



Mass Deployment of VMware Fusion

A Practical Guide to Planning, Deploying,
and Managing Windows on the Mac



| | |
|--------------------------------|----|
| Introduction | 3 |
| Chapter 1 | |
| Tools for Software | |
| Deployment on macOS..... | 5 |
| Chapter 2 | |
| Creating the VMware Fusion | |
| Mass Deployment Package | 6 |
| Chapter 3 | |
| Deploying VMware Fusion with | |
| VMware Workspace ONE UEM | 10 |
| Chapter 4 | |
| Creating Windows Virtual | |
| Machines for Mac Users | 13 |
| Chapter 5 | |
| Systems Management: Managing | |
| Windows Virtual Machines | 18 |
| Conclusion | 19 |
| Appendix | |
| Deploying VMware Fusion: | |
| A General Workflow | 20 |

Introduction

VMware Fusion and Running Windows on the Mac

While historically considered a more consumer-focused solution, Mac hardware has been gaining traction in the enterprise. A primary reason has been the rise of employee device choice in the workplace.

Employees new to the workforce have put pressure on hiring organizations to offer Mac hardware in place of the traditional Windows-based hardware. As a result, some organizations have looked to virtualization—running Windows on the Mac—to solve application compatibility challenges.

Windows-based business-critical applications, peripherals, and web applications that previously blocked the uptake of Mac hardware are now easily accessible, thanks to technologies like VMware Fusion. For department-based deployments of Macs, employee- and contractor-owned Macs, and even “Mac for Employee Choice,”

deploying Windows on a Mac with VMware Fusion opens the door to an easier, less complex way of delivering your existing Windows application portfolio to macOS.

But there also exists the use case of web and mobile application developers, who typically need access to platform-specific development tools. In the case of Apple platforms (iOS, tvOS, and macOS), most of the development tools only run within macOS and can only be tested on macOS. As Apple’s EULA requires virtual instances of macOS (which can be used for one-off testing) to run on Apple hardware, VMware Fusion can provide a critical virtualization capability for efficient dev/test workflows AND Microsoft application compatibility (Visual Studios, Office Add-Ins, etc.) without the need for multiple devices.



Software Deployment Challenges

The mass deployment of a fully-configured operating system image was historically a difficult task. Not only does image testing and creation take a great deal of time, the image is quickly outdated as software and configuration setting standards change. From this perspective, Apple made a shift away from supporting “monolithic” imaging workflows towards advocating modern management using a build-on-demand workflow.

In a modern management workflow, administrators start with a vanilla (unmodified) operating system (delivered from the factory or recovery partition) which is then transformed to current standard after enrollment with a device management system (such as VMware Workspace ONE). In the modern management age, the components supporting virtualization on macOS become just another component delivered to the device as part of the deployment workflow.

This guide focuses on tools and management systems used for mass deploying an application in macOS. It then moves on to explain how to deploy VMware Fusion with VMware Workspace ONE UEM. Then we briefly explain how to deploy a Windows-based VM and various aspects used to manage of the actual VM. Finally, the appendix covers a broad blueprint that an administrator could use to help build a deployment workflow in a non-VMware device management tool.

Chapter 1

Tools for Software Deployment on macOS

In the modern management age, the desired end-state of a user's device is a combination of configurations and applications delivered on-demand. The device management system delivers non-store software (such as VMware Fusion) as a package (.pkg), which is a bundle of files and folders. Each package is a part of the overall standard image, building upon the base operating system.

Modern management saves time for administrators in the long-term as subsequent updates to the standard configuration require dramatically less effort.

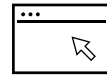
With this method, you can push out only the software needed per workstation (and assigned user). Additionally, when you need to perform an update to the operating system or a software component, you can choose to either make a new package for the item being deployed or augment the existing package to include it.

Package Creation Tools

As you build a workflow to deploy and manage VMware Fusion, you may need to create your own package or modify existing packages. A few tools typically used to create and/or modify macOS packages include:



Packages



The Luggage



Jamf Composer

Package Deployment Tools

Once you've created the package you intend to deploy, a number of tools are available for deploying software packages to managed devices:



**VMware
Workspace ONE**



munki



Apple Remote Desktop

Chapter 2

Creating the VMware Fusion Mass Deployment Package

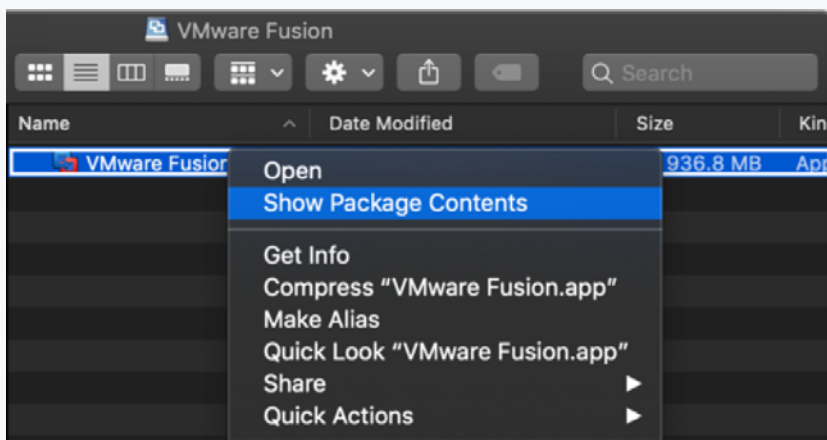
VMware Fusion includes a standard macOS package installer that has been bundled inside an installer application. As a result, installing VMware Fusion using standard package tools simply requires a user or administrator to use the package that's bundled inside the VMware Fusion installer application. The installer package can be invoked through the application or extracted from the application and run stand-alone.

To create the VMware Fusion mass deployment package, you'll need:

- The VMware Fusion application downloaded from the VMware Download Center. For more information, see [Downloading and installing VMware Fusion](#).
- Volume License Key for VMware Fusion:
Standard or Professional (Pro) Edition

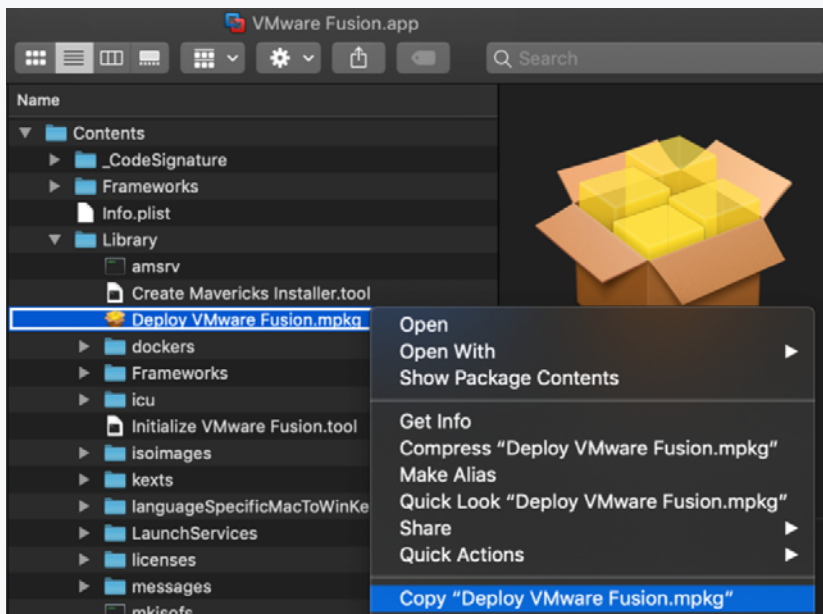
Follow these steps to create the
VMware Fusion mass deployment package:

1. Right-click the downloaded **VMware Fusion.app** icon and click **Show Package Contents**:

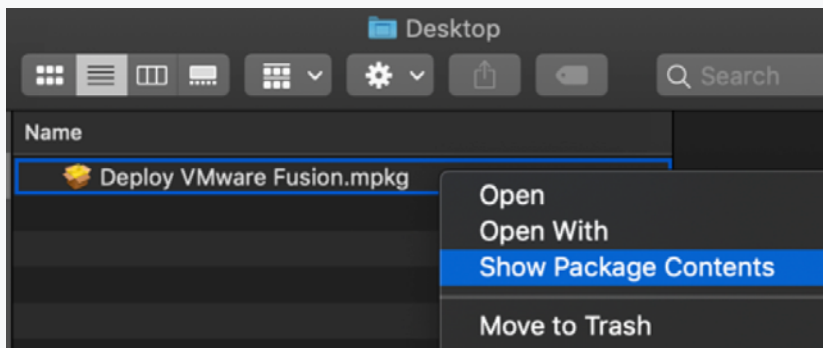


continued

- Expand the Contents and Library folders to find **Deploy VMware Fusion.mpkg**. Right-click on it and then click **Copy “Deploy VMware Fusion.mpkg”**:



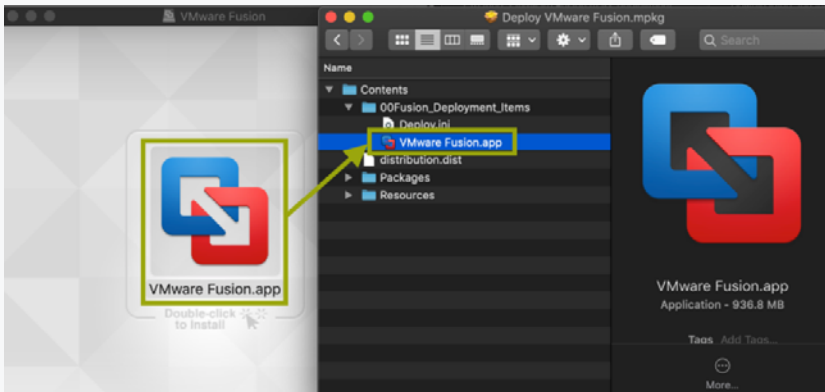
- Right-click on your desktop and click **Paste Item**. This step creates a copy of the deployment package template on your desktop.
- Right-click the **Deploy VMware Fusion.mpkg** icon and click **Show Package Contents**:



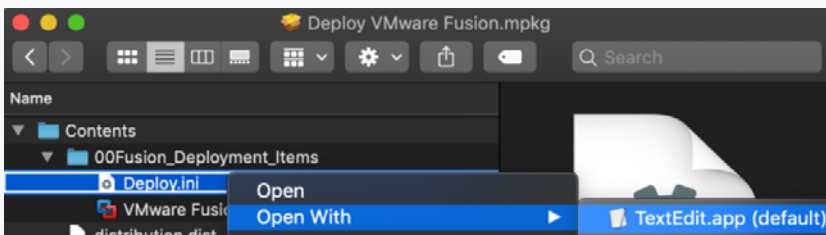
- Expand the **Contents** folder and locate the **00Fusion_Deployment_Items** folder.

continued

6. Copy the downloaded **VMware Fusion.app** to the **00Fusion_Deployment_Items** folder:



7. Open the **00Fusion_Deployment_Items/Deploy.ini** file in a text editor:



8. Locate the **[Volume License]** entry in the file.
9. Remove the **#_** at the start of the next line and replace **XXXXX-XXXXX-XXXXX-XXXXX-XXXXX** with your volume license key:

```
# VMware Fusion Mass Deployment Configuration file
# Edit this file to configure your deployment.
# Do not use quotes in values; lines beginning with '#' are comments.
#
# This configuration file applies to the items located in the Fusion
# deployment "payload" folder; i.e., the folder where this .ini file is located.
#
# QuickStart:
# To have a functioning Fusion Deployment Installer, do one or more of the
# following steps, any of which is optional:
# -- Enter your license key in the [Volume License] section below;
# -- Place a copy of the VMware Fusion.app in this payload folder;
# -- Place a copy of the virtual machines you want to deploy to each client
# in this payload folder.
#
# Section: Volume License
#
# The Volume License key can be entered in this configuration file,
# otherwise the application will prompt the user for it at first launch.
#
# In the line below the section name, uncomment (remove the '#')
# and enter the 25-character key separated by 4 dashes.
#
[Volume License]
key = ABCDE-FGHIJ-KLMNO-PQRST-UVWXY
#
# Section: UI Defaults
```

WARNING: Ensure there is no space at the beginning of the “key = ABCDE...” line, or the package will not install.

continued

10. Save and close the **Deploy.ini** file.

WARNING: If the mass deployment package will be targeted to macOS 10.14.5 and later, you must ensure the notarization ticket is stapled to the VMware Fusion application. Refer to <https://ikb.vmware.com/s/article/70653> for steps to staple the notarization ticket.

11. Close the **Deploy VMware Fusion.mpkg** Finder window.

Chapter 3

Deploying VMware Fusion With VMware Workspace ONE UEM

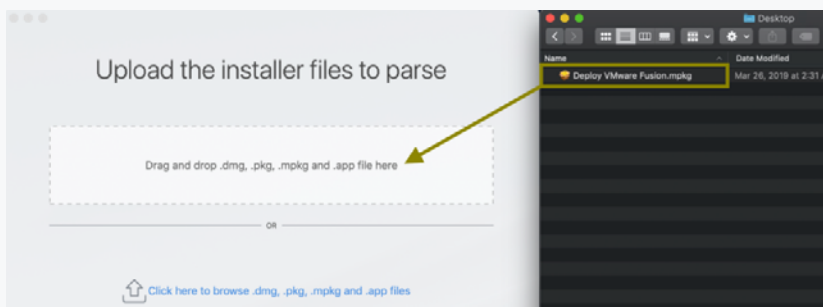
This chapter focuses on using VMware Workspace ONE UEM to deploy VMware Fusion to managed Mac hardware. We'll cover how to prepare the mass deployment package for distribution and then how to assign it to devices.

Parse mpkg with VMware AirWatch Admin Assistant

The VMware AirWatch Admin Assistant reads the mass deployment package to gather metadata about the file. It further packages the metapackage (mpkg) into a disk image (dmg) for deployment via Workspace ONE UEM.

Follow these steps to parse the mpkg:

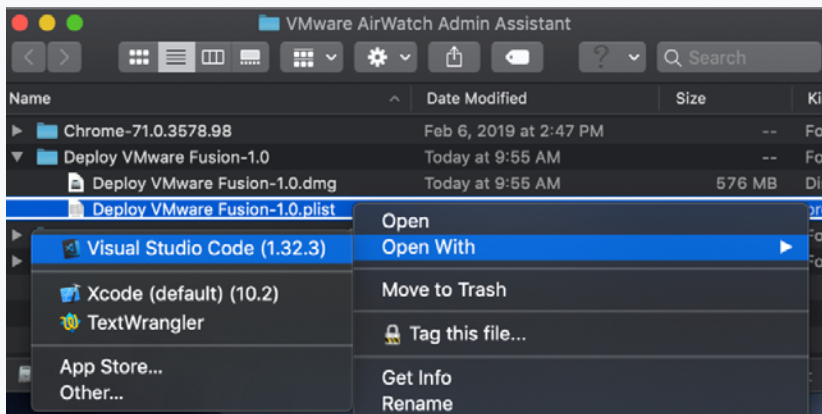
1. Launch the VMware AirWatch Admin Assistant. For more information on how to install VMware AirWatch Admin Assistant, [click here](#).
2. Drag and drop the **Deploy VMware Fusion.mpkg** file to the VMware AirWatch Admin Assistant window:



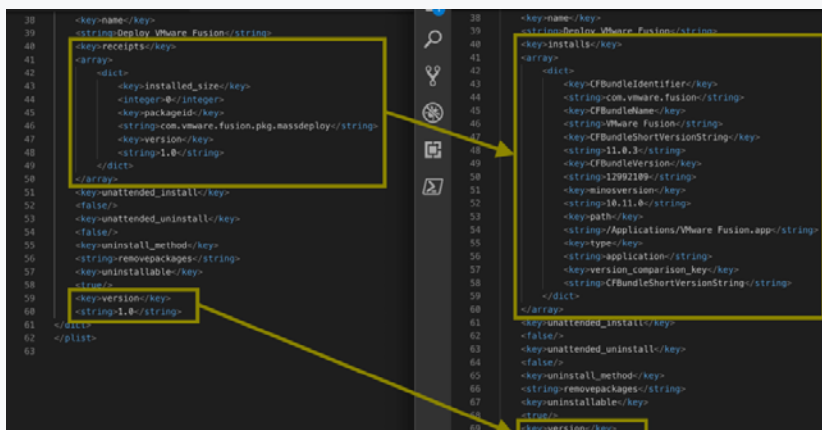
3. When the process completes, click **Reveal in Finder**.
4. Expand the **VMware AirWatch Admin Assistant** folder, then expand the **Deploy VMware Fusion-1.0** folder.

continued

5. Right-click the **Deploy VMware Fusion-1.0.plist** file and **Open With** the text editor of your choice (such as Visual Studio Code). Optionally, you can click **Other...** and select **TextEdit**:



6. Replace the **Receipts** array with an **Installs** array and modify the **Version** to the correct VMware Fusion version number. This information can be found in the **Info.plist** file contained in the mpkg by showing the contents of **Deploy VMware Fusion.mpkg/Contents/00Fusion_Deployment_Items/VMware Fusion.app/Contents/Info.plist**:



7. Save **Deploy VMware Fusion-1.0.plist** and close the text editor.

Create Package Deployment in Workspace ONE UEM

In the next steps, you'll configure Workspace ONE UEM to deploy the mass deployment package using the metadata and dmg file you created in the previous step. This allows you to deliver the mass deployment package to a list of users and/ or devices, either on-demand or automatically.

Follow these steps to start deploying Fusion:

1. Within the Workspace ONE UEM console, Expand **Apps & Books > Applications > Native** and select the **Internal** tab.
2. Click **Add Application**.
3. Click **Upload** then **Choose File**.
4. Browse to and select the **Deploy VMware Fusion-1.0.dmg** file created by VMware AirWatch Admin Assistant. Click **Choose** and then **Save**.
5. Click **Continue**.
6. Click **Upload** then **Choose File**.
7. Browse to and select the **Deploy VMware Fusion-1.0.plist** file created by VMware AirWatch Admin Assistant. Click **Choose** and then **Save**.
8. Click **Continue** then click **Save and Assign**.
9. Click **Add Assignment**.
10. Select the **Assignment Group** containing the users and/or devices you'll deploy VMware Fusion to.
11. Select **Auto** as the app delivery method and click **Add**.
12. Click **Save & Publish** and then **Publish**.

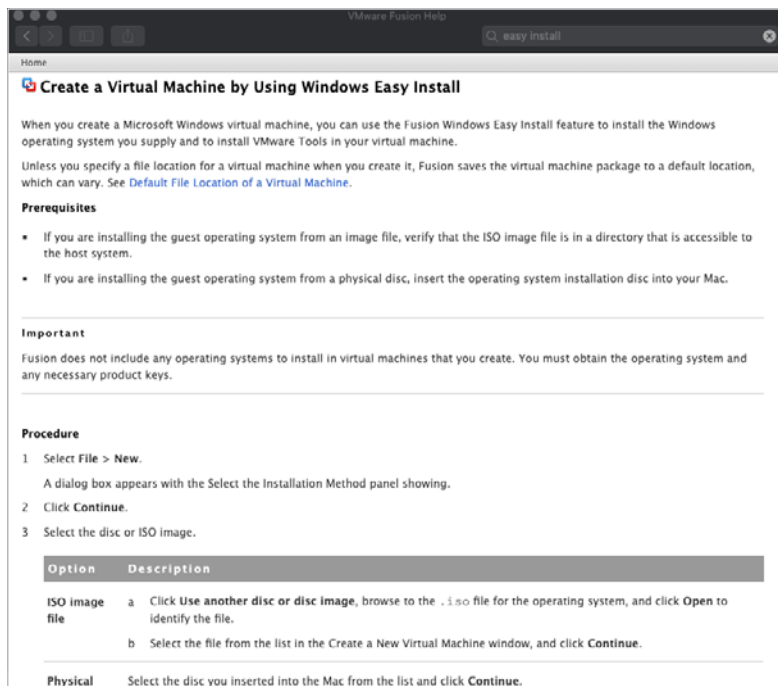
Chapter 4

Creating Windows Virtual Machines For Mac Users

At this point you have created a package and installed VMware Fusion on your computers. We will now move on to creating and deploying the virtual machines themselves. In this section, we will focus on using Windows, as that is the primary use case for running VMware Fusion on the Mac.

Creating the Virtual Machine

To start off, we'll create a base installation of Windows 10. To do so, launch VMware Fusion and click **New**. Insert a Windows installation CD or disk image (.iso) and follow the steps for Windows Easy Install. This step will install Windows automatically, including all necessary VMware drivers. For more details, refer to the VMware Fusion Help topic **“Create a Virtual Machine by Using Windows Easy Install.”**



NOTE: If you are using a corporate modified or custom-built Windows 10 installation media or disk image, you should NOT use Windows Easy Install, which assumes a default Microsoft-provided Windows installation media. In this case, uncheck “Use Easy Install” in the New Virtual Machine Assistant and install Windows manually.

When you're setting up your virtual machine, there are a few settings you can configure to maximize the performance of your systems. By default, VMware Fusion's settings for memory, processors, and hard disk are designed to balance the needs of performance for both Windows and Mac applications.

In addition to virtual hardware settings, you can also enable:

- Shared Folders
- Mirrored Folders
- Shared Applications
- Printing
- Adding Comment in the Virtual Machine Library

Install Your Windows Applications

When you're deploying a Windows virtual machine, you will likely install additional software that's required for your business into the virtual machine before you deploy. Installing those applications now will ease your initial deployment.

After initial deployment, you can use a device management solution such as VMware Workspace ONE UEM to deploy additional Windows software to your Windows virtual machine as you would do with many of the solutions available for Windows 10. In other words, modern management concepts can also be used to manage the virtual machines running within VMware Fusion.

General Considerations for Preparing Windows for Mass Deployment

One of the first things you will want to do with the virtual machine is to assign it a new Windows name. This step will prevent multiple virtual machines on the network from occupying a conflicting namespace. This is typically accomplished via the Sysprep process (or as part of embedding a provisioning package). More information about Sysprep can be found on the [Microsoft website](#).

Sysprep also handles generalizing the virtual machine image and wiping clean any unique identifiers. Windows has a Security Identifier, or SID. Even if two computers have independent network addresses (MAC), if the SID is the same, one won't be able to access the network as effectively as

it otherwise would. As a reminder, the Sysprep process can be run eight times before the image will need to be rebuilt from scratch.

These are the basic methods for the deployment of Windows systems. Like the deployment of Mac systems, this is a full-time position in many organizations and therefore there is a wide variety of information online and in print that is geared to preparing and sharing information on Sysprep and Visual Basic scripting. Many organizations will likely have an existing infrastructure for their Windows deployments and require very little additional tooling for scripts and methods to work in a VMware Fusion environment.

Modifying the Virtual Machine for Mass Deployment

Similar to the previous section, there are a number of things that need to be changed in the virtual machine configuration file to prepare it for mass deployment. Much like failing to prepare the Windows 10 operating system will cause problems, failure to adequately prepare the virtual machine file may cause conflicts when the virtual machine image is deployed at scale.

First, power off the virtual machine. This step is important as there are slight differences in Intel processors that could potentially cause problems if you resume the VM on an older or newer computer. Having the machine start from power-up will avoid these problems.

Next, you'll need to address the unique identifiers. Computers have various unique identifiers that serve a similar purpose, such as the MAC address. If these identifiers conflict, it can create communication problems. VMware virtual machines have another identifier called the UUID. While not important to the guest, this identifier is how Fusion and other VMware products keep track of virtual machines.

These settings are stored in the virtual machine's settings (.vmx) file. Before you distribute the virtual machine you created and configured, you'll need to edit the settings file to remove machine-specific identifiers. Once they are removed, VMware Fusion will recreate them on first launch on the deployed computer.

Follow these steps:

1. Right-click on the virtual machine bundle and select **Show Package Contents**.
2. Find the **.vmx** file and open it with TextEdit or your favorite text editor.
3. Remove lines in this file that localize the virtual machine to the system it was created—specifically any lines that begin with the following:

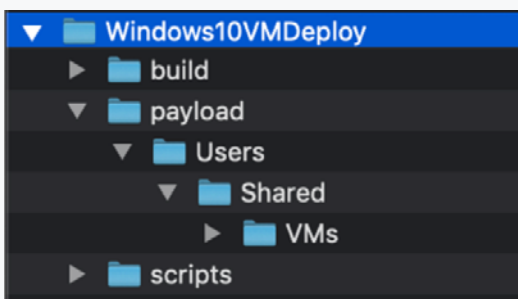
```
ethernet0.addressType =  
uuid.location =  
uuid.bios =  
ethernet0.generatedAddress =  
ethernet0.generatedAddressOffset =
```

Deploying the Windows Virtual Machine to Macs

Once you have deployed the VMware Fusion software, you'll need to deploy the actual virtual machines that Fusion will be utilizing. Deploying the virtual machines and **.vmx** files to Mac OS X can be done through a script, package, or **.dmg** file. In this example, we'll create a package containing the virtual machine using built-in macOS command line tools. Note that this same process can also be done in other packaging tools (such as Packages).

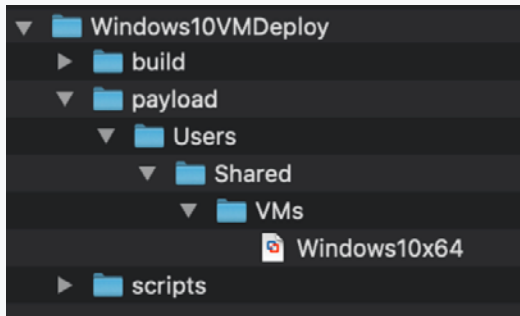
To get started, follow these steps on the macOS machine where you've built your standard Fusion virtual machine:

1. On the Desktop, create a new folder called **Windows10VMDeploy** and create the following directory structure underneath:



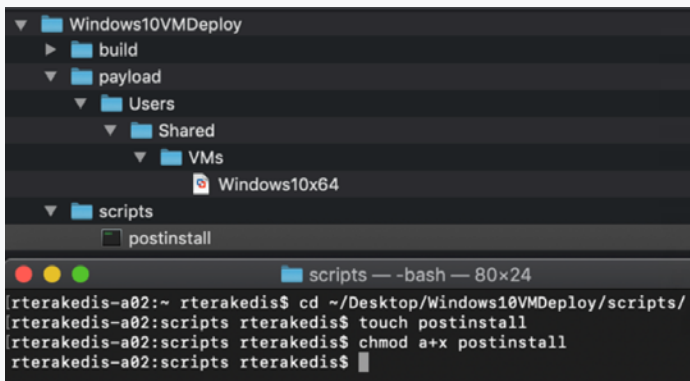
continued

2. Copy the **Windows10x64** VM image into the **./payload/Users/Shared/VMs** directory:



3. Open **Terminal.app** on your machine and run the following commands to create a postinstall file:

```
cd ~/Desktop/Windows10VMDeploy/scripts/  
touch postinstall  
chmod a+x postinstall
```



4. Right-click the **postinstall** file, select **Open With...** and then select **TextEdit**.
5. Paste the following commands into the **postinstall** to automatically add the VM into the user's Fusion Library:

```
#!/bin/sh  
echo '[{"vmwarevmPath": "/Users/Shared/  
VMs/Windows10x64.vmwarevm"}]' >> /Library/  
Application\ Support/VMware/VMware\ Fusion/  
Shared/PresetVMs.plist  
plutil -convert xml1 /Library/Application\  
Support/VMware/VMware\ Fusion/  
Shared/PresetVMs.plist
```

continued

6. Save the **postinstall** file and quit the text editor.
7. Run the following command in the terminal (all a single line) to build the deployment package, making sure to substitute an appropriate bundle identifier instead of `com.yourcompany...`:

```
sudo pkgbuild --install-location / --identifier  
"com.yourcompany.VMs.Windows10x64" --version  
"1.0.0" --root  
~/Desktop/Windows10VMDeploy/payload --scripts  
~/Desktop/Windows10VMDeploy/scripts  
~/Desktop/Windows10VMDeploy/build/DeployVM-  
Windows10x64.pkg
```

```
rterakedis-a02:~ rterakedis$ sudo pkgbuild --install-location / --identifier "com.yourcompany.VMs.Windows10  
x64" --version "1.0.0" --root ~/Desktop/Windows10VMDeploy/payload --scripts ~/Desktop/Windows10VMDeploy/scr  
ipts ~/Desktop/Windows10VMDeploy/build/DeployVM-Windows10x64.pkg  
Password:  
pkgbuild: Inferring bundle components from contents of /Users/rterakedis/Desktop/Windows10VMDeploy/payload  
pkgbuild: Adding top-level postinstall script  
  
^X^Z^C  
rterakedis-a02:~ rterakedis$ sudo pkgbuild --install-location / --identifier "com.yourcompany.VMs.Windows10  
x64" --version "1.0.0" --root ~/Desktop/Windows10VMDeploy/payload --scripts ~/Desktop/Windows10VMDeploy/scr  
ipts ~/Desktop/Windows10VMDeploy/build/DeployVM-Windows10x64.pkg  
pkgbuild: Inferring bundle components from contents of /Users/rterakedis/Desktop/Windows10VMDeploy/payload  
pkgbuild: Adding top-level postinstall script  
pkgbuild: Wrote package to /Users/rterakedis/Desktop/Windows10VMDeploy/build/DeployVM-Windows10x64.pkg
```

The package containing the virtual machine and the script are saved in the build directory: `~/Desktop/Windows10VMDeploy/build`

With the deployment package ready, you can follow the same process used for the VMware Fusion mass deployment package to deploy the VM image via Workspace ONE UEM. This same package should be deployable via other device management tools as well. When deploying the virtual machines to user devices, it's recommended to set the deployment for on-demand installation instead of automatic. This setting allows the user to request the VM image if needed but otherwise doesn't slow down onboarding and/or consume disk space on the user's device.

Chapter 5

Systems Management: Managing Windows Virtual Machines

As you deploy Windows 10 virtual machines to your macOS fleet, you may want to have visibility into the status of those virtual machines. This can help ensure that your Fusion users are keeping those VMs up-to-date and help simplify their lives by offering up applications for them to install. Numerous solutions are available to help with this task, but this section provides some ideas for you to consider. The degree to which you manage the VMs depends on your organization's tolerance for risk and the bandwidth of your endpoint administrators.

VMware Tools for Windows Management in Fusion Virtual Machines

Similar to the underlying Fusion host machine, virtual machines can be managed by VMware Workspace ONE UEM. By including a provisioning package in your Sysprep'ed image, you can automatically onboard these devices at first boot. At that point, Workspace ONE UEM can help you deliver operating system updates, applications, and configurations to the VM. Before proceeding down this path, it is critical to understand how the end user will be using the virtual machines. Some capabilities inherently native to VMs (cloning, snapshots, etc.) may positively impact end-user productivity but typically cause issues due to duplicated unique identifiers and configuration drift from the device management server's inventory.

Microsoft Tools for Patch Management and Updates

Microsoft also provides basic functionality you can use to help maintain virtual machines installed inside Fusion. This is not an exhaustive list but can help administrators understand available options.

For patch management, you can consider deploying the Windows Software Update Service (WSUS). WSUS queries Microsoft for available updates and provides a mechanism for admins to approve updates for delivery to connected clients. This also eliminates the need for numerous virtual machines to speak directly to the internet to determine available Microsoft operating system updates.

For configuration management, administrators can leverage built-in policies. Policies can be managed from Active Directory on domain-joined virtual machines (e.g. "Group Policy"). They can also be configured individually in the VM image as Local Security Policy, though this method does not allow centralized management.

Large enterprises that already have an investment in System Center Configuration Manager can also leverage this infrastructure to manage virtual machines. By installing the SCCM agent in the virtual machine, administrators can deliver updates, apps, and configurations.

Conclusion

Windows and Mac mass deployments are fairly similar in nature when it comes to the methodologies used. However, deploying both simultaneously to create a heterogeneous operating system environment per host can be a fairly complicated task. In this document we have reviewed the procedures for setting up a virtual machine deployment infrastructure using VMware Fusion.

When you're preparing any system for mass deployment, it's critical to "measure twice and cut once." The more testing you do, the more successful you'll be.

In many multi-OS environments, organizations attempt to unify the environment that is presented to their users. For example, using a combination of features within VMware Fusion and Microsoft Windows, you can allow your

users to see the same Documents folder whether they are in Windows or macOS. This folder can then be synchronized with the user's online cloud storage (such as Microsoft OneDrive).

Finally, the additional footprint of multiple operating systems increases the need for security for your environment. It is strongly recommended that considerations for securing each operating system en masse be handled separately and be well thought-out. Training is essential to making sure that your environment is as secure as possible. This extends beyond the operating systems in use and into each application that is deployed.

Appendix

Deploying VMware Fusion: A General Workflow

This appendix describes a general workflow to help administrators deploy VMware Fusion using non-VMware device management tools, which includes the following steps:

1. Create the VMware Fusion deployment package.
2. Create a group of users/devices for deployment scope.
3. Deploy the VMware Fusion package to the deployment scope.
4. Deploy standard virtual machines to the deployment scope via self-service.
5. Bring virtual machines under management for visibility.

1. Create the VMware Fusion Deployment Package

Using the process defined earlier in this document, ensure you've created a mass deployment package (pkg) that includes your specific licensing file and any configuration settings (.ini). This package should be added to your device management server as an application for deployment to macOS devices. **Note:** It is not recommended to embed VM images directly into the mass deployment package.

2. Create Groups of Users/Devices for Deployment Scopes

In your device management system, create a group of users and/or devices which should be targeted for installing VMware Fusion. If you intend to also deploy “standard” virtual machine images, you should also create groups that allow you to target who should receive a specific VM image.

3. Deploy the VMware Fusion Package to the Deployment Scope

Within your device management system, map or assign the VMware Fusion deployment package to the appropriate group(s) of users/devices. This assignment is typically deployed automatically (rather than on-demand) so Fusion is installed when the device is first on-boarded for the user.

4. Deploy Virtual Machines to the Deployment Scope via Self-Service

If your organization chooses to do so, repeat the previous steps for any standard virtual machine (.vmwarevm) image you wish to make available to VMware Fusion users. As VM images tend to be large, it is recommended to offer the images via a self-service mechanism. This allows users to request the large downloads only if they need them and prevents unnecessary disk space consumption. Also, by deploying the images encapsulated as a package, you can deliver a script which can automatically add the image to the user's Fusion Library.

5. Bring Virtual Machines Under Management For Visibility

If your organization prefers, you can bring the deployed virtual machines under management in your device management system. By doing so, you'll gain visibility into whether the VMs are patched and up-to-date. You can also help users maintain the devices by offering up apps and configurations. The downside to managing virtual machines is that some capabilities inherently native to VMs (cloning, etc.) may cause issues with some management systems due to duplicated unique identifiers.