



# Interoperability of Bloombase StoreSafe and Huawei OceanStor Dorado V3 All-Flash Storage System for Transparent Storage Encryption

March, 2018

The logo for Bloombase, featuring the word "BLOOMBASE" in a bold, blue, sans-serif font with a registered trademark symbol.



## Executive Summary

Huawei's OceanStor Dorado V3 all-flash storage is the ideal choice for enterprises' mission-critical business. It is the industry's first commercial use of NVMe all-flash storage, and it delivers high-performing, reliable, and efficient storage services. Bloombase StoreSafe storage encryption security solution performs as storage proxy providing transparent encryption and un-encryption of contents stored in enterprise storage systems to lock down business sensitive information with state-of-the-art encryption. This document outlines the steps carried out to test interoperability of implementing Bloombase StoreSafe storage encryption solution on Huawei OceanStor Dorado V3 all-flash storage over Internet Small Computer System Interface (iSCSI) protocol.

Information in this document, including URL and other Internet Web site references, is subject to change without notice. Unless otherwise noted, the example companies, organizations, products, people and events depicted herein are fictitious and no association with any real company, organization, product, person or event is intended or should be inferred. Complying with all applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the express written permission of Bloombase.

Bloombase may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Bloombase, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

This document is the property of Bloombase. No exploitation or transfer of any information contained herein is permitted in the absence of an agreement with Bloombase, and neither the document nor any such information may be released without the written consent of Bloombase.

© 2018 Bloombase, Inc.

Bloombase, Keyparc, StoreSafe are either registered trademarks or trademarks of Bloombase in the United States, European Union and/or other countries.

The names of actual companies and products mentioned herein may be the trademarks of their respective owners.

Document No.: BLBS-TN-Bloombase-StoreSafe-Huawei-OceanStor-Dorado-V3 -Interoperability-USLET-EN-Ro.9

# Table of Contents

<b>Table of Contents</b>	<b>3</b>
<b>Purpose and Scope</b>	<b>6</b>
<b>Assumptions</b>	<b>7</b>
<b>Infrastructure</b>	<b>8</b>
<b>Setup</b>	<b>8</b>
<b>Huawei OceanStor as Storage Device for iSCSI Security</b>	<b>9</b>
<b>Bloombase StoreSafe Storage Encryption Security Software Appliance</b>	<b>9</b>
<b>Storage System</b>	<b>10</b>
<b>Ethernet Switch</b>	<b>10</b>
<b>Storage Hosts</b>	<b>10</b>
<b>Configuration Overview</b>	<b>11</b>
<b>Huawei OceanStor Dorado V3</b>	<b>11</b>
<b>Bloombase StoreSafe Security Server</b>	<b>13</b>
<b>Validation Tests</b>	<b>16</b>
<b>Test Scenarios</b>	<b>16</b>
<b>Validation Matrix</b>	<b>16</b>
<b>Raw Volume Tests</b>	<b>17</b>
<b>File System Tests</b>	<b>17</b>
<b>Result</b>	<b>18</b>
<b>Raw Volume Tests</b>	<b>18</b>
<b>File System Tests</b>	<b>19</b>
<b>Conclusion</b>	<b>21</b>
<b>Acknowledgement</b>	<b>22</b>
<b>Disclaimer</b>	<b>23</b>
<b>Technical Reference</b>	<b>24</b>



# Purpose and Scope

This document describes the steps necessary to transparently secure Huawei OceanStor Dorado V3 all-flash storage system with Bloomberg StoreSafe storage encryption security software appliance to lock down sensitive business data on disk with state-of-the-art cryptographic technology. Specifically, we cover the following topics:

- Preparing Bloomberg StoreSafe Storage Encryption Security Software Appliance
- Preparing Huawei OceanStor Dorado V3 all-flash storage system
- Preparing HPE ProLiant DL320e Server
- Preparing HPE 1920-48G Ethernet Switch
- Interoperability testing on host systems including Red Hat Enterprise Linux (RHEL)

# Assumptions

This document outlines the use case scenarios of implementing Bloombase Non-Disruptive Transparent Storage Encryption solution on Huawei OceanStor Dorado V3 all-flash storage system. Therefore, it is assumed that you are familiar with operation of storage systems and major operating systems including Linux, Windows, AIX, HPUX and Solaris. It is also assumed that you possess basic UNIX administration skills. The examples provided may require modifications before they are run under your version of UNIX.

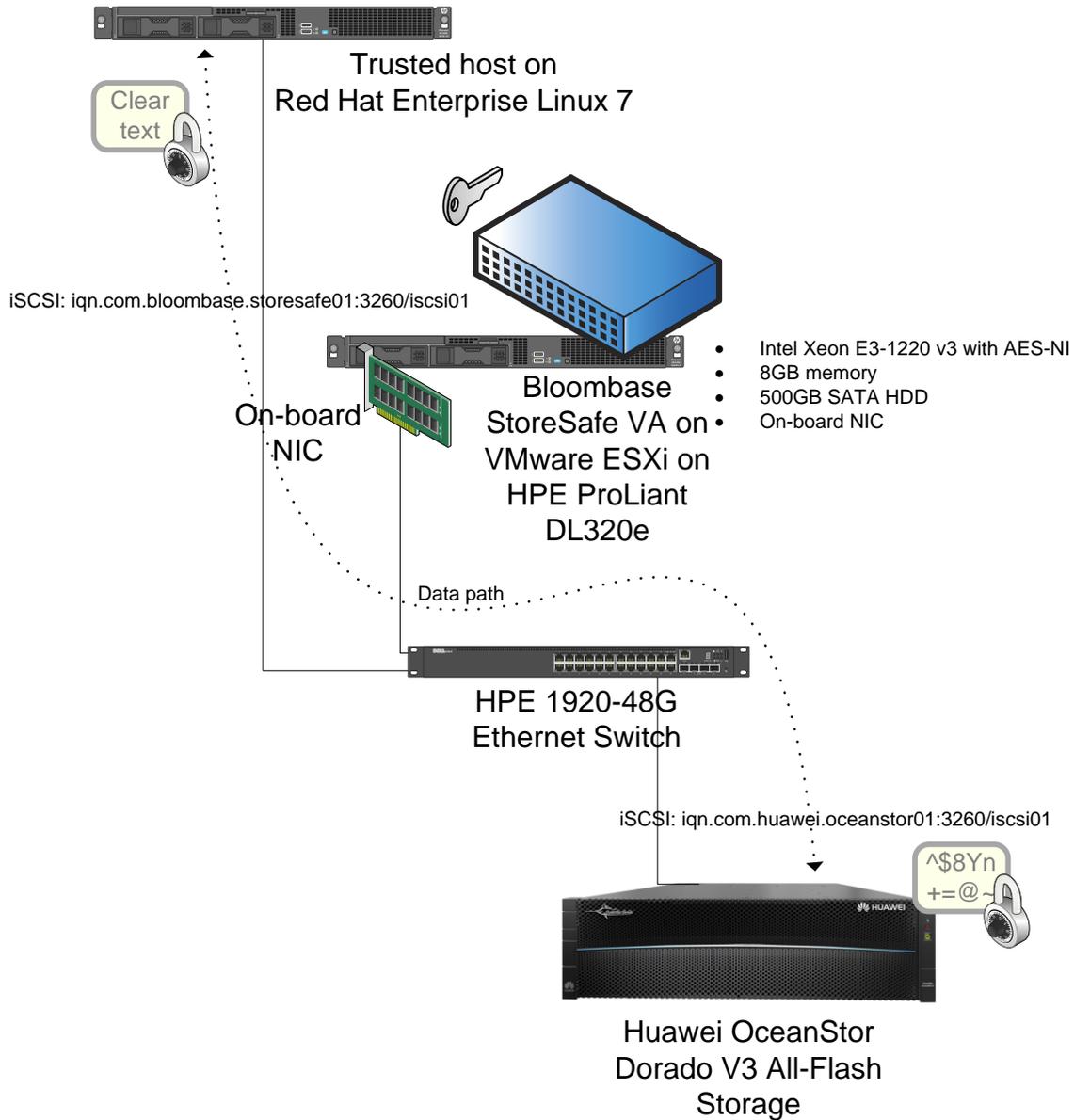
As Huawei OceanStor Dorado V3 is the storage backend to Bloombase StoreSafe storage encryption security software appliance, you are recommended to refer to installation and configuration guides of specific model of Huawei OceanStor Dorado V3 disk array. We assume you have basic knowledge of storage networking and information cryptography. For specific technical product information of StoreSafe, please refer to our website at <https://www.bloombase.com> or Bloombase SupPortal <https://supportal.bloombase.com>.

# Infrastructure

## Setup

The validation testing environment is setup as in below charts:

### Huawei OceanStor as Storage Device for iSCSI Security



## Bloombase StoreSafe Storage Encryption Security Software Appliance

<b>Server</b>	HPE ProLiant DL320e
<b>Processors</b>	Intel Xeon E3-1220 v3
<b>Memory</b>	8 GB
<b>Operating System</b>	Bloomberg StoreSafe Software Appliance v3.4 on Bloomberg OS 7
<b>Storage Encryption Software</b>	Bloomberg StoreSafe Software Appliance ISO edition

## Storage System

<b>Storage</b>	Huawei OceanStor Dorado V3 Storage System
<b>Model</b>	Huawei OceanStor Dorado6000 v3

## Ethernet Switch

<b>Model</b>	HPE 1920-48G Ethernet Switch
<b>Link Speed</b>	10/100/1000Base-T auto-sensing and 10GbE SFP+

## Storage Hosts

<b>Model</b>	HPE ProLiant DL320e
<b>Operating System</b>	Red Hat EL6 on VMware ESX/ESXi4

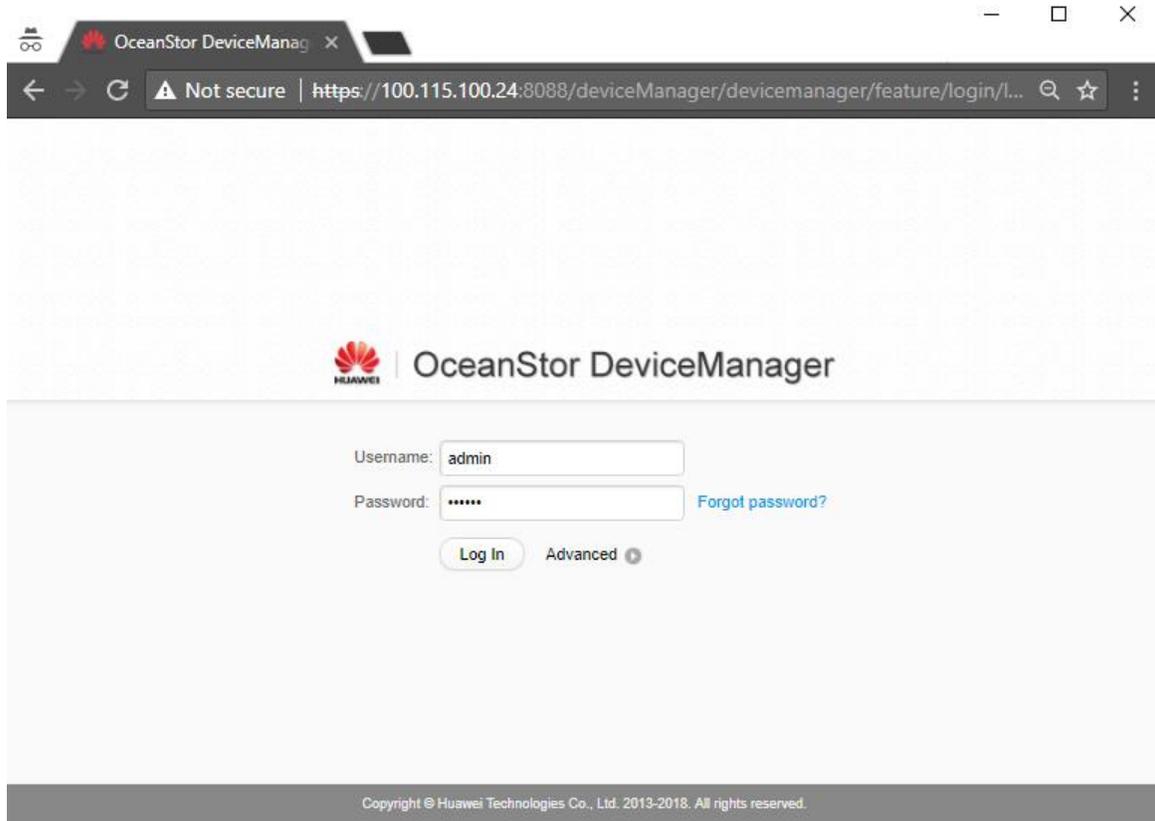
# Configuration Overview

## Huawei OceanStor Dorado V3

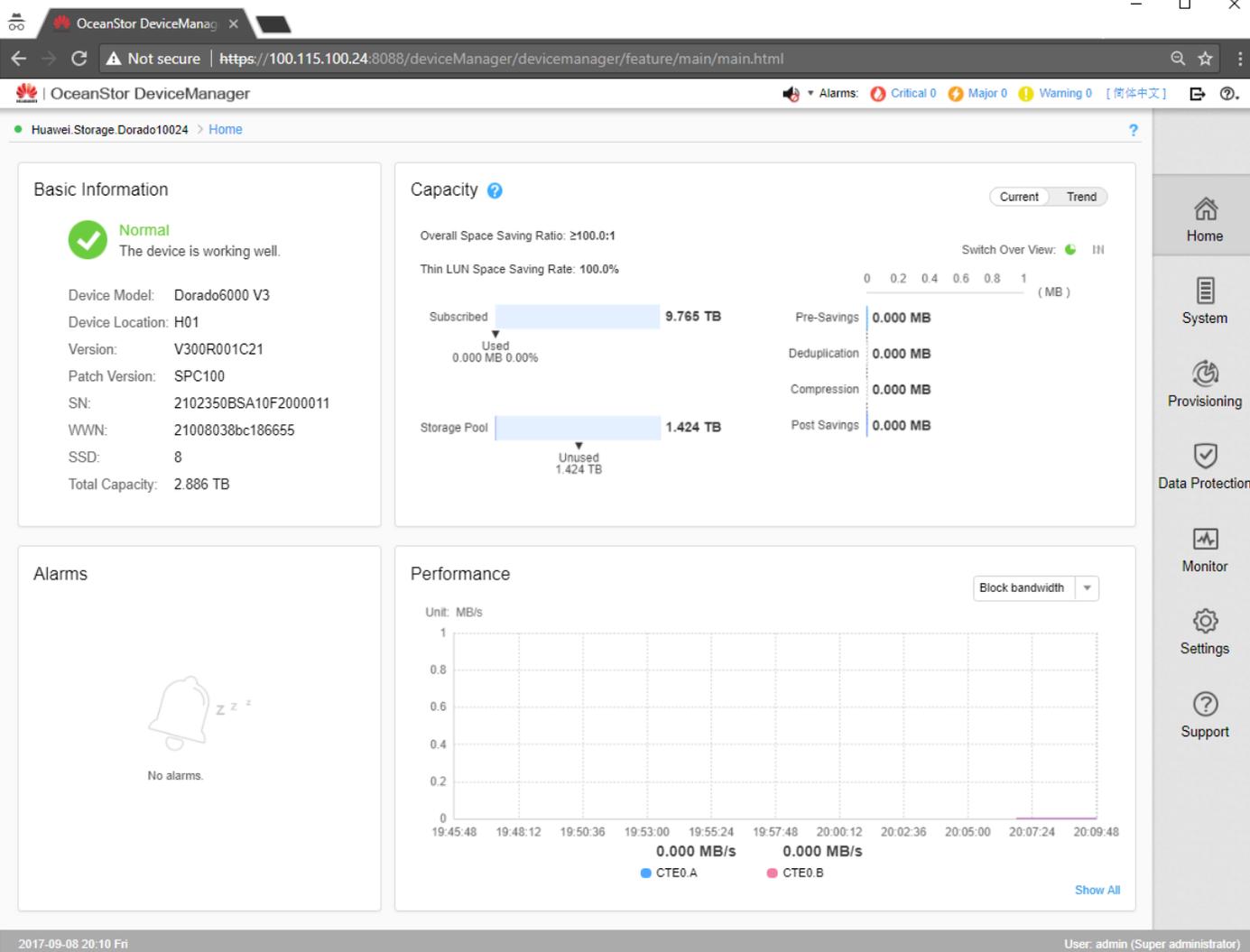
Huawei OceanStor Dorado V3

- OceanStor Dorado5000 V3
- OceanStor Dorado6000 V3

are accessed by logging in to their respective Device Manager web management console with the respective network port IP addresses.



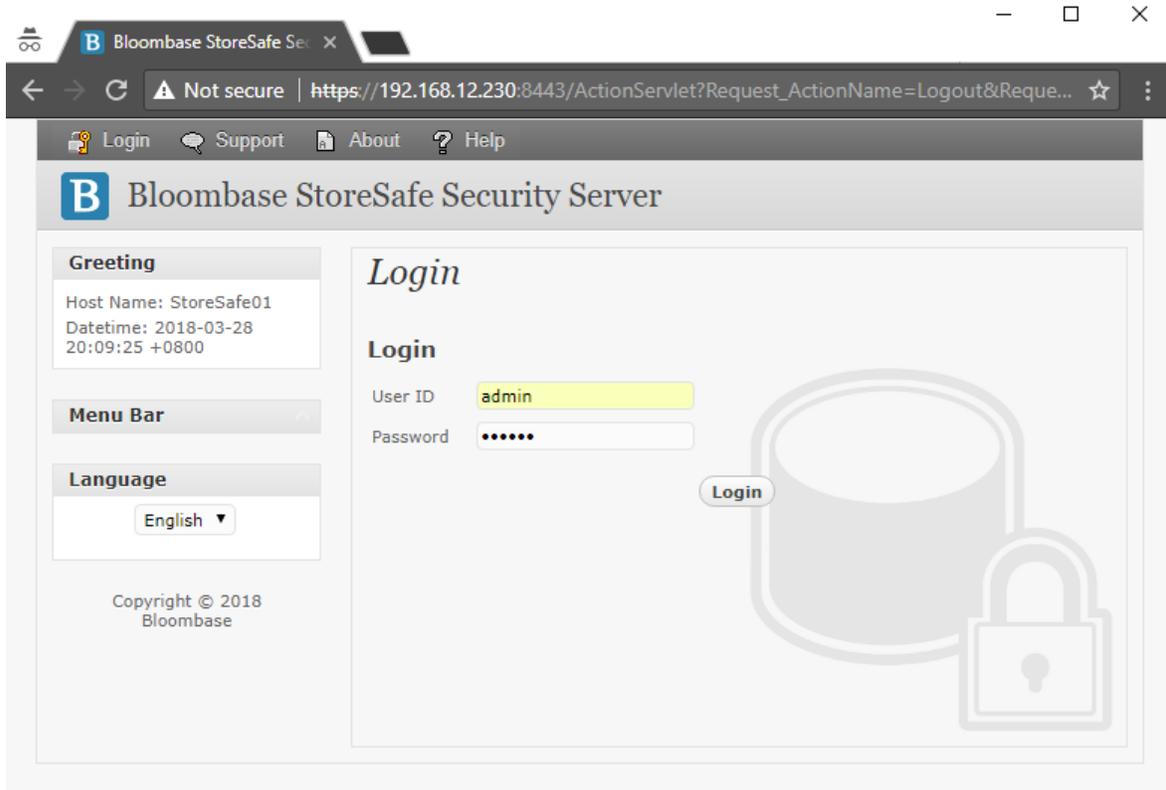
Disk Domains, Storage Pools, LUNs, LUN Groups, Hosts, Host Groups, Port Groups and Mapping View are created through the OceanStor Provisioning page.



## Bloombase StoreSafe Security Server

Bloombase StoreSafe supports file-based, object-based, share-based and volume-based on-the-fly storage encryption. In this interoperability test, iSCSI IP-SAN volume-based encryption is validated against Huawei OceanStor Dorado V3 all-flash storage systems.

Bloombase StoreSafe Web Administration Console Login page.



The Main dashboard page of the Bloombase StoreSafe web console displays the system and server information.

**Bloombase StoreSafe Security Server**

Main | Logout | Support | About | Help

**Greeting**

Host Name: StoreSafe01  
User: admin  
Datetime: 2018-03-28 20:11:34 +0800

**Menu Bar**

- System
- Operation
- Network Security
- High Availability
- Administration
- Key Management
- StoreSafe Configurations
- Storage

**Language**

English

Copyright © 2018 Bloombase

### Main

#### System Information

Product Name	Bloombase StoreSafe Security Server	Version	3.4.6.21
Host Name	StoreSafe01 / localhost	System Up Since	2018-03-24 01:55:10 +0800
Host Addresses	1 ens192 fe80:0:0:0:250:56ff:fe87:66c6, 192.168.12.230		
Licensee	C=US O=Bloombase\ Inc. CN=SPFSSF2666	Serial Number	9830
Validity	<input checked="" type="checkbox"/>	Perpetuality	<input checked="" type="checkbox"/>

#### Server Information

Operating System	Linux amd64 3.10.0-327.el7.ssfsc.x86_64	Processors	1
Memory Utilization	3%	Total Memory	519,110,656
Max Memory	4,151,836,672	Free Memory	380,883,064
Disk Space Utilization	25%	Total Disk Space	14,879,293,440
Used Disk Space	3,739,713,536	Free Disk Space	11,139,579,904

#### Application Status

Application Status   

Last Shutdown Time

Last Standby Time

Last Startup Time 2018-03-24 01:55:18 +0800

# Validation Tests

## Test Scenarios

### Validation Matrix

Validation tests span across models of Huawei OceanStor Dorado V3, Bloomberg StoreSafe Storage Encryption Software Appliance, server hardware platform, and host platform.

Test Condition	Candidate
Storage System	<ul style="list-style-type: none"><li>• Huawei OceanStor Dorado5000 V3</li><li>• Huawei OceanStor Dorado6000 V3</li></ul>
Storage Encryption	<ul style="list-style-type: none"><li>• Bloomberg StoreSafe Storage Encryption Software Appliance on x86-based HPE ProLiant DL320e</li></ul>
Ethernet Switch	<ul style="list-style-type: none"><li>• HPE 1920 48G Ethernet Switch</li></ul>
Host Hardware	<ul style="list-style-type: none"><li>• HPE ProLiant DL320e</li></ul>

- Host Operating Systems
- Red Hat Enterprise Linux 6 on VMware ESXi (hypervisor)

### Raw Volume Tests

The following tests are carried out for hosts to access encrypted data from Huawei OceanStor Dorado V3 all-flash storage system via Bloombase StoreSafe storage security software appliance via operating system file-systems

Test	Description
Write disk with zeros	Write zeros into encrypted storage target via Bloombase StoreSafe, platform equivalence of UNIX's dd if=/dev/zero of=/dev/sda
Read disk to null device	Read from encrypted storage target via Bloombase StoreSafe, platform equivalence of UNIX's dd if=/dev/sda of=/dev/null
Wipe disk with random data	Write random zeros and ones into encrypted storage target, platform equivalence of UNIX's dd if=/dev/urandom of=/dev/sda

### File System Tests

The following tests are carried out for hosts to access encrypted data from Huawei OceanStor Dorado V3 all-flash storage system via Bloombase StoreSafe storage security software appliance via operating system file-systems

- ext3 for Linux

Test	Description
Discovery	Platform equivalence of UNIX's iscsiadm -m discovery -tst
Connect	Platform equivalence of UNIX's iscsiadm -m node -p

Filesystem partition	Platform equivalence of UNIX's mkfs
Directory creation	Platform equivalence of UNIX's mkdir
Directory rename	Platform equivalence of UNIX's mv
Directory removal	Platform equivalence of UNIX's rm
Directory move	Platform equivalence of UNIX's mv
File creation	Platform equivalence of UNIX's echo XXX >
File rename	Platform equivalence of UNIX's mv
File removal	Platform equivalence of UNIX's rm
File move	Platform equivalence of UNIX's mv
File append – by character	Platform equivalence of UNIX's echo XXX >>
File append – by block	Platform equivalence of UNIX's echo XXX >>
File parameters inquiry	Platform equivalence of UNIX's ls *X
File permission configurations	Platform equivalence of UNIX's chmod
Softlink/Symbolic link removal	Platform equivalence of UNIX's rm
Softlink/Symbolic link move	Platform equivalence of UNIX's mv

---

## Result

### Raw Volume Tests

Test	Validation Pass	Remarks
Write disk with zeros	✓	

Read disk to null device	✓
Wipe disk with random data	✓

---

## File System Tests

Test	Validation Pass	Remarks
Discovery	✓	
Connect	✓	
Filesystem partition	✓	
Directory creation	✓	
Directory rename	✓	
Directory removal	✓	
Directory move	✓	
File creation	✓	
File rename	✓	
File removal	✓	
File move	✓	
File append – by character	✓	
File append – by block	✓	
File parameters inquiry	✓	
File permission configurations	✓	
Softlink/Symbolic link	✓	

removal

Softlink/Symbolic link move ✓

---

# Conclusion

Huawei OceanStor Dorado V3

- OceanStor Dorado5000 V3
- OceanStor Dorado6000 V3

passed all Bloombase interopLab's interoperability tests with Bloombase StoreSafe storage encryption software appliance on raw and cooked file system access over iSCSI protocol.

Bloombase Product	Operating System	Huawei OceanStor Dorado V3
Bloombase StoreSafe Software Appliance	Red Hat Enterprise Linux 6	<ul style="list-style-type: none"> <li>• OceanStor Dorado5000 V3</li> <li>• OceanStor Dorado6000 V3</li> </ul>

# Acknowledgement

We would like to thank Huawei for sponsoring the Huawei OceanStor Dorado V3 all-flash storage system used in tests of this technical report and in particular Mr Yanzi Yan and Mr Jason Jia for their constant support throughout the testing.

# Disclaimer

The tests described in this paper were conducted in the Bloombase InteropLab. Bloombase has not tested this configuration with all the combinations of hardware and software options available. There may be significant differences in your configuration that will change the procedures necessary to accomplish the objectives outlined in this paper. If you find that any of these procedures do not work in your environment, please contact us immediately.

# Technical Reference

1. Bloomberg StoreSafe, <http://www.bloomberg.com/products/storesafe/>
2. Bloomberg StoreSafe Security Server Technical Specifications, <http://www.bloomberg.com/content/8936QA88>
3. Bloomberg StoreSafe Security Server Compatibility Matrix, <http://www.bloomberg.com/content/e8Gzz281>
4. Huawei OceanStor Dorado V3, <http://e.huawei.com/us/products/cloud-computing-dc/storage/unified-storage/dorado-v3>
5. HPE ProLiant DL320e, <http://www8.hp.com/us/en/products/proliant-servers/product-detail.html?oid=5379527>
6. Brocade 300 SAN Switch, <http://www.brocade.com/en/products-services/storage-networking/fibre-channel/300-switch.html>
7. HPE 1920-48G Ethernet Switch, <https://www.hpe.com/us/en/product-catalog/networking/networking-switches/pip.switches.7399514.html>

8. Cavium QLogic QLE2672, <https://cavium.com/fc-adapters-2670-series.html>

9. Red Hat Enterprise Linux, <http://www.redhat.com/en/technologies/linux-platforms/enterprise-linux>