interopLab

Interoperability of Bloombase StoreSafe and Emulex 40Gb Ethernet Network Adapter for Data-at-Rest Encryption

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Executive Summary

Avago/Broadcom/Emulex carrier grade 40Gb Ethernet adapters / network interface cards (NIC) and fiber-optic transceivers are validated by Bloombase's interopLab to run with Bloombase StoreSafe software appliance to secure NFS Network Attached Storage (NAS) by state-of-the-art encryption. This document describes the steps carried out to test interoperability of Emulex 40G NICs with Bloombase StoreSafe running on x86-based Intel Xeon hardware server with AES-NI cryptographic acceleration. Host system on Red Hat Enterprise Linux (RHEL) / CentOS is validated with Emulex 40G NIC-powered Bloombase StoreSafe securing NFS network shares provisioned at Network Attached Storage (NAS).

Document No.: BLBS-TN-Bloombase-StoreSafe-Emulex-40Gb-Ethernet-Adapter-Interoperability-USLET-EN-R0.9

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Purpose and Scope

This document describes the steps necessary to integrate Emulex 40GbE NICs with Bloombase StoreSafe software appliance to secure sensitive corporate business data stored at Network Attached Storage (NAS). Specifically, we cover the following topics:

- Setting up Bloombase StoreSafe software appliance on x86-based server hardware with Emulex 40GbE NIC(s)
- Setting up NAS storage system
- Interoperability testing on host system Red Hat Enterprise Linux (RHEL) / CentOS

Assumptions

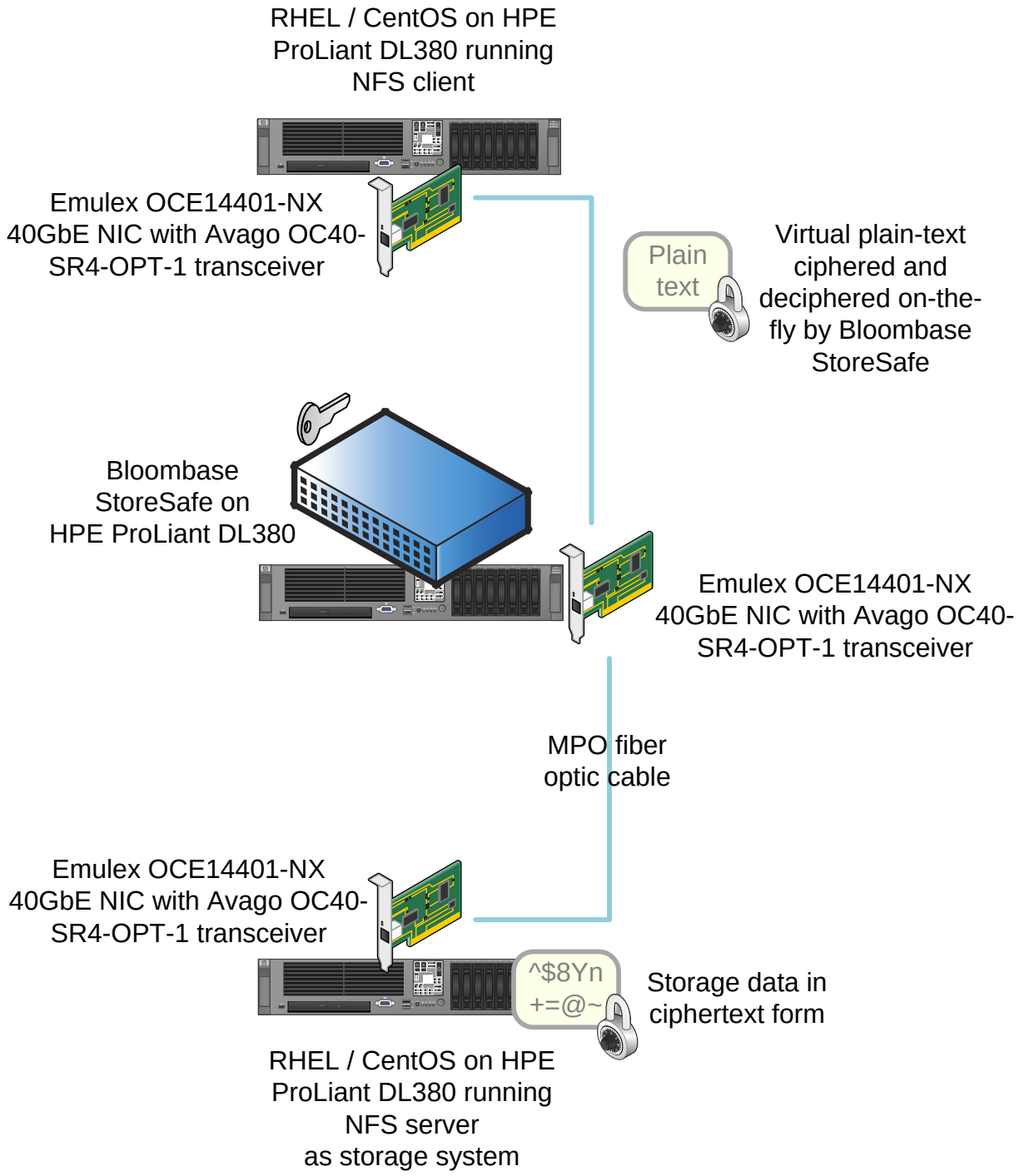
This document describes interoperability testing of Emulex powered Bloombase StoreSafe software appliance on NAS storage system. Therefore, it is assumed that the reader is familiar with operation of storage systems and major operating systems including Linux. It is also assumed that the reader possesses basic UNIX administration skills. The examples provided may require modifications before they are run under specific version(s) of UNIX.

As Emulex 40Gb Ethernet adapters are hardware option to Bloombase StoreSafe, the reader is recommended to refer to installation and configuration guides of specific model of Emulex 40G NIC for the platform to test on. We assume the reader has basic knowledge of storage networking and information cryptography. For specific technical product information of Bloombase 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 set up as in below figure:



Bloombase StoreSafe

Server	HPE ProLiant DL380
Processors	2 x Intel Xeon CPU
Memory	8 GB
Disk Free Space	10 GB
Storage Encryption Software	Bloombase StoreSafe Software Appliance

40Gb Ethernet Adapters

Model	Emulex OneConnect OCe14401-NX
Speed	40 Gbps
Interface	PCI-E

Transceivers

Model	Avago OC40-SR4-OPT-1

Network Attached Storage (NAS)

NAS Storage	Red Hat Enterprise Linux (RHEL) / CentOS on HPE ProLiant DL380 running NFS server as storage system
Link Speed	40 Gbps
Ethernet Adapter	Emulex OneConnect OCe14401-NX NIC with Emulex OC40-SR4-OPT-1 transceiver

Storage Host

Model	HPE ProLiant DL380
Operating System	Red Hat Enterprise Linux (RHEL) / CentOS

Ethernet Adapter	Emulex OneConnect OCe14401-NX NIC with Emulex OC40-SR4-OPT-1 transceiver

Configuration Overview

Emulex 40Gb Ethernet Adapter

Emulex 40G NICs

- Emulex OCE14401-NX

are installed onto the x86-based Intel Xeon hardware appliance running Bloombase StoreSafe, client host and NAS running Red Hat Enterprise Linux / CentOS.

Avago OC40-SR4-OPT-1 QSFP transceiver modules have been used to pair with the Emulex OCE14401-NX.

MPO multi-mode patch cables were used in this test enabling the Emulex NICs and transceivers to deliver 40Gbps Ethernet network throughput.

Bloombase OS comes with Emulex OneConnect NIC Driver 11.0.232.0 off-the-shelf.

Customers may update the driver binaries optionally by signing on the Bloombase text-based management console and gaining command prompt access by entering the maintenance mode.

Download the latest driver at http://www.avagotech.com/products/ethernet-connectivity/network-adapters/oce14401-nx#downloads.

Untar the driver binaries by command:

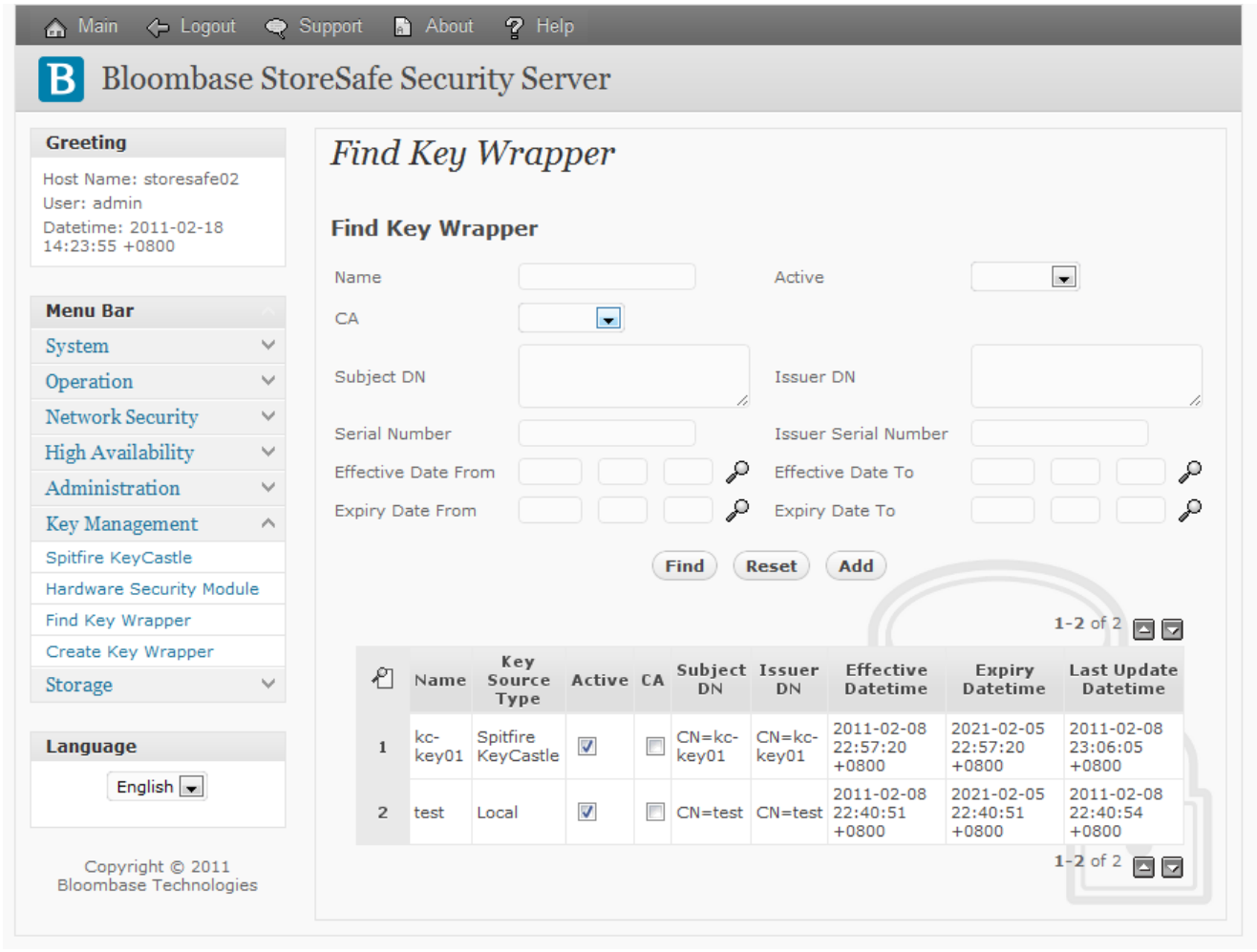
```
# tar -xvf elx-be2net-dd-rhel7-<version>.tar.gz
```

To update the Emulex OneConnect driver at Bloombase OS, run the following commands:

```
# cd ./elx-rhel7-be2net-dd-<version>
# ./elx_net_install.sh
```

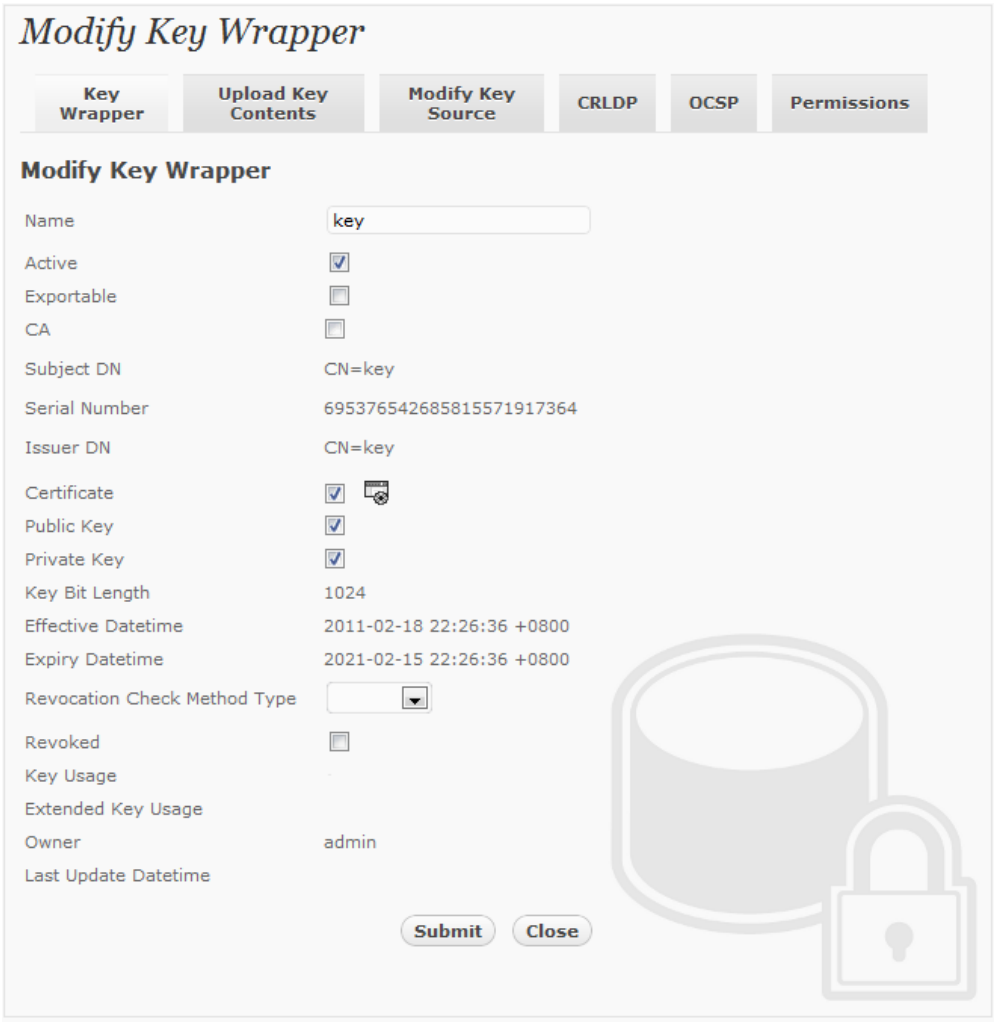
Bloombase StoreSafe

Bloombase StoreSafe delivers on-the-fly encryption security of file-based, block-based, object-based and sequential storage systems. In this interoperability test, NAS file-based encryption is validated with Emulex 40G NICs.



Encryption Key Configuration

Generate encryption key with name ‘key’ in bundled Bloombase KeyCastle key life-cycle management tool.

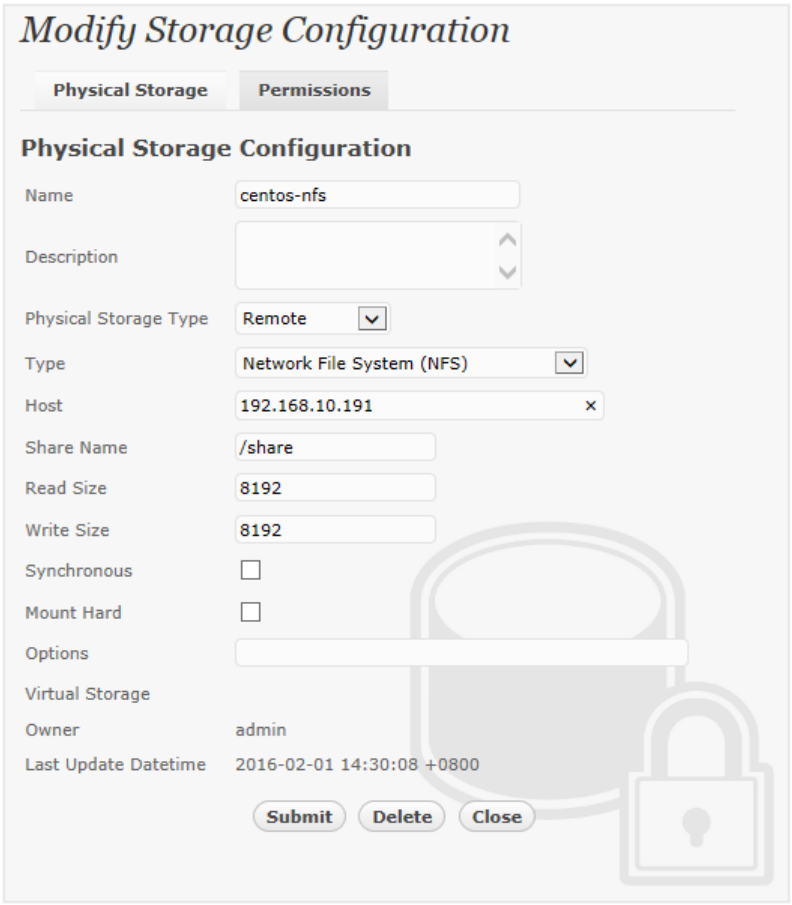


Virtual NAS Configuration

Bloombase StoreSafe file-based virtual storage and physical storage settings are configured as follows.

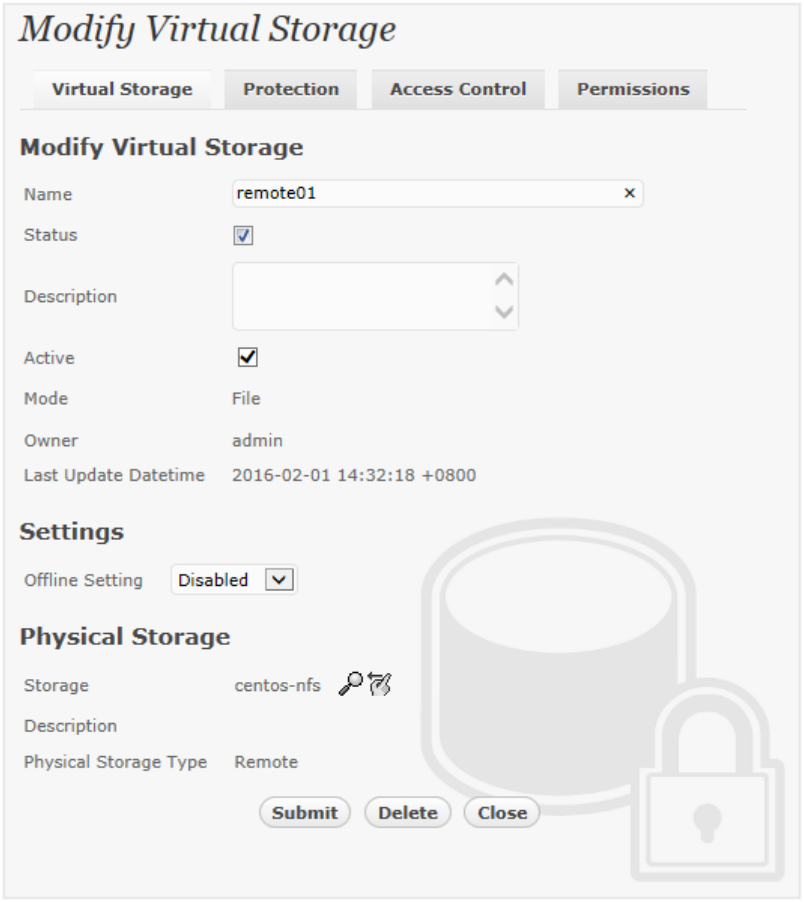
Physical Storage Configuration

Red Hat Enterprise Linux (RHEL) / CentOS NFS file share is provisioned via Bloombase StoreSafe web-based management console.



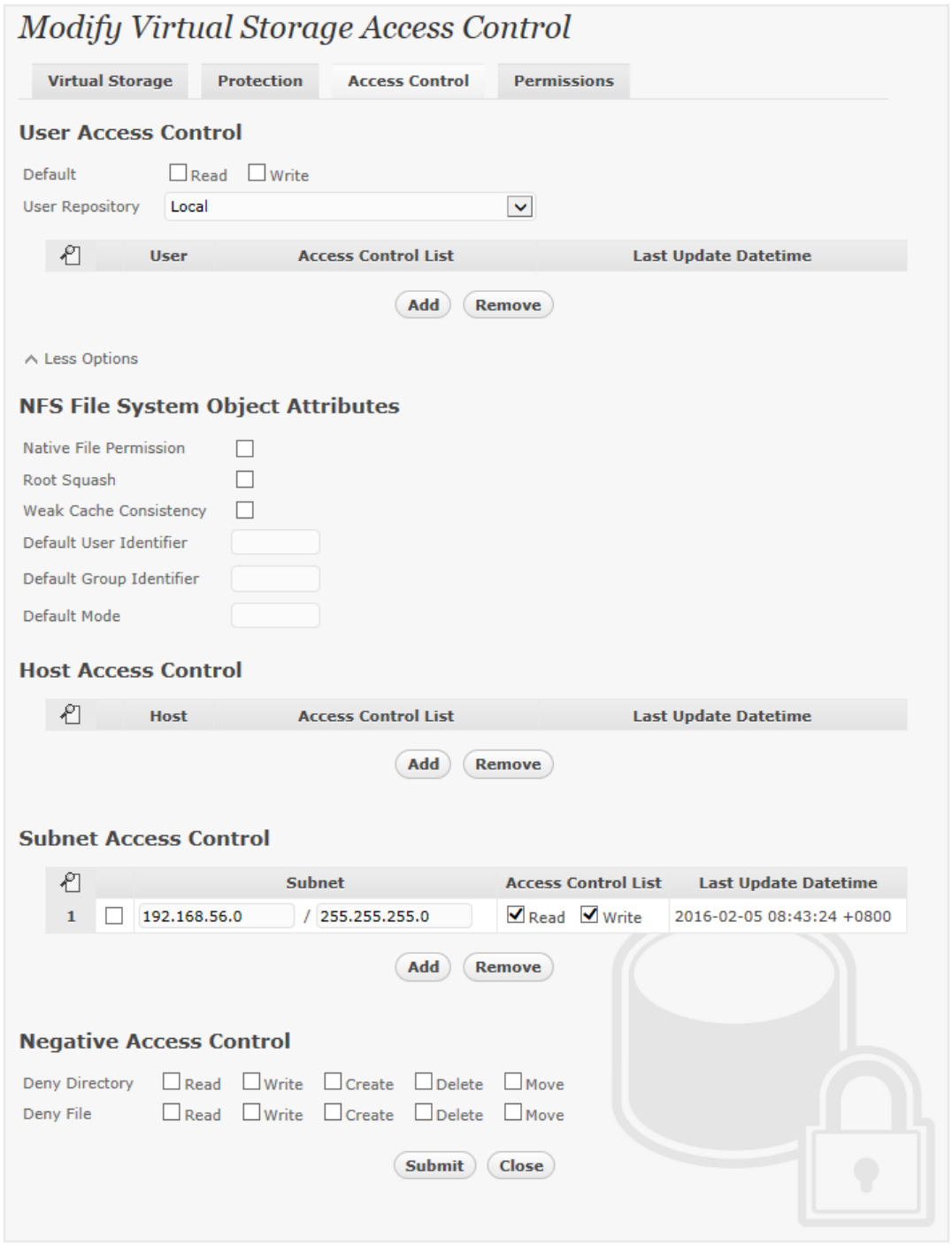
Encrypted Virtual Storage Provisioning

Virtual storage namely ‘remoteo1’ of type ‘File’ is created to virtualize physical storage ‘centos-nfs’ for application transparent bump-in-the-wire encryption protection over NFS protocol on Emulex 40GbE NICs.



Protection type is specified as ‘Privacy’ and secure the NFS share using AES 256-bit encryption with encryption key ‘key’.

Provision authorized subnet to access virtual storage and assign to access control list.



Validation Tests

Test Scenarios

Validation Matrix

Validation tests span across models of Emulex 40G NICs, Bloombase StoreSafe, appliance hardware platform, and client host platform.

Test Condition	Component
Ethernet Adapter	Emulex OCE14401-NX with Avago OC40-SR4-OPT-1
Storage System	Red Hat Enterprise Linux (RHEL) / CentOS on x86-based HPE ProLiant DL380 running NFS server as storage system
Storage Encryption Appliance	Bloombase StoreSafe on x86-based Intel Xeon HPE ProLiant DL380

Client Host Hardware	HPE ProLiant DL380
Client Host Operating System	Red Hat Enterprise Linux (RHEL) / CentOS running NFS client

File System Tests

The following tests are carried out at storage host to access encrypted NAS storage via Emulex powered Bloombase StoreSafe via NFS protocol:

- ext3 for Linux

Test	Description
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

File System Tests

Test	Validation Pass	Remarks
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

Emulex 40G NICs

- Emulex OCE14401-NX

pass all Bloombase interopLab's interoperability tests with Bloombase StoreSafe

Bloombase Product	Client Operating System	Network Interface Card
Bloombase StoreSafe	Red Hat Enterprise Linux / CentOS	Emulex OCE14401-NX with Avago OC40-SR4-OPT-1 transceivers

Acknowledgement

We would like to thank Avago Technologies / Broadcom Limited/ Emulex Corporation for sponsoring and supporting the 40G NICs and transceivers used in the tests of this technical report.

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. Bloombase StoreSafe Technical Specifications, http://www.bloombase.com/content/8936QA88
2. Bloombase StoreSafe Compatibility Matrix, http://www.bloombase.com/content/8396639C
3. Avago / Emulex 40G NICs, http://www.avagotech.com/products/ethernet-connectivity/network-adapters/oce14401-nx