UNITED STATES PATENT TRIAL AND APPEAL BOARD

VEEAM SOFTWARE CORPORATION)
Petitioner,)
vs.) Case No.
SYMANTEC CORPORATION) IPR 2013-00150
Patent Owner.)

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DEPOSITION OF PRASHANT SHENOY, Ph.D.

WASHINGTON, D.C.

NOVEMBER 8, 2013

The deposition of PRASHANT SHENOY, Ph.D. was convened on Friday, November 8, 2013, commencing at 9:40 a.m., at the offices of Sterne Kessler Goldstein & Fox, 1100 New York Avenue, Northwest, Washington, D.C., Suite 800, before Paula G. Satkin, Registered Professional Reporter and Notary Public.

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PROCEEDINGS

Whereupon--

PRASHANT SHENOY, Ph.D.
a witness, called for examination, having been first duly sworn, was examined and testified as follows:

EXAMINATION BY COUNSEL FOR PATENT OWNER
BY MR. RICHETTI:

Q. Good morning, Dr. Shenoy.
A. Good morning.
Q. Good to see you again.
Can you please state your name and address for the record?
A. Prashant Shenoy, 6 Bixby Court, North Hampton, Massachusetts 01060.
Q. Dr. Shenoy, you know that you're attending today's deposition with respect to a declaration you provided for Veeam; is that correct?
A. Yes.
Q. And if you could just give me just some briefly just background of how it came to be that you were providing this declaration in this proceeding?

A. So I was contacted by the Veeam attorneys through an expert witness firm asking if I would be willing to provide some expert testimony. They provided me with the background of what the patent was about. It was in my area of expertise. So I had a meeting with the attorneys and they told me they were going to file an IPI and they would like me to provide my expert opinion on several matters on which I submitted in the declaration.
Q. And you mentioned that when you looked at the '086 patent and reviewed it you realized that it was in your area of expertise; is that fair? I'm trying to restate your testimony; is that fair?
A. Yes.
Q. What would you consider that area of your expertise?
A. Broadly speaking, virtualization machines.
Q. And I believe in a prior deposition you might have mentioned that one of your areas of expertise was distributed systems; is that correct?
A. Yes. Distributed systems, as

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well.
Q. And where does virtualization or virtual machines fit within distributed systems, if at all?
A. Distributed ion operating systems, that's the broad area. With the context of this area there are several sub disciplines; virtualization and networking, virtualization technologies used for various tasks fall as a sub discipline within this broad area.
Q. With respect to the '086 patent, if you could just generally briefly describe when you read it what was your impression? What was the technology being described?
A. So the '086 patent broadly deals with virtual machines and more specifically deals with backup and disaster recovery of virtual machines.
Q. And that's reflected right in the title; correct, for the '086 patent where it says disaster recovery and backup using virtual machines?
A. Yes.
Q. And, Dr. Shenoy, if you could look at Veeam Exhibit 1002 and just let me know if

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you recognize that document.
A. Yes. I do recognize this document.
Q. And what is it?
A. It is the declaration I provided.
Q. And, Dr. Shenoy, I apologize for jumping around, but you've been deposed before; correct?
A. Yes.
Q. In fact, it's been in this proceeding. Just to go over some ground rules, and I know we've spent a considerable amount of time together already, but if there's ever a moment in time in which you don't understand my question, please let me know. I appreciate the courtesy and the patience you demonstrated at the last deposition and obviously someone with your experience, I might misstate things from time to time and I appreciate you just straightening me out if I go off course or try to work together to kind of get through the deposition; is that fair?
A. Yes. Thank you.
Q. Okay. So, Dr. Shenoy, you mentioned that you have expertise with virtual

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machines; correct?
A. Yes.
Q. Can you just elaborate a little bit on your experience with virtual machines?
A. So as I mentioned before, my broad area of research is distributed and operating systems. Over the past probably ten, maybe 13 years my research has focused on aspects of operating and distributed systems that relate to virtualization. We have had a number of research projects in this area. We've collaborated with industry with projects in this area and we've done papers on it.
Q. And what's a virtual machine?
A. So it is somewhat broad term in the art. Broadly speaking, a virtual machine implements or emulates an interface, depending on what interface it emulates you can have different types of virtual machines. You have the hardware interface or the hardware on the computer system. You have what's called hardware level virtualization and hardware virtual machines. We emulate -- when you have OS level or operating system level virtual machines. You can even have application level

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virtual machines like Java virtual machines that emulate and interface with an application.
Q. And how do you create a virtual machine?
MR. PICKARD: Objection. Lacks foundation.
THE WITNESS: It would depend on the context. I just mentioned three or four different types of virtual machines. Depending on what specifically you are looking at in terms of the type of virtual machine, the procedures to create it is somewhat different.
BY MR. RICHETTI:
Q. So is a common type of virtual machine when you create a machine both hardware and operating system level. So you have almost like a complete computer machine, but it's really just virtual?
MR. PICKARD: Object to form.
THE WITNESS: So the specific type of virtual machine you just referred to, it is the virtual machine itself is emulating the hardware. The operating system that's running on it is not emulated. It is a real operating system that just runs on the virtual machine,

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which provides the abstraction of a physical machine by emulating it.
BY MR. RICHETTI:
Q. So working with that type of virtual machine, how would you create that one?
A. So you would need to use one of the many products that are available, virtualization products, and using those virtualization products you can create a new virtual machine, which would be empty when you create it.
Q. And what types of software are you aware of that create these -- the type of virtual machine you just described?
A. There are several different products that are available on the market, VMware is a company that sells a range of products in this space. Microsoft also sells virtualization products. There are some that are freely available at no cost like XEN virtual machine, KVM, that are available as part of the Linux operating system, which is free. There are several others. These are some examples.
Q. And which ones have you worked with in your career?

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A. Worked with VMware, XEN, X-E-N, that's how you spell it, KVM, an acronym.
Q. Okay.
A. I've used those.
Q. And you mentioned you've used VMware products; is that correct?
A. Yes.
Q. What types of VMware products have you used?
A. As part of our research we have used a few different products that they make. That is the workstation product, which you run on a typical PC. There is the ESX server product, which would run on servers. So at least those two.
Q. And you mentioned you worked with virtualization products from XEN?
A. Yes.
Q. Which ones?
A. So XEN is the name of the virtualization product. There is a different company that sells it. I'm not sure of the name of the company, but it refers to XEN.
Q. Is that for a workstation or a server environment?

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A. You could use it for either one.
Q. You mentioned about KVM. Is that the name product, the product of a name or is it the company that makes it?
A. It stands for kernel virtual machine. It does virtualization technology that is part of the Linux operating system. It is an open source community generated technology.
Q. Now, with respect to the VM products, you've mentioned there are two. One that works on workstation and one that works on a server?
A. Yes.
Q. Can you just briefly describe the differences between the two systems?
A. So the virtual or VMware that runs on a workstation, it requires an operating system to be already running on the machine. This operating system is typically known as the host of the operating system and then the virtualization product from VMware allows you to create virtual machine that run on top of the host operating system.
On the server side there are a few different ways to run virtualization

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technologies. The ESX product in particular runs on what is referred to bare metal. So you don't need an operating system to run. You can run the virtual machine, monitor of the virtual machines kernels as it's referred to directly on the physical machine. There are other products that also run the servers that work like the workstation product. They need an operating system to be running and they run on top.
Q. And for the workstation VMware product, did it have a name?
A. So there are several different variants of it that VMware sells. One is called VMware Workstation is a product that is sold for MAC's operating system. So, therefore, it was VMware Fusion. So I remember at least those two.
Q. These are the two that you worked with; correct?
A. Those are the two that I worked with. Yes.
Q. And with respect to the ESX server which -- do you know which versions of the server software you worked on?
A. I don't recollect the exact

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virtual numbers. All I can say is that we have used it in our research for several years now.
Q. And by several years, I know you may not be able to give us an exact date, but just an order of magnitude. Does that mean within the last five years or you've been using within the last ten years, the last 20 years?
A. At least for five years.
Q. So in working with, just as an example, the ESX server VMware software, have you had an opportunity to create a virtual machine?
A. The research project was my graduate students. So we have created virtual machines together as part of the project.
Q. I'm sorry. So does that mean you supervised it or did you actually create the virtual machine?
A. I think supervised would be a more reasonable way to put it.
Q. Okay. Is another name for these virtual machine products called the virtual machine monitor? Are you familiar with that term?
MR. PICKARD: Objection.

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Compound.
THE WITNESS: I am familiar with the term virtual machine monitor. I would not say it's another name for all of those products. At least the ESX server uses a virtual machine monitor.
BY MR. RICHETTI:
Q. And what does that mean to you, virtual machine monitor?
A. The virtual machine monitor is a piece of software that is emulating hardware and managing the virtual machines that are running on top.
Q. So is it fair to say that the virtualization software, just picking an example of the one you used like the ESX server, has at least two roles. There's the creation of the virtual machine and then the management of the virtual machine while it's operating?
A. Typically the creation is done by a user. The virtual machine monitor would perform the necessary steps to execute that command. Once created the virtual machine monitor will manage the virtual machine.
Q. And so based on your experience,

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the creation of the virtual machine through a software virtualization product such as ESX server is something that is going to be initiated by a user; is that fair?
A. It could be a user or it could be a program that can create virtual machines, as well.
Q. Okay. So we've talked about the virtualization software such as VMware ESX server allows you to create the virtual machine and it allows you to manage the resources of the virtual machine. Is there anything else that the software permits you to do?
A. So I use the term manage very broadly. It may well have a variety of different things you could to do to manage virtual machines. Just an example of these may be pausing virtual machines, suspending them, starting them. There are several different functions the virtualization software might provide. I put all of those under the management category.
Q. I appreciate that.
You mentioned pausing the machine. Why would you want to pause a virtual machine?

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A. It is an operation that is supported by virtualization technologies broadly. It is equal to in a laptop when you close the lid of the laptop the operating system pauses and then later on you can start working with the machine again. This provides a similar function to pause the execution of the virtual machine for any reason that the user may want to pause it for.
Q. So when you say pause, Dr. Shenoy, are you saying it's more like when a computer goes to sleep? Is that the analogy you're drawing when you say you close the lid on the laptop?
A. So pause could mean several different things because it's a broad term. There are different ways of pausing a virtual machine. Putting a computer to sleep would be one of them, yes.
Q. What's another way that you could pause a machine?
A. You could pause it, so there are many ways to pause a virtual machine. For instance, you could pause it such that it stays in memory and you can resume the memory. You

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