Insight Management and HP IO Accelerators (ioTurbine version 2.1) – Supported Environments and Scenarios
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Objective:
Describe how to set up a 2.1-ioTurbine environment with ESXi 5.1 hosts (Intel and AMD servers) as Insight Management 7.2 managed nodes.

This white paper also describes various scenarios for use of Insight Management features (including the Matrix Operating Environment) managing virtual machines provisioned to hypervisor hosts using HP IO Accelerator solutions.

Setup Details

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<th>FW/OS/SW</th>
<th>Version</th>
</tr>
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<td>OA</td>
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<tr>
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<td>iLo4</td>
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<td>SPP</td>
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<td>ESXi Host</td>
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<td>VM Guest</td>
<td>Windows 2008 R2</td>
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<td>vCenter managing ESXi hosts and ioTurbine Management Server's ESX host</td>
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<td>VSL driver on the HP IO Accelerator cards</td>
<td>3.2.3</td>
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<td>ioTurbine</td>
<td>2.1</td>
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<td>ioTurbine Host package</td>
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<td>ioTurbine Guest package</td>
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CMS

| Insight Management                  | 7.2                      |

Server/Card

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<th>Server/Card</th>
<th>Model</th>
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<tr>
<td>Server</td>
<td>BL465c Gen8, BL460c Gen8-ESXi, BL465cG7-vCenter</td>
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<tr>
<td>HP IO Accelerator Card (Fusion IO card)</td>
<td>HP 785 GB MLC IO Accelerator</td>
</tr>
<tr>
<td>Enclosure</td>
<td>c7000</td>
</tr>
<tr>
<td>Virtual Connect Module</td>
<td>HP VC FlexFabric 10Gb/24-Port Module</td>
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</table>
Configure ESX hosts

Configuring the ESX hosts for Insight Management involves the following steps:

1. Discover the hosts in HP SIM
2. License and configure the hosts for HP SIM, Insight Control, and the Matrix Operating Environment via the Managed System Setup Wizard

**Note:** Customers wishing to use IO accelerators (such as Fusion-io IOTurbine) can do so in a Matrix environment with limitations. The hypervisor version and Virtual Connect modules need to support the Fusion-io/IOTurbine accelerator.

Matrix will not provision the hypervisor host to use the IO accelerators (the installation and configuration of the hypervisor using these accelerators is independent of Matrix and described in the following sections of this white paper). Matrix can then be used to provision VMs to the registered hypervisor host.

Configure VMs

Depending on the customer scenarios, the virtual machines could be created and configured in a variety of ways:

- Manually created via Insight Control virtual machine management
- Automatically created as part of a manually defined logical server (Matrix OE)
- Automatically created when provisioning a Matrix infrastructure orchestration service template

There are no special configuration steps for VMs on hypervisor hosts using HP IO Accelerators other than a need to adhere to a minimum memory value of 4 GB.

**Note:** Required minimum memory for VM - 4GB

ioTurbine configuration

Configuration of the ioTurbine product for hypervisor host use involves following steps:

1. Install the **HP IO Accelerator cards** in the ESXi hosts (two used for this setup).
2. Important considerations prior to deploying the ioTurbine host driver:
   - Ensure DNS forward and reverse lookup is configured for all systems in ioTurbine environment.
   - Use a static IP address for the ioTurbine management server.
   - Ensure to install VSL driver components on the hosts where caching is configured.
3. Install the VSL driver v3.2.3 on hosts
   - Download the VSL driver for the specific IO accelerator card model from the HP site.
   - Install iomemory-vsl and libvsl bundle v.3.2.3 and upgrade ioMemory device's firmware v.3.2.3 on the ESXi hosts via SSH.
   - iomemory-vsl bundle install:
     - Install the iomemory-vsl bundle by running the following command against ESXi host using SSH:
       #esxcli software vib install -d <offline-bundle>
     - Where <offline-bundle> is the absolute path to the offline bundle on the hypervisor host.
     - For example,
       #esxcli software vib install -d /vmfs/volumes/FusionIO-VMs/bundles/iomemory-vsl-5X-3.2.3.952-offline_bundle-1051472.zip
     - Reboot the host.
   - libvsl bundle install:
     - Install the libvsl bundle by running the following command against ESXi host using SSH:
       #esxcli software vib install -d <offline-bundle>
     - Where <offline-bundle> is the absolute path to the offline bundle on the hypervisor host.
- For example,
  `#esxcli software vib install -d /vmfs/volumes/FusionIO-VMs/bundles/libvsl-1.0.0-5X-offline-bundle.3.2.3.952.zip`
  Reboot the host.
  - ioMemory device's firmware upgrade:
    - Run the fio-status command to ensure that the ioMemory device's firmware is up-to-date.
    `#fio-status`
    - If the output shows that the device is running in minimal mode, then upgrade the firmware. Navigate to the firmware path and run the command to upgrade the firmware v.3.2.3 of the IO Accelerator card.
    `#fio-update-iodrive -d <device-to-update> <fffile>`
    - Where `<device-to-update>` is the IO card and `<fffile>` is the firmware bundle on the hypervisor host.
    - For example,
      `#fio-update-iodrive -d /dev/fct0 ./ioaccelerator_3.2.3-20130221.fff`
    - Reboot the host to activate new firmware.

4. **Deploy the ioTurbine Management Server**

   - In the vSphere Client, deploy the `iosphere-vme.ovf` file to create the virtual appliance on the host where the ioSphere VM Edition Management Server will reside.

5. **Register the vCenter Server**

   - Launch the Management server GUI by providing the IP address or hostname in the browser window. On the ioSphere screen, login with user “admin” and password “fusionio”. (User may change the password while deploying the ioTurbine Management Server)
   - Register the vCenter server by entering its IP address or hostname and the credentials.
   - On the Remote Access screen, click **Use pre-configured SSL Certificate**.
   - Close the ioSphere browser, restart vSphere Client and connect to the vCenter server.
   - This process adds a **Fusion ioSphere** tab to the vSphere Client interface.

6. **Install the Host Package**

   - To install the Host package via vCenter GUI, click on the host. Click **Fusion ioSphere** tab.
   - If ioSphere does not detect ioTurbine software on the host, then install the Host software.

**Note**

- It is recommended **not** to deploy the Management Server on any of the managed hosts.
- Ensure the ESXi host where the management server is installed has a data store with at least 25 GB of free space.
- Ensure that the management server and the managed hosts are being managed by the same vCenter.
After successful host package install, **Cache** option is displayed in the **Fusion ioSphere** tab.

**Note**: Before Host package install, enable firewall for HTTPClient and CIM Secure Server on the host and enter the host in maintenance mode. After Host package install, exit maintenance mode and disable firewall for HTTPClient and CIM Secure Server.

**License**

- On the host **Configure** tab, click the disclosure icon to the left of **Licenses**. ioTurbine Virtual software comes with two Direct and two Virtual evaluation licenses that will run until the expiration date listed on the screen.
Configure caching

There are 2 types of caching. They are Host-based and Guest-based caching.

**Host-based versus Guest-based caching**

**Host-based**
- Caching at the host level means no additional software needs to be installed on the VMs.
- Caches VMDK files (i.e., the logical equivalent of disks for guest operating systems in the VMware virtual environment). Can be configured to cache all the VMDKs (or drives) for a virtual machine or only specified VMDKs.

**Guest-based**
- Caching at the guest level means ioTurbine software is installed on the VM.
- Allows to cache block devices on the VM. On Windows VMs, you can also cache on the disk, volume, or file level.

**Steps to configure cache on the VMs:**
1. From the vCenter client, click on the ESXi host.
2. On the right panel, click Manage Caching. The devices available to be used for caching are listed.
3. Select the device used for caching. Click Show advanced cache settings.

**Note:** Clicking Save without clicking any options on the Show advanced cache settings link will cause ioTurbine to cache all the VMs in host-based caching mode.
4. Select the caching mode for VMs displayed in the table. Options available in the Caching Method column are:
   - **Host-based**: To deselect a VMDK from host-based caching, click **Edit** in the **Caching Selection** column for the VM.
   - **Guest-based**: Enter User Name and Password for the VM to configure the VM for Guest-based caching. ioSphere configures the caching device and installs the ioTurbine guest-based caching software to the VM. By default, guest-based caching is configured to cache all volumes on the VM with the volumes filter.
     
     **Note**: The guest-based caching configuration can be changed by clicking on the VM’s **Fusion ioSphere** tab.
   - **No Caching**: VM is not configured for any of the caching method, if No Caching option is selected for the VM.

5. Click **Confirm** to confirm the cache settings.

   This process configures the caching device and VMs for host and guest based caching as specified.
Further sections of this white paper cover Insight Management use case scenarios in this environment.

**Scenario List**

**Scenario 1 – create card -> card**
- Make templates of VMs with the HP IO Accelerator card installed on the ESX host (using IC virtual machine management).
- Deploy those templates to a target ESX host with the HP IO Accelerator card installed (using Matrix infrastructure orchestration service templates referencing the VM templates).

**Scenario 2 – create card -> non-card**
- Make templates of VMs with the HP IO Accelerator card installed on the ESX host (using IC virtual machine management).
- Deploy those templates to a target ESX host without the HP IO Accelerator card installed (using Matrix infrastructure orchestration service templates referencing the VM templates).

**Scenario 3 – move card -> card**
- VM move in cluster setup with the HP IO Accelerator card installed on the ESX hosts (using HP Matrix Operating Environment).

**Scenario 4 – move card -> non-card**
- Deactivate VM on a host with the HP IO Accelerator card (using HP Matrix Operating Environment).
- Try to activate it on a host without the HP IO Accelerator card and observe the behavior (using HP Matrix Operating Environment).

**Scenario 5 - move non-card -> card**
- Deactivate VM on a host without the HP IO Accelerator card (using HP Matrix Operating Environment).
- Try to activate it on host with the HP IO Accelerator card and observe the behavior (using HP Matrix Operating Environment).

**Scenario 6 (BL460c Gen8) – create card -> card**
- Make templates of VMs with the HP IO Accelerator card installed ESX host (using Insight Control virtual machine management).
- Deploy those templates to a target ESX host with the HP IO Accelerator card installed (using Matrix infrastructure orchestration service templates referencing the VM templates).

**Test Environment**
- Scenarios 1 to 5 were executed on a BL465c Gen8 server.
- Scenario 6 was executed on a BL460c Gen8 server.
- All the scenarios have been executed with Volume based caching.

**Scenario 1 – create card -> card**
- Make templates of VMs with the HP IO Accelerator card installed ESX host.
- Deploy those templates to a target ESX host with the HP IO Accelerator card installed.

**On source host**
- Enable and configure caching on source VM.
- Create source VM template via HP Insight Control virtual machine management.
- Deploy the VM template on target host via HP Matrix infrastructure orchestration.

The architect would have created a Matrix service template which indicated provisioning of virtual servers using the created VM templates. If Matrix infrastructure orchestration is not in use, the VM template could be deployed via Insight Control virtual machine management.
Host-based cache VM

Guest-based cache VM

Note: When VM guest is enabled to use host-based caching instead of guest-based caching, the configuration and statistical information for VM guest is not displayed in the Fusion-io ioSphere tab for that VM guest. This is because caching is being performed at the host level. To manage VM configuration and view cumulative caching performance for host based caching VM, select the host’s Fusion-io ioSphere tab.

Results on target host
- VM created successfully on target host.
- Cache is disabled; cache settings are retained on target VM.

Host-based cache VM

Guest-based cache VM
Further actions on target VM

- Enable cache on the target VM. VM reboots and cache enabled on the target VM.

Host-based cache VM

Guest-based cache VM
Scenario 2 – create card -> non-card

- Make templates of VMs with the HP IO Accelerator card installed on the ESX host.
- Deploy those templates to a target ESX host without the HP IO Accelerator card installed.

On source host

- Enable and configure caching on source VM.
- Create source VM template via HP Insight Control virtual machine management.
- Deploy the VM template on target host via HP Matrix infrastructure orchestration.

The architect would have created a Matrix service template which indicated provisioning of virtual servers using the created VM templates. If Matrix infrastructure orchestration is not in use, the VM template could be deployed via Insight Control virtual machine management.

Host-based cache VM

Guest-based cache VM

Results on target host

- VM created successfully on target host.
- Cache cannot be enabled or configured, since target host is not configured for HP IO Accelerator environment.
Host-based cache VM and Guest based cache VM

Guest-based cache VM

Scenario 3 – move card -> card

- VM move in cluster set up with the HP IO Accelerator cards installed on the ESX hosts

On source host:

- Enable and configure caching on source VM.
- Live move the VM via the HP Matrix Operating Environment logical server management capabilities.

Host-based cache VM and Guest-based cache VM

Guest-based cache VM
Results on target host

- VM moved successfully on target host.
- Cache is enabled; cache settings are retained on target VM.

Host-based cache VM and Guest-based cache VM

<table>
<thead>
<tr>
<th>Guest-based cache VM</th>
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</thead>
</table>

Scenario 4 — move card -> non-card

- Deactivate VM on a host with the HP IO Accelerator card.
- Try to activate it on a host without the HP IO Accelerator card and observe the behavior.

The Matrix Operating Environment is not aware of the presence of the HP IO Accelerator cards in the hypervisor hosts. If the environment has some servers/hosts with the HP IO Accelerator card and others which do not have the card, it will be important for the administrator to group resources appropriately. For example, all members of the ESX cluster may have or not have the card (so movement within the cluster will always be to like configurations).
On source host

- Enable and configure caching on source VM.
- Deactivate the VM on source host via HP Matrix Operating Environment.
- Activate VM on target host via HP Matrix Operating Environment.

Host-based cache VM

Guest-based cache VM

Results on target host:

- VM activated successfully on target host.
- VM fails to power on with below error message in the HP Matrix Operating Environment and the vCenter GUI.

HP Matrix Operating Environment
vCenter GUI

Resolution
It is a VMWare issue, where after movement of the VM, VM fails to power on. As a workaround, delete 2 lines from the configuration file ".vmx" of the VM.

```
sscsi1:0.filters = "iot_filter"
sscsi1:0.filters = "bcad79b0 4000"
```

Refer to the link for details:

- VM powers on successfully after following the workaround steps.
- Cache cannot be enabled or configured, since target host is not configured for HP IO Accelerator environment.

Host-based cache VM and Guest-based cache VM

Guest-based cache VM

Scenario 5 — move non-card -> card

- Deactivate VM on a server without the HP IO Accelerator card.
- Try to activate it on server with the HP IO Accelerator card and observe the behavior.

The Matrix Operating Environment is not aware of the presence of the HP IO Accelerator cards in the hypervisor hosts. If the environment has some servers/hosts with the HP IO Accelerator card and others which do not have the card, it will be important for the administrator to group resources appropriately. For example, all members of the ESX cluster may have or not have the card (so movement within the cluster will always be to like configurations).
On source host

- Cache cannot be enabled or configured, since source host is not configured for HP IO Accelerator environment.
- Deactivate the VM on source host via HP Matrix Operating Environment.
- Activate the VM on target host via HP Matrix Operating Environment.

Results on target host

- VM activated successfully on target host.
- VM powers on successfully on target host.

Host-based cache VM

Guest-based cache VM

Further actions on target VM

- Enable cache on the target VM. VM reboots and cache enabled on the target VM.

Host-based cache VM
Guest-based cache VM
Scenario 6 (BL460c Gen8) — create card -> card

- Make templates of VMs with the HP IO Accelerator card installed in the ESX host.
- Deploy those templates to a target ESX host with the HP IO Accelerator card installed.

**Note**: This is the same as Scenario 1 but with a different blade.

**On source host**:
- Enable and configure caching on the source VM.
- Create source VM template via HP Insight Control virtual machine management.
- Deploy the VM template on target host via HP Matrix infrastructure orchestration.

The architect would have created a Matrix service template which indicated provisioning of virtual servers using the created VM templates. If Matrix infrastructure orchestration is not in use, the VM template could be deployed via Insight Control virtual machine management.

**Host-based cache VM and Guest-based cache VM**
**Guest-based cache VM**

- VM created successfully on target host.
- Cache is disabled; cache settings are retained on target VM.

**Host-based cache VM and Guest-based cache VM**

Further actions on target VM
- Enable cache on the target VM. VM reboots and cache enabled on the target VM.
Errors and Resolution

Error
HP IO Accelerator cache card fails to get assigned.

The steps followed are:

- Insert the card in server A and install Host package on the ESX host A.
- Assign the card as caching device successfully and perform tasks.
- Remove the card from server A and insert in server B. Install Host package on the ESX host B.
- Now, while trying to assign the card as caching device on host B, the below error is observed.
Resolution

- Format the HP IO Accelerator card by creating and deleting data store in VCenter UI. Formatting is required to erase the previous server identifier details on the HP IO Accelerator card.

Error
Evaluation license do not detect in ioTurbine management server though displays in vCenter UI.

ioTurbine management server

```
iotcli@iotms21:~> iot list --license
License Expiration           : NO LICENSE AVAILABLE
License Capacity Tier per host: NO LICENSE AVAILABLE
Total Licenses               : 0
Licenses in-use(checked-out) : 0
Licenses remaining           : 0

iotcli@iotms21:~> [1]
```
Resolution:
- Make sure ioTurbine management server and hosts system date and time are in sync.
- To change ioTurbine management server's date and time, login to ioTurbine management server with administrative privileges.
- Set date and time
  - # date -s <date, time>
  - Ex: #date -s "26 JUL 2013 15:59:00"

Error:
After VM live move, VM do not list under Cache section of the target host. The moved VM guest keeps listing under source host's Fusion ioSphere tab.

Resolution:
Restart the ioTurbine management server.
Learn more at

Download Links:

VSL drivers 3.2.3 for ESXi 5.x (HP IO Accelerator for VMware ESXi 5.x)
http://h20000.www2.hp.com/bizsupport/TechSupport/SoftwareDescription.jsp?lang=en&cc=us&prodTypeId=3709945&prodSeriesId=3900933&prodNameId=5232486&swEnvOID=4115&swLang=13&mode=2&taskId=135&swItem=MTX-16fd7e3177b43468b939178ff

ioTurbine 2.1
http://support.fusionio.com/
- Create user account, sign in and download the software.

iometer-2006.07.27.win32.i386
- Download the iometer software for the respective VM OS.

Document references:

VSL 3.2.3 User Guide
Available with the downloaded software under Documentation folder.

ioTurbine 2.1 Installation and Administrators Guide
Available with the downloaded software under Documentation folder.