

Taking control of the virtual image life cycle process

Putting virtual images to work for you



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Introduction

Virtualization continues to lead a sea change for enterprise-scale data centers and cloud environments, delivering well-established benefits such as cost savings, reduced physical space and power requirements, simpler and more flexible testing environments, faster server provisioning, and improved ROI. Yet for many organizations, one of virtualization's greatest benefits is only now being realized in the form of highly portable and flexible virtual images. A natural extension of virtualization technology, virtual images help organizations achieve even greater efficiencies and cost savings.

Virtual images explained

Virtual images are essentially large binary files that may contain operating systems, applications and middleware. These encapsulations of a configured application environment—which may

also contain other information such as patches or integration code—serve as the building blocks for application deployments that can have variable parameters, integration with middleware, and other customizations.

Virtual images are a small but very important part of a larger virtualization ecosystem that includes other components including virtual machines. Although they sound similar, the difference between a virtual image and a virtual machine is distinct: a virtual machine is an isolated software container created to run on virtualized platforms with four virtualized resources (CPU, RAM, storage and networking) but still requires the installation of an operating system and applications or requires a virtual image to provide them. Once deployed, a virtual image functions as a virtual machine with a preinstalled, preconfigured operating system and an application stack optimized to provide a specific set of services.

These workloads are deployed as virtual images on hypervisors such as VMware, IBM PowerVM™, IBM z/VM® or KVM. These hypervisors provide a layer of abstraction between operating systems and physical resources on a machine, which enables multiple operating systems and application stacks to run on a single physical resource, enabling higher levels of resource utilization.

Virtual image challenges

Because virtual images are so easy to create and copy into new virtual environments, their proliferation has become a growing challenge for organizations. With thousands of images in a virtualized environment, it can be difficult to know which images are really needed, which images need additional governance, and which images are just taking up expensive storage space, who owns the images, and even what is in the image. This so-called image sprawl is one of the biggest problems that organizations with virtualized data centers need to wrap their arms around.

Another major challenge with virtual images is the difficulty in creating a system of virtual servers from individual virtual machines in order to provide a multitiered distributed service to customers. Finally, customers are looking to adopt an image management approach for higher-value applications including composite images that may run on multiple virtual machines. The ability to make virtual images portable across various configurations in the enterprise by depersonalizing them and then automatically adding the location- and environment-specific information during deployments opens image management to many more high-value customer use cases. And for cloud computing, organizations need a workflow for the deployment of virtual images that can be customized and governed based on deployment parameters and topologies.

Businesses need a way to build, manage and deploy images—both those created internally and those purchased from vendors—to various virtualized platforms in a scalable manner. This is important in order to keep track of configuration settings, patch levels, versions, and licensing status. Once images are deployed, organizations need tools to rapidly monitor and update images, track changes, and conduct audits. These maintenance activities should extend to dormant images too, as they may require security patches to prevent malware from inadvertently spreading across the IT infrastructure. Finally, businesses need to be able to integrate their deployed images within their existing processes and management tools.

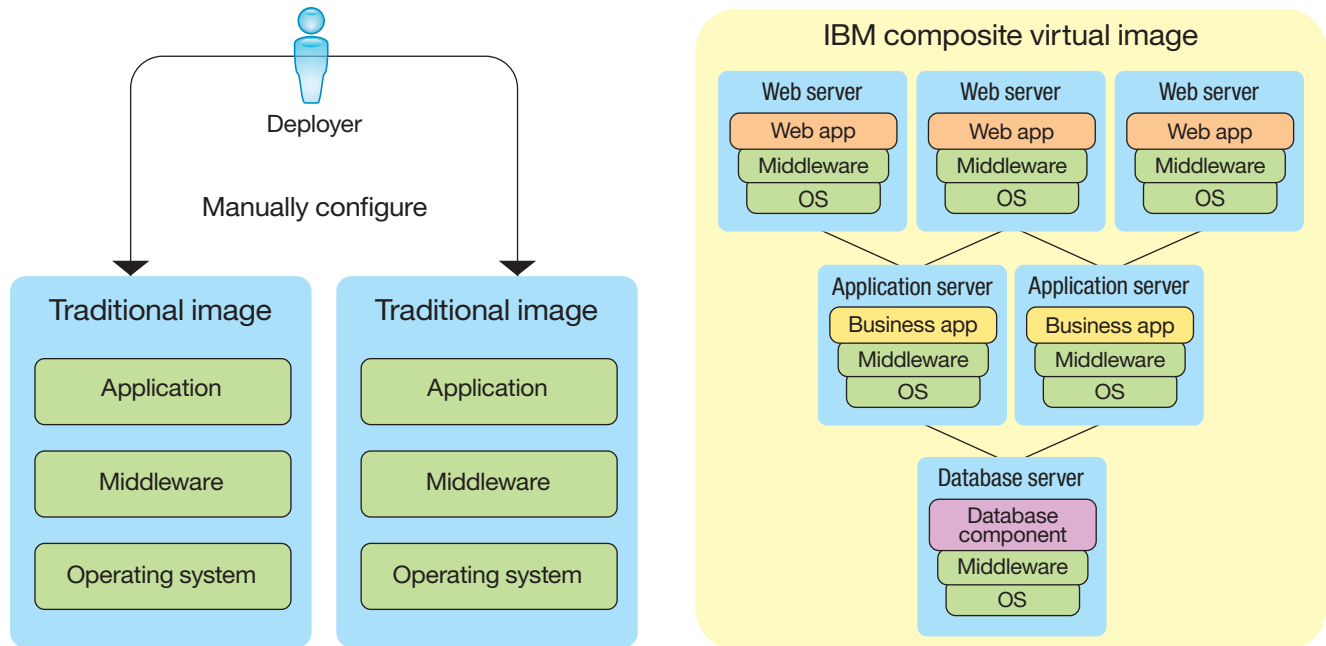
Because virtual images have so many variable parameters including integration with other middleware and customizations, organizations using virtual images can quickly become overwhelmed with the management and governance of virtual images. This ever-increasing complexity can threaten the ability of IT organizations to focus on innovation and new services for

their customers, because they must instead spend a significant portion of their time on mundane or repetitive tasks such as maintaining a library of virtual images or manually building virtual images.

Composite virtual images

A new type of virtual image—a composite image—seeks to alleviate some of the challenges of traditional virtual images. Composite images provide users with valuable insight into the structure of the image's components, thereby allowing them to deploy the images in an on-demand fashion to many different hypervisor targets. A composite image can include components from a multitiered application that can be deployed on multiple virtual machines and then be reconnected. For example, a multitiered application could have one or more web servers on one virtual machine, an application server on another and a database server on yet another. A composite image captures all three images, plus the metadata about how they are connected with each other, so it can be redeployed as a composite image somewhere else.

Because traditional virtualization solutions treat virtual images as standalone objects, there's no way to understand the relationships between them. By not knowing how an image is configured to work with other images, users are missing a key piece of information that could help them understand the interrelationships between the various pieces. With composite images, users can deploy a single image collection that contains all the individual images that work together, and then the captured configuration information can be used to reestablish the relationships between them so that they run together like they did before. The composite image collection acts like a template for creating these systems of virtual servers—which is why the process of creating a composite image is called templatization.



Traditional virtual images are unable to capture the interrelationships between various image components. IBM composite virtual images capture metadata about how the components are connected with each other.

Virtual image life cycle solutions

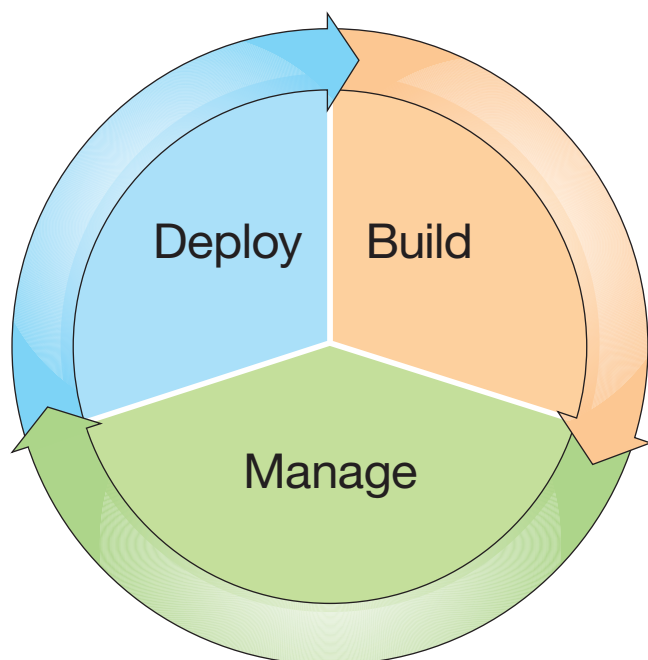
Clearly, organizations need a way to take control of the virtual image management process with an advanced life cycle solution that can help organizations build, deploy and manage virtual images and machines. IBM recognizes this need with an array of intelligent products designed to help rein in image sprawl, reduce time to service, provide automation, boost employee productivity, and lower operational expenses.

Here's a look at the three parts of the process and how IBM products and services can help.

Step 1: Build

Making a virtual image begins with the steps of capturing an operating system, then adding the necessary middleware and applications. Once captured, you can deploy as often as needed.

Image lifecycle management



An effective image life cycle management solution provides a continuous cycle of image management processes.

With IBM Tivoli® Provisioning Manager 7.2.0.1, organizations can help optimize efficiency, accuracy and service delivery by automating best practices for data center provisioning activities. With support for IBM AIX®, Linux®, Solaris and Microsoft® Windows®, this general-purpose solution helps you capture virtual images for rapid redeployment by automatically provisioning software and configurations to Windows servers and clients. The solution supports the Distributed Management Task Force's Open Virtualization Format (OVF)—an industry-standard, platform-independent, efficient, extensible, and open packaging and distribution format for virtual machines.

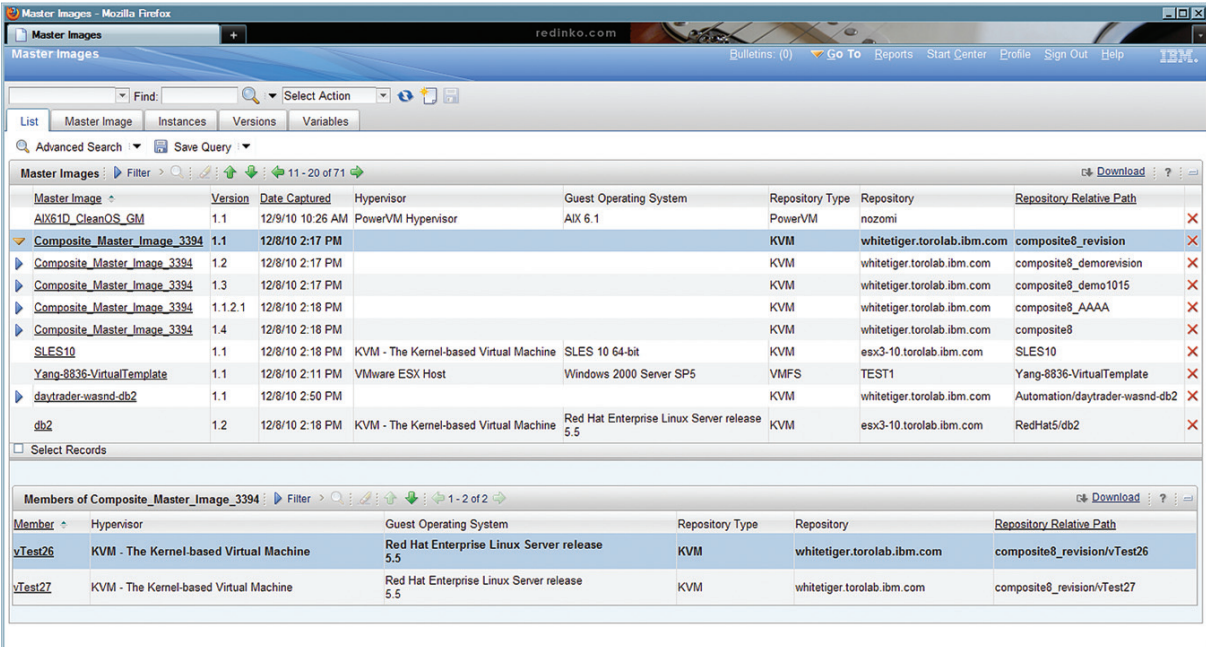
While composite images are desired within a production environment, it is necessary to support earlier stages of the application life cycle where the composite application is changing and needs to be deployed on a regular basis for testing purposes. To support development teams that strive to be agile, it is necessary to automate deployment processes to reduce errors and provide repeatability. The IBM Deployment Planning and Automation capability provides a comprehensive solution that allows organizations to plan, automate, and govern the deployment of composite applications, reducing time, resources, and costs of deployments. Using organizational standards, teams can quickly and easily specify an application's deployment into a composite virtual environment and automatically generate the infrastructure and application workflows that are exposed as a service catalog entry in the IBM Service Delivery Manager catalog. For organizations developing their own software, this solution plugs directly into the Rational® development suite for improved collaborative application life cycle management. Communication barriers between development and operations teams are now overcome with a common toolset and communication mechanism for application deployments.

Step 2: Manage

Any management system needs to be able to pull information from the build and deployment stages to better manage the deployed image. This should include capabilities for versioning, patching and updating images, as well as the ability to capture images from a running system which can then be modified for deployment in other locations or simply restored in its original location. In the event of a problem, you also need to be able to track relationships between golden master images and copies of the master that have been distributed between the repository, which is where the images are stored, and a library, which is where the images are cataloged and managed.

Through a component of Tivoli Provisioning Manager called Federated Image Library, users have a single point of control to access all images, whether they are in an IBM intelligent image repository, or in other repositories like a file system or other

hypervisors. With an intelligent repository, you can remove duplication among images to save storage space, and you can also make offline changes to the image so you don't have to bring up each image if you want to update or patch them.



The screenshot shows the Tivoli Provisioning Manager Master Images interface. The main table lists master images with columns for Master Image, Version, Date Captured, Hypervisor, Guest Operating System, Repository Type, Repository, and Repository Relative Path. A secondary table shows the members of a specific composite master image.

Master Image	Version	Date Captured	Hypervisor	Guest Operating System	Repository Type	Repository	Repository Relative Path
AIX61D_CleanOS_GM	1.1	12/9/10 10:26 AM	PowerVM Hypervisor	AIX 6.1	PowerVM	nozomi	
Composite_Master_Image_3394	1.1	12/8/10 2:17 PM			KVM	whitetiger.torolab.ibm.com	composite8_revision
Composite_Master_Image_3394	1.2	12/8/10 2:17 PM			KVM	whitetiger.torolab.ibm.com	composite8_demorevision
Composite_Master_Image_3394	1.3	12/8/10 2:17 PM			KVM	whitetiger.torolab.ibm.com	composite8_demo1015
Composite_Master_Image_3394	1.1.2.1	12/8/10 2:18 PM			KVM	whitetiger.torolab.ibm.com	composite8_AAAA
Composite_Master_Image_3394	1.4	12/8/10 2:18 PM			KVM	whitetiger.torolab.ibm.com	composite8
SLES10	1.1	12/8/10 2:18 PM	KVM - The Kernel-based Virtual Machine	SLES 10 64-bit	KVM	esx3-10.torolab.ibm.com	SLES10
Yang-8836-VirtualTemplate	1.1	12/8/10 2:11 PM	VMware ESX Host	Windows 2000 Server SP5	VMFS	TEST1	Yang-8836-VirtualTemplate
daytrader-wasnd-db2	1.1	12/8/10 2:50 PM			KVM	whitetiger.torolab.ibm.com	Automation/daytrader-wasnd-db2
db2	1.2	12/8/10 2:18 PM	KVM - The Kernel-based Virtual Machine	Red Hat Enterprise Linux Server release 5.5	KVM	esx3-10.torolab.ibm.com	RedHat5/db2

Member	Hypervisor	Guest Operating System	Repository Type	Repository	Repository Relative Path
vTest26	KVM - The Kernel-based Virtual Machine	Red Hat Enterprise Linux Server release 5.5	KVM	whitetiger.torolab.ibm.com	composite8_revision/vTest26
vTest27	KVM - The Kernel-based Virtual Machine	Red Hat Enterprise Linux Server release 5.5	KVM	whitetiger.torolab.ibm.com	composite8_revision/vTest27

The Tivoli Provisioning Manager Federated Image Library helps users manage their virtual images from a single point of control.

For x86 users, Tivoli Provisioning Manager for Images provides the value of OS deployment to physical environments and also helps reduce labor costs by better managing image sprawl by automatically discovering, capturing and storing images in a central repository.

For organizations moving to cloud computing, Tivoli Service Automation Manager enables users to request, deploy, monitor and manage cloud computing services to help lower the cost of service delivery through automation and reduced skill requirements. It offers an integrated management capability that addresses the life cycle changes of a cloud service.

IBM WebSphere® CloudBurst™ Appliance offers cloud-based deployment of middleware application patterns in a secure hardware device. This solution accelerates the capabilities of infrastructure-centric solutions like Tivoli Service Automation Manager by allowing users to access WebSphere and IBM DB2® virtual images and patterns easily and quickly, creating application environments that can be deployed securely and managed in a private cloud.

Step 3: Deploy

In this stage of the process, images are taken from storage to create an instance of the image for booting the system and attaching data where needed. This includes any customization of the image, such as specifying the IP address and port number, for the deployed instance. For a customer trying to deploy an application first in their test environment, then the preproduction environment, and then the production environment, they would be required to rebuild each of those systems independently. IBM allows you to deploy it once, capture it as a golden master image with a new version number, redeploy it somewhere else, change it around, capture it again with a new version number, and redeploy it in a third place.

One issue that arises from older virtual images is that numerous patches may have been issued since the image was created. Left unpatched, these virtual images could create a security threat in your organization. After a patch is released, the patched version of the virtual image must be proliferated to other places that can recapture them as golden images and then redeploy them. IBM Tivoli Endpoint Manager for Lifecycle Management gives users an automated, simplified patching process that can administer virtual images from a single console. This, combined with Tivoli Provisioning Manager's ability to capture golden image

templates and redeploy, version and track image provenance, allows the customer to maintain the golden images and all of their cloned instances in a current, patched state.

Advanced virtual image management in action

Organizations in many industries are meeting the challenges of image management head-on using IBM virtual image management solutions. For example, a leading provider of retirement and insurance products and services uses Tivoli Provisioning Manager, Tivoli Service Automation Manager, and other IBM management tools to consolidate 16 data centers down to just two virtualized data centers using a cloud delivery model. Because deployment of the company's virtual images is now based on standardized images, it can do patching more rapidly and efficiently by simply updating the golden image and then redeploying the new instance of the patched image across the organization.

Getting your feet wet with virtual images

For organizations still familiarizing themselves with the powerful advantages of virtualization, advanced solutions designed to help control virtual image sprawl may be more than what is needed. IBM offers two products that can cover the basics of virtual image building, managing and deployment. For organizations that are not dealing with a cloud delivery model, or for companies that are just starting off with virtualization, IBM Systems Director VMControl™ for IBM Power Systems™ and IBM System z offers a simple way to help deploy and store operating systems as virtual images. Once installed, VMControl seamlessly integrates into Systems Director's browser-based interface and can import, deploy, capture and maintain best-practices virtual server images and store those images in an image repository.

Tivoli Provisioning Manager for Images is designed to help organizations reduce the time and costs associated with desk-side support and direct interaction with target systems. Available for Linux, Solaris and Windows, this solution allows you to standardize on fewer golden master images for heterogeneous systems through universal image, driver injection and optimized image repository features. It automates remote deployment of operating systems from one simple interface and helps reduce costly on-site support.

For more information

To learn more about IBM image management solutions, contact your IBM representative or IBM Business Partner, or visit ibm.com/tivoli and ibm.com/rational/cloud/deployment

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