

# HCIBench 2.0 User Guide

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## Introduction

Performance evaluation is an important part of considering any storage solutions. Higher performing solutions can support more workloads on a given configuration, better accommodate applications, minimize potential performance problems, as well as be more cost-effective. There are strong motivations to prefer higher performing solutions to lesser alternatives.

Unfortunately, obtaining directly comparable performance results from publicly available information is difficult at best. There is an infinite variety of potential test scenarios—and many vendors discourage publishing for marketing and competitive reasons.

This leaves IT professionals in the position of having to run their own tests and interpreting the results. This has long been a standard practice in evaluating external storage arrays, but the newer generation of hyperconverged solutions—such as VMware vSAN™—presents new testing challenges.

In a hyperconverged architecture, each server is intended to support many application VMs, as well as contribute to the pool of storage available to applications. This is best modeled by invoking many dozens of test VMs, each accessing multiple stored VMDKs. The goal is to simulate a very busy cluster.

Unfortunately, popular storage performance testing tools do not directly support this kind of model. To achieve a simulation of a busy production cluster, much effort is required to automate load generation, monitoring and data collection after the fact. These steps waste so much valuable time available to do actual testing, even worse may introduce errors into the process.

To address this situation, VMware released a storage performance testing automation tool—HCIBench—that automates the use of the popular Vdbench and Fio as testing tools in larger clusters. Users simply specify the testing parameters they would like to run, and HCIBench instructs these workload generators what to do on each and every node in the cluster.

HCIBench aims to simplify and accelerate customer Proof of Concept (POC) performance testing in a consistent and controlled way. This tool fully automates the end-to-end process of deploying test VMs, coordinating workload runs, aggregating test results, and collecting necessary data for troubleshooting purposes. Evaluators choose the profiles they are interested in; HCIBench does the rest quickly and easily.

This tool is provided free of charge and with no restrictions. Support will be provided solely on a best-effort basis as time and resources allow, by the [VMware vSAN Community Forum](#).

Per the VMware EULA, users who want to publicly share their testing results are requested to submit their hardware configuration, methodology, parameter files and test results for review before publication at [vsanperformance@vmware.com](mailto:vsanperformance@vmware.com).

We will make every effort to get back to you quickly.

## Overview

### HCIBench Tool Architecture

HCIBench is specifically designed for running performance tests against a shared datastore in VMware vSphere®. It generates a test workload using either Vdbench or Fio. HCIBench is delivered in the form of an Open Virtualization Appliance (OVA).

The Controller VM contains the following components:

- Ruby vSphere Console (RVC)
- Graphite Container
- Grafana Container
- vSAN Observer
- Automation bundle
- Configuration files
- Fio binary
- Linux test VM template

The Controller VM has all the needed components installed. The core component is RVC (<https://github.com/vmware/rvc>) with some extended features enabled. RVC is the engine of this performance test tool, responsible for deploying guest VMs, conducting Vdbench or Fio runs, collecting results, and monitoring vSAN by using vSAN Observer.

During the installation process, you need to download the Vdbench binaries directly from the Oracle website one time only if you choose Vdbench as the workload generator. While the use of Vdbench is unrestricted, Oracle does not provide redistribution rights in their license. If you choose to use Fio, you do not need to do anything because we already have the Fio binary included.

The automation bundle, consisting of Ruby and Bash scripts, is developed to modularize features such as test VM deployment, VMDK initialization, and Vdbench or Fio runs, as well as automate and simplify the entire testing process. The automation bundle reads user-defined configuration information about the test environment and the target workload profile, then interacts with RVC as necessary to carry out the following tasks:

- Connect to the vSphere environment to be tested. The tool itself can be deployed in a separate vSphere environment but must have access to the target cluster that is tested.
- Deploy Linux test VMs in the target cluster based on user inputs of the number of guest VMs and virtual disks per VM.
- Optionally prepare each virtual disk to initialize storage, a similar way to “thick provisioning eager zero” or sequentially writing to storage before benchmarking to avoid first write penalty.
- Transfer workload parameter file to each guest VM. The parameter file defines the target workload and runtime specification.
- Start vSAN Observer before testing and generate vSAN statistics upon test completion.
- Kick off Vdbench or Fio instances against each virtual disk on each guest VM and run for the defined duration.

- Collect and aggregate Vdbench or Fio performance data.

Figure 1 shows the architecture of the tool and its components.

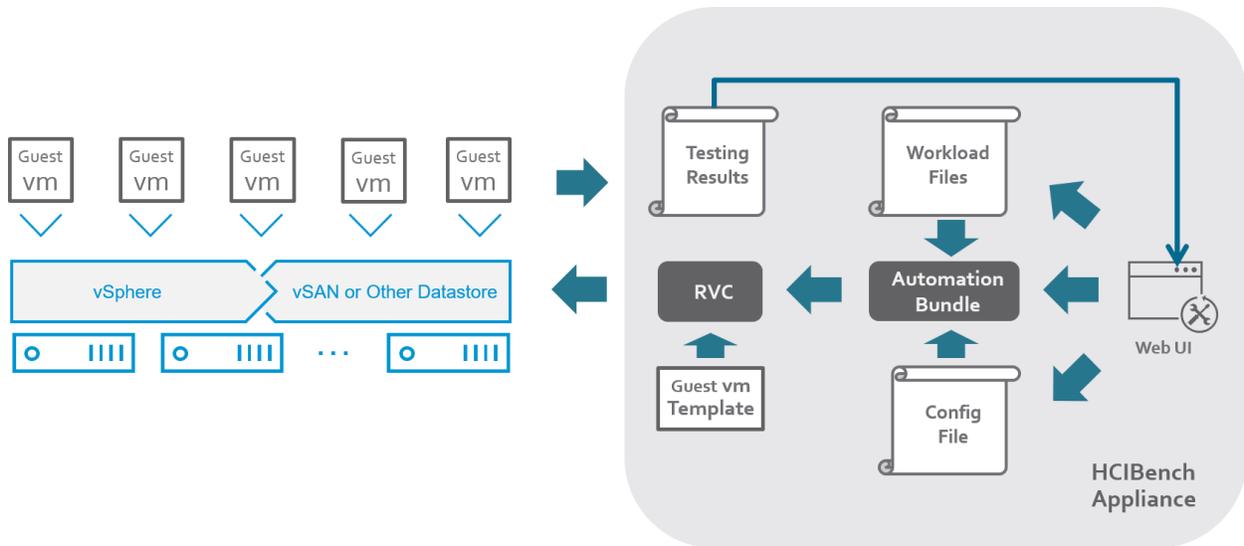


Figure 1. HCIBench VM Specification

### Controller VM

- CPU: 8 vCPU
- RAM: 8GB
- OS VMDK: 16GB
- Operating system: Photon OS 1.0
- OS Credential: user is responsible for creating the root password when deploying the VM.
- Software installed: Ruby 2.3.0, Rubygem 2.5.1, Rbvmomi 1.8.2, RVC 1.8.0, sshpass 1.05, Apache 2.4.18, Tomcat 8.54, JDK 1.8u102, Fio 3.1.2, Graphite 1.15, Grafana 6.0.2, Python 3.5.4

### Guest VM

- CPU: 4 vCPU
- RAM: 8 GB
- OS VMDK: 16GB
- OS: Photon OS 1.0
- OS Credential: root/vdbench
- Software installed: JDK 1.8u102
- SCSI Controller Type: VMware Paravirtual
- Data VMDK: number and size defined by user

## Installation and Configuration

### Prerequisites

Before deploying HCIBench, the environment must meet the following requirements:

- The cluster is created and configured properly.

- The network that will be used by the Guest VM is defined on all the hosts in the cluster. If a DHCP service is available, the Guest VM can obtain their network configurations from the DHCP server. If the network does not have DHCP service or an insufficient number of IP addresses HCIBench can assign static IP address. To accomplish this, the HCIBench source network “VM Network” must be mapped to the same network as the guest VM (See Figure 2).
- The vSphere environment where the tool is deployed can access the vSAN Cluster environment to be tested.
- Network Environment:
  - HCIBench **Management Network**:
    - Can communicate to the port **443** of vCenter and all ESXi hosts in the target cluster.
    - Can be accessed via browser on ports **8080, 8443**(Configuration Page), **80**(Results and Resource Page) and **3000**(Grafana Service).
  - HCIBench **Management Network** or **VM Network**:
    - Can Ping guest VMs through guest VM Network.
    - Can SSH to guest VMs through guest VM Network.
  - Guest VMs can talk to either HCIBench **Management Network** or **VM Network** on port **2003** to transfer live performance data to Graphite service in HCIBench.

Source Network	Destination Network
VM Network	VM Network
Management Network	VM Network

2 items

Figure 2. Source Networks

## Tool Installation

1. In VMware vCenter®, select **Deploy OVF Template** then enter either the URL to the OVA or select a local copy of the **HCIBench 2.0.ovf** from the client system.

Deploy OVF Template

- 1 Select an OVF template **Select an OVF template**
- 2 Select a name and folder **Select an OVF template from remote URL or local file system**
- 3 Select a compute resource
- 4 Review details
- 5 License agreements
- 6 Select storage
- 7 Select networks
- 8 Customize template
- 9 Ready to complete

Enter a URL to download and install the OVF package from the Internet, or browse to a location accessible from your computer, such as a local hard drive, a network share, or a CD/DVD drive.

URL

Local file

http | <https://remoteserver-address/filetodeploy.ovf> | .ova

Choose Files | HCIBench\_2.0.ovf

CANCEL BACK NEXT

Figure 3. Select an OVF Template

- When prompted for a name, leave the default name or enter a new name, then select a location for the appliance.

Deploy OVF Template

- ✓ 1 Select an OVF template
- ✓ 2 Select a name and folder
- 3 Select a compute resource
- 4 Review details
- 5 License agreements
- 6 Select storage
- 7 Select networks
- 8 Customize template
- 9 Ready to complete

Select a name and folder  
Specify a unique name and target location

Virtual machine name: HCIBench\_2.0

Select a location for the virtual machine.

- ✓ vcsa.lab01.vsanpe.vmware.com
  - > dc01

CANCEL BACK NEXT

Figure 4. Select Name and Folder

- Select the cluster where the HCIBench appliance should be deployed.

Deploy OVF Template

- ✓ 1 Select an OVF template
- ✓ 2 Select a name and folder
- ✓ 3 Select a compute resource
- 4 Review details
- 5 License agreements
- 6 Select storage
- 7 Select networks
- 8 Customize template
- 9 Ready to complete

Select a compute resource  
Select the destination compute resource for this operation

- ✓ dc01
  - > cluster01

Compatibility

✓ Compatibility checks succeeded.

CANCEL BACK NEXT

Figure 5. Select Compute Resource

#### 4. Review the deployment details.

Deploy OVF Template

- ✓ 1 Select an OVF template
- ✓ 2 Select a name and folder
- ✓ 3 Select a compute resource
- 4 Review details**
- 5 License agreements
- 6 Select storage
- 7 Select networks
- 8 Customize template
- 9 Ready to complete

**Review details**  
Verify the template details.

Publisher	No certificate present
Product	HCIBench
Version	2.0
Vendor	VMware Inc.
Description	If you find a bug or have any difficulties of using this tool, please post your comment to <a href="https://labs.vmware.com/flings/hcibench">https://labs.vmware.com/flings/hcibench</a> or contact <a href="mailto:vsanperformance@vmware.com">vsanperformance@vmware.com</a> .
Download size	1.0 GB
Size on disk	2.4 GB (thin provisioned) 216.0 GB (thick provisioned)

CANCEL BACK NEXT

Figure 6. Review Details

#### 5. Review and accept the license agreement.

Deploy OVF Template

- ✓ 1 Select an OVF template
- ✓ 2 Select a name and folder
- ✓ 3 Select a compute resource
- ✓ 4 Review details
- 5 License agreements**
- 6 Select storage
- 7 Select networks
- 8 Customize template
- 9 Ready to complete

**License agreements**  
The end-user license agreement must be accepted.

Read and accept the terms for the 2 license agreements.

- Agreement 1
- Agreement 2

**Agreement 1**

VMWARE TECHNOLOGY PREVIEW LICENSE AGREEMENT

Notice to User: This Technology Preview License Agreement (the Agreement) is a CONTRACT between you (either an individual or a single entity) (you or Licensee) and VMware, Inc. (VMware), which covers your use of the Technology Preview Software (as defined below). If you do not agree to the terms of this Agreement, then do not install or use the Technology Preview Software. By explicitly accepting this Agreement, however, or by installing, copying, downloading, accessing, or otherwise using the Technology Preview Software, you are acknowledging and agreeing to be bound by the following terms.

1. DEFINITIONS. (a) Technology Preview Software means the unreleased, concept

I accept all license agreements.

CANCEL BACK NEXT

Figure 7. License Agreement

#### 6. Select the storage and storage policy for the appliance. HCIBench does not generate a substantial amount of I/O during testing so it can reside on the datastore being tested.

## Deploy OVF Template

✓ 1 Select an OVF template  
✓ 2 Select a name and folder  
✓ 3 Select a compute resource  
✓ 4 Review details  
✓ 5 License agreements  
**6 Select storage**  
7 Select networks  
8 Customize template  
9 Ready to complete

Select storage  
Select the storage for the configuration and disk files

Encrypt this virtual machine

Select virtual disk format: As defined in the VM storage policy ▾

VM Storage Policy: Datastore Default ▾

Name	Capacity	Provisioned	Free	Type
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	VM
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	VM
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	VM
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	VM
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	VM

Compatibility

✓ Compatibility checks succeeded.

CANCEL BACK NEXT

Figure 8. Select Storage and Policy

- Map the “Management Network” to the network through which the HCIBench will be accessed. If the network prepared for Guest VM does not have the DHCP service, map the “VM Network” to the same network; otherwise, ignore the “VM Network”.

## Deploy OVF Template

✓ 1 Select an OVF template  
✓ 2 Select a name and folder  
✓ 3 Select a compute resource  
✓ 4 Review details  
✓ 5 License agreements  
✓ 6 Select storage  
**7 Select networks**  
8 Customize template  
9 Ready to complete

Select networks  
Select a destination network for each source network.

Source Network	Destination Network
VM Network	VM Network ▾
Management Network	VM Network ▾

2 Items

IP Allocation Settings

IP allocation: Static - Manual

IP protocol: IPv4

CANCEL BACK NEXT

Figure 9. Map Networks

- On the customize template, enter a system password for HCIBench. If the HCIBench management interface uses DHCP, the network information should be left blank. If HCIBench uses a specific

address, select static on the management network and then enter the desired network configuration.

Deploy OVF Template

- ✓ 1 Select an OVF template
- ✓ 2 Select a name and folder
- ✓ 3 Select a compute resource
- ✓ 4 Review details
- ✓ 5 License agreements
- ✓ 6 Select storage
- ✓ 7 Select networks
- 8 Customize template**
- 9 Ready to complete

Network		5 settings
Management Network Gateway	ex. 192.168.0.1 / leave this empty if DHCP is used	<input type="text"/>
Management Network IP	ex. 192.168.0.44 / leave this empty if DHCP is used	<input type="text"/>
DNS	ex. 192.168.1.1 / leave this empty if DHCP is used	<input type="text"/>
Management Network Netmask	ex. 255.255.255.0 / leave this empty if DHCP is used	<input type="text"/>
Management Network Type	<input type="button" value="DHCP"/>	
Root Credential		1 settings
System Password	root password, the length should be 6-16	<input type="password" value="Password"/> <span style="color: red; font-weight: bold;">ⓘ</span> <input type="password" value="Confirm"/> <input type="password" value="Password"/>

Figure 10. Configure Management Network and System Password

9. Review the configuration and click finish.

Deploy OVF Template

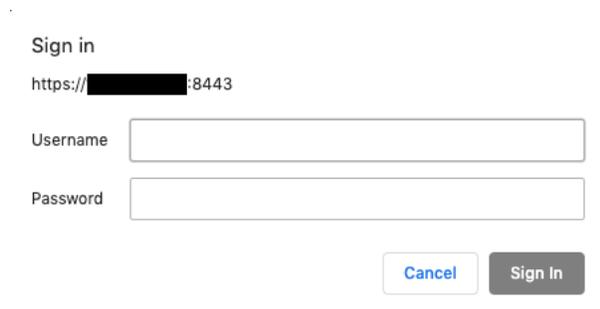
- ✓ 1 Select an OVF template
- ✓ 2 Select a name and folder
- ✓ 3 Select a compute resource
- ✓ 4 Review details
- ✓ 5 License agreements
- ✓ 6 Select storage
- ✓ 7 Select networks
- ✓ 8 Customize template
- 9 Ready to complete**

Provisioning type	Deploy from template
Name	HCIbench_2.0-001
Template name	HCIbench_2.0
Download size	1.0 GB
Size on disk	216.0 GB
Folder	<span style="background-color: black; color: black;">████████████████████</span>
Resource	<span style="background-color: black; color: black;">████████████████████</span>
Storage mapping	1
All disks	<span style="background-color: black; color: black;">████████████████████</span> As defined in the VM storage policy
Network mapping	2
VM Network	VM Network
Management Network	VM Network
IP allocation settings	
IP protocol	IPV4
IP allocation	Static - Manual

Figure 11. Review and Start Deployment

## Test Configuration

After deployment, you can navigate to [https://HCIBench\\_IP:8443/](https://HCIBench_IP:8443/) to start configuration and kick off the test. Before accessing the configuration page, the root user ID and password must be used to authenticate to prevent unauthorized access to HCIBench.



Sign in

https://[REDACTED]:8443

Username

Password

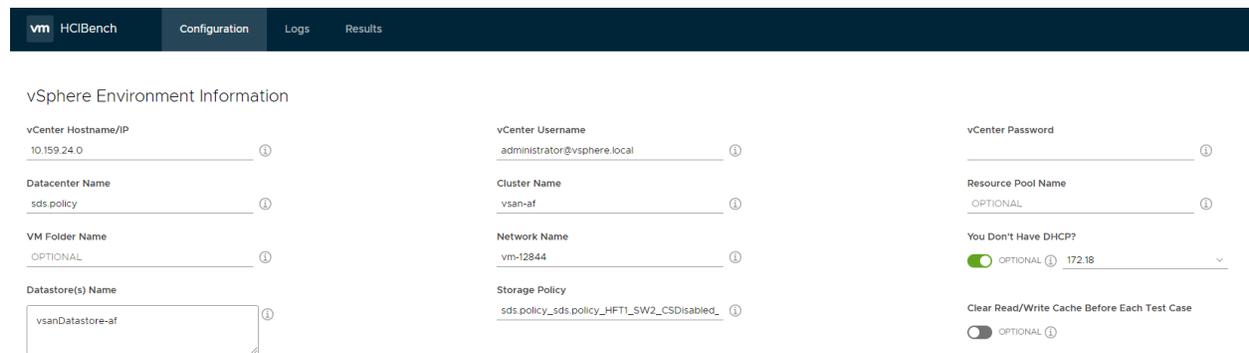
Figure 12. HCIBench Login

There are four main sections in this configuration page:

- vSphere environment
- Benchmarking tool
- Guest vm configuration
- Testing configuration

### vSphere Environment Information

In this section, all fields not marked “**OPTIONAL**” are required. You must provide the vSphere environment information where the target cluster is configured, including vCenter IP address, vCenter credential, name of the datacenter, name of the target cluster, and name of the Datastore. If you are testing on VMC environment or want to specify the resource pool or vm folder to deploy guest VMs, you should fill those fields as well.



vm HCIBench Configuration Logs Results

vSphere Environment Information

vCenter Hostname/IP 10.159.24.0	vCenter Username administrator@vsphere.local	vCenter Password
Datacenter Name sds.policy	Cluster Name vsan-af	Resource Pool Name OPTIONAL
VM Folder Name OPTIONAL	Network Name vm-12844	You Don't Have DHCP? <input checked="" type="checkbox"/> OPTIONAL 172.18
Datastore(s) Name vsanDatastore-af	Storage Policy sds.policy_sds.policy_HFT1_SW2_CSDisabled	Clear Read/Write Cache Before Each Test Case <input checked="" type="checkbox"/> OPTIONAL

Figure 13. Specify vSphere Environment Information

- **Network Name** defines which network the guest VMs should use. If not specified, the default value is **VM Network**.
- **You Don't Have DHCP?** Instructs HCIBench to set static IPs for guest VMs and use the “VM Network” NIC to communicate with the guest VMs. If it is checked, you can find a static IP

prefix from the list on the right handside. Make sure the prefix you choose is **NOT** being used in the guest VM Network.

- **Datastore Name** specifies the datastores that are tested against and all the guest VMs are deployed on. You need to enter the name of the datastore. Testing multiple datastores in parallel is also supported. You can enter the datastore names one per line. In this cases, the virtual machines are deployed evenly on the datastores. For example, if you enter two datastores and 100 virtual machines, 50 virtual machines will be deployed on each datastore.

Specify Hosts to Deploy

OPTIONAL ⓘ

Hosts

```
esx1.vmware.local
esx2.vmware.local
```

Figure 14. Specify Hosts in the Cluster

- **Specify Hosts to Deploy** allows you to specify particular hosts to deploy guest VMs on, when this parameter checked, you will need to fill up the host(s) in the target cluster you want to have the VMs deployed on; if this is not checked, VMs will be deployed on all the hosts in the target cluster in round-robin manner. In general, it's only needed when you want to deploy guest VMs onto part of the hosts within the cluster.
- **Storage Policy** allows you to specify the name of a Storage Policy that is applied to the client VMs and all the virtual disks.

Clear Read/Write Cache Before Each Test Case

OPTIONAL ⓘ

Host Username

REQUIRED IF CLEAR CACHE CHECKED ⓘ

Host Password

REQUIRED IF CLEAR CACHE CHECKED ⓘ

Figure 15. Clear Read/Write Cache

- **Clear Read/Write Cache Before Each Testing** is the option designed for vSAN users to flush the cache tier before each test case, ESXi **Host Username** and **Host Password** must be specified if this box is checked. Also, you will need SSH access from HCIBench to all the ESXi hosts in the vSAN Cluster. This option requires that all the ESXi hosts have the same username and password.
- **Reuse VMs If Possible** allows user to reuse the guest VMs in the cluster if they are existing and compatible with the VM specification. If not compatible, existing guest VMs will be deleted and new VMs will be deployed. **Compatible** means the existing VMs can be found and access from

HCIBench; the specified **VM Prefix** is same with existing VMs; **Number of VMs, Number of Disks** are not greater than the existing VMs and **Size of Data Disk** is same with the existing VMs, Vdbench or Fio binaries installed properly.

- **EASY RUN** is specifically designed for vSAN users, by checking this, HCIBench is able to handle all the test configurations below by identifying the vSAN configuration. **EASY RUN** helps to decide how many guest VMs should be deployed, the number and size of virtual disks of each VM, the way of preparing virtual disks before testing. The **Guest VM Configuration** and **Testing Configuration** sections below will be hidden if this option is checked. Once **EASY RUN** is checked, you can select the following one to four workload profiles to run:
  - 4K, 70% Read, 100% Random test to simulate the most common workloads.
  - 4K, 100% Read, 100% Random test to show the best realistic I/O per second of this given configuration.
  - 8K, 50% Read, 100% Random test to simulate the OLTP workloads.
  - 256K, 100% Write, 100% Sequential test to show the best realistic Throughput of this given configuration

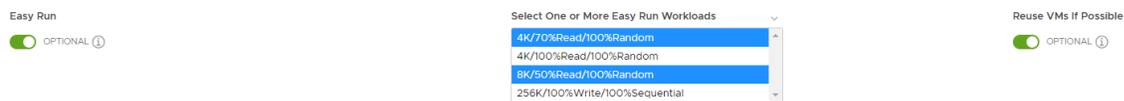


Figure 16. Easy Run and Reuse VMs

## Benchmarking Tool

HCIBench can use Fio or Vdbench as the performance workload generator, if Vdbench is selected, you need to download and upload the Vdbench zip to HCIBench. To do so, click **Download Vdbench**. After the download is completed, you should upload the zip file. And the server will automatically put the Vdbench zip to /opt/output/vdbench-source. This step is a once-for-all action. The following screen disappears from the page after you upload the Vdbench file successfully.



Figure 17. Benchmarking Tool Selection

## Guest VM Configuration

In this section, the only required parameter is **Number of VMs** that specifies the total number of guest VMs to be deployed for testing. If you enter multiple datastores, these VMs are deployed evenly on the datastores. The rest parameters are optional:

- **VM Name Prefix** specified the prefix of the VM Name. The default value is depending on the benchmarking tool selection, if Fio is selected, the value here will be hci-fio; when Vdbench is selected, the value will be hci-vdb. Also, you can change the prefix as you want.
- The **Number of Data Disk** parameter specifies how many virtual disks to be tested are added to each guest VM. The default number is eight.

- The **Size of Data Disk** parameter specifies the size (GB) of each VMDK to be tested. The total number of simulated workload instances is **Number of VM \* (times) Number of Data Disk**. The default number is ten.

VM Name Prefix	Number of VMs	Number of Data Disk	Size of Data Disk in GiB
hci-fio	16	8	10

Figure 18. Specify Guest VM Information

### Testing Configuration

- **Test Name** parameter is the name of the test, by specifying this parameter, for example “DemoTest”, HCIBench will create a local directory with the same name in “/opt/output/results/” on the Controller VM for storing collected results from all guest VMs and statistics produced by vSAN Observer. If not specified, a name “resultsTIMESTAMP” will be generated and the same name directory will be created under “/opt/output/results”. All the test cases results could be browsed at [http://HCIBench\\_IP/results](http://HCIBench_IP/results), or click the **Results** tab on the navigation bar.
- For the **Workload Parameter File**, If a parameter file is uploaded or generated to the controller before, it already exists in HCIBench. In this case, you can select the existing Vdbench or Fio parameter file from the drop-down list depending on which workload you selected. You can also refresh the drop-down list by clicking the **REFRESH** button. After you finish generating a parameter file or uploading a parameter file, click the **REFRESH** button and it makes the file displayed in the drop-down list without refreshing the entire page to avoid user-input loss. Delete the parameter file by clicking the **DELETE** button. You have two options to add parameter file into the drop-down list:

Generate it by yourself:

Create parameter files by clicking **ADD**, which redirects you to the workload generation page, the title of this page is depending on the tool selection you made earlier, if you had Fio selected, the title is Fio Parameter Generation. No matter which tool you selected, the input fields are the same. All the fields without “OPTIONAL” are required. After clicking **SUBMIT**, click **REFRESH** to update the drop-down list.

Number of Disks to Test  
 ⓘ

Working-Set Percentage  
 ⓘ

Number of Threads Per Disk  
 ⓘ

Block Size  
 ⓘ

Read Percentage  
 ⓘ

Random Percentage  
 ⓘ

I/O Rate  
 ⓘ

Test Time  
 ⓘ

Warmup Time  
 ⓘ

Reporting Interval  
 ⓘ

Figure 19. Specify Vdbench Workload Parameters

Upload it by yourself:

If the desired parameter file does not exist, you can create a self-defined parameter file and upload it to the controller by clicking the **Choose File** button in the **Upload a Parameter File** section. After uploading, click **REFRESH** and the file you uploaded will be in the drop-down list. For Vdbench or Fio parameter file format, refer to the [Vdbench User Guide](#) or [Fio User Guide](#).

Testing Configuration

Test Name  
 ⓘ

Prepare Virtual Disk Before Testing  
 RECOMMENDED ⓘ

Select a Workload Parameter File  
    ⓘ

Testing Duration (Seconds)  
 ⓘ

Upload a Parameter File  
 No file chosen  ⓘ

Delete VM After Testing  
 OPTIONAL ⓘ

Figure 20. Specify the Test Configuration

**Note:** The value of **Number of Data Disk** in the guest VM Specification section must match the value of **Number of Disks to Test** defined in the parameter files. For example, if you specify to create 10 data disks per guest VM, 10 raw disks are created. Therefore, in the parameter files, the same number or less of disks are expected. Since we are using Photon OS, beware the first data disk starts from /dev/sda, the last disk is the OS disk.

Users can choose whether to initialize the data VMDKs of guest VMs. There are two options of storage initialization, **ZERO** and **RANDOM**. **RANDOM** is particularly for storage that has de-duplication enabled, if the storage that is tested against does not have de-duplication enabled, use **ZERO** instead to initialize storage to avoid first-write penalty.

The **Testing Duration** parameter is for overriding the elapsed value in parameter files. This parameter defines the test duration for each run. If not specified, each test run uses its own elapsed value.

When the **Clean up VMs** parameter is checked, all the guest VMs are removed after all the testing is completed; otherwise, all the VMs are preserved.

### Save Configuration

Press the **SAVE CONFIG** button to save the parameter configuration settings. If the configuration setting is not saved and the page is refreshed, the system will read the previous-saved parameter configuration. Until you successfully saved the config, the **VALIDATE CONFIG** and **START TEST** buttons are disabled to enforce you save your configuration before validating or starting testing.

### Configuration Validation

After completing the tool configuration, you can validate all settings by clicking the **VALIDATE CONFIG** button. This step checks if all the required information is correctly provided. Additionally, it validates basic environment sanity including whether vSAN is enabled in the cluster, whether the hosts specified belong to the cluster and can access the vSAN datastore. Furthermore, this function estimates the storage usage by all guest VMs on the vSAN datastore and alert if it exceeds 80 percent of the usable capacity after deployment.

## Information

2019-04-05 17:59:02 -0700: Validating Fio binary and the workload profiles...  
2019-04-05 17:59:03 -0700: Validating VC IP and Credential...  
2019-04-05 17:59:04 -0700: VC IP and Credential Validated  
2019-04-05 17:59:04 -0700: Validating Datacenter sds.policy...  
2019-04-05 17:59:04 -0700: Datacenter sds.policy Validated  
2019-04-05 17:59:04 -0700: Validating Cluster vsan-af...  
2019-04-05 17:59:05 -0700: Cluster vsan-af Validated  
2019-04-05 17:59:06 -0700: Cluster vsan-af has DRS mode: disabled  
2019-04-05 17:59:07 -0700: Validating If Any Hosts in Cluster vsan-af is in Maintenance Mode...  
2019-04-05 17:59:08 -0700: All the Hosts in Cluster vsan-af are not in Maitainance Mode  
2019-04-05 17:59:08 -0700: Validating Network vm-128...

-----  
Network vm-128 doesn't exist!  
-----

CLOSE

Figure 21. Validation Failure

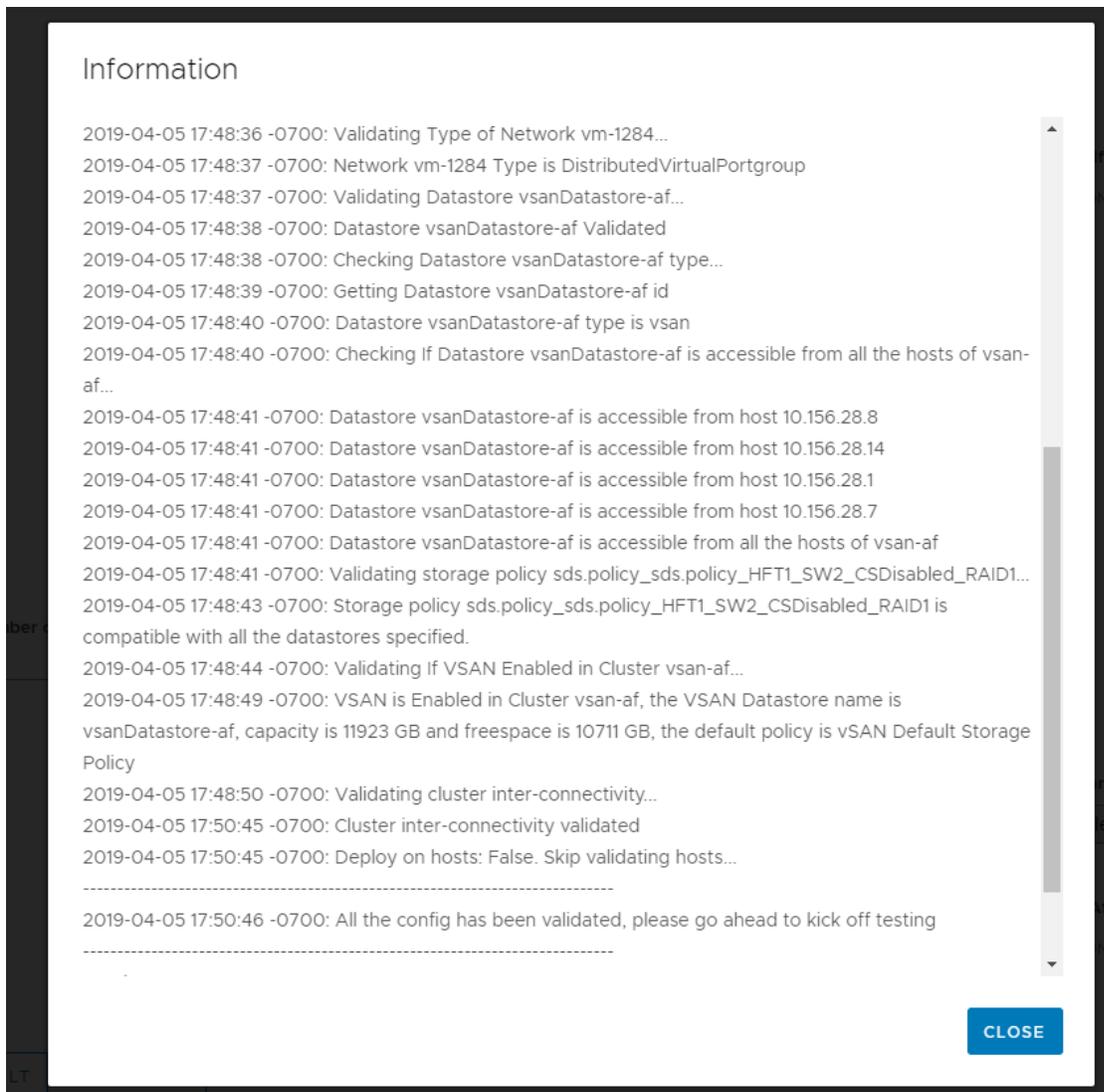


Figure 22. Configuration Validation

After the validation is successfully completed, a message is displayed to inform you that you can continue with the testing.

## Tool Usage

### How to Run Tests

You can click the **START TEST** button to start the program. The testing is a time-consuming operation with the test progress toolbar displayed on the web page.

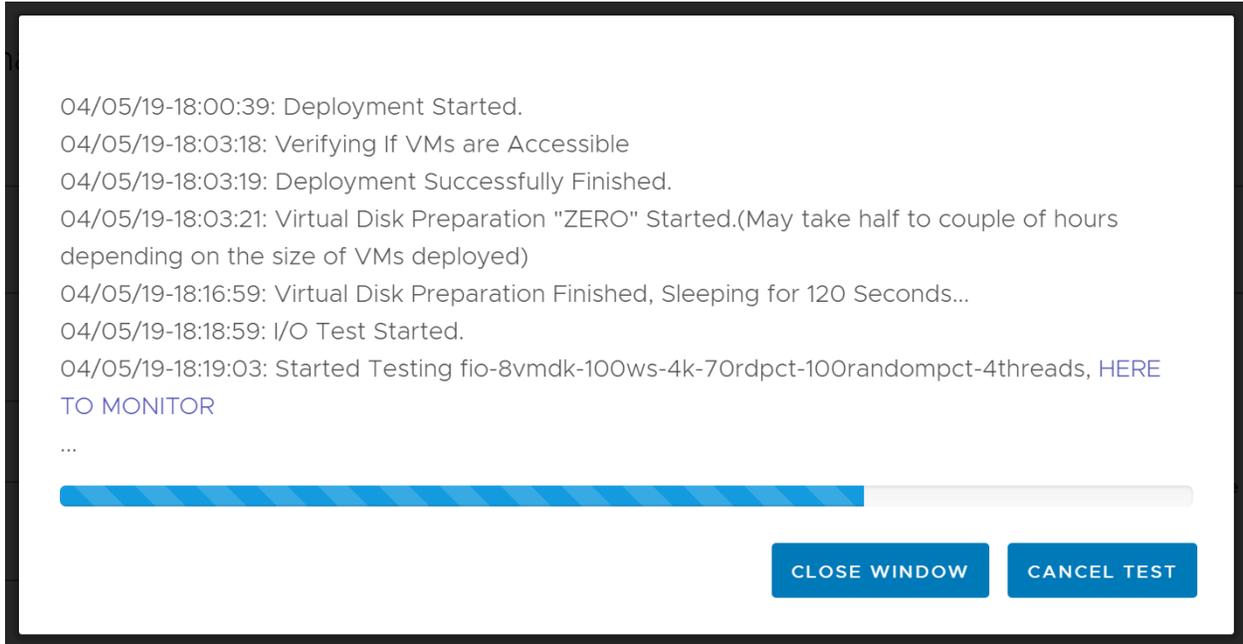


Figure 23. Test in Progress

During the testing, you can monitor the live performance from guest VMs showed up in Grafana by clicking **HERE TO MONITOR**, which lands you on Grafana page: [http://HCIBench\\_IP:3000](http://HCIBench_IP:3000) to monitor the live performance, and to reduce the space utilization on the disk, the graph is only available while the testing is running

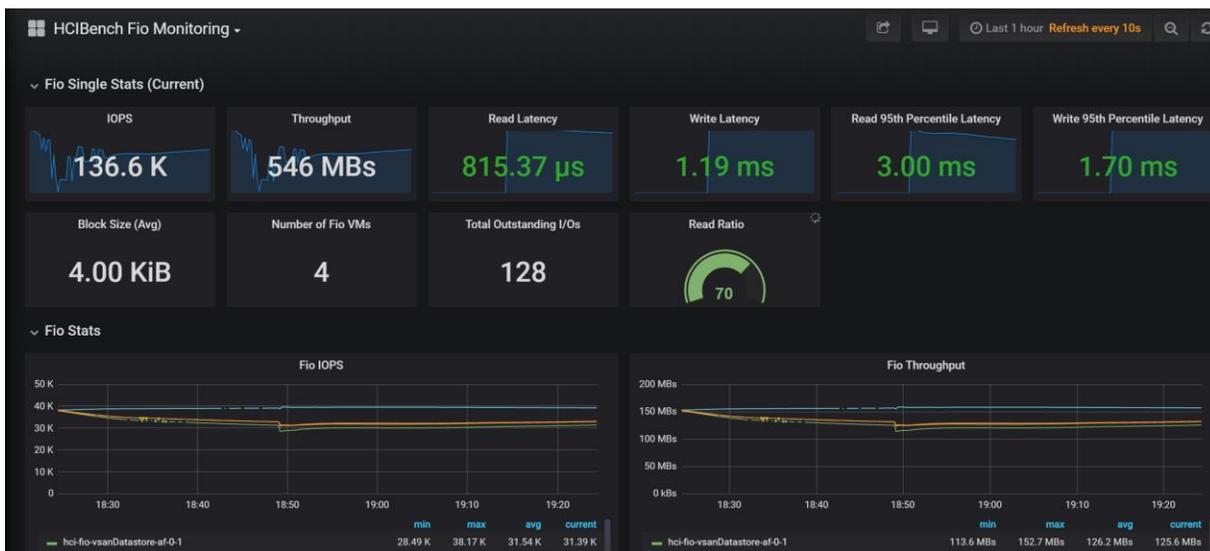


Figure 24. Grafana Performance Monitoring

Also, you can kill the test process by clicking the **CANCEL TEST** tab.

### How to Consume Test Results

After the Vdbench or Fio testing is completed, the test results are collected from all the guest VMs. You can view the results at [http://HCIBench\\_IP/results](http://HCIBench_IP/results) in a web browser, or click the **Results** tab to review it.



Filename	Size
<a href="#">vdbench/</a>	
<a href="#">vdbench.xls</a>	251.4 kb

Apache Tomcat/8.5.4

Figure 25. Test Results

Each of the subdirectories in “/opt/output/results/TestName” directory uses the name of the user-defined parameter file, and contains all original results produced by each Vdbench or Fio instance and vSAN Observer data.

The aggregated result of one test run is summarized in the text file with the name <DIR\_NAME>-res.txt, containing the datastore’s name and four statistics: number of VMs used for testing, IOPS, throughput, latency details, and host resource consumption. If vSAN is enable, the CPU used by vSAN will also be calculated.

```

Datastore: vsanDatastore
=====
Version: vdbench50407
Run Def: RD=run1; I/O rate: Uncontrolled MAX; elapsed=3600 warmup=1800; For loops: None
VMs      = 16
IOPS     = 220742.50 IO/s
THROUGHPUT = 862.29 MB/s
LATENCY  = 2.4291 ms
R_LATENCY = 2.0581 ms
W_LATENCY = 3.2948 ms
95%tile_LAT = 5.3764 ms
=====
Resource Usage:
CPU USAGE = 74.69%
RAM USAGE = 10.29%
VSAN PCPU USAGE = 29.1208%
=====
If you are interested in improving the IOPS/THROUGHPUT/LATENCY, please find the details in file
performance_diag_result.html in directory vdb-8vmdk-100ws-4k-70rdpct-100randompct-4threads-1543282552
```

Figure 26. Aggregated Performance Data

You can find all of the original result files produced by Vdbench or Fio instances inside the subdirectory corresponding to a test run. In addition to the text files, there is another subdirectory named `iotest-hcibench/fio-<VM#>vm` inside, which is the statistics directory generated by vSAN Observer. Also, you should be able to find the following files:

**HCIBench-VERSION-logs.tar.gz:** HCIBench pre-validation and testing logs.

**hcibench.cfg:** HCIBench configuration parameters

**vdbench.cfg/fio.cfg:** Vdbench/Fio parameter profile.

Filename	Size
<a href="#">hci-vdb-vsanDatastore-af-0-1.txt</a>	51.8 kb
<a href="#">HCIBench-2.0-logs.tar.gz</a>	6.8 kb
<a href="#">iotest-vdbench-4vm/</a>	
<a href="#">hci-vdb-vsanDatastore-af-0-3.txt</a>	51.8 kb
<a href="#">vdbench.cfg</a>	0.8 kb
<a href="#">performance_diag_result.html</a>	2.1 kb
<a href="#">hcibench.cfg</a>	0.6 kb
<a href="#">hci-vdb-vsanDatastore-af-0-4.txt</a>	51.8 kb
<a href="#">hci-vdb-vsanDatastore-af-0-2.txt</a>	51.8 kb

Figure 27. Files in Test Subfolder

**performance\_diag\_result.html:** If testing against vSAN 6.6U1 or later and using HCIBench 1.6.6 or later releases, turning on **CEIP** (Customer Experience Improvement Program) and **vSAN Performance Service**, each HCIBench run will send the testing results as well as the testing configuration to VMware Cloud to help user to analyze the potential issue that blocks from achieving a certain goal (maximum IOPS, maximum throughput, or minimum latency). Users are able to land to the specific vCenter page and the KB article of any potential issues detected from the hyperlink provided in this file.

Select the category you want to improve

To Get Better Throughput

**Potential Issue: One or more disk(s) are not in active use**

Description: This is applicable to all-flash vSAN clusters only. This implies that one or more disks do not have any IOs. While some disks may not have IOs for some intervals of time, the best performance is usually achieved when IOs are spread across all vSAN capacity devices evenly. Consult Ask VMware for a recommendation on possible solutions. [Ask VMware](#)

Please go to [vCenter](#) to locate the time range named `HCIBench-vdb-8vmdk-100ws-4k-60rdpct-100randompct-2threads-1554358467` for more details

Figure 28. vSAN Performance Diagnostic

Open the stats.html file inside the statistics directory, you can find the vSAN performance statistics for debugging or evaluating purposes.

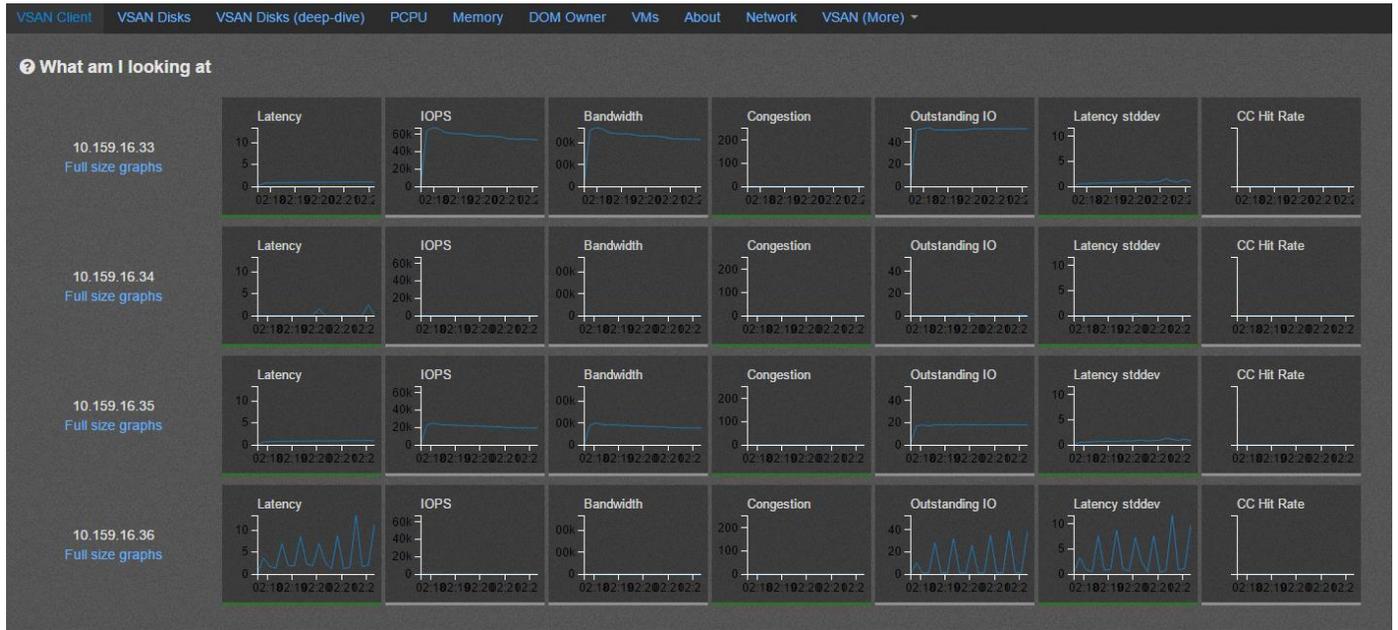


Figure 29. vSAN Observer Statistics

### How to Download Test Results to Local Disk

Download the test results by clicking the **SAVE RESULT** button. The latest test result details are zipped to a file and you can download the file to your local client.

## About the Author and Contributors

Charles Lee, Chen Wei, and Victor Chen in the VMware Product Enablement team wrote the original version of this paper. Catherine Xu, technical writer in the Product Enablement team, edited this paper to ensure that the contents conform to the VMware writing style.



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