monitor (VMM);

determining, in the computer and based on said communication, CPU utilization of said domain attributable to said VM;

determining, for the VM, CPU utilization allocated by a scheduler to the VM; and

determining, for the VM, total CPU utilization attributable to the VM by summing the determined CPU utilization allocated to the VM by the scheduler and the determined CPU utilization of the domain attributable to the VM.

160. The '707 Accused Products perform a method comprising "observing, in a computer, communication from a virtual machine (VM) to a domain in which a device driver for a shared resource resides, wherein the domain is separate from a virtual machine monitor (VMM)."

161. Broadcom and VMware's vSphere products allow VMs to share CPU, storage, and networking resources. For example, vSphere, is described by Broadcom and VMware as a "virtualization platform, which transforms data centers into aggregated computing infrastructures that include CPU, storage, and networking resources."[131]

[remainder of page intentionally left blank]

[131] "VMware vSphere Documentation," VMware.com (captured December 4, 2022), https://web.archive.org/web/20221204141132/https://docs.vmware.com/en/VMware-vSphere/index.html.

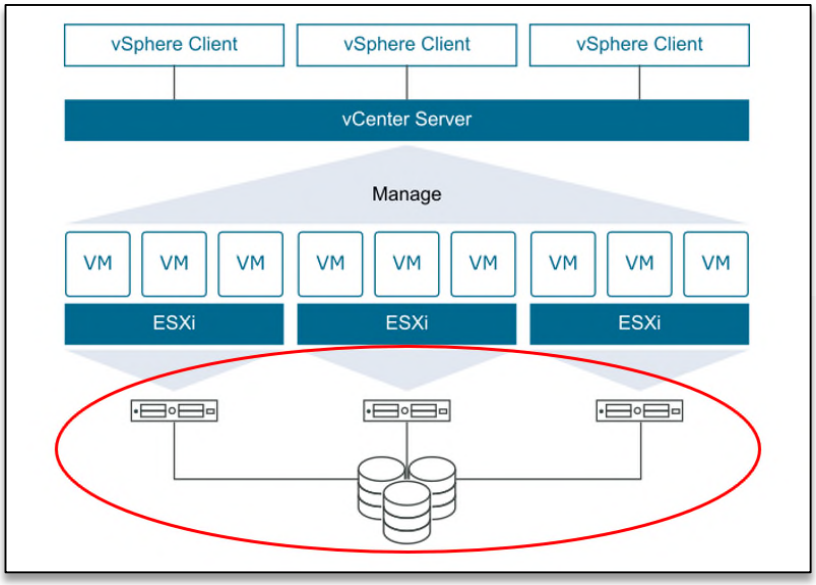


Figure 15. Annotated vSphere architecture diagram with the shared CPU, storage, and networking resources circled in red.

162. Broadcom and VMware describe that "the two core components of vSphere are ESXi and vCenter Server."[132] ESXi creates and runs virtual machines while vCenter Server allows for managing multiple "hosts"—individual computers running ESXi—and pooling resources between those hosts.[133] As shown, each host runs an instance of ESXi which in turn runs multiple VMs. VCenter Server manages the multiple instances of ESXi and interacts with the vSphere Client.

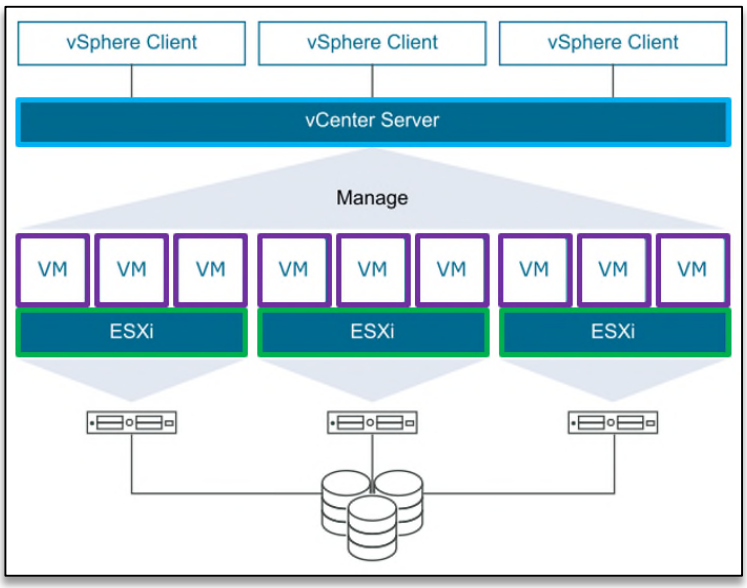


Figure 16. Annotated vSphere architecture diagram with ESXi instances in green, vCenter Server in blue, and individual VMs in purple.

[132] *Id.*

[133] *Id.*

163. Within ESXi is an "underlying operating system, called VMkernel."[134] VMkernel provides "[r]esource scheduling" functionality for ESXi. VMkernel interfaces with hardware to deliver the shared CPU, storage, and network resources from the host to specific virtual machines.[135]

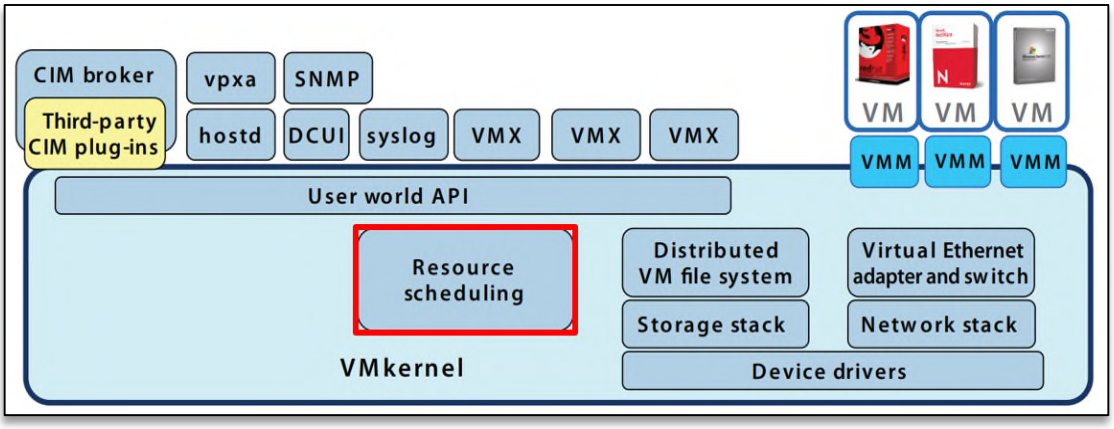


Figure 17. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper with "Resource Scheduling" highlighted in red.

164. Each virtual machine communicates with the VMkernel through a process running on top of the VMkernel called a virtual machine monitor ("VMM"). This communication includes VM requests for host resources—indeed, VMkernel "has control of all hardware devices on the [host], and manages resources for the applications."[136]

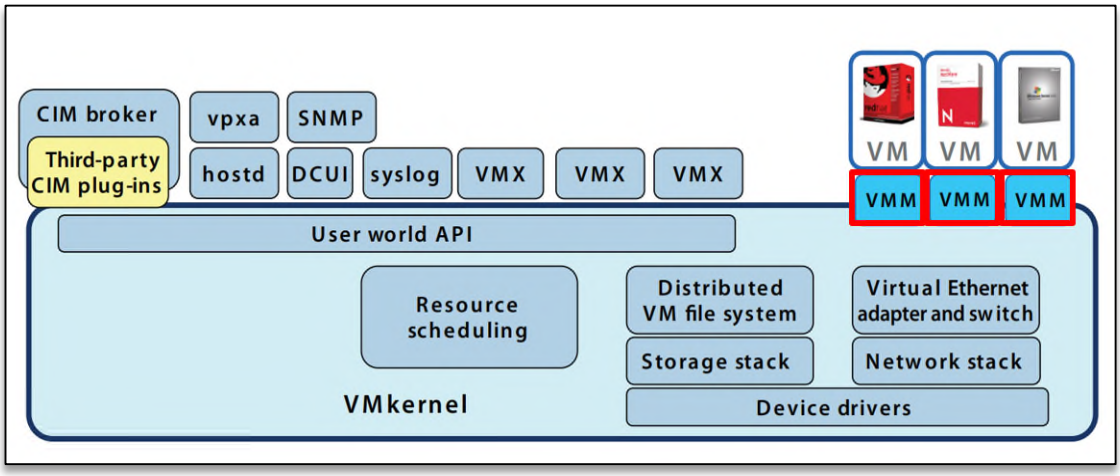


Figure 18. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper with VMMs highlighted in red.

165. The VMMs are separate from the VMkernel and device drivers. Specifically, the

[134] "The Architecture of VMware ESXi," VMware.com (captured December 9, 2008), https://web.archive.org/web/20081209120933/http://www.vmware.com/files/pdf/ESXi_architecture.pdf.

[135] *Id.*

[136] *Id.*

VMM is one of the "main processes that run[s] on top of VMkernel."[137]

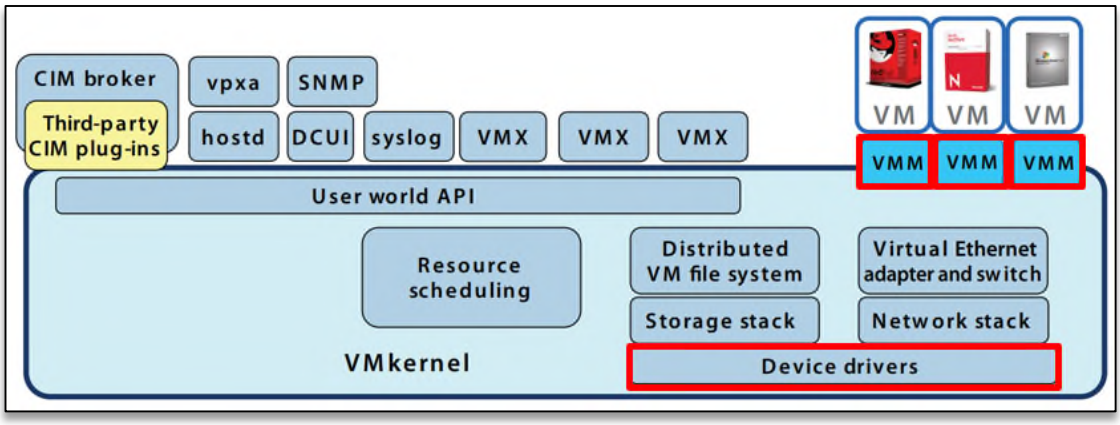


Figure 19. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper with VMMs and device drivers highlighted to show their separation with respect to the VMkernel.

166. The VMkernel includes the device drivers for the shared resources.

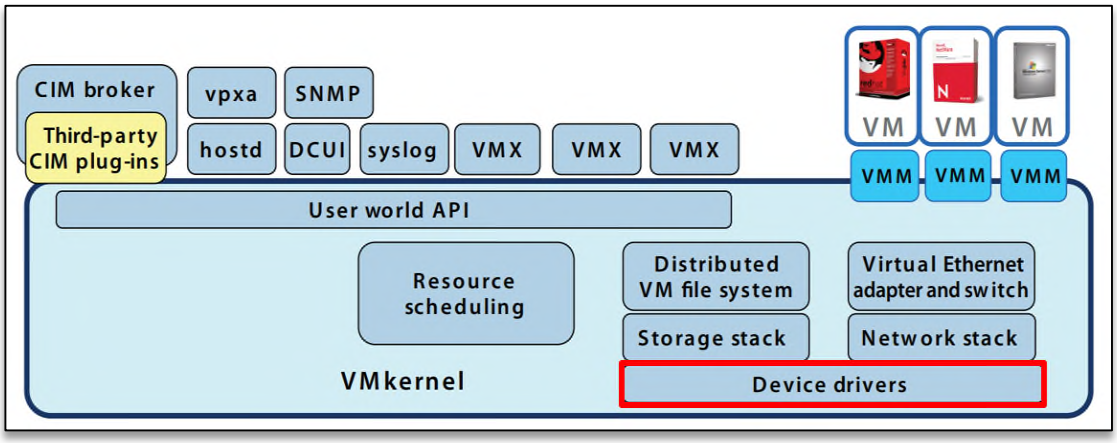


Figure 20. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper showing location of device drivers in the VMkernel using red highlighting.

167. The "Common Information Model (CIM) system" is another process that runs on top of VMkernel.[138] This system is described as "enabl[ing] a framework for agentless, standards-based monitoring of hardware resources for ESXi."[139] The CIM system consist of "a CIM object manager, often called a CIM broker, and a set of CIM providers."[140] Specifically, "VMware [] writes providers that implement monitoring of server hardware, ESX/ESXi storage infrastructure, and virtualization-specific resources" and "these providers run inside the ESXi system."[141]

---

[137] *Id.*

[138] *Id.*

[139] *Id.*

[140] *Id.*

[141] *Id.*

168. The '707 Accused Products perform the step of "determining, in the computer and based on said communication, CPU utilization of said domain attributable to said VM."

169. For example, vSphere includes a "statistics subsystem [which] collects data on the resource usage of inventory objects."[142] The product literature explains:

> [H]osts use data counters to query for statistics. A data counter is a unit of information relevant to a given inventory object or device. Each counter collects data for a different statistic in a metric group. For example, the disk metric group includes separate data counters to collect data for disk read rate, disk write rate, and disk usage. Statistics for each counter are rolled up after a specified collection interval.[143]

170. For example, one calculated metric, %SYS, is the "[p]ercentage of time spent in the ESXi VMkernel on behalf of the . . . virtual machine . . . to process interrupts and to perform other system activities."

171. The '707 Accused Products perform the step of "determining, for the VM, CPU utilization allocated by a scheduler to the VM."

172. For example, another calculated metric, %RUN, is the percentage of total CPU time scheduled.[144]

173. The '707 Accused Products perform the step of "determining, for the VM, total CPU utilization attributable to the VM by summing the determined CPU utilization allocated to the VM by the scheduler and the determined CPU utilization of the domain attributable to the VM."[145]

174. For example, the CPU panel displays "server-wide statistics as well as statistics for . . . virtual machine CPU utilization."[146] One of these statistics, %USED, reflects the percentage of physical CPU core cycles used and may be calculated for specific virtual machines.[147]

175. %USED is calculated using the following formula (summation highlighted in red):

$$\%USED = \%RUN + \%SYS - \%OVRLP$$

---

[142] "vSphere Monitoring and Performance," VMware.com (copyright 2010-2021), https://docs.vmware.com/en/VMware-vSphere/7.0/vsphere-esxi-vcenter-server-703-monitoring-performance-guide.pdf.

[143] *Id.*

[144] *Id.*

[145] *Id.*

[146] *Id.*

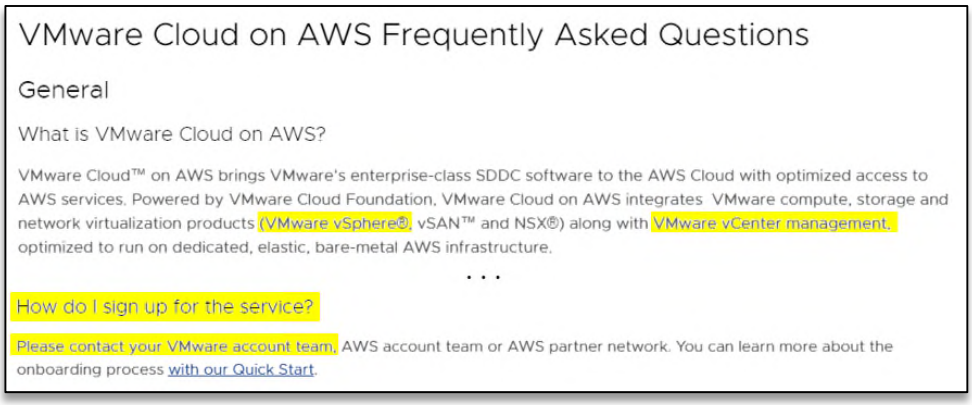
[147] *Id.*

176. Accordingly, the '707 Accused Products perform all steps of Claim 1 of the '707 Patent.

DIRECT INFRINGEMENT

177. Broadcom and VMware directly infringe the '707 Patent in multiple ways.

178. Broadcom and VMware directly infringe the '707 Patent when they perform the claimed methods of the '707 Patent, in violation of at least 35 U.S.C. § 271(a), by providing the '707 Accused Products as a service.


VMware Cloud on AWS Frequently Asked Questions

General

What is VMware Cloud on AWS?

VMware Cloud™ on AWS brings VMware's enterprise-class SDDC software to the AWS Cloud with optimized access to AWS services. Powered by VMware Cloud Foundation, VMware Cloud on AWS integrates VMware compute, storage and network virtualization products (VMware vSphere®, vSAN™ and NSX®) along with VMware vCenter management, optimized to run on dedicated, elastic, bare-metal AWS infrastructure.

. . .

How do I sign up for the service?

Please contact your VMware account team, AWS account team or AWS partner network. You can learn more about the onboarding process with our Quick Start.

Figure 21. Annotated screenshot from VMware Cloud Tech Zone FAQ page explaining the VMware Cloud on AWS Service and how to sign up.

179. When a customer signs up for and uses a vSphere cloud-based service (*e.g.*, VMware Cloud on AWS), Broadcom and VMware perform the claimed methods as discussed above by controlling and maintaining responsibility for the infringing functionality. Alternatively, Broadcom and VMware condition the benefit of the '707 Accused Products on Broadcom and VMware's partners performing the infringing functionality and Broadcom and VMware's control the manner and timing of said performance.

180. For example, Broadcom and VMware maintain a "Shared Responsibility Model" that is "common among the different VMware Cloud Providers" and "defines distinct roles and responsibilities between the VMware Cloud Infrastructure Services provider and an organization consuming the service."[148] As shown below, Broadcom and VMware maintain responsibility for the "vSphere Lifecycle." As further confirmation, when describing the AWS implementation, Broadcom and VMware describe one of the goals of the shared responsibility model as being to

[148] "VMware Cloud Well-Architected Framework for VMware Cloud on AWS," VMware.com (copyright 2023), https://docs.vmware.com/en/VMware-Cloud-Well-Architected-Framework/services/vmcwaf-aws.pdf.

"[p]rotect VMware-managed objects" including "management appliances" and "hosts."[149] The "management appliances" and "hosts" execute code performing the steps of Claim 1 described above.

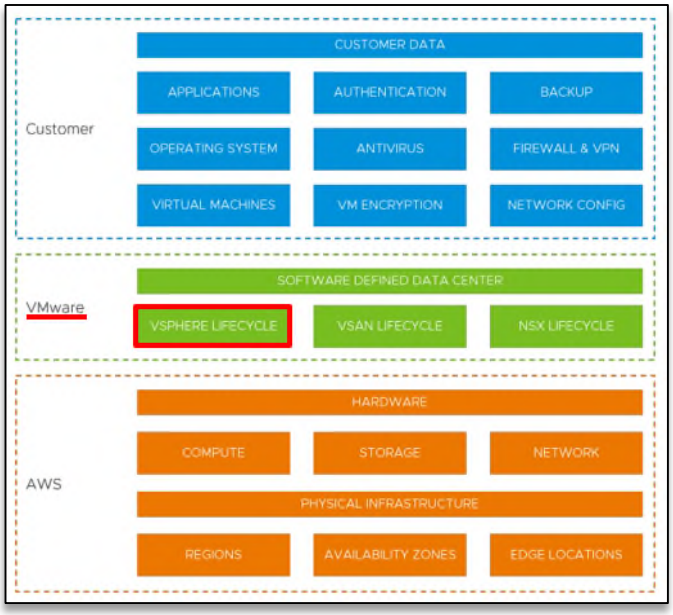


Figure 22. Annotated diagram from the "VMware Cloud Well-Architected Framework for VMware Cloud on AWS" document splitting responsibility between the customer, VMware, and AWS and showing vSphere as a responsibility of VMware highlighted in red.

181. Broadcom and VMware also directly infringe by using the claimed method to demonstrate, test, install, and configure the '707 Accused Products for their customers. For example, Broadcom and VMware directly infringe by using the '707 Accused Products for demonstrating via VMware Hands-on Labs, *infra*.

INDIRECT INFRINGEMENT: INDUCEMENT

182. Broadcom and VMware had knowledge of the '707 Patent and had knowledge of, or were willfully blind, as to Broadcom's and VMware's infringement of the '707 Patent.

183. Broadcom and VMware have had knowledge of the '707 Patent since at least August 3, 2012, when the '424 Patent was cited by an examiner at the United States Patent and Trademark Office ("USPTO") during a rejection of VMware Inc.'s application that ultimately issued as U.S. Patent No. 8,650,564. The '424 Patent incorporates by reference U.S. Patent Application Nos.

[149] "VMware Cloud on AWS: vCenter Architecture," VMware.com (copyright 2005-2024), https://vmc.techzone.vmware.com/vmc-arch/docs/compute/vmc-aws-vcenter-architecture#sec27179-sub1.

11/070,602 and 11/070,605, and the '707 Patent issued from Application No. 11/070,605. Accordingly, once VMware had knowledge of the '424 Patent on August 3, 2012, it also had, or recklessly disregarded knowledge of, the '707 Patent.[150]

184. Further, the USPTO identified and relied upon the '707 Patent to reject the claims in a Symantec patent application for the patent that ultimately issued as U.S. Patent No. 9,143,410. Broadcom acquired Symantec on November 4, 2019, and Symantec's knowledge of the '707 Patent is therefore imputed to Broadcom. Additionally, Broadcom would have obtained knowledge of Symantec's patents prosecutions during the pre-sale due diligence process.

185. Further, VMware was provided with knowledge of the '707 Patent when the USPTO's rejected—on March 13, 2014, on September 30, 2014, and again on January 30, 2015—Symantec's patent application as unpatentable over the '707 Patent. Symantec's responses on June 13, 2014, December 30, 2014, and April 30, 2015 to the USPTO's rejections, including substantively discussing and amending over the '707 Patent, and Symantec's discussion of the '707 Patent with the USPTO during an examiner interview on May 15, 2015 are further evidence of Symantec's, and by extension, Broadcom's knowledge of the '707 Patent.

186. VMware was also reminded of the '707 Patent when the USPTO listed the publication corresponding to the '707 Patent in a notice of references cited on July 29, 2019 during prosecution of VMware's application that issued as U.S. Patent No. 10,628,330.

[remainder of page intentionally left blank]

[150] The '707 Patent has similar disclosures identifying the '891 Patent, discussed below, and the '424 Patent, while the '891 Patent has similar disclosures identifying the '424 and '707 Patents. Thus, the USPTO's and Broadcom's references to any one of these three patents—the '424, '707, and '891 Patents—are further evidence that VMware had, or should have had, knowledge of the other two patents.

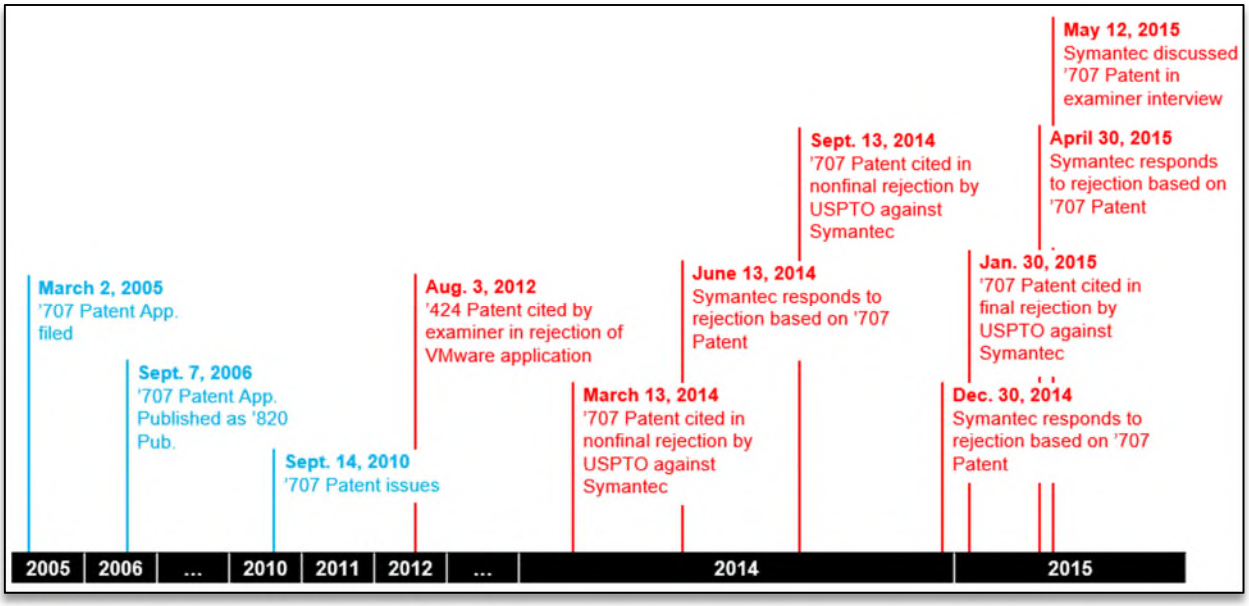


Figure 23. Timeline showing Broadcom's knowledge of the '707 Patent with activities related to '707 Patent in blue and activities related to Broadcom's knowledge in red.

187. VMware patents US Patent Nos. 9,143,410, and 10,628,330 ("the '707 Overlapping Patents") cited the '707 Patent, or a publication of the '707 Patent during the prosecution of the '707 Overlapping Patents. The patent examiner rejected the patent application for US Patent No. 9,143,410 in light of the '707 Patent. VMware was therefore aware of the overlap between the '707 Overlapping Patents and the '707 Patent. The '707 Overlapping Patents are practiced by at least VMware vSphere product, and other '707 Accused Products. Thus, VMware would have known that the VMware vSphere product infringed the '707 Patent or decided to be willfully blind as to the likelihood of infringement.

188. Thus, VMware had knowledge of infringement of the '707 Patent or was willfully blind to its infringement of the '707 Patent by the '707 Accused Products.

189. VMware's knowledge of the Asserted Patents, including the '707 Patent, can be imputed to Broadcom for the reasons stated above, ¶¶ 85-89, 124-125, incorporated by reference herein.

190. During its due diligence of VMware, Broadcom analyzed the risks and opportunities associated with the '707 Patent and any products owned by VMware that practice the '707 Patent. This analysis included a review of the prosecution history of the '707 Overlapping Patents and an analysis of any risk products that practiced the '707 Patent infringed patents identified in the

prosecution history for the '707 Patent.

191. Thus, Broadcom had knowledge of infringement or was willfully blind as to the likelihood of its infringement of the '707 Patent prior to the filing of the Original Complaint.

192. Broadcom's direct knowledge of the Asserted Patents, including the '707 Patent, is detailed above, ¶¶ 126-128, incorporated by reference herein.

193. The service of the Original Complaint provided an additional source of knowledge of the '707 Patent to Broadcom and VMWare. Broadcom and VMWare also received additional knowledge and notice of their infringement of the '707 Patent by the '707 Accused Products when the Original Complaint was served.

194. Broadcom and VMware have actively induced infringement of at least Claim 1 of the '707 Patent in violation of at least 35 U.S.C. § 271(b). Users of the '707 Accused Products directly infringe at least Claim 1 of the '707 Patent when they use the '707 Accused Products in the ordinary, customary, and intended way. Broadcom and VMware's inducements include, without limitation and with specific intent to encourage the infringement, knowingly inducing consumers to use the '707 Accused Products within the United States in the ordinary, customary, and intended way by, directly or through intermediaries, supplying the '707 Accused Products to consumers within the United States and instructing and encouraging such customers to use the '707 Accused Products in the ordinary, customary, and intended way, which Broadcom and VMware know or should know infringes at least Claim 1 of the '707 Patent.

195. Broadcom and VMware sell the '707 Accused Products to their customers as software for installation on customer computer(s). When Broadcom and VMware's customers install the '707 Accused Products and run a virtual machine, at least Claim 1 of the '707 Patent is performed. In at least this way, the customers of Broadcom and VMware directly infringe the '707 Patent ***while*** Broadcom and VMware know of the '707 Patent, know or should know that these activities infringe the '707 Patent, and specifically intend and instruct for their customers to infringe. Broadcom and VMware have provided and continue to provide these instructions to infringe despite knowing of the '707 Patent and knowing or being willfully blind to the fact these activities infringe the '707 Patent.

196. By way of example, Broadcom and VMware's instructions to their customers to infringe are made at least through their creation and distribution of marketing, promotional, and instructional materials. The promotional and product literature for the Accused Products is designed to instruct, encourage, enable, and facilitate the user of the '707 Accused Products to use the '707 Accused Products in a manner that directly infringes the '707 Patent. And Broadcom and VMware provide instructions, support, and technical assistance to their customers in support of committing the infringement.

197. One nonlimiting example of Broadcom and VMware's inducement includes at least VMware Hands-on Labs for vSphere-based products.

198. On Broadcom and VMware's official VMware YouTube page, Broadcom and VMware explain that VMware Hands-On Labs "delivers a real virtualized infrastructure in the cloud powered by VMware" to let customers "try out products from the convenience of [their] browser."[151] Broadcom and VMware further explain that "each self-paced lab is guided with a manual and built in modules so you can take all or just part of a lab and come and go from labs as often as you like."[152]

Figure 24. Screenshot from VMware YouTube video titled "What are VMware Hands-on Labs?," showing VMware Hands-on Lab Environment highlighted with in-lab manual highlighted in red.

199. Broadcom and VMware offer VMware Hands-on Labs directly related to use of the vSphere functionality that infringes the '707 Patent. For example, Broadcom and VMware offer a

[151] "What are VMware Hands-on Labs," VMware YouTube Channel, YouTube.com (June 25, 2014), https://www.youtube.com/watch?v=XggYeVsK_R0, 0:25-32.

[152] *Id.*, 0:34-42.

VMware Hands-on Lab on "vSphere Performance Optimization."

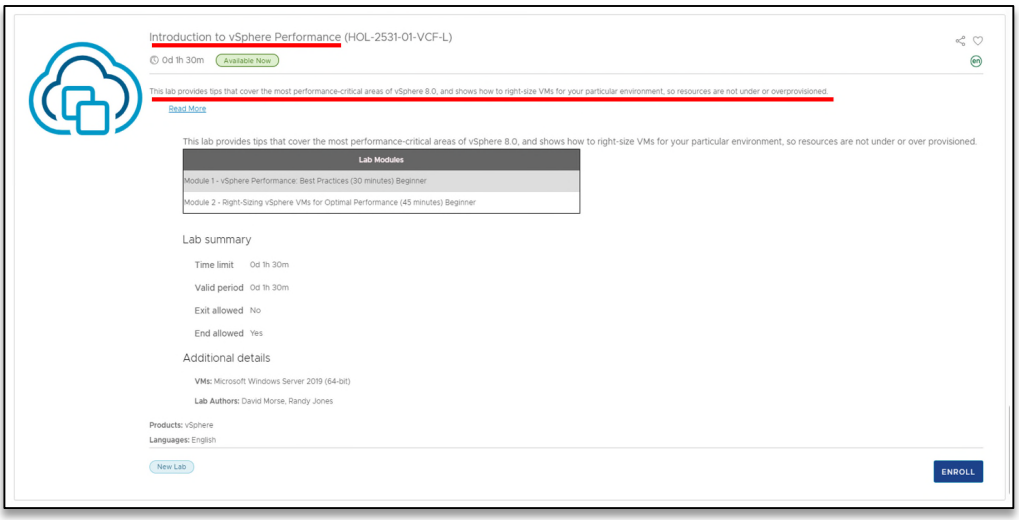


Figure 25. VMware Hands-on Lab course catalog entry showing Hands-on Lab titled "Introduction to vSphere Performance."[153]

Figure 26. VMware Hands-on Lab course showing manual discussing instructions specific to CPU Performance in vSphere.

200. Broadcom and VMware thus encourage their customers to infringe the '707 Patent at least by instructing customers on how to infringe by providing "manuals and built in modules" in proximity to "actual VMware products" for customers to practice infringing conduct through their VMware Hands-on Labs.

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[153] "Catalog," VMware Hands-on Labs, https://labs.hol.vmware.com/HOL/catalog.

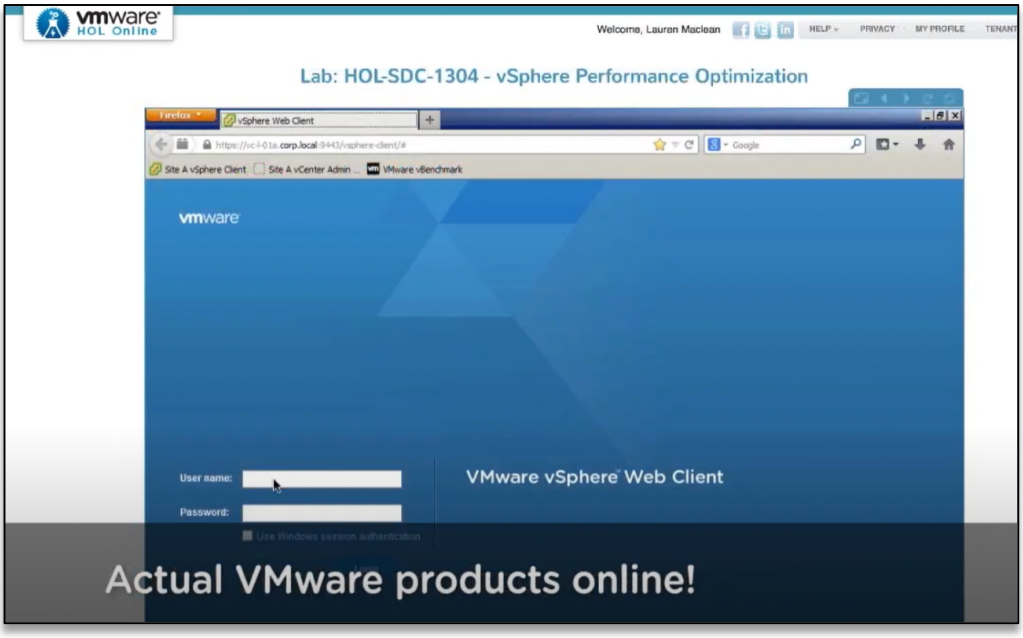

Figure 27. Screenshot from VMware YouTube video titled "What are VMware Hands-on Labs?"

201. Besides the VMware Hand-on Labs discussed above, Broadcom and VMware publicly share numerous instructions, troubleshooting manuals, and product documentations through Broadcom's support portal (https://support.broadcom.com/) and at https://docs.vmware.com/en/VMware-vSphere/index.html.

202. Like the Hands-on Labs discussed above, these support documents also provide step-by-step instructions explaining how to use the '707 Accused Products in an infringing manner to determine performance metrics such as CPU utilization.

203. Thus, Broadcom and VMware have induced their customers to infringe the '707 Patent. Broadcom and VMware's knowing inducement of their customers to infringe has caused and continues to cause damage to Netflix, and Netflix is entitled to recover damages sustained as a result of Broadcom and VMware's wrongful acts in an amount subject to proof at trial.

INDIRECT INFRINGEMENT: CONTRIBUTORY INFRINGEMENT

204. As detailed above, Broadcom and VMware had knowledge of the '707 Patent and had knowledge, or were willfully blind, as to Broadcom's and VMware's infringement of the '707 Patent.

205. Broadcom and VMware have actively contributed to infringement of at least Claim 1 of the '707 Patent in violation of at least 35 U.S.C. § 271(c). Broadcom and VMware sell the '707

Accused Products, which are software specially made or especially adapted to practice the method claimed in at least Claim 1 of the '707 Patent.

206. The infringing components of the '707 Accused Products have no substantial function or use other than to practice the invention claimed in at least Claim 1 of the '707 Patent at least because infringement of the claimed method is performed automatically when customers start a virtual machine using the '707 Accused Products installed on a computer system.

207. The '707 Accused Products are material components of the claimed method recited in at least Claim 1 of the '707 Patent and are not a staple article or commodity of commerce, including because they are specifically configured to infringe according to at least Claim 1 of the '707 Patent (*see, e.g.*, ¶¶ 157-181).

208. Broadcom and VMware's contributory infringements include, without limitation, making, offering to sell, and/or selling within the United States, and/or importing into the United States, the '707 Accused Products, which each include one or more components for use in practicing at least Claim 1 of the '707 Patent, knowing the component to be especially made or especially adapted for use in an infringement of at least Claim 1 of the '707 Patent (*see, e.g.*, ¶¶ 157-206), and not a staple article or commodity of commerce suitable for substantial non-infringing use.

WILLFUL INFRINGEMENT

209. As detailed above, Broadcom and VMware had knowledge of the '707 Patent and had knowledge, or were willfully blind, as to Broadcom's and VMware's infringement of the '707 Patent.

210. Broadcom and VMware's infringement of the '707 Patent has been willful and deliberate.

211. As discussed above, Broadcom and VMware have had knowledge of the '707 Patent as of August 3, 2012.

212. As discussed above, Broadcom and VMware knew or should have known that their actions constitute infringement or recklessly disregarded those facts.

213. The willfulness facts for the Asserted Patents, ¶¶ 152-155, *supra*, are incorporated by reference herein.

214. Broadcom and VMware have willfully infringed the '707 Patent. Broadcom and VMware's knowing and willful infringement has caused and continues to cause damage to Netflix, and Netflix is entitled to recover damages sustained as a result of Broadcom and VMware's wrongful acts in an amount subject to proof at trial.

THIRD CLAIM FOR RELIEF

Infringement of U.S. Patent No. 8,799,891 (the "'891 Patent")

Against Broadcom and VMware

215. Netflix incorporates by reference paragraph nos. 1-214, *supra*.

216. Defendant Broadcom and VMware have infringed, and continue to infringe, at least Claims 1-24 of the '891 Patent, either literally or under the doctrine of equivalents, by making, using, selling, and/or offering for sale within the United States and/or importing into the United States products that are covered by at least Claims 1-24 of the '891 Patent. These products include, but are not limited to VMware vSphere Foundation, VMware Cloud Foundation, VMware Cloud on AWS, Azure VMware Solution, Google Cloud VMware Engine, Oracle Cloud VMware Solution, IBM Cloud for VMware Solutions, Alibaba Cloud VMware Service, as well as any other vSphere-based products and/or services (collectively, the "'891 Accused Products").

217. Claim 1 of the '891 Patent recites:

> A method comprising:
>
> observing communication from a given virtual machine (VM) of a plurality of VMs, to a virtual machine monitor (VMM), by observing communication from said VM that is requesting access to a resource, as an access request for said VM by said VMM; and
>
> determining, based on said communication, utilization of the CPU by said VMM specifically attributable to said VM, and not attributable to any other of the plurality of VMs, wherein the utilization of the CPU by said VMM is the utilization of the CPU by said VMM performed for processing said access request for said VM by said VMM.

218. The '891 Accused Products implement a method comprising "observing communication from a given virtual machine (VM) of a plurality of VMs, to a virtual machine monitor (VMM), by observing communication from said VM that is requesting access to a resource, as an access request for said VM by said VMM."

219. Broadcom and VMware's vSphere products allow VMs to share CPU, storage, and networking resources. For example, vSphere, is described by Broadcom and VMware as a "virtualization platform, which transforms data centers into aggregated computing infrastructures that include CPU, storage, and networking resources."[154]

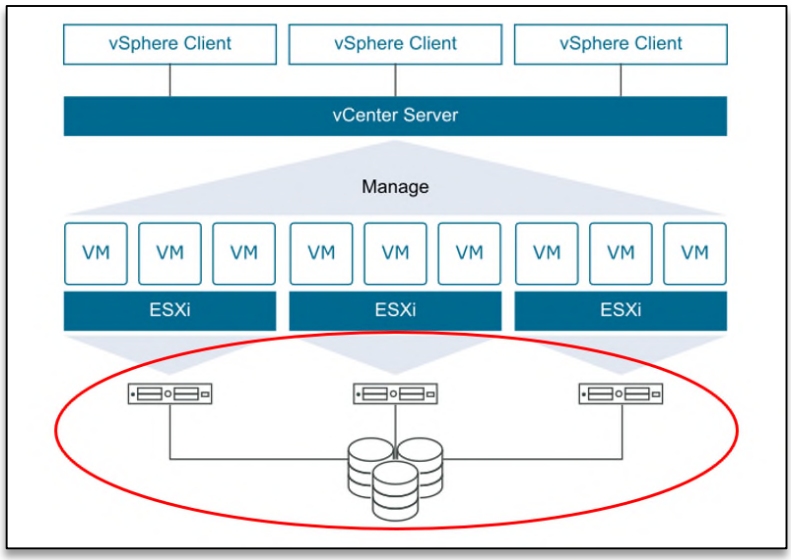

Figure 28. Annotated vSphere architecture diagram with the shared CPU, storage, and networking resources circled in red.

220. Broadcom and VMware describe that "the two core components of vSphere are ESXi and vCenter Server."[155] ESXi creates and runs virtual machines while vCenter Server allows for managing multiple "hosts"—individual computers running ESXi—and pooling resources between those hosts.[156] As shown, each host runs an instance of ESXi which in turn runs multiple VMs. VCenter Server manages the multiple instances of ESXi and interacts with the vSphere Client.

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[154] "VMware vSphere Documentation," VMware.com (captured December 4, 2022), https://web.archive.org/web/20221204141132/https://docs.vmware.com/en/VMware-vSphere/index.html.

[155] *Id.*

[156] *Id.*

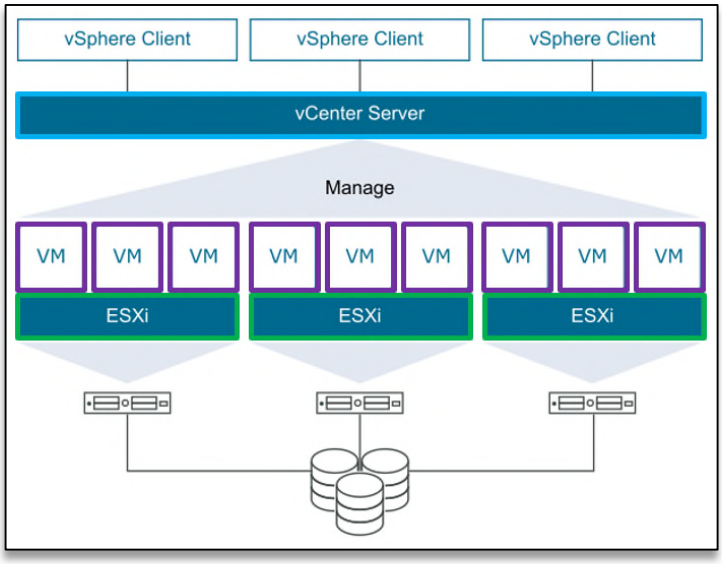

Figure 29. Annotated vSphere architecture diagram with ESXi instances in green, vCenter Server in blue, and individual VMs in purple.

221. Within ESXi is an "underlying operating system, called VMkernel."[157] VMkernel provides "[r]esource scheduling" functionality for ESXi. VMkernel interfaces with hardware to deliver the shared CPU, storage, and network resources from the host to specific virtual machines.[158]

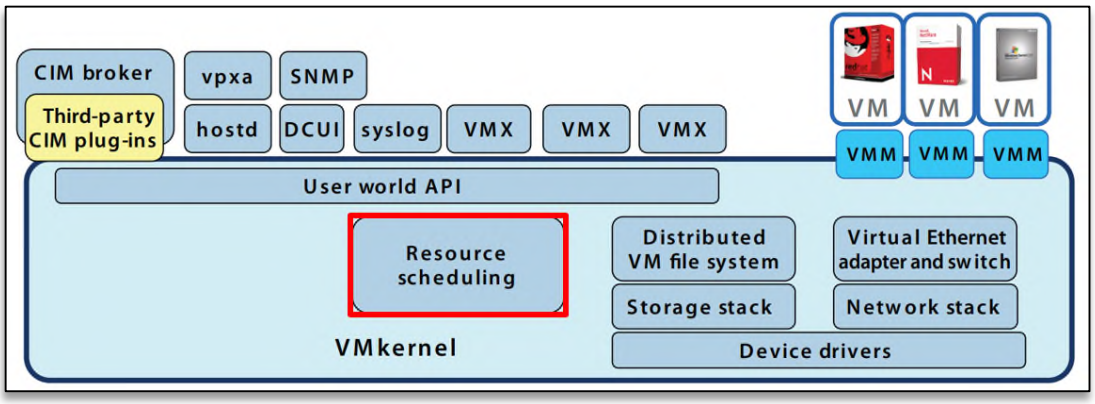

Figure 30. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper with "Resource Scheduling" highlighted in red.

222. Each virtual machine communicates with the VMkernel through a process running on top of the VMkernel called a virtual machine monitor ("VMM"). This communication includes VM requests for host resources—indeed, VMkernel "has control of all hardware devices on the [host], and manages resources for the applications."[159]

---

[157] "The Architecture of VMware ESXi," VMware.com (captured December 9, 2008), https://web.archive.org/web/20081209120933/http://www.vmware.com/files/pdf/ESXi_architecture.pdf.

[158] *Id.*

[159] *Id.*

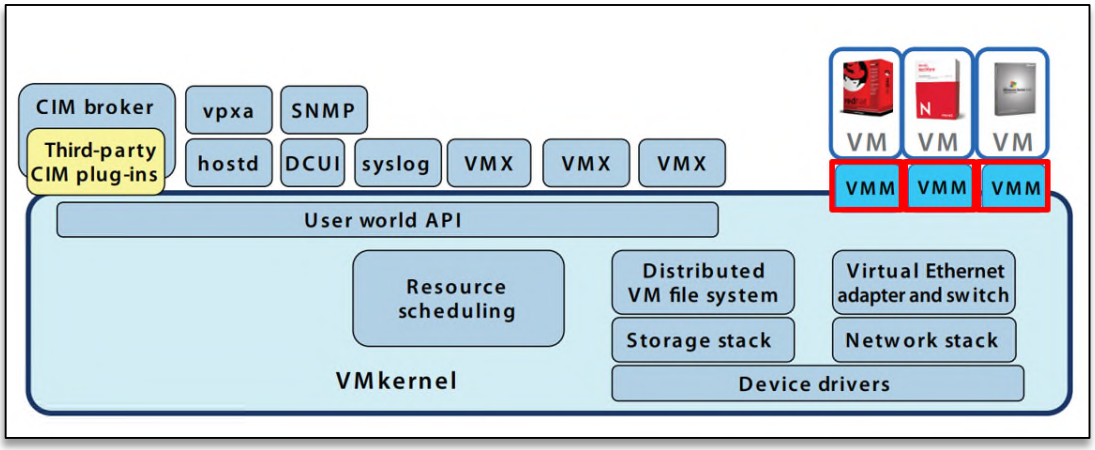

Figure 31. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper with VMMs highlighted in red.

223. The VMkernel includes the device drivers for the shared resources.

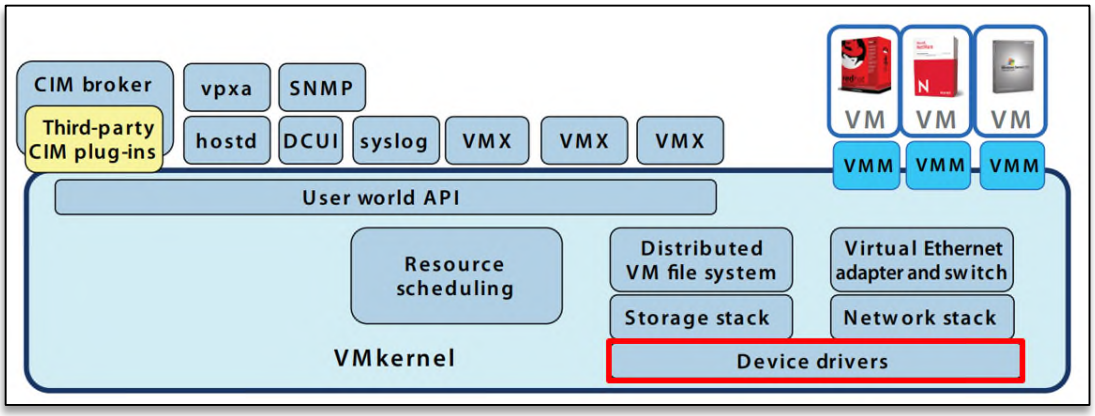

Figure 32. Annotated Figure 1 from "The Architecture of VMware ESXi" white paper showing location of device drivers in the VMkernel using red highlighting.

224. The "Common Information Model (CIM) system" is another process that runs on top of VMkernel.[160] This system is described as "enabl[ing] a framework for agentless, standards-based ***monitoring of hardware resources for ESXi***."[161] The CIM system consist of "a CIM object manager, often called a CIM broker, and a set of CIM providers."[162] Specifically, "VMware [] ***writes providers that implement monitoring of server hardware, ESX/ESXi storage infrastructure, and virtualization-specific resources***" and "these providers run inside the ESXi system."[163]

225. The '891 Accused Products also perform the step of "determining, based on said

[160] *Id.*

[161] *Id.*

[162] *Id.*

[163] *Id.*

communication, utilization of the CPU by said VMM specifically attributable to said VM, and not attributable to any other of the plurality of VMs, wherein the utilization of the CPU by said VMM is the utilization of the CPU by said VMM performed for processing said access request for said VM by said VMM."

226. For example, vSphere includes a "statistics subsystem [which] collects data on the resource usage of inventory objects."[164] The product literature explains:

> [H]osts use data counters to query for statistics. A data counter is a unit of information relevant to a given inventory object or device. Each counter collects data for a different statistic in a metric group. For example, the disk metric group includes separate data counters to collect data for disk read rate, disk write rate, and disk usage. Statistics for each counter are rolled up ***after a specified collection interval***.[165]

227. vSphere monitors CPU usage of virtual machines. For example, the CPU panel displays "server-wide statistics as well as statistics for . . . virtual machine CPU utilization."[166] One of these statistics, %USED, reflects the percentage of physical CPU core cycles used and may be calculated for specific virtual machines.[167]

228. %USED is calculated using the following formula:

$$\%USED = \%RUN + \%SYS - \%OVRLP$$

229. In this formula, %RUN is the percentage of total time scheduled but does not account for system time.

230. %SYS is the "[p]ercentage of time spent in the ESXi VMkernel on behalf of the . . . virtual machine . . . to process interrupts and to perform other system activities."

231. %OVRLP is the "[p]ercentage of system time spent during scheduling of a resource pool, virtual machine, or world on behalf of a different resource pool, virtual machine, or world while the resource pool, virtual machine, or world was scheduled." For example, "if virtual machine A is being scheduled and a network packet for virtual machine B is processed by the ESXi

[164] "vSphere Monitoring and Performance," VMware.com (copyright 2010-2021), https://docs.vmware.com/en/VMware-vSphere/7.0/vsphere-esxi-vcenter-server-703-monitoring-performance-guide.pdf.

[165] *Id.*

[166] *Id.*

[167] *Id.*

VMkernel, the time spent appears as %OVRLP for virtual machine A and %SYS for virtual machine B." Accordingly, the '891 Accused Products perform all steps of Claim 1 of the '891 Patent.

DIRECT INFRINGEMENT

232. Broadcom and VMware directly infringe the '891 Patent in multiple ways.

233. Broadcom and VMware directly infringe the '891 Patent when they perform the claimed methods of the '891 Patent, in violation of at least 35 U.S.C. § 271(a), by providing the '891 Accused Products as a service.

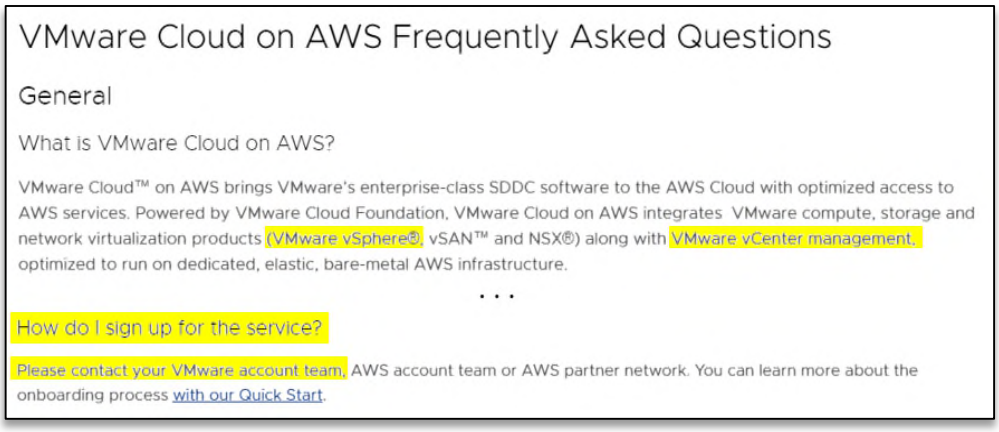

Figure 33. Annotated screenshot from VMware Cloud Tech Zone FAQ page explaining the VMware Cloud on AWS Service and how to sign up.

234. When a customer signs up for and uses a vSphere cloud-based service (*e.g.*, VMware Cloud on AWS), Broadcom and VMware perform the claimed methods as discussed above by controlling and maintaining responsibility for the infringing functionality. Alternatively, Broadcom and VMware conditions the benefit of the '891 Accused Products on Broadcom and VMware's partners performing the infringing functionality and Broadcom and VMware's control of the manner and timing of said performance. Broadcom and VMware maintain a "Shared Responsibility Model" that is "common among the different VMware Cloud Providers" and "defines distinct roles and responsibilities between the VMware Cloud Infrastructure Services provider and an organization consuming the service."[168]

235. Broadcom and VMware maintain responsibility for the "vSphere Lifecycle." As further confirmation, when describing the AWS implementation, Broadcom and VMware describe

[168] "VMware Cloud Well-Architected Framework for VMware Cloud on AWS," VMware.com (copyright 2023), https://docs.vmware.com/en/VMware-Cloud-Well-Architected-Framework/services/vmcwaf-aws.pdf.

one of the goals of the shared responsibility model as being to "[p]rotect VMware-managed objects" including "management appliances" and "hosts."[169] The "management appliances" and "hosts" execute code performing the steps of Claim 1.

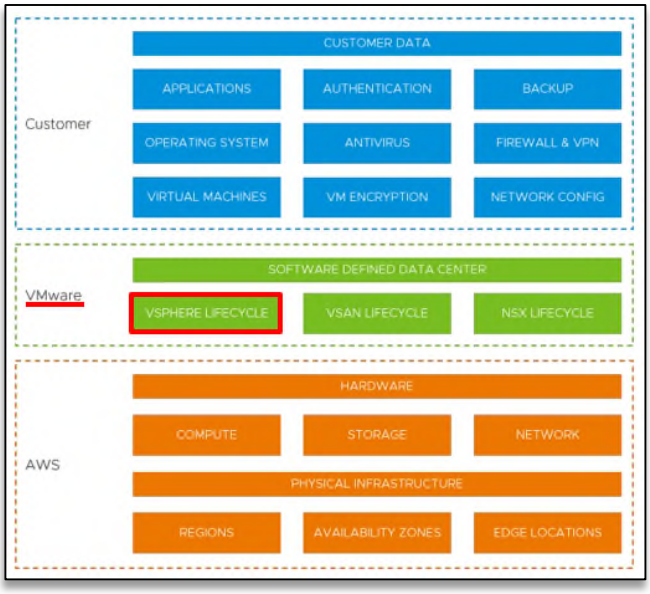

Figure 34. Annotated diagram from the "VMware Cloud Well-Architected Framework for VMware Cloud on AWS" document splitting responsibility between the customer, VMware, and AWS and showing vSphere as a responsibility of VMware highlighted in red.

236. Broadcom and VMware also directly infringe by using the claimed method to demonstrate, test, install, and configure the '891 Accused Products for their customers. For example, Broadcom and VMware directly infringe by using the '891 Accused Products for demonstrating via VMware Hands-on Labs, *infra*.

INDIRECT INFRINGEMENT: INDUCEMENT

237. Broadcom and VMware had knowledge of the '891 Patent and had knowledge of, or were willfully blind, as to Broadcom's and VMware's infringement of the '891 Patent.

238. Broadcom and VMware have had knowledge of the '891 Patent since at least September 28, 2011 based on VMware's prosecution of the application that ultimately issued as U.S. Patent No. 8,171,141. There, the USPTO identified the publication corresponding to the '891 Patent in a notice of references cited as pertinent to VMware's application. On August 7, 2019, during prosecution of VMware's application that issued as U.S. Patent No. 10,628,330, the USPTO

[169] "VMware Cloud on AWS: vCenter Architecture," VMware.com (copyright 2005-2024), https://vmc.techzone.vmware.com/vmc-arch/docs/compute/vmc-aws-vcenter-architecture#sec27179-sub1.

again identified the publication corresponding to the '891 Patent in a notice of references cited as pertinent to VMware's application.

239. Broadcom and VMware have had knowledge of the '891 Patent since at least August 3, 2012 based on VMware's knowledge of the '424 Patent. As noted above, VMware's knowledge of the '424 Patent can be traced back to August 3, 2012, when the '424 Patent was cited by an examiner at the United States Patent and Trademark Office ("USPTO") during a rejection of VMware's application that ultimately issued as U.S. Patent No. 8,650,564. The '424 Patent incorporates by reference U.S. Patent Application Nos. 11/070,602 and 11/070,605, and the '891 Patent issued from Application No. 11/070,602. Accordingly, once VMware had knowledge of the '424 Patent on August 3, 2012, it also had, or recklessly disregarded knowledge of, the '707 Patent.

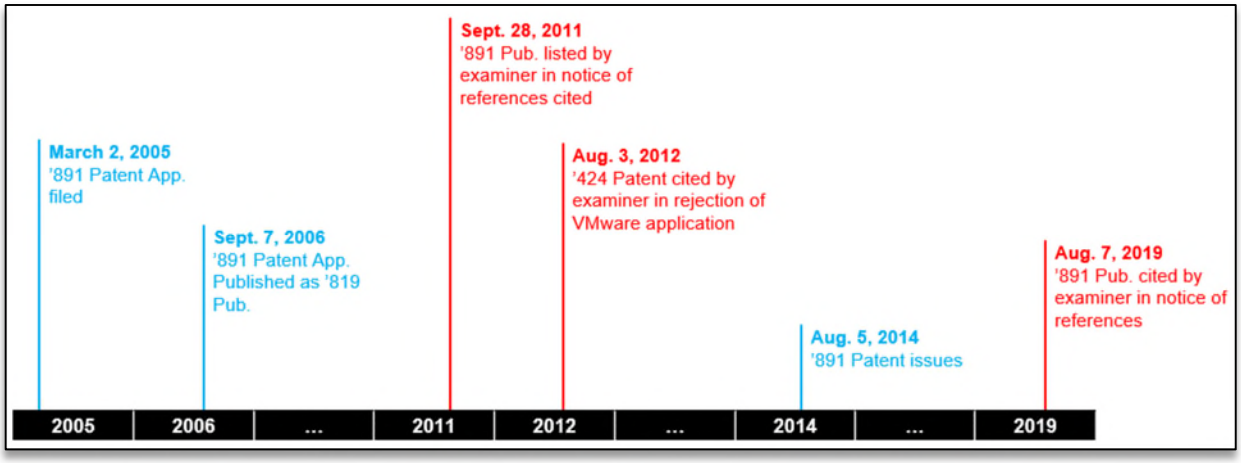

Figure 35. Timeline showing Broadcom and VMware's knowledge of the '891 Patent with activities related to '891 Patent in blue and activities related to Broadcom and VMware's knowledge of the '891 Patent in red.

240. VMware patents US Patent Nos. 8,171,141, and 10,628,330 ("the '891 Overlapping Patents") cited the '891 Patent, or a publication of the '891 Patent during the prosecution of the patents. VMware was therefore aware of the overlap between the '891 Overlapping Patents and the '891 Patent.

241. The '891 Overlapping Patents are practiced by the VMware vSphere product. Thus, VMware would have known that the VMware vSphere product infringed the '891 Patent or decided to be willfully blind as to the likelihood of infringement.

242. Thus, VMware had knowledge of infringement of the '891 Patent or was willfully blind to Broadcom and VMware's infringement of the '891 Patent by the '891 Accused Products.

243. VMware's knowledge of the Asserted Patents, including the '891 Patent, can be imputed to Broadcom for the reasons stated above, ¶¶ 85-89, 124-125, incorporated by reference herein.

244. Broadcom's direct knowledge of the Asserted Patents, including the '891 Patent, is detailed above, ¶¶ 126-127, incorporated by reference herein.

245. During its due diligence of VMware, Broadcom analyzed the risks and opportunities associated with the '891 Patent and any products owned by VMware that practice the '891 Patent. This analysis included a review of the prosecution history of the '891 Overlapping Patents and an analysis of any risk products that practiced the '891 Patent infringed patents identified in the prosecution history for the '891 Patent.

246. Thus, Broadcom had knowledge of infringement or was willfully blind as to the likelihood of its infringement of the '891 Patent prior to the filing of the Original Complaint.

247. The service of the Original Complaint provided an additional source of knowledge of the '891 Patent to Broadcom and VMWare. Broadcom and VMWare also received additional knowledge and notice of their infringement of the '891 Patent by the '891 Accused Products when the Original Complaint was served.

248. Broadcom and VMware have actively induced infringement of at least Claim 1 of the '891 Patent in violation of at least 35 U.S.C. § 271(b). Users of the '891 Accused Products directly infringe at least Claim 1 of the '891 Patent when they use the '891 Accused Products in the ordinary, customary, and intended way. Broadcom and VMware's inducements includes, without limitation and with specific intent to encourage the infringement, knowingly inducing consumers to use the '891 Accused Products within the United States in the ordinary, customary, and intended way by, directly or through intermediaries, supplying the '891 Accused Products to consumers within the United States and instructing and encouraging such customers to use the '891 Accused Products in the ordinary, customary, and intended way, which Broadcom and VMware know or should know infringes at least Claim 1 of the '891 Patent.

249. Broadcom and VMware sell the '891 Accused Products to their customers as software for installation on customer computer(s). When Broadcom and VMware's customers

install the '891 Accused Products and run a virtual machine, at least Claim 1 of the '891 Patent is performed. In at least this way, the customers of Broadcom and VMware directly infringe the '891 Patent ***while*** Broadcom and VMware know of the '891 Patent, know or should know that these activities infringe the '891 Patent, and specifically intend and instruct for their customers to infringe. Broadcom and VMware have provided and continue to provide these instructions to infringe despite knowing of the '891 Patent and knowing or being willfully blind to the fact these activities infringe the '891 Patent.

250. Broadcom and VMware's instructions to their customers to infringe are made at least through their creation and distribution of marketing, promotional, and instructional materials. The promotional and product literature for the Accused Products is designed to instruct, encourage, enable, and facilitate the user of the '891 Accused Products to use the '891 Accused Products in a manner that directly infringes the '891 Patent. And Broadcom and VMware provide instructions, support, and technical assistance to their customers in support of committing the infringement.

251. One nonlimiting example of Broadcom and VMware's inducement includes at least VMware Hands-on Labs for vSphere-based products.

252. On the official VMware YouTube page, Broadcom and VMware explain that VMware Hands-On Labs "delivers a real virtualized infrastructure in the cloud powered by VMware" to let customers "try out products from the convenience of [their] browser."[170] Broadcom and VMware further explain that "each self-paced lab is guided with a manual and built in modules so you can take all or just part of a lab and come and go from labs as often as you like."[171]

[remainder of page intentionally left blank]

[170] "What are VMware Hands-on Labs," VMware YouTube Channel, YouTube.com (June 25, 2014), https://www.youtube.com/watch?v=XggYeVsK_R0, 0:25-32.

[171] *Id.*, 0:34-42.

Figure 36. Screenshot from VMware YouTube video titled "What are VMware Hands-on Labs?," showing VMware Hands-on Lab Environment highlighted with in-lab manual highlighted in red.

253. Broadcom and VMware offer VMware Hands-on Labs directly related to use of the vSphere functionality that infringes the '891 Patent. For example, Broadcom and VMware offer a VMware Hands-on Lab on "vSphere Performance Optimization."

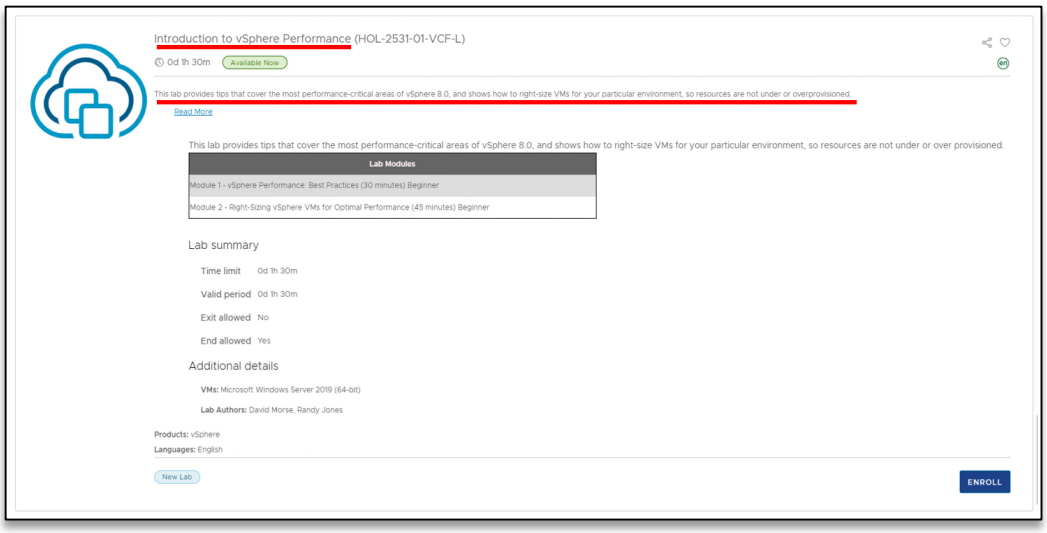

Figure 37. VMware Hands-on Lab course catalog entry showing Hands-on Lab titled "Introduction to vSphere Performance."[172]

[remainder of page intentionally left blank]

[172] "Catalog," VMware Hands-on Labs, https://labs.hol.vmware.com/HOL/catalog.

Figure 38. VMware Hands-on Lab course showing manual discussing instructions specific to CPU Performance in vSphere.

254. Broadcom and VMware thus encourage their customers to infringe the '891 Patent at least by instructing customers on how to infringe by providing "manuals and built in modules" in proximity to "actual VMware products" for customers to practice infringing conduct through their VMware Hands-on Labs.

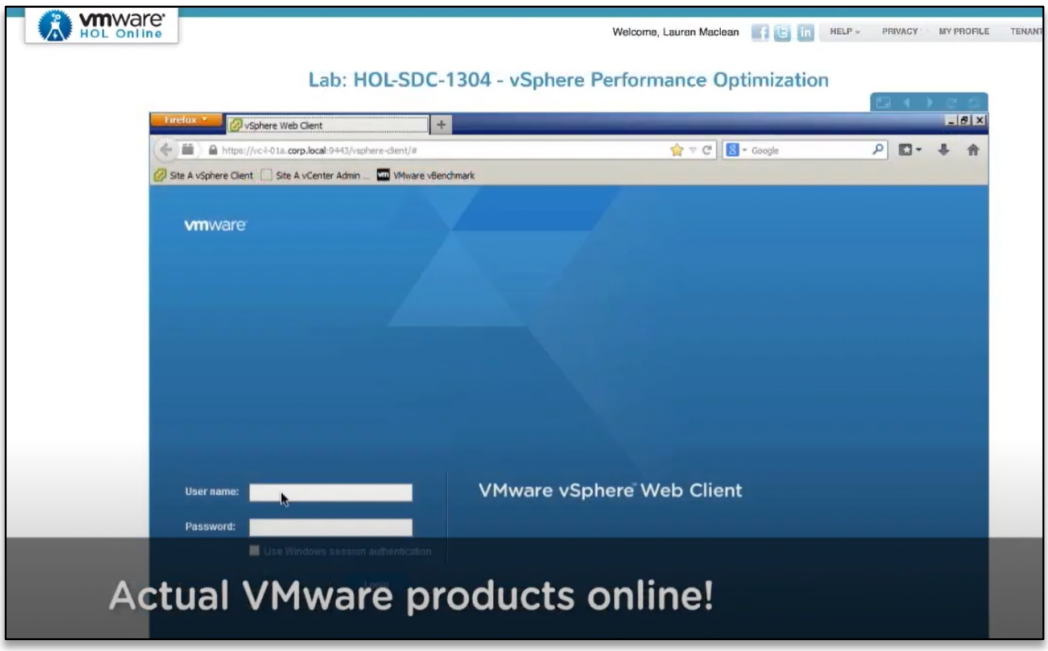

Figure 39. Screenshot from VMware YouTube video titled "What are VMware Hands-on Labs?"

255. Besides the VMware Hand-on Labs discussed above, Broadcom and VMware publicly share numerous instructions, troubleshooting manuals, and product documentations through Broadcom's support portal (https://support.broadcom.com/) and at

https://docs.vmware.com/en/VMware-vSphere/index.html.

256. Like the Hands-on Labs discussed above, these support documents also provide step-by-step instructions explaining how to use the '891 Accused Products in an infringing manner to determine performance metrics such as CPU utilization.

257. Thus, Broadcom and VMware have induced their customers to infringe the '891 Patent. Broadcom and VMware's knowing inducement of their customers to infringe has caused and continues to cause damage to Netflix, and Netflix is entitled to recover damages sustained as a result of Broadcom and VMware's wrongful acts in an amount subject to proof at trial.

INDIRECT INFRINGEMENT: CONTRIBUTORY INFRINGEMENT

258. As detailed above, Broadcom and VMware had knowledge of the '891 Patent and had knowledge of, or were willfully blind, as to Broadcom's and VMware's infringement of the '891 Patent.

259. Broadcom and VMware have actively contributed to infringement of at least Claim 1 of the '891 Patent in violation of at least 35 U.S.C. § 271(c). Broadcom sells the '891 Accused Products, which are software specially made or especially adapted to practice the method claimed in at least Claim 1 of the '891 Patent.

260. The infringing components of the '891 Accused Products have no substantial function or use other than to practice the invention claimed in at least Claim 1 of the '891 Patent at least because infringement of the claimed method is performed automatically when customers start a virtual machine using the '891 Accused Products installed on a computer system.

261. The '891 Accused Products are material components of the claimed method recited in at least Claim 1 of the '891 Patent and are not a staple article or commodity of commerce, including because they are specifically configured to infringe according to at least Claim 1 of the '891 Patent (*see, e.g.*, ¶¶ 215-237).

262. Broadcom and VMware's contributory infringements include, without limitation, making, offering to sell, and/or selling within the United States, and/or importing into the United States, the '891 Accused Products, which each include one or more components for use in practicing at least Claim 1 of the '891 Patent, knowing the component to be especially made or especially

adapted for use in an infringement of at least Claim 1 of the '891 Patent (*see, e.g.*, ¶¶ 215-260), and not a staple article or commodity of commerce suitable for substantial non-infringing use.

WILLFUL INFRINGEMENT

263. As detailed above, Broadcom and VMware had knowledge of the '891 Patent and had knowledge of, or were willfully blind, as to Broadcom's and VMware's infringement of the '891 Patent.

264. Broadcom and VMware's infringement of the '891 Patent has been willful and deliberate.

265. As discussed above, Broadcom and VMware have had actual knowledge of the '891 Patent as of August 3, 2012.

266. As discussed above, Broadcom and VMware knew or should have known that their actions infringe and actively induce infringement of the '891 Patent.

267. The willful infringement facts for the Asserted Patents, ¶¶ 152-155 *supra*, are incorporated by reference herein.

268. Thus, Broadcom and VMware have willfully infringed the '891 Patent. Broadcom and VMware's knowing and willful infringement has caused and continues to cause damage to Netflix, and Netflix is entitled to recover damages sustained as a result of Broadcom and VMware's wrongful acts in an amount subject to proof at trial.

FOURTH CLAIM FOR RELIEF

Infringement of U.S. Patent No. 8,185,893 (the "'893 Patent")

Against Broadcom and VMware

269. Netflix incorporates by reference paragraph nos. 1-268, *supra*.

270. Broadcom and VMware have infringed, and continue to infringe, at least Claims 1-11 and 16 of the '893 Patent, either literally or under the doctrine of equivalents, by making, using, selling, and/or offering for sale within the United States and/or importing into the United States products that are covered by at least Claims 1-11 and 16 of the '893 Patent. These products include, but are not limited to VMware vSphere Foundation, VMware Cloud Foundation, VMware Cloud on AWS, Azure VMware Solution, Google Cloud VMware Engine, Oracle Cloud VMware

Solution, IBM Cloud for VMware Solutions, Alibaba Cloud VMware Service, as well as any other vSphere-based products and/or services when used in conjunction with VMware Cloud Director' auto-scale groups (collectively, the "'893 Accused Products").

271. Claim 16 of the '893 Patent recites:

> A method for use in a system having plural physical machines that contain active virtual machines, comprising:
>
> receiving, at a load balancer, a request from a client;
>
> in response to the request, determining whether at least one additional virtual machine should be started up;
>
> in response to determining that at least one additional virtual machine should be started up, the load balancer sending at least one command to start up the at least one additional virtual machine in at least one of the physical machines;
>
> determining, by the load balancer, whether a workload loading of the active virtual machines and the at least one additional virtual machine has fallen below a threshold;
>
> in response to determining that the workload loading has fallen below the threshold, disabling a particular one of the active virtual machines and the at least one additional virtual machine;
>
> a placement controller selecting placement of the active virtual machines and the at least one additional virtual machines on the physical machines to achieve a predefined policy;
>
> computing, by the placement controller, indicators associated with corresponding plural different layouts of the active virtual machines and the at least one additional virtual machine on the physical machines, where the indicators provide information regarding performances of the corresponding layouts, and wherein each of the indicators is computed based on parameters associated

with a corresponding one of the plural layouts;

comparing, by the placement controller, the indicators; and

selecting, by the placement controller, one of the plural layouts based on the comparing.

272. The '893 Accused Products implement a method comprising "receiving, at a load balancer, a request from a client."

273. "VMware Cloud Director" allows "tenant users to auto scale applications depending on the current CPU and memory use."[173] In order to enable this functionality a user "must configure, publish, and grant access to the auto scale solution."[174] Additionally the user must "Add Rule[s]" for VMware Cloud Director to use for the operation and VMware's manuals instruct users to do so. These rules are then received by VMware Cloud Director which then executes the auto scaling feature.

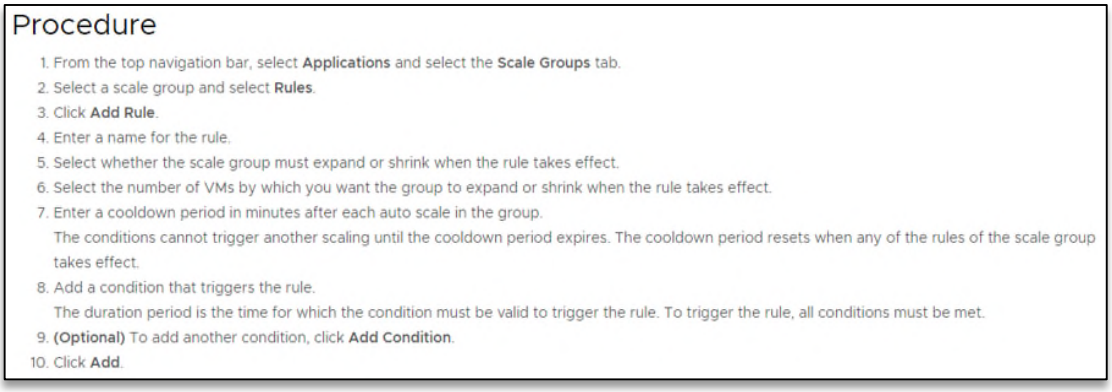

Figure 40. Screenshot showing procedure for auto-scaling in VMware Cloud Director.[175]

[remainder of page intentionally left blank]

[173] "VMware Cloud Director Service Provider Admin Guide," VMware.com (copyright 2018-2024), https://docs.vmware.com/en/VMware-Cloud-Director/10.5/VMware_Cloud_Director_SP_Admin_Guide.pdf.

[174] *Id.*

[175] "Add an Auto Scaling Rule," VMware.com (updated April 8, 2021), https://docs.vmware.com/en/VMware-Cloud-Director/10.4/VMware-Cloud-Director-Tenant-Portal-Guide/GUID-BF73856A-0BDB-4091-8632-2B7AFE3A839E.html.

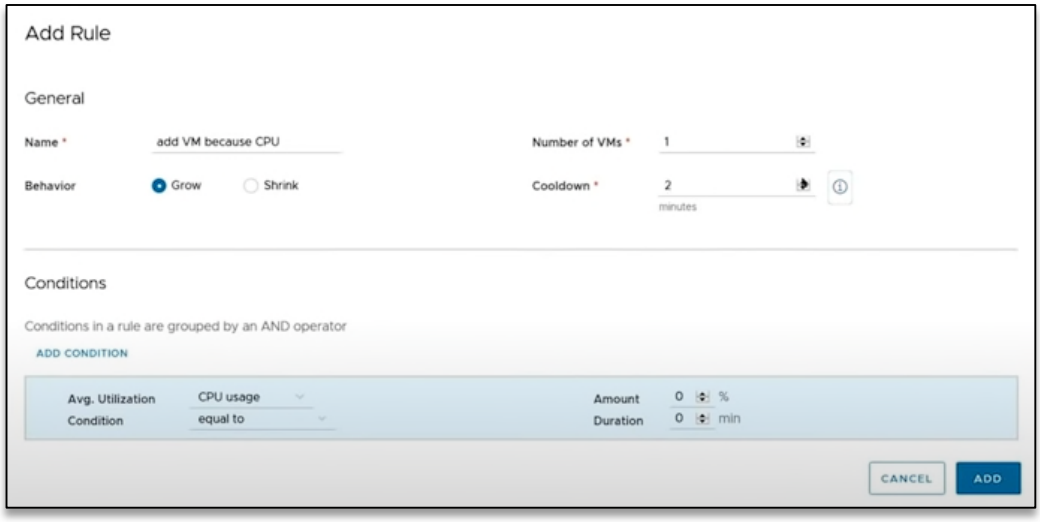

Figure 41. Screenshot showing the interface for a user to "Add Rule" for auto scaling in VMware Cloud Director.[176]

274. The '893 Accused Products further implement a method comprising "in response to the request, determining whether at least one additional virtual machine should be started up" and "in response to determining that at least one additional virtual machine should be started up, the load balancer sending at least one command to start up the at least one additional virtual machine in at least one of the physical machines."

275. For example, VMware Cloud Director uses "predefined criteria for the CPU and memory use" to determine whether to "automatically scale up or down the number of VMs in a selected scale group."[177] The predefined criteria is established using the "Add Rule" functionality discussed above. Broadcom and VMware further explain that the "amount of VMs in a scale group changes automatically depending on the conditions that you define."[178] As shown in the exemplary screenshot below, the "Add Rule" interface enables VMware Cloud Director to "Grow" an application by a certain number of VMs when a "Rule" is satisfied, e.g., when a condition comprising a predefined CPU usage over a predefined duration is met.

[176] "Feature Friday Episode 50 - VMware Cloud Director Autoscaling," VMware Cloud Services Provider YouTube Channel, YouTube.com (June 4, 2021), https://www.youtube.com/watch?v=vieF6LzvEfU.

[177] *Id.*

[178] "Create a Scale Group," VMware.com (updated April 8, 2021), https://docs.vmware.com/en/VMware-Cloud-Director/10.4/VMware-Cloud-Director-Tenant-Portal-Guide/GUID-1075DA82-1EA4-4E33-8CBD-2908F7760D8C.html.

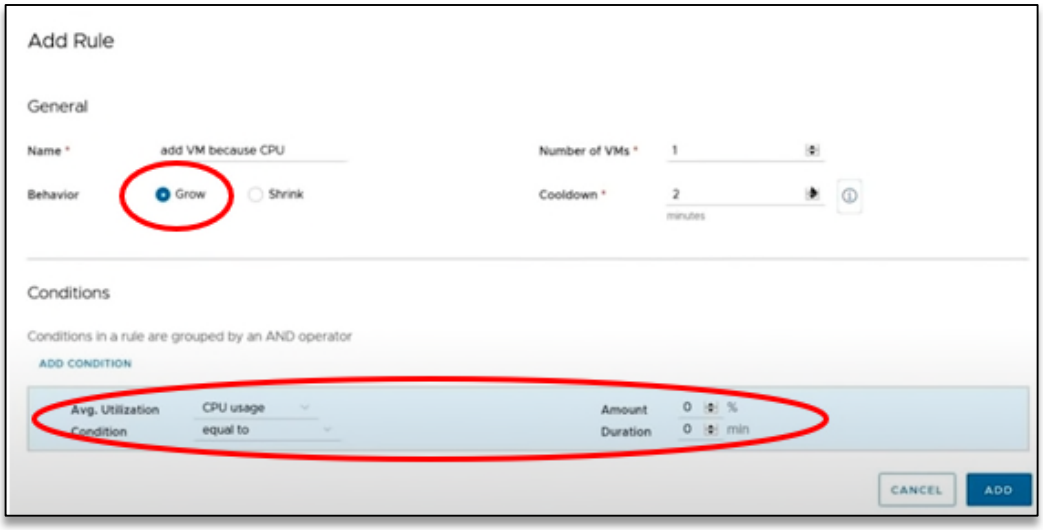

Figure 42. Screenshot showing "Add Rule" UI in VMware Cloud Director and highlighting the "grow" behavior with associated condition in red circles.[179]

276. The '893 Accused Products implement a method comprising "determining, by the load balancer, whether a workload loading of the active virtual machines and the at least one additional virtual machine has fallen below a threshold" and "in response to determining that the workload loading has fallen below the threshold, disabling a particular one of the active virtual machines and the at least one additional virtual machine."

277. For example, as discussed above VMware Cloud Director uses "predefined criteria for the CPU and memory use" to determine whether to "automatically scale up or down the number of VMs in a selected scale group." The predefined criteria are established using the "Add Rule" functionality discussed above. Broadcom and VMware further explain that the "amount of VMs in a scale group changes automatically depending on the conditions that you define." As shown in the exemplary screenshot below, the "Add Rule" interface allows for VMware Cloud Director to "Shrink" an application by a certain number of VMs when a "Rule" is satisfied, e.g., a condition comprising a predefined CPU usage over a predefined duration is met (this selection is unchecked in the example below).

[remainder of page intentionally left blank]

[179] "Feature Friday Episode 50 - VMware Cloud Director Autoscaling," VMware Cloud Services Provider YouTube Channel, YouTube.com (June 4, 2021), https://www.youtube.com/watch?v=vieF6LzvEfU.

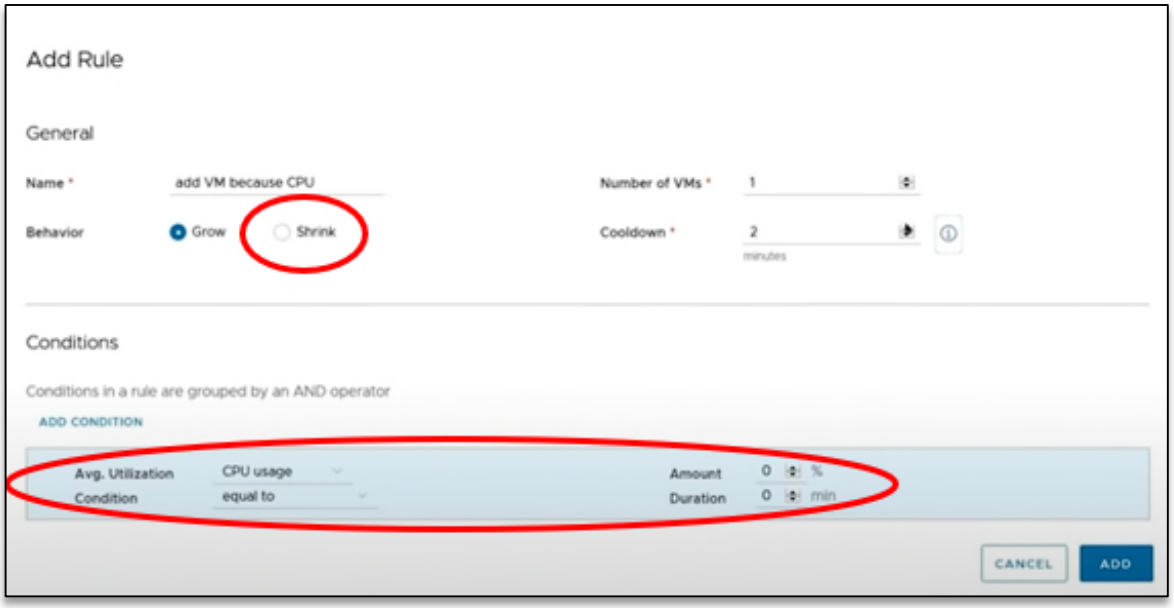

Figure 43. Screenshot showing "Add Rule" UI in VMware Cloud Director and highlighting the "Shrink" behavior with associated condition in red circles.[180]

278. The '893 Accused Products implement a method comprising "a placement controller selecting placement of the active virtual machines and the at least one additional virtual machines on the physical machines to achieve a predefined policy."

279. vSphere's Distributed Resource Scheduler ("DRS") performs multiple functions within vSphere including placing a VM on an appropriate host when the VM is powered on, migrating virtual machines to other hosts within a cluster to maximize performance, and distributing VMs across vSphere cluster hosts to comply with affinity and anti-affinity rules.[181]

[remainder of page intentionally left blank]

[180] "Feature Friday Episode 50 - VMware Cloud Director Autoscaling," VMware Cloud Services Provider YouTube Channel, YouTube.com (June 4, 2021), https://www.youtube.com/watch?v=vieF6LzvEfU.

[181] Distributed Resource Scheduler, VMware.com, https://www.vmware.com/products/cloud-infrastructure/vsphere/drs-dpm.

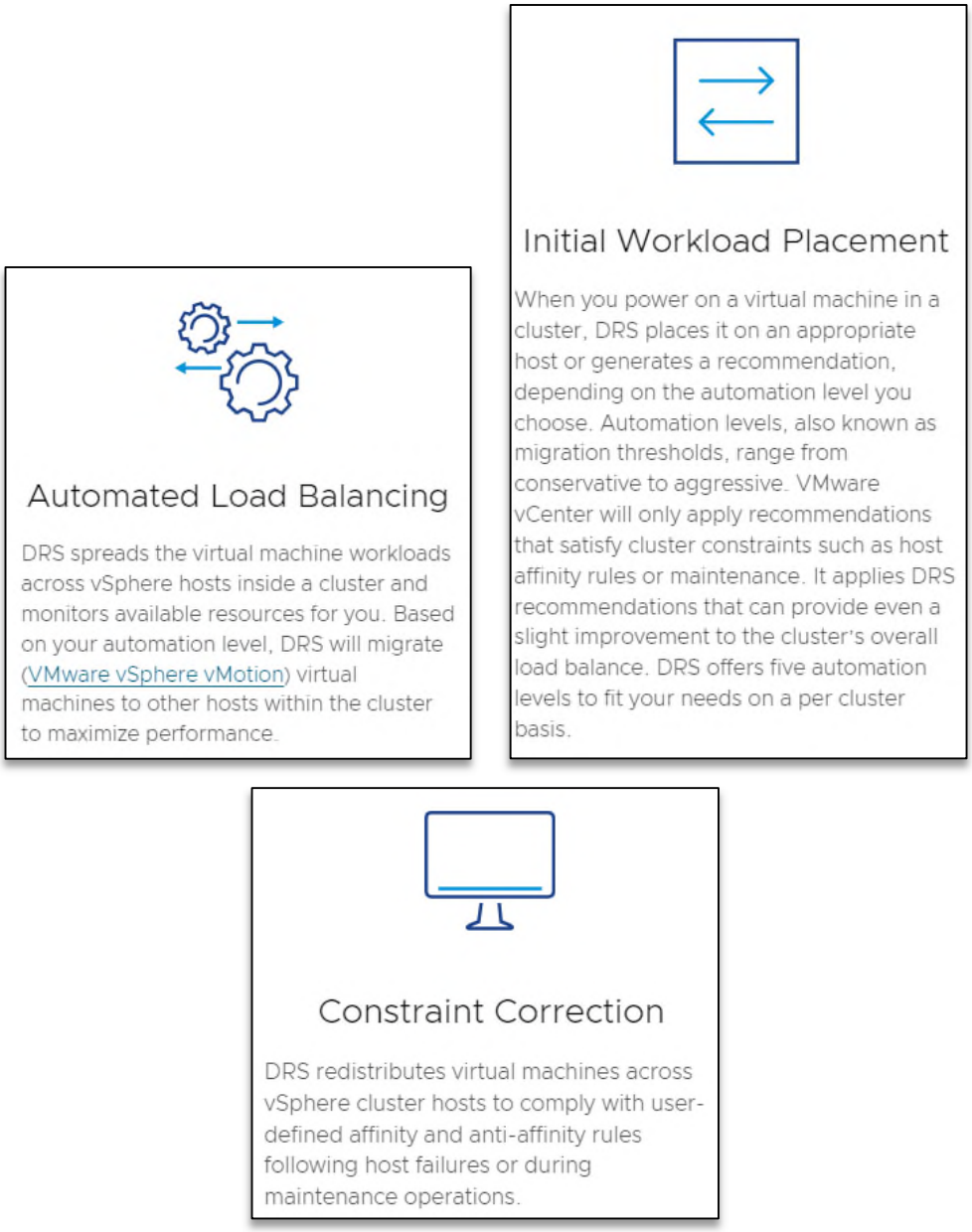

Figure 44. Screenshots explaining certain features of DRS in vSphere.

280. With the release of vSphere 7, VMware introduced "Improved DRS" which it described as "tak[ing] a very different approach" as compared to "old DRS" and explained that "[t]he DRS logic [was] completely rewritten to have a more fine-grained level of resource scheduling with the main focus on workloads."[182] For example, VMware's Improved DRS "computes a VM DRS score on each host and moves the VM to the host that provides the highest VM DRS score."[183]

[182] Niels Hagoort, "vSphere 7 – Improved DRS," VMware.com (March 25, 2020), https://blogs.vmware.com/vsphere/2020/03/vsphere-7-improved-drs.html.

[183] *Id.*

281. The '893 Accused Products implement a method comprising "computing, by the placement controller, indicators associated with corresponding plural different layouts of the active virtual machines and the at least one additional virtual machine on the physical machines, where the indicators provide information regarding performances of the corresponding layouts, and wherein each of the indicators is computed based on parameters associated with a corresponding one of the plural layouts."

282. For example, VMware and now Broadcom describe VM DRS Score as follows:

> The new DRS logic quantifies virtual machine happiness by using the VM DRS score. First, let me emphasize that the VM DRS Score is not a health score for the virtual machine! It is about the execution efficiency of a virtual machine. The score values range from 0 to 100% and are divided into buckets; 0-20%, 20-40%, and so on.
>
> Obtaining a VM DRS score of 80-100% indicates that there is mild to no resource contention. It does not necessarily mean that a virtual machine in the 80-100% bucket is doing way better than a virtual machine in the lower buckets. That is because there are many metrics that influence the VM DRS score. Not only performance metrics are used, but capacity metrics are also incorporated in the algorithm.
>
> The performance drivers for the VM DRS score are contention based, using metrics like CPU %ready time, good CPU cache behavior, and memory swap. The reserve resource capacity, or headroom, that a current ESXi host has is also taken into account to determine the VM DRS score. Will the virtual machine be able to burst resource consumption on its current host and to what level? Are there other ESXi hosts in the cluster that have more headroom available? All these factors play an important role in the calculation of the VM DRS score.

283. The VM DRS score is computed for each host in the cluster to which a VM could be moved.[184] Additionally, Improved DRS runs every minute.[185]

284. The '893 Accused Products implement a method comprising "comparing, by the placement controller, the indicators" and "selecting, by the placement controller, one of the plural layouts based on the comparing."

285. In a video titled "What's New with DRS in vSphere 7," Broadcom and VMware explain of the VM DRS score: "we calculate that score for this specific virtual machine on each and

[184] *See* Niels Hagoort, "vSphere 7 – Improved DRS," VMware.com (March 25, 2020), https://blogs.vmware.com/vsphere/2020/03/vsphere-7-improved-drs.html.

[185] *See id.*

every host in the cluster and we will do so each and every minute."[186] The VM DRS scores are calculated for each potential destination host and the calculated VM DRS scores are compared to find the ideal host.

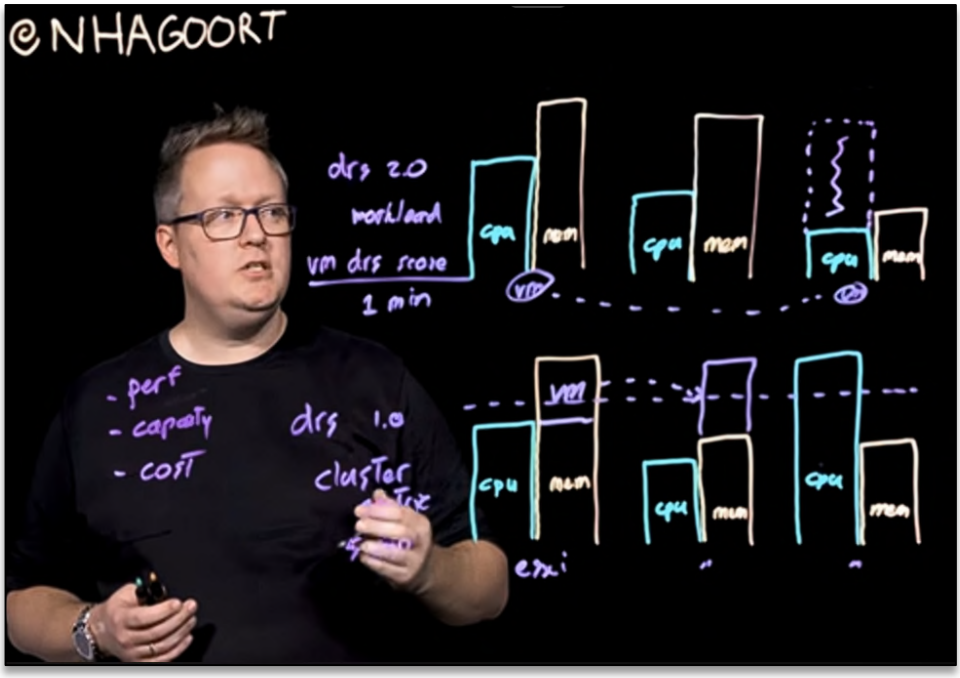

Figure 45. Screenshot from a YouTube video published on the VMware vSphere Channel titled "What's New with DRS in vSphere 7" where the VMware Technical Marketing Architect describes the function of the Improved DRS and the VM DRS Score.

286. DRS then uses the comparison of VM DRS Scores to "migrate [] virtual machines to other hosts within the cluster to maximize performance." Specifically, "[t]he new DRS logic . . . computes a VM DRS score on each host and moves the VM to the host that provides the highest VM DRS score."[187]

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[186] "What's New with DRS in vSphere 7," VMware vSphere YouTube Channel, YouTube.com (March 10, 2020), https://www.youtube.com/watch?v=vnuUzW7Yffo.

[187] Niels Hagoort, "vSphere 7 – Improved DRS," VMware.com (March 25, 2020), https://blogs.vmware.com/vsphere/2020/03/vsphere-7-improved-drs.html.

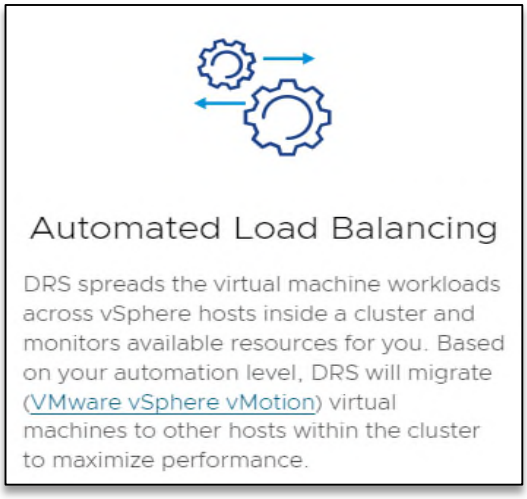

Figure 46. Screenshot explaining automated load balancing feature of DRS in vSphere.[188]

DIRECT INFRINGEMENT

287. Broadcom and VMware directly infringe the '893 Patent in multiple ways.

288. For example, in some cases, VMware directly infringe the '893 Patent at least when they perform the claimed methods of the '893 Patent, in violation of at least 35 U.S.C. § 271(a), by providing the '893 Accused Products as a service.[189]

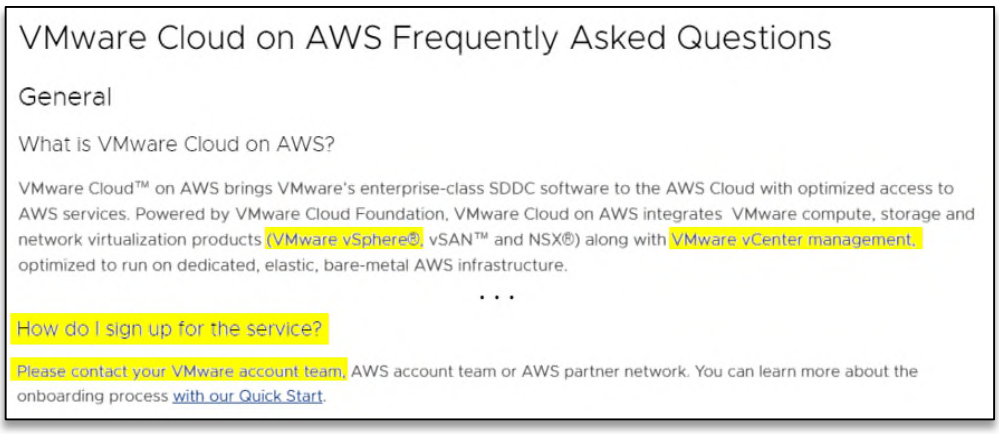

Figure 47. Annotated screenshot from VMware Cloud Tech Zone FAQ page explaining the VMware Cloud on AWS Service and how to sign up.

289. When a customer signs up for and uses a vSphere cloud-based service (*e.g.*, VMware Cloud on AWS), Broadcom and VMware perform the claimed methods as discussed above by controlling and maintaining responsibility for the infringing functionality. Alternatively, Broadcom

[188] Distributed Resource Scheduler, VMware.com, https://www.vmware.com/products/cloud-infrastructure/vsphere/drs-dpm.

[189] VMware Cloud Director is offered as a service compatible with, for example, VMware Cloud on AWS. *See* "VMware Cloud on AWS: VMware Cloud Director service Now Available," VMware.com (May 28, 2020), https://blogs.vmware.com/cloud/2020/05/28/vmware-cloud-aws-vmware-cloud-director-service-now-available/.

and VMware condition the benefit of the '893 Accused Products on Broadcom and VMware's partners performing the infringing functionality and Broadcom and VMware control the manner and timing of said performance. Broadcom and VMware maintain a "Shared Responsibility Model" that is "common among the different VMware Cloud Providers" and "defines distinct roles and responsibilities between the VMware Cloud Infrastructure Services provider and an organization consuming the service."[190] As shown below, Broadcom and VMware maintain responsibility for the "vSphere Lifecycle." As further confirmation, when describing the AWS implementation, Broadcom and VMware describe one of the goals of the shared responsibility model as being to "[p]rotect VMware-managed objects" including "management appliances" and "hosts."[191] The "management appliances" and "hosts" execute code performing the steps of Claim 16 described above.

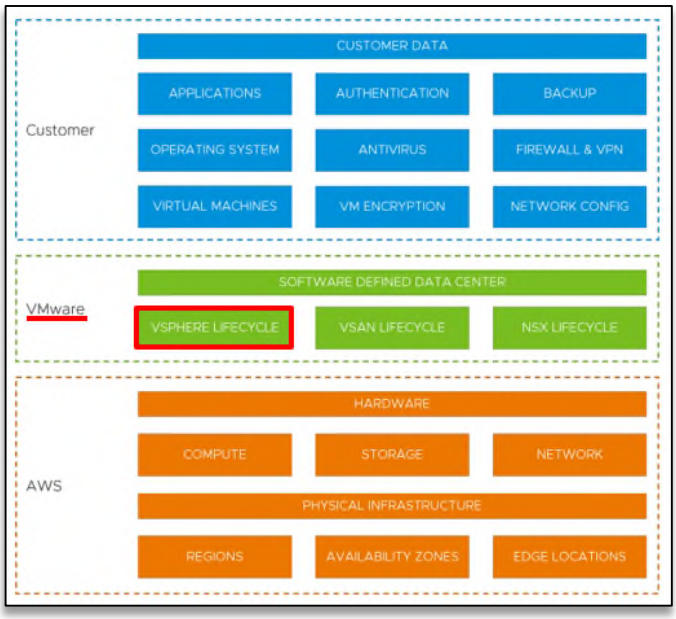

Figure 48. Annotated diagram from the "VMware Cloud Well-Architected Framework for VMware Cloud on AWS" document splitting responsibility between the customer, VMware, and AWS and showing vSphere as a responsibility of VMware highlighted in red.

290. Broadcom and VMware also directly infringe by using the claimed method to demonstrate, test, install, and configure the '893 Accused Products for their customers. For example,

[190] "VMware Cloud Well-Architected Framework for VMware Cloud on AWS," VMware.com (copyright 2023), https://docs.vmware.com/en/VMware-Cloud-Well-Architected-Framework/services/vmcwaf-aws.pdf.

[191] "VMware Cloud on AWS: vCenter Architecture," VMware.com (copyright 2005-2024), https://vmc.techzone.vmware.com/vmc-arch/docs/compute/vmc-aws-vcenter-architecture#sec27179-sub1.

Broadcom and VMware directly infringe by using the '893 Accused Products for demonstrating via VMware Hands-on Labs, *infra*.

INDIRECT INFRINGEMENT: INDUCEMENT

291. Broadcom and VMware had knowledge of the '893 Patent and had knowledge of, or were willfully blind, as to Broadcom's and VMware's infringement of the '893 Patent.

292. Broadcom and VMware have had knowledge of the '893 Patent since at least July 31, 2014, when VMware received the first of numerous citations to either the '893 Patent or the publication corresponding to the '893 Patent (U.S. Pub. No. 2008/0104608, the "'608 Publication"). During prosecution of the application that issued as U.S. Patent No. 9,152,448, the USPTO cited to the '608 Publication (even though the '893 Patent issued on May 22, 2012) in a notice of references cited dated July 31, 2014. The '608 Publication was also listed in additional references cited on September 21, 2015 during prosecution of applications that issued as U.S. Patent No. US9513946 and on July 23, 2018 during prosecution of the application that issued as U.S. Patent No. 10,139,876. The '893 Patent was listed in a notice of references on June 20, 2017 during prosecution of the application that issued as U.S. Patent No. 10,348,628.

293. Additionally, both VMware and the USPTO substantively addressed the contents of the '893 Patent. During prosecution of VMware's U.S. Patent No. 9,513,946, VMware's application claims were rejected in view of the '608 Publication on September 21, 2015 and April 11, 2016. VMware also addressed the '608 Publication in responses to the USPTO filed on December 18, 2015 and July 7, 2016. The USPTO also rejected VMware's application claims during prosecution of U.S. Patent No. 10,139,876 on July 23, 2018.

294. VMware also cited the '893 Patent in an Information Disclosure Statement ("IDS") on February 7, 2020 as part of prosecution of U.S. Patent No. 11,183,713. VMware also cited the '608 Publication to the USPTO in numerous IDSs between December 9, 2015 and March 11, 2021. *See* prosecution histories of U.S. Patent Nos. 9,367,414; 9,495,259; 10,586,048; 10,929,171; 10,944,673; 11,140,218; 11,153,406; 11,212,356; 11,223,494; 11,595,250; 11,611,625; 11,659,061.

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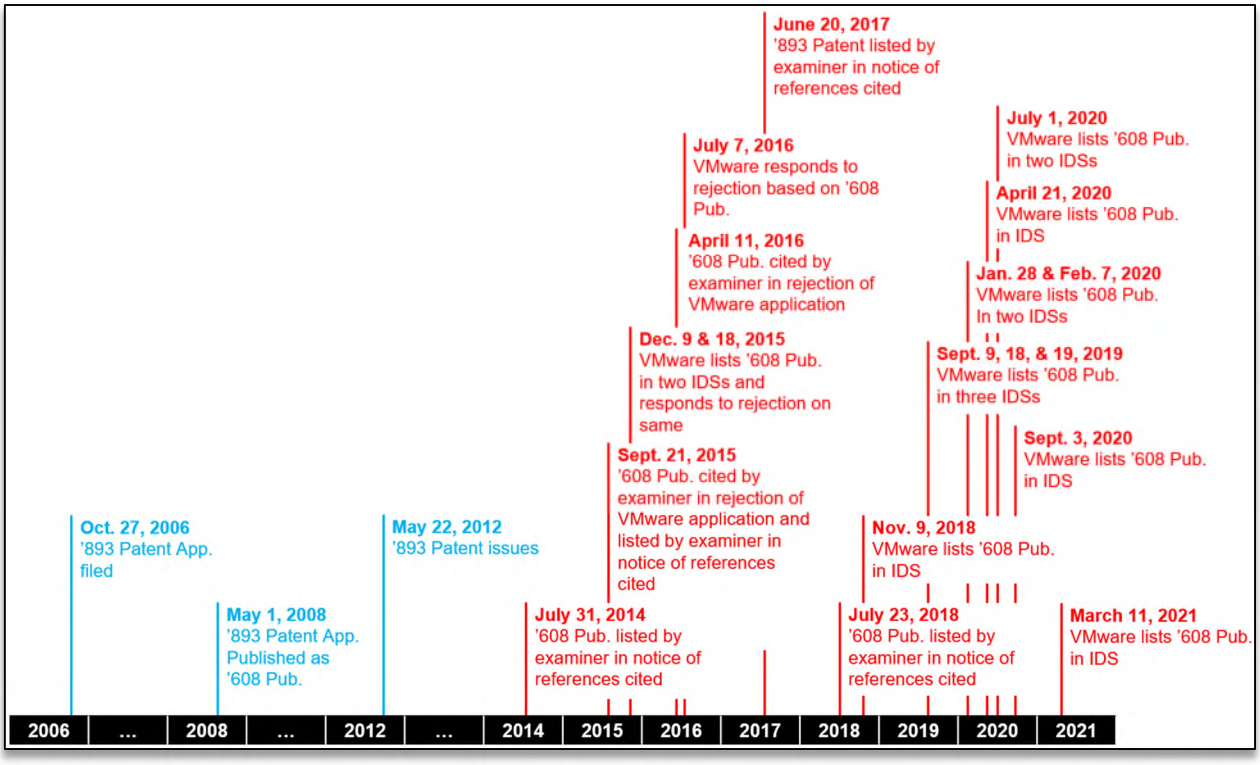

Figure 49. Timeline showing Broadcom and VMware's knowledge of the '893 Patent with activities related to '893 Patent in blue and activities related to Broadcom and VMware's knowledge of the '893 Patent in red.

295. VMware also identified US Patent Nos. 9,152,448, 9,367,414, 9,495,259, 9,513,946, 10,139,876, 10,348,628, 10,586,048, 10,929,171, 10,944,673, 11,140,218, 11,153,406, 11,182,713, 11,212,356, 11,223,494, 11,595,250, 11,611,625 and 11,659,061 ("the '893 Overlapping Patents") as covering multiple products, including the VMware vSphere, one of the '893 Accused Product.[192] All the '893 Overlapping Patents either cite the '893 Patent itself or the corresponding patent publication for the '893 Patent as a reference. Thus, VMware would have known that at least the VMware vSphere product infringed the '893 Patent and/or at least would have been willfully blind as to the likelihood of infringement.

296. Thus, VMware had knowledge of infringement of the '893 Patent or was willfully blind to its infringement of the '893 Patent by the '893 Accused Products prior to the filing of the Original Complaint.

297. VMware's knowledge of the Asserted Patents, including the '893 Patent, can be imputed to Broadcom for the reasons stated above, ¶¶ 85-89, 124-125, incorporated by reference

[192] "VMware Patents," VMware.com (captured May 31, 2022), available at https://web.archive.org/web/20220531103333/https:/www.vmware.com/download/patents.html.

herein.

298. Broadcom's direct knowledge of the Asserted Patents, including the '893 Patent, is detailed above, ¶¶ 126-127, incorporated by reference herein.

299. During its due diligence of VMware, Broadcom analyzed the risks and opportunities associated with the '893 Patent and any products owned by VMware that practice the '893 Patent. This analysis included a review of the prosecution history of the '893 Overlapping Patents and an analysis of any risk products that practiced the '893 Patent infringed patents identified in the prosecution history for the '893 Patent.

300. Thus, Broadcom had knowledge of infringement or was willfully blind as to the likelihood of its infringement of the '893 Patent prior to the filing of the Original Complaint.

301. The service of the Original Complaint provided an additional source of knowledge of the '893 Patent to Broadcom and VMWare. Broadcom and VMWare also received additional knowledge and notice of their infringement of the '893 Patent by the '893 Accused Products when the Original Complaint was served.

302. Broadcom and VMware have actively induced infringement of at least Claim 16 of the '893 Patent in violation of at least 35 U.S.C. § 271(b). Users of the '893 Accused Products directly infringe at least Claim 16 of the '893 Patent when they use the '893 Accused Products in the ordinary, customary, and intended way. Broadcom and VMware's inducement include, without limitation and with specific intent to encourage the infringement, knowingly inducing consumers to use the '893 Accused Products within the United States in the ordinary, customary, and intended way by, directly or through intermediaries, supplying the '893 Accused Products to consumers within the United States and instructing and encouraging such customers to use the '893 Accused Products in the ordinary, customary, and intended way, which Broadcom and VMware know or should know infringes at least Claim 16 of the '893 Patent.

303. Broadcom and VMware sell the '893 Accused Products to their customers as software for installation on customer computer(s). When Broadcom's customers install the '893 Accused Products and run a virtual machine, at least Claim 16 of the '893 Patent is performed. In at least this way, Broadcom and VMware's customers directly infringe the '893 Patent ***while***

Broadcom and VMware know of the '893 Patent, or should know that these activities infringe the '893 Patent, and specifically intend and instruct their customers to infringe. Broadcom and VMware have provided and continue to provide these instructions to infringe despite knowing of the '893 Patent and knowing or being willfully blind to the fact these activities infringe the '893 Patent.

304. Broadcom and VMware's instructions to their customers to infringe are made at least through their creation and distribution of marketing, promotional, and instructional materials. The promotional and product literature for the Accused Products is designed to instruct, encourage, enable, and facilitate the user of the '893 Accused Products to use the '893 Accused Products in a manner that directly infringes the '893 Patent. And Broadcom and VMware provide instructions, support, and technical assistance to their customers in support of committing the infringement.

305. One nonlimiting example of Broadcom and VMware's inducement includes at least VMware Hands-on Labs for vSphere-based products.

306. On the official VMware YouTube page, Broadcom and VMware explain that VMware Hands-On Labs "delivers a real virtualized infrastructure in the cloud powered by VMware" to let customers "try out products from the convenience of [their] browser."[193] Broadcom and VMware further explain that "each self-paced lab is guided with a manual and built in modules so you can take all or just part of a lab and come and go from labs as often as you like."[194]

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[193] "What are VMware Hands-on Labs," VMware YouTube Channel, YouTube.com (June 25, 2014), https://www.youtube.com/watch?v=XggYeVsK_R0, 0:25-32.

[194] *Id.*, 0:34-42.

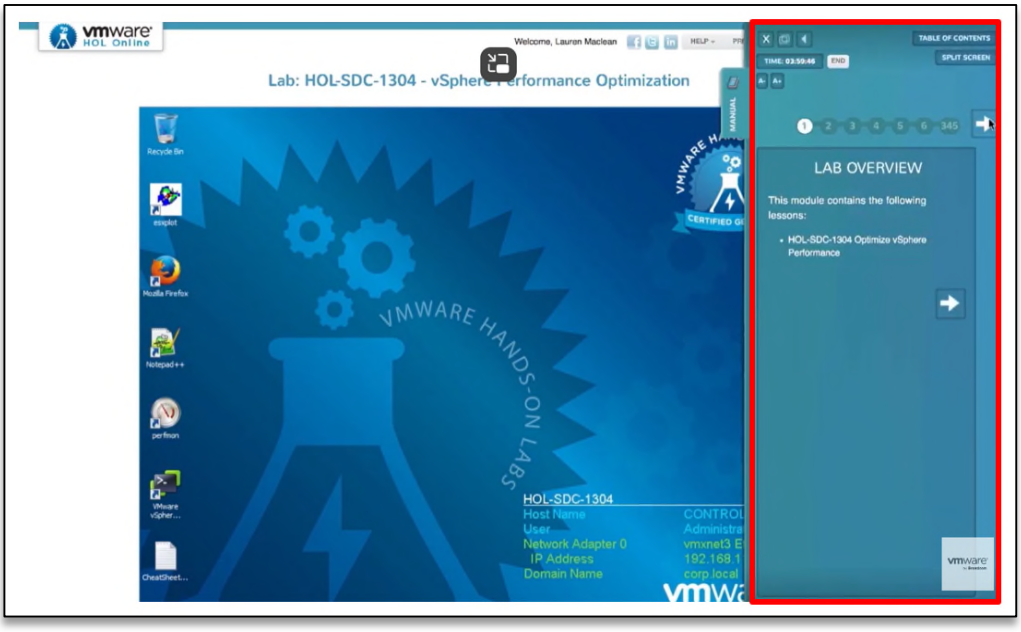

Figure 50. Screenshot from VMware YouTube video titled "What are VMware Hands-on Labs?," showing VMware Hands-on Lab Environment highlighted with in-lab manual highlighted in red.

307. Broadcom and VMware thus encourage their customers to infringe the '893 Patent at least by instructing customers on how to infringe by providing "manuals and built in modules" in proximity to "actual VMware products" for customers to practice infringing conduct through their VMware Hands-on Labs.

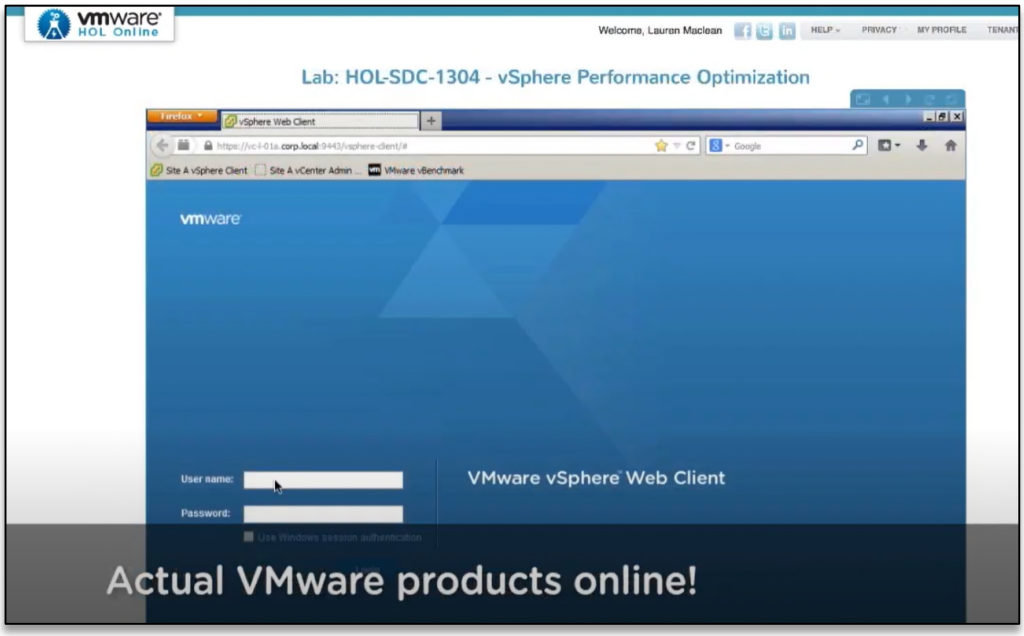

Figure 51. Screenshot from VMware YouTube video titled "What are VMware Hands-on Labs?"

308. Besides the VMware Hand-on Labs discussed above, Broadcom and VMware publicly share numerous instructions, troubleshooting manuals, and product documentations

through Broadcom's support portal (https://support.broadcom.com/), https://docs.vmware.com/en/VMware-vSphere/index.html, and https://docs.vmware.com/en/VMware-Cloud-Director/index.html.

309. Like the Hands-on Labs discussed above, these support documents also provide step-by-step instructions explaining how to use the '893 Accused Products in an infringing manner to determine performance metrics such as CPU utilization.

310. Thus, Broadcom and VMware have induced their customers to infringe the '893 Patent. Broadcom's knowing inducement of their customers to infringe has caused and continues to cause damage to Netflix, and Netflix is entitled to recover damages sustained as a result of Broadcom and VMware's wrongful acts in an amount subject to proof at trial.

WILLFUL INFRINGEMENT

311. As detailed above, Broadcom and VMware have knowledge of the '893 Patent and had knowledge of, or were willfully blind, as to Broadcom's and VMware's infringement of the '893 Patent.

312. Broadcom and VMware's infringement of the '893 Patent has been willful and deliberate.

313. As discussed above, Broadcom and VMware have had actual knowledge of the '893 Patent as of July 31, 2014.

314. As discussed above, Broadcom and VMware knew or should have known that their actions infringe and actively induce infringement of the '893 Patent.

315. The willful infringement facts for the Asserted Patents, ¶¶ 152-155 *supra*, are incorporated by reference herein.

316. Thus, Broadcom and VMware have willfully infringed the '893 Patent. Broadcom and VMware's knowing and willful infringement has caused and continues to cause damage to Netflix, and Netflix is entitled to recover damages sustained as a result of Broadcom and VMware's wrongful acts in an amount subject to proof at trial.

FIFTH CLAIM FOR RELIEF

Infringement of U.S. Patent No. 8,863,122 (the "'122 Patent")

Against Broadcom and VMware

317. Netflix incorporates by reference paragraph nos. 1-316, *supra*.

318. Broadcom and VMware have infringed, and continue to infringe, at least Claims 10-12 of the '122 Patent, either literally or under the doctrine of equivalents, by making, using, selling, and/or offering for sale within the United States and/or importing into the United States products that are covered by at least Claims 10-12 of the '122 Patent. These products include, but are not limited to, the vSphere Client and the ESXI Host Client (the "'122 Accused Product").

319. Claim 10 of the '122 Patent recites:

> A method, comprising:
>
> providing a first graphical user interface (GUI) from a host computer to a remote computer, the first GUI displaying on the remote computer a list of a plurality of virtual machines and to enable a user of the remote computer to select one of the virtual machines from the list as well as an action to be performed on the selected virtual machine, the selected action to be performed on the selected virtual machine independent of the other of the plurality of virtual machines;
>
> receiving user input from the remote computer via the first GUI, the user input including a selection of a virtual machine and an action to be performed on the selected virtual machine;
>
> in accordance with the user input, performing the action using the host computer on the selected virtual machine; and
>
> generating a second GUI to enable the user of the remote computer to select a virtual machine from the plurality of virtual machines to which a hardware peripheral device accessible to the remote computer is to be mapped;

wherein said action is selected from the group consisting of starting, stopping, re-booting and shutting down.

320. The '122 Accused Products perform all the claimed steps.

321. The '122 Accused Products implement a method comprising "providing a first graphical user interface (GUI) from a host computer to a remote computer, the first GUI displaying on the remote computer a list of a plurality of virtual machines and to enable a user of the remote computer to select one of the virtual machines from the list as well as an action to be performed on the selected virtual machine, the selected action to be performed on the selected virtual machine independent of the other of the plurality of virtual machines," "receiving user input from the remote computer via the first GUI, the user input including a selection of a virtual machine and an action to be performed on the selected virtual machine," and "in accordance with the user input, performing the action using the host computer on the selected virtual machine."

322. For example, the vSphere Client, the HTML5 based web client that "is automatically installed as part of the vCenter Server appliance."[195] The product documentation explains that "[t]he vSphere Client is the primary interface for connecting to and managing vCenter Server instances."[196] The vSphere Client is accessed by "[o]pening a Web browser and enter[ing] the URL for your vCenter Server instance: https://vcenter_server_ip_address_or_fqdn" or "enter[ing] the URL for the vSphere Client: https://vcenter_server_ip_address_or_fqdn/ui."[197] Thus, the vSphere Client is provided from vCenter Server to a remote computer through the web browser.

323. The vSphere Client display a drop-down list of virtual machines on a specific host.

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[195] "Log In to vCenter Server by Using the vSphere Client," VMware.com (updated August 28, 2020), https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-CE128B59-E236-45FF-9976-D134DADC8178.html; Abhijith Prabhudev, "What's New in vSphere 6.5: vCenter management clients," VMware.com (December 1, 2016), https://blogs.vmware.com/vsphere/2016/12/new-vcenter-management-clients-vsphere-6-5.html; "VMware vSphere Documentation," VMware.com https://docs.vmware.com/en/VMware-vSphere/index.html.

[196] *Id.*

[197] "vCenter Server and Host Management, Update 3 VMware vSphere 7.0, VMware ESXI 7.0, vCenter Server 7.0," VMware.com (copyright 2009-2024), https://docs.vmware.com/en/VMware-vSphere/7.0/vsphere-esxi-vcenter-server-703-host-management-guide.pdf.

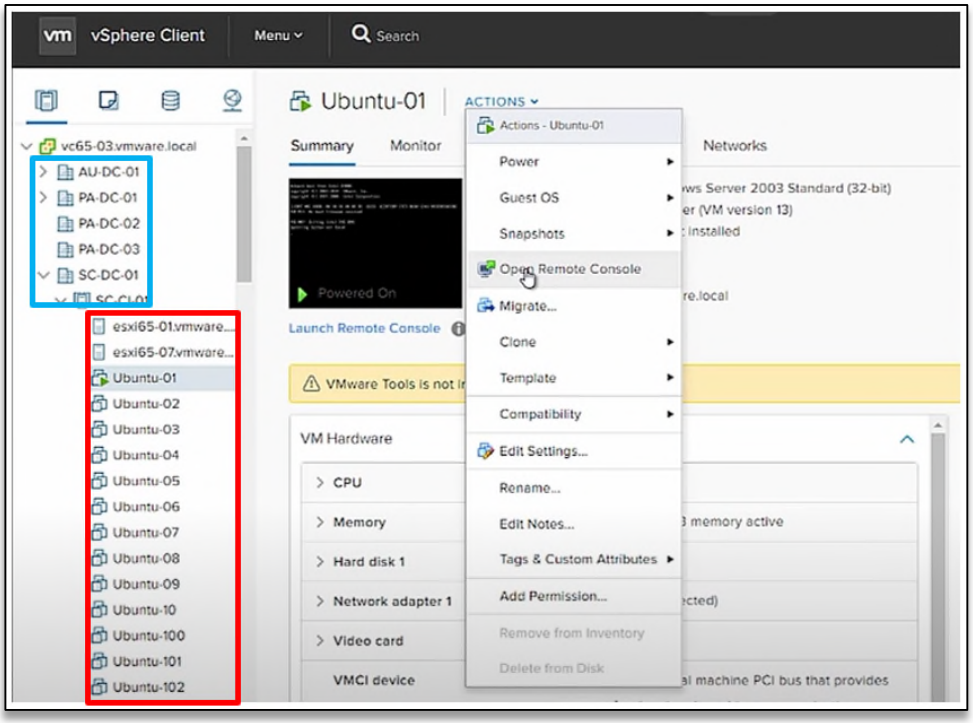


Figure 52. Screenshot of vSphere Client showing drop down menu of hosts highlighted in blue and drop down menu of virtual machines highlighted in red.

324. Once the drop-down list of virtual machines is displayed, a user may select one by clicking on it to display information on that virtual machine.

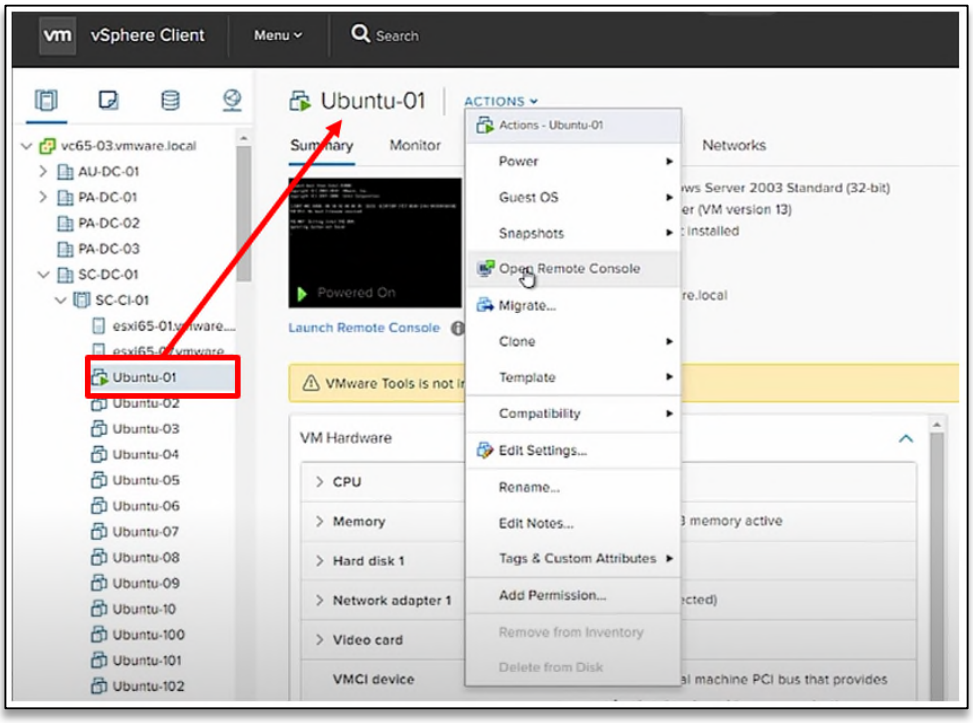


Figure 53. Screenshot of vSphere Client with selected virtual machine highlighted in red.

325. Once a virtual machine is selected, the user may select an "Actions" drop down menu to see a list of actions which may be performed with respect to the selected virtual machine.

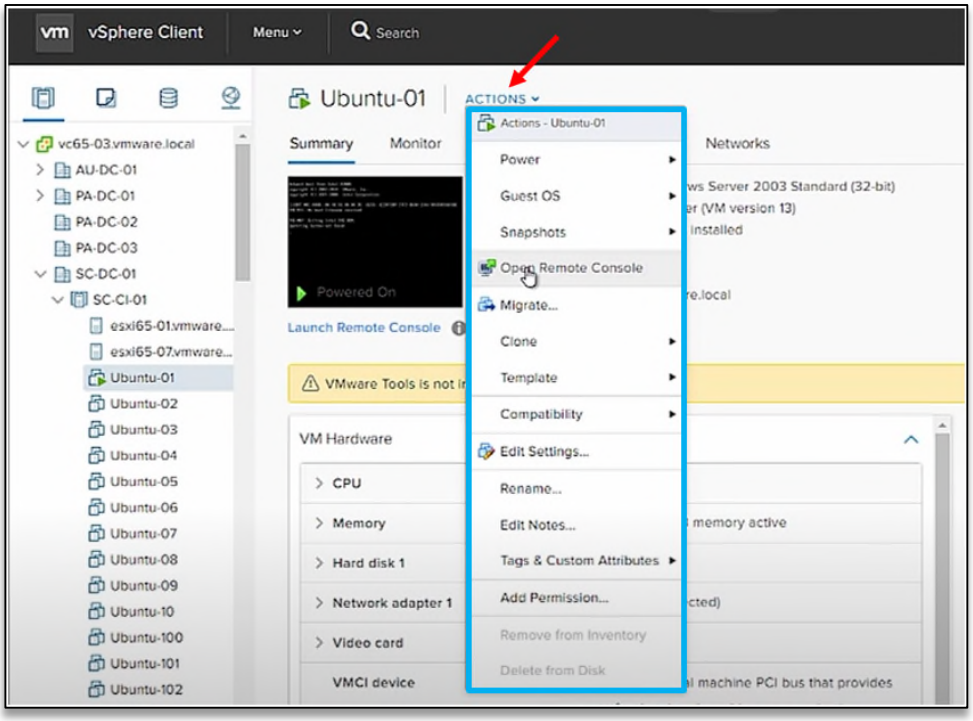


Figure 54. Screenshot of vSphere Client with "Actions" button highlighted with red arrow and list of possible actions highlighted in blue.

326. The '122 Accused Products implement a method comprising "generating a second GUI to enable the user of the remote computer to select a virtual machine from the plurality of virtual machines to which a hardware peripheral device accessible to the remote computer is to be mapped."

327. For example, the vSphere client includes a GUI that allows a user to select a virtual machine and customize the "hardware" of said virtual machine by mapping a hardware device (*e.g.*, a CD/DVD drive) to a virtual machine.

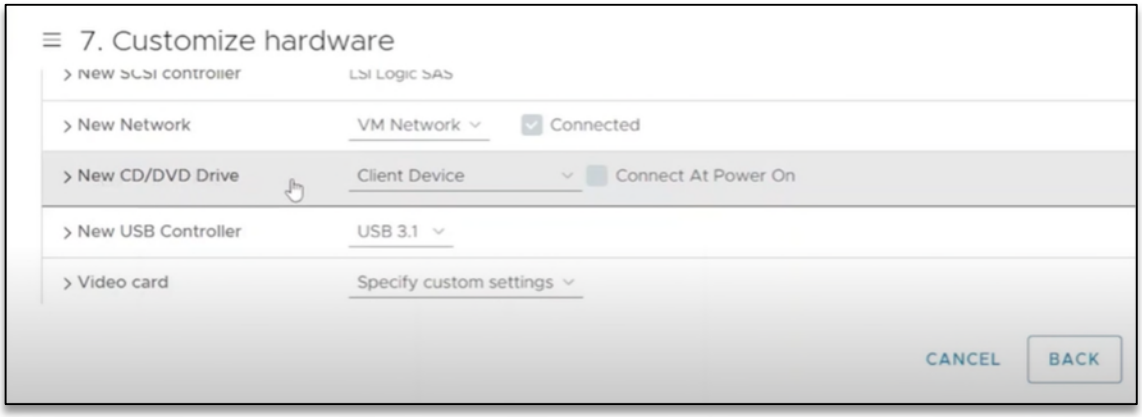
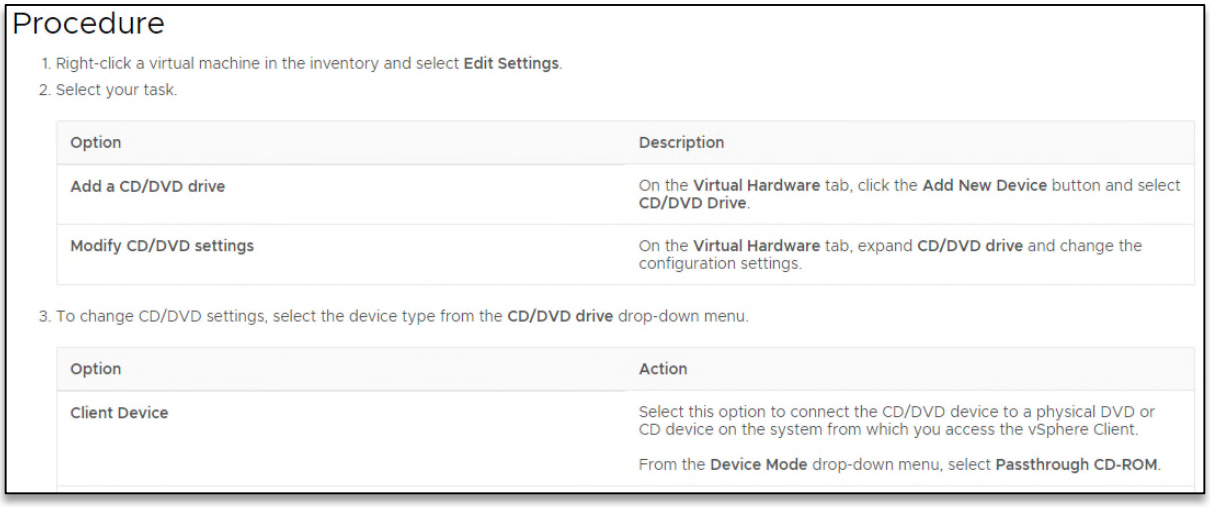


Figure 55. Screenshot of vSphere Client "Customize Hardware" GUI.



Procedure

1. Right-click a virtual machine in the inventory and select **Edit Settings**.
2. Select your task.

Option	Description
Add a CD/DVD drive	On the **Virtual Hardware** tab, click the **Add New Device** button and select **CD/DVD Drive**.
Modify CD/DVD settings	On the **Virtual Hardware** tab, expand **CD/DVD drive** and change the configuration settings.

3. To change CD/DVD settings, select the device type from the **CD/DVD drive** drop-down menu.

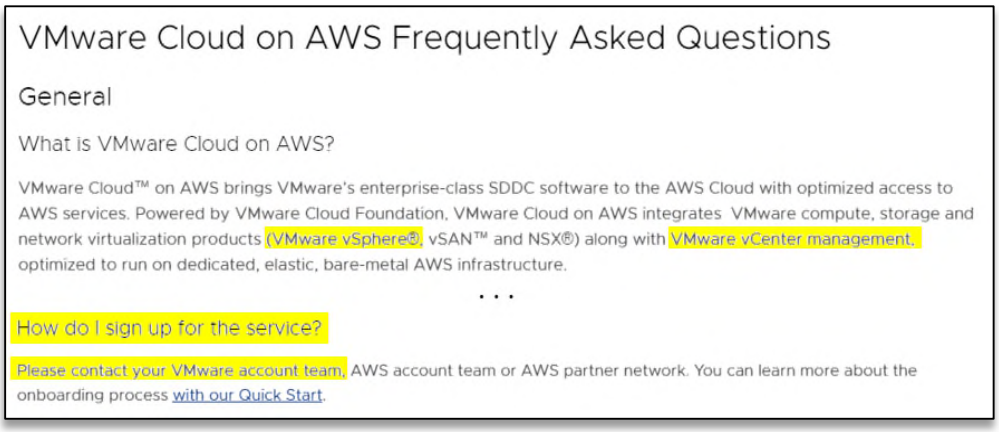
Option	Action
Client Device	Select this option to connect the CD/DVD device to a physical DVD or CD device on the system from which you access the vSphere Client. From the **Device Mode** drop-down menu, select **Passthrough CD-ROM**.

Figure 56. Screenshot from VMware website explaining how to enable "Passthrough CD-ROM" from the vSphere Client.[198]

DIRECT INFRINGEMENT

328. Broadcom and VMware directly infringe the '122 Patent in multiple ways.

329. Broadcom and VMware directly infringe the '122 Patent at least when they perform the claimed methods of the '122 Patent, in violation of at least 35 U.S.C. § 271(a), by providing the '122 Accused Products as a service.[199]



VMware Cloud on AWS Frequently Asked Questions

General

What is VMware Cloud on AWS?

VMware Cloud™ on AWS brings VMware's enterprise-class SDDC software to the AWS Cloud with optimized access to AWS services. Powered by VMware Cloud Foundation, VMware Cloud on AWS integrates VMware compute, storage and network virtualization products (VMware vSphere®, vSAN™ and NSX®) along with VMware vCenter management, optimized to run on dedicated, elastic, bare-metal AWS infrastructure.

. . .

How do I sign up for the service?

Please contact your VMware account team, AWS account team or AWS partner network. You can learn more about the onboarding process with our Quick Start.

Figure 57. Annotated screenshot from VMware Cloud Tech Zone FAQ page explaining the VMware Cloud on AWS Service and how to sign up.

330. When a customer signs up for and uses a vSphere cloud-based service (*e.g.*, VMware Cloud on AWS), Broadcom and VMware perform the claimed methods as discussed above by

[198] "How do I Add or Modify a Virtual Machine CD or DVD Drive," VMware.com (updated January 25, 2024), https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vm_admin.doc/GUID-C58B93A7-52CF-456D-95C1-8B5A906C9619.html.

[199] As explained below, vSphere Client is installed in VMware vCenter.

controlling and maintaining responsibility for the infringing functionality.

331. Broadcom and VMware also conditions the benefit of the '122 Accused Products on the end-user performing the infringing functionality and Broadcom controls the manner and timing of said performance. Broadcom and VMware maintain a "Shared Responsibility Model" that is "common among the different VMware Cloud Providers" and "defines distinct roles and responsibilities between the VMware Cloud Infrastructure Services provider and an organization consuming the service."[200] As shown below, Broadcom and VMware maintain responsibility for the "vSphere Lifecycle." As further confirmation, when describing the AWS implementation, Broadcom and VMware describe one of the goals of the shared responsibility model as being to "[p]rotect VMware-managed objects" including "management appliances" and "hosts."[201] The "management appliances" and "hosts" execute code performing the steps of Claim 1 described above.

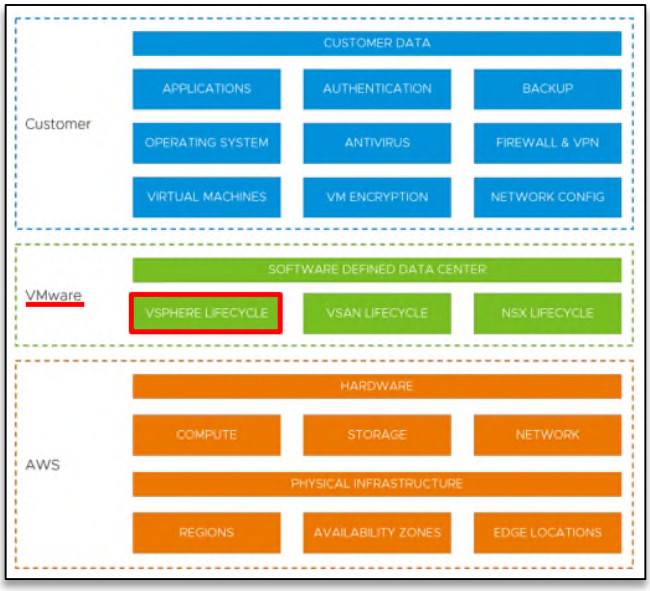


Figure 58. Annotated diagram from the "VMware Cloud Well-Architected Framework for VMware Cloud on AWS" document splitting responsibility between the customer, Broadcom, and AWS and showing vSphere as a responsibility of VMware highlighted in red.

332. Broadcom and VMware directly infringe by using the claimed method to

[200] "VMware Cloud Well-Architected Framework for VMware Cloud on AWS," VMware.com (copyright 2023), https://docs.vmware.com/en/VMware-Cloud-Well-Architected-Framework/services/vmcwaf-aws.pdf.

[201] "VMware Cloud on AWS: vCenter Architecture," VMware.com (copyright 2005-2024), https://vmc.techzone.vmware.com/vmc-arch/docs/compute/vmc-aws-vcenter-architecture#sec27179-sub1.

demonstrate, test, install, and configure the '122 Accused Products for their customers. For example, Broadcom and VMware directly infringe by using the '122 Accused Products for demonstrating via VMware Hands-on Labs, *infra*.

INDIRECT INFRINGEMENT: INDUCEMENT

333. Broadcom and VMware had knowledge of the '122 Patent and had knowledge of, or were willfully blind, as to Broadcom's and VMware's infringement of the '122 Patent.

334. Broadcom and VMware have had knowledge of the '122 Patent since at least August 16, 2013, when VMware received the first of numerous rejections based on the publication corresponding to the '122 Patent (U.S. Pub. No. 2012/0124580, the "'580 Publication"). During prosecution of the application that issued as U.S. Patent No. 8,938,680, the USPTO rejected VMware's patent application's claims based on the '580 Publication in rejections on August 16, 2013 and a final rejection on January 31, 2014. VMware discussed and proposed amendments over the '580 Publication on November 15, 2013 and responded to these rejections on November 18, 2013 and June 2, 2014.

335. VMware was reminded of the '122 Patent, when VMware's claims in a second application were rejected based on the '580 Publication. During prosecution of the application that issued as U.S. Patent No. 10,079,797, the USPTO issued rejections on December 9, 2016, May 19, 2017, and September 11, 2017 based on the '580 Publication. VMware responded to and substantively addressed the '580 Publication on February 9, 2017, August 21, 2017, and January 11, 2018, respectively, as well as in an April 10, 2017 response to a USPTO advisory action.

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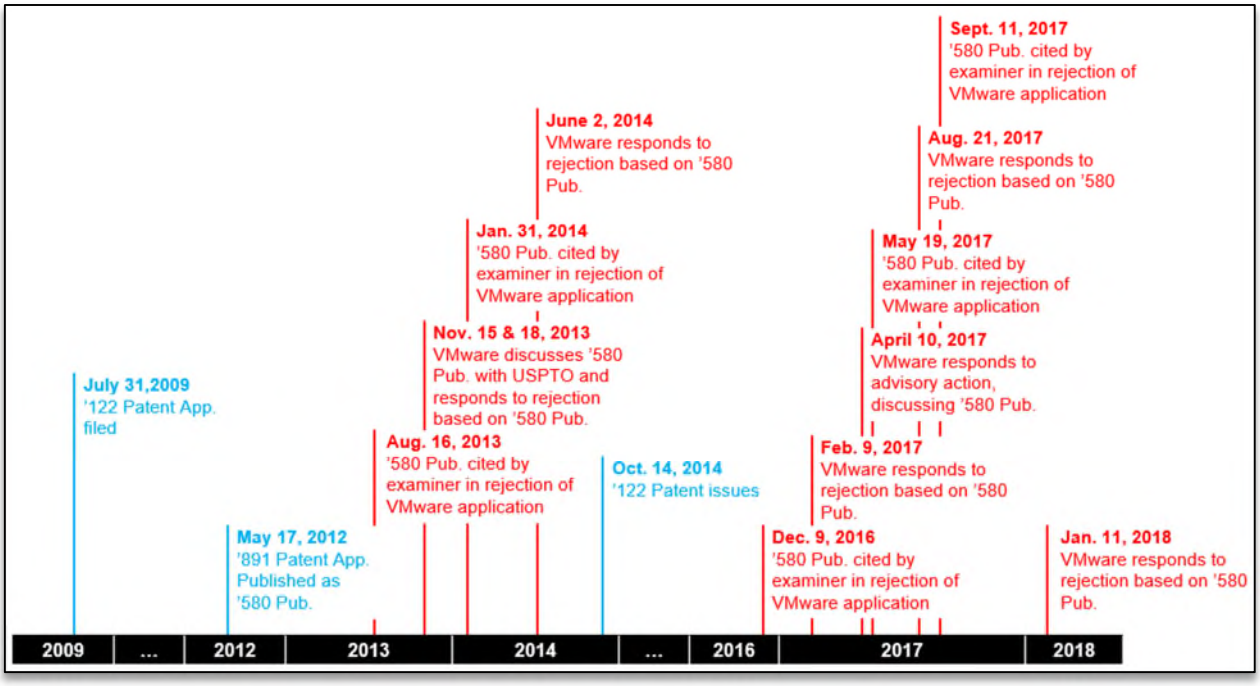

Figure 59. Timeline showing Broadcom and VMware's knowledge of the '122 Patent with activities related to '122 Patent in blue and activities related to the Broadcom and VMware's knowledge of the '122 Patent in red.

336. The patent publication for the '122 Patent was identified and cited multiple times during the patent prosecution of VMware's patent, US Patent No. 8,938,680. US Patent No. 8,938,680 was identified as being practiced by VMware's product, though the specific product was not specifically identified.[202] As such, VMware was aware that US Patent No. 8,938,680 overlapped with the '122 Patent. At least the VMware vSphere product and other '122 Accused Products practiced US Patent No. 8,938,680. VMware would have known that at least VMware vSphere and other '122 Accused Products infringed the '122 Patent or decided to be willfully blind as to its infringement.

337. Thus, VMware had knowledge of infringement of the '122 Patent or was willfully blind to its infringement of the '122 Patent by the '122 Accused Products.

338. VMware's knowledge of the Asserted Patents, including the '122 Patent, can be imputed to Broadcom for the reasons stated above, ¶¶ 85-89, 124-125, incorporated by reference herein.

339. Broadcom's direct knowledge of the'122 Patent, is detailed above, ¶¶ 126-127,

[202] "VMware Patents," VMware.com (captured May 31, 2022), available at https://web.archive.org/web/20220531103333/https:/www.vmware.com/download/patents.html.

incorporated by reference herein.

340. In addition, during its due diligence of VMware, Broadcom analyzed the risks and opportunities associated with the '122 Patent and any products owned by VMware that practice the '122 Patent. This analysis included a review of the prosecution history of the '122 Overlapping Patents and an analysis of any risk products that practiced the '122 Patent infringed patents identified in the prosecution history for the '122 Patent.

341. Thus, Broadcom had knowledge of infringement or was willfully blind as to the likelihood of its infringement of the '122 Patent prior to the filing of the Original Complaint.

342. The service of the Original Complaint provided an additional source of knowledge of the '122 Patent to Broadcom and VMWare. Broadcom and VMWare also received additional knowledge and notice of their infringement of the '122 Patent by the '122 Accused Products when the Original Complaint was served.

343. Broadcom and VMware have induced infringement of at least Claim 10 of the '122 Patent in violation of at least 35 U.S.C. § 271(b). Users of the '122 Accused Products directly infringe at least Claim 10 of the '122 Patent when they use the '122 Accused Products in the ordinary, customary, and intended way. Broadcom and VMware's inducements include, without limitation and with specific intent to encourage the infringement, knowingly inducing consumers to use the '122 Accused Products within the United States in the ordinary, customary, and intended way by, directly or through intermediaries, supplying the '122 Accused Products to consumers within the United States and instructing and encouraging such customers to use the '122 Accused Products in the ordinary, customary, and intended way, which Broadcom and VMware know or should know infringes at least Claim 10 of the '122 Patent.

344. Broadcom and VMware sell the '122 Accused Products to their customers as software for installation on customer computer(s). When Broadcom and VMware's customers install the '122 Accused Products and run a virtual machine, at least Claim 10 of the '122 Patent is performed. In at least this way, the customers of Broadcom and VMware directly infringe the '122 Patent ***while*** Broadcom and VMware know of the '122 Patent, and should know that these activities infringe the '122 Patent, and specifically intend instruct their customers to infringe. Broadcom and

VMware have provided and continue to provide these instructions to infringe despite knowing of the '122 Patent and knowing or being willfully blind to the fact these activities infringe the '122 Patent.

345. Broadcom and VMware's instructions to their customers to infringe are made at least through their creation and distribution of marketing, promotional, and instructional materials. The promotional and product literature for the Accused Products is designed to instruct, encourage, enable, and facilitate the user of the '122 Accused Products to use the '122 Accused Products in a manner that directly infringes the '122 Patent. And Broadcom and VMware provide instructions, support, and technical assistance to their customers in support of committing the infringement.

346. One nonlimiting example of Broadcom and VMware's inducement includes at least VMware Hands-on Labs for vSphere-based products.

347. On the official VMware YouTube page, Broadcom and VMware explain that VMware Hands-On Labs "delivers a real virtualized infrastructure in the cloud powered by VMware" to let customers "try out products from the convenience of [their] browser."[203] Broadcom and VMware further explain that "each self-paced lab is guided with a manual and built in modules so you can take all or just part of a lab and come and go from labs as often as you like."[204]

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[203] "What are VMware Hands-on Labs," VMware YouTube Channel, YouTube.com (June 25, 2014), https://www.youtube.com/watch?v=XggYeVsK_R0, 0:25-32.

[204] *Id.*, 0:34-42.

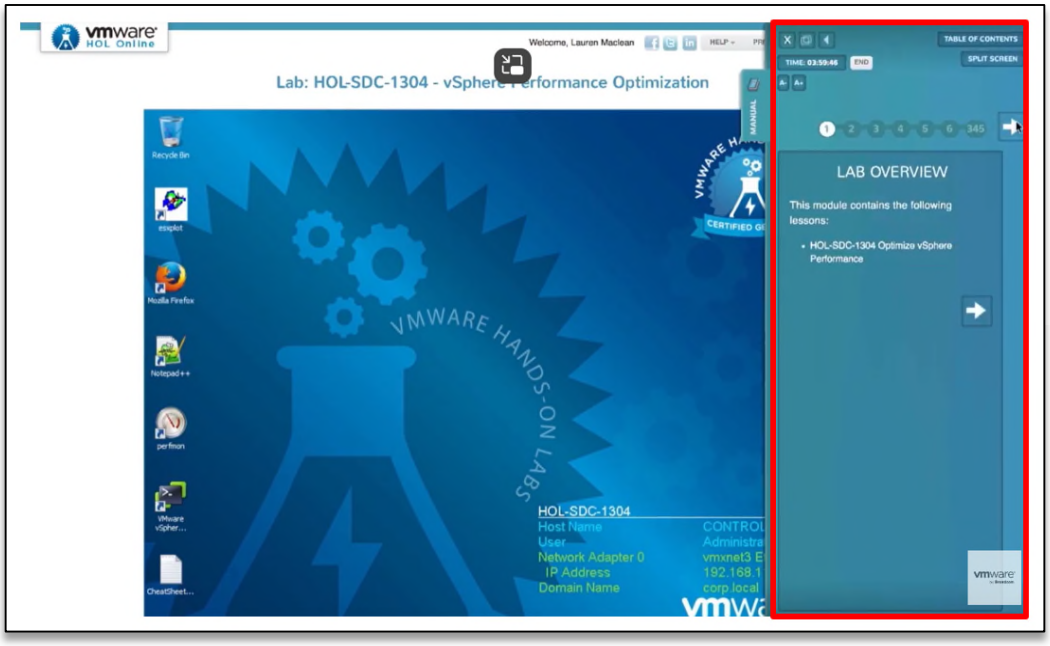

Figure 60. Screenshot from VMware YouTube video titled "What are VMware Hands-on Labs?," showing VMware Hands-on Lab Environment highlighted with in-lab manual highlighted in red.

348. Broadcom and VMware thus encourage their customers to infringe the '122 Patent at least by instructing customers on how to infringe by providing "manuals and built in modules" in proximity to "actual VMware products" for customers to practice infringing conduct through their VMware Hands-on Labs.

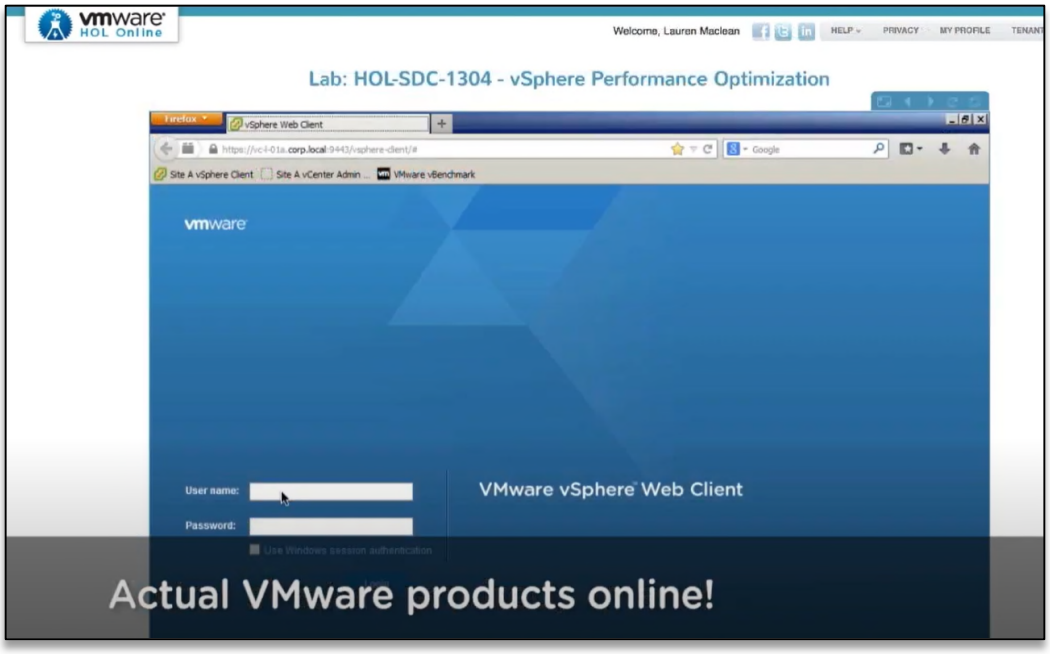

Figure 61. Screenshot from VMware YouTube video titled "What are VMware Hands-on Labs?"

349. Besides the VMware Hand-on Labs discussed above, Broadcom and VMware publicly share numerous instructions, troubleshooting manuals, and product documentations

through their support portal (https://support.broadcom.com/), https://docs.vmware.com/en/VMware-vSphere/index.html, and https://docs.vmware.com/en/VMware-Cloud-Director/index.html.

350. Like the Hands-on Labs discussed above, these support documents also provide step-by-step instructions explaining how to use the '122 Accused Products in an infringing manner to determine performance metrics such as CPU utilization.

351. Thus, Broadcom and VMware have induced their customers to infringe the '122 Patent. Broadcom and VMware's knowing inducement of their customers to infringe has caused and continues to cause damage to Netflix, and Netflix is entitled to recover damages sustained as a result of Broadcom and VMware's wrongful acts in an amount subject to proof at trial.

WILLFUL INFRINGEMENT

352. As detailed above, Broadcom and VMware had knowledge of the '122 Patent and had knowledge of, or were willfully blind, as to Broadcom's and VMware's infringement of the '122 Patent.

353. Broadcom and VMware's infringement of the '122 Patent has been willful and deliberate.

354. As discussed above, Broadcom and VMware have had actual knowledge of the '122 Patent since August 16, 2013.

355. As discussed above, Broadcom and VMware knew or should have known that their actions infringe and actively induce infringement of the '122 Patent.

356. The willful infringement facts for the Asserted Patents, ¶¶ 152-155 *supra*, are incorporated by reference herein.

357. Thus, Broadcom and VMware have willfully infringed the '122 Patent. Broadcom and VMware's knowing and willful infringement has caused and continues to cause damage to Netflix, and Netflix is entitled to recover damages sustained as a result of Broadcom and VMware's wrongful acts in an amount subject to proof at trial.

PRAYER FOR RELIEF

Netflix respectfully requests the following relief:

A. That the Court enter judgment that Broadcom, alone or in combination with VMware, willfully infringes each of the Asserted Patents;

B. That the Court award damages to Netflix for Broadcom's infringement, either alone or on combination with VMware, including interest;

C. That the Court award treble damages and attorneys' fees under 35 U.S.C. §§ 284 and 285;

D. That the Court award Netflix its statutory costs; and

E. That the Court award Netflix any and all other relief to which Netflix may be entitled and that the Court may deem just, equitable, and proper.

JURY DEMAND

Netflix respectfully demands a jury trial pursuant to Rule 38(b) of the Federal Rules of Civil Procedure on all claims and issues so triable.

Dated: March 17, 2025

BAKER BOTTS L.L.P.

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