LightOS for VMware
Performance, Simplicity, Scalability

Lightbits Labs® LightOS® is a software-defined block storage solution offering hyperscale efficiency, performance and flexibility. It delivers composable, high-performance, scale-out and redundant NVMe over TCP (NVMe/TCP) storage that performs like local flash.

Virtualization platforms have changed the way applications consume and manage resources over the last couple of decades. These platforms enable better isolation, security, portability and management of applications in a way that was not possible before. VMware® is a best-of-breed virtualization platform in the market and is a fundamental building block that powers the majority of data-center and cloud deployments all over the world.

LightOS storage for VMware provides a seamless integration via the vCenter® plugin allowing applications and workloads to consume high-performance feature-rich NVMe storage for virtual machines and manage the LightOS cluster.

SIMPLIFIED STORAGE MANAGEMENT FOR VMware ENVIRONMENTS

The migration path from legacy iSCSI based storage area network (SAN) arrays to LightOS modern NVMe/TCP scaleout software-defined storage (SDS) is as simple as triggering storage vMotion™ for your virtual machines. In a single step, admins can migrate existing virtual machines from old SAN protocols to modern high performance NVMe/TCP. Admins can easily interact and monitor LightOS storage clusters directly from vCenter view. Operations such as cluster expansion and LightOS cluster upgrades can be easily and quickly performed with zero disruption directly from vCenter.

LightOS greatly simplifies storage provisioning and storage management by integrating into vCenter and minimizing configuration decisions. With simple and intuitive vCenter plugin the vSphere admin can easily provision VMFS datastores powered by NVMe/TCP volumes, control volume policies such as availability, protection, data-reduction and QoS. LightOS software upgrade is fully managed, quick, online with no disruption and easily triggered from the vCenter. LightOS lets you interact and monitor your storage cluster and perform operations directly from the main vCenter view.
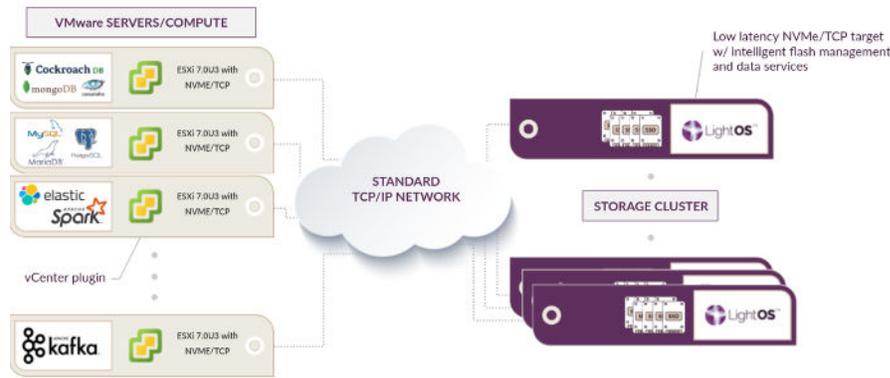
APPLICATION PORTABILITY

Virtual machines can't rely on special hardware to ensure portability. LightOS volumes can be easily attached to ESXi hosts without requiring special hardware or protocols. While some NVMe-oF implementations require RDMA via the RoCE protocol, requiring specialized network interface cards (NICs) and often special drivers. NVMe/TCP is natively supported with ESXi 7.0U3 and readily available. NVMe/TCP works on any Ethernet NIC. Thus you have complete portability in your server infrastructure as there are no special requirements for NIC drivers, block drivers or special NICs and you enjoy standard interfaces with off-the-shelf components.

WHY LIGHTBITS?

Cloud-native storage for VMware. Simplify high performance, scalable and highly available storage while lowering cost.

Overview of a VMware deployment utilizing LightOS NVMe/TCP targets for VM storage

APPLICATION ACCELERATION

The number of stateful applications deployed as virtual machines is growing every day. vSphere requires a scalable, low latency and high performance persistent storage to host such virtual machines efficiently. Most of the popular stateful applications call for local SSDs, with NVMe highly recommended when deployed on bare metal:

MySQL • PostgreSQL • MariaDB • MongoDB • Redis • Apache Cassandra • Splunk • Apache Kafka • Apache Spark

As described above, utilizing local SSDs for the virtual machine datastore functionality would meet the performance requirements of these applications but would break VM/application portability. Lots of storage solutions offer disaggregated storage but not anywhere near local flash performance.

LightOS storage performs near local NVMe flash. ESXi hosts with 25Gbps Ethernet ports or faster, LightOS volumes may even outperform a single local NVMe drive. This is due to the relatively low write performance of NVMe drives compared to their read performance as well as a reduction in contention for resources if multiple virtual-machines were utilizing different partitions on the same NVMe drive.

Thus, with LightOS volumes in your VMware environment, applications whose best practices call for local NVMe flash can get the same performance yet maintain the portability associated with virtual machines. A single LightOs cluster can deliver over 40M IOPS (random Read) and 10PB user capacity, with less than 200µs latency.

ENTERPRISE-CLASS AVAILABILITY AND EFFICIENCY

vSphere virtualization platform is designed to make applications portable, available and consistent by freeing applications from server awareness. Applications can move between servers, data centers and environments. They can scale up or down, or be started elsewhere if a server fails. Applications that perform their own data protection via replication, that takes CPU and network resources and are often not flash-aware. With such an application running on top of VMware, a local drive failure may result in a full data rebuild. This can have a long and detrimental effect on the network and the application service itself.

LightOS makes storage continuously available with SSD level Elastic RAID and volume level synchronous replication across user-defined failure domains with no single-point of failure. vSphere administrators do not need to worry about cumbersome cluster layout, capacity or load balancing. LightOS seamlessly and automatically handles all these complex operations, providing a single-click experience for provisioning volumes. The outcome is no service disruption, application recovery takes much less time and does not impact network performance or burden application services with additional load.

Increased uptime
Increased utilization

Higher Performance
Increased Utilization

In the case of a ESXi host failure, VMs will move to alternate servers with shared NVMe/TCP backed datastores and the applications will only need to synchronize changes that were missed while the VM was offline.

LightOS provides volume policies to address data-reduction, QoS and data protection schemes with space-efficient snapshots and clones for NVMe/TCP mounted datastores. The vSphere admin can intuitively perform backup schedules with a well-defined retention policy.

LOWERING TOTAL COST OF OWNERSHIP (TCO)

LightOS lowers your total cost of ownership both for the initial purchase, as well as over time with greater operational efficiency. VMware environments utilizing local NVMe are often only 15-25% utilized. When moving to a LightOS NVMe/TCP volumes storage service there are vast improvements in capacity and performance utilization. This means less money is spent on NVMe flash while providing a more operationally efficient VMware environment.

RICH DATA SERVICES

Lower TCO is not only achieved by improving capacity and performance utilization. LightOS offers rich data services that are not generally associated with NVMe storage, at NVMe performance latencies. All LightOS persistent volumes are thin provisioned and when combined with compression support (that can be enabled/disabled on a per-volume basis), LightOS can achieve total data reduction levels as high as 10:1 in service provider and private cloud environments. Additionally, thin snapshots and clones allow for DevOps functionality in dynamic environments by making development datastores/databases instantly available with the same performance as the datastores/databases they were cloned from.

LightOS makes QLC flash viable in a VMware service environment

ENABLING QLC FLASH

QLC flash is inexpensive, but often not suitable for use in ESXi hosts where the write pattern is unpredictable.
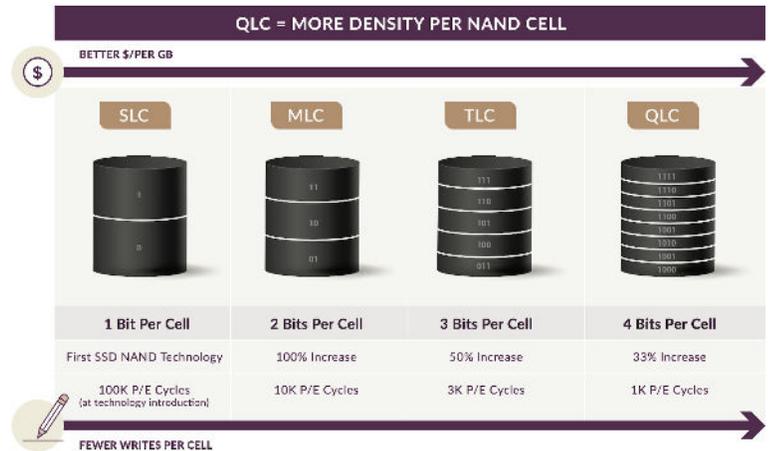
LightOS Intelligent flash management layer converts all the unpredictable write patterns to QLC flash-friendly wide sequential writes. Improving your QLC endurace up to 20x as well as performance and latency.
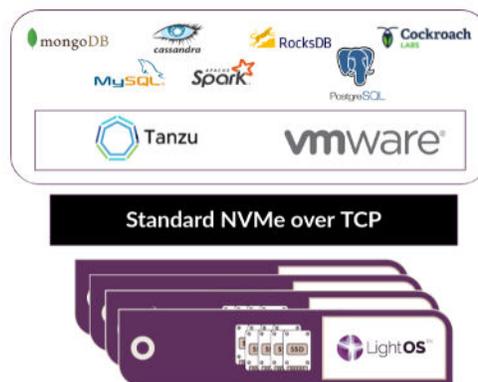
DEPLOYING NVMe/TCP ON ESXi SERVERS

Lightbits Labs developed NVMe/TCP and contributed it to the upstream kernel so it's open source and part of the standard Linux kernel since kernel 5.0.

Lightbits worked with VMware as a design partner to enable NVMe/TCP support in ESXi 7.0U3. Many enterprises rely on VMware robust support matrix to adopt new technologies in a simple and consistent way.

Now enterprises can leverage increased performance, lower latency, increased scalability and availability by simply upgrading to the latest generally available ESXi 7.0U3 with in-box support for NVMe/TCP and deploying LightOS NVMe/TCP based scaleout SDS solution. VMware clusters can now use NVMe/TCP on the same network infrastructure and get up to 4x more IOPs and 1/6 the latency for small block operations. NVMe/TCP utilizes the same network cards and infrastructure that might be used by protocols like iSCSI. Network switches don't require any special settings for the NVMe/TCP storage protocol. The LightOS NVMe/TCP target software is a set of software packages applied to a base Linux distribution. It's a target-side only solution that works with the networking hardware and practices already in place in the data center.

LightOS connected via NVMe/TCP to VMware, and Kubernetes

DEPLOYING LightOS NVMe/TCP CLUSTER FOR VMware

SOFTWARE-DEFINED STORAGE

LightOS software is licensed per storage server on an annual subscription basis. It runs on x86 servers and utilizes standard Ethernet cards and NVMe drives. In general, the minimum CPU requirement is 10 cores. Storage servers, in general, should use 100Gbps Ethernet interfaces with each interface capable of supporting up to 8-10 GB/s of storage bandwidth, largely depending on the number of CPU cores. Lightbits Labs is happy to provide reference platform guides and/or consulting on the right server configuration tailored to workload requirements.

DEPLOYMENT READY APPLIANCES

For those that value convenience in a heavily tested and optimized platform, LightOS is available as a SuperSSD appliance. This 2U, 24 drive platform comes in various pre-configured capacities with software and hardware support. This is the fastest and easiest way to get LightOS deployed and is backed by world-wide warranty and support services.

WHY LightOS FOR VMware

With the 7.0U3 release of ESXi by VMware, users can now adopt NVMe-oF with standard TCP/IP in a simple and frictionless way and at the same time enjoy increased performance, lower latency and improved efficiency. LightOS is the leading solution in the NVMe/TCP space, offering a scaleout SDS solution focused on high-performance, data availability and protection, enterprise features and now compatible with ESXi and integrated into your VMware environment.

LightOS meets the requirements to be the best high performance storage solution for VMware. It supercharges your applications running in virtual machines while increasing reliability and flexibility by providing:

- Near local flash performance with greater utilization of your storage investment
- Improved service levels and a better user experience with consistent latency
- Faster rebuild time with higher resiliency levels
- Standard, simple, secure storage access to any of your ESXi hosts
- No changes to your TCP/IP network with no proprietary ESXi drivers
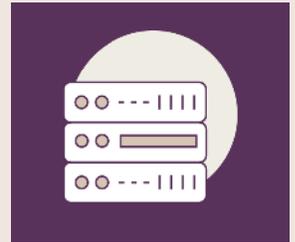- Standard-compliant discovery service

Finally, you can separate storage from compute without all the drama, and at lower cost.

THE POWER OF CHOICE

Select the x86 server platform hardware and NVMe drives from a vendor of choice

SuperSSD™ makes deployment easy with full hardware and software support

FIND OUT MORE

To learn more, please visit our website, www.lightbitslabs.com
To contact our team, email us at info@lightbitslabs.com