

SOLUTION BRIEF

Dell EMC VxFlex family and CloudLink™: Robust Data at Rest Encryption

Minimal performance tradeoff for applications

Teams responsible for managing large-scale and rapidly growing data center infrastructure constantly have challenge for scalability and flexibility needs. Enterprises are transitioning from the traditional datacenter to a hyperconverged infrastructure (HCI) approach to address these challenges. HCI based offerings give enterprises the ability to support modern workload and provides a simplified solution to manage their infrastructure needs.

Dell EMC provides HCI solution through VxFlex family products that includes VxFlex integrated rack and VxFlex appliance. These industry-leading cloud infrastructure products are powered by software defined storage VxFlex OS and enterprise class server PowerEdge from Dell EMC. The VxFlex family products are designed keeping high performance and scale in mind.

Dell EMC VxFlex OS™ enables organizations to create server-based SANs from local server storage that delivers on-demand performance and capacity. VxFlex OS is a software-defined solution that enables you to transform direct-attached storage (DAS) on existing hardware into shared block storage. It offers considerable scalability and extreme performance with flexible and elastic storage capacity and nodes.

In a modern data center security is paramount but traditional security controls are no longer sufficient for data owners responsible for securing sensitive data regardless of its location. New security solutions, including data encryption, must address privacy, regulatory, and data remanence (residual data) requirements. The solutions must be flexible enough to support various encryption approaches for diverse use cases. In a software defined storage deployment, the best encryption is directly integrated, providing policy-based key management, and flexibility to support the entire datacenter.

Dell EMC CloudLink offers significant benefits of directly integrating with VxFlex. It provides storage infrastructure-level encryption that secures sensitive information within machines and volumes across public, hybrid, and private clouds. Encryption mechanism of CloudLink is completely transparent to the applications deployed on the physical and virtual machines that consume the storage.

This solution brief highlights CloudLink performance evaluation on VxFlex family and recommends best practices to minimize any performance overload.

Contents

- Data at Rest Encryption for SDS
- Performance implications
- Best practices
- Validation environment

VxFlex family

- Flexibility to deploy from either server SAN or two-layer architecture
- Single unified dashboard to perform complex and tedious infrastructure deployment and orchestration



- Linear scalability delivers consistent performance and latency
- Offers unmatched fault tolerance by its unique self-healing architecture
- Real time resource allocation and deallocation without disturbing the existing system

CloudLink features

- Provides infrastructure-level data-at-rest encryption for Dell EMC VxFlex Family
- Unified dashboard for easy deployment of the CloudLink HA cluster
- Manages encryption keys and security policy
- Provides a complete set of REST APIs for encryption management and monitoring
- Leverages FIPS 140 validated OS native encryption tools and RSA BSAFE encryption libraries

CloudLink capabilities

- VM encryption
- Volume level encryption
- Software defined storage encryption
- Self-encrypting drive key management using HBA
- External key management over Key Management Interoperability Protocol (KMIP)

Data at Rest Encryption for SDS

CloudLink provides software-based Data at Rest Encryption (DaRE) for Storage Data Servers (SDS) that is completely transparent to the features and operation of the VxFlex OS. It uses `dm-crypt`, a native Linux encryption package, to secure SDS devices. A proven high-performance volume encryption solution, `dm-crypt` is widely implemented for Linux machines.

CloudLink encrypts the SDS devices with unique keys. Enterprise security administrators can control these keys with CloudLink Center. The CloudLink Center provides centralized, policy-based key release, enabling single-screen security monitoring and management across one or more VxFlex OS deployments, including storage-only, hyperconverged, and those on ESXi.

CloudLink Center also hosts a full set of REST APIs that enable full automation of deployment tasks.

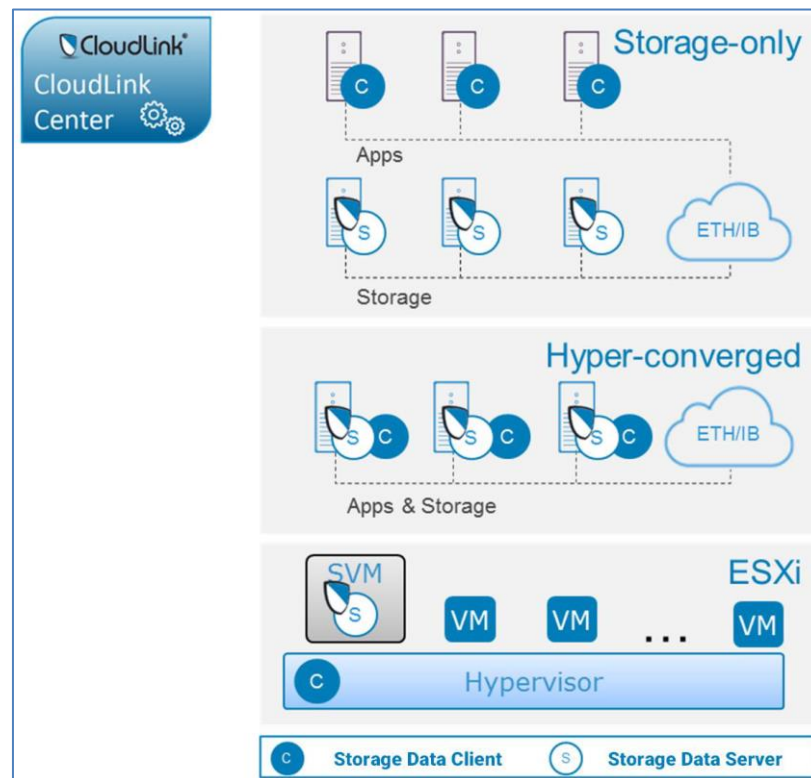


Figure 1. CloudLink encryption for software-defined storage

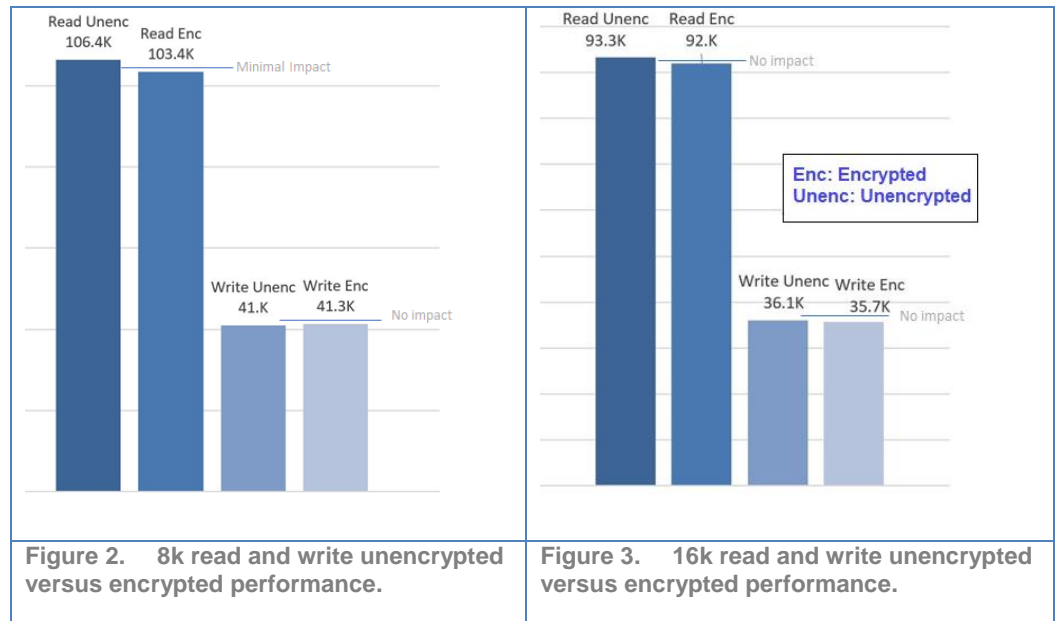
Proving the Value: CloudLink on VxFlex family

No or minimal
performance
impact for
realistic database
transactions.

Performance implications

CloudLink encryption performance was validated by simulating real-time database transactions using predominant 8k and 16k read/write workload. To generate this real-time database transactions, TPC-C like benchmarking simulator was used.

The following graphs depict the performance results before and after enabling CloudLink on VxFlex family:



Based on the validation results, it was observed that for realistic database workload when you enable CloudLink there is very minimal or no impact on read/write performance.

Best practices

Implement the following best practices to minimize the read/write performance impact:

VxFlex OS

- Set mode to high performance

```
"scli --set_performance_parameters --all_sds --all_sdc --  
apply_to_mdm --profile high_performance"
```

- Reserve all memory and ensure all vCPUs are from the same socket.
- Directly access SSD disks using Dell HBA330 card in pass-through mode.

CloudLink benefits

- Provides best-in-class performance
- Avoid risk associated with proprietary encryption
- Provides single data encryption solution across hybrid cloud
- Easy integration with VxFlex OS

VMware Settings

- ESXi IO outstanding to 256 from default 32

```
"for dev in `esxcli storage core device list|grep ^eui`;  
do esxcli storage core device set -d $dev -O 256; done"
```

- Ensure the change persistent on reboot by following code snippet

```
"localcli --plugin-dir /usr/lib/vmware/esxcli/int/ boot  
storage restore --paths"
```

- Set disk scheduler to maximum 64

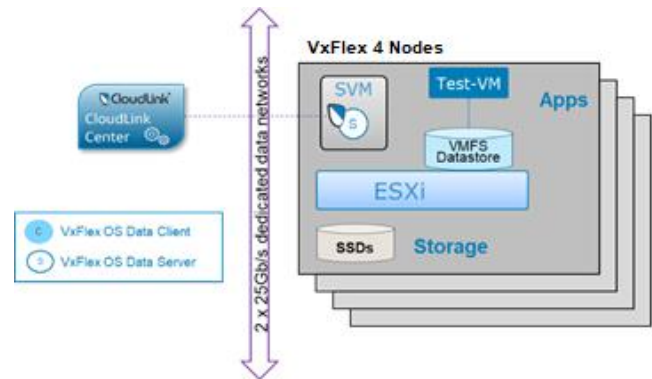
```
"esxcli system settings advanced set -o /Disk/SchedQuantum  
-i 64"
```

Network

- Enable Jumbo frames on data network

Validation environment

- Four VxFlex nodes cluster
- Storage and compute on the same nodes (ESXi nodes)
- SVMs with 12 vCPUs
- 16 SSDs per node to avoid disk bottleneck
- 2 x 25 Gb/s data networks for each node Theoretical maximum network throughput is around 5.6 GB/s per node
- Separate management network to avoid affecting data traffic
- One test VM on each node to generate real-time workload



***Disclaimer:** Real-time database workloads are simulated through FIO tool IO workload using 8k and 16k profiles. Performance results may vary depending on use cases.



The information in this publication is provided "as is". Dell Inc. makes no representations or warranties of any kind with respect to the information in this publication, and specifically disclaims implied warranties of merchantability or fitness for a particular purpose. Use, copying, and distribution of any software described in this publication requires an applicable software license.

Copyright © 2019 Dell Inc. or its subsidiaries. All Rights Reserved. Dell Technologies, Dell, EMC, Dell EMC and other trademarks are trademarks of Dell Inc. or its subsidiaries. Intel, the Intel logo, the Intel Inside logo and Xeon are trademarks of Intel Corporation in the U.S. and/or other countries. Other trademarks may be trademarks of their respective owners. Published in the USA November 2019 Solution Brief.