

# **Why Microsoft Virtualization is Different (and possibly better)**

**Version 1.0**

**Internet Research Group  
August 2008**

## **About The Internet Research Group**

[www.irg-intl.com](http://www.irg-intl.com)

The Internet Research Group (IRG) provides market research and market strategy services to product and service vendors. IRG services combine the formidable and unique experience and perspective of the two principals: John Katsaros and Peter Christy, each an experienced industry veteran. The overarching mission of IRG is to help clients make faster and better decisions about product strategy, market entry, and market development. Katsaros and Christy recently published a book on high tech business strategy *Getting It Right the First Time* – Praeger, 2005 [www.gettingitrightthefirsttime.com](http://www.gettingitrightthefirsttime.com).



---

## Table of Contents

1.	<b>Introduction .....</b>	<b>1</b>
2.	<b>Framing the Discussion .....</b>	<b>1</b>
3.	<b>Paths Not Taken .....</b>	<b>2</b>
4.	<b>Thinking About Hypervisors .....</b>	<b>3</b>
5.	<b>The Overarching IT Challenges .....</b>	<b>5</b>
6.	<b>What Does Microsoft Know About IT Life Cycle Costs? .....</b>	<b>5</b>
7.	<b>Microsoft System Center, the Dynamic Systems Initiative and Models .....</b>	<b>6</b>
8.	<b>Infrastructure Maturity Models, Assessments and Optimization .....</b>	<b>7</b>
9.	<b>Summary and Implications to Other Vendors.....</b>	<b>9</b>



# 1. Introduction

As Microsoft cranks up the Hyper-V sales and marketing efforts much will be said about Microsoft virtualization and how it is different from VMware's offering. It will be easy to diminish what Microsoft says as an attempt to change the discussion from the fact that Microsoft is late to market and clearly behind VMware in key product aspects<sup>1</sup>. For those who are waiting gleefully for the downfall of Microsoft it will be hard to convince them differently. For others we hope to provide some valuable perspective and illumination on the important topic of virtualization and (to us) the fascinating competition between VMware and Microsoft.

At the root of all of this is improving the cost-efficiency of IT. Microsoft has a long term initiative (the Dynamic System Initiative) that has been underway for more than five years and has shown real improvements in the operating economics of Windows Server computing. The one-time saving achieved when consolidating a data center with VMware is more dramatic. The question is whether thinking about all of this from a virtual machine perspective is fundamentally better or whether in the long term virtualization will be only one cog in the Dynamic Systems (more recently Dynamic IT) process.

# 2. Framing the Discussion

Diane Green always emphasized that VMware was a "hypervisor company" and directed her team to focus on the support and application of hypervisor based system technology (her interpretation of "virtualization"). VMware found a rich vein of opportunity starting with data center consolidation and now disaster recovery and rapidly built a large and profitable software company.

Microsoft agrees that hypervisor-based virtualization is an important element of IT, but views this form of virtualization as only one piece of a much larger and more interesting picture. Microsoft argues that you need to care a lot about what goes into the virtual machine image and not just manage virtual machine images: (a) you need to carefully manage the components of the virtual machine (the O/S image and application image) to keep them up to date and patched for newly identified vulnerabilities, (b) you want to minimize the number of O/S variants in the data center just as you want to minimize the number of different

---

<sup>1</sup> Most notably the first release of Hyper-V is without any real equivalent to VMware's Vmotion that enables moving a "live" application from one server to another.

hardware platforms; (c) the hypervisor can be much smarter if it understands how the operating system works and communicates with it (VMware agrees but doesn't build the operating systems it virtualizes – mostly Windows – Microsoft has an unfair advantage since it builds both hypervisor and operating systems).

If Diane is right and this is all about hypervisors then it is in Microsoft's best interest to deflect the conversation as possible because otherwise Microsoft is mostly late to the market. On the other hand, what if Microsoft is right and there is much to be gained by applying the learning of virtualization (abstraction and automation) much more broadly? In this case VMware is the weak player in the game simply because Microsoft participates much more broadly in modern IT.

There are many ways in which we could contrast these alternative views. We think the right framework is to consider the overall impact on the economics of IT – which approach does a better job of helping a CIO do more for less? Choosing this perspective might seem to be jumping immediately on the Microsoft bandwagon because they are a much bigger company with a much broader set of products. But if you ask why hypervisor virtualization has taken off so rapidly and had such a big impact the answer is precisely because it made a visible difference on IT economics and helped VMware customers do more for less.

### 3. Paths Not Taken

Virtualization is a very broad topic. There are many other reports we could have written but didn't. Some of the important choices made are these:

1. We have focused here on VMware and Microsoft and for this report not on Citrix and Xen. The Xen open source project and XenSource (the company built to provide commercially support and products for Xen and subsequently purchased by Citrix) have played a large role in evolution of virtualization to where it is today; Citrix is bound to play an important role in desktop virtualization building on their leadership in remote application delivery to date. All that notwithstanding we have chosen here to focus on the competition between VMware and Microsoft.
2. Although the primary business of virtualization to date has been within the enterprise (data center consolidation, disaster recovery) over the next five years it will profoundly impact cloud computing as well. That fact notwithstanding we have chosen to focus here on the issues within the enterprise and leave the other topic for later.<sup>2</sup>

---

<sup>2</sup> The cloud topic is at once separate and intertwined given that Microsoft promotes a strategy of software and services which emphasize that enterprise version of cloud services is key.

## 4. Thinking About Hypervisors

This is not going to be a technical discussion but we have to ground it in the facts about hypervisor virtualization. A hypervisor is software that emulates what the raw hardware of a server does<sup>3</sup>. A virtualized server is like a timeshare machine of the past except that rather than running multiple applications on a single server (timesharing) we're now running multiple independent (virtual) servers on one hardware platform.

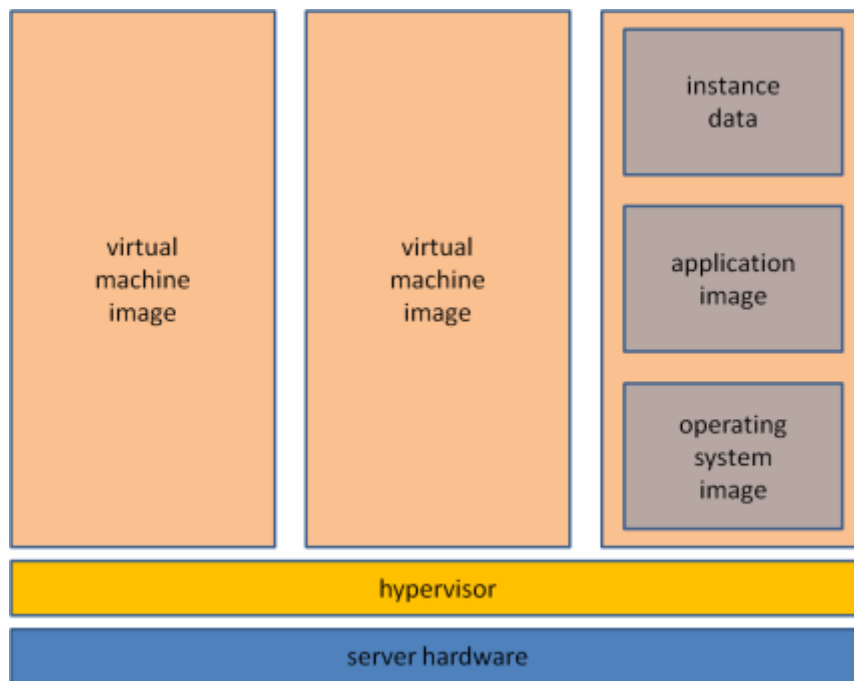


Figure 1: Virtualized Server and Virtual Machine Image Layout

There are two huge advantages to virtualizing servers: (1) It enables a large reduction of the number of servers required since the needs of many simple physical servers can be consolidated onto a single machine (with attendant benefits of space, power and cooling) and (2) It breaks the dependence of a particular server on a specific hardware configuration. Prior to virtualization increasing application capacity would take between 3 weeks and 3 months because a new server had to be ordered, installed, built and then provisioned. With virtualization the same process takes less than an hour and enables the data center to be built on a fewer number of platform types.

A set of hypervisor enabled servers and the attendant control system (an application that VMware calls Virtual Center) are able to quickly deploy and run essentially any application that can run on standard Intel hardware without

<sup>3</sup> To be precise, in today's systems this function is done by a combination of the hypervisor and some additional hardware that Intel and AMD have recently added to PC and server CPU's.

regard to the operating system or version on which it is built. This is the essence of the “hypervisor” value proposition and the practical value is clear from the rapid and enthusiastic acceptance of VMware.

Although hypervisor-based virtualization is clearly very valuable, here are a set of real issues that all motivate at least considering Microsoft’s argument that the virtual machine is better thought of as a container rather than an atomic element of system operation:

- Virtualization makes it easy to have a lot of different operating system variants running on the data center. From a security and operational reliability perspective that’s not a good idea.
- It seems obvious that the more the hypervisor knows about what the guest operating system and application are doing the more intelligently the virtualized server can be managed. The fact that any X86 system can be virtualized is very powerful, but that doesn’t mean that “seeing” inside isn’t useful<sup>4</sup>.
- If you carefully manage the guest operating systems being used then you end up with a large number of virtual machines each with a private version of the same operating system, better than having many different versions running but not ideal. With a more intelligent cooperation between the O/S and hypervisor much of the O/S image could be shared greatly reducing the overall server memory required.

Finally, why should you care about this difference anyway? Given the impact of virtualization and the change this implies for many other parts of IT (e.g., security) a significant part of the IT industry and most enterprise customers have a vested interest in understanding how this competition is likely to evolve. If Microsoft’s view of virtualization is materially better, that would be important. On a more specific level, what do you do if you’re a vendor like Cisco with a strong interest building data center network solutions that are synergistic with virtualization? Cisco is a strong VMware partner and VMware investor. As such it’s not surprising that they sing from Diane’s songbook and it’s all about the hypervisor and virtual machine images. What if Microsoft is right? Would that change the kind of data center network you would want?

---

<sup>4</sup> These are all complex issues that are necessarily simplified here. For example, VMware has defined a set of hypervisor APIs by which a virtualization aware guest (a “paravirtualized” or “enlightened” O/S) can give more information to the hypervisor. It isn’t clear if or when various versions of Windows will take advantage of that compared to when comparable optimization is in Hyper-V. Today VMware does a better job of memory optimization just by watching for data to be written to a memory page (until then a page can be shared). Microsoft has suggested a higher-level integration between Windows Server and Hyper-V.

## 5. **The Overarching IT Challenges**

We've said that we will examine this topic in terms of the challenges that modern IT faces. The challenge to IT is simple: do more (do better) for less money.

Virtualization took off because of the direct role it plays in implementing this mission. A virtualized data center costs less and operates more reliably. Using virtualization to create a disaster recovery solution is dramatically cheaper than previous methods and improves application availability. The question then is whether Microsoft's broader view of "virtualization" is tangibly better for this mission?

Improving the IT cost efficiency isn't easy. The majority of the IT budget is spent maintaining and operating what already exists. There aren't any silver bullets. In order to improve IT cost efficiency you have to understand how customers spend money and then work with them to reduce those costs. The hard part is that the money spent for new products isn't that important. If Microsoft reduced the price of Windows Server 2008 by 50% it wouldn't help their customers that much compared for example with what Microsoft is trying to do: improve the Windows offerings so the cost of ongoing operations is reduced. Reductions in OpEx are much more important if possible. This perspective – attack costs indirectly – turns out to be at the center of our analysis.

## 6. **What Does Microsoft Know About IT Life Cycle Costs?**

Microsoft cares more about IT Life Cycle Costs than you might expect given their geeky and developer focused persona. First, Microsoft successfully sells software across a broad swath of IT and works with their customers to make those products better over time. Second, in the last five years Microsoft had the epiphany that they potentially deliver more value to their customers indirectly (by helping reduce these larger costs) than they could by just adding to new features and functions to the products themselves. To explain this in a little detail we'll talk about Microsoft's long term initiative in systems management, and their use of infrastructure maturity assessments.

## 7. Microsoft System Center, the Dynamic Systems Initiative and Models

Microsoft's System Center is a product line where Microsoft's focus on life-cycle cost reduction is clear.

Five years ago Bob Muglia<sup>5</sup> hired Kirill Tatarinov and together they started to strengthen the Microsoft systems management story. At that time systems management was a Windows Server liability. Over the last five years Microsoft's systems management portfolio (now branded as Systems Center) has become a real asset as well as a nearly \$1B product line. System Center is an excellent example of how Microsoft can more than neutralize the "cost" of the Windows Server license by providing functionality (system management) that more than makes up in overall lifecycle costs for the cost of the Microsoft licenses. If you consider the overall cost of running a set of servers, Microsoft argues (with substantiation) that it is cheaper to run Windows Server with Systems Center than to do the same applications on LINUX despite the fact that that LINUX is "free."

Microsoft has a specific vision for the long-term evolution of systems management that they have called the Dynamic Systems Initiative<sup>6</sup> (DSI) that helps explain in turn why the Microsoft view of virtualization is different at the VM level. The long term goal is to help customers incrementally automate their IT operations (automatic capacity management, automatic problem detection and remediation, etc.) thereby reducing operating costs and improving quality. IBM tried to do this in past with an initiative called "Autonomic Computing" that wasn't really successful. DSI is very different from Autonomic Computing.

Microsoft believes that the key to ultimately cracking this important challenge lies in capturing essential details about the design and performance assumptions of an application component or system, and using all this contextual information as part of the solution. In Microsoft's somewhat confusing terminology this is capturing key "models" in a machine readable form and using these models as an essential element of the solution. Microsoft's conclusion is that Autonomic Computing failed to achieve its goal because it's impossible to adequately understand what systems and applications do just by observing them execute – you need to know more about how they were designed and why. Microsoft would extend this and point out that VM's are just as cryptic as application binaries and that you have to get down to the software components that constitute the VM before you have enough information to manage the overall process. This is one of the reasons why Microsoft doesn't think of a virtual machine as an atomic entity, instead viewing it as necessarily formed of an O/S image, and application image, and various instance data.

---

<sup>5</sup> The Microsoft executive responsible for the Server and Tools Business (STB)

<sup>6</sup> Muglia describes this as a ten year program now about half-way done.

DSI addresses ultimately the complete life cycle management of IT from the business process down to the physical network and servers. Microsoft's System Center Operations Manager (formally known more colorfully as MOM) is a management tool for all of these IT levels down to the raw hardware whereas VMware offers a tool only for virtual machine management (Virtual Center) – just one of the levels. System Center already has a lot of functionality for the management of the core components of virtual machines (e.g., update management).

Later this year more details in Microsoft's investment in this area will come out when various aspects of what Microsoft calls "Oslo" are introduced at PDC 2008, including a repository for models of many forms and a new process server capable of executing a particular form of application structure based on Windows Workflow Foundation and Windows Communications Foundation. Although Microsoft has not yet revealed any of their go-to-market focus for Oslo it is quite possible that one of the applications could be for the rule based management of virtual machines (the implementation of this broader vision). In all likelihood it will take more than five years to complete the Dynamic System vision, but it should be clear that this is much more than just marketing hype. Dynamic IT is a broad effort to reduce the cost and improve the quality of the entire IT stack.

Microsoft believes that ultimately the value of virtualizing many levels in the IT stack – not just the hardware level – has a much bigger contribution than has been achieved by hardware virtualization already. But in order to achieve these additional savings it is necessary to apply the learning of virtualization – abstraction and automation – to the key components within the VM – specifically the operating system and the applications – as well.

## 8. Infrastructure Maturity Models, Assessments and Optimization

Several years ago Microsoft began an effort with outside consultants to survey customers and ask about the "infrastructure"<sup>7</sup> they had in place and their cost-of-ownership figures (e.g., cost per year to manage and service each PC). The data gathered was very useful because it showed that infrastructure investments did yield significant cost-of-ownership returns, and that you could think of infrastructure elements as being clustered into a number of layers, with ROI maximized if built out a lower level of infrastructure first and then moved on to upper layers. Microsoft identified infrastructure maturity levels as Basic (no real benefit), standardized (the orderly deployment of infrastructure) and rationalized (the orderly deployment and increased management). Later Microsoft added a

---

<sup>7</sup> Infrastructure means all the tools, process and organization in place in addition to the basic systems, platforms and applications. For example, directory systems or a change control process would be considered infrastructure. See [www.microsoft.com/io](http://www.microsoft.com/io) for more detail.

further stage – Dynamic – giving their view of the incremental value of an evolution to a process-led and model-driven automation of IT.

Microsoft has found this initial study to have been of high value. It has helped rationalize the product and technology development roadmap. It has also proven an excellent basis for customer contact. Microsoft continues to do infrastructure assessments with customers, adds the data they collect to their growing data base, and uses the discussion as a means to develop with the customer a rationalized infrastructure investment plan that is easier to sell to management, and often increases the spend with Microsoft.

We claimed earlier that Microsoft knows a surprising amount about IT cost of ownership. These maturity model studies are a good example especially because they are an important part of Microsoft's ongoing dialog with their customers.

## 9. Summary and Implications to Other Vendors

VMware timed the virtualization opportunity perfectly. The power of inexpensive CPU's made virtualization practical. The increased focus on IT cost effectiveness over the last five years created the high market demand. Because virtualization could be accomplished relatively easily (replacing physical servers with virtual servers) and delivered economic return far beyond simple technical progress (faster with more features) virtualization has swept through IT with remarkable speed. Diane Green has focused their effort on the value of the hypervisor and that bet has paid off handsomely to date.

Given VMware's success and the high business value attributed to hypervisor-based virtualization it's not surprising that many on the outside also think that virtualization must be all about the hypervisor.

In the announcements that we anticipate at VMworld 2008 VMware will talk about virtual machines along with more metadata that describes what is in the VM and how the VM should be deployed. This all makes sense, but as it happens the strength of Microsoft's view will increase. Given that in a Windows dominated application environment (the sweet spot of virtualization today) this will be attributes that Microsoft has much more knowledge and control of than does VMware, Microsoft's competitive stature we think will grow as well. This would be true in any case. The fact that Microsoft has a long term initiative along these lines amplifies it.

Microsoft has a much broader and in many ways more interesting perspective on the topic realizing that abstraction and automation (the essence of virtualization) bring potentially large value at many levels in the IT stack, not just for virtual machines and hypervisors. Microsoft is almost certain to play a major role in virtualization. Other vendors building products for a virtualized world (e.g., data center networking) would do well to pay close attention to Microsoft's view of virtualization as well as VMware's. They are quite different and the differences have real business implications.