

## ioTurbine Virtual 2.2.5



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## Caching overview

ioTurbine Virtual allows you to cache VMs in a VMware environment and dramatically increase their performance. Caching can be configured in two ways: host-based caching (or hypervisor caching) and guest-based caching:

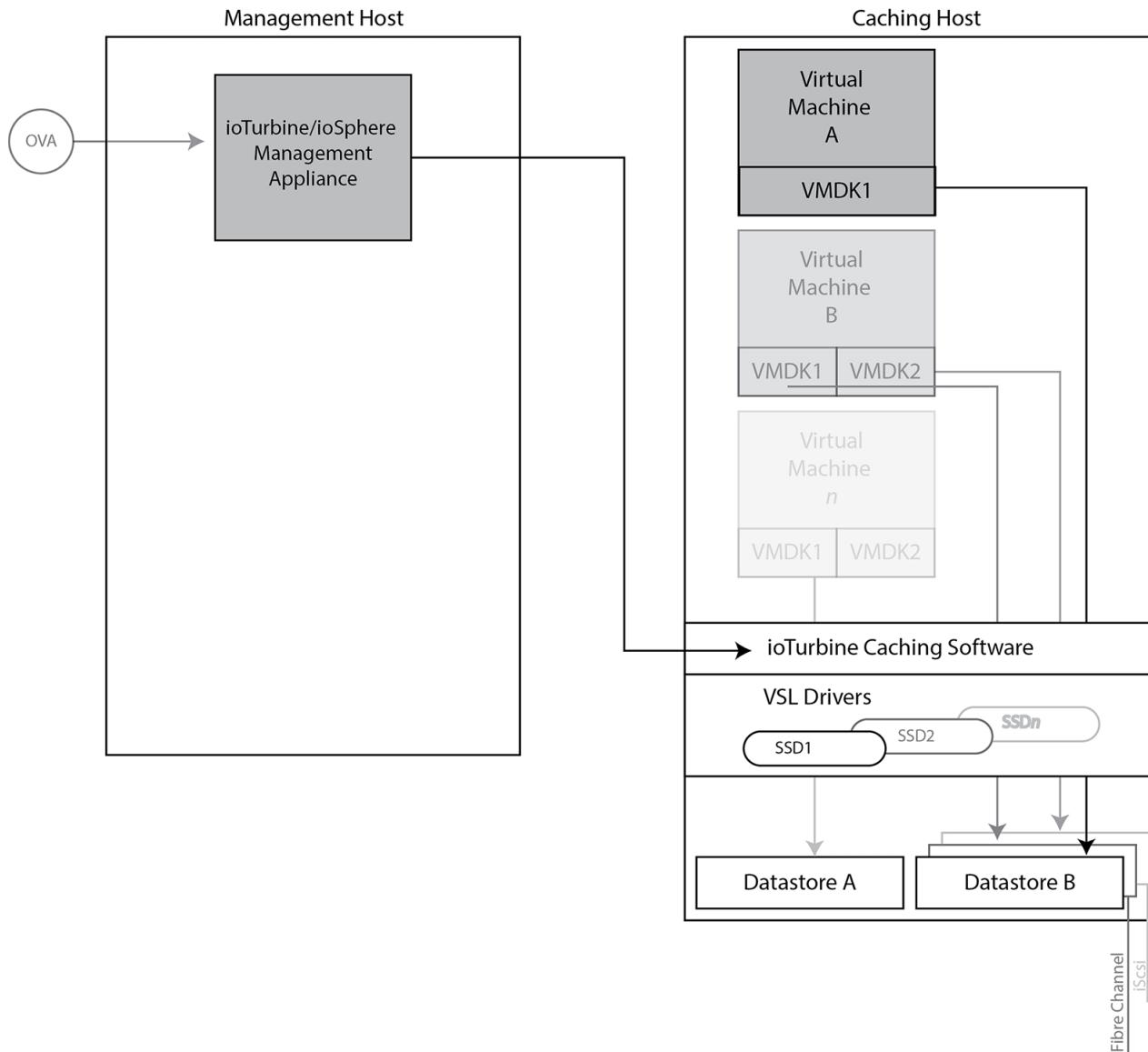
- Host-based Caching
  - Host-based caching does not require additional software to be installed on your VMs.
  - Host-based caching does not require administrative login credentials for the VM.
- Guest-based Caching
  - On Windows, guest-based caching provides greater granularity in what you choose to cache. For example, on Windows VMs you can cache specific files or specific volumes. With Linux guest-based caching, you can only specify caching at the volume or disk level.
  - As a general rule, guest-based caching performance will be better than host-based caching performance.

The ioTurbine solution consists of a management server and caching software. The management server is deployed as a virtual machine on a host that is not caching, and the caching software is deployed on hosts that contain ioMemory device .

The following figures illustrate the logical placement of these components.

## ioTurbine Host-based Caching

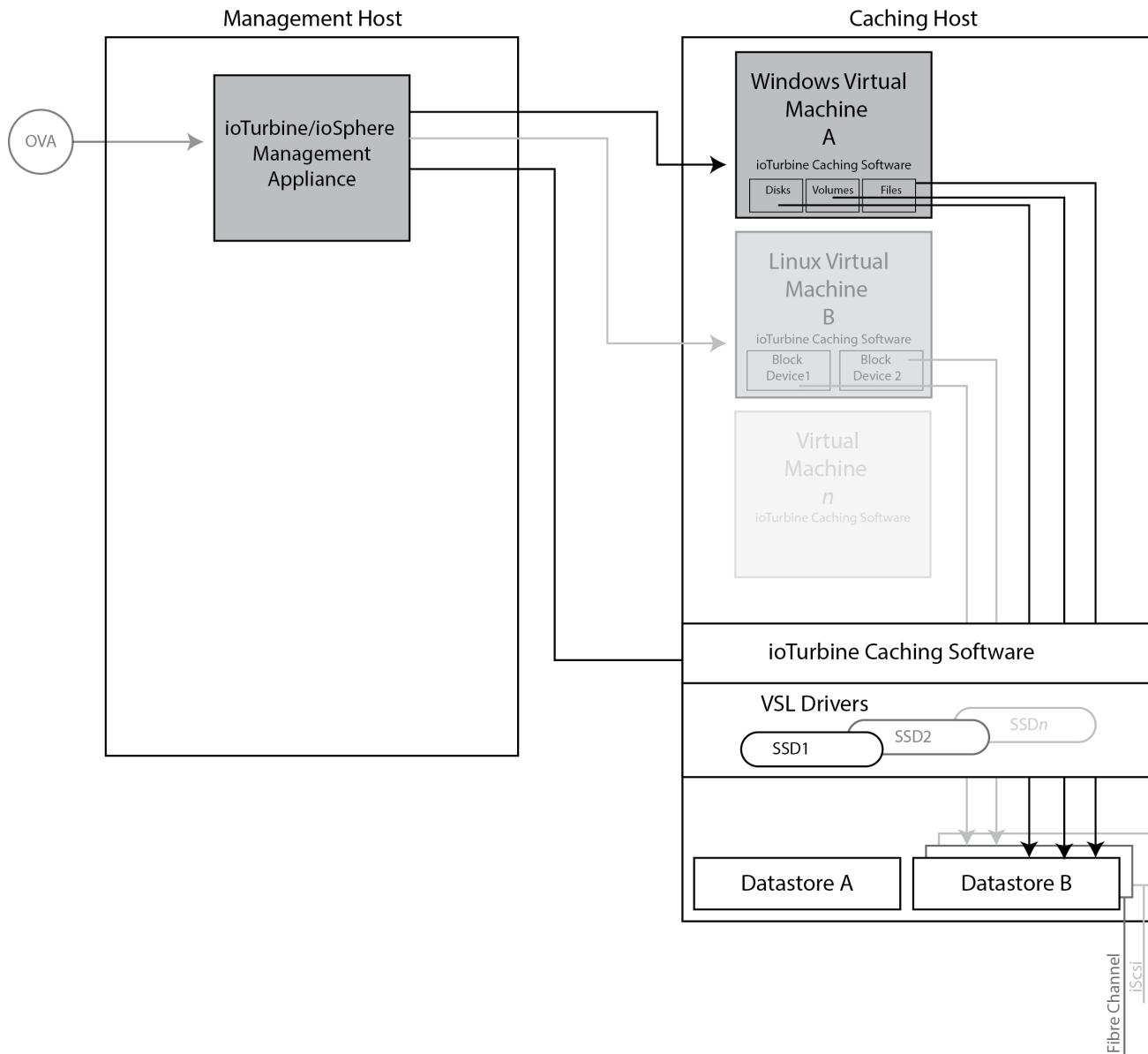
### Overview



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## ioTurbine Guest-Based Caching

### Overview



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## Installation overview

ioTurbine works in conjunction with VMware vCenter and ESXi hosts to provide caching capability to your virtual machines (VMs). The product consists of the management server and various software components that need to be deployed in your VMware environment.

There are six phases in the ioTurbine deployment process:

1. [Obtaining software](#)
2. [Preparing network and ESXi hosts](#)
3. [Deploying the management server](#)
4. [Installing ioMemory Device drivers on caching ESXi hosts](#)
5. [Configuring ioTurbine](#)
6. [Verifying caching configuration](#)

The sections that follow provide details on the deployment steps required in each of these phases. Note that the deployment steps are oriented towards new installs on caching hosts where there is no existing SanDisk software. If you are installing ioTurbine on hosts where ioMemory Devices and drivers are already correctly installed and configured, some of the steps may not be required.

A one-page summary of these phases and their steps is provided in the *ioTurbine Virtual Quick Deployment Guide*:



Refer to the *ioTurbine Virtual 2.2.5 Release Notes* for system requirements.

## ioTurbine Virtual Quick Deployment Guide

See ioTurbine product documentation for detailed installation instructions.

The instructions in this Quick Deployment Guide are intended for use with SanDisk PCIe ioMemory devices. If you are using an ioMemory device or SSD device from a vendor other than SanDisk, please refer to the instructions from the vendor and do not download or install drivers from <http://support.fusionio.com>.

### Download files from support.fusionio.com

Download --> ioMemory Device --> VMware\_ESXi-5.0--><vsl-version>

- cross\_vmware-esx-drivers-scsi-iomemory-vsl\_50..<vsl-version>.....offline-bundle.zip
- libvsl-1.0.0-5--offline-bundle.<vsl-version>.....zip
- fusion\_3.2.8.....fff (optional)

①

Download --> ioSphere --> VMware\_ESXi-5.x --> 3.15.0-iosphere

- fusionio-cimprovider-esxi5-bundle-3.15.0....zip (for manual install)

Download --> ioTurbine - Virtual --> VMware\_ESXi-5.x --> 2.2.5-ioturbine-virtual

- iosphere-vme-2.2.5....ova
- fio\_iot\_offline\_bundle\_esxi5-2.2.5....zip (for manual install)

Copy license file from welcome letter: LicenseFile.lic

### Prepare network and ESXi environment

- Ensure forward (A record) and reverse (PTR record) lookup entries in DNS for management server VM

②

- Open httpClient (80,443) and CIM Secure Server (5989) ports in all ESXi firewalls

Settings are found on the vSphere Client Host Configuration tab: **Security Profile > Firewall Properties**

- Reduce User Resource Allocation limit by .64% of aggregate formatted capacity of SSDs used for caching  
From vSphere Client Host Configuration tab

**System Resource Allocation > Advanced > user > Edit Settings > Memory Resources Limit**

③

### Deploy ioTurbine Virtual management server

- Deploy ioTurbine management server OVA from vSphere Client: **File > Deploy OVF template**

- From ioSphere web interface, register management server with vCenter

### Install VSL and ioTurbine caching software on all caching ESXi hosts

- Ensure the ESXi host is in maintenance mode

④

- From ESXi command line

```
esxcli software vib install -d /scratch/downloads/cross_vmware-esx-drivers-scsi-iomemory-vsl_50..<vsl-version>.....offline-bundle.zip  
esxcli software vib install -d /scratch/downloads/libvsl-1.0.0-5--offline-bundle.<vsl-version>.....zip  
esxcli software vib install -d /scratch/downloads/fio_iot_offline_bundle_esxi5-2.2.5....zip (manual install only)  
esxcli software vib install -d /scratch/downloads/fusionio-cimprovider-esxi5-bundle-3.15.0....zip (manual install only)
```

- Reboot the ESXi host

- Run fio-status to verify status is "attached" and "online," but **not** "MINIMAL MODE"

- If VSL is in minimal mode, ioMemory device may need a firmware update which requires a host reboot.

⑤

### Configure ioTurbine

- From vSphere Client Fusion ioSphere tab, click **Install New Software**

- Or, if you manually installed fio\_iot\_offline\_bundle\_esxi51, type the following:

```
ssh iotcli@<management server> (using password "iotcli")  
iot vmp --login -va <vCenterName> -vu <adminUser> (enclose Active Domain credentials in quotation marks)  
iot provision --startmonitor --vmhost <CachingHost1>
```

- From vSphere Client Fusion ioSphere tab of data center, license ioTurbine Virtual

- From vSphere Client Fusion ioSphere tab of host, click Manage Caching link and select a cache device

- Take ESXi host out of maintenance mode and restart VMs targeted for guest-based caching

- From vSphere Client Fusion ioSphere tab of host, click Manage Caching link and set VM caching method

⑥

### Verify the ioMemory device is configured and caching is active

From vSphere Client Fusion ioSphere tab view live performance graphs

- "Live Performance: ioMemory" and "Live Performance: Cache"

### About Memory Requirements

When deploying ioTurbine Virtual on an ESXi host, you will need to ensure that there is adequate memory reserved for both the ioTurbine software and the ioMemory VSL software. This is accomplished by modifying the System Resource Pool for *user* on the ESXi hosts where you plan to install caching.

The amount of memory to allocate for ioTurbine and ioMemory VSL software is directly related to the formatted capacity of the ioMemory Device or devices that are installed in the host. The table below identifies the *general rule* for reserving memory.

Component	Memory Required
ioTurbine	.14 % of the total formatted capacity of all caching devices in the host
ioMemory VSL software	General application:  .5 % of the total formatted capacity of all ioMemory Devices in the host  Worst Case:  For information about worst case values of the total formatted capacity for all ioMemory Devices in the host, please refer to the VSL documentation.

For example, if you were using a 1TB ioMemory Device that has been formatted to 80% capacity for caching in a general application environment, you would want to reduce the limit of *user* System Resource Pool on the host by 5369MB:

$$[(1024 \times 1024\text{MB}) \times .8] * (.005 + .0014) = 5369\text{MB}$$

On a host, then, with 32GB of memory, you would uncheck the "Unlimited" box under Memory Resources in the Edit user Resource Allocation dialog, and reduce the memory "Limit" from a value like 32454MB to 27085MB:

$$32454 - 5369 = 27085$$

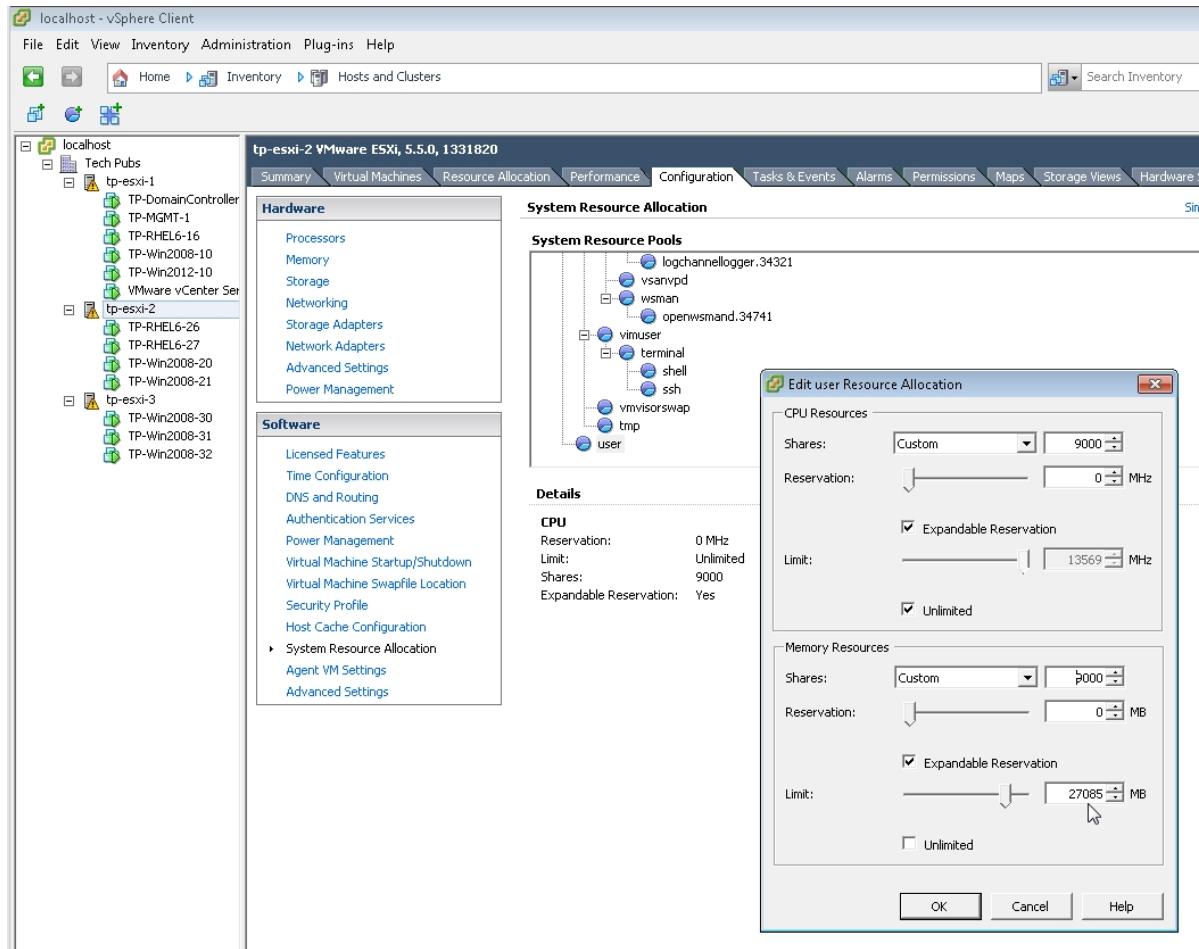
Using the vSphere client modify user Memory Resources from the host Configuration tab by clicking

- **System Resource Allocation > Advanced > user > Edit Settings > Memory Resource Limits**

Using the vSphere Web Client modify user Memory Resources using the host **Manage > Settings > System Resource Allocation** page.

At the bottom of the edit dialog, in the Memory Resources section, deselect **Unlimited** and then, in the **Limit** field set the max limit to the appropriate amount.

## ioTurbine Virtual 2.2.5 Installation Guide



For most applications, then, reserving .64% of the aggregate size of all ioMemory Devices in the host for ioTurbine caching will be sufficient. However, the amount of memory that needs to be reserved is workload dependent. In a worst case scenario, you may need to reserve up to 2.15% of the total size of all the ioMemory devices for use by the ioMemory VSL software. In these cases, then, you would need to reserve 2.29% of the aggregate formatted capacity of all ioMemory Devices in the host for ioTurbine caching.

For a more detailed discussion of this configuration, refer to the "Modifying a VMware Resource Pool to Reserve Memory" section of the *ioMemory VSL User Guide for VMware ESX and ESXi* as well as the "Sufficient System Memory (RAM)" section of the *ioMemory VSL Release Notes*.

For a more detailed discussion of this configuration, refer to the "Modifying a VMware Resource Pool to Reserve Memory" section of the *IBM ioMemory VSL User Guide for VMware ESX and ESXi* as well as the "Sufficient System Memory (RAM)" section of the *IBM ioMemory VSL Release Notes*.

### About Cache Device Constraints

In ioTurbine Virtual you can select up to eight devices to cache your VMs. However, there are some constraints on the usable capacity of these devices that vary depending on whether you are caching in guest-based or host-based mode.

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Clustering using active/failover shared disks is supported only on Windows with MSCS, using IoTurbine Virtual or IoTurbine Direct with guest-based caching. No other shared-disk configurations are supported on Windows, Linux, or any other operating system.

For hosts where VMs only utilize guest-based caching:

- Maximum single device size: 16TB.
- Maximum aggregate size of all devices: 128TB (8 devices x 16TB). You can assign up to 8TB per VM for guest-based caching, but total capacity assigned to all guest-caching VMs cannot exceed 128TB.

For hosts where VMs only utilize host-based caching:

- Maximum single device size: 16TB. However, only 8TB (ESXi 5.5) or 2.14TB (ESXi 5.0/5.1) can be used for VMs utilizing host-based caching.
- Maximum aggregate size of all devices: 128TB (8 devices x 16TB). However, only 8TB (ESXi 5.5) or 2.14TB (ESXi 5.0/5.1) of the aggregate size can be used for VMs utilizing host-based caching .

For hosts where there is a mix of host-based and guest-based caching, aggregate cache size for host-based caching will be limited to 8TB (ESXi 5.5) or 2.14TB (ESXi 5.0/5.1) but any capacity beyond that can be used for guest-based caching.



Each 1TB of caching requires 1.5GB RAM, so if you are caching with 8TB, you will need 12GB of RAM on the host.

### Example of a Single Cache Device Greater than 2.14TB (ESXi 5.0/5.1)

If you were using a 3.2TB ioScale device for guest-based caching only, all the space would be available as cache.



All ioScale devices need to be down-formatted for use in a caching environment. If you set the cache device using the management server GUI, the ioScale device will automatically be formatted correctly. However, if you set the cache device using the CLI make sure you have formatted the ioScale device to 80% of factory capacity.

If you were using the ioScale device for host-based caching only, only 2.14TB (ESXi 5.0/5.1) of the device would be used for caching and the remaining amount would be unused.

If you were using the 3.2 ioScale device for both guest-based and host-based caching, there would be 2.14TB (ESXi 5.0/5.1) of cache available for VMs which are caching in either host-based or guest-based mode, and the remaining space would be available for VMs caching in guest-based mode.

### Example of Two Cache Devices Greater than 2.14TB (ESXi 5.0/5.1)

If you were using two 3.2 ioScale devices for guest-based caching only, the combined space of both devices would be available as cache.

## IoTurbine Virtual 2.2.5 Installation Guide

If you were using the ioScale devices for host-based caching only, only 2.14TB (ESXi 5.0/5.1) of the combined capacity of the devices would be used for caching and the remaining amount would be unused.

If you were using the ioScale devices for both guest-based and host-based caching, there would be 2.14TB (ESXi 5.0/5.1) of cache available for VMs caching in either host-based or guest-based mode, and the remaining space would be available for VMs caching in guest based mode.

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### About vMotion support

ioTurbine supports vMotion of VMs between ESXi hosts, and it dynamically allocates cache capacity as VMs move between hosts. When a VM is vMotioned away from a host, the VM's caching capacity is released and re-allocated to the remaining VMs on the host. Similarly, when the VM is vMotioned onto a new host, caching capacity will be assigned to the VM and the caching capacity available for other VMs will be reduced.

Be aware of the following vMotion considerations:

- At a minimum, target hosts for caching VMs must have the ioTurbine VLUN driver installed. However, we recommend that all target hosts for caching VMs have an ioMemory Device and the full ioTurbine software package installed to maintain the performance of the cached VMs.
- vMotioning a VM invalidates its cache, and the VM's cache will need to re-warm after vMotion is complete.
- VMware should not allow a VM which is caching in either guest-based or host-based mode to vMotion to an ESXi server that does not have ioTurbine installed. If in some way a caching VM does end up on a host without ioTurbine, the VM may not be able to start.

### Firewall requirements

Review the table below prior to implementing ioTurbine in your environment. For additional details on ports and connectivity in the vSphere environment refer to the vSphere Security Guide:

<http://pubs.vmware.com/vsphere-55/topic/com.vmware.ICbase/PDF/vsphere-esxi-vcenter-server-55-security-guide.pdf>

### ioTurbine Virtual 2.2.5 Firewall Port Requirements

Component (From)	Firewall Rule	Component (To)	Port	Protocol	Description
vCenter Server	Inbound/Outbound	ESXi Host	HTTPS (443)	TCP	Default ports for VMware I/O -- can be changed.
vCenter Server	Inbound	Management Server	HTTPS (443)	TCP	Management Server operations, install/-configure guest.
vCenter Server	Inbound	vSphere Client	HTTPS (443)	TCP	Default ports for VMware I/O -- can be changed.
Management Server	Inbound	vSphere Client	HTTPS (443)	TCP	Provide data from ioTurbine to vSphere Client UI.
Management Server	Inbound	ESXi Host	Port 80	TCP	Download host package to ESXhost.
Management Server	Outbound	vCenter Server	HTTPS (443)	TCP	Management Server operations, install/-configure guest.
Management Server	Outbound	ESXi Host	CIM (5989)	TCP	Communications with the vLUN driver.
ESXi Host	Inbound/Outbound	vCenter Server	HTTPS (443)	TCP	Default ports for VMware I/O --- can be changed.
ESXi Host	Inbound	Management Server	CIM (5989)	TCP	Communications with the vLUN driver.
ESXi Host	Outbound	Management Server	Port 80/443	TCP	Download host package to ESXi host.
vSphere Client	Outbound	vCenter Server	HTTPS (443)	TCP	Default ports for VMware I/O -- can be changed.
vSphere Client	Outbound	Management Server	HTTPS (443)	TCP	Pulls data to vSphere Client UI.
vSphere Client	Inbound/Outbound	vCenter Server	HTTPS (8443)	TCP	ioTurbine plugin to be installed from the vSphere Client.

## Phase 1: Obtaining software

In order to install and run ioTurbine you will need the license file sent to you, as well as the following software components that can be downloaded from support.fusionio.com:

- SSD drivers
- VSL driver
- libvsl library
- Firmware update file (optional)
- ESXi CIM Provider
- ioTurbine Management Server OVA:

### Accessing ioTurbine software

Customers who purchase an ioTurbine license receive a welcome letter from Fusion-io which has a license file attachment and instructions on accessing and downloading the software. The letter specifies the following steps for gaining access to the ioTurbine files:



If you are using an ioMemory Device from a vendor other than Fusion-io, do not download or install drivers from [support.fusionio.com](http://support.fusionio.com). Contact your vendor to obtain the correct drivers for your device.

1. Register at support.fusionio.com if you haven't already. Click the **Register now** link on the upper right side of the support page to start the registration process.
2. Contact Fusion-io customer support by telephone or email so they can authorize your account to download the ioTurbine software as well as to access any drivers and utilities that you may require. The Fusion-io representative can authorize not only your account but also, as appropriate, other registered accounts in your organization to access the software.
3. After your account has been authorized, login to support.fusionio.com and click **Downloads**. Use the product selector to access the ioTurbine software and documentation at the following locations:



If you have installed a version of ESXi software that contains and installs ioMemory VSL software (e.g. VMware-ESXi-5.5-RollupISO.iso), you will still need to install the libvsl library.



In the filenames listed below, naming conventions can vary between ioMemory VSL software versions. In some places build numbers have been replaced with bullets.

<b>VSL Driver and Firmware</b>	
Product Selector	<p><u>ESXi 5.0 or 5.1</u></p> <p><b>Download &gt; ioDrive2 &gt; VMware_ESXi-5.x &gt; &lt;vsl-version&gt;</b></p> <p><u>ESXi 5.5</u></p> <p><b>Download &gt; ioDrive2 &gt; VMware_ESXi-5.5 &gt; &lt;vsl-version&gt;</b></p> <div style="border: 1px solid yellow; padding: 5px;">  Other supported device paths can be specified, for example:  <b>Download &gt; ioScale3 &gt; VMware_ESXi-5.5 &gt; &lt;vsl-version&gt;</b> or  <b>Download &gt; Gen3 &gt; VMware_ESXi-5.5 &gt; &lt;vsl-version&gt;</b> </div>
VSL Driver	<p><u>Recommended</u></p> <p><u>ESXi 5.0 or 5.1</u></p> <p>cross_vmware-esx-drivers-scsi-iomemory-vsl_500.&lt;vsl-version&gt;.*****.*****-offline-bundle.zip</p> <p><u>ESXi 5.5</u></p> <p>cross_vmware-esx-drivers-scsi-iomemory-vsl_550.&lt;vsl-version&gt;.*****.*****-offline-bundle.zip</p> <p><u>Optional for ESXi 5.0 or 5.1</u></p> <p>cross_vmware-esx-drivers-block-iomemory-vsl_500.&lt;vsl-version&gt;.*****.*****-offline-bundle.zip</p> <div style="border: 1px solid yellow; padding: 5px;">  If you are downloading a version of the VSL that is earlier than 3.2.6, you must use the block-iomemory-vsl driver. However, if you are using VSL 3.2.6 or above, we recommend you use the scsi-iomemory-vsl driver, but you can optionally use the block driver. If you are using ESXi 5.5 you must use the scsi-iomemory-vsl driver. </div>
libvsl library	<p><u>ESXi 5.0 or 5.1</u></p> <p>libvsl-1.0.0-500-offline-bundle.&lt;vsl-version&gt;.****.zip</p> <p><u>ESXi 5.5</u></p> <p>libvsl-1.0.0-550-offline-bundle.&lt;vsl-version&gt;.****.zip</p>
Firmware file (optional)	<b>fusion_&lt;vsl-version&gt;-*****.fff</b>
Install Location	Files need to be copied to <b>/scratch/downloads</b> , or a similar temporary location, on each ESXi host where you want to perform caching.

<b>CIM Provider</b>	
Product Selector	<b>Download &gt; ioSphere &gt; VMware_ESXi-5.x &gt; 3.15.0-iosphere</b>
CIM Provider (optional, for manual install)	fusionio-cimprovider-esxi5-bundle-3.15.0-•••.zip
Install Location	File needs to be copied to /scratch/downloads, or a similar temporary location, on each ESXi host where you want to perform caching.

<b>ioTurbine Software</b>	
Product Selector	<b>Download &gt; ioTurbine - Virtual &gt; VMware_ESXi-5.x &gt; 2.2.3-iоТurbine-virtual</b>
OVA	.ova
ioTurbine Caching Software (optional, for manual install)	<p>One of the following:</p> <ul style="list-style-type: none"> <li>• fio_iot_offline_bundle_esxi50-2.2.3-•••.zip</li> <li>• fio_iot_offline_bundle_esxi51-2.2.3-•••.zip</li> <li>• fio_iot_offline_bundle_esxi55-2.2.3-•••.zip</li> </ul>
Install Location	<ul style="list-style-type: none"> <li>• OVA needs to be copied to the local file system where you are running the vSphere client</li> <li>• Zip file needs to be copied to /scratch/downloads, or a datastore, on each ESXi host where you want to perform caching.</li> </ul>

In addition to files downloaded from the support site, you will also need the `LicenseFile.lic` file that was attached to your welcome letter.

<b>ioTurbine Software License</b>	
ioTurbine Welcome Letter	Attachment
License File	<code>LicenseFile.lic</code>
Install Location	<code>LicenseFile.lic</code> needs to be copied to the local file system where you are running the vSphere client.

## Phase 2: Preparing network and ESXi hosts

Before installing ioTurbine, there are some configurations you need to check in your network and your ESXi environment. Work through the checklist below to verify your environment is ready to deploy ioTurbine software:

- ❑ Ensure that your ioMemory Devices or ioScale devices are installed in your hosts and are properly formatted.

If you are using a new ioMemory Device or ioScale device with factory formatting, you do not need to re-format it. If necessary, ioTurbine will format the device for optimal caching settings when it is selected as a cache device. We strongly recommend that you let ioTurbine re-format your ioMemory Device or ioScale device.

If you are using an ioMemory Device or ioScale device that has been formatted with 512 byte sectors to something other than factory size, ioTurbine will not change the format.

ESXi requires all block storage devices to be formatted with 512 Byte sector sizes. This applies for ioMemory Device devices and non-ioMemory Device SSDs. In addition, the device capacity must not be formatted to its maximum size. The ioTurbine application requires the drive to be formatted to 80% of shipped capacity. You can use either the GUI or CLI to format the device and set both values. In the GUI, select 512 Byte as the sector size, and High Performance for capacity (equivalent to 80% capacity). In CLI, you can set the two values by running the fio-format VSL utility. For example, the VSL syntax is:

```
fio-format -b 512B -s 80% <device>
```

Providing approximately 20% unused space on the device provides the reserve capacity for ioTurbine to perform properly.

If you are using an SSD that is not an ioMemory Device or ioScale device, follow the manufacturer's instructions for properly formatting the device. Select a comparable "High Performance" setting for the SSD.

- ❑ Ensure the ESXi hosts where you want to deploy caching are in maintenance mode. It is a VMware best practice to put ESXi hosts in maintenance mode before installing software on them.

However, for new installs ioTurbine Virtual does not require the caching ESXi hosts to be in maintenance mode. If there has been a partial install of ioTurbine Virtual on the target ESXi host (e.g. just the management server or just the ioTurbine Virtual software), or if you are updating existing caching software, or if you are uninstalling, then the target ESXi will need to be in maintenance mode. Before putting the target ESXi host into maintenance mode, you can either shut down the VMs on the host or you can vMotion the VMs to a different host while you are installing ioTurbine.

If you put an ESXi server where you want to deploy caching into maintenance mode, the VMs will need to be powered on manually after the caching software has been installed on the host. Or, if you vMotioned the VMs to another host, you will need to vMotion the VMs back.

- ❑ Ensure that the ESXi host where you will deploy the ioTurbine management server and all ESXi hosts where you want to deploy caching have the following ports open:

- httpClient (80,443)—When installing ioTurbine Virtual on an ESXi host using the management server, this port needs to be open on the target ESXi server during installation. After installation is complete,

the port can be disabled.

If you are installing IoTurbine Virtual from the CLI, you can temporarily enable httpClient access on the target ESXi server by adding the `forcemodifyfirewallsetting` option to the `iot` package install command.

- CIM Secure Server (5989)

You can enable httpClient access on all the ESXi servers managed by your vCenter using either the vSphere client or the CLI command `iot system --sethostfirewallsetting`.

Using the vSphere client, open the the httpClient or CIM Secure Server ports using the host Configuration tab and clicking

- **Security Profile > Firewall Properties > httpClient**
- **Security Profile > Firewall Properties > CIM Secure Server**

Using the vSphere Web Client, open these ports using the host Manage tab and clicking **Settings > Security Profile** page.

If you are using an ioMemory Device from an OEM vendor, ensure that you are familiar with your vendors best practices for installing and configuring the ioMemory Device in your ESXi host, including:

- Obtaining and installing the correct drivers
- Upgrading the BIOS
- Enabling High Performance
- Disabling C-State
- Disabling Intel VT-D

If you are using an ioMemory Device, ensure that on all the ESXi hosts where you will be caching VMs, you have reduced the limit for user resource memory resources by at least .64% of the aggregate formatted capacity of all ioMemory Devices in the host. This is necessary to ensure that the VSL driver for the ioMemory device has adequate system memory to run. For more specific information, and for exceptions to this general rule see the [About Memory Requirements](#) section.

For an additional discussion of this configuration, refer to the "Modifying a VMware Resource Pool to Reserve Memory" section of the *ioMemory VSL User Guide for VMware ESX and ESXi* as well as the "Sufficient System Memory (RAM)" section of the *ioMemory VSL Release Notes*.

For an additional discussion of this configuration, refer to the "Modifying a VMware Resource Pool to Reserve Memory" section of the *IBM ioMemory VSL User Guide for VMware ESX and ESXi* as well as the "Sufficient System Memory (RAM)" section of the *IBM ioMemory VSL Release Notes*.

Ensure that you have created a DNS entry for the IoTurbine management server with both forward (A record) and reverse (PTR record) lookup entries. All ESXi hosts that will be caching will need to be able to ping the management server

by name. When you deploy the management server you can set the name of the management server VM to match this DNS entry.

- ❑ We recommend that the vCenter server that manages the hosts where you will be caching is not operating in linked mode. If your vCenter is using linked mode, you can either take the vCenter server out of linked mode before installing ioTurbine or you can register the management server with only one vCenter and only use that vCenter to manage caching.
- ❑ Ensure that the ESXi hosts where you want to perform caching are being managed by the same vCenter server that the ioTurbine management server will register with.
- ❑ Ensure that each ESXi host is configured with correct date, time, and time zone. If possible in your environment, enable the NTP client on all your ESXi hosts to get time from the same NTP server. VMs using guest-based caching need to have their clocks set to approximately the same time as the management server.
- ❑ Ensure the ESXi host where you will be installing the management server has an available datastore with at least 10GB of free space for thin provisioning or 65GB of free space for thick provisioning.
- ❑ Ensure that the VMs on the caching ESXi hosts are running the latest version of VMware tools. For those VMs where you want to deploy guest-based caching, the VMs must be running the latest versions of VMware tools. For those VMs where you want to use host-based caching, we recommend that these VMs be running VMware tools, but it is not required.
- ❑ If you are booting your ESXi host from USB/SD, ensure that each ESXi host has an alternate persistent scratch location defined per VMware best practices.
- ❑ If you want to use the vSphere Web Client, you will need to configure vCenter to display classic plug-ins. See [Using the management server with the vSphere web client](#) or consult the "Enabling Script Plug-In Support in the vSphere Web Client" section of the [VMware vSphere 5.5 Documentation Center](#).

## Phase 3: Deploying the management server

The ioTurbine management server is a virtual appliance that is deployed on a non-caching ESXi host managed by your vCenter. The management server is deployed into the VMware environment as an OVA file.

To deploy the management server:

1. Copy the ova file to the workstation where you will be running the vSphere client.
2. Start the vSphere client and login to your vCenter as a user who has rights to provision and manage virtual machines.
3. From the vSphere client click **File > Deploy OVF Template** and choose

ova

Or, from vSphere Web Client, perform the following steps:

- a. In the Object Navigator click **vCenter > Hosts and Clusters**
- b. Click the arrows to disclose the host where you want to deploy the .OVA file. The management server should not be deployed on an ESXi host where caching is, or will be, taking place.
- c. Right click the Host object, and click **Deploy OVF Template**



Clustering using active/failover shared disks is supported only on Windows with MSCS, using ioTurbine Virtual or ioTurbine Direct with guest-based caching. No other shared-disk configurations are supported on Windows, Linux, or any other operating system.

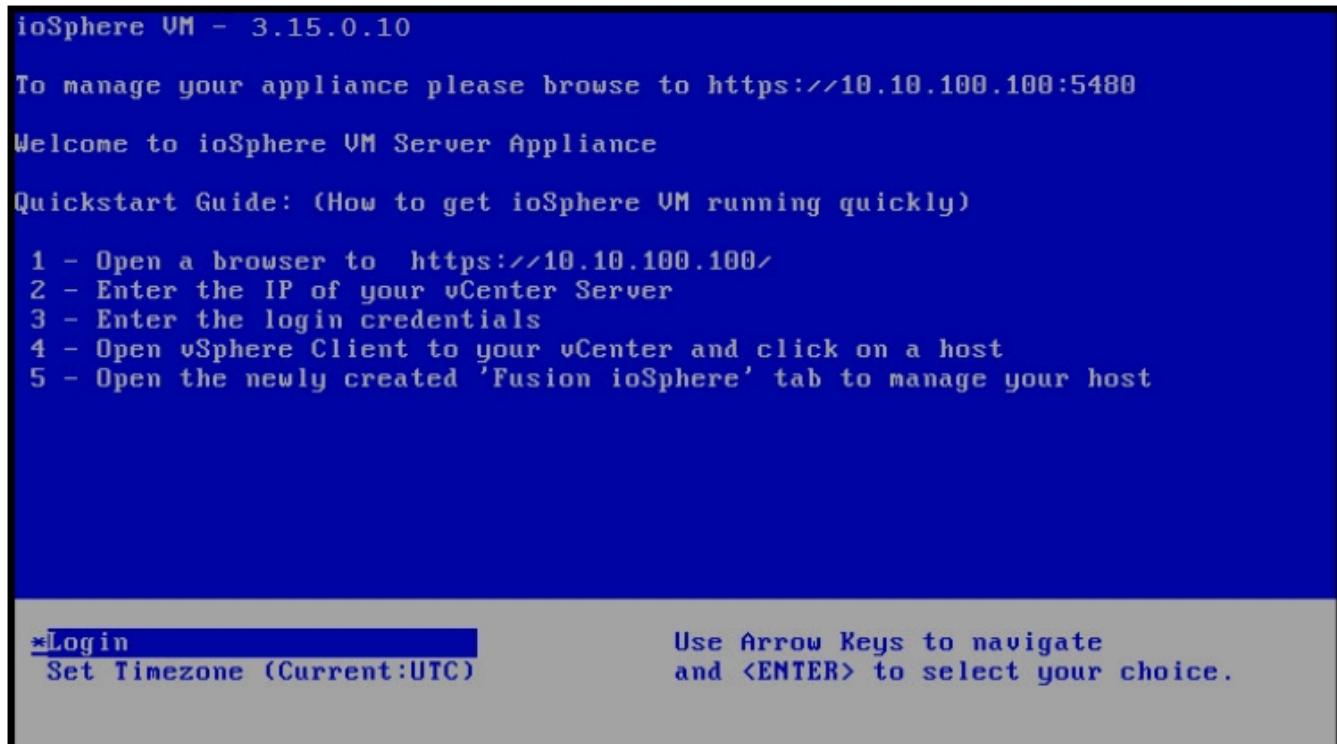
4. Work through the installation wizard.

- On the **Host/Cluster** page, specify the location for the management server. We recommend that you install the management server on a host where no caching will take place. You can, however, move the management server to a caching host after both the host caching software and the management server have been installed and configured. If the management server is running on a caching host, avoid making changes or issuing CLI commands that will cause the host to reboot (e.g. upgrading the host caching software) or the management server to reboot (e.g. configuring the management server for guest-based caching). You can configure the management server for host-based caching if desired.
- On the **Properties** page of the vSphere client, or on the **Customize template** page of the vSphere Web Client, provide a fully qualified host name for the management server. This host name should have forward (A record) and reverse (PTR record) lookup entries in DNS. Also set a password that will be used for the root and admin users on the management server. If you do not set a password, the default password will be "fusionio".
- If you do not enter any Networking Properties, the management server will be configured to use DHCP. We do not recommend DHCP for ioTurbine Virtual, unless you have DHCP reservations set for the management

server and all caching ESXi hosts in the system.

- Do not enter more than two comma separated DNS servers.

5. On the Ready to Complete page of the wizard, click **Power on after deployment** and click **Finish**.
6. After the console tab of the management server displays the blue Fusion ioSphere software VM screen, click the console screen and then use the arrow keys to select **Set Timezone**. Work through the prompts to set the correct time zone for the management server.



7. Consult the blue Fusion ioSphere software VM screen to determine the browser address for the management server. In your browser enter the displayed URL:

<https://<managementserver>/index.html>

where

- *managementserver* is the fully qualified hostname or IP address of the management server.

For example, you might enter something like this: <https://vmeHost/index.html>

8. On the Fusion ioSphere software screen, login with user *admin* and default password "fusionio". Or, if you changed the password in step 4, use the password you set.

- On the vCenter Server Configuration screen, type in the vCenter server hostname or IP address and supply credentials for a user who has sufficient privileges to manage virtual machines and extensions. Then click **Continue**.

The screenshot shows the Fusion ioSphere management interface. The top navigation bar includes links for OVERVIEW, CONFIGURATION, ALERTS, REPORTS, and SETTINGS. On the left, a sidebar menu lists APPLICATION, REMOTE ACCESS, REMOTE ACCESS KEY, AGENTS, LICENSES, DATABASE, VCENTER SERVER (which is selected and highlighted with a blue arrow), LABELS, and SAVED SEARCHES. The main content area is titled 'VCENTER SERVER' and contains the sub-instruction 'Configure the vCenter server connection parameters.' It features three input fields: 'Server' (containing 'tp-vcenter-1.int.fusionio.com'), 'Username' (containing 'root'), and 'Password' (containing '\*\*\*\*\*'). A 'Register' button is located below these fields.

- On the Remote Access screen, click **Use pre-configured SSL Certificate**, or install your own certificate and key, and click **Save Changes**.
- If Security Warnings display in the vSphere Client, respond to them appropriately.
- Close the browser.

The ioTurbine management server is now installed.

#### Verifying the management server DNS entry

To determine if there are problems with the name resolution of your management server, you can run `iot system --doctor` on the command line of the management server. Any DNS issues with the management server will be noted in the output of the command.

To run `iot system --doctor`:

- Login to the management server with the following credentials:

Username: `iotcli`  
Password: `iotcli`

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2. From the management server command line, enter the following command:

```
iot system --doctor
```

The output of the command will look something like this:

```
iotcli@tp-vme-1:~> iot system --doctor
[2014/05/01 10:51:49] IP Address 10.1.100.94
[2014/05/01 10:51:49] DNS entry for your host is tp-vme-1.int.fusionio.com
[2014/05/01 10:51:49] Hostname tp-vme-1.int.fusionio.com matches DNS entry
[2014/05/01 10:51:49] DNS IP address matches yours
[2014/05/01 10:51:49] Pinging nameserver 10.1.100.30
[2014/05/01 10:51:51] Pinging nameserver 10.1.100.31
[2014/05/01 10:51:53] Pinging nameserver 10.1.100.64
[2014/05/01 10:51:55] Pinging nameserver 10.1.100.65
[2014/05/01 10:51:57] Pinging nameserver 10.2.100.64
[2014/05/01 10:51:59] Pinging nameserver 10.2.100.65
[2014/05/01 10:52:01] Tomcat running as 5295
[2014/05/01 10:52:01] License manager running as 5206
[2014/05/01 10:52:01] Postgres seems to be running as 5262
[2014/05/01 10:52:01] Root disk has sufficient space. 43% left
[2014/05/01 10:52:01] OK
```

## Phase 4: Installing caching device drivers on caching ESXi hosts

Each of the ESXi hosts where you want to deploy caching will require a function caching device, such as a SanDisk SAS or SATA drive with its associated drivers and software. This software can be downloaded from [support.fusionio.com](http://support.fusionio.com). (For additional details on downloading software see [Phase 1: Obtaining Software](#).)



If you are using an ioMemory Device from a vendor other than Fusion-io, do not install drivers from support.fusionio.com. Contact your vendor to obtain the correct drivers for your device.



If you are using a non-ioMemory device, do not perform the procedures in this section. Contact your vendor to obtain the correct drivers for your device, and refer to the vendor documentation for driver installation procedures.

If you haven't already done so, install and configure the SSDs you plan to use as cache devices.

For ioMemory devices, the following software needs to be installed on each caching ESXi host:

- VSL driver
- libvsl library

To install drivers on a caching ESXi host:

1. If you haven't already, put the ESXi host where you want to deploy the drivers and software into maintenance mode.
2. Copy the following files to /scratch/downloads, or a datastore, on the caching ESXi host:
  - cross\_vmware-esx-drivers-scsi-iomemory-vsl\_5••.<vsl-version>••••••••••••••-offline-bundle.zip
  - libvsl-1.0.0-5••-offline-bundle.<vsl-version>•••••.zip
  - fusion\_<vsl-version>-•••••••.fff (optional)



In the filenames listed above, build numbers have been replaced with bullets.



You can alternately upload these files into a VMware Update Manager (VUM) repository, and then include them in a Host Extension baseline. Remediating the host with a baseline that includes these files will install the software. After remediation, continue with Phases 5 and 6 of the install process.

3. Login to the ESXi host as root or as an administrative user with rights to install software. (If you are using ssh to login, you may need to first "Enable ESXi Shell" under Troubleshooting Options on the console of the ESXi server.)
4. Using the full path and file name, enter the following commands:

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```
esxcli software vib install -d  
/scratch/downloads/cross_vmware-esx-drivers-scsi-ioemory-vsl_  
5••.3.2.8.*****.offline-bundle.zip esxcli software vib install -d  
/scratch/downloads/libvsl-1.0.0-5••-offline-bundle.3.2.8.*****.zip
```

5. If no errors were reported while installing the files, reboot your host.
6. After the host reboots, login to the host as root or as an administrative user with rights to install software.
7. From the command line run the following command: `fio-status`

The output of the `fio-status` command will indicate if the VSL driver installed correctly. Specifically, look for status that indicates "fct0 Attached" and "fioa State: Online."

If you see output that indicates the card is in minimal mode, e.g. "Status unknown: Driver is in MINIMAL MODE," you will need to troubleshoot your driver installation. In some cases, the VSL driver will come up in minimal mode because the firmware on the ioMemory Device is too old. If this is the case, you will need to update the firmware on your ioMemory Device using the `fio-update-iodrive` command. For instructions on how to update firmware on your ioMemory Device refer to the "Upgrading the Firmware" section of the *ioMemory VSL User Guide for VMware ESX and ESXi* as well as the "Upgrading Devices for ioMemory VSL software" section of the *ioMemory VSL Release Notes*.

After upgrading the firmware on the ioMemory Device, reboot the host and repeat steps 6 and 7. If `fio-status` still does not indicate the VSL driver installation was successful, contact customer support at [support.fusionio.com](http://support.fusionio.com).

After `fio-status` indicates the driver has been successfully installed and that the ioMemory Device is online, repeat this process on any other ESXi hosts where you want to deploy caching.

## Phase 5: Installing ioTurbine software on caching ESXi hosts

Each of the ESXi hosts where you want to deploy caching will require the ioTurbine Virtual software. This software can be downloaded from [support.fusionio.com](http://support.fusionio.com). (For additional details on downloading software see [Phase 1: Obtaining Software](#).)

If you haven't already done so, install and configure the SSDs, ioMemory Devices, or ioScale devices you plan to use as cache devices, as described in See "Phase 4: Installing caching device drivers on caching ESXi hosts" on page 22

The following software needs to be installed on each caching ESXi host:

- ioTurbine Virtual software
- CIM provider

The procedure below describes how to perform a new installation of ioTurbine. It assumes a caching device has been physically installed in the caching hosts, but that no SanDisk software is installed on the ESXi servers where you want to perform caching.

### Installing ioTurbine caching software with the management server (preferred method)

Use either the **Fusion ioSphere** tab in the vSphere client interface, or the **Classic Solutions** tab in the vSphere Web Client, to install host caching software on ESXi hosts. Perform the following steps to install the host caching software with the management server interface:

1. If you haven't already done so, log in to your vCenter using a vSphere client.
2. In the inventory tree, or in the Object Navigator, on the left of the screen, click an ESXi host where you want to cache and then click either the **Fusion ioSphere** tab or the **Classic Solutions** tab.

The management server user interface displays the host Configure tab.

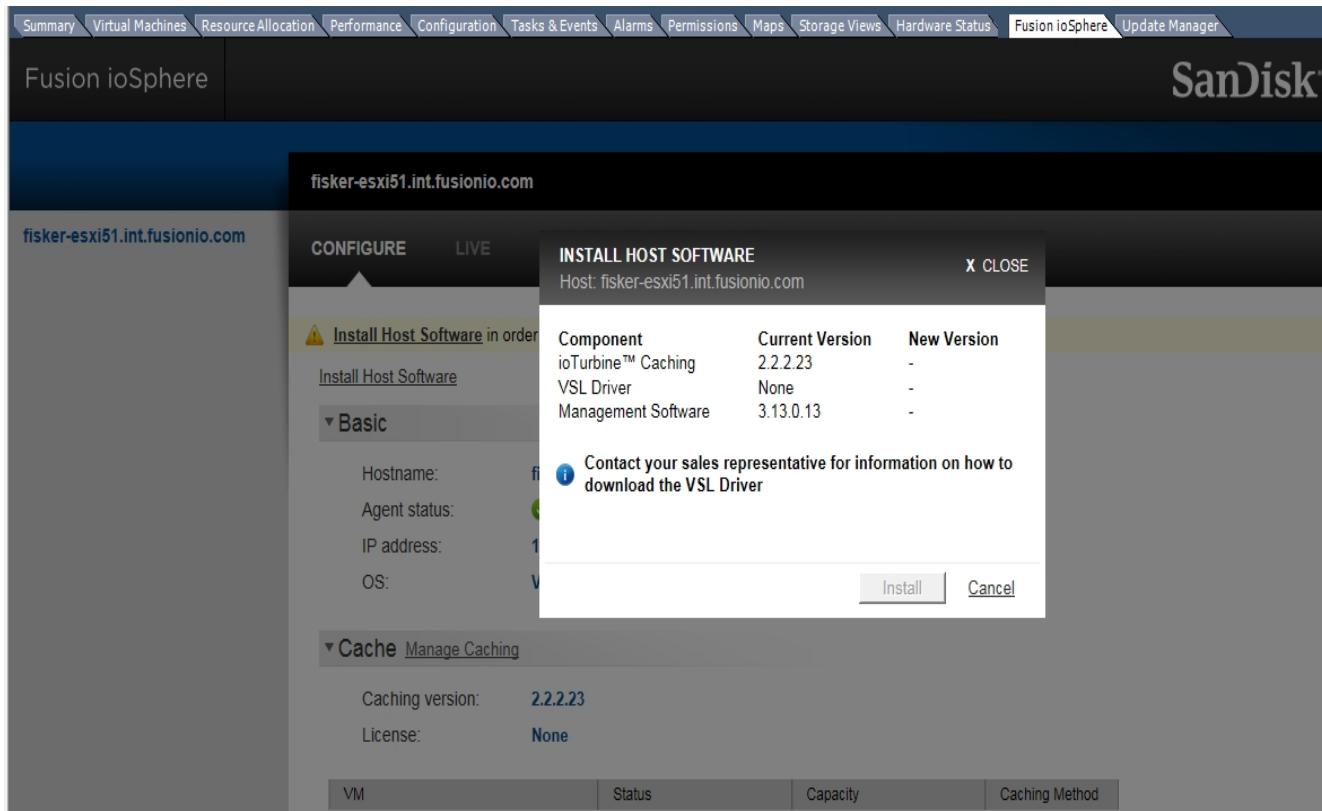
3. Click **Install Host Software**.
4. Click **Install**.

The management server installs the caching software on the host.

5. Repeat steps 2-4 on each ESXi host where you want to cache.
6. Log in to the host as root or as an administrative user with rights to install software.

ioTurbine Virtual is now installed on your ESXi hosts.

## ioTurbine Virtual 2.2.5 Installation Guide



### Installing ioTurbine caching software manually

Before installing the ioTurbine software on a caching ESXi host, perform these steps:

1. If you haven't already, put the ESXi host where you want to deploy the software into maintenance mode.
2. Copy the following files to `/scratch/downloads`, or a datastore, on the caching ESXi host:
  - `fio_iot_offline_bundle_esxi5•.zip` (for manual install)
  - `fusionio-cimprovider-esxi5-bundle-3.13.0-•••.zip` (for manual install)



In the filenames listed above, build numbers have been replaced with bullets.

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## Phase 6: Configuring ioTurbine

After you have completed deploying the ioTurbine software on all the caching hosts in your environment, complete the following configuration steps:

1. [Configure the management server to monitor your caching hosts](#)
2. [Deploy the ioTurbine caching software on hosts](#)
3. [License the ioTurbine software](#)
4. [Select cache devices on your hosts](#)
5. [Take caching ESXi hosts out of maintenance mode](#)
6. [Configure VMs for either guest-based caching or host-based caching](#)

### Monitoring caching hosts



If you deployed the caching software to your ESXi host using the management server "Install Host Software" functionality, you can skip this section. The `--startmonitor` command described below is only required for caching software installed from the command line of the ESXi host.

The ioTurbine management server needs to monitor your caching ESXi hosts to keep track of VMs that are added and removed from inventory.

To identify ESXi hosts for monitoring:

1. Login to the management server with the following credentials:

Username: `iotcli`

Password: `iotcli`

2. From the management server command line, authenticate the management server with vCenter by typing the following command:

```
iot vmp --login --vmpaddress <vCenterAddress> --vmpuser <vCenterUsername> --vmp-  
password <vCenterPassword>
```

where

*vCenterAddress* is the IP address or the fully qualified hostname of the Fusion ioSphere software Virtual Center server

*vCenterUsername* is the name of a user who has sufficient rights to authenticate with the management server.

*vCenterPassword* is the password for the user

For example, you might enter a command that looks something like this:

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```
iotcli@TP-IOT-1:~> iot vmp --login --vmppaddress 10.1.100.176 --
vmpuser root --vmppassword vmware
Logged in to VMP : 10.1.100.176
```

3. Enter the following command. Include all your caching ESXi servers as command line arguments.

```
iot provision --startmonitor --vmhost <CachingHost>
```

where

*CachingHost*—is the fully qualified hostname or IP address of the ESXi server where you installed ioTurbine caching software

For example, you might enter a command that looks something like this:

```
iotcli@tp-vme-1:~> iot list --vmhost tp-esxi-2.int.fusionio.com
Host : tp-esxi-2.int.fusionio.com
Hypervisor Caching Enabled : false
Host License Enabled : false
Host Autocache Enabled : false
Read Update Enabled : true
Host Monitoring Enabled : false
ioTurbine Caching Version : 2.1.3.177
Management Software Version : 3.13.0.152
ioMemory Driver Version : 3.2.8.1336

iotcli@tp-vme-1:~> iot provision --startmonitor --vmhost tp-esxi-
2.int.fusionio.com
Successfully enabled monitoring on host : tp-esxi-2.int.fusionio.com

iotcli@tp-vme-1:> iot list --vmhost tp-esxi-2.int.fusionio.com
Host : tp-esxi-2.int.fusionio.com
Hypervisor Caching Enabled : false
Host License Enabled : false
Host Autocache Enabled : false
Read Update Enabled : true
Host Monitoring Enabled : true
ioTurbine Caching Version : 2.1.3.177
Management Software Version : 3.13.0.152
ioMemory Driver Version : 3.2.8.1336
```

4. Repeat step 3 for all caching ESXi hosts in your environment where you performed a manual installation.

The management server is now configured to monitor the caching ESXi hosts in your environment.

#### Licensing ioTurbine Virtual

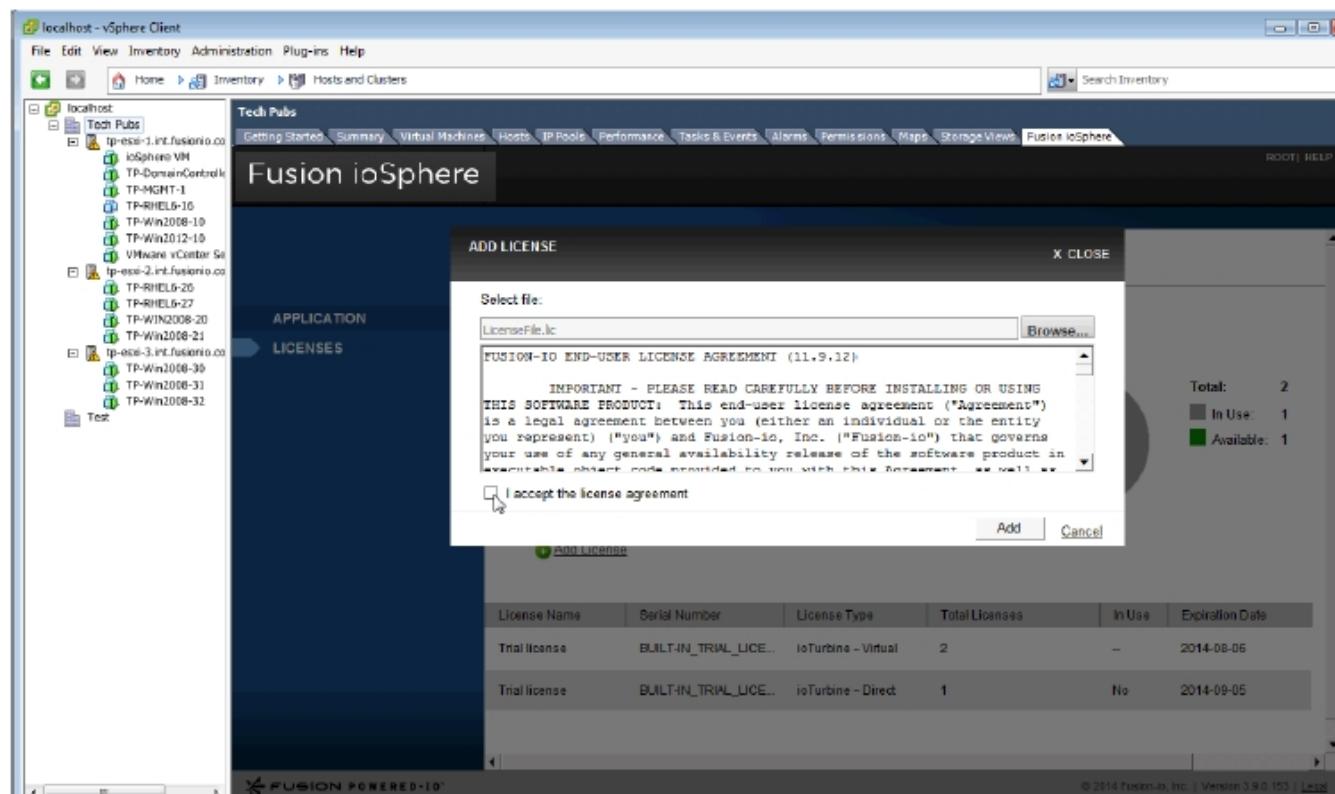
Use either the **Fusion ioSphere** tab in the vSphere client interface, or the **Classic Solutions** tab in the vSphere Web Client, to license ioTurbine Virtual. All licenses added to the management server will be automatically distributed across caching ESXi hosts.

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1. If you haven't already done so, log in to your vCenter using a vSphere client.
2. In the inventory tree, or in the Object Navigator, on the left of the screen, click one of data centers managed by your vCenter. Then click either the **Fusion ioSphere** tab or the **Classic Solutions** tab.

The Licenses screen displays.

3. In the Licenses windows, click **Add a License**.
4. Click **Browse** and navigate to the location of the license file.
5. Accept the license agreement.
6. Click **Add**.



The licenses in your license file are added to the management server. You can repeat the steps above to add as many licenses to the vCenter as required. Licenses will be consumed by any caching ESXi hosts that is managed by the vCenter when cache devices are selected. Additionally, if a host is added to the vCenter, and the host has IoTurbine installed and caching devices selected, licenses will be consumed.

License Name	Serial Number	License Type	Total Licenses	In Use	Expiration Date
Trial license	BUILT-IN_TRIAL_LICEN...	ioTurbine - Direct	1	No	2014-09-05
Fusion-io Test Custo...	FCS_TESTCUSTOMER_...	ioTurbine - Virtual	32	—	2017-04-08

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### Selecting cache devices on ESXi hosts

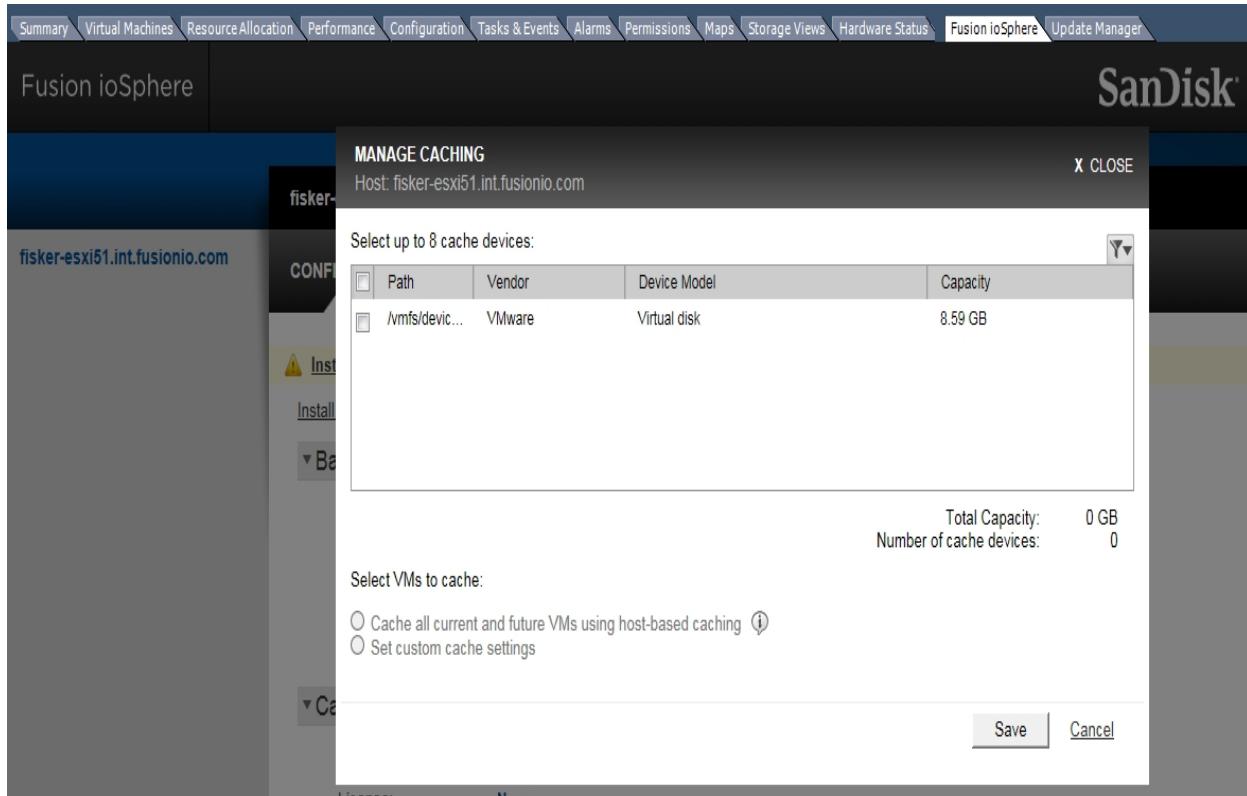
Use either the **Fusion ioSphere** tab in the vSphere client interface, or the **Classic Solutions** tab in the vSphere Web Client, to select the cache device or cache devices on a host.

To set cache devices on an ESXi host:

1. If you haven't already done so, login to your vCenter using a vSphere client.
2. In the inventory tree, or in the Object Navigator, on the left of the screen, click one of the ESXi hosts you have configured for caching and then click either the **Fusion ioSphere** tab or the **Classic Solutions** tab.

The management server user interface displays the host Configure tab.

3. Next to the Cache label, click **Manage Caching**.



4. From the manage caching dialog click on one or more devices listed in the cache device table. You can select up to eight cache devices per host.

**WARNING:** Selecting a device to be a cache device will result in the permanent loss of all data currently on the device.

**!** If you are using a new ioMemory Device or ioScale device with factory formatting, ioTurbine may reformat the device to an optimal caching capacity. We strongly recommend that you let ioTurbine reformat your ioMemory Device.



If you are using an ioMemory Device or ioScale device that has been formatted with 512 byte sectors to something other than factory size, IoTurbine will not change the format. We strongly recommend that the device not be formatted to its maximum size.

ESXi requires all block storage devices to be formatted with 512 Byte sector sizes. This applies for ioMemory devices and non-ioMemory SSDs. In addition, the device capacity must not be formatted to its maximum size. The IoTurbine application requires the drive to be formatted to 80% of shipped capacity. You can use either the GUI or CLI to format the device and set both values. In the GUI, select 512 Byte as the sector size, and High Performance for capacity (equivalent to 80% capacity). In CLI, you can set the two values by running the fio-format ioMemory VSL utility. For example, the VSL syntax is:



```
fio-format -b 512B -s 80% <device>
```

Providing approximately 20% unused space on the device provides the reserve capacity for IoTurbine to perform properly.



If you are using an SSD that is not an ioMemory Device or ioScale device, follow the manufacturer's instructions for properly formatting the device. Select a comparable High Performance setting for the SSD.

5. Click either **Cache all current and future VMs using host-based caching** or **Set custom cache settings**.
6. If you select **Set custom cache settings**, configure the VMs you want to cache.



Host-based caching on shared VMDKs is not supported.

**MANAGE CACHING**

Host: tp-esxi-2 X CLOSE

Select up to 8 cache devices:

Path	Vendor	Device Model	Capacity
\vmfs/device...	FUSIONIO	IODRIVE	964 GB

Total Capacity: 964 GB  
Number of cache devices: 1

Select VMs to cache:

- Cache all current and future VMs using host-based caching i
- Set custom cache settings

Edit All VMs Edit reboot settings for all

VM	Caching Method	Caching Selection	Reboot Now
TP-RHEL6-27	No Caching <span>EDIT</span>		N/A
TP-RHEL6-26	Host-based <span>EDIT</span>	Cache All <span>EDIT</span>	N/A
TP-Win2008-20	Guest-based <span>EDIT</span>	Cache All	<input checked="" type="checkbox"/>
TP-Win2008-21	Host-based <span>EDIT</span>	Cache All <span>EDIT</span>	N/A

Automatically cache new VMs using host-based caching

Save Cancel

7. Click **Save**.

8. If asked, click **Confirm**.

The selected device or devices are set as cache devices.



If you get a "Failed to configure caching" error that says the "Cache device is in use by another host," you may need to reformat the device. **First verify that the device you selected really is the device you want to use for caching.** Then, on the Host Configure tab of the management server, click **More Actions > Low-Level format** and then format the device for "High Performance." After the format completes, try setting the cache device again.



**!** **ERROR:** Failed to configure caching

Assign Caching Device on HostSystem:host-45 failed: The VLUN server failed to execute on the host. Details : Cache device is in use by another host: format the cache device and try again.  
TP-RHEL6-7: Operation was cancelled.  
TP-RHEL6-8: Operation was cancelled.  
TP-WIN2K8-31: Operation was cancelled.  
TP-WIN2K8-33: Operation was cancelled.

Repeat these steps on all caching ESXi hosts.

#### Taking caching hosts out of maintenance mode

After setting the cache device on your caching ESXi host, use the vSphere client interface to take your ESXi hosts out of maintenance mode.

Power on, or vMotion back, the VMs that will run on the host. Guest-based caching cannot be installed, uninstalled, configured, nor changed from guest-based to "No Caching" mode if the VM is not powered on. However, host-based caching can be configured with the VM in a powered on or powered off state.



Configuring a powered-on VM for host-based caching that has large or heavily used disks (i.e. VMDKs) can be time consuming. In some cases it can take several hours. If possible, consider configuring host-based caching on this class of VM while it is powered-off.

#### Configuring VMs for Caching

There are three caching methods you can set for specific VMs:

- Host-based—the VMDK files of a VM are cached; no software is installed on the VM
- Guest-based—caching software is installed on the VM which allows more granular caching options and slightly better caching performance.
- No Caching

Use the Fusion ioSphere tab or the **Classic Solutions** tab in the vSphere client interface to configure caching on VMs:

1. If you haven't already done so, login to your vCenter using a vSphere client.
  2. In the inventory tree, or in the Object Navigator, on the left of the screen, click one of the ESXi hosts you have configured for caching and then click either the **Fusion ioSphere** tab or the **Classic Solutions** tab.
- The management server user interface displays the host Configure tab.
3. Next to the Cache label, click **Manage Caching**.
  4. Click **Set custom cache settings**.

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If you want to set all the VMs on the host to cache using the same method, then click **Edit All VMs** and select the caching method you want applied to all VMs. Then skip to step 6.

5. In the VM table, in the Caching Method column, click **Edit** next to the VM you want to configure.
6. From the drop down click either **No Caching**, **Host-based**, or **Guest-based**.
7. If you want to enable auto-caching on the host, which means that any new VMs added to the host will be configured to cache all volumes in host-based mode, click "Cache all current and future VMs using host-based caching."
8. After configuring the caching method for the VMs click **Save**.
9. If asked, click **Confirm**.
10. If you have selected guest-based caching, enter the login credentials for a user who has rights to install software on the VM or VMs you want to install guest-based caching on and then click **Done**.

The caching method you selected is set for the VMs on the caching ESXi host.

Repeat these steps on each caching ESXi host in your environment.

**MANAGE CACHING**

Host: tp-esxi-2. X CLOSE

Select up to 8 cache devices:

Path	Vendor	Device Model	Capacity
/vmfs/device...	FUSIONIO	IODRIVE	964 GB

Total Capacity: 964 GB  
Number of cache devices: 1

Select VMs to cache:

- Cache all current and future VMs using host-based caching ⓘ
- Set custom cache settings

[Edit All VMs](#) [Edit reboot settings for all](#)

VM	Caching Method	Caching Selection	Reboot Now
TP-RHEL6-27	No Caching <a href="#">EDIT</a>	N/A	
TP-RHEL6-26	Host-based <a href="#">EDIT</a>	Cache All <a href="#">EDIT</a>	N/A
TP-Win2008-20	Guest-based <a href="#">EDIT</a>	Cache All	<input checked="" type="checkbox"/>
TP-Win2008-21	<input type="button" value="No Caching"/> <input type="button" value="Host-based"/> <input style="background-color: #0070C0; color: white; border: 1px solid #0070C0; padding: 2px; cursor: pointer;" type="button" value="Guest-based"/>	Cache All <a href="#">EDIT</a>	N/A

Automatically cache new VMs using host-based caching

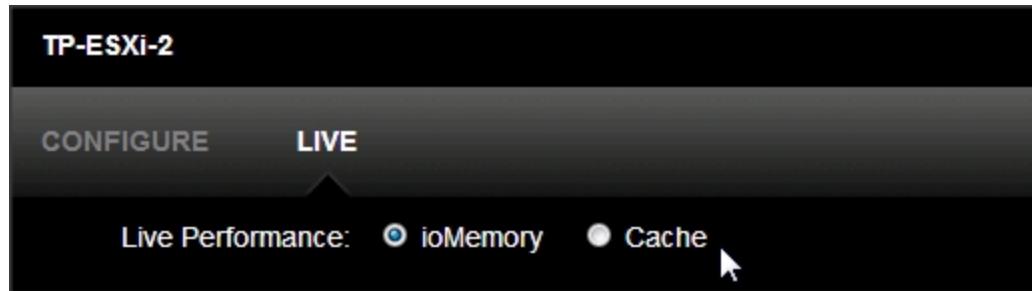
[Save](#) [Cancel](#)

 For guest-based caching and host-based caching you can also edit the Caching Selection. For details on how to do this refer to the "Editing Caching Selection for VMs Using guest-based caching" and "Editing caching selection for VMs using host-based caching" sections of the *Administrator Guide*.

## Phase 7: Verifying caching configuration

An easy way to verify that caching is configured on a host is to view the Live Performance tab in the Fusion ioSphere tab. If you have configured ioTurbine correctly, there should be options to view performance on the following two components:

- The ioMemory Device
- The ioTurbine cache



To view Live Performance graphs for ioMemory Device and Cache:

1. If you haven't already done so, login to your vCenter using a vSphere client.
2. In the inventory tree, or in the Object Navigator, on the left of the screen, click one of the ESXi hosts you have configured for caching and then click either the **Fusion ioSphere** tab or the **Classic Solutions** tab.  
The management server user interface displays the host Configure tab.
3. Click the **Live** tab.
4. Click either the ioMemory Device or Cache radio buttons to see the Live Performance graphs.

As a general rule, if you can see activity occurring these graphs, it indicates that ioTurbine is installed correctly.

For additional details refer to "About Live Performance Graphs for Hosts" and "About Live Performance Graphs for Vms" in the *Administrator Guide*



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## Upgrading caching software

If you want to upgrade your caching software to a newer version, perform the steps below.

### Upgrading ioTurbine Virtual 2.1.3 or 2.1.5 to a newer version

There is not an in-place upgrade for a 2.1.3 or 2.1.5 management server to a 2.2.x management server. To upgrade to a 2.2.x management server, you will need to import settings from an existing 2.1.3 or 2.1.5 management server.

#### Importing an existing caching environment

To deploy a new 2.2.x management server and import your existing caching environment:

1. Deploy the 2.2.x management server OVA file.
2. Log in to the console of the new 2.2.x management server as user *root*. (The root password was set during deployment of the OVA.)
3. From the command line of the management server enter the following command:

```
iot system --import <fqdn-IP>
```

where

*fqdn-IP*—is the fully qualified domain name or IP address of your existing management server

A script will run to extract all the information from the existing management server and write it to the new 2.2.x management server. After successfully importing the information, the script will shutdown the existing management server and change the networking settings on the new 2.2.x management server to match the existing management server's settings.



The new 2.2.x management server will have its host name set to match the previous management server; however, the vSphere inventory name that you used when deploying the 2.2.x management server will stay the same.

After the upgrade the following management server settings should be intact:

- vCenter registration
- Host and VM configurations
- Guest credentials
- Performance stats
- Custom FTP information

## Upgrading host caching software

If you want to upgrade the version of the host software running on any of your caching ESXi servers, you can push the new software out from your updated management server. Updating your host software uses the same steps as a new install, and the new install will overwrite the existing software and the host will be rebooted.

## Upgrading to a new ESXi version

If you have ioTurbine installed on an ESXi host, and you want to upgrade to a new ESXi version, perform the following steps:

1. Shutdown, or vMotion off, all VMs that are currently running on the host you want to upgrade.
2. Uninstall the ioTurbine caching software on the host. Instructions for accomplishing this can be found in the section [Uninstalling ioTurbine from the ESXi server](#) section.
3. Upgrade your ESXi host software.
4. Re-install the ioTurbine Virtual caching software. Instructions for accomplishing this can be found in [Phase 4: Deploying ioMemory Device Drivers.htm](#).
5. Restart, or vMotion back, the VMs you want to cache on the host.

## Uninstalling ioTurbine Virtual

To uninstall ioTurbine Virtual from an ESXi host where caching is taking place, perform the following steps:

1. [Stop host-based caching on any VMDKs.](#)
2. [Stop guest-based caching on any VMs that are using it and remove the guest-based caching software.](#)
3. [Unassign all cache devices.](#)
4. [Put the ESXi host in maintenance mode and uninstall from the ESXi server](#)
5. [Unregister the management server.](#)

Details on how to perform these steps are provided below.

## Stopping host-based caching on VMDKs

To stop host-based caching on any VMDKs on the ESXi server:

1. Login to the management server.

Username: iotcli

Password: iotcli

2. From the management server command line, authenticate the management server with vCenter by typing the following command:

```
iot vmp --login --vmpaddress <vCenterAddress> --vmpuser <vCenterUsername> --vmppassword <vCenterPassword>
```

where

- *vCenterAddress* is the IP address or the fully qualified hostname of the vCenter server
- *vCenterUsername* is the name of a user who has sufficient rights to register or unregister the management server.
- *vCenterPassword* is the password for the user

For example, you might enter a command that looks something like this:

```
iotcli@tp-vme-1:~> iot vmp --login --vmpaddress tp-vcenter-1 --vmpuser root --vmppassword vmware  
Logged in to VMP : tp-vcenter-1
```

3. Stop host-based caching on the host by typing the following command:

```
iot provision --vmhost <host name> --stopcache
```

where

- *host name* is the IP address or fully qualified hostname of the target ESXi server

For example, you might enter a command that looks something like this:

```
iotcli@tp-vme-1:~> iot provision --vmhost tp-esxi-2 --stopcache  
Successfully completed stop cache operation
```

4. For each VM that has VMDKs that are being cached in host mode, remove them from host-based caching.

You can do this either by disabling caching on all the VMDKs or by removing the specific VMDKs that are being cached.

If the VM was configured to cache all its VMDKs in host-based mode, you can disable caching on these VMDKs by typing:

```
iot provision --vmguest <guest name> --disablecachingmode  
hypervisor
```

where

- *guest name* is the VM's display name in vSphere, the IP address, or the fully qualified hostname of the guest virtual machine whose VMDK files you want to remove from caching.

For example, you might enter a command that looks something like this:

```
iotcli@tp-vme-1:~> iot provision --vmguest TP-RHEL6-5 --disablecachingmode hypervisor  
Disable Hypercache Mode Task on TP-RHEL6-5 got successfully submitted, This may take several  
minutes to complete.  
Errorcode : 0  
Disable Hypercache Mode Task on TP-RHEL6-5 successfully completed
```

If the VM was configured to cache only specified VMDKs, you can remove these VMDKs by typing.

```
iot provision --vmguest <guest name> --removevmdk "<fully qualified vmdk  
name>"
```

where

- *guest name* is the VM's display name in vSphere, the IP address, or the fully qualified hostname of the guest virtual machine whose VMDK files you want to remove from caching.
- *fully qualified vmdk name* is the name of the VMDK you want to remove from caching. You can determine the fully qualified name by using the `iot list --configuredvmdks` command (see below).

For example, you might enter commands that look something like this:

```
iotcli@tp-iot-1:~> iot list --vmguest TP-WIN2K8-4 TP-WIN2K8-5 --configuredvmdks --  
guestuser  
administrator --guestpassword Atest12345
```

No VMDKs configured on the Guest : TP-WIN2K8-4  
VMDKs configured on the Guest : TP-WIN2K8-5 are :

```
VMDK Filename : [datastore1 (1)] TP-Win2K8-5/TP-Win2K8-5_1.vmdk  
VMDK Label : Hard disk 2  
VMDK Caching Running : true  
VMDK Capacity (GB) : 10
```

```
iotcli@tp-iot-1:~> iot provision --vmguest TP-WIN2K8-5 --removevmdk "[datastore1  
(1)] TP-Win2K8-5/TP-Win2K8-5_1.vmdk"  
Delete Primary VMDK Task on TP-WIN2K8-5 got successfully submitted, This may take  
several minutes to complete.  
Errorcode : 0  
Delete Primary VMDK Task on TP-WIN2K8-5 successfully completed
```

Perform these steps on all VMs that are using host-based caching on the ESXi host.

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## Stopping and removing guest-based caching

To stop guest-based caching on any VMs on the ESXi server

1. Login to the management server.

Username: iotcli

Password: iotcli

2. From the management server command line, login in to the VMware vCenter server that manages the ESXi servers where you want to configure host-based caching by typing the following command:

```
iot vmp --login --vmpaddress <vCenterAddress> --vmpuser <vCenterUsername> --vmp-  
password <vCenterPassword>
```

where

- *vCenterAddress* is the IP address or the fully qualified hostname of the vCenter server
- *vCenterUsername* is the name of a user who has sufficient rights to register the management server.
- *vCenterPassword* is the password for the user

For example, you might enter a command that looks something like this:

```
iotcli@tp-vme-1:~> iot vmp --login --vmpaddress tp-vcenter-1 --vmpuser root --vmp-  
password vmware Logged in to VMP : tp-vcenter-1
```

3. For each VM that is using guest-based caching, stop caching by issuing the following command:

```
iot provision --vmguest <guest name> --guestuser <username> --guestpassword <pass-  
word> --stopvolumecache
```

where

- *guest name* is the VM's display name in vSphere, the IP address, or the fully qualified hostname of the guest virtual machine where you want to stop caching.
- *username* is the name of a user who has rights to install software on the guest virtual machine.
- *password* is the password for the user.



By default, Windows VMs are caching with volume-level caching. If you have configured guest-based caching at a file or disk level, type the same command replacing --stopvolumecache with --stopfilecache or --stopdiskcache.

For example, you might enter a command that looks something like this:

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```
iotcli@TP-IOT-1:~> iot provision --vmguest TP-WIN2K8-4 --guestuser administrator --  
guestpassword Atest12345 --stopvolumecache
```

Stop Caching Task on TP-WIN2K8-4 got successfully submitted, This may take several minutes to complete.

Errorcode : 0

Stop Caching Task on TP-WIN2K8-4 successfully completed

4. Uninstall guest-based caching on the VM by typing the following command:

```
iot package --vmguest <guest name> --uninstall --guestuser <username> --  
guestpassword <password>
```

where

- *guest name* is the VM's display name in vSphere, the IP address, or the fully qualified hostname of the guest virtual machine where you want to stop caching.
- *username* is the name of a user who has rights to install software on the guest virtual machine.
- *password* is the password for the user.



NOTE: For Windows VMs, successfully entering this command results in rebooting the VM.

For example, you might enter a command that looks something like this:

```
iotcli@TP-IOT-1:~> iot package --vmguest TP-WIN2K8-4 --uninstall --guestuser administrator --  
guestpassword Atest12345
```

Perform these steps on all VMs that are using guest-based caching on the ESXi host.

## Unassigning cache devices

To unassign all cache devices on the ESXi host:

1. Login to the management server.

Username: iotcli

Password: iotcli

2. From the management server command line, login in to the VMware vCenter server that manages the ESXi servers where you want to configure host-based caching by typing the following command:

```
iot vmp --login --vmpaddress <vCenterAddress> --vmpuser <vCenterUsername> --vmppassword <vCenterPassword>
```

where

- *vCenterAddress* is the IP address or the fully qualified hostname of the vCenter server
- *vCenterUsername* is the name of a user who has sufficient rights to register or unregister the management server.
- *vCenterPassword* is the password for the user

For example, you might enter a command that looks something like this:

```
iotcli@tp-vme-1:~> iot vmp --login --vmpaddress tp-vcenter-1 --vmpuser root --vmppassword  
vmware Logged in to VMP : tp-vcenter-1
```

3. Determine all devices that have been assigned for caching by typing the following command:

4. List the LUNs which are available to be used as cache devices by typing the following command:

```
iot list --vmhost <host name> --listssds
```

where

- *host name* is the IP address or fully qualified hostname of the target ESXi server

For example, you might enter a command that looks something like this:

```
iotcli@tp-vme-1:~> iot list --vmhost tp-esxi-2 --listssds  
DeviceName : Local FUSIONIO Disk (eui.23048d1615ec4265002471579b151a8a)  
Uuid : 0100000000313232394436393733494f44524956  
Type : disk  
Vendor : Fusion-io  
CanonicalName : eui.23048d1615ec4265002471579b151a8a  
Capacity (GB) : 964  
DeviceModel : IODRIVE  
DevicePath : /vmfs/devices/disks/eui.23048d1615ec4265002471579b151a8a  
LunCount : 0  
Percent : 99
```

5. For each assigned device, unassign it by typing the following command:

```
iot provision --vmhost <host name> --unassigndevice <DeviceName>
```

where

- *host name* is the IP address or fully qualified hostname of the target ESXi server
- *DeviceName* is the Canonical Name of the device displayed in the --listssds commands.

For example, you might enter a command that looks something like this:

```
iotcli@tp-vme-1:~> iot provision --vmhost tp-esxi-2 --unassigndevice  
eui.23048d1615ec4265002471579b151a8a  
Unassign Caching Device on eui.23048d1615ec4265002471579b151a8a got  
successfully submitted, This may take several minutes to complete.  
Errorcode : 0  
Unassign Caching Device on eui.23048d1615ec4265002471579b151a8a  
successfully completed
```

## Uninstalling ioTurbine from the ESXi server

To remove ioTurbine Virtual software from the target ESX host:

1. Using the vSphere client put the ESXi server you want to uninstall ioTurbine Virtual from into maintenance mode.
2. Login to the management server.

Username: iotcli

Password: iotcli

3. Uninstall ioTurbine Virtual from the desired ESXi server by typing the following command:

```
iot package --uninstall --vmhost <host name>
```

where

- *host name* is the IP address or fully qualified hostname of the target ESXi server you want remove the ioTurbine software from.

```
iotcli@tp-vme-1:~> iot package --vmhost tp-esxi-2 --uninstall
```

If you are upgrading the Host, an automatic reboot of the Host will be carried out. For fresh installation, Host reboot is not required. Do you wish to continue? [y/N]y

Uninstall Host package on tp-esxi-2 got successfully submitted, This may take several minutes to complete.

Errorcode : 0

Uninstall Host package on tp-esxi-2 successfully completed



Uninstalling ioTurbine Virtual host software will cause the ESXi server to reboot.

After the ESXi server reboots, ioTurbine Virtual will have been removed from the ESXi server. However any ioMemory VSL software you may have installed will not be removed.

## Unregistering the management server

To unregister the management server from the vCenter server:

1. Login to the management server.

Username: iotcli

Password: iotcli

2. From the management server command line, authenticate the management server with vCenter by typing the following command:

```
iot vmp --login --vmpaddress <vCenterAddress> --vmpuser <vCenterUsername> --vmppassword <vCenterPassword>
```

where

- *vCenterAddress* is the IP address or the fully qualified hostname of the vCenter server
- *vCenterUsername* is the name of a user who has sufficient rights to register the management server.
- *vCenterPassword* is the password for the user

For example, you might enter a command that looks something like this:

```
iotcli@tp-vme-1:~> iot vmp --login --vmpaddress tp-vcenter-1 --vmpuser root --vmppassword vmware Logged in to VMP : tp-vcenter-1
```

3. Unregister the management server by typing the following command:

```
iot vmp --unregister --vmpaddress <vCenterAddress> --vmpuser <vCenterUsername> --vmppassword <vCenterPassword>
```

where

- *vCenterAddress* is the IP address or the fully qualified hostname of the vCenter server
- *vCenterUsername* is the name of a user who has sufficient rights to register or unregister the management server.
- *vCenterPassword* is the password for the user

For example, you might enter a command that looks something like this:

```
iotcli@tp-vme-1:~> iot vmp --unregister --vmpaddress tp-vcenter-1 --vmpuser root --vmppassword vmware
Successfully Unregistered vCenter Server : tp-vcenter-1
```

After the management server is unregistered, IoTurbine Virtual has been successfully uninstalled.

## Appendix A:

### vCenter user permissions

When deploying the management server appliance (ova), you will need to be logged into the vCenter as a user who has the following minimum permissions:

#### Datastore

- Allocate space

#### Extension

- Register extension
- Unregister extension
- Update extension

#### Global

- Diagnostics

#### Host > CIM

- CIM interaction

#### Host > Configuration

- Query patch
- Maintenance
- Security profile and firewall

#### Host > Local operations

- Reconfigure virtual machine

#### Tasks

- Create task
- Update task

#### Virtual Machine > Configuration

- Add new disk
- Add or remove device
- Advanced
- Remove disk

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**Virtual Machine > Guest Operations**

- Guest Operation Modification
- Guest Operation Program Execution
- Guest Operation Queries

**Virtual Machine > Interaction**

- Power off
- Power on

**Virtual Machine > Snapshot**

- Create snapshot
- Remove snapshot
- Rename snapshot

**Virtual Machine > State (ESXI 5.0)**

- Create snapshot
- Remove snapshot
- Rename snapshot

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## Appendix B: Using the management server with the vSphere web client

The management server can be accessed from the vSphere web client; however, some configuration is required. The sections below provide details these configuration steps.

### Pre-requisites

The following prerequisites must be met in order to run the management server from the vSphere web client:

- The Adobe Flash 11.5.0 (or greater) plug-in needs to be installed and enabled in your browser.
- The VMware Client Integration Plug-in needs to be installed and enabled in your browser.

### Enabling script-based plug-ins

For the management server to run in the vSphere web client, you need to enable script-based plug-ins in vCenter.



NOTE: The procedure below is written for the vCenter appliance, but the procedure on the Windows vCenter is analogous.

1. ssh into your vmware appliance as user root.
2. Change to the directory that contains the `webclient.properties` file:  
Linux: `/var/lib/vmware/vsphere-client`  
Windows: `%ProgramData%\VMware\vSphere`
3. Edit the `webclient.properties` file and add the following line at the bottom of the file:  
`scriptPlugin.enabled = true`
4. Restart the web client server process by typing the following at a command prompt:

Linux: `/etc/init.d/vsphere-client restart`

Windows: `net stop "VMware vSphere Web Client"`  
`net start "VMware vSphere Web Client"`

After the process restarts, the vCenter will be configured for script-based plug-ins.

### Deploying the management server

Deploy the management server as described in [Phase 3: Deploying the management server](#). Take special note of the fully-qualified domain name you give the management server in step 4. **When specifying the management server in the vSphere web client always use this fully-qualified domain name.** Using only the host name can result in certificate errors.



NOTE: The browser considers different IP addresses and DNS names to be different web sites for security purposes. To have the browser display the management server plug-in in the Classic Solutions tab, you must enter a URL with the same host name or IP address as was used by the system to register the plug-in with the vCenter server. This hostname or IP address is displayed on the Settings tab under **Remote Access > Host Name**.

### Deploying a custom certificate and key pair

If you are going to deploy a custom certificate and key pair, the best time to do so is in step 10 of [Phase 3: Deploying the management server](#). By doing this as part of the initial management server configuration, the management server's .key file will be updated accordingly and all remote access keys deployed manually, or automatically as part of guest-based caching configuration, will be correct.

To install a custom certificate and key pair, perform the following steps as part of step 10 in the management server deployment process:

1. Under the heading **SSL Certificate Options**, click **Custom SSL certificates**.
2. For the custom key, click **Choose File** and navigate to the location of your key and select it.
3. For the custom certificate, click **Choose File** and navigate to the location of your certificate and select it.
4. If your CA Chain is embedded in your custom certificate, skip to step 5. Otherwise, for the CA Chain click **Choose File** and navigate to the location of the chain file and select it.
5. Click **Save Changes**.

The custom certificate and key pair is now installed in on the management server.

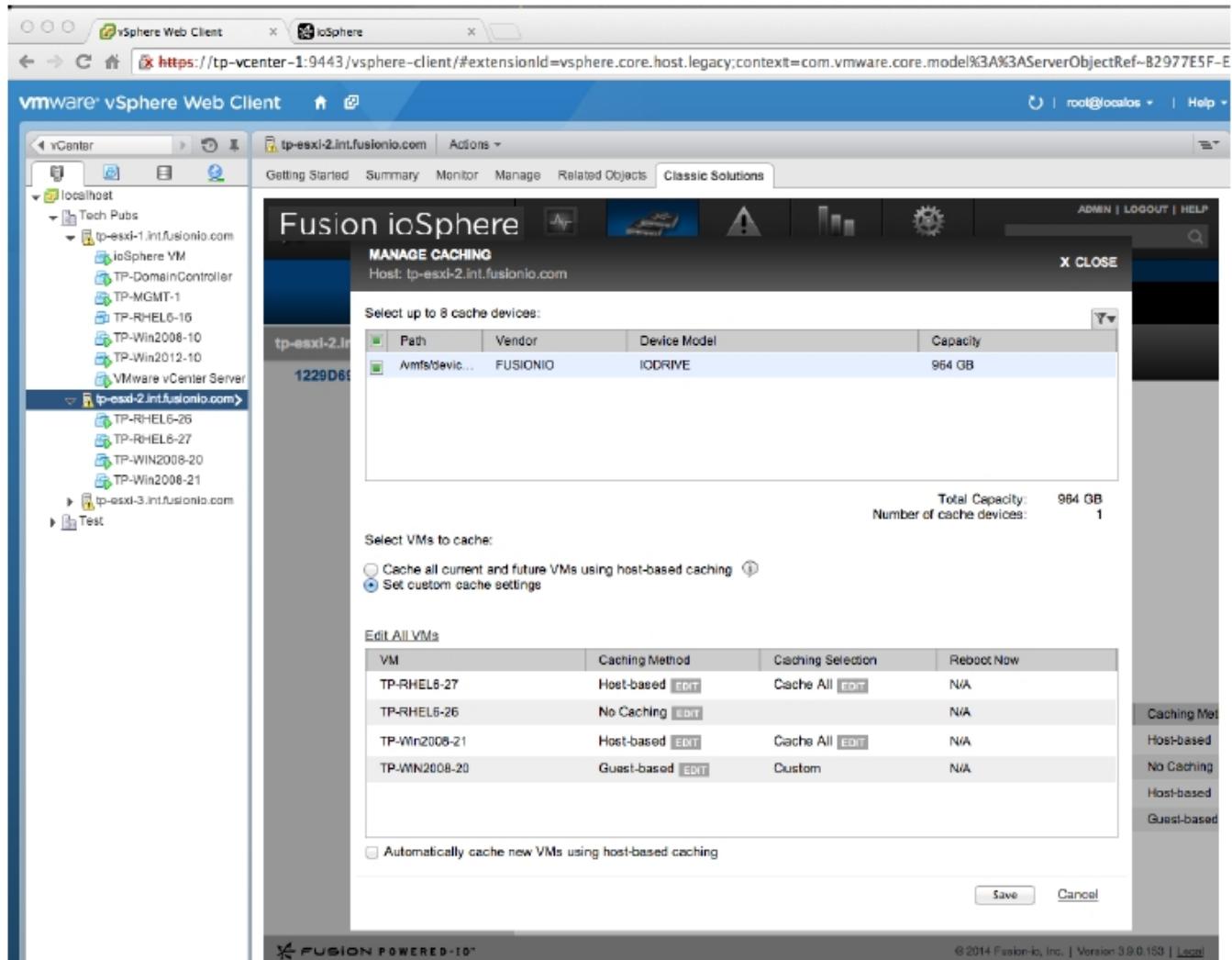
### Accessing the management server from the vSphere web client

After completing the configuration steps above, the classic solutions tab will be visible when a host or VM is selected in the vSphere inventory. If it fails to do so because of an invalid security certificate and lack of a issuer chain, perform the following steps:

1. Open a separate tab in the same browser and enter the fully qualified domain name for your management server. This should be the exact, fully qualified name that you used in step 4 of [Phase 3: Deploying the management server](#)
2. Accept the security risk and wait for the management server login page to appear.
3. After the login page appears, return to the vSphere web client tab.
4. In the Classic Solutions tab, right-click in the page and select **Reload Frame**.

The management server should now display in the Classic Solutions tab.

## IoTurbine Virtual 2.2.5 Installation Guide



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## Appendix C: Installing and Upgrading with VUM

The install packages for IoTurbine Virtual are compatible with the VMware Update Manager (VUM). To use VUM to install or update software on ESXi hosts, follow these steps:

1. Download the IoTurbine Virtual install packages (see [Phase 1: Obtaining Software](#) ).
2. Import the packages into the VUM Patch Repository.
3. Include the packages in a Host Extension baseline.
4. Remediate your ESXi host with the baseline that contains the latest IoTurbine Virtual packages.



If you deployed the caching software to your ESXi host using the management server "Install Host Software" functionality, you can skip this section. The `--startmonitor` command described below is only required for caching software installed from the command line of the ESXi host.

## **Download location**

Software, utilities, and related documentation can be found at:

<http://support.fusionio.com>

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