MacStadium

MacStadium VMware Private Cloud

Quick Start Guide

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The MacStadium VMware Private Cloud Quick Start Guide is designed to get users quickly up and running with their MacStadium VMware private cloud and to provide an overview of the VMware features available within a MacStadium private cloud. A VMware-based Mac private cloud offers the ability to implement true automation for continuous integration (CI) and continuous deployment (CD) pipelines for all iOS and Mac app development. Users can dynamically provision VMs of any OS, pool resources to get the most out of their physical infrastructure, and gain efficiency by cloning or linking VMs instead of manually re-imaging individual Macs. VMware-based private clouds from MacStadium are the perfect solution for DevOps or any SaaS use case that requires macOS running on genuine Apple hardware.

While in the Mac world there aren't native containerization tools, virtualization tools like VMware can be used to create container-like, thin-provisioned VMs. VMware and other virtualization platforms allow MacStadium to create and deploy scalable private clouds built on Mac infrastructure. MacStadium is the undisputed industry leader in implementing VMware on Mac infrastructure. Our ability to run ESXi on Mac hardware in an enterprise-grade, scalable, and secure private cloud is truly unique. MacStadium customers from Capital One to Box to Travis CI have used VMware to automate their iOS and Mac app CI/CD environments.

VMware Enterprise Plus

MacStadium VMware private cloud environments are deployed with VMware Enterprise Plus licensing which includes the latest stable release version of vSphere and the vCenter app for efficient management and scaling. MacStadium uses its Service Provider license and volume purchasing power to deliver VMware's powerful hypervisor technology at a fixed monthly rate that is typically lower than customers would pay if attempting to procure VMware directly.

VMware is an excellent option for customers who:

- Want a proven and reliable hypervisor with robust functionality and a long track record of success in enterprise IT

- Already have experience with VMware, or are willing to learn
- Need more developed support for plugins/API integrations
- Are comfortable waiting for new macOS releases to be debugged/supported
- Want to reduce resource usage via DRS and Instant Clone features
- Require well-documented security and compliance features like encrypted storage at rest, VM encryption with secure key storage, or virtual E/W firewalls for VM isolation/micro-segmentation

Be aware that there can be a learning curve if your team is not already familiar with VMware. Also, keep in mind that supporting CI/CD projects on Mac hardware is not VMware's primary use case. Never fear, though. MacStadium is here to help. VMware's rich feature set allows iOS and Mac app development teams to capture the benefits of virtualization and automation to streamline CI/CD workflows on Mac infrastructure to improve reliability, performance, and scalability.

For more information on other MacStadium virtualization options, see Mac Private Cloud Solutions.

Getting Started

Once you request a VMware-based private cloud from MacStadium, the MacStadium provisioning team will create a ticket that you can access via the MacStadium portal, which contains your connection information. In the "IP Plan" document, you'll find the necessary information for gaining access to your private cloud, instructions for accessing your vCenter, your IP allocation, your host assignments, and more.

Setting up Access with a Remote Access Virtual Private Network (VPN)

Before you can gain access to your MacStadium VMware private cloud, you must first configure   your firewall which for security reasons initially blocks all access by default. Our recommended method, and the one most MacStadium customers follow, is to access your VMware private cloud via a Remote Access VPN.

IP Plan Document

Welcome to your MacStadium Private Cloud. This document includes server details and initial login information for your environment. Let us know if you need any help!

MacStadium

Step 1: VPN

Access Cisco AnyConnect   VPN tutorial (link)

Server Address:	xxx.xx.xx.xx
Username (Case Sensitive):	Company Name
Password:	xxxxxxxxxxxxxxx

We recommend doing this via the Cisco AnyConnect client. You can find detailed instructions for configuring your firewall and connecting to the Cisco AnyConnect Secure Mobility Client here:

Configure Cisco AnyConnect Secure Mobility Client

vCenter Login

Once you're connected via VPN, you can connect to your vCenter instance over a secure connection. Use the information in the "IP Plan" available via the MacStadium portal to find the address of your vCenter web client and your login credentials.

As long as you are using vSphere 6.5+ then you can use the HTML5 version by appending "`/ui`" to your login url, e.g., `https://xx.xx.xxx.xx/ui`

Otherwise, if you are using the Flash version and you receive a white screen, you might need to whitelist the site in your browser. In Chrome, this is under Content Settings > Flash. You will need to add an exception to allow for the IP address of your vCenter host. Then, refresh the original page and it should load.

You should now be able to see the vSphere client in your browser.
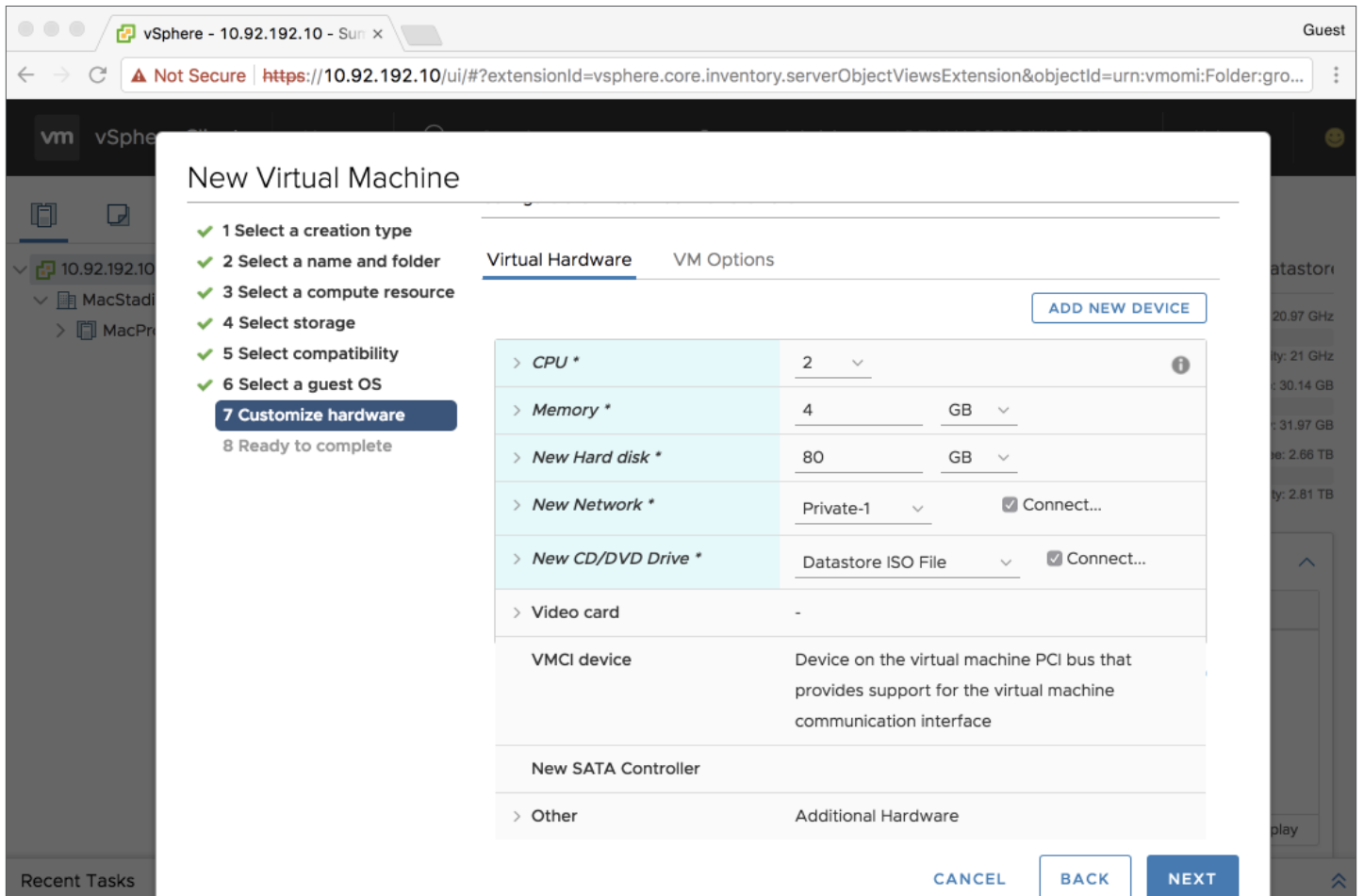
Creating a Virtual Machine

The MacStadium private cloud options you selected will determine the number of physical hosts you see in your vSphere cluster. As you grow, this ultimately lets you manage multiple networks or groups of hosts within the same interface.

To create a single virtual machine running macOS:

1. In the Navigator, right-click on the Cluster and select "`New Virtual Machine`."

2. Select "`Create a new virtual machine`" and then select `Next`.

3. Choose a name, e.g "`macOS-10.12`" and then select `Next`.

4. In "`Select a compute resource`," click `Next`. If prompted, select a specific host to deploy to if your cloud doesn't have `[DRS Mode]` turned on. This just means that your image will run on that specific host vs. VMware determining a host for you.

5. Select the datastore for your VM's files (generally you will only have one of these). Select `Next`.

6. Select the default presented for `Compatibility` and then `Next`.

7. Select Guest OS Family "`Other`" and Guest OS Version "`Apple Mac OS X 12.13 (64-bit)`." Don't worry that this won't match the actual macOS version; we only need one that is close.

8. Select the following virtual hardware settings before selecting Next:
   - CPU: `2`
   - Memory: `4GB`
   - New Hard Disk: `80GB`
   - New Network: `Browse > Private-1` (The name of your private range in your IP Plan)
   - Expand `CPU` and select "`Expose hardware assisted virtualization to the guest OS`" (in case you want a nested VM)

- New CD/DVD Drive: `Datastore ISO File`. Select `ISO > OSX > macOS_Sierra.iso`. Ensure that `Connect` is ticked.

9. Check to see that your summary looks correct, and then `Finish`.

Installing macOS

Shortly after finishing the wizard, you should now have a virtual machine listed within your cluster in the web interface.
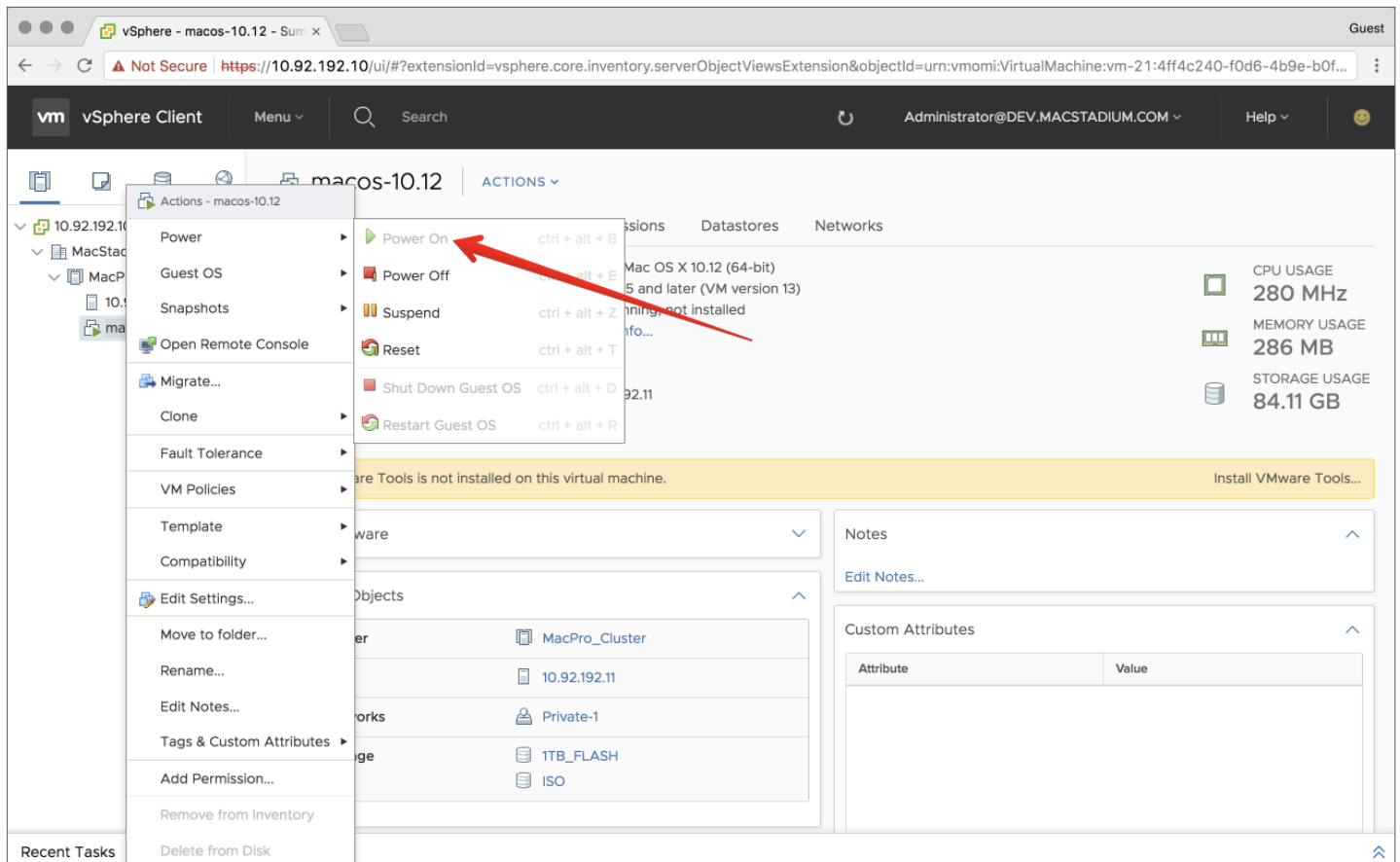
To install macOS:

1. Right-click on the virtual machine and select `Power > Power On`.

2. Click on the virtual machine and then click on the preview image. You should now see the macOS installer initializing.

3. From the "`Install macOS`" screen, if you only see the DVD image, you will need to select `Utilities > Disk Utility` from the menu.
   - Select "`VMware Virtual SATA Hard Drive Media`"
   - Select "`Erase`" with defaults
   - Close Disk Utility and select "`Untitled`"

4. Wait for the installer to run.

5. When at "`How Do You Connect`," select `Local network (Ethernet)`.

6. Select TCP/IP Connection Type "`Manually`" and enter the following details before `Next`:
   - IP Address: `10.254.50.2` (The first address from your IP Plan under the Private-1 range)
   - Subnet Mask: `255.255.255.0`
   - Router Address: `10.254.50.1`
   - DNS Servers: `8.8.8.8, 8.8.4.4` (Google's DNS servers)

7. Skip Location Services and Apple ID.

8. Create an Account and note the account details.

9. Set the time zone to your local time.

You should now be on the desktop with a working Mac virtual machine.

Installing VMware Guest Tools

VMware has a set of tools that must be installed on macOS. These get mounted via a virtual CD drive. You can find instructions from VMware here or use this guide below to install or upgrade your tools manually.

ISO Download and Upload to vCenter

1. Download a recent version of VMware Tools and unzip it so that you have a `darwin.iso`.

2. Login into your vCenter instance.

3. Use your storage tabs to navigate to your datastore.

4. Browse your datastore. You can upload the ISO to the root folder or create an ISO folder.

Install Tools

1. Shut down your machine from within macOS.

2. From the web interface, right-click on your virtual machine and select `Power > Power Off`.

3. Right-click on your virtual machine and select `Edit Settings`.

4. Change `CD/DVD Drive 1` to `Datastore ISO File` and select the ISO you uploaded.

5. Right-click on your virtual machine and select `Power > Power On`.

6. After the reboot, go back into the desktop of the virtual machine and log in.

7. Install the VMware Tools when prompted.

During the tools install, you will get blocked by a security exception from the macOS; step through and explicitly allow it. This happens during the steps of the UI installer and is necessary to allow the VMware signed tool to make modifications to the OS.

Supporting Features

VMware was the first hypervisor to include Macs as part of their hardware compatibility list (HCL) and has steadily increased support for Mac virtualization functionality since. There are several VMware features MacStadium customers can leverage to optimize and improve their CI/CD virtualization and automation endeavors.

Creating VMs from the Marketplace or OVF

The VMware Marketplace exchange platform gives users the means to find hundreds of preconfigured VMs ready to be deployed. Files of type `.ovf` can be executed immediately for easy deployment in both development and testing environments.

You can find more information about the VMware Solution Exchange here.

The OVA/F Transfer plug-in allows you to import and export virtual machines as OVF/OVA templates to/from vCenter via the vRealize Orchestrator. However, be aware that while MacStadium customers can run vRealize Orchestrator, we do not offer technical support for that product.

Linked Clones

Linked Clones are virtual machine copies created from the snapshot of a single parent VM. They share virtual disks with the parent VM in an ongoing manner, which conserves disk space and allows multiple VMs to use the same OS. Linked clones allow for faster creation of virtual machines by using the exact files on the parent VM at the time of snapshot and allow a VM to look and feel more like a container. It's an excellent method of creating short-lived ephemeral VMs.

Instant Clones

Instant clones are very similar to linked clones in that they share a virtual disk of a parent VM and therefore consume less storage than a full VM. But, instant clones take it one step further by doing the same thing with memory. Instant clones are created off a running VM instead of a powered off VM. This provides better methods of management for provisioning, updates, and memory utilization. Instant clones are also an excellent method of creating single use ephemeral VMs with faster boot-times and more stability. Instant Clones are only available in VMware 6.7+.

High Availability (HA)

VMware HA provides protection against hardware failures. The HA service always monitors your virtual machines and can restart failed VMs on alternative host servers to reduce application downtime.

vMotion

VMware vSphere vMotion enables zero downtime live migration of workloads from one server to another. vMotion guarantees the integrity of these operations so the service remains available during scheduled maintenance. This feature is also very useful for migrating to new computing or storage resources as your environment grows.

vNetwork Distributed Switch (VDS)

The VDS provides a centralized interface from which you can configure, monitor and administer virtual machine network switching for the entire data center. The vNetwork Distributed Switch ensures quality of service (QoS) to different VMware network features by allocating the maximum bandwidth wherever needed. While MacStadium does not enable this feature, customers are able to leverage this functionality if they choose to do so.

For more information, see vSphere Distributed Switch.

Distributed Resource Scheduler (DRS)

When activity peaks, the DRS can automatically and evenly spread the load of virtual machines across all the nodes in your private cloud. MacStadium enables this feature for Resource Management by default. Customers can also enable Power Management, but must implement it themselves.

For more information, see Enable VMware DRS to Manage Workloads.

Snapshots

A snapshot captures the entire state of a VM at the time the snapshot is taken. Snapshots are useful when you need to repeatedly revert to the same state, but you don't want to create multiple virtual machines.

For more information, see VMware backup and the VMware snapshot.

Rollbacks

VMware provides users with a way to revert to earlier versions of the full installation and individual components as well as a method to rollback network changes that may have incorrect configurations. Currently, MacStadium only supports network rollback, not host rollback.

For more information, see vSphere Networking Rollback.

Storage vMotion

VMware Storage vMotion gives administrators the means to move virtual machines to different storage without any downtime. Storage vMotion guarantees the integrity of these operations so the service remains available during scheduled storage maintenance. This feature is also very useful for migrating to new storage arrays.

For more information, see Under the Covers with Storage vMotion.

Thin Provisioning

Thin Provisioning increases VM storage efficiency through dynamic allocation and intelligent provisioning of physical storage capacity. Thin Provisioning lets you use just as much storage capacity as currently needed and add required storage space at a later time. By eliminating the need to periodically request more storage, Thin Provisioning helps to eliminate application downtime.

For further detail, visit Thin Provisioning.

vSphere Replication

vSphere Replication delivers flexible, reliable and cost-efficient replication to enable data protection and disaster recovery for all virtual machines in your environment. Replication creates a copy of a virtual machine that can be stored locally within a cluster or at another site, providing a data source to rapidly restore a virtual machine within minutes.

For further reading, see vSphere Replication.

Storage I/O Control (SIOC)

VMware SIOC helps improve the quality of storage in vSphere. Users can configure rules and strategies for every virtual machine and application to enable permanent availability. At a basic level SIOC is monitoring the end-to-end latency of a datastore. As soon as congestion is detected, resources are automatically allocated to high priority applications. MacStadium does not offer assistance with this feature, but customers can choose to enable it. SAN storage is required.

For more detail, see Enabling and Monitoring Storage I/O Control.

Network I/O Control

Network I/O control addresses network traffic convergence and management challenges by flexibly partitioning physical network bandwidth among the different types of vSphere network traffic flows. Be aware customers must enable Network I/O Control by themselves.

For more information, see Network I/O Control.

Hot Add

Customers must enable Hot Add before they can leverage its functionality. Hot Add lets you add memory resources for a VM

while the machine is still powered on, preventing service disruptions caused by having to power down to reconfigure the VM.

Keep in mind that Hot Add must be enabled on the VM while it is offline, and that it is also OS dependent.

Host Profiles

VMware lets you store configuration information for a group of hosts in a host profile. This can be created from the reference host.

Storage Distributed Resource Scheduler (DRS)

Storage DRS is an intelligent vCenter Server feature for efficiently managing VMFS and NFS storage, similar to the DRS which optimizes the performance and resources of vSphere clusters.

Datastore Clusters

A VMware Datastore Cluster is a collection of multiple datastores, which from the VM provisioning perspective can be viewed as a single entity.

APIs

VMware maintains an extensive library of APIs. To browse, search, and inspect APIs across all major VMware platforms, see the VMware API Explorer page.

There were several additions to the 6.7 release that improve virtualization efforts on Mac infrastructure. William Lam of virtuallyGhetto.com prepared an extensive list detailing each offering and its functionality. For the list, see New vSphere 6.7 APIs worth checking out.

For more information on APIs for developers and automation specialists, see Introducing Developer and Automation Interfaces for vSphere 6.7.

Maintenance

All VMware environments require maintenance to meet individual growth needs, stay secure and compliant, and ensure optimization.

Scaling

You can easily increase the capacity of your Mac VMware private cloud by sending MacStadium a ticket to add more capacity. Normal turnaround is less than 5 days, which can also be made faster by providing advanced notice. Our minimum resolution for upgrades is 30 days. For downgrades, we require 60 days' notice.

Patches and Upgrades

MacStadium maintains your environment up to the hypervisor. That same flexibility also means that customers are ultimately responsible for their own environment. Please note that updates are generally the responsibility of the customer, but MacStadium will gladly offer support and guidance if needed. Subscribe to MacStadium's newsletter for information on new versions and recommended upgrades.

Customers can leverage the VMware Update Manager to upgrade their environmental components. For more information, see Understanding Update Manager and the Update Manager documentation.

As a responsible vendor, VMware issues frequent advisories and patches designed to implement security protections as well as feature updates and bug fixes. If you are not already subscribed, we strongly recommended registering for the VMware Security Announcements list to stay abreast of relevant issues and fixes. Register for the list via VMware Security Announcements.

VMware vCloud Usage Meter

A stipulation of our licensing agreement is that we must be able to poll your vCenter for running virtual machines using VMware vCloud Usage Meter. MacStadium requires at least read-only administrator privileges per VMware for this purpose.