

VMware® Infrastructure 3

Advanced Technical Design Guide

~and~

Advanced Operations Guide

Two books in one!



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Chapter 6: Rapid VM Deployment

Within a VM there are many methods to automate the VM's creation. Some companies persist in using PXE booting within the VM to leverage their existing deployment tools such as Microsoft RIS, Alteris, or HP's Rapid Deployment Pack. Additionally, there are free virtual appliances which are geared up to deploying various operating systems to a VM, one being the Ultimate Deployment Appliance. Quite often this is done to save time by removing the need for validating existing configurations. Another reason may be merely political – making it easier to implement VMs by changing as little as possible about existing business practices or procedures.

We can create a new VM exclusively to VMware VirtualCenter merely by duplicating an existing VM – a process referred to as cloning or templates. Some older users of VMware refer to this as a “golden master,” but whatever term you choose to use – template, clone, image or golden master – they all mean the same thing; you've taken an existing VM and copied it.

Before you create a template you need to ask yourself a couple of questions. Firstly, how big would you like the guest operating system boot partition to be? When you create a new VM *from* a template there is no easy way to adjust on-the-fly the size of the VM's hard-disk. Secondly, how much software beyond installing the operating system and VMware Tools will you include in your base OS? For example, you might wish to consider including other things such as a service pack, hot fixes, anti-virus, and possibly even a backup agent. Most people balk at the idea of including products such as Active Directory, Citrix Presentation Server, or Microsoft SQL which experience has shown to create more problems than they solve. Sometimes vendors do not support it, and if they do their products often need extensive pre and post-preparation. The length and reliability of such steps are sometimes so long and unpredictable that such products are often installed by secondary scripts after the VM has been created. This can sometimes mitigate the template process being “blamed” by application owners as being the source of their problems.

Creating a template of a VM doesn't just duplicate the VM's virtual disks. Additionally, the VM's .vmx configuration file is duplicated and renamed with .vmtx extension. This means that all the settings behind your VM are being dupli-

cated, too. This saves time by reducing the number of wizards and dialog boxes you need to answer and complete.

GOTCHA:

This can also include undesirable settings like connections to removable devices such as CD-ROMs or floppy disks – as well as connections to internal switches. These settings are undesirable because they cause problems with VMotion and DRS. Disable these devices before taking your template.

In the past, one of the challenges of templates was keeping their software up to date. This is the same challenge PC deployment people face when using disk cloning software to build new PCs. It is relatively easy to build a PC and duplicate it with PowerQuest Drive Image Pro or Symantec Ghost. The tricky thing is keeping the library of images current. The same problem bedevils templates in VMware, not least because whenever a new build of ESX is released VMware Tools also requires a software upgrade, too. A new feature called “convert to template” significantly eases the management of templates – and makes it incredibly easy to keep the software inside a template with regular updates such as:

- Windows Updates
- YUM Updates
- Anti-Virus Definitions

There are three main ways to create a template:

- **Clone to Template**

This copies the VM and converts it to the template format. If you have used previous versions of VirtualCenter, they are just like a conventional template in VirtualCenter 1.x. During the creation of the template you have the ability to compact, which significantly reduces the size of the disk, but both compacting and creating a VM from this format is slower than if it was in its original format. Of course, a good reason to compact a template is to save on disk space. To use the compact format it is recommended you use a VMFS volume as the storage location.

- **Convert to Template**

This simply marks a VM as a template. It is much quicker than using “clone to template” as no copy process is generated at all. It takes seconds to mark a VM as a template and seconds to convert it back to being a VM. First you build the VM and convert it to a template, and when the software inside the template becomes stale and out of date, you can quickly unmark it back to being a VM again. Power on and run your software update. Lastly, once you are satisfied that the software is as current as it can be you convert it back to the template format. The whole process takes seconds, allows you to keep your templates up to date with the latest software, and doesn’t generate any file copy events at all.

Another way to consider this template format is merely as a VM that you can’t power on or a VM which is only used as the source for creating new VMs.

- **Clone**

There is nothing particular special about the clone option; it merely copies the VM. You do lose out on the features of “clone” or “convert” to template such as being able to copy and compress the source – and being able to quickly update the “base” VM. To clone a VM you would need rights to the VM, as you would with the other two options. But as templates can be stored and moved into other locations where different permissions reside, templates are often easier from a delegation or permissions perspective, too.

Unlike VirtualCenter 1.x., there is no specific location for templates in the VI Client interface. Most users tend to create a folder to hold them in the Inventory View of “Virtual Machines and Templates.” Of course, where they get physically stored – iSCSI, SAN, or NAS – depends on your resources. Generally, the template LUN is presented to all ESX hosts in a given datacenter to allow centralized management and access to the templates themselves.

GOTCHA:

To create a template or clone, the VM must be powered off first. You cannot create a template from a VM that is using a VMware Snapshot or if it is in a suspended power state. However, you can duplicate a VM while it is powered

on by engaging a snapshot and then exporting the virtual disks using the vmkfstools command. Usage of the vmkfstools command is covered in Chapter 10: *ESX on the Command-Line*.

Creating a Folder for Holding Templates

1. In the VI Client switch to the View called Virtual Machines and Templates.
2. Right-click your DataCenter, in my case the London DataCenter.
3. Choose New Folder.
4. Type in a name. In my case I used _Templates to make sure it was always at the top of the list in the view.

Using Clone to a Template

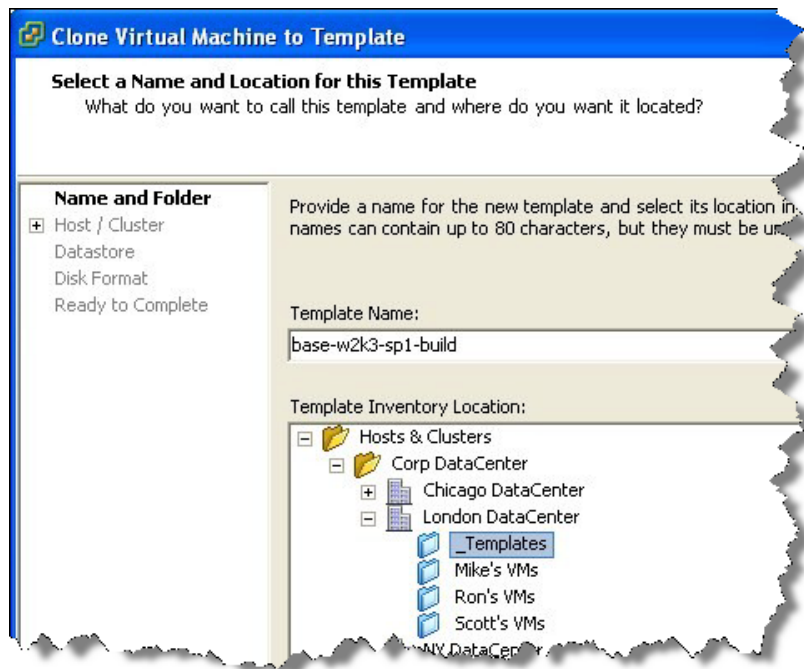
GOTCHA:

You cannot create a template while a snapshot is engaged on the source VM. You will find the options to Clone, Clone to Template, and Convert to Template are greyed out.

1. In the Inventory View, "Hosts and Clusters."
2. Select a VM you powered off as your source for the template.
3. Right-click the VM, and select Clone to a Template.

Figure 6.1 shows me typing in a friendly name such as "base-w2k3-sp1-build" and selecting the _Template Folder as the location in the inventory.

Figure 6.1



Note:

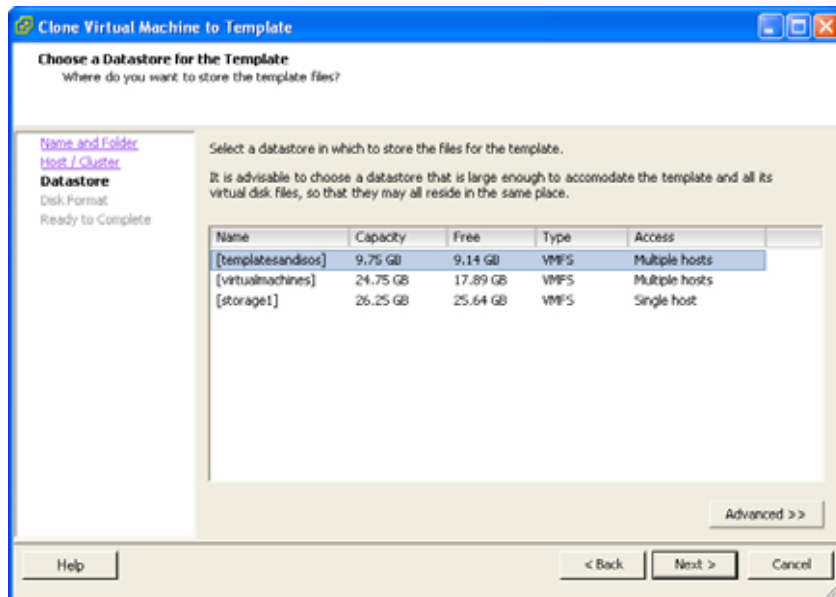
I will choose esx1.vi3book.com as the location for this template. A record is kept in the VirtualCenter indicating with which ESX host the VM was originally registered. This is not a problem so long as the template is stored on shared storage visible to the ESX hosts that will use that template. Even if that ESX host is re-installed you can still browse the datastore where the template was stored and register the .vmtx file with another ESX host.

4. Select the physical location for storing the template files.

Note:

I recommend an LUN or NAS export presented to all your ESX hosts. Figure 6.2 shows "Choose a datastore for the template" dialog which will assist you in selecting a good storage location for the template. It will show you the amount of free space, file system format such as VMFS, and, critically, if that volume is available for single host or many hosts.

Figure 6.2



5. At this point you have the choice of Normal (all storage formats) or Compact (VMFS only).

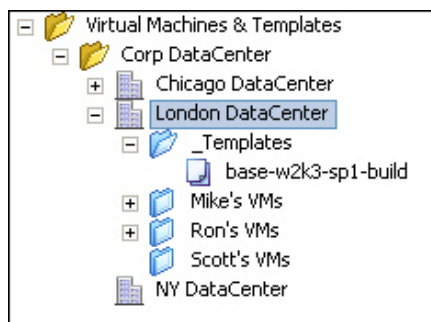
Note:

I like to keep my templates as small as possible. I'm going to use the Compact format. The compact is slower to create and deploy a template, but does save a large amount of precious space. The downside of compact is that is not easy to maintain the template and stop the software inside of it from becoming out of date.

6. Click Finish.

Figure 6.3 shows that templates appear with special icon – making them easy to identify in the inventory.

Figure 6.3



Using Convert to a Template

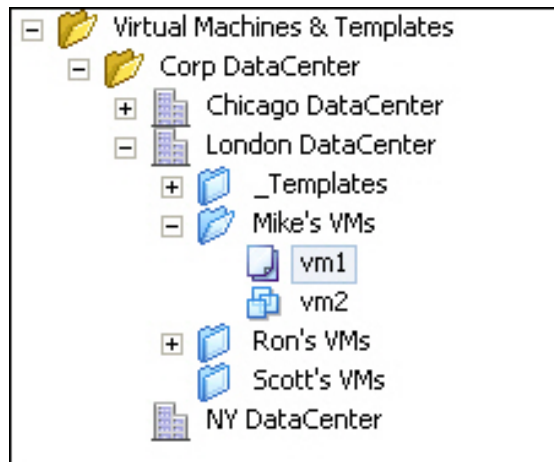
Remember, this method offers a very quick way of making a template – and unmarking it back as a VM to update your template as software changes. The only thing that feels “odd” is if you ever do this in the inventory view of “Hosts & Clusters.” If you convert a VM into a template in the “Host and Clusters” view, the VM seems to disappear from the list. This isn’t a bug, it is by design. You will find your VM in the inventory view of “Virtual Machines and Templates.”

1. In the Inventory View, “Hosts and Clusters” -
2. select a VM you powered off as your source for the template.
3. Right-click the VM, and select Convert to a Template,

Note: Notice how the VM disappears from the list.

4. Change the Inventory View to “Virtual Machines and Templates.” It will be located in the same VM Folder where it was created. Figure 6.4 shows my vm1 converted into the template format. It could be renamed, and drag-and-dropped into the _Templates folder for consistency purposes.

Figure 6.4



Note:

If you right-click a VM in this format you will find you have a “Convert to Virtual Machine” menu option. This allows you to quickly return the template to a VM, so you can easily keep the software within the VM up to date.

Creating a New VM from a Template

Before you rush ahead and clone or create a new VM from a template, you need to make a onetime change to VirtualCenter, especially if you’re creating a Windows VM. Windows cannot be duplicated without resetting a number of attributes such as:

- NetBIOS name
- Domain Membership
- IP Settings
- SID (Security Identifier)

If you are creating new Linux VMs from a template you will have less attributes to reset such as hostname and IP settings. Fortunately, VMware has integrated Microsoft's System Preparation (sysprep) tool into VirtualCenter. VMware also has some open-source scripts that help change some attributes inside Linux. Unfortunately, Microsoft does not allow third-parties like VMware to distribute sysprep as part of their product code. Instead, we must manually copy sysprep to the VirtualCenter. If you fail to do this, options in the VI Client will not appear and will be greyed out. Specifically, the "Guest Customization Wizard" option will be unavailable.

This copying of sysprep triggers VMware's "Guest Customization Wizard" which appears during the process of creating a new VM. It allows us to reset Windows attributes prior to the first proper boot of Windows. VMware uses the information gathered in the guest customization wizard to create an "answer file" to the mini-installation wizard which normally runs after running sysprep manually. VMware uses a "disk mount" service in the VirtualCenter to access the virtual disk of the VM to inject sysprep and the answer file.

There are two "features" of sysprep of which you need to be aware. Firstly, it contains a password reset of the administrator account option which does not work consistently across all platforms of Microsoft Windows. This is outlined in the VMware KB article 1965. Password reset does not work with Windows 2003 regardless of the service pack used and will not work when you try to reset the password using the Guest Customization Wizard. More specifically, this happens if you engage the option to "Delete All User Accounts" which is required for resetting the Administrator's password when it is not blank. Figure 6.5 shows this error message.

Figure 6.5



As you can see, resetting the password and using the "Delete All User Accounts" option works in Windows 2000 but not in 2003. The only way to reset passwords in Windows 2003 is if the original source of the template has no password set for the Administrator account. This is not allowed in most peo-

ple's local policy of Windows 2003. I imagine anyway that most datacenters would balk at such a configuration – it would be too easy to create a new VM from a template with no password set on the Administrator account. Additionally, it has a negative impact on other services such as the Encrypted File System (EFS) feature.

Personally, I don't use the password reset option in the Guest Customization Wizard. I prefer to set a complex password on my original source VM – and then manually reset the new VM's password before handing it over to the application owner. If you wish to use the password reset then the configuration changes with each version of Windows.

Windows 2000: Set a password for administrator.

Reset password during customization.

Enable "Delete All User Accounts."

Windows 2003: Leave the password blank.

Reset the password during customization.

Do not enable "Delete All User Accounts."

Windows XP: Leave the password blank.

Reset the password during customization.

Do not enable "Delete All User Accounts."

Secondly, if you wish your sysprep VM to join a Microsoft Domain, you must run a DHCP Server with a scope for subnet where the VM resides. When the sysprep "mini-installation" process is running it is set to be a DHCP client (even if you specify a static IP configuration during the guest customization wizard), and static IP configurations are not applied until the first full boot of

Windows. Therefore, without a valid IP configuration from a DHCP server during the sysprep process, the VM would not successfully join a domain. These “features” are attributes of sysprep – and not bugs in the VMware template process.

Lastly, at various times in VirtualCenter history, VMware has seen it fit to move the storage location in the file system of the VirtualCenter server. In a clean installation of VirtualCenter 2.x the correct location should be in:

C:\Documents and Settings \All Users\ Application Data\ VMware\ Windows\ resources\ sysprep

Adding Sysprep Support to VirtualCenter

You have some choices about how you want to run sysprep in conjunction with VirtualCenter. You can use just one version, sysprep 1.1 for all flavors of Windows, or alternatively, you can hunt down the various versions of sysprep distributed with Windows and have each version of Windows (2000, XP, 2003) use its own version.

You can find sysprep within the support\tools\deploy.cab file on most modern copies of Windows CD such as Windows 2000, Window XP, and Windows 2003. If you are running Windows Vista you will find sysprep in the \Windows\System32\ directory. You should be aware that at the time of writing there is no support the 64-bit versions of sysprep.

You can also find copies of sysprep on the Microsoft Website by searching the below listed file names:

Sysprep 1.1

Q257813_W2K_spl_X86_EN.exe

<http://www.microsoft.com/downloads/details.aspx?familyid=0C4BFB06-2824-4D2B-ABC1-0E2223133AFB&displaylang=en>

Windows XP Service Pack 2

WindowsXP-KB838080-SP2-DeployTools-ENU.cab

<http://www.microsoft.com/downloads/details.aspx?familyid=3E90DC91-AC56-4665-949B-BEDA3080E0F6&displaylang=en>

Windows 2003 Service Pack 1 Version

WindowsServer2003-KB892778-SP1-DeployTools-x86-ENU.cab

<http://www.microsoft.com/downloads/details.aspx?FamilyID=A34EDCF2-EBFD-4F99-BBC4-E93154C332D6&displaylang=en>

To begin using SysPrep:

1. Extract your version(s) of sysprep.
2. Copy them to:

C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\Windows\resources\sysprep

Creating a New VM from a Template

1. In the **Virtual Machines and Templates** view, locate your template.
2. **Right-click the template**, and choose **Deploy this virtual machine from template**.
3. **Type in a name for the new VM**, and **select a folder location**.
4. **Select an ESX host** on which the VM will run.
5. **Select a datastore** for where the VM will be stored.
6. Choose to **Customize using the guest Customization Wizard**.

Note:

This option will be unavailable and greyed out if sysprep has not been copied to VirtualCenter and your VM is running a Windows guest operating system.

The remainder of the dialog boxes should be fairly self explanatory to anyone who is familiar with Windows. If you have a copy of Windows that requires an OEM number (like all copies of Windows 2003 do) it is a good idea to input this now – otherwise the sysprep mini-installation wizard stalls waiting for user input. At the end of the Customization Wizard you will have the option to save your inputs for further use. This saves you from having to fill in the Guest Customization Wizard every time you use it. To do this, use the third option in the deploy wizard called “Customize using an existing customization specification” and enable the option at the bottom of the dialog called “Use the Customization Wizard to temporarily adjust the specification before deployment.”

Administrators will find the dialog boxes differ when creating a template from Linux guest operating system. VMware has a built-in script that executes inside the Linux guest to reset its IP and hostname settings.

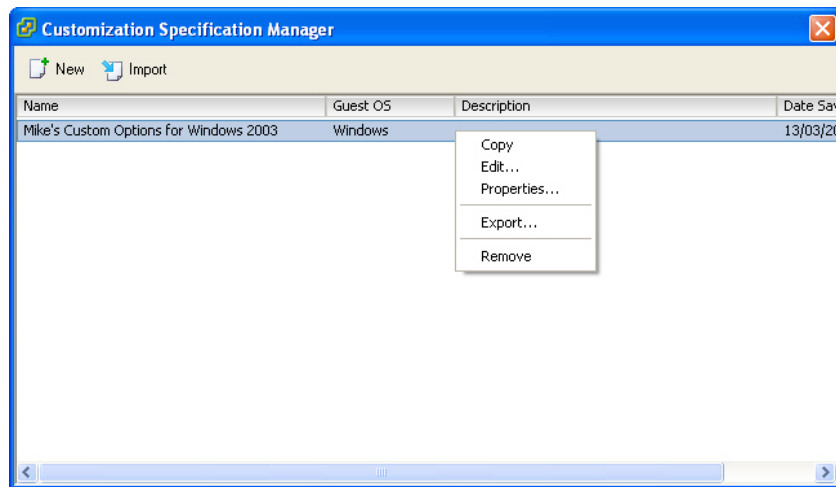
Using the Customization Specification Manager

Occasionally, you will accidentally save a custom configuration – which you would rather delete – or have existing custom configurations which you want to modify. The custom configuration manager allows you to manage these from one single UI. It allows you to:

- Copy an existing custom configuration
- Edit an existing custom configuration
- Rename an existing custom configuration (using the properties option)
- Export to an XML file
- Import from an XML file

This import feature is useful to previous users of VirtualCenter 1.x which used an XML format for storing custom configurations. You will find it in the VI Client under Edit and Customization Specifications. Figure 6.6 shows this simple application's basic functionality.

Figure 6.6



Summary

In this chapter I've tried to show you the options that you have for provisioning new copies of Windows or Linux. This is a major feature of VMware VirtualCenter. Research has shown that the provisioning process (the process of deploying a new server) can take weeks. With VMware templates we can have a new server online in a matter of hours. In fact, what might need reviewing are the other procedures that create bottlenecks in the process. Very often these are not technical issues but IT management processes such as the time it takes to request and process things like DNS Registrations, change management requests, and approvals and security audits. Alongside I/O virtualization and VDI, some people think the "next big thing" to hit IT will be management applications that automate the whole workflow process.
