

# HCIBench User Guide

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## Introduction

Evaluating performance is an important part of considering any storage solution. Higher performing solutions can support more workloads on a given configuration, better accommodate application, 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 hyper-converged solutions – such as VMware vSAN™—presents new testing challenges.

In a hyper-converged architecture, each server is intended to support both 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 testing tool in larger clusters. Users simply specify the testing parameters they would like to run, and HCIBench instructs Vdbench 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 file 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

The tool is specifically designed for running performance tests using [Vdbench](#) against a vSAN datastore. It is delivered in the form of Open Virtualization Appliance (OVA) that includes the following components:

- The test Controller VM installed with:
  - Ruby vSphere Console (RVC)
  - vSAN Observer
  - Automation bundle
  - Configuration files
- 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 Vdbench Guest VMs, conducting Vdbench 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. While the use of Vdbench is unrestricted, Oracle does not provide redistribution rights in their license.

The automation bundle, consisting of Ruby and Bash scripts, is developed to modularize features such as test VM deployment, VMDK initialization, and Vdbench 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 vSAN environment to be tested. The tool itself can be deployed in a separate vSphere environment but must have access to the vSAN Cluster.
- Deploy Linux test VMs in the vSAN Cluster based on user input of the number of test VMs and the number of vDisks per VM.
- Optionally run the dd command on each vDisk to initialize storage, a similar way to “thick provisioning eager zero” or sequentially writing to storage before benchmarking.
- Transfer Vdbench parameter file to each test 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 instances against each vDisk on each test VM and run for the defined duration.
- Collect and aggregate Vdbench performance data.

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

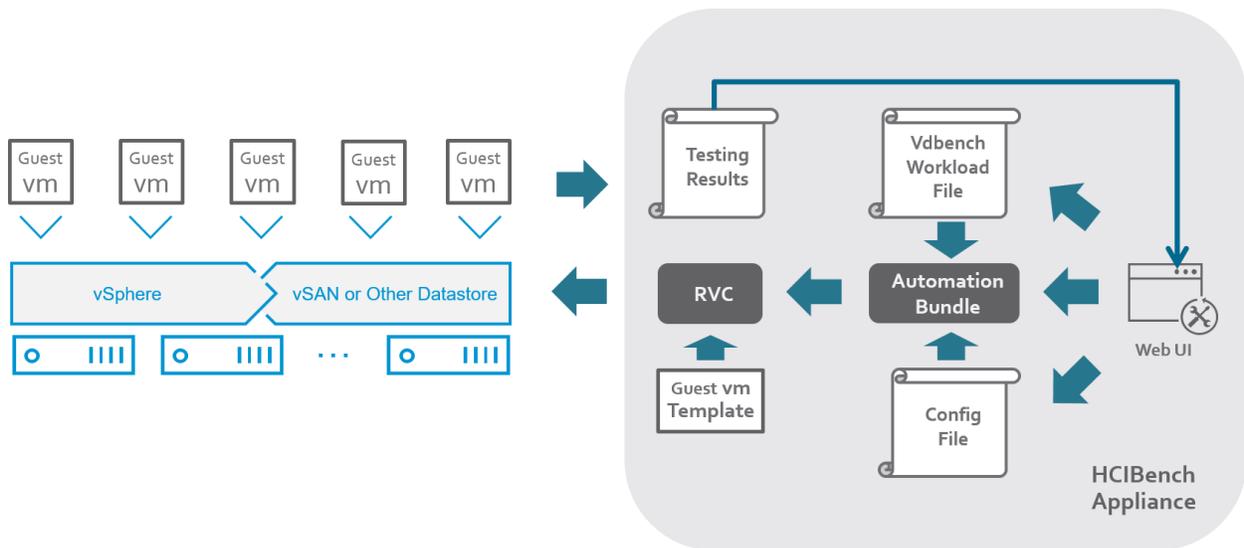


Figure 1. HCIBench Architecture

## 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

### Vdbench Guest VM

- CPU: 4 vCPU
- RAM: 8GB
- OS VMDK: 16GB
- OS: Photon OS 1.0
- OS Credential: root/vdbench
- Software installed: JDK 1.8u102, fio 2.13
- SCSI Controller Type: VMware Paravirtual
- Data VMDK: number and size to be defined by user

## Installation and Configuration

### Prerequisites

Before deploying this performance test tool packaged as OVA, make sure the environment meets the following requirements:

- The vSAN Cluster is created and configured properly

- The network for Vdbench Guest VMs is ready, and should have DHCP service enabled; if the network doesn't have DHCP service, "VM Network" must be mapped to the same network when HCIBench being deployed.
- The vSphere environment where the tool is deployed can access the vSAN Cluster environment to be tested

The tool can be deployed into any vSphere environment.

## Tool Installation

Deploy the **HCIBench.ova** to a vSphere environment, accept the EULA of Photon OS and choose thin provision for disk format, then map the "Management Network" to the network which the HCIBench will be accessed through; if the network prepared for Vdbench Guest VM doesn't have DHCP service, map the "VM Network" to the same network, otherwise just ignore the "VM Network".

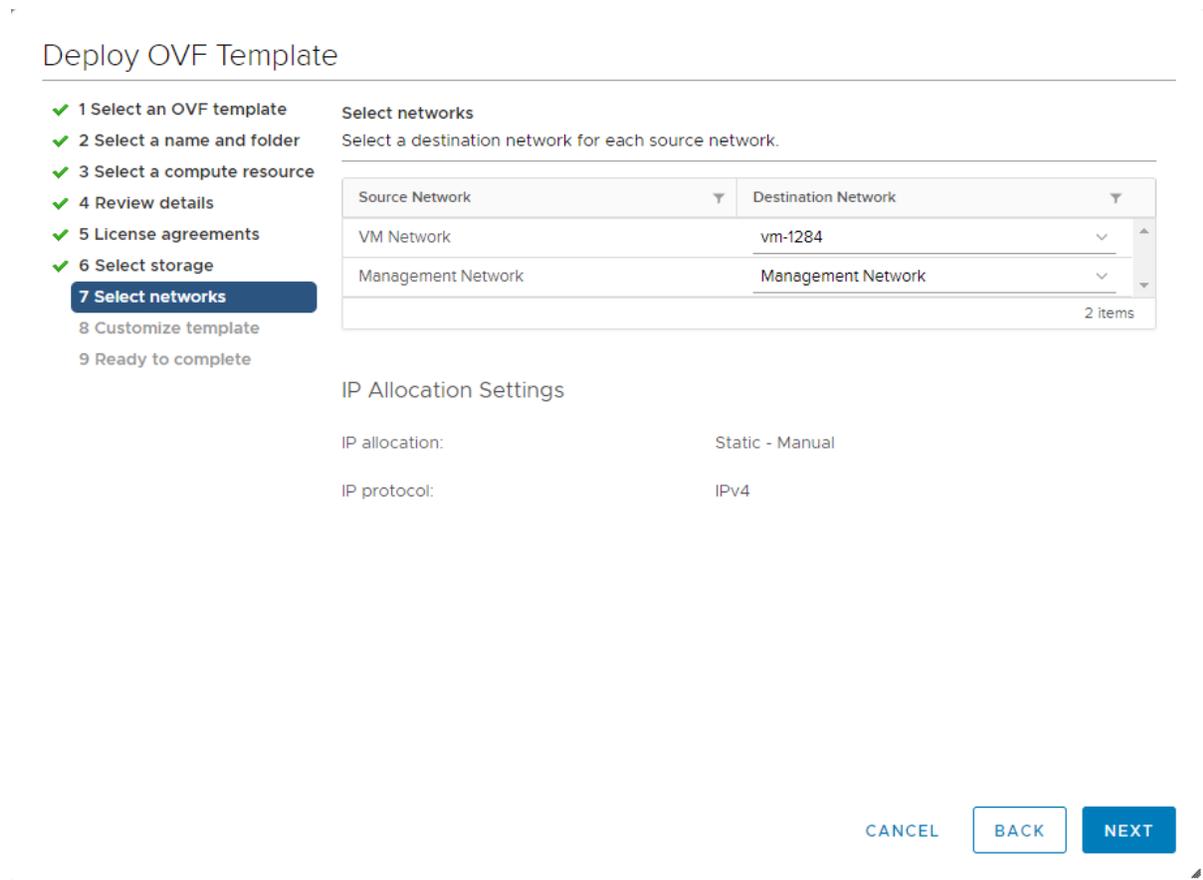


Figure 2. Map Networks

After mapping the networks configure the management network and the system password of HCIBench in the next page. The network information could be left blank if DHCP is selected.

## 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

**Customize template**  
Customize the deployment properties of this software solution.

✓ All properties have valid values

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="text" value="DHCP"/>
Root Credential	1 settings
System Password	root password, the length should be 6-16 Password <input type="password" value="....."/> Confirm Password <input type="password" value="....."/>

CANCEL BACK NEXT

Figure 3. Configure Management Network and System Password

## Tool 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.

There are three main sections in this configuration file:

- vSphere Environment Information

In this section, all the parameters with \* are required. You must provide the vSphere environment information where the vSAN Cluster is configured, including vCenter IP address, vCenter credential, name of the datacenter, name of the vSAN Cluster, and name of the Datastore. If you are testing on VMC environment or want to specify the resource pool and/or vm folder to deploy test VMs, you should fill those fields as well.

- The **Network Name** parameter defines which network the Vdbench Guest VMs should use. The default value is VM Network.
- If **Set Internal Static IP for Vdbench Client VMs** parameter is checked, HCIBench will set static IPs for Vdbench guest VMs and use "VM Network" to communicate with those client VMs. If it is checked, you can find a static IP prefix from the **Select Internal Static IP Prefix** list. Make sure the prefix you choose is not being used in the Vdbench Guest VM Network.
- The **Datastore Name** parameter specifies the datastores that are tested against and all the Vdbench 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 are deployed on each datastore.

The screenshot shows the 'vSphere Environment Information' section of the HCIBench Configuration Page. It contains several input fields, each with a red asterisk indicating a required field: vCenter Hostname/IP, vCenter Username, vCenter Password, Datacenter Name, Cluster Name, Resource Pool Name, VM Folder Name, and Network Name. There is also a checked checkbox for 'Set Internal Static IP for Vdbench Client VMs' and a dropdown menu for 'Select Internal Static IP Prefix' with '172.30' selected.

Figure 4. Specify vSphere Environment Information

The screenshot shows the 'Storage Policy' section of the configuration page. It features a text input field for the storage policy name and a checked checkbox for 'Clear Read/Write Cache Before Each Testing'.

Figure 5. Specify Storage Policy and Cache Clearing Option

- **Storage Policy** is the option allow you to specify the name of a Storage Policy which will be applied to the data disks when being added to the guest VMs.
- **Clear Read/Write Cache Before Each Testing** is the option desgined for vSAN user to flush the cache tier before each Vdbench test case, ESXi **Host Username** and **Host Password** must be specified if this box is checked.

- Cluster Hosts Information

If this parameter is unchecked, ignore the **Hosts** field below, for the **Host Username/Password** fields can also be ignored if **Clear Read/Write Cache Before Each Testing** is unchecked. In this mode, a Vdbench Guest VM is deployed by the vCenter and then is cloned to all hosts in the vSAN Cluster in a round-robin fashion. The naming convention of Vdbench Guest VMs deployed in this mode is “vdbench-vc-<DATASTORE\_NAME>-<#>”.

If this parameter is checked, all the other parameters except **EASY RUN** must be specified properly.

The **Hosts** parameter specifies IP addresses or FQDNs of hosts in the vSAN Cluster to have Vdbench Guest VMs deployed, Vdbench Guest VMs are deployed directly to the specified hosts concurrently. To reduce the network traffic, five hosts are running deployment at the same time then it moves to the next five hosts. Each host also deploys at an increment of five VMs at a time. The naming convention of test VMs deployed in this mode is “vdbench-<HOSTNAME/IP>-<DATASTORE\_NAME>-batch<VM#>-<VM#>”.

In general, it is recommended to check **Deploy on Hosts** for deployment if you only want to deploy VMs to some of the ESXi hosts.

**EASY RUN** is specifically designed for vSAN user, by checking this, HCIBench is able to handle all the configurations below by identifying the vSAN configuration. **EASY RUN** helps to decide how many client VMs should be deployed, the number and size of VMDKs of each VM, the way of preparing virtual disks before testing etc. the configurations below will be hidden if this option is checked.

**EASY RUN** sequentially conducts three test cases:

- 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
- 256K, 100% Write, 100% Sequential test to show the best realistic Throughput of this given configuration

**Re-Use The Existing VMs If Possible** allows user to reuse the Vdbench client VMs in the cluster if they are existing and compatible with the VM specification. If not compatible, existing Vdbench guest VMs will be deleted and new VMs will be deployed.

**Compatible** means the existing VMs can be found and access from HCIBench; specified **VM Prefix** is same with existing VMs; **Number of VMs**, **Number of Disks** are not greater than existing VMs and **Size of Data Disk** is same with existing VMs, Vdbench binary installed properly.

#### Cluster Hosts Information

##### Directly Deploy on Hosts (OPTIONAL)

Deploy on Hosts

##### Hosts

10.156.28.1  
10.156.28.14

##### Host Username

##### Host Password

EASY RUN

Re-Use The Existing VMs If Possible

Figure 6. Specify vSAN Cluster Nodes

- Vdbench Guest VM Specification

In this section, the only required parameter is **Number of VMs** that specifies the total number of Vdbench 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 **Number of Data Disk** parameter specifies how many VMDKs to be tested are added to each Vdbench Guest VM. 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**. Default number is ten.

#### Vdbench Guest VM Specification

##### VM Name Prefix

vdbench

##### Number of VMs

16 \*

##### Number of Data Disk

4

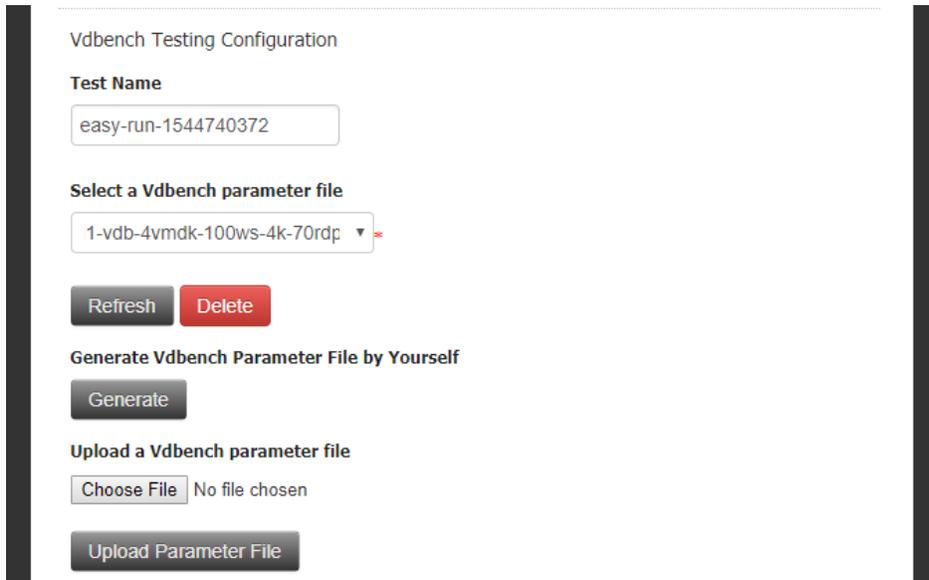
##### Size of Data Disk

28

Figure 7. Specify Test VM Information

## Vdbench Testing Configuration

The **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 under “/opt/output/results/” on the Controller VM for storing collected results from all Vdbench 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://Controller\\_VM\\_IP/results](http://Controller_VM_IP/results). You can get the Vdbench parameter file in the following ways:



Vdbench Testing Configuration

**Test Name**

**Select a Vdbench parameter file**

1-vdb-4vmdk-100ws-4k-70rdp

Refresh Delete

**Generate Vdbench Parameter File by Yourself**

Generate

**Upload a Vdbench parameter file**

Choose File No file chosen

Upload Parameter File

Figure 8. Vdbench Workload Configuration

- Select a Vdbench file in the drop-down box.

If a parameter file is uploaded or generated to the controller before, it already exists in the controller. In this case, you can select the existing Vdbench parameter file and reuse it. 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.

- Upload a Vdbench parameter file

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 Vdbench Parameter File** section. After uploading, click **Refresh** button above, the file you uploaded will be in the drop-down list. For Vdbench parameter file format, refer to the [Vdbench Users Guide](#).

- Generate a Vdbench parameter file

If you do not want to edit a Vdbench parameter file manually, which is error prone, this tool also provides a **Vdbench Parameter File Generate Page** for you to easily create a self-defined parameter file through the GUI. By clicking the **Generate** button, you are redirected to the following page:

### Vdbench Parameter File Generate Page

---

**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 9. Generate Page of Vdbench Parameter File

**Note:** The value of **Number of Data Disk** in the Vdbench Guest VM Specification section must match the value of **Number of Disks to Test** defined in the Vdbench parameter files. For example, if you specify to create 10 data disks per Guest VM, 10 raw disks are created. Therefore, in the Vdbench parameter files, the same number or less of disks are expected.

Refer to the [Vdbench Users Guide](#) for configuration of workload parameter files.

### Prepare Virtual Disk Before Testing

ZERO ▼

### Testing Duration (seconds)

### Clean up VMs

Clean up VMs after testing

You can choose to prepare the virtual disks on Vdbench guest VMs before testing (OPTIONAL). The methodology is running FIO within each Vdbench guest VM. RANDOM option is particularly used for storage which has deduplication enabled while ZERO option is for storage doesn't have deduplication enabled

Figure 10. Other Parameters

Users can choose whether to initialize the data VMDKs of test VMs. There are two options of storage initialization, **ZERO** and **RANDOM**. **RANDOM** is particularly for storage that has de-duplication enabled, if the storage will be tested against doesn't 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 Vdbench parameter files. This parameter defines the test duration for each run. If not specified, each Vdbench test run uses its own elapsed value.

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

### Download Vdbench

Before running the test, you must download the [Vdbench tool](#) from the Oracle website.

Click the **Download** button. After the download is completed, you should upload the zip file. And the server will automatically put the Vdbench file 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.

### Download the Vdbench

Download

### Upload the Vdbench File

Choose File No file chosen

Upload Vdbench

Figure 11. Download the Vdbench

### Save Configuration

Press the **Save Configuration** button to save the parameter configuration settings. If the configuration setting is not saved, the system uses the previous-saved parameter configuration by default.

## Configuration Validation

After completing the tool configuration, you can validate all settings by clicking the **Validate** 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

```
2015-12-15 14:42:47 -0800: Validating VC IP and Credential...
2015-12-15 14:42:51 -0800: VC IP and Credential Validated
2015-12-15 14:42:51 -0800: Validating Datacenter Lab...
2015-12-15 14:42:54 -0800: Datacenter Lab Validated
2015-12-15 14:42:54 -0800: Validating Cluster vSAN...
2015-12-15 14:42:55 -0800: Cluster vSAN Validated
2015-12-15 14:42:55 -0800: Validating Network VM Network-1284...
2015-12-15 14:42:58 -0800: Network VM Network-1284 Validated
2015-12-15 14:42:58 -0800: Checking if Network VM Network-1284 is accessible from all the hosts of vSAN...
2015-12-15 14:43:05 -0800: Network VM Network-1284 is accessible from host 10.156.28.21
2015-12-15 14:43:07 -0800: Network VM Network-1284 is accessible from host 10.156.28.22
2015-12-15 14:43:10 -0800: Network VM Network-1284 is accessible from host 10.156.28.23
2015-12-15 14:43:12 -0800: Network VM Network-1284 is accessible from host 10.156.28.24
2015-12-15 14:43:12 -0800: Network VM Network-1284 is accessible from all the hosts of vSAN
2015-12-15 14:43:12 -0800: Validating Type of Network VM Network-1284...
2015-12-15 14:43:13 -0800: Network VM Network-1284 Type is Network
2015-12-15 14:43:13 -0800: Validating Datastore vsanDatastore...
2015-12-15 14:43:17 -0800: Datastore vsanDatastore Validated
2015-12-15 14:43:19 -0800: Checking Datastore vsanDatastore type...
2015-12-15 14:43:22 -0800: Datastore vsanDatastore type is vsan
2015-12-15 14:43:22 -0800: Checking if Datastore vsanDatastore is accessible from all the hosts of vSAN...
2015-12-15 14:43:27 -0800: Datastore vsanDatastore is accessible from host 10.156.28.21
2015-12-15 14:43:27 -0800: Datastore vsanDatastore is accessible from host 10.156.28.22
2015-12-15 14:43:27 -0800: Datastore vsanDatastore is accessible from host 10.156.28.23
2015-12-15 14:43:27 -0800: Datastore vsanDatastore is accessible from host 10.156.28.24
2015-12-15 14:43:27 -0800: Datastore vsanDatastore is accessible from all the hosts of vSAN
2015-12-15 14:43:27 -0800: Validating if vSAN Enabled in Cluster vSAN...
2015-12-15 14:43:35 -0800: vSAN is Enabled in Cluster vSAN, the vSAN Datastore name is vsanDatastore, capacity is 22132 GB and freespace is 13434 GB
2015-12-15 14:43:45 -0800: Deploy on hosts: False. Skip validating hosts...
-----
2015-12-15 14:43:45 -0800: All the config has been validated, please go ahead to kick off testing
-----
```

Figure 12. Configuration Validation

### Information

```
2015-12-15 14:47:27 -0800: Validating VC IP and Credential...
-----
VC 10.156.169.96 IP or Credential Info incorrect!
-----
```

Figure 13. Validation Failure

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 **Test** button to start the program. The testing is a time-consuming operation with the test progress toolbar displayed on the web page.

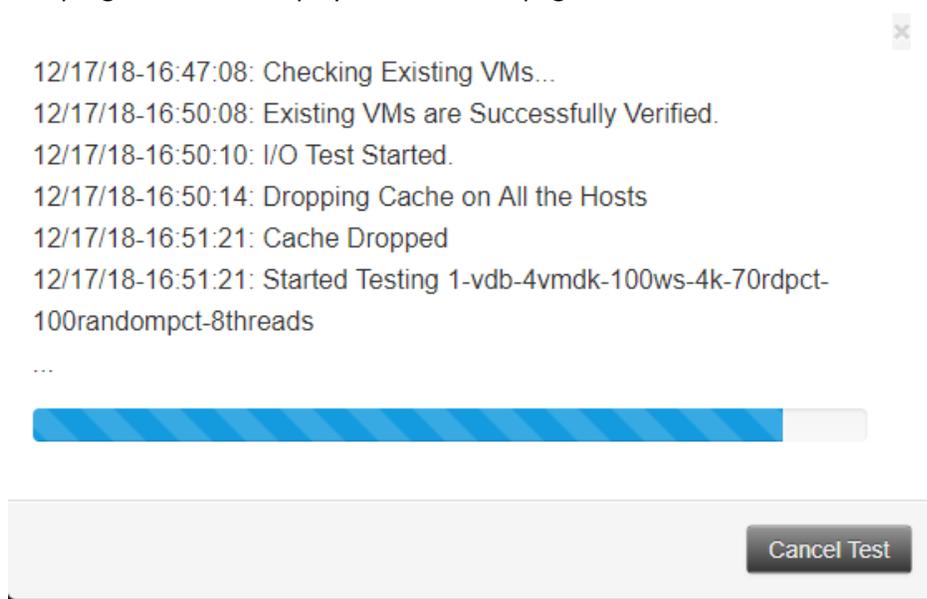


Figure 14. Test in Progress

During the testing, you can kill the test process by clicking the **Cancel Test** tab.

### How to Consume Test Results

After the Vdbench testing finishes, the test results are collected from all Vdbench instances in the test VMs. And you can view the results at [http://HCIBench\\_IP/results](http://HCIBench_IP/results) in a web browser.

## Index of /results

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 <a href="#">Parent Directory</a>		-	
 <a href="#">SystemRun/</a>	2016-08-11 13:52	-	
 <a href="#">pilot1/</a>	2016-08-11 11:26	-	

Figure 15. Test Results

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

The aggregate 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 16. Aggregated Performance Data

You can find all of the original result files produced by Vdbench instances inside the subdirectory corresponding to a test run. In addition to the text files, there is another subdirectory named iotest-vdbench-<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:** Vdbench parameter profile.

**performance\_diag\_result.html:** If testing against vSAN 6.6U1 and using HCIBench 1.6.6 or above, turning on **CEIP**(Customer Experience Improvement Program) and **vSAN Performance Service**, each HCIBench run will send over 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(Max IOPS, Max Throughput or Minimum Latency). User is able to land to the specific vCenter page and the KB article of

any potential issues detected from the hyperlink provided in this file.

## Index of /results/easy-run-1543279973/vdb-8vmdk-100ws-4k-70rdpct-100randompct-4threads-1543282552

Name	Last modified	Size	Description
Parent Directory		-	
<a href="#">HCIBench-1.6.8-logs.tar.gz</a>	2018-11-26 19:23	86K	
<a href="#">hcibench.cfg</a>	2018-11-26 19:23	578	
<a href="#">iotest-vdbench-16vm/</a>	2018-11-26 19:21	-	
<a href="#">performance_diag_result.html</a>	2018-11-26 19:23	3.2K	
<a href="#">vdbench-vsanaDatastore-0-1.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-2.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-3.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-4.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-5.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-6.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-7.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-8.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-9.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-10.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-11.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-12.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-13.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-14.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-15.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench-vsanaDatastore-0-16.txt</a>	2018-11-26 19:20	750K	
<a href="#">vdbench.cfg</a>	2018-11-26 19:23	891	

Figure 17 Detailed Performance Data

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

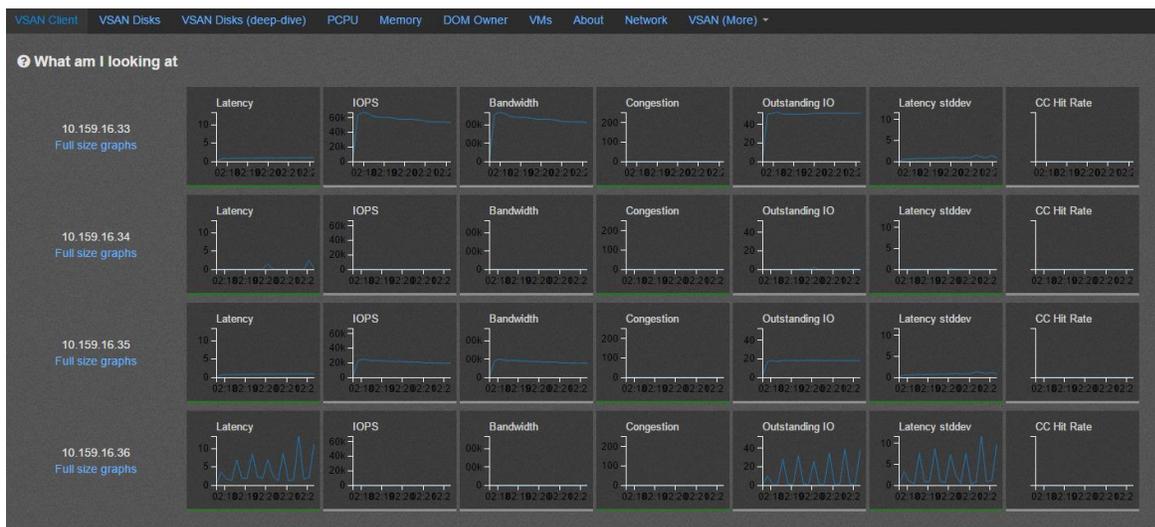


Figure 18. vSAN Observer Statistics

## 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

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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