Excelero

HIGH-PERFORMANCE AND LOW-LATENCY STORAGE FOR OPENSTACK

CASE STUDY

teutoStack

INTRODUCTION

OpenStack deployments are surging as Service Providers and Enterprises are increasingly implementing Multi-Cloud strategies. New workloads such as machine learning and artificial intelligence are creating new opportunities for service providers but also bring unseen performance requirements for OpenStack Clouds. teuto.net, a leading service provider in Germany, chose Excelero's NVMesh™ Server SAN along with Mellanox SN2100 switches to enable exceptional performance and low latency for their OpenStack-based DBaaS and Virtual Machine offerings.
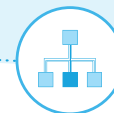
OPENSTACK ON THE RISE

OpenStack was first introduced in 2010 as a free and open source software platform for cloud computing. The software enables service providers to compete with Amazon Web Services and gave enterprises alternatives to private cloud solutions such as VMware. After an initial slow start, OpenStack deployments are now surging, especially as Enterprises are increasingly implementing Multi-Cloud strategies. A game changer in the success of OpenStack was also the fact that all major Linux distributors are now also offering OpenStack distributions, complete with support and services, which heavily reduced the effort and risk for customers wanting to deploy OpenStack.

After researching NVMe over Fabrics (NVMf) options, teuto.net tried iscsi appliance-based storage solutions, then vetoed it as limiting seamless growth and increasing costs – as well as vetoing Dell EMC ScaleIO which didn't support NVMf and was costly.

OPENSTACK (BLOCK) STORAGE OPTIONS

OpenStack is essentially a software layer that enables customers to deploy, control and manage large pools of compute, networking and storage resources throughout a datacenter. For storage, OpenStack supports object, file and block storage protocols, respectively through the OpenStack Storage services Swift, Manila and Cinder.

There are numerous storage systems on the market that support the various OpenStack storage protocols. A popular storage solution for OpenStack is Ceph, which uses an object storage mechanism for data storage and exposes the data through object, file and block interfaces. The ability to use one storage platform for all on commodity hardware makes Ceph very attractive. But the versatility of the platform also has its cost: the layered architecture has a big impact on the performance and makes the solution less attractive for new workloads such as real-time analytics, machine learning and artificial intelligence, where performance and low latency is the highest priority.

Block storage is implemented in OpenStack by the block storage service (Cinder), which supports multiple back-ends in the form of drivers: a customer's choice of storage system must be supported by a block storage driver. Excelero's NVMesh features a Cinder block storage driver that was designed to provide low-latency access to distributed, high-performance NVMe flash storage. Thanks to its unique RDDA technology and client-side architecture, NVMesh enables 10 times lower IO latency and 20 times higher IOPs performance than Ceph.

"By moving to Excelero and Mellanox for our teutoStack public cloud offering, we achieved stunning performance with an all-Linux implementation that is streamlined, resilient and automated. More importantly, we're positioned to capture growth areas such as analytics, machine learning and AI where demanding databases require storage to match."

Burkhard Noltensmeier, CEO at teuto.net

teutoStack chooses NVMesh for DBaaS

teuto.net, a German Service Provider that leads through innovation, has a popular OpenStack offering – teutoStack – that combines public and private cloud as well as hosted Kubernetes (containers). Customers choose teutoStack for a variety of workloads. The company is seeing a lot of growth potential in areas such as analytics, machine learning and AI where demanding databases require storage to match.

Ceph's performance lagged. Therefore, teuto.net had to look for an alternative solution. After investigating several options, teuto.net eventually selected NVMesh for its low-latency, high performance block storage tier. Besides its unique RDMA-based NVMe sharing technology, which lets applications enjoy the full performance of underlying storage without adding latency, teuto.net particularly liked the software-only, hardware-agnostic approach. Excelero's partnerships with teuto.net's long-time system integrator Boston Limited and network technology provider Mellanox made the implementation even more straightforward.
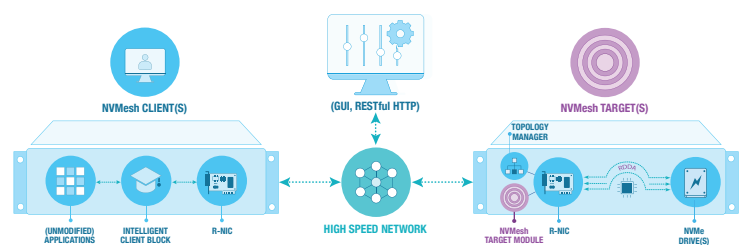
teutoStack Cloud runs NVMesh on SuperMicro servers from Boston Limited along with Mellanox ConnectX-4 and ConnectX-5 NICs running 2x25Gb Ethernet to each client node. It uses OpenStack Cinder to manage storage through the NVMesh Cinder driver. With both Mellanox' and Excelero's support for Ubuntu, teuto.net enjoys an all-Linux implementation for easy integrated orchestration and monitoring.

PERFORMANCE TEST RESULTS

During initial testing, which investigated NVMesh performance for virtual machines, the combined NVMesh/Mellanox solution delivered 8,000 iOPS per VM, compared to 400 iOPS with Ceph, such that **teuto.net now recommends its NVMesh-based teutoStack Cloud for customers** with demanding private cloud OpenStack requirements. Also, due to its layered architecture, Ceph typically runs at higher latency of up to 2,5 milliseconds, which further reduces IOPs performance. Excelero's NVMesh achieved 10 time lower IO Latency, around 250 microseconds, through all layers up the virtual machine.

teuto.net deployed Excelero's NVMesh™ Server SAN along with Mellanox SN2100 switches to enable exceptional performance with low-latency block storage in its teutoStack Cloud. **teuto.net achieved 1000% lower latency and 2,000% higher IOPs with NVMesh** compared to Ceph while avoiding costly, less scalable appliances and proprietary vendor solutions.

NVMesh®

With Excelero's NVMesh, OpenStack providers can enjoy all the benefits of NVMe in a distributed fashion while meeting all their storage requirements. NVMesh is a Software-Defined Storage platform that enables customers to design scale-out block storage infrastructures for the most demanding OpenStack applications, such as databases and virtual machines. NVMesh supports legacy enterprise SQL databases, but also more modern NoSQL and distributed database platforms.

NVMesh features Elastic NVMe, a distributed block layer that allows any OpenStack application to utilize pooled NVMe storage devices across a network at local speeds and latencies. Distributed NVMe storage resources are pooled with the ability to create arbitrary, dynamic block volumes that can be utilized by any host running the NVMesh block client. These virtual volumes can be striped, mirrored or both while enjoying centralized management, monitoring and administration. In short, applications can enjoy the latency, throughput and IOPS of a local NVMe device while at the same time getting the benefits of centralized, redundant storage.

NVMesh provides the ability to attach volumes ubiquitously, enabling users to mount databases or boot virtual machines on any server at any time. NVMesh is deployed as a virtual, distributed non-volatile array and supports both converged and disaggregated architectures, giving customers full freedom in their architectural design.

NVMesh® BENEFITS

SCALE & PERFORMANCE

- Leverage full NVMe performance at scale, without adding network latency
- Predictable application performance – ensure that storage is not a bottleneck
- Scale your performance and capacity linearly

EFFICIENCY

- Maximize the utilization of your NVMe flash devices
- Choose hardware from any server, storage and network vendor
- Easy to manage & monitor, reduces the maintenance TCO
- Balance CPU and storage resources

FLEXIBILITY

- Choice of architecture: converged, disaggregated or mixed
- Mix different storage media types to optimize for cost, scale or performance
- Scale storage and compute separately, as needed

ABOUT EXCELERO

Excelero enables enterprises and service providers to design scale-out storage infrastructures leveraging standard servers and high-performance flash storage. Founded in 2014 by a team of storage veterans and inspired by the tech giants' shared-nothing architectures for web-scale applications, the company has designed a software-defined block storage solution that meets performance and scalability requirements of the largest web-scale and enterprise applications.

With Excelero's NVMesh, customers can build distributed, high-performance server SAN for mixed application workloads. Customers benefit from the performance of local flash, with the convenience of centralized storage while avoiding proprietary hardware lock-in and reducing the overall storage TCO. The solution has been deployed for hyper-scale Industrial IoT services, machine learning applications and massive-scale simulation visualization.