

VMware I/O Analyzer Installation and User's Guide

Version 1.6



You can find the most up-to-date technical documentation on the VMware Web site at:

<http://www.vmware.com/support/>

The VMware Web site also provides the latest product updates.

If you have comments about this documentation, submit your feedback to:

docfeedback@vmware.com

© 2014 VMware, Inc. All rights reserved. This product is protected by U.S. and international copyright and intellectual property laws. VMware products are covered by one or more patents listed at <http://www.vmware.com/go/patents>.

VMware, the VMware “boxes” logo and design, Virtual SMP, and VMotion are registered trademarks or trademarks of VMware, Inc. in the United States and/or other jurisdictions. All other marks and names mentioned herein may be trademarks of their respective companies.

Revision: 20140326

VMware, Inc.
3401 Hillview Ave.
Palo Alto, CA 94304
www.vmware.com

Contents

Introduction	5
I/O Analyzer Usage Modes	5
I/O Analyzer Overview of Operation	5
I/O Analyzer Hardware and Software Requirements	6
I/O Analyzer Software Compatibility	6
I/O Analyzer Hardware Requirements	6
I/O Analyzer Configuration Maximums	6
I/O Analyzer Version History	7
I/O Analyzer Version 1.6	7
I/O Analyzer Version 1.5.1	7
I/O Analyzer Version 1.5	7
I/O Analyzer Version 1.1	7
I/O Analyzer Version 1.0	7
1 Installing I/O Analyzer	9
Obtain and Install I/O Analyzer	9
Create a Larger Secondary Virtual Disk (Optional)	11
Enable the I/O Analyzer Web UI	12
Install Additional I/O Analyzer Copies as Worker VMs	13
2 Using I/O Analyzer	15
Using the I/O Analyzer Workload Generator	15
Selecting One or More Controller Appliances	15
Configuring I/O Analyzer Tests	15
Adding Hosts to the I/O Analyzer Host List	15
Adding I/O Analyzer Workloads	16
I/O Analyzer Workload Configurations	17
Using the I/O Analyzer Listening Mode	18
I/O Analyzer Test Scheduler	18
Scheduling A New I/O Analyzer Test	18
Managing I/O Analyzer Tests	19
Using the I/O Analyzer Trace Repository	20
Collecting a vSCSI Trace	20
Uploading a Trace to I/O Analyzer	20
3 I/O Analyzer Reporting	23
Viewing Test Results	23
A I/O Analyzer Troubleshooting, Advanced Usage, and FAQs	25
I/O Analyzer Troubleshooting	25
Troubleshooting Startup and Login Issues	25
The I/O Analyzer IP Address Shows the Apache Default page	25
Troubleshooting Workload Configuration Issues	25
Some VMs Are Not on the List	25
A VM IP Address is Inaccurate	26
Troubleshooting Test Run Issues	26

The Test Does Not Start When “Run Now” Button is Clicked	26
Iometer Doesn't Run	26
A Test is Stuck for a Long Time	26
Troubleshooting Test Scheduler Issues	27
The Test Manager says “Iometer guestSummary timeout. Stats will be omitted for this test.”	27
I/O Analyzer Virtual Appliance Timezone is Wrong	27
Troubleshooting Test Results Issues	27
No Workload is Generated	27
You Get Blank Results	28
OutOfMemoryError in /var/log/tomcat6/catalina.out	28
Trace Replay Generates Low (or no) IOPS, tryScpTrace.py failed at remote Error	28
Some Charts Are Missing in the Results Page	28
Some Charts Have Gaps	28
Some VMs/Devices/Adapters Are Missing From the Results	28
My Time-series Charts Seem to Misalign with Workload Generator	29
Troubleshooting Trace Repository Issues	29
Uploaded Trace is not Profiled Correctly	29
I/O Analyzer Advance Usage	30
Upgrade From I/O Analyzer 1.5 or 1.5.1 to I/O Analyzer 1.6	30
Change the Target Block Device for Iometer Tests	30
Edit or Add Iometer Configuration Files at the Controller	30
Abort an Ongoing I/O Analyzer Test	31
Enable esxtop CSV Dump	31
Disable Collection of NFS Client Statistics	31
Adjust Statistics Collection Interval	32
Adjust the JVM Heap Size	32
Remove Unused Trace Files From Worker VMs to Save Virtual Disk Space	33
I/O Analyzer Frequently-Asked Questions	34
General I/O Analyzer Usage	34
Is It Safe to Publicly Expose the I/O Analyzer Virtual Appliance?	34
Can Multiple Users Simultaneously Operate the Same Controller VM?	34
Can I Change the I/O Analyzer Virtual Appliance Password?	34
Why are There Multiple esxtop Files for Each Host?	34
Workload Configuration	34
Can I Mix Iometer Tests With Trace Replay Tests?	34
Can a Single Worker VM Simultaneously Run Multiple Workloads?	34
What Happens if a Test Duration is Longer Than a Trace?	34
Can I Add a Host That Has no Worker VMs?	35
Test Results	35
Why Do All My I/Os Hit the Cache?	35
Where Can I Learn the Meaning of Specific Counters?	35
Can I Import Test Results From Another I/O Analyzer Virtual Appliance?	35
Can I Mount a Separate Disk to Store all Test Results?	35
Why Can't esxplot Import the Generated esxtop*.csv Files?	35
How Do I Interpret the timeseries* Files in the Tarball?	36
Network Does Not Automatically Come Up	36
The I/O Analyzer Virtual Appliance Isn't Acquiring an IP Address Via DHCP	36
The I/O Analyzer Virtual Appliance is Missing a Network Interface	36
How to Contact the I/O Analyzer Team	38

Introduction

VMware I/O Analyzer is an integrated framework designed to measure storage performance in a virtual environment and to help diagnose storage performance concerns. I/O Analyzer, supplied as an easy-to-deploy virtual appliance, automates storage performance analysis through a unified interface that can be used to configure and deploy storage tests and view graphical results for those tests.

I/O Analyzer can use Iometer to generate synthetic I/O loads or a trace replay tool to deploy real application workloads. It uses the VMware VI SDK to remotely collect storage performance statistics from VMware ESX/ESXi hosts. Standardizing load generation and statistics collection allows users and VMware engineers to have a high level of confidence in the data collected.

I/O Analyzer Usage Modes

I/O Analyzer has a number of modes that can be used to measure a storage system's performance:

- I/O Analyzer Iometer Tests

I/O Analyzer can use Iometer, an open-source synthetic I/O subsystem measurement and characterization tool, to drive load.

- I/O Analyzer Trace Replay Tests

I/O Analyzer can replay vSCSI I/O traces, either those included with I/O Analyzer or those collected and uploaded by the user, to simulate real-world I/O patterns.

- I/O Analyzer Listening-Mode Tests

I/O Analyzer can be used to measure storage system performance when an external load is played on that storage system.

I/O Analyzer also includes a number of features and utilities that allow convenient creation, scheduling, and monitoring of tests, as well as detailed analysis of test results.

I/O Analyzer Overview of Operation

I/O Analyzer is supplied as a virtual appliance, downloadable from VMware. The user installs instances of this virtual appliance on one or more ESX/ESXi hosts. For each appliance instance the user creates a virtual disk on which to run the tests (or, optionally, uses the default virtual disk).

One I/O Analyzer virtual appliance, called a controller VM, is used to configure the environment, initiate tests, and view results. Most interaction with I/O Analyzer is through this controller virtual appliance, and most of that is accomplished through a web interface.

One or more I/O Analyzer virtual appliances, called worker VMs, are used to generate I/O load.

Each worker VM to be included in the test must be controlled by exactly one controller VM. In addition to its controller functions, a controller VM can also optionally perform the functions of a worker VM.

I/O Analyzer Hardware and Software Requirements

This section describes the hardware needed to run I/O Analyzer and the software with which it is compatible.

I/O Analyzer Software Compatibility

I/O Analyzer is compatible with VMware ESX/ESXi version 4.0 or later.

NOTE Though I/O Analyzer can be used with vSphere Client versions compatible with the ESX version (or versions) being used, examples in this document use vSphere Client version 5.1. Use of other versions will be similar.

I/O Analyzer Hardware Requirements

I/O Analyzer requires, at minimum:

- A host system capable of running a version of ESX/ESXi specified above
- A storage system to be tested

The I/O Analyzer virtual appliance uses a single vCPU, 2GB of virtual RAM, and approximately 16.5GB of disk space.

NOTE The default size of the secondary virtual disk included with I/O Analyzer is 100MB. We recommend that this be replaced with a larger disk, as described in [“Create a Larger Secondary Virtual Disk \(Optional\)”](#) on page 11. Doing so, however, could potentially significantly increase the disk space used by I/O Analyzer.

I/O Analyzer Configuration Maximums

I/O Analyzer 1.6 has been tested with the following configurations:

- Up to 32 ESX/ESXi hosts per I/O Analyzer controller VM.

NOTE To run I/O Analyzer tests with more than this number of ESX/ESXi hosts, we recommend using multiple controller VMs.

- Up to a cumulative total of 512 VMs running on all the hosts being monitored by a single I/O Analyzer controller VM.

Configurations larger than those described above might work, but have not been tested. If you do try larger configurations, you might need to increase the JVM heap size, as described in [“Adjust the JVM Heap Size”](#) on page 32.

I/O Analyzer Version History

I/O Analyzer Version 1.6

I/O Analyzer version 1.6 is a minor maintenance release. It added:

- Upgraded to SLES 64-bit VM
- Upgraded to 64-bit JVM with 1.6GB default heap size
- Upgraded to Tomcat6
- Disabled esxstop CSV output by default to avoid running out of JVM heap
- Added experimental NFS-client stats collection
- Added experimental non-persistent configuration option
- Various bug fixes
- Updated documentation (this guide)

I/O Analyzer Version 1.5.1

I/O Analyzer version 1.5.1 is a minor maintenance release. It added:

- Minor backend updates
- Additional documentation (this guide)

I/O Analyzer Version 1.5

I/O Analyzer version 1.5 added:

- A significantly enhanced user interface
- A test scheduler
- More detailed storage, network, and CPU statistics
- The option to annotate tests and results

I/O Analyzer Version 1.1

I/O Analyzer version 1.1 added:

- Trace replay functionality
- Graphical display of results for both Iometer and trace replay

I/O Analyzer Version 1.0

The initial I/O Analyzer release.

Installing I/O Analyzer

This chapter describes the preparation steps that must be performed before running VMware I/O Analyzer. It is divided into the following sections:

- [“Obtain and Install I/O Analyzer”](#) on page 9
- [“Enable the I/O Analyzer Web UI”](#) on page 12

Obtain and Install I/O Analyzer

The I/O Analyzer virtual appliance can be obtained as a .zip file from VMware. Once you have the .zip file, follow the instructions below to install I/O Analyzer.

NOTE I/O Analyzer 1.5 has no provision for upgrading from an older I/O Analyzer installation. However, to preserve existing data when upgrading from 1.5 or 1.5.1 to 1.6, see [“Upgrade From I/O Analyzer 1.5 or 1.5.1 to I/O Analyzer 1.6”](#) on page 30.

- 1 Uncompress the zip file, extracting the I/O Analyzer .ova file.
- 2 Place the .ova file on a Windows system on which you have the vSphere Client software installed.
- 3 Within the vSphere Client, connect to the vSphere Server managing the ESX host on which you will run the I/O Analyzer virtual appliance.

NOTE The ESX host must meet the version requirements specified in [“I/O Analyzer Software Compatibility”](#) on page 6.

- 4 Click **File > Deploy OVF Template...**
- 5 In the **Deploy OVF Template** window, click the **Browse...** button, browse to the I/O Analyzer .ova file, and click **Open**.
- 6 Again at the **Deploy OVF Template** window, click **Next**.
- 7 At the **OVF Template Details** window click **Next**.
- 8 At the **Name and Location** window, enter a name for this I/O Analyzer virtual appliance (the default is **IoAnalyzer**), select the cluster or ESX host on which you want this appliance to run, then click **Next**.

NOTE The I/O Analyzer virtual appliance name should contain no spaces or commas. The name should consist entirely of letters, numbers, dots, and dashes.

- 9 At the **Datastore** window, select the datastore where you want the I/O Analyzer virtual appliance files to be stored, then click **Next**.

NOTE The I/O Analyzer virtual appliance can be placed on the “target” datastore (that is, the datastore to be analyzed), or on any other available datastore. Placing it on the target datastore, however, will cause the I/O Analyzer administrative storage load to be included in the tests, reducing the accuracy of those tests.

A better option is to place the virtual appliance on a datastore *not* being tested, then either move the default 100MB test virtual disk to the datastore to be tested, or (preferably) create a larger virtual disk (as described in “[Create a Larger Secondary Virtual Disk \(Optional\)](#)” on page 11) and place it on the datastore to be tested.

- 10 At the **Disk Format** window select the radio button for a provisioning type, then click **Next**.

NOTE We recommend selecting **Thick Provision Eager Zeroed**. If desired, however, I/O Analyzer virtual appliance instances that will be used as worker VMs (rather than test controllers) can be thin provisioned.

- 11 At the **Network Mapping** window select the desired network, then click **Next**.

- 12 At the **IP Address Allocation** section select **DHCP**, then click **Next**.

NOTE While I/O Analyzer should work with a static IP address, all testing has been done with DHCP.

- 13 At the **Ready to Complete** window click **Finish**.

I/O Analyzer gathers performance statistics through the network. You should therefore make sure that all the ESX/ESXi hosts you will be testing can be reached by the I/O Analyzer virtual appliance.

Create a Larger Secondary Virtual Disk (Optional)

This section is optional but strongly recommended.

NOTE If an I/O Analyzer virtual appliance will be used only as a controller VM, and *not* as a worker VM (see “[I/O Analyzer Overview of Operation](#)” on page 5 for definitions), you can save disk space by not performing the steps in this section for the controller VM. The steps are still strongly recommended for all worker VMs.

I/O Analyzer uses a secondary virtual disk as a test disk for both Iometer and Trace Replay tests.

The default size of the secondary virtual disk is 100MB. This default size typically fits entirely within the cache on most storage arrays. If you want to test the non-cached performance of the storage array, you can delete this default secondary virtual disk and create a larger one as follows:

- 1 Shut down the I/O Analyzer virtual appliance.
- 2 Open the vSphere Client and go to the **Summary** tab for the I/O Analyzer virtual appliance.
- 3 Click **Edit Settings**.
- 4 Select **Hard Disk 2** and click **Remove**.

NOTE This step is necessary. If you simply add a new disk without removing the exiting disk, I/O Analyzer will continue to use the 100MB existing disk.

- 5 Add a new virtual disk of your desired size, selecting **Thick Provision Eager Zeroed**.

NOTE Make sure to provision the new disk on the “target” datastore (that is, the datastore to be analyzed).

NOTE In addition to the use of a standard virtual disk, I/O Analyzer also supports the use of an RDM (raw device mapping) disk.

- 6 Power on the I/O Analyzer virtual appliance. I/O Analyzer will automatically recognize and use the new virtual disk.

Enable the I/O Analyzer Web UI

Before using I/O Analyzer, you must enable its web user interface (UI). To do so, follow these steps:

- 1 If it's not already powered on, power on the I/O Analyzer virtual appliance.
- 2 Within the vSphere Client, access the console of the I/O Analyzer virtual appliance.
- 3 At the I/O Analyzer virtual appliance console, log in to the appliance using the credentials username: **root**, password: **vmware**.

NOTE It is necessary to log in to the appliance in order for the web interface to be available.

- 4 Still at the vSphere Client, click on the Summary tab and record the IP address of the I/O Analyzer virtual appliance.

NOTE Alternatively, you can use the `ifconfig` command from within the appliance by opening a terminal and typing `ifconfig`. Under **eth0**, look for **inet addr**.

- 5 From a web browser (we recommend using Mozilla Firefox or Google Chrome), enter the IP address of the I/O Analyzer virtual appliance.
- 6 You should be taken to the I/O Analyzer virtual appliance home page. If you are not taken there, see [“Troubleshooting Startup and Login Issues”](#) on page 25.

Install Additional I/O Analyzer Copies as Worker VMs

I/O Analyzer supports the optional use of multiple I/O Analyzer virtual appliances — on one ESX/ESXi host or on multiple ESX/ESXi hosts — as worker VMs to drive additional load on the storage system being tested. These additional I/O Analyzer virtual appliances are called worker VMs, as described in [“I/O Analyzer Overview of Operation”](#) on page 5.

If you wish to use this capability, you should install additional I/O Analyzer virtual appliances using the instructions in this chapter.

NOTE I/O Analyzer virtual appliances that will be used *only* as worker VMs don't need the full 2GB of guest memory required for the test controllers. If desired, worker VMs can be provisioned with 512MB or 1GB of guest memory.

Using I/O Analyzer

Once you've downloaded the I/O Analyzer virtual appliance and deployed it on an ESX/ESXi host, you're ready to use the tool. This chapter describes how to do so.

I/O Analyzer has two major components: a workload generator and a trace repository. In the workload generator, you can create workload configurations, schedule new tests, and browse test results. In the trace repository, you can upload a new vSCSI trace and view trace profiles. Both components are described in this chapter.

Using the I/O Analyzer Workload Generator

This section describes how to create an I/O Analyzer workload and how to schedule a test to be run.

Selecting One or More Controller Appliances

Configuration and control of I/O Analyzer is accomplished primarily through a controller virtual appliance. This can be any I/O Analyzer virtual appliance installed in your environment. You access this appliance through a web browser using its IP address, configure it for your environment, then use it to start tests, monitor their progress, and view the results. The controller appliance, in turn, communicates with the other I/O Analyzer virtual appliances (which are then termed "worker VMs") and the ESX/ESXi hosts in your environment.

It is possible to simultaneously run more than one controller appliance; this is sometimes done to increase storage I/O load beyond what one controller appliance can provide (see "[I/O Analyzer Configuration Maximums](#)" on page 6). A worker VM, however, can be controlled by no more than one controller appliance at any time.

Configuring I/O Analyzer Tests

To create a workload configuration, you must first provide credentials to all ESX/ESXi hosts you plan to test. You must then properly configure all worker VMs. A configuration that contains a set of ESX/ESXi hosts and a set of worker VMs can then be used to start a new test or be saved as a new configuration.

Adding Hosts to the I/O Analyzer Host List

- 1 From the I/O Analyzer web interface, click the **WORKLOAD CONFIGURATION** button.
- 2 At the **Config I/O Analyzer Tests** page, look in the **Hosts List** pane to see if the ESX/ESXi host or hosts you will be using are already on the list.

If they're not on the list, enter the IP addresses or hostnames, and the root passwords, of any that are missing.

NOTE I/O Analyzer does support DNS hostname lookup for ESX hosts. If using hostnames instead of IP addresses, however, make sure the DNS service is working properly on the network where you deploy the I/O Analyzer virtual appliance.

- 3 If a host is on the list, but might the VMs on that host have changed, you should delete the host (using the **Delete Host** button adjacent to that host in the host list) and add it again (using the **Add New Host** button).

Adding I/O Analyzer Workloads

- 1 If you've just finished adding one or more new ESX/ESXi hosts to the host list, wait for the VM list to be updated.
- 2 Still at the **Config I/O Analyzer Tests** page, in the **Add Workload Entry** pane, select a worker VM from the drop-down list.

NOTE Once a host's credential are verified, all powered-on VMs running on that host that have a valid IP address will be shown in the drop-down list, while VMs that are powered-off or do not have a valid IP address will not be shown.

If a VM's IP address changes after a host is added, the VM list might contain stale IP address. To avoid this, delete the host and re-add it to the list, then manually update all corresponding config files.

NOTE You should select only I/O Analyzer VMs as workers.

- 3 From the drop-down **Test Type** list, select a test type, either **Iometer** or **Trace Replay**.

NOTE Any single I/O Analyzer test configuration can contain only one test type, either Iometer or Trace Replay, but not both.

For Iometer:

- a From the drop-down **Workload** list, select your desired Iometer workload spec.
For a brief summary of the selected workload spec, hover the mouse pointer over **[overview]** (to the right of the drop-down menu).

For Trace Replay:

- a From the drop-down **Trace** list, select your desired trace file.
For a brief summary of the selected trace, hover the mouse pointer over **[overview]** (to the right of the drop-down menu). For a detailed profile, click the **Characteristics** link.

NOTE You can also upload your own traces, as described in ["Using the I/O Analyzer Trace Repository"](#) on page 20.

- b From the drop-down **Device** list, select a Linux block device where the trace can be replayed.
By default, I/O Analyzer comes with **sdb**, which is 100MB in size. This can be enlarged or replaced by a new VMDK, as described in ["Create a Larger Secondary Virtual Disk \(Optional\)"](#) on page 11.
- c In the **Replay Pace** field, enter the pace to use when replaying the trace.

The trace replay pace will be increased or decreased by the factor entered here.

- By default **Replay Pace** is set to 1, meaning the trace will be replayed at its original pace.
- A value less than 1 will cause the trace to be replayed at a slower pace than the original.
- A value greater than 1 will cause the trace to be replayed at a pace faster than the original.

One reason to slow down the trace replay would be if the original trace was collected using a faster system or storage than the replay environment, thus potentially representing more load than the replay environment can support. By entering a value of 0.5, for example, the time between each request would be doubled, slowing the trace by a factor of 2.

Similarly, if the trace was collected on a slower system than the replay environment, a value higher than 1 could be entered, thus decreasing the time between requests.

- d From the drop-down **Disk Size Adjustment** list, select either **Wrap Around** or **Ignore**.
This option specifies how to handle requests that exceed the size of the trace replay device. For example, if the trace working set size is 20GB (that is, the LBNs addressed in the trace span a 20GB space), but the trace replay device is only 15GB, the requests whose LBNs exceed 15GB can be either wrapped to map onto the smaller device (in this case, as a modulo of 15GB) or ignored.
- 4 When done selecting and configuring a worker VM, click the **Add** button to add it to the workload list.

NOTE Each worker VM can associate with at most one workload entry in a configuration.

- 5 Repeat [Step 2](#) and [Step 3](#) until all desired worker VMs are configured.

I/O Analyzer Workload Configurations

The I/O Analyzer **Workload Configuration** pane allows you to create, delete, load, or edit workload configurations. Each of these tasks is addressed below.

Create a New I/O Analyzer Workload Configuration

Once you've configured and added all the worker VMs you want to use in your workload, you're ready to create a new I/O Analyzer workload configuration.

- 1 At the **Config I/O Analyzer Tests** page, in the **Workload Configuration** pane, enter a configuration name in the **Config Name** field.
- 2 In the **Duration** field, enter the number of seconds to run each workload.
We recommend that this value be set to at least 120 seconds.

NOTE The duration entered in this field is used only when a workload configuration is run at this time (using the **Run Now** button). It is not stored with the configuration.

This duration setting therefore does not apply when running a test at a later time from this page, or when scheduling a test using the I/O Analyzer Test Scheduler page (described in "[I/O Analyzer Test Scheduler](#)" on page 18); the Test Scheduler page has its own duration entry field.

- 3 If desired, in the **Description** field, enter a description for this workload.
- 4 To save the workload for later use, click the **Save as a New Config** button.
- 5 To run the test, click the **Run Now** button.

The test status will be updated below, or can be viewed on the Test Scheduler page. Wait until it finishes, then proceed to the results page (click the **View Test Results** button near the top of the browser window).

Delete an I/O Analyzer Workload Configuration

- 1 At the **Config I/O Analyzer Tests** page, in the **Workload Configuration** pane, select a configuration from the **Load Existing Config** drop-down list.
- 2 Click the **Load Config** button.
- 3 Click the **Delete Config** button.

NOTE Before clicking the **Delete Config** button, make sure you've loaded the config. Otherwise it's easy to delete the wrong one.

Load and Run an I/O Analyzer Workload Configuration

- 1 At the **Config I/O Analyzer Tests** page, in the **Workload Configuration** pane, select a configuration from the **Load Existing Config** drop-down list.
- 2 Click the **Load Config** button.
- 3 In the **Duration** field, enter the number of seconds to run each workload.
We recommend that this value be set to at least 120 seconds.

- 4 Run the test by clicking the **Run Now** button.

The test status will be updated below, or can be viewed on the Test Scheduler page. Wait until it finishes, then proceed to the results page (click the **View Test Results** button near the top of the browser window).

Edit an I/O Analyzer Workload Configuration

To edit an I/O Analyzer workload configuration, you must load the configuration, make the changes, delete the original configuration, then save the edited one.

- 1 At the **Config I/O Analyzer Tests** page, in the **Workload Configuration** pane, select a configuration from the **Load Existing Config** drop-down list.
- 2 Click the **Load Config** button.
- 3 Make any desired changes to the workload configuration.
- 4 Click the **Delete Config** button.
- 5 Click the **Save as a New Config** button.

Using the I/O Analyzer Listening Mode

If, instead of Iometer or Trace Replay, you want to use your own workload generator, I/O Analyzer supports "listening mode." In listening mode, I/O Analyzer collects host statistics from all the hosts in the host list, but no guest level statistics are collected.

If a test containing no workload entry is run, that test will default to listening mode.

NOTE Because of the absence of guest statistics in listening-mode tests, identifying these tests later is easier if they are given meaningful test names and descriptions.

I/O Analyzer Test Scheduler

The I/O Analyzer test scheduler provides a way to schedule multiple pre-defined tests to run or schedule a pre-defined test to run at a later time. It also has a simple test manager pane to monitor scheduled tests and the progress of the current test.

Scheduling A New I/O Analyzer Test

To schedule a new test, follow these steps:

- 1 From the I/O Analyzer web interface, click the **TEST SCHEDULER** button.
- 2 At the **I/O Analyzer Test Scheduler** page, from the drop-down list at the top of the page, select a configuration.

NOTE The list shows the configurations that have been added using the **Workload Configuration** page.

- 3 Specify a date and time for the test.

If you want the test to run as soon as possible, click the **Get Current Server Time** button.

NOTE If no other tests are running, using the **Get Current Server Time** button means the new test will start immediately when you click the **Schedule Test** button.

If any tests are running, or if other tests have an earlier scheduled run time than the new test, the scheduler will set the new test to pending status until those earlier tests are completed.

- 4 Optionally, provide a description of the new test.
- 5 Click the **Schedule Test** button
- 6 If desired, repeat [Step 2](#) through [Step 5](#) to schedule additional tests.

Managing I/O Analyzer Tests

I/O Analyzer includes a test manager that shows a list of running, pending, and completed tests. It includes the following features:

- Cancel pending test

To cancel a pending test, click the **Cancel** button, adjacent to the test.

- Aborting an ongoing test

To abort an ongoing test, refer to [“Abort an Ongoing I/O Analyzer Test”](#) on page 31.

- Delete complete or canceled tests

The test manager shows all complete and canceled tests unless they’re deleted. To delete completed and canceled tests, click the **Delete** button, adjacent to the test. To delete all completed or canceled tests, click the **Clear Complete/Cancelled Tests** button (above the test list).

Using the I/O Analyzer Trace Repository

In addition to using Iometer to generate synthetic loads, I/O Analyzer allows the “replay” of application workload I/O streams.

The I/O Analyzer virtual appliance comes with sample traces from a few common applications, such as Microsoft Exchange Mail Server, an OLTP workload, and so on. As described in this section, you can also collect traces from applications of your choice and upload them to I/O Analyzer.

Collecting a vSCSI Trace

To collect a trace from an application's I/O workload using the `vscsiStats` utility on an ESX/ESXi host, follow these steps:

- 1 Reset the statistics by typing in an ESX/ESXi shell:
`vscsiStats -r`
- 2 Start collecting statistics and create a unique ID for them:
`vscsiStats -s -t -w <worldId> -i <handleId>`
(where `<worldId>` is the world ID for the virtual machine in which you will be running the workload and `<handleId>` is the identifier for the specific virtual disk you will be testing).

NOTE You can find `<worldId>` and `<handleId>` with the `vscsiStats -l` command. You can find additional attributes of the `vscsiStats` utility with the `vscsiStats -h` command.

- 3 Using the unique ID generated in the previous step, configure ESX/ESXi to capture the statistics in a disk file:
`logchannellogger <unique-id> <temporary-file-name>`
- 4 Run your application within the virtual machine identified by `<worldId>`.
- 5 After the application run is completed (or the trace collection is over) return to the ESX/ESXi shell and stop the `logchannellogger` process by typing `<Ctrl>-C`.
- 6 Stop the statistics collection:
`vscsiStats -x -w <worldId> -i <handleId>`
- 7 Convert the binary trace file to a .csv file:
`vscsiStats -e <temporary-file-name> > <trace-file-name.csv>`

Uploading a Trace to I/O Analyzer

Traces collected with `vscsiStats` can be uploaded from either a local filesystem or a remote machine.

NOTE Uploaded traces must be in .csv format.

To upload a trace, follow these steps:

- 1 From the I/O Analyzer web interface, click the **UPLOAD A VSCSI TRACE** button.
- 2 At the **vSCSI Trace Upload** page, in the **Trace Name** field, enter a name for the trace you are about to upload.

NOTE The trace name should contain only letters, numbers, dashes, and dots.

NOTE Later in the process, when you click either **Upload Remote File** or **Upload Local File**, I/O Analyzer will create a directory with this name under `/var/www/traces/`.

- 3 In the **Description** field, if desired, enter a description for the trace you are about to upload. (This is optional, but can help identify traces in the future.)

- 4 If uploading from a remote machine:

NOTE The remote machine can be either a physical machine or a virtual machine, as long as it has an SSH daemon running.

- a Under **Upload from Remote Host/VM**, enter the hostname or IP address of the remote machine.
 - b Enter a username and password that has read permissions to the trace file to be uploaded.
 - c Enter the absolute path to the trace file (for example, `/home/johndoe/traces/exchange.csv`).
 - d Click **Upload Remote File**.
- 5 If uploading from a local disk:
 - a Under **Upload from Local Disk**, click **Browse**.
 - b Browse to the trace file you wish to upload, select it, then click **Open**.
 - c Back in the **Upload from Local Disk** window, click **Upload Local File**.
 - 6 Once a trace is uploaded, backend scripts automatically extract from it basic information, such as I/Os per second, LBN distribution, inter-arrival time, and so on, then create graphs of the data. These graphs can be found on the **Trace Characteristics** page (click the **VSCSI TRACE CHARACTERISTICS** button then select the desired trace from the drop-down menu at the top).

I/O Analyzer Reporting

This chapter describes how to see the results of an I/O Analyzer test.

Viewing Test Results

To view the results of an I/O Analyzer test, follow these steps:

- 1 Click the **VIEW TEST RESULTS** button.
- 2 From the drop-down menu near the top of the page, select the test you want to view.

NOTE Iometer tests use the prefix IOMETER, Trace Replay tests use the prefix REPLAY, and listening mode tests use the prefix LISTENING.

After the prefix, the test name contains the configuration name, followed by the starting timestamp of the test.

If a very recent test is not listed, try again after a few minutes.

- 3 Once the test is selected, the **Test Results** page shows the average metrics and displays graphs showing how these numbers changed during the test.

For Iometer tests, the average numbers are taken from the Iometer application running in the guest and the graphs are plotted with time-series data collected from the host once every 20 seconds.

For Trace Replay results, only host-level details are displayed.

The **Download Results** button can be used to download the entire esxtop data and other computed metrics.

For information about the displayed metrics, see [“Where Can I Learn the Meaning of Specific Counters?”](#) on page 35.

I/O Analyzer Troubleshooting, Advanced Usage, and FAQs



This appendix provides troubleshooting assistance, advanced usage tips, and answers to frequently-asked questions about I/O Analyzer.

I/O Analyzer Troubleshooting

This section provides troubleshooting assistance for I/O Analyzer.

Troubleshooting Startup and Login Issues

The I/O Analyzer IP Address Shows the Apache Default page

If you enter the I/O Analyzer virtual appliance IP address into a web browser and are taken to the Apache default page, try rebooting the appliance.

NOTE Rebooting the I/O Analyzer virtual appliance might change its DHCP assigned IP address. Thus after rebooting, make sure to access the appliance's web UI using the new IP address, if it's different.

If the problem persists, manually start the I/O Analyzer daemon as follows:

- 1 Within the vSphere Client, access the console of the I/O Analyzer virtual appliance.
- 2 At the I/O Analyzer virtual appliance console, log in to the appliance using the credentials username: **root**, password: **vmware**.
- 3 Within the I/O Analyzer virtual appliance open a terminal and type:
`/root/ioAnalyzerScripts/launchIoAnalyzer.sh &`
- 4 Try again to access the I/O Analyzer web UI from a browser. (If you get the same Apache page, wait a few seconds and try again.)

Troubleshooting Workload Configuration Issues

Some VMs Are Not on the List

VMs won't be listed if they are not powered on, don't have a valid IP address, or don't have VMware Tools installed.

VMs That Aren't Powered on Or Don't Have a Valid IP Address

VMs that are not powered on or don't have a valid IP address will not be displayed.

If a VM powers on or obtains a valid IP address after you add the corresponding host to the list, delete the host and re-add it.

NOTE Re-adding hosts in general does not require re-adding all workload entries. The only exception is if some VMs have new IP addresses; in that case all stale workload entries must be manually updated.

VMs That Don't Have VMware Tools Installed

VMs that don't have VMware Tools installed won't be displayed, though their VMDK stats will still be collected.

A VM IP Address is Inaccurate

If a VM's IP address changes after you add the host, the web UI will not know. If you are aware of the IP address changes, delete the host and re-add it. You will also have to manually update all stale workload entries in all configurations.

NOTE This can sometimes happen unexpectedly. If you run an Iometer or Trace Replay test but see no workload generated on the results page, it is likely that one or more worker VMs have changed IP address after you created your configuration. In this case you should fix the configuration, then rerun the test.

Troubleshooting Test Run Issues

The Test Does Not Start When “Run Now” Button is Clicked

Most often this problem is due to the host credentials (IP address or root password) changing after the host was added to the list.

When a test is scheduled to run, the backend will re-validate all host credentials. If your host credentials are out of date and you end up having no valid host, the scheduler will reject the test.

To fix this problem, delete the host, then re-add it.

NOTE Re-adding hosts in general does not require re-adding all workload entries. The only exception is if some VMs have new IP addresses; in that case all stale workload entries must be manually updated.

Iometer Doesn't Run

If you have checked that DHCP did NOT reassign your worker VMs new IP addresses, but Iometer still did not run on the workers, this most likely means there are networking issues between the I/O Analyzer controller virtual appliance and the problematic worker VM.

Ping from the controller VM to the worker VM and make sure the round trip time (RTT) is under 1.5 seconds.

If RTT is above 1.5 seconds, it can happen that either SCP might timeout when transferring the Iometer configuration file or Iometer starts before the configuration file transfer finishes. In either case, Iometer will not run. Since 1.5 seconds is uncommonly long, fix any potential network problems before using I/O Analyzer.

If networking problem cannot be addressed, consider placing the controller VM and all worker VMs geographically close to each other (perhaps on the same physical switch).

If a networking issue is unlikely to be the problem, check `/tmp/run-iometer.log` on the worker VM to see whether Iometer has had any problems.

A Test is Stuck for a Long Time

The I/O Analyzer scheduler is equipped with several timeout mechanism. If, despite this feature, I/O Analyzer gets stuck for an unreasonably long time, you can abort the currently-running test as described in [“Abort an Ongoing I/O Analyzer Test”](#) on page 31.

If the problem persists, contact the I/O Analyzer team (see [“How to Contact the I/O Analyzer Team”](#) on page 38).

Troubleshooting Test Scheduler Issues

The Test Manager says “Iometer guestSummary timeout. Stats will be omitted for this test.”

If you see this message, at least one of the worker VMs that should run Iometer did not generate an `iometer.csv` output file. Most likely this is because Iometer is not correctly invoked on the worker VM. Try the following:

In the vSphere Client, open the **Console** tab of the worker VM and see whether an Iometer window is open and Iometer is stuck.

If Iometer is running without a valid ICF spec (that is, you see an Iometer window but it is not running any spec), contact the I/O Analyzer team for a solution (see “[How to Contact the I/O Analyzer Team](#)” on page 38).

If Iometer failed to start (that is, you see no Iometer window at all), make sure the I/O Analyzer controller virtual appliance can reach the worker VM. Do this by using SSH from the controller VM to the worker VM.

I/O Analyzer Virtual Appliance Timezone is Wrong

The I/O Analyzer virtual appliance sets its system clock from its ESX/ESXi host at boot time and, in most installations, periodically thereafter. If the I/O Analyzer virtual appliance time is incorrect, check the ESX/ESXi host clock and timezone settings as well as the I/O Analyzer timezone setting.

ESX/ESXi Host Clock Setting

To update the clock on an ESX/ESXi host:

- If possible, set the ESX/ESXi host to use an NTP server.

NTP can be configured from the vSphere Client in ESX/ESXi version 4.0 and later as described in kb.vmware.com/kb/2012069

- If no NTP server is available, you can manually set the ESX/ESXi time using:
`date -S MMDDhhmmYY; hwclock -systohc`

NOTE For ESXi, this *must* be in UTC.

ESX Host Timezone Setting

ESX and ESXi behave differently regarding timezones:

- ESXi does not support timezones, so the time *must* be in UTC. Setting it to a local time is likely to cause problems running I/O Analyzer.
- ESX does support timezones; thus for ESX hosts you should make sure the timezone is set correctly.

I/O Analyzer Virtual Appliance Timezone Setting

To change the timezone setting in the I/O Analyzer virtual appliance, follow these steps:

- 1 Within the vSphere Client, access the console of the I/O Analyzer virtual appliance.
- 2 Within the I/O Analyzer virtual appliance console, run:
`yast timezone`
- 3 Use the arrow keys and tabs to change the selected timezone.
- 4 When the desired timezone has been selected, press **F10** to save your changes and exit the configuration screen.

Troubleshooting Test Results Issues

No Workload is Generated

If you don't see any workload generated on the result page, it is likely that worker VMs have had their IP addresses changed after you compose the configuration. Try fixing the configuration and rerunning the test.

Note that this can happen that you schedule a number of tests and, in between tests, some of your worker VMs are assigned new IP addresses via DHCP. In such cases, the controller VM will not be able to communicate with the worker VM.

You Get Blank Results

If you can't even see host statistics on the results page, it's likely that the backend was unable to connect to any of the hosts. Log in to the appliance and check `/var/www/ioa.log` to find the root cause.

Another possible cause is JVM exhausting the entire heap. In our lab environment, we've tested I/O Analyzer for more than five hours without running out of memory. However, we recommend keeping tests under two hours. To see if this is the cause, check `/var/log/tomcat6/catalina.out` and look for out of memory exception.

If you do need an extremely long test that I/O Analyzer keeps failing, you will need to increase the tomcat server's heap size, as described in ["Adjust the JVM Heap Size"](#) on page 32.

OutOfMemoryError in /var/log/tomcat6/catalina.out

If a test is terminated prematurely and shows few or no stats on the results page, look in the `/var/log/tomcat6/catalina.out` file for an `OutOfMemoryError`.

If this error is found, increase the JVM heap size as described in ["Adjust the JVM Heap Size"](#) on page 32.

Trace Replay Generates Low (or no) IOPS, tryScpTrace.py failed at remote Error

If the results page shows that Trace Replay generated low (or no) IOPS, look on the controller VM in the file `/var/www/ioa.log` for the following error message:

```
tryScpTrace.py failed at remote
```

This error indicates that a worker VM doesn't have enough disk space to store a trace file. In this case you'll need to delete unused trace files (or increase disk space) so that trace replay can function normally, as described in ["Remove Unused Trace Files From Worker VMs to Save Virtual Disk Space"](#) on page 33.

Some Charts Are Missing in the Results Page

I/O Analyzer uses scripts at the backend to generate charts. The scripts cannot work properly with any VM names that include spaces or commas. For those VMs, you won't be able to see automatic charts. However, you can still get their raw time-series data by downloading the tarball.

Some Charts Have Gaps

I/O Analyzer pulls performance data during a test through networks. If for any reason a host becomes unreachable during the test, I/O Analyzer will keep retrying. During this time, no samples will be collected and you might thus see a flat line or a series of zeros until I/O Analyzer recovers from the error.

Some VMs/Devices/Adapters Are Missing From the Results

If a VM is missing, it's likely that it was powered off during the entire test period.

For other counter groups, it's likely that they are "inactive."

In order to be considered "active":

- A disk device or disk adapter must have an average IOPS of at least 0.1.
- A network port must have an average PktTx/Sec of at least 0.1.

If these thresholds are too high or low for you, contact the I/O Analyzer team for information about configuring them (see ["How to Contact the I/O Analyzer Team"](#) on page 38).

My Time-series Charts Seem to Misalign with Workload Generator

The statistics collection and workload generator are synchronized by a fixed delay. We would recommend running a test longer to even out the misalignment during the warm-up and cool-down periods.

If exact timing is a definite requirement in your scenarios, contact the I/O Analyzer team for more information regarding fine-tuning synchronization delay (see [“How to Contact the I/O Analyzer Team”](#) on page 38).

Troubleshooting Trace Repository Issues

Uploaded Trace is not Profiled Correctly

The backend trace parsing script accepts only traces in .csv format. Make sure you follow the steps specified in the [“Collecting a vSCSI Trace”](#) on page 20. If the format is not compatible, the scripts might fail to generate charts.

If the **Trace Characteristics** page shows a broken trace file, remove it as follows:

- 1 Within the vSphere Client, access the console of the I/O Analyzer virtual appliance.
- 2 At the I/O Analyzer virtual appliance console, log in to the appliance using the credentials username: **root**, password: **vmware**.
- 3 Within the I/O Analyzer virtual appliance open a terminal.
- 4 Within the terminal window, go to the `/var/www/traces` directory.
- 5 Find the problematic trace folder and delete the entire folder.

I/O Analyzer Advance Usage

This section provides guidance for advanced usage of I/O Analyzer.

Upgrade From I/O Analyzer 1.5 or 1.5.1 to I/O Analyzer 1.6

If you want to preserve existing data when upgrading from I/O Analyzer 1.5 or 1.5.1 to I/O Analyzer 1.6, you can copy the following folders from the 1.5 or 1.5.1 virtual appliance to the 1.6 virtual appliance:

Workload configurations: `/var/www/runConfigs`

All trace files (both built-in and uploaded): `/var/www/traces`

All test results: `/var/www/expts`

Change the Target Block Device for Iometer Tests

The default I/O Analyzer configuration file is built to test only one virtual hard disk at a time. The default ICF files use the first new virtual hard disk as the target disk for all benchmark runs.

Keep in mind the following:

- If you want to change properties of the virtual hard disk (such as its size), you'll need to replace the current disk with a new one (see [“Create a Larger Secondary Virtual Disk \(Optional\)”](#) on page 11). Remember to delete the unwanted disk before adding the new disk. This is needed so that the default configuration files recognize the correct target disk to run the benchmark (in Iometer the target disk is "sdb").
- To change the target location within the ESX host, delete the unwanted virtual hard disk before creating a new one.

Edit or Add Iometer Configuration Files at the Controller

To edit existing configuration files through the backend:

- 1 Within the vSphere Client, access the console of the I/O Analyzer controller virtual appliance.
- 2 At the I/O Analyzer controller virtual appliance console, log in to the appliance using the credentials username: **root**, password: **vmware**.
- 3 Within the I/O Analyzer controller virtual appliance open a terminal.
- 4 Within the terminal window, go to the `/var/www/configs` directory.
- 5 Edit the configuration files using the vi text editor.

To add new configuration files through the back end:

- 1 Within the vSphere Client, access the console of the I/O Analyzer controller virtual appliance.
- 2 At the I/O Analyzer controller virtual appliance console, log in to the appliance using the credentials username: **root**, password: **vmware**.
- 3 Within the I/O Analyzer controller virtual appliance open a terminal.
- 4 Within the terminal window, run the following commands to start Iometer:


```
/usr/bin/dynamo &
wine /usr/bin/Iometer.exe
```
- 5 Configure Iometer to your specifications using the Iometer UI in the I/O Analyzer controller virtual appliance console and test it by running it.
- 6 Save the new configuration using the Iometer UI:
 - a Click the **Save** icon.
 - b Specify the path as `/var/www/configs/`

- c Provide a name for the `.icf` file.

NOTE For customized workloads, the first character of the `.icf` file name must be a letter (a-z or A-Z).

- 7 After making any changes (modifications, deletions, or additions) to the Iometer configuration files, restart the tomcat service to populate the new files by running the following command:
`/etc/init.d/tomcat6 restart`

NOTE Upon initialization, the backend server will pick up all valid Iometer specification files under `/var/www/configs` that have a `.icf` file extension.

Abort an Ongoing I/O Analyzer Test

Due to the support of multiple distributed worker VMs, there is no simple way to abort ongoing I/O Analyzer tests. If you do need to do so, you must first kill all running workload generators, then reset the test scheduler.

NOTE In addition to canceling the currently-running test, these steps will also cancel all pending tests. In addition, the next test run might contain some stale statistics.

- To kill Iometer:

Using the vSphere Client, log in to the worker VM and close the Iometer window.

- To kill trace replayer:

Using the vSphere Client, log in to the worker VM and run the following command in a terminal window:
`pkill 'pgrep vscsi-replay'`

- To reset the scheduler:

Using the vSphere Client, log in to the controller VM and run the following command in a terminal window:
`/etc/init.d/tomcat6 restart`

Enable esxtop CSV Dump

To enable CSV output from `esxtop`, access the following URL from a web browser:

http://<IOANALYZER_CONTROLLER_IP_ADDR>:8180/IOAnalyzer/ioanalyzer/script?command=set-dumpmode&value=true

This will cause `esxtop` to redirect its output to a CSV file.

NOTE This change is *not* persistent. It will last only until the I/O Analyzer controller virtual appliance is next rebooted or its tomcat server is restarted, at which time this option will be reset to its default value (false).

Disable Collection of NFS Client Statistics

To disable collection of NFS client statistics, access the following URL from a web browser:

http://<IOANALYZER_CONTROLLER_IP_ADDR>:8180/IOAnalyzer/ioanalyzer/script?command=set-NfsClientStats&value=false

This will cause I/O Analyzer to stop collecting NFS statistics.

NOTE This change is *not* persistent. It will last only until the I/O Analyzer controller virtual appliance is next rebooted or its tomcat server is restarted, at which time this option will be reset to its default value (true).

Adjust Statistics Collection Interval

To adjust the frequency with which I/O Analyzer collects statistics, access the following URL from a web browser:

http://<IOANALYZER_CONTROLLER_IP_ADDR>:8180/IOAnalyzer/ioanalyzer/script?command=set-vtop-interval&value=<interval>

where *<interval>* is the desired collection interval, in seconds. This value must be an integer, with a minimum value of 6.

NOTE This change is *not* persistent. It will last only until the I/O Analyzer controller virtual appliance is next rebooted or its tomcat server is restarted, at which time this option will be reset to its default value (20).

Adjust the JVM Heap Size

The default JVM heap size is 1.6GB and the default guest memory of the I/O Analyzer controller virtual appliance is 2GB.

If a test is terminated prematurely and shows few or no stats on the results page, and the `/var/log/tomcat6/catalina.out` file contains `OutOfMemoryError`, you might need to increase your JVM heap size.

To confirm that this is the problem, use the following HTTP command from a web browser to monitor I/O Analyzer backend server memory usage:

http://<IOANALYZER_CONTROLLER_IP_ADDR>:8180/IOAnalyzer/ioanalyzer/script?command=check-heap-size

The lowest free memory will typically occur when I/O Analyzer initializes stats collection. If free memory drops below 100MB, keep reloading the above page to see if the system is able to increase free memory. If free memory remains below 100MB for more than a minute, this is an indication that your JVM heap size is too low.

To increase the JVM heap size, reboot the I/O Analyzer controller virtual appliance, open a terminal in the appliance, and open the file `/etc/tomcat6/tomcat6.conf` in a text editor.

Line 23 of `tomcat6.conf` will look similar to this:

```
23 JAVA_OPTS="-Xms1638m -Xmx1638m"
```

On line 23, replace both occurrences of the value 1638 with your desired heap size in MB.

After editing the `tomcat6.conf` file, perform whichever one of the following steps applies:

- If the new heap size is at least a few hundred MB smaller than the guest memory:
 - a Restart tomcat server so that it will pick up the new heap size by running the following command:


```
/etc/init.d/tomcat6 restart
```
- If the new heap size is at *not* least a few hundred MB smaller than the guest memory:
 - a Power off the I/O Analyzer controller virtual appliance.
 - b Increase the appliance guest memory to be at least a few hundred MB greater than the new heap size.
 - c Power on the I/O Analyzer controller virtual appliance.

After rebooting the appliance or restarting the tomcat server, use the above HTTP command to check whether the new configuration is in effect.

If you're unable to connect to the above HTTP command, check `/var/log/tomcat6/catalina.out` in the I/O Analyzer controller virtual appliance. If the log shows the error:

```
There is insufficient memory for the Java Runtime Environment to continue.
```


increase the I/O Analyzer controller virtual appliance guest memory as described above.

NOTE In order to accommodate addressing overhead and other running processes the I/O Analyzer controller virtual appliance guest memory must be at least a few hundred MB larger than the JVM heap size.

Remove Unused Trace Files From Worker VMs to Save Virtual Disk Space

When running tests in Trace Replay mode, the controller VM will automatically distribute trace files to all the worker VMs. Deleting a trace on a controller VM, however, does not remove the trace file from all worker VMs. If the worker VMs are low on disk space you can delete unwanted trace files by connecting to the worker VMs using SSH and deleting unwanted trace files under `/var/www/traces`.

NOTE This section is describing removing trace files *only* from worker VMs. If you remove trace files from a controller VM, those traces will be permanently removed from that controller VM's workload list.

Controller VMs should preferably be provided a comparatively large amount of disk space to store trace files and other data.

When a worker VM doesn't have enough disk space to store a trace file you might see the error described in ["Trace Replay Generates Low \(or no\) IOPS, tryScpTrace.py failed at remote Error"](#) on page 28.

I/O Analyzer Frequently-Asked Questions

This section contains answers to frequently-asked questions about I/O Analyzer.

General I/O Analyzer Usage

Is It Safe to Publicly Expose the I/O Analyzer Virtual Appliance?

For a variety of security reasons, we highly discourage exposing the I/O Analyzer virtual appliance to public access.

All ESX/ESXi host credentials are kept on unencrypted storage within the I/O Analyzer virtual appliance. Publicly exposing the I/O Analyzer virtual appliance could expose your enterprise network to serious security threats.

Can Multiple Users Simultaneously Operate the Same Controller VM?

No. I/O Analyzer does not have strict synchronization at the backend. Multi-user scenarios are thus not currently supported.

Can I Change the I/O Analyzer Virtual Appliance Password?

Changing the I/O Analyzer virtual appliance password can only be done via shell login.

Note that all worker VMs would have to change to the same password so that the backend script at the controller VM is able to communicate with all workers.

After changing the password for all workers, on the controller VM edit the following three files to contain the new password:

```
/root/ioAnalyzerScripts/copy_from_server.pl
/root/ioAnalyzerScripts/copy_to_server.pl
/root/ioAnalyzerScripts/ioalib.py
```

Why are There Multiple esxtop Files for Each Host?

Starting with I/O Analyzer 1.5, a different method is used to pull performance statistics. This new approach exports all available counters. If during a test, the available counters are changed (for example, a new VM is powered on), the backend thread will create a new esxtop output file to include the newly added counters.

Workload Configuration

Can I Mix Iometer Tests With Trace Replay Tests?

No, I/O Analyzer does not support mixing different types of test in the same configuration. However, you might be able to simulate this by simultaneously using multiple controller VMs. Alternately, you could accomplish this by running workload generators manually and use listening mode to collect the statistics.

NOTE If you simultaneously use multiple controller VMs, but want to still have all the statistics in one place, you can have the controller VM (preferably the one running the Iometer tests) collect statistics from all the hosts. You can do this by adding any needed additional hosts (that is, any hosts the Iometer controller VM isn't already monitoring) to the test without specifying a workload.

Can a Single Worker VM Simultaneously Run Multiple Workloads?

No, each worker VM in a configuration can associate with at most one workload entry.

What Happens if a Test Duration is Longer Than a Trace?

If a test is configured to run for longer than the trace duration, during the remaining portion of the test the trace replayer will be completely silent. For example, if you schedule a 500 second test with a 300 second trace, the last 200 seconds of the test run will have no disk activity.

If you want to run a trace in a loop, schedule multiple tests containing that trace.

Can I Add a Host That Has no Worker VMs?

Yes, if a host is added but no worker VMs are running on it, the backend will simply run listening mode on that host.

Test Results

Why Do All My I/Os Hit the Cache?

By default, I/O Analyzer comes with a 100MB virtual disk, located under `/dev/sdb`. With such a small disk, it is likely that nearly all disk I/Os will hit the cache. To switch to a larger disk, follow the instructions in [“Create a Larger Secondary Virtual Disk \(Optional\)”](#) on page 11.

Where Can I Learn the Meaning of Specific Counters?

I/O Analyzer collects performance statistics via the same infrastructure that `esxtop` uses. All counters have the same meaning as in `esxtop`. Refer to `esxtop` documentation for the official definition of those counters.

For storage related counters, the following KB article might be useful:

http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1008205

For general `esxtop` counters, the following whitepaper might be useful:

<http://communities.vmware.com/docs/DOC-9279>

Can I Import Test Results From Another I/O Analyzer Virtual Appliance?

If you have multiple I/O Analyzer virtual appliances, and would like to store all results on the same one, you can transfer all folders under `/var/www/expts` from one appliance to another.

I/O Analyzer does not currently support importing results that are generated by versions of I/O Analyzer prior to 1.5 or results that are not generated by I/O Analyzer.

Can I Mount a Separate Disk to Store all Test Results?

Yes. Mount your desired disk/partition to `/var/www/expts` at the controller VM. The backend server reparses all folders under this path every time you open the result page.

Why Can't esxplot Import the Generated esxtop*.csv Files?

Starting with version 1.5, I/O Analyzer uses a different method of pulling performance counters. The output `.csv` files follow the same format while exporting more counters than `esxtop` batch output. Because of these additional counters, `esxplot` might not interpret some of them correctly. To fix this problem in `esxplot`, replace the `IsColZero` function in `esxplot.py` as follows:

```
def IsColZero(self, index):
    """
    Return true if all of the data is essentially zero
    """
    for value in self.columns[index]:
        floatValue = 0.0
        try:
            floatValue = float(value)
        except ValueError:
            continue
        if floatValue != 0.0:
            return False
    return True
```

In order to run the modified `esxplot.py` you'll have to install Python 2.6+, `wxPython`, and `numpy`.

Also note that the esxtop output files generated by I/O Analyzer 1.5+ do not usually follow the same exporting order as esxtop/resxtop.

How Do I Interpret the timeseries* Files in the Tarball?

Table A-1 through Table A-3, below, describe the contents of the timeseries* files in the tarball.

NOTE TIMESTAMP is the relative timestamp, in which zero means the starting time of the test.

Disk related counters (adapter, device, or VM):

Table A-1. Interpretation of Disk-Related Counters (adapter, device, or VM) in timeseries* Files

*-iops	TIMESTAMP	READS/s	WRITES/s	CMDS/s
*-throughput	TIMESTAMP	MBREADS	MBWRITES	MBTOTAL
*-latency [for adapters or devices]	TIMESTAMP	DAVG	KAVG	QAVG
*-latency [for VMs]	TIMESTAMP	LatRd	LatWr	

Network-related counters (timeseries-network-*):

Table A-2. Interpretation of Network-Related Counters (timeseries-network-*) in timeseries* Files

*-droprate	TIMESTAMP	DropTx	DropRx
*-pkps	TIMESTAMP	PkpsTx	PkpsRx
*-throughput	TIMESTAMP	MbpsTx	MbpsRx

CPU-related counters:

Table A-3. Interpretation of CPU-Related Counters in timeseries* Files

esxtop-pcpuutil	TIMESTAMP	CPU #0	CPU #1	[...]	CPU #N-1 ⁽¹⁾
esxtop-pcpuused	TIMESTAMP	CPU #0	CPU #1	[...]	CPU #N-1 ⁽¹⁾
esxtop-coreutil	TIMESTAMP	CPU #0	CPU #1	[...]	CPU #N-1 ⁽¹⁾

1. Where N is the total number of logical CPUs/cores in the host.

Network Does Not Automatically Come Up

If an I/O Analyzer virtual appliance network doesn't automatically come up, check the following common reasons.

The I/O Analyzer Virtual Appliance Isn't Acquiring an IP Address Via DHCP

By default, the I/O Analyzer virtual appliance uses DHCP to acquire an IP address. If your environment doesn't have a DHCP server, perform the following steps:

- 1 Manually configure an IP address in the I/O Analyzer virtual appliance.
- 2 Launch the I/O Analyzer daemon by running the following startup script in a terminal:
~/ioAnalyzerScripts/LaunchIoAnalyzer.sh

The I/O Analyzer Virtual Appliance is Missing a Network Interface

If the ifconfig command doesn't show a valid network interface, run the following commands:

```
rm /etc/udev/rules.d/70-persistent-net.rules
udevadm trigger
sed -i -e 's/eth[0-9]\+/eth0/g' /etc/udev/rules.d/70-persistent-net.rules
udevadm trigger
/etc/init.d/network restart
```

At this point ifconfig should recognize eth0.

If your environment doesn't have a DHCP server, follow the instructions in [Appendix A, "The I/O Analyzer Virtual Appliance Isn't Acquiring an IP Address Via DHCP,"](#) on page 36.

How to Contact the I/O Analyzer Team

To contact the I/O Analyzer team, send email to:

`io-analyzer-info@vmware.com`

For help troubleshooting I/O Analyzer issues, please attach the following log files:

- `/var/www/ioa.log`
- `/var/log/tomcat6/catalina.out`
- `/tmp/run-iometer.log`
- `/tmp/trace-replay.log`
- `/tmp/ia-daemon.log`