

Tableau Server on VMware vSphere:

Achieving high availability on a virtualized platform

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Abstract

In combination, Tableau and VMware provide a comprehensive enterprise-ready business intelligence solution that can be implemented quickly with comprehensive high availability and reduced downtime features. This whitepaper outlines the reasons why organizations should consider Tableau Server on VMware Infrastructure, maximizing their investments in VMware Infrastructure and optimally utilizing hardware resources in highly availability environments. This paper is intended for IT administrators with some familiarity with both technologies. It focuses on the technical details and provides guidance for deploying Tableau Server on VMware vSphere™. We include recommendations and best practices for configuring Tableau Server VMs to work seamlessly with reduced downtime and high availability and great performance based on our in-house scalability and functional testing.

Introduction to Tableau & VMware

Tableau

The key differentiator of Tableau to other BI solutions is its ease of use by both administrators and users, a true self-service analytics platform. Native connections to all popular data sources and accessible deep analytics capabilities means you'll finally get the full value from your data. And by empowering more end users, you'll have more people making data-driven decisions, giving your company a competitive advantage. Class-leading security, integration, and scalability can be deployed in a few hours instead of taking several months.

Tableau Server

Tableau Server is a business intelligence platform that allows you to share and manage data as live connections and extracts, and publish visualizations and analysis to a secure and managed enterprise analytics platform — on premises or in the cloud.

Built to simplify sharing and collaborating of interactive data visualizations, Tableau Server offers the following advantages:

- Flexible data architecture
- Scalable
- Secure
- Highly available
- Mobile accessible
- Automatic data and content updates
- Embedded analytics
- Hybrid deployment options

The following articles provide more background on Tableau Server:

- [Tableau Server overview](#)
- [Tableau Server Help](#)
- [Tableau Server Administrator Guide](#)

VMware

VMware Infrastructure is a full-infrastructure virtualization suite that provides comprehensive virtualization, management, resource optimization, application availability, and operational automation capabilities in an integrated offering. VMware Infrastructure virtualizes and aggregates the underlying physical hardware resources across multiple systems. In addition, VMware Infrastructure brings a set of distributed services that enable fine-grain, policy-driven resource allocation, high availability, and consolidated backup of the entire virtual datacenter. These distributed services enable an IT organization to establish and meet their production service level agreements for their customers in a cost effective manner. Read more about [VMware products here](#).

Both Tableau and VMware support distributed services and processes. The high availability and reduced downtime mechanisms provided by both products will be described further in this paper.

High Availability & Reduced Downtime

Tableau Server High Availability

Making Tableau Server highly available (HA) means taking measures to reduce the potential downtime of the individual services to a minimum by configuring the server for added redundancy. For more information on how to configure Tableau Server for HA, please read the [High Availability whitepaper](#).

Standalone vs. Multi-Node Configuration

The most basic configuration of Tableau Server is as a standalone-mode installation which has very little redundancy built in. Although we have built-in process-level redundancy even on a standalone-mode installation, the single-server configuration lacks hardware-level redundancy and the ability to provide automatic Repository failover.

Tableau recommends adding additional server nodes to allow for more comprehensive redundancy. This approach enables additional nodes to host copies of all processes. Distributed architecture built around Tableau Server enables these redundant processes to communicate between themselves and provide the ability to have automatic Repository failover. The minimum number of computer nodes required to achieve this basic level of redundancy is three.

In a typical three-node configuration, Tableau recommends redistributing all processes from the primary node to the worker nodes, with the primary hosting only the Gateway and Search & Browse processes. In this configuration, even if the worker with the Active Repository fails, the worker with the Passive Repository automatically becomes active.

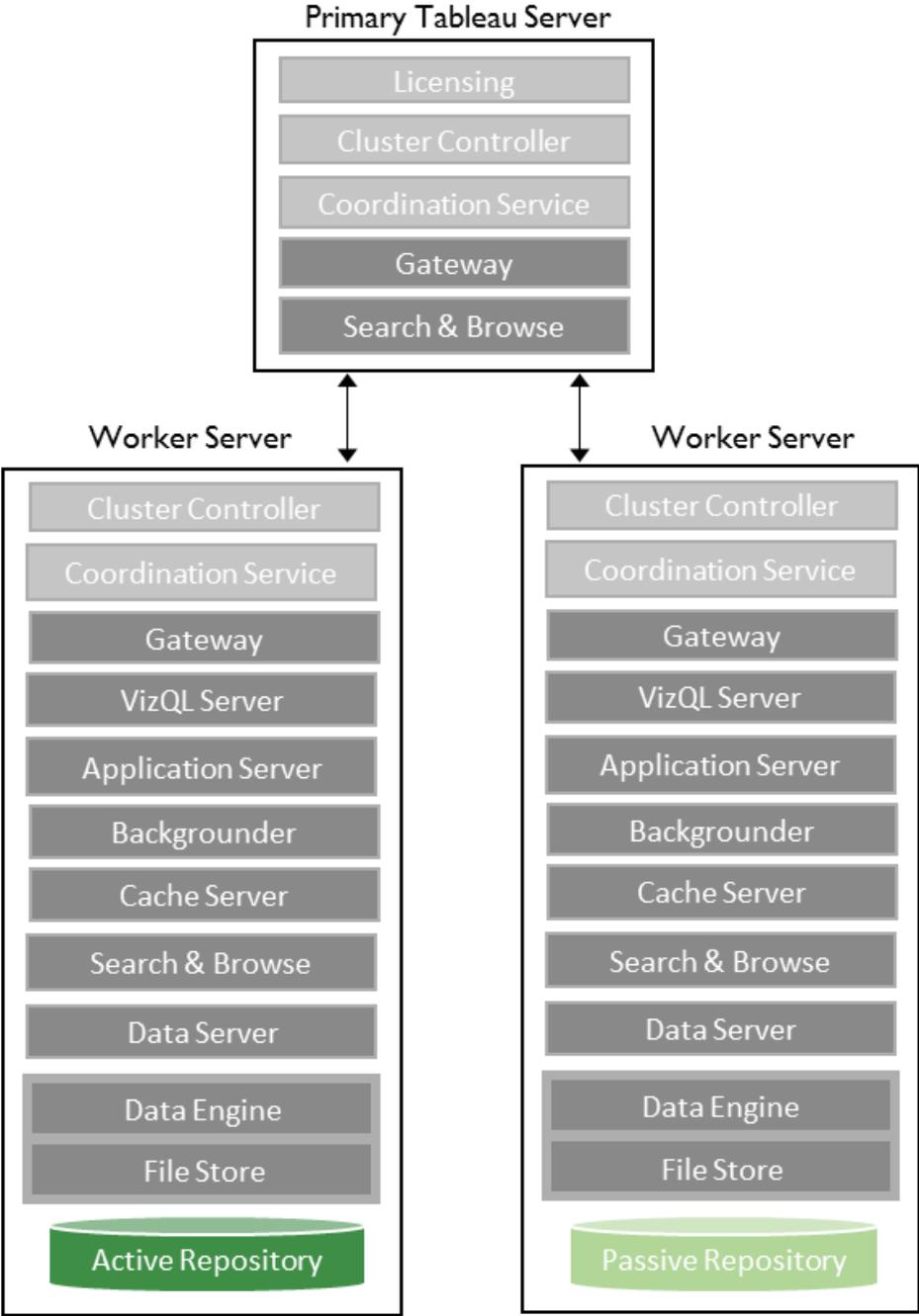


Figure 1. Example of a basic three-node HA deployment of Tableau Server.

While the above recommended configuration helps safeguard the processes hosted on the workers through duplication, the gateways on all nodes, including the primary node, are still vulnerable to unexpected downtime. With a failed gateway, a node becomes unreachable. To address this, Tableau recommends two additional measures: adding an external load balancer and staging a backup primary node.

Load Balancer

While gateway processes exist on all nodes with the above recommended configuration, there is no notion of active and passive gateway processes in the cluster. All gateways are active and are used to route requests to available server processes. To further reduce potential downtime for the Tableau Server cluster, Tableau recommends configuring a load balancer in front of all gateway processes on the entire cluster. That way, if one Gateway process goes down, the load balancer can still redirect traffic to the other functioning Gateway processes and keep the Tableau Server cluster running. See the [Tableau Server Administration Guide](#) for more information on setting up an external load balancer.

Backup Primary

To further replicate the functionality of the primary node in the cluster, Tableau recommends creating a backup primary node as a failsafe. This is an additional node which is in a ready state and can take over should the primary node fail. It is not an active server, but when configured as outlined in the documentation, it is ready to become the active primary node. You need to license the backup primary during installation, but it does not consume any licenses until it becomes the active primary. See the [Tableau Server Administration Guide](#) for more information on how to use a Backup Primary.

When using Tableau Server with VMware vMotion, it may not be necessary to configure a Backup Primary. See the Migrations section below for more details.

VMware vMotion

VMware vMotion enables the live migration of virtual machines from one VMware vSphere host to another VMware vSphere host with no perceivable impact to the end user. Live migration of a virtual machine involves transferring the entire execution state of the virtual machine from the source vSphere host to the destination vSphere host over a high-speed network. vMotion brings invaluable benefits to administrators. It helps prevent server downtime, enables troubleshooting, and provides flexibility. Learn more about [VMware vMotion here](#).

VMware can automatically decide whether to live-migrate virtual machines or leave it up to the system admin to migrate manually. This is dependent on the chosen “automation level” of the VMware Distributed Resource Scheduler (DRS) enabled on the cluster on which the virtual machine is created. Learn more about [VMware Distributed Resource Scheduling here](#).

Let's say the cluster is configured for "full automation." If the host on which the virtual machine is created experiences unexpected events such as a reboot or is put into maintenance mode, DRS senses a need to rebalance the resources consumed by the cluster. This results in the migration of the virtual machine to another host to better balance the overall resource utilization of the cluster.

Before going any further, you should have a thorough understanding of [VMware vMotion best practices](#).

Tableau Server on VMware Infrastructure

Migrations

Given the immense value VMware vMotion provides to the system administrators in terms of greatly reducing VM downtime, it made sense for engineers at Tableau to investigate installing and configuring Tableau Server on VMware virtual machines. This helped us see firsthand how well Tableau Server worked following the migration of virtual machines to different hosts.

We were pleased to determine that Tableau Server continues to function and perform as expected, even after the Tableau Server VM is migrated to another host by vMotion.

The fact that Tableau Server can be migrated between VMs eliminates the need for a backup primary and manual failover intervention when deploying a Tableau Server cluster on VMware virtual machines. The testing conducted by Tableau using Tableau Server installed on VMware using vMotion has yielded the following steps and recommendations for deploying Tableau Server on VMware Infrastructure that are provided later in the document..

Latency Sensitivity

Tableau Server prefers very low latency or jitter when performing complex data visualization or analysis. Running Tableau Server on a virtualization platform can pose some challenges due to the inherent overhead of abstracting and sharing physical hardware and resources.

VMware addresses the latency challenges posed by virtualization in their whitepaper: [Deploying Extremely Latency-Sensitive Applications in VMware vSphere 5.5](#)

We recommend applying settings greater than 40% if you are not getting the level of performance that you expect from your deployment of Tableau Server on VMware. In the next section, we go into some more details of our own testing around some of these settings and the performance impact on Tableau Server.

Scalability Testing

Based on customer use cases, we crafted a set of experiments that inform Tableau Servers scalability best practices on VMware. We wanted to validate two key configurations for VMware as part of our experiments:

1. What is the impact to scalability of Tableau Server when it is deployed with another compute intensive application on the same ESX host?
2. How does changing critical configuration such as “CPU Reservation” impact Tableau Server when co-located with another CPU intensive workload?

VMware Terminology

To best understand these experiments, we will first review some basic terminology around some of VMware settings. The figure below shows a screenshot of the resource settings dialog that has the relevant CPU configurations. In our experiments, we primarily focused on CPU settings while keeping the memory settings as default.

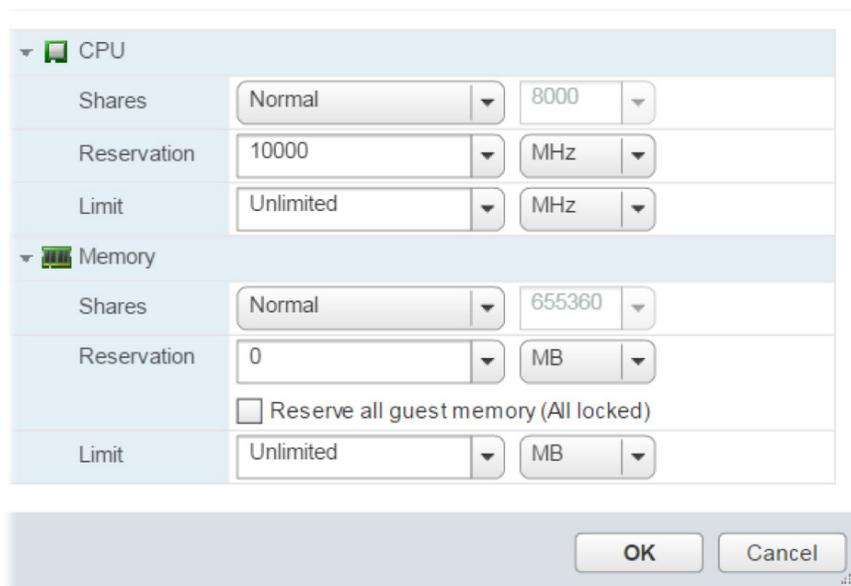


Figure 2: Edit Resource Settings Dialog for configuring CPU reservations from vSphere.

VMware has several configurations, as seen in the above figure that can impact how Tableau Server performance on the VMware platform. Based on VMware documentation, here are key configuration settings and how they may impact performance.

- Shares: Shares specify the relative importance of a virtual machine (or resource pool). If a virtual machine has twice as many shares of a resource as another virtual machine, it is entitled to consume twice as much of that resource when these two virtual machines are competing for resources.

Shares are typically specified as High, Normal, or Low and these values specify share values with a 4:2:1 ratio, respectively. You can also select Custom to assign a specific number of shares (which expresses a proportional weight) to each virtual machine. Specifying shares makes sense only with regard to sibling virtual machines or resource pools, that is, virtual machines or resource pools with the same parent in the resource pool hierarchy. Siblings share resources according to their relative share values, bounded by the Reservation and Limit. When you assign shares to a virtual machine, you always specify the priority for that virtual machine relative to other powered-on virtual machines.

Simply put, the configuration of Shares specifies relative weights and tells VMware how to allocate resources like CPU and RAM across the various virtual machines that are currently running on an ESX host. In addition to Shares, you can configure Reservation and Limits.

- Reservation: A reservation specifies the guaranteed minimum allocation for a virtual machine.

vCenter Server or ESX/ESXi allows you to power on a virtual machine only if there are enough available unreserved resources to satisfy the reservation of the new virtual machine. The server guarantees that amount even when the physical server is heavily loaded. The reservation is expressed in concrete units of megahertz for CPU.

For example, assume you have 2GHz available and specify a reservation of 1GHz for VM1 and 1GHz for VM2. Now each virtual machine is guaranteed to at a minimum have access to 1GHz, if it needs it. For example, if VM1 is using only 500MHz, VM2 can use 1.5GHz.

There is a common misconception that if you reserve a % of your CPU for Tableau Server, that VMware will not allow other workloads to use that capacity when Tableau is not using it fully. From the above example, you can see that in cases where one workload is not fully utilizing the compute capacity reserved for it, another workload can benefit from it.

Setup, Methodology & Experimentation

Below is the physical and virtual machine set-up we created for the experimentation. We had a Tableau Server cluster of 3 virtual machines. One VM was running as the Tableau Server primary machine. The other two VMs were running as the workers. In addition, we created a CPU intensive application that would allow us to force high utilization of the CPU in a given virtual machine. This allowed us to simulate what we call high latency workloads for each of the VMs in a consistent way across experiments and test iterations.

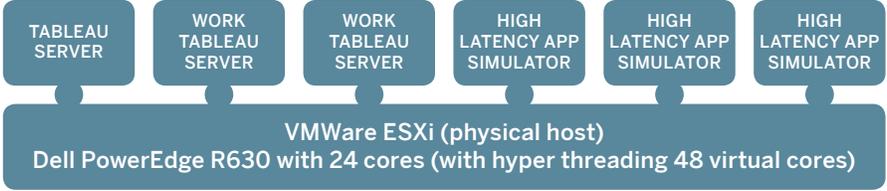


Figure 3: A logical view of deployment architecture for the experiments

In addition, we ran all of these virtual machines on the same ESX host to eliminate variations introduced by network traffic had we used multiple ESX hosts.

We used Dell Inc. PowerEdge R630 - Intel(R) Xeon(R) CPU E5-2690 v3 @ 2.60GHz with 2 sockets and 12 cores per socket. In total we had 24 physical cores which Hyper Threading brought up to 48 virtual cores.

We computed the total CPU compute capacity available as below:

Total CPU capacity: $24 \times 2.6\text{GHz} = 62.38 \text{ GHz} = 62380 \text{ MHz}$

There were a total of 6 VMs deployed on this physical machine - 3 of these were Tableau Server nodes (setup in a standard 3-node HA configuration as shown in Figure 1) and one test machine that simulated a third party application that was CPU intensive, such as a database or other high CPU consuming process.

VM IDENTIFIER	VIRTUAL CORES	RAM	RUNNING COMPONENT	NOTES
VM ₁	16	64 GB	Tableau Server Primary	Repository & Base Install Only
VM ₂	16	64 GB	Tableau Server Worker	All Other Components
VM ₃	16	64 GB	Tableau Server Worker	All Other Components
VM ₄	32	64 GB	Simulated High CPU Usage App	High latency application
VM ₅	32	64 GB	Simulated High CPU Usage App	High latency application
VM ₆	32	64 GB	Simulated High CPU Usage App	High latency application

We therefore had a total of 144 vCPUs across 24 physical cores on the ESX host with hyper threading enabled for increased performance.

Given this deployment, the cluster was oversubscribed by a factor of 3 (144 vCores / 48vCores).

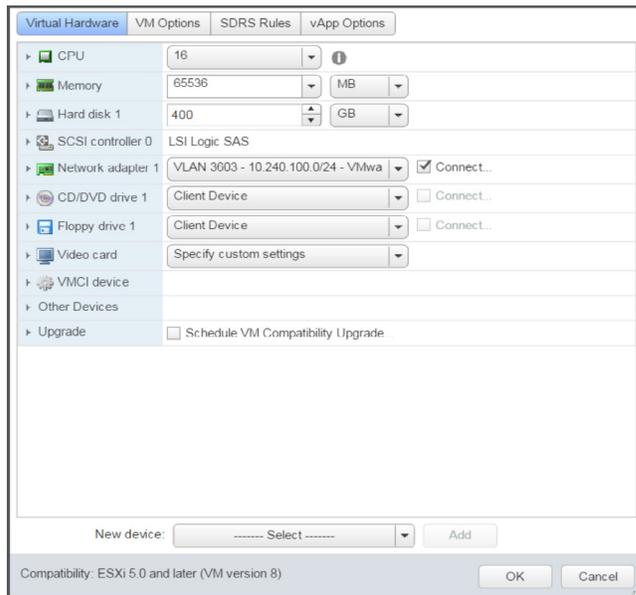


Figure 4: VMware vSphere VM Settings showing the base level setting for an individual VM in the cluster.

Results & Observations

We ran multiple iterations of these experiments to first understand what impact a high latency application running on a shared ESX host would have on Tableau Server in conditions of normal “Shares” (equal weights to all VMS - which is the default) and with no CPU reservations.



Figure 5: Effect of running an increasing number of high latency apps together with Tableau Server on VMs on a shared ESX hosts without CPU Reservations

We found that both scalability and performance of the cluster were negatively impacted when Tableau was sharing compute infrastructure with other high latency application on a shared VMware ESX host. When there was no high latency application running alongside Tableau Server (first row), we found that scalability and performance for Tableau Server was within 10% of running Tableau Server on dedicated physical hardware in comparable tests.

Where possible, for best performance and scalability, we recommend that CPU reservation be used for Tableau Server when deploying it on VMware servers on premise.

It's not always practical to permanently isolate other third party high latency applications from Tableau. For this reason, we wanted to understand the impact of CPU reservation on Tableau Server under such high latency workloads. For this, we ran each iteration of the test with a specific set of CPU Reservation settings in VMware. This setting, as absolute MHz, was by design increased in stages to inform the impact of this setting on Tableau Server's performance and scalability.

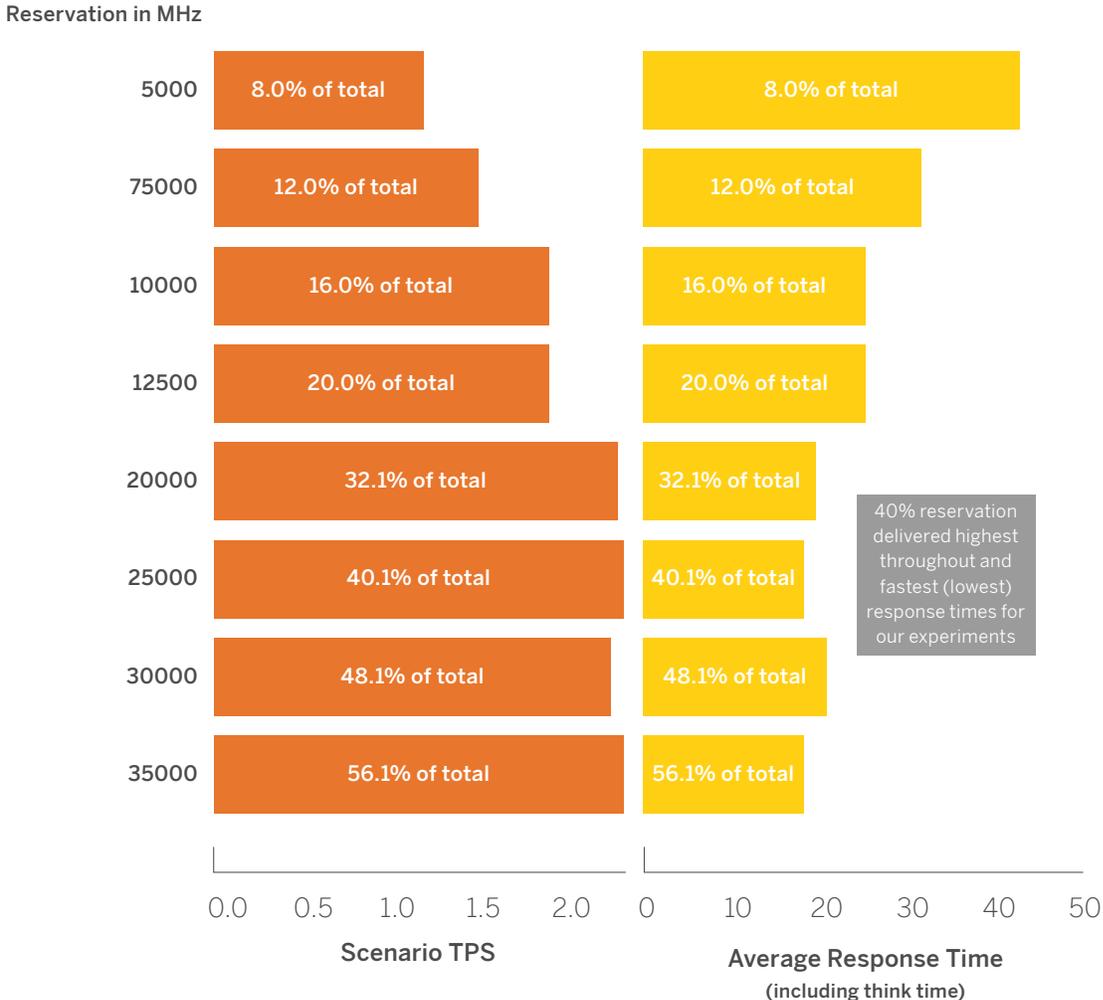


Figure 6: Impact of increasing CPU reservation under shared high latency loads on VMware ESX

Each row in figure 6 represents an iteration of our tests at a specific CPU reservation setting denoted in the text in the first column. The orange bar is measuring the scenarios throughput per second (total number of end to end test scenario as described in the Tableau Server V10 Scalability whitepaper). The yellow bars are showing the average response time for the scenario in seconds and include think time.

We are showing both the absolute MHz numbers and the percentages to inform very large ESX hosts or ESX hosts with smaller configurations on core capacity. In our experiments we observed that generally around a 40% (i.e.. 2.5GHz) reservation where the optimal performance and scalability was achieved.

Recommendations

While your actual results may vary depending on your workloads, third party applications and services co-located with Tableau Server may have performance and scalability implications depending on your virtualization platform configuration.

We recommend you work with your VMware ESX administrator to test what type of configuration may be ideal for your deployment given the experimentation described in this whitepaper.

When running Tableau Server on a VMware platform you should configure the virtual machines running Tableau Server to have CPU reservation. While percentages can be misleading depending on how large an ESX host you are running, you should start between 10,000 Mhz to 25,000Mhz of CPU reservation and incrementally add more based on the performance results you experience.

In addition, note that allocating any percentage of the CPU to Tableau Server does not mean that either Tableau or VMware will reserve that much compute at all times. It is up to the VMware platform to deliver Tableau Server the configured amount of compute as configured in vSphere when Tableau Server requests it.

In addition to CPU, there are many other tuning and configuration settings in VMware that were out of the scope for this paper.

Deployment Steps and Recommendations

This section provides steps and recommendations for configuring virtual machines and deploying Tableau Server to take advantage of the benefits of the vMotion capabilities of VMware Infrastructure.

Sizing and Hardware Considerations

Tableau Server system requirements, in terms of number of CPUs and amount of RAM, vary based on numerous factors, including: the target workload, extract sizes, and the number of users concurrently logged onto the server.

The Tableau whitepaper [Guide to Scaling Tableau Server for Self-Service Analytics](#) provides recommendations on deploying Tableau Server at enterprise scale. It discusses planning considerations and addresses sample deployment scenarios, helping ensure you size your deployment correctly.

The minimum sizing recommendations of Tableau Server are only suggested for proof-of-concept purposes, see the [Minimum Hardware Recommendations](#). For production use please see the sizing guide recommendations published by Tableau: [Guide to Scaling Tableau Server for Self-Service Analytics](#). Note that when sizing for failover, the failover hosts should have at least as much capacity and resources as the original VM host to support the same loads.

Prerequisites

- Thorough understanding and experience setting up vMotion enabled VMware Infrastructure
- vMotion-enabled vSphere virtual infrastructure with one vCenter Server and at least two ESXi servers
- Administrative level access to VMware vCenter Server using web client
- Remote desktop application or equivalent tools like vSphere Desktop Client or vSphere web client
- Sizing and topology of Tableau Server preplanned
- Tableau Server license
- Tableau Server installer, 64-bit version

Step 1: Create Virtual Machine(s)

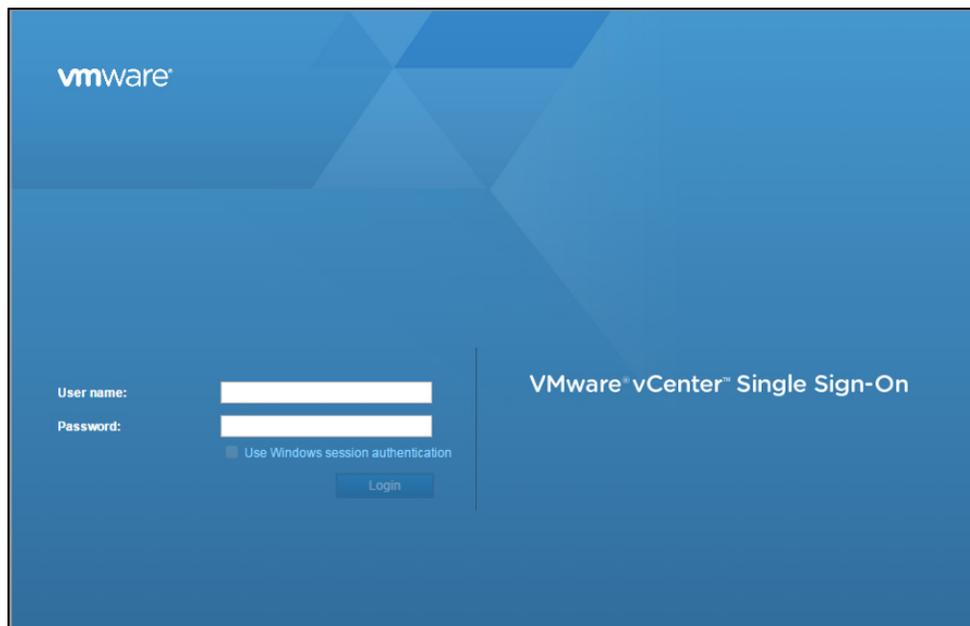
- To begin, you must deploy a VMware Virtual Machine for each node of your Tableau Server cluster.
- There are two ways to create virtual machines on VMware Infrastructure to deploy Tableau Server:
 - Deployment using the VM Creation Wizard
 - Deployment using a VM Template

Both options are discussed below.

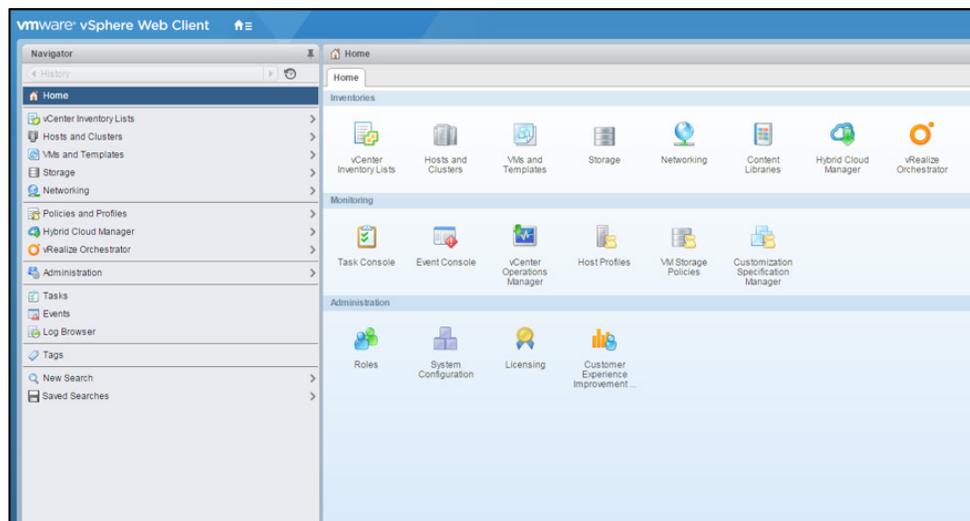
Option 1 – Deployment using VM Creation Wizard

The first option for creating a virtual machine is to deploy a VMware Virtual Machine using the VM Creation Wizard.

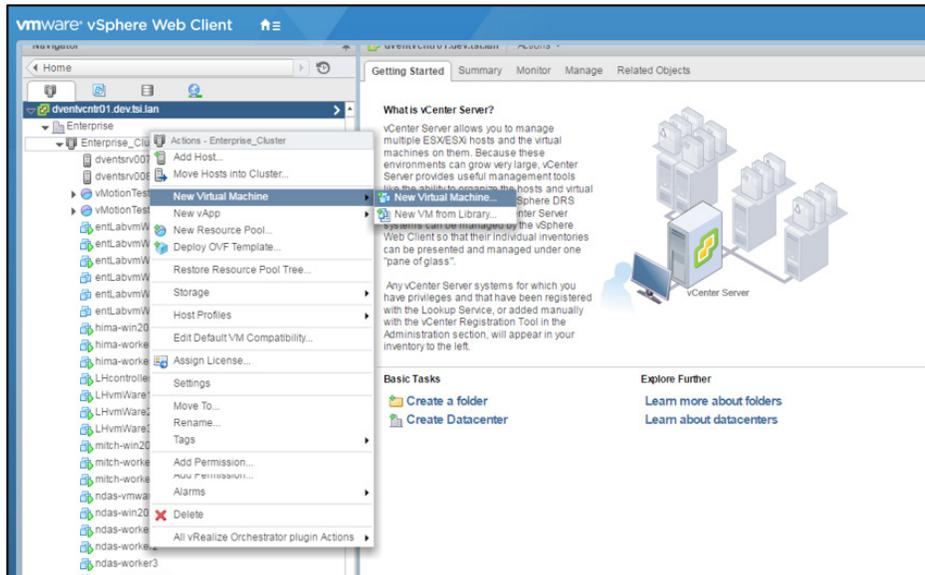
1. Launch a web browser and point it to the instance of vCenter Server hosted in your organization, typically at: https://<IP_Address_Of_vCenter_Server>



2. Sign in using a username and password with administrator-level privileges. You will land on the home page:



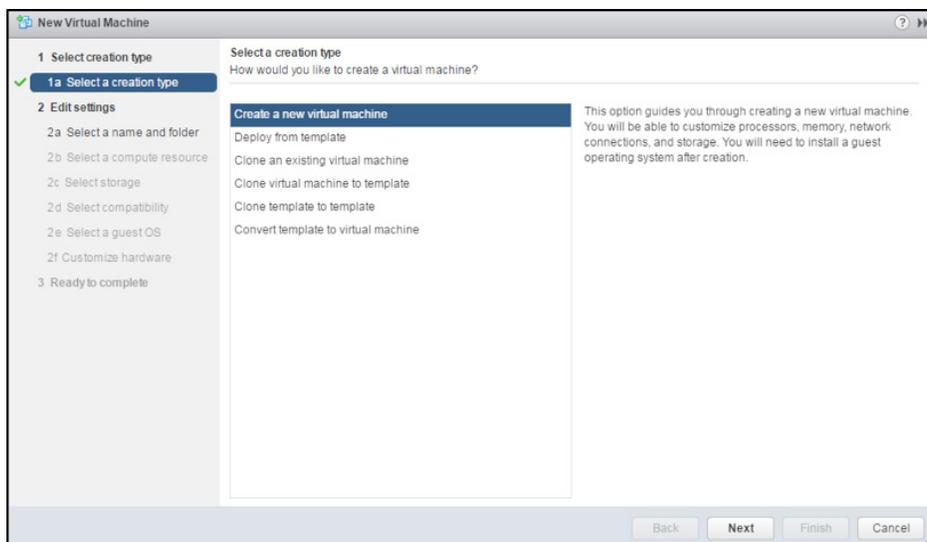
3. Click **Hosts & Cluster** in the left pane of the UI. This will display all the Data Centers, Clusters, Resource Pools, and Hosts available in the inventory in the left pane.



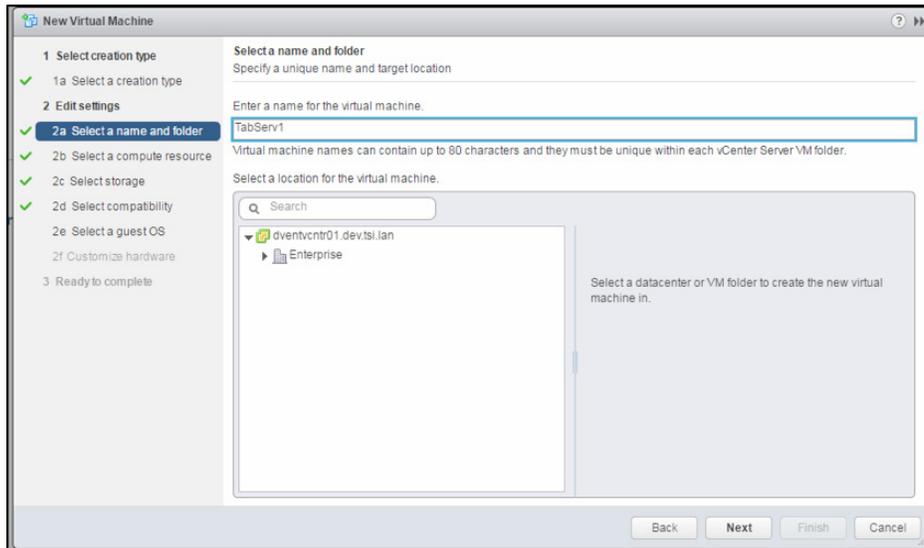
4. Select a cluster with a minimum of two vSphere hosts. The cluster needs to be DRS-enabled. When adding a VM to a DRS-enabled Cluster, VMware Infrastructure load balances the VM across all available underlying hosts that are powered on. This efficiently utilizes resources from all the underlying hosts dynamically. Discuss with your IT team how best to identify a DRS-enabled Cluster or [Read this KB Article](#) to get instructions on how to enable DRS on clusters by yourself.

5. Right-click on the cluster and click **New Virtual Machine**.

6. Select **create a new virtual machine** and click **Next**.

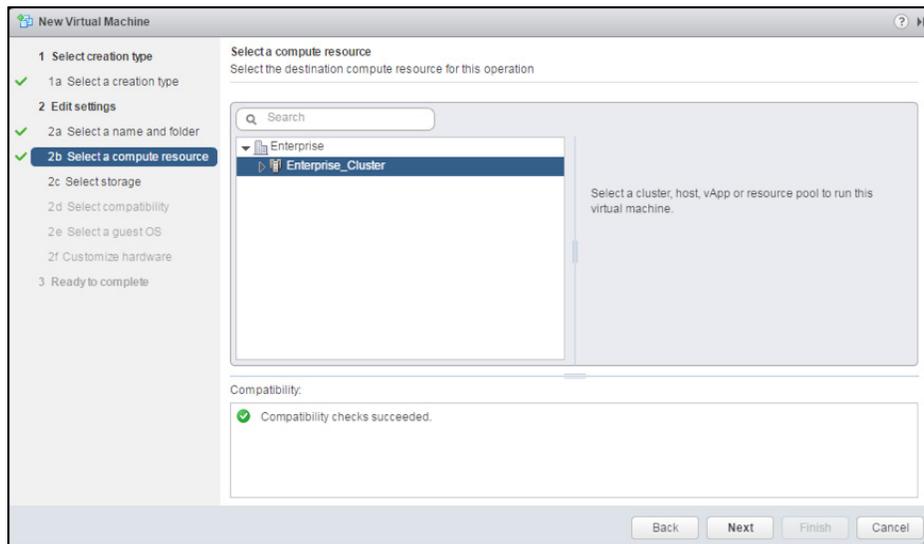


7. Follow through the workflow to name the VM (for example, TabServ1).

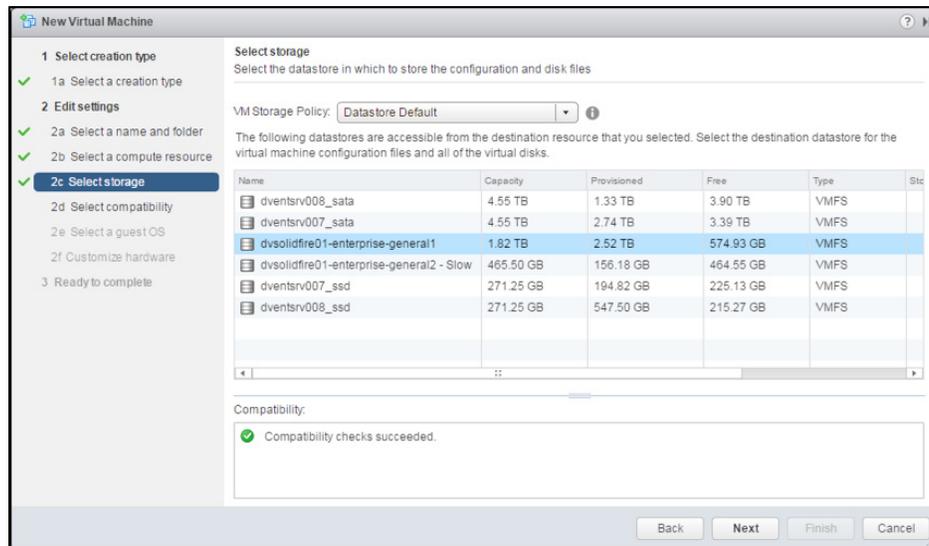


Select a cluster as a part of choosing Computer Resource. In the screen shot below, “Enterprise_Cluster” is selected as the resource. This will force VMware Infrastructure to choose the best vSphere host to place the virtual machine on.

Ensure the compatibility checks are successful.

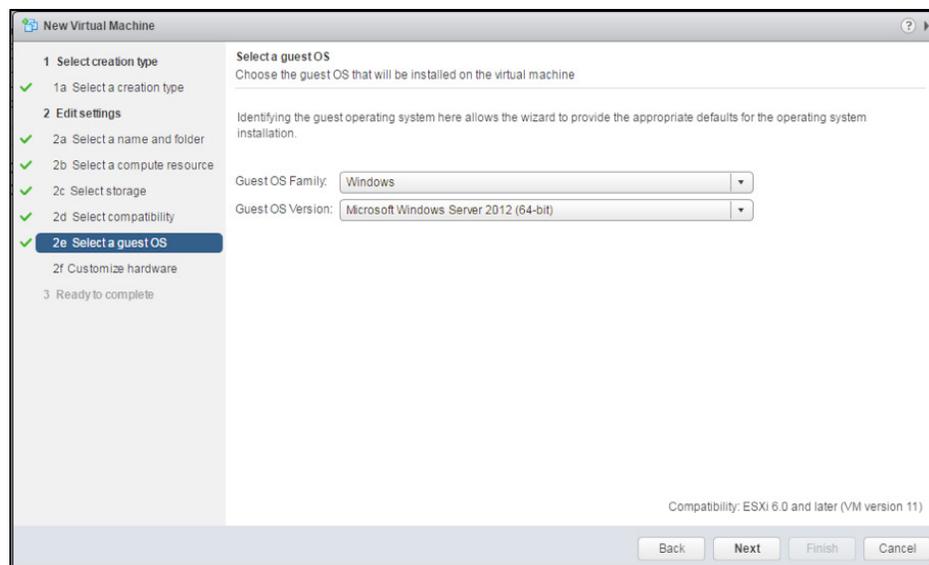


8. Choose a shared data-store accessible by all the hosts within a DRS-enabled cluster. Choosing this data-store enables the system and system administrator to live migrate the VM to another host within the same cluster, should they need to, thus enabling failover and HA in a seamless manner.

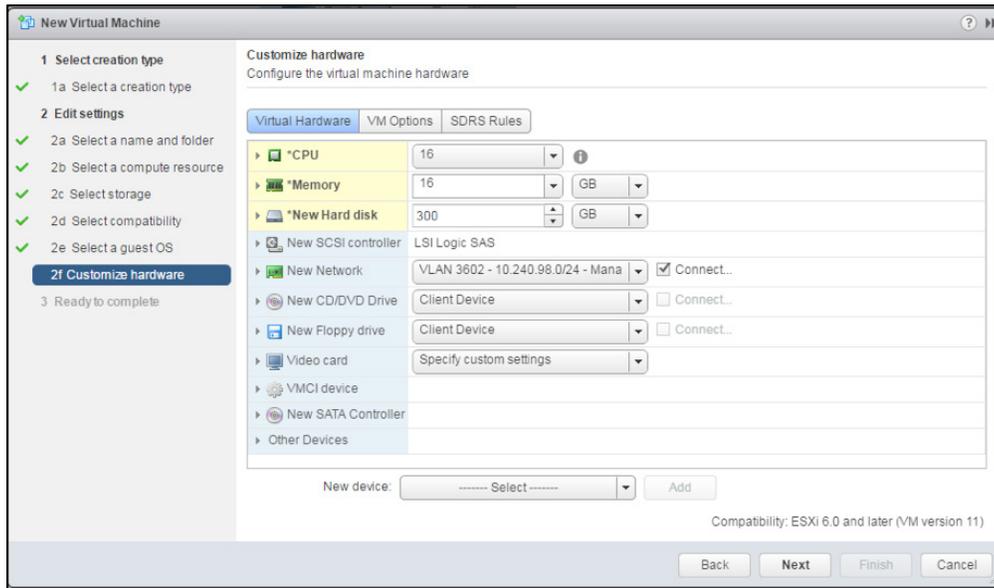


9. For guest OS, select Windows 2012 R2.

Note: While Tableau Server is supported on all operating systems listed in the [Tableau Documentation for List of Supported Operating Systems](#), Tableau strongly recommends using Windows 2012 R2. We have done extensive testing of Tableau Server using Windows 2012 R2 OS on VMware VMs.



10. Change the vCPU, vRAM and vDisk of the VM to match your **sizing requirements**.
Click **Next** to continue.



11. Click **Finish** to complete the VM creation.

Install Guest Operating System on Virtual Machine

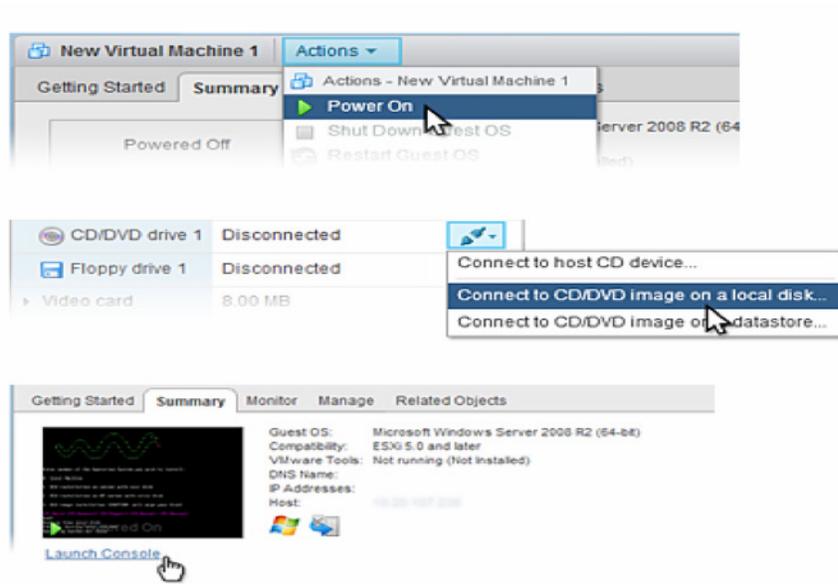
1. Select the virtual machine in the inventory and select **Actions > Power On**.
2. On the virtual machine **Summary** tab, click the “Connect CD/DVD-ROM” icon and select **Connect to CD/DVD image on a data-store**.
3. Click **Launch Console**.
4. After the virtual machine is powered on, install the guest operating system as you would any other computer.

After the guest operating system is installed and running, **install VMware Tools**. This improves the performance of your virtual machine.

Option 2 - Deployment using VM Template

The second option for creating a virtual machine is to deploy a VMware Virtual Machine from a VM Template which already has a guest OS installed.

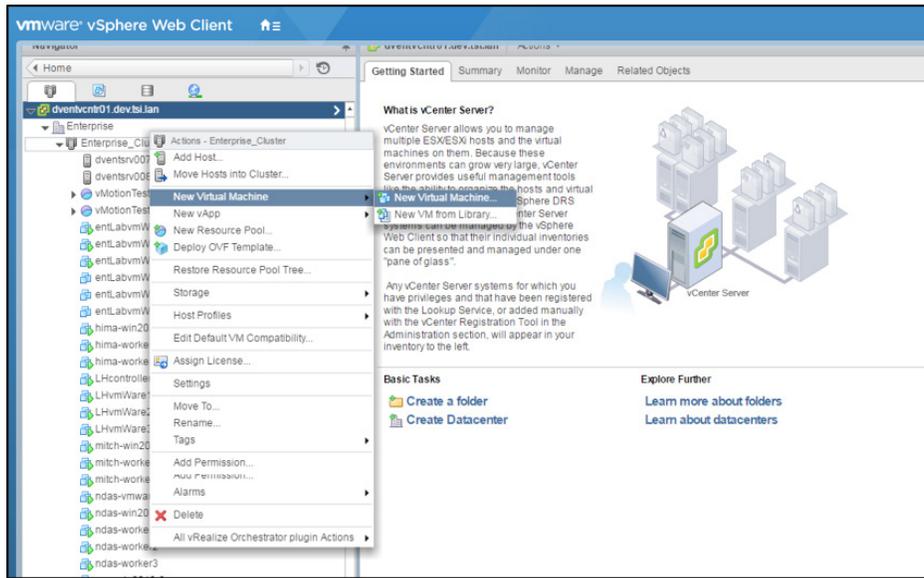
1. Navigate to the VM & Template section of the web client after logging in.



2. Navigate to the folder which contains the Template for the VM.
3. Select a Windows 2012 R2 VM Template.

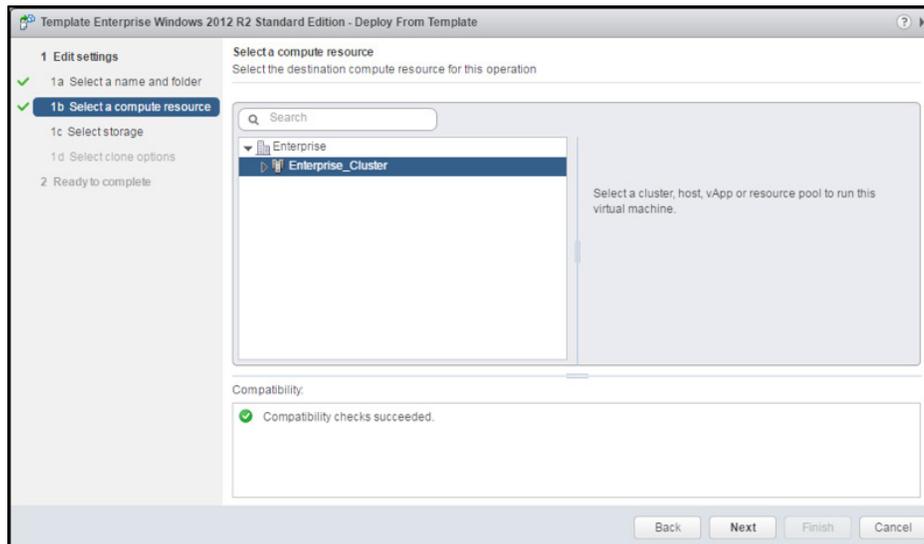
Note: While the Tableau Server is supported on all operating systems listed in the [Tableau Documentation for List of Supported Operating Systems](#), Tableau strongly recommends using Windows 2012 R2. We have done extensive testing of Tableau Server using Windows 2012 R2 OS on VMware VMs.

4. Right-click the VM Template and click **New VM From This Template**.

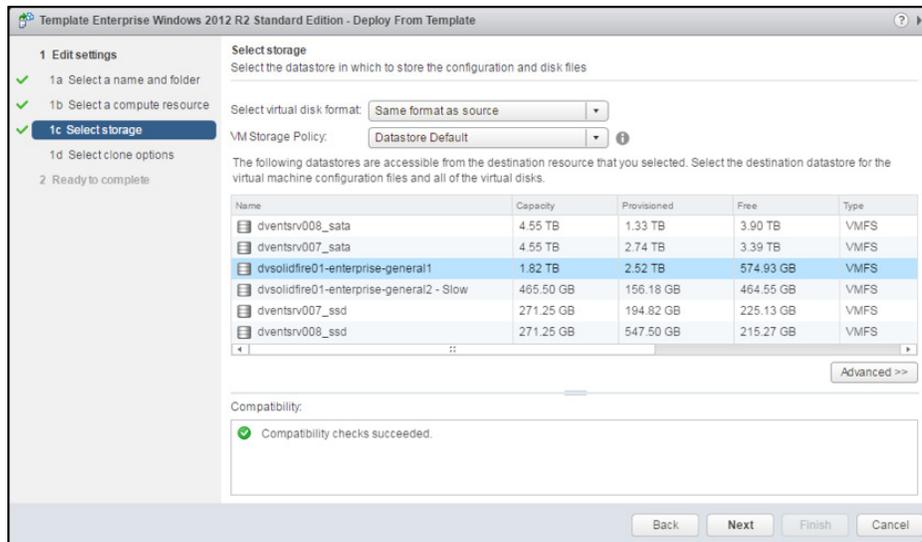


5. For the computer resource, select a cluster. In the screen shot below, “Enterprise_Cluster” is selected as the resource on which to create the VM. This will force the VMware Infrastructure to choose the best vSphere host to place the virtual machine on.

Ensure the compatibility checks succeed. Click **Next** to continue.



6. Choose a shared data-store accessible by all the hosts within a DRS-enabled cluster. Choosing this data-store enables the system or system administrator to live migrate the VM to another host within the same cluster, should they need to, thus enabling failover and HA in a seamless manner. Click **Next** to continue.



7. Under **Select Clone Options** you can choose to:
- Customize Operating System
 - Customize virtual machine's hardware
 - Power on the virtual machine after Template creation.

Tableau recommends leaving the “Clone Options” unchanged, unless you have specific configuration preferences. Click **Next** to continue.

8. Click **Finish** to complete instantiating the VM from a Template.
9. Once the VM is instantiated, power on the VM if it isn't already powered on.

Step 2: Connect to Virtual Machine Using RDP

- After the VM is powered on, click the **Summary** tab of the VM to determine the DNS name or the IP address.
- Launch the remote desktop application on your client machine. Connect to the VM using the DNS name or IP address and appropriate user credentials.
- Click **Connect** to establish a remote desktop connection to the VM.

Step 3: Install Tableau Server on Virtual Machine(s)

Installing Tableau Server on a VMware VM instance is similar to installing on any other server.

Manual Install

1. While logged into the VM, open a web browser and browse to the [Tableau Server download page](#). Download the installer and save it directly to a location on disk. We recommend the 64-bit version.
2. Double-click the installer on the VM to start the server installation process. For more information, see the installation guide in the [Tableau Installation Guide](#)
3. After the installation completes, you need to create the initial admin account by either opening a browser to the **http://localhost** or executing tabadmin commands. This is covered in the [Tableau Installation Guide](#).

Automated Install

Another easy and automated way to install Tableau Server is using [Automated Installation of Tableau Server Scripts](#).

Add Workers and Configure Tableau Server for High Availability

1. Create worker nodes on VMware Infrastructure. We recommend you add worker nodes to a DRS-enabled cluster. Doing so enables live migration of worker nodes in the event a failover is required and optimizes utilization of resources of the VMware Infrastructure in general. For more information, see additional documentation on deploying Tableau Server to distributed environments: [Distributed Environments](#).
2. Add worker nodes to the Tableau Server: [Add Worker Nodes](#).
3. Move all processes off of the primary node to the worker nodes, with the primary hosting only Gateway and Search & Browse processes.

Once complete, check the status of your Tableau Server cluster. See the diagram below for an example.

The screenshot shows the Tableau Server Status page. The top navigation bar includes 'Content', 'Users', 'Groups', 'Schedules', 'Tasks', 'Status', and 'Settings'. The main heading is 'Server Status'. Below it, the 'Process Status' section indicates the real-time status of processes running in Tableau Server. A table lists various processes across three nodes: Primary (10.0.1.11), Worker 1 (10.0.1.12), and Worker 2 (10.0.1.13). The status of each process is indicated by green checkmarks (Active), green circles with a refresh icon (Busy), or green checkmarks (Passive). A legend at the bottom identifies these icons: Active (green checkmark), Busy (green circle with refresh icon), Passive (green checkmark), Unlicensed (orange triangle), Down (red X), and Status unavailable (grey square).

Process	Primary 10.0.1.11	Worker 1 10.0.1.12	Worker 2 10.0.1.13
Cluster Controller	✓	✓	✓
Gateway	✓	✓	✓
Application Server		✓✓	✓✓
VizQL Server		✓✓	✓✓
Cache Server		✓✓	✓✓
Search & Browse	✓	✓	✓
Backgrounder		✓	✓
Data Server		✓	✓
Data Engine		✓	✓
File Store		🔄 Synchronizing	🔄 Synchronizing
Repository		✓	✓

Figure 2. Example of Tableau Server status page for a three-node Tableau Server deployment configured for high availability.

4. Configure a load balancer as described in the online documentation: [Load Balancer](#).

Step 4: Access Tableau Server using your browser

Make sure that users can access the server.

1. On your local computer (not on the VM instance), open a browser.
2. Enter the URL based on the DNS or IP Address of the VM. For example, if you entered the DNS name TabServ1, the URL would be the following: **http://TabServ1**.

If you cannot connect to Tableau Server, check the suggestions in [Troubleshooting](#).

Other Considerations

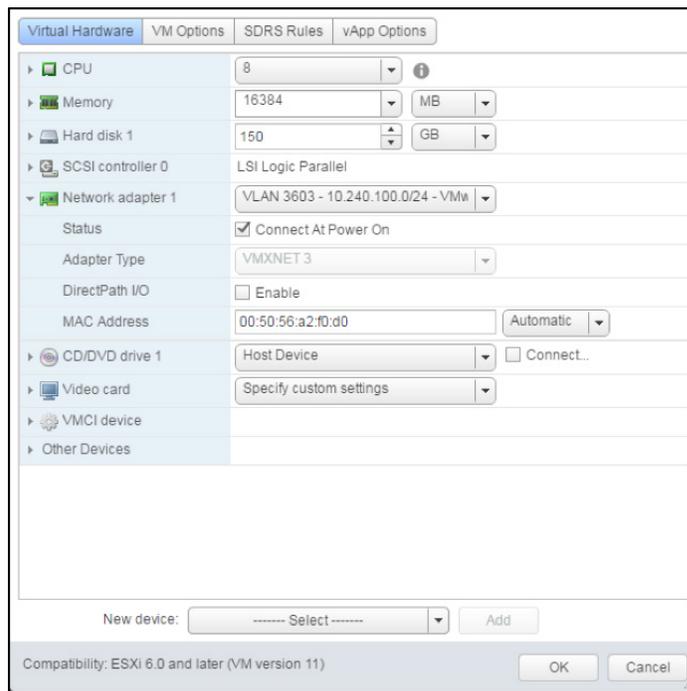
Additional Recommendations

One possible side effect of migrating virtual machines with Tableau Server installed on them is that the instance might become unlicensed. This can happen if the hardware of the underlying VMware Infrastructure changes during the migration.

Tableau Server licensing is closely tied to the MAC address and UUID of the physical or virtual machine on which it is deployed. If any of these change, the licensing will fail.

To avoid having unlicensed Tableau Server instances when using vMotion with VMware, we recommend two additional configuration values:

Mac address Assignment: “Static vs. Auto”



There is a MAC address assignment configuration option in the VMware environment that lets you set the MAC Address of Virtual Machines to **Static**. This is recommended when the underlying hardware may be different for migrations across clusters. If the migration happens within a cluster that has identical machines, MAC address assignment can be set to **Automatic**.

Read more about [Setting Mac Address of VM Using vSphere Web Client here](#).

Boundary of Migrations: “Within cluster vs. outside cluster”

vMotion migrations, in most cases, are triggered due to the DRS mechanism in VMware. DRS applies to migrations within the same cluster. Our testing scope was limited to migrating VMs within the same cluster, so we recommend you keep migrations of virtual machines within a DRS-enabled cluster.

Recent releases of vSphere support cross vCenter, cross vSwitch, and Long Distance migrations of VMware VMs. It is therefore possible to have migrations across VM cluster(s). If the underlying hardware is different there is a chance that the MAC address may change thus resulting in licensing failures on Tableau Server.

Also, don't overlook the effect that latency has on performance when deciding where to migrate nodes. Especially when choosing between different clusters or geographically dispersed vSphere hosts in a cluster. As an example, a Tableau customer had a scenario in which one of the worker nodes was in the US and the other was in the EU. Tableau Support showed that performance of the remote worker, due to latency, was severely impacting the local node and affecting the overall user experience of Tableau Server.

Removing a VMware Instance

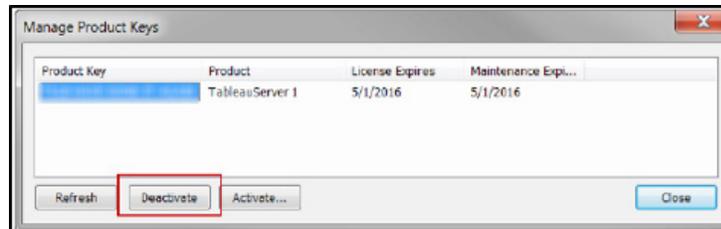
If you are temporarily shutting down the VMware VM instance, you don't need to do anything with your Tableau Server license. When a VM is shut down temporarily, all of the allocated resources are retained and you can restart the instance and resume Tableau at any time.

If you are shutting down and deleting the VM instance permanently, you should deactivate your Tableau Server license first. If you don't do this, the license may transfer to a new instance of VMware VM should you start one up again. This can break provisions of your licensing agreement and result in Tableau Server becoming unlicensed.

Perform the following steps before permanently shutting down a VM:

1. Sign in to the VM instance.
2. Create a backup of Tableau Server and then copy the .tsbak file to another location that will continue to be accessible after the instance is no longer available. For more information, see [Back Up Tableau Data](#) in the Tableau Server documentation.

3. Run the “Manage Product Keys” utility, by navigating to **Start > All Programs > Tableau Server > Manage Product Keys**.
4. Select the product key for the instance, and then click **Deactivate**.



You can now shut down and delete the instance.

Improving Security

In the above, Step 4: Access Tableau Server Using Your Browser, we connected to Tableau Server using an unsecured HTTP connection. Tableau however recommends configuring SSL/TLS with valid, trusted certificate(s) to communicate with Tableau Server. For more details, refer to [Security Hardening Recommendation](#) in the Tableau Online Help.

Troubleshooting

If you’re having trouble with Tableau Server or with getting access to the server after installation, please first review [Troubleshoot Tableau Server Install and Upgrade](#).

Some additional Troubleshooting guidelines are listed below.

Can’t install Tableau Server

- Ensure machine settings meet the Tableau Server minimum hardware requirements.
- Ensure the operating system bit version matches that of Tableau Server. A Tableau Server 64-bit installer will not install on a 32-bit OS.
- Run the server installer with administrator privileges.

Can’t connect to the instance using RDP

- Ensure you’re using the right credentials.
- Choose the “Other User” option and enter your credentials there.
- Ensure that you’re using a username that is valid on the VMware VM instance.

Can't access the server from a remote browser

- Sign in to the instance and make sure that the server is running.
- In the instance, open a browser and access the server locally (for example, using `http://localhost`).

“Tableau Server is unlicensed” error

- This error can occur if you've shut down instances without first deactivating the license. Ensure the VMware instance was properly removed. For further troubleshooting, please refer to [Handle an Unlicensed Server](#)

Other issues

For issues with using or installing Tableau Server, contact Tableau Support: support@tableau.com

Conclusion

In conclusion, Tableau Server and VMware are two powerful enterprise tools that complement each other seamlessly. By following the recommendations and best practices outlined in this document, customers can leverage the combined strengths of both Tableau Server and VMware vMotion.

About Tableau

Tableau helps people transform data into actionable insights that make an impact. Easily connect to data stored anywhere, in any format. Quickly perform ad hoc analyses that reveal hidden opportunities. Drag and drop to create interactive dashboards with advanced visual analytics. Then share across your organization and empower teammates to explore their perspective on data. From global enterprises to early-stage startups and small businesses, people everywhere use Tableau's analytics platform to see and understand their data.

Resources

[Tableau for the Enterprise: An IT overview](#)

[Tableau Server Administration Guide](#)

[Tableau Server Scalability: A Technical Deployment Guide for Server Administrators](#)

[Tableau Server 10.0 High Availability: Delivering mission-critical analytics at scale](#)

[Deploying Extremely Latency-Sensitive Applications in VMware vSphere 5.5](#)

[VMware Resource Allocation Shares](#)

[VMware vMotion best practices](#)

