interopLab

Interoperability of Bloombase StoreSafe and Huawei OceanStor V3-Series for Transparent Storage Encryption

December, 2016

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HUAWEI

Executive Summary

Huawei's new-generation mid-range and high-end Huawei OceanStor V3 Series enterprise unified storage with its unique features provides converged architecture, protocols and platforms, offering comprehensive high-performance solutions for enterprises of all sizes. Essentially Bloombase StoreSafe agentless unified storage encryption security solution performs as storage proxy providing transparent encryption and un-encryption of contents stored in enterprise Network attached Storage (NAS), Storage Area Network (SAN) and RESTful object stores for authorized hosts and applications. This document outlines the steps carried out to test interoperability of implementing Bloombase Non-Disruptive Transparent Storage Encryption solution on Huawei OceanStor V3 Series enterprise unified storage over Internet Small Computer System Interface (iSCSI) and Fibre Channel Protocol (FCP). Huawei's OceanStor V3 Series is validated by Bloombase's interopLab to run with Bloombase StoreSafe application-transparent storage area network (SAN) encryption server on Bloombase OS running on x86-based appliance.

Document No.: BLBS-TN-Bloombase-StoreSafe-Huawei-OceanStor-V3-Series-Interoperability-USLET-EN-R0.92

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Purpose and Scope

This document describes the steps necessary to transparently secure Huawei OceanStor V3 Series enterprise unified storage with Bloombase StoreSafe enterprise storage security server to secure sensitive corporate business data in a storage area network (SAN). Specifically, we cover the following topics:

- Preparing Bloombase StoreSafe Security Server
- Preparing Huawei OceanStor V3 Series enterprise unified storage
- Preparing HPE ProLiant DL320e Server
- Preparing Cavium QLogic QLE2672 HBA
- Preparing Brocade 6505 SAN Switch
- Preparing Cavium QLogic QLE7442 NIC
- Preparing Dell 1524 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 V3 Series enterprise unified storage. 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.

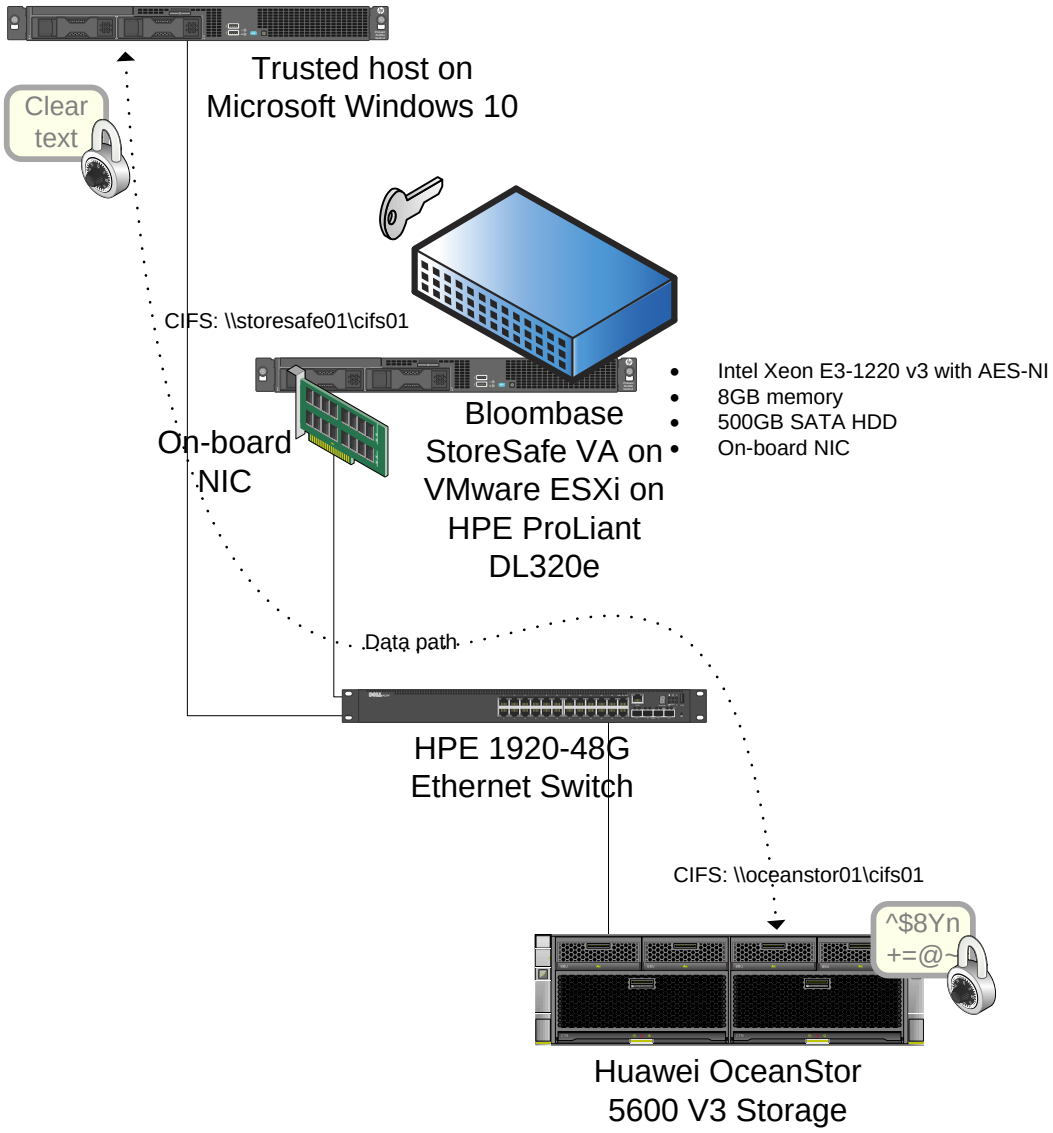
As Huawei OceanStor V3 Series are enterprise unified storage systems to Bloombase StoreSafe encryption software appliance, you are recommended to refer to installation and configuration guides of specific model of Huawei OceanStor V3 Series. We assume you have basic knowledge of storage networking and information cryptography. For specific technical product information of StoreSafe, please refer to our website at http://www.bloombase.com or Bloombase SupPortal http://supportal.bloombase.com

Infrastructure

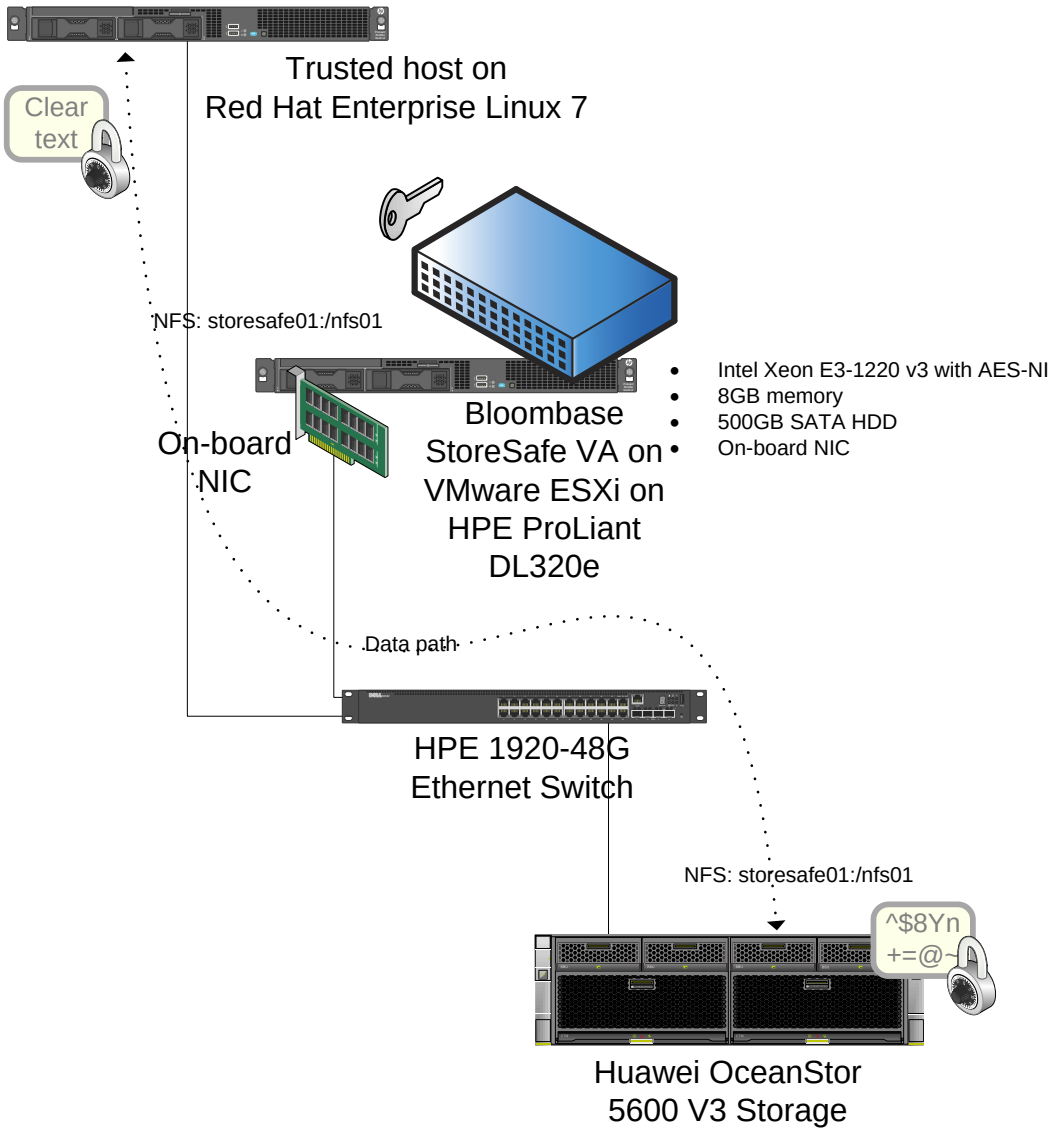
Setup

The validation testing environment is setup as in below charts:

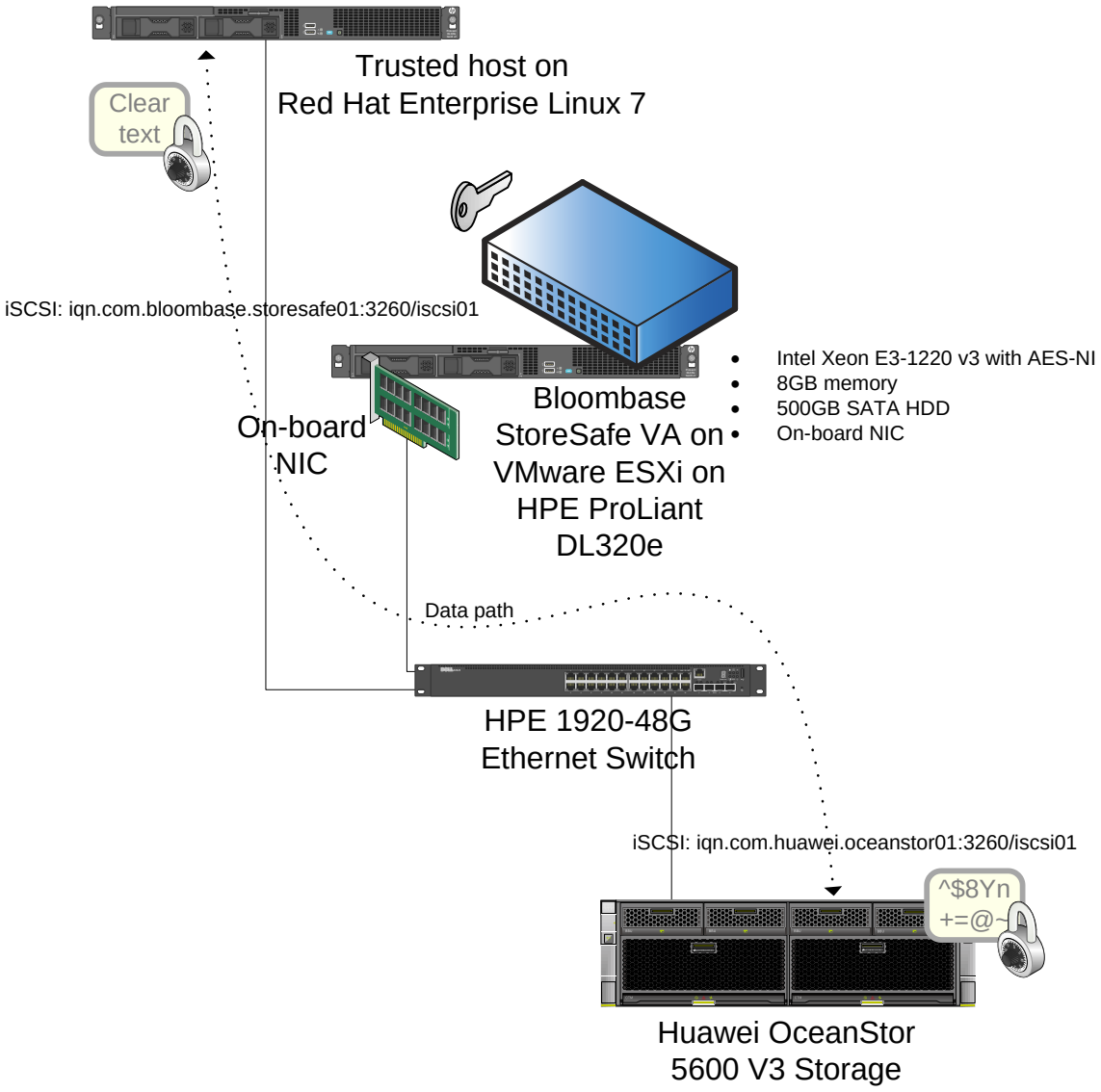
Huawei OceanStor as Storage Device for CIFS Security



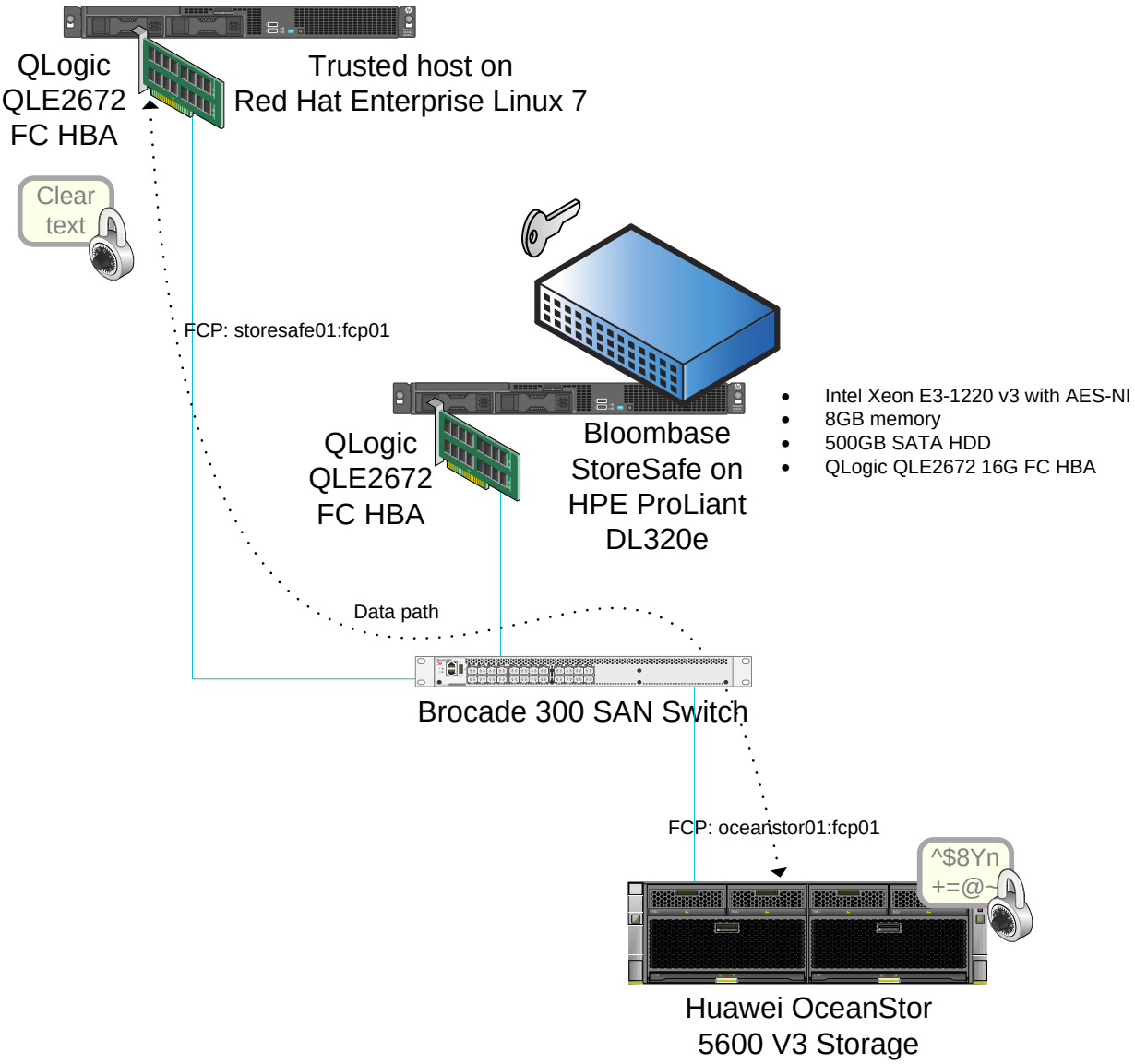
Huawei OceanStor as the Storage Device for NFS Security



Huawei OceanStor as Storage Device for iSCSI Security



Huawei OceanStor as Storage Device for FC-SAN Security



Bloombase StoreSafe Storage Software Appliance

Server	HPE ProLiant DL320e
Processors	Intel Xeon E3-1220 v3
Memory	8 GB
Operating System	Bloombase StoreSafe Software Appliance v3.4 on Bloombase OS 7
Storage Encryption Software	Bloombase StoreSafe Security Server

Storage System

Storage	Huawei OceanStor V3 Series Storage
Model	OceanStor 5600 v3

Fibre Channel Host Bus Adapters

Model	Cavium QLogic QLE2672-CK
Speed	16 Gbps
Interface	PCI-E

SAN Switch

Model	Brocade 300 SAN Switch
Link Speed	16/8/4/2 Gbps auto-sensing

Ethernet NIC

Model	Cavium QLogic QLE7442
Speed	10 GbE
Interface	PCI-E

Ethernet Switch

Model	Dell 1524 Ethernet Switch
Link Speed	10/100/1000Base-T auto-sensing and 10GbE SFP+

Storage Hosts

Model	HPE ProLiant DL320e
Operating System	Red Hat EL6 on VMware ESX/ESXi4
Host Bus Adapter	Cavium QLogic QLE2672-CK

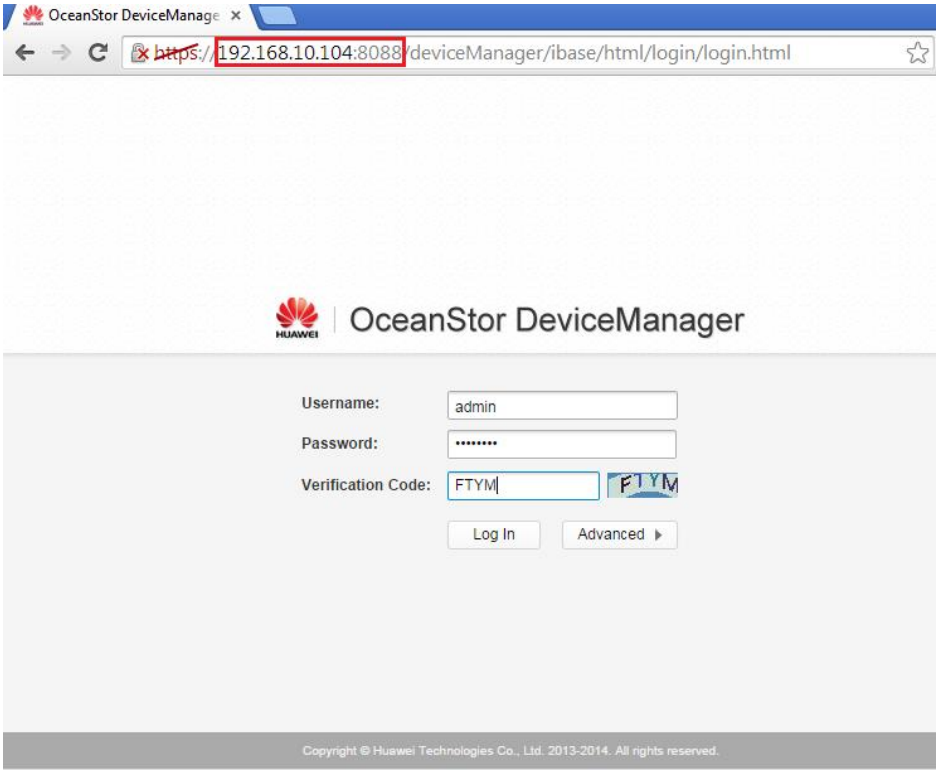
Configuration Overview

Huawei OceanStor V3 Series

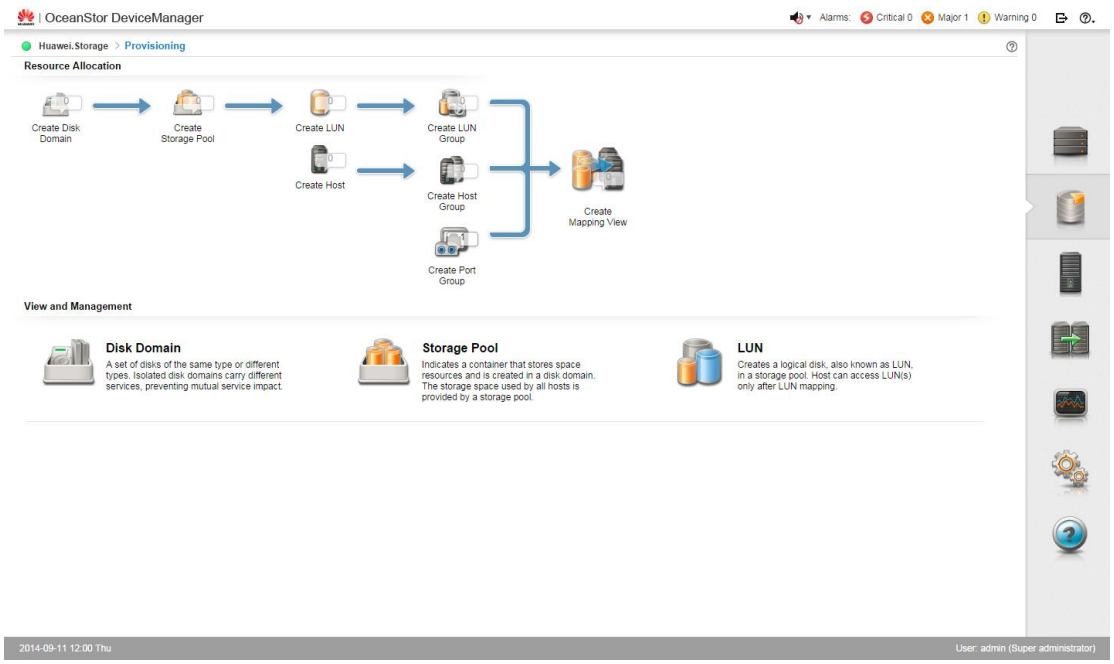
Huawei OceanStor V3 Series

- OceanStor 5300/5500/5600/5800 V3
- OceanStor 6800 V3
- OceanStor 18000 V3

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



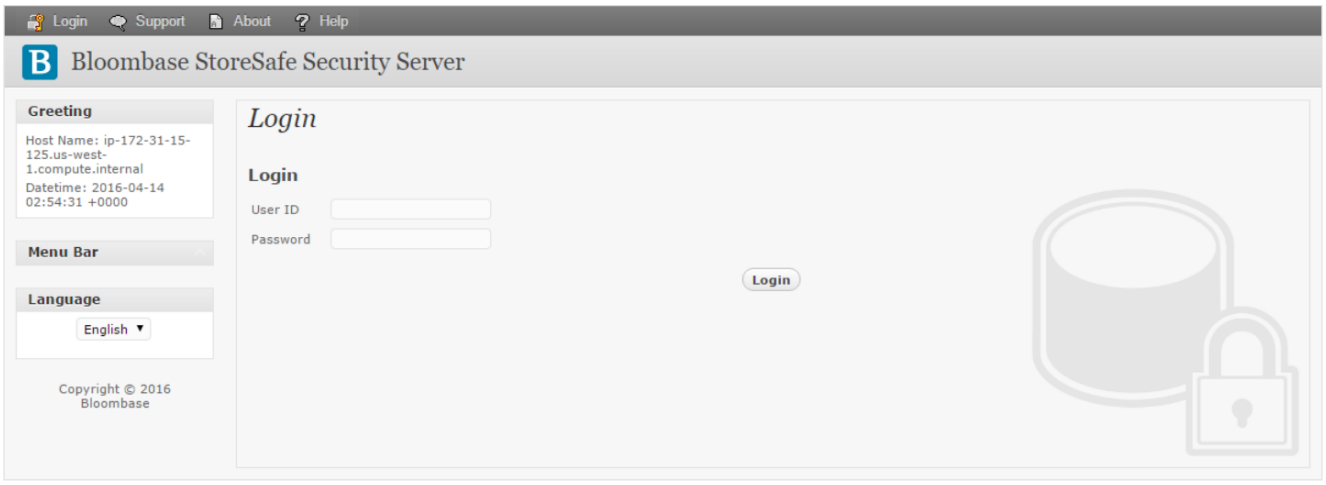
Disk Domains, Storage Pools, LUNs, LUN Groups, Hosts, Host Groups, Port Groups and Mapping View are created through the OceanStor Provisioning page.



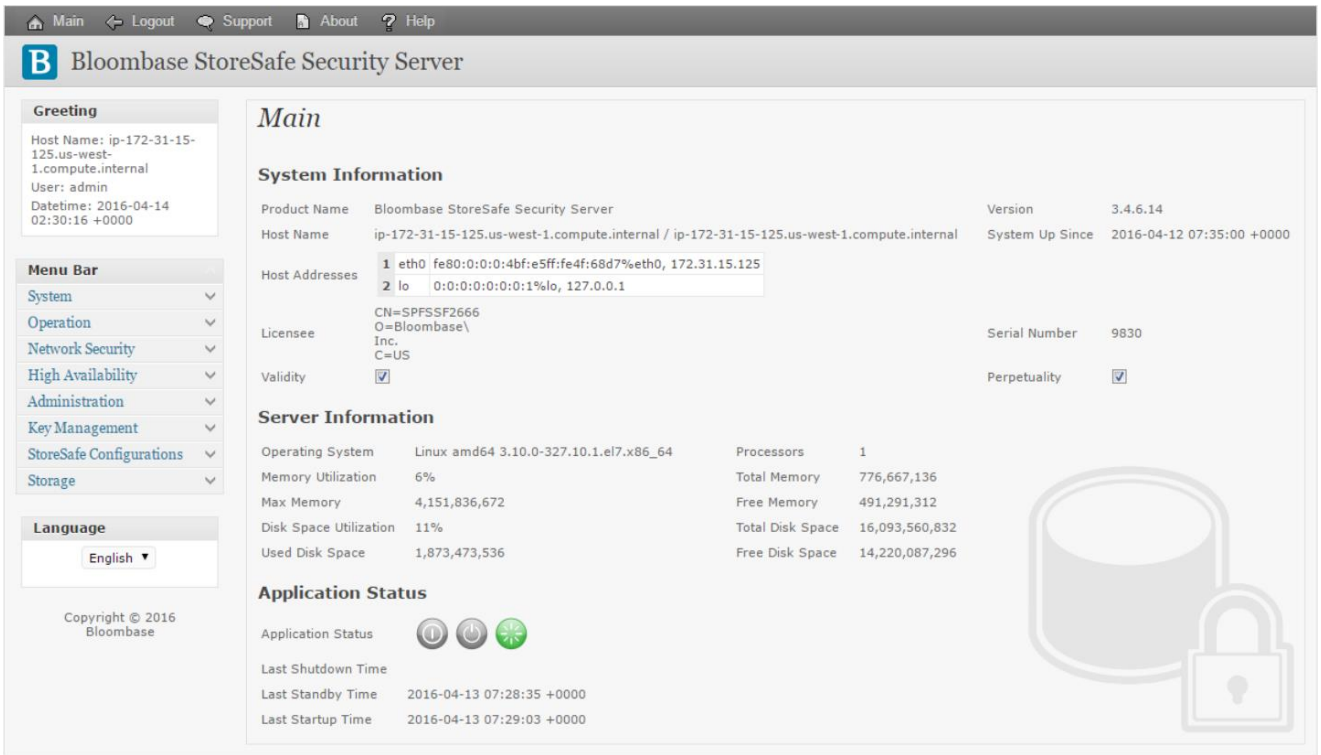
Bloombase StoreSafe Security Server

Bloombase StoreSafe supports both file-based and block-based on-the-fly storage encryption. In this interoperability test exercise, iSCSI and fibre channel SAN block-based encryption is validated against Huawei OceanStor V3 Series enterprise unified 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.



Validation Tests

Test Scenarios

Validation Matrix

Validation tests span across models of Huawei OceanStor V3 Series, Bloombase StoreSafe Security Server, appliance hardware platform, and host platform.

Test Condition	Candidate
Enterprise Unified Storage System	• OceanStor 5300/5500/5600/5800 V3 • OceanStor 6800 V3 • OceanStor 18000 V3
Storage Encryption Appliance	• Bloombase StoreSafe Security Server on x86-based HPE ProLiant DL320e
SAN Switch	• Brocade 6505 SAN Switch
Ethernet Switch	• Dell 1524 Ethernet Switch

Host Server Hardware	• HPE ProLiant DL320e • Cavium QLogic QLE2672 HBA • Cavium QLogic QLE7442 NIC
Host Operating Systems	• Red Hat Enterprise Linux 6 • VMware ESX/ESXi (hypervisor)

Raw Storage Device Tests

The following tests are carried out for hosts to access encrypted data from Huawei OceanStor V3 Series enterprise unified storage via Bloombase StoreSafe software appliances via operating system file-systems

Test	Description
For iSCSI encryption	
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
For FC-SAN encryption	
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 V3 Series enterprise unified storage via Bloombase StoreSafe security server via operating system file-systems

- ext3 for Linux

Test	Description
For iSCSI encryption	
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

For FC-SAN encryption	
Initialize disk	Platform equivalence of UNIX's lsmod
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 Storage Device Tests

Test	Validation Pass	Remarks
For iSCSI encryption		
Write disk with zeros	✓	
Read disk to null device	✓	
Wipe disk with random data	✓	
For FC-SAN encryption		
Write disk with zeros	✓	
Read disk to null device	✓	
Wipe disk with random data	✓	

File System Tests

Test	Validation Pass	Remarks
For iSCSI encryption		
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	✓

For FC-SAN encryption	
Initialize disk	✓
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 V3 Series

- OceanStor 5300/5500/5600/5800 V3
- OceanStor 6800 V3
- OceanStor 18000 V3

passed all Bloombase interopLab's interoperability tests with Bloombase StoreSafe enterprise storage encryption server on file system access over iSCSI and FCP encryption.

Bloombase Product	**Operating System**	**Huawei OceanStor V3 Series**
Bloombase StoreSafe Security Server	Red Hat Enterprise Linux 6	• OceanStor 5300/5500/5600/5800 V3 • OceanStor 6800 V3 • OceanStor 18000 V3

Acknowledgement

We would like to thank Huawei Technologies Co. Ltd. for sponsoring the Huawei OceanStor V3 Series enterprise unified storage system used in tests of this technical report and in particular Mr Jason Jia and Mr Keith Wong 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

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