

# Performance Benefits of NVMe™ over Fibre Channel vs Traditional FCP for Oracle Database

NVMe™ over Fibre Channel delivered higher transactions per minute and completed the work in less time than SCSI FCP for the Oracle Database workloads.



## Executive Summary

NetApp's ONTAP 9.4 is the first generally available enterprise storage offering enabling a complete **NVMe™ over Fibre Channel (NVMe/FC)** solution. NVMe/FC solutions are based on the recent T11/INCITS committee **FC-NVMe** block storage standard, which specifies how to extend the NVMe command set over Fibre Channel in accordance with the NVMe over Fabrics™ (NVMe-oF™) guidelines produced by the NVMe Express™ organization.

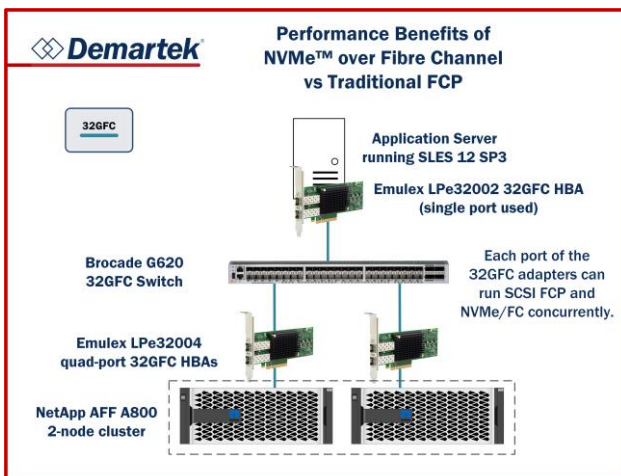
## Why Move to NVMe over Fibre Channel?

The vast majority of enterprise datacenters use Fibre Channel SANs to store mission-critical data. Many of the customers running these datacenters already have the hardware necessary to run NVMe/FC, including Fibre Channel switches, adapters and storage. With this solution from NetApp and Broadcom, moving to NVMe/FC with this existing hardware requires only a software upgrade on the host initiators and the storage targets.

For this test report, Demartek worked with the Emulex Division of Broadcom to demonstrate the benefits of NVMe over Fibre Channel on the NetApp AFF A800, Emulex Gen 6 Fibre Channel Adapters, and Brocade Gen 6 Fibre Channel SAN switches **using real-world applications**.

## Key Findings and Conclusions

- > **NVMe/FC accelerates existing workloads:** Enterprise applications such as Oracle Database, SAP HANA, Microsoft SQL Server and others can immediately take advantage of NVMe/FC performance benefits.
- > **Test results (OLTP):** We observed **11% higher** transactions per minute using NVMe/FC for the Oracle database.
- > **Test results (Data Warehousing):** We observed that using NVMe/FC allowed the fixed amount of work to **complete in ¾ the time** compared to traditional Fibre Channel protocol for the Oracle database.
- > **NVMe/FC is easy to adopt:** All of the performance gains we observed were made possible by a software upgrade.
- > **NVMe/FC protects your investment:** The benefits we observed were with existing hardware that supports 32GFC.

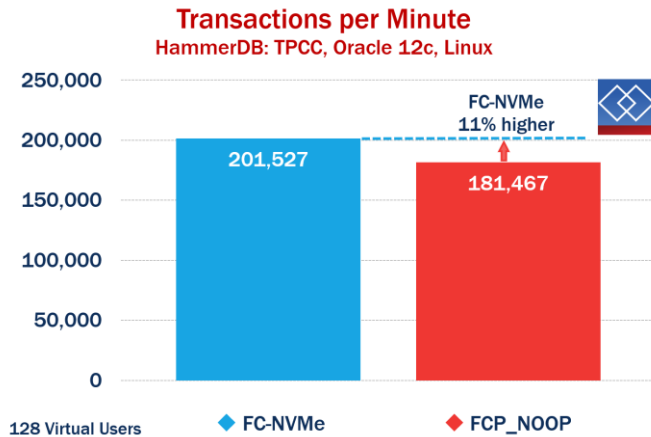


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## Performance Results for Oracle Database

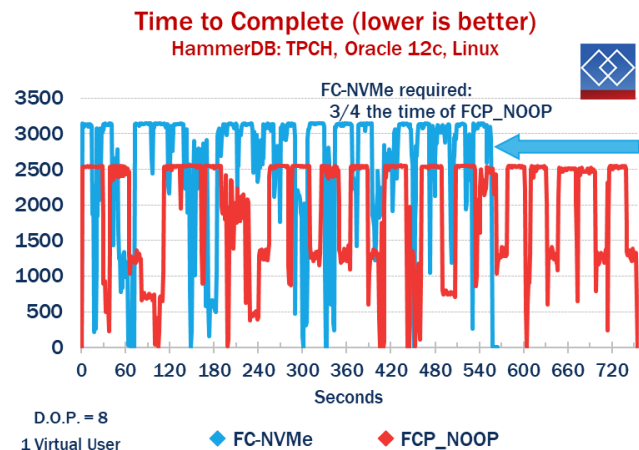
### OLTP (“TPC-C like”) Workload

For an OLTP workload similar to TPC-C, we found that using the FC-NVMe protocol achieved **11% higher transactions per minute** than traditional Fibre Channel running on Linux using the optimal “NOOP” scheduler.



### Data Warehousing (“TPC-H like”) Workload

For a data warehousing workload similar to TPC-H, we found that when using FC-NVMe the fixed workload **completed in 3/4 of the time** compared to traditional Fibre Channel running on Linux using the optimal “NOOP” scheduler.



## Summary and Conclusion

NVMe/FC leverages the parallelism and performance benefits of NVMe with the robust, reliable enterprise-grade storage area network technology of Fibre Channel.

For the configuration tested, only a software upgrade was required in the host initiators and storage targets. This means that investments already made in Fibre Channel technology can be adopted easily without requiring the purchase of new hardware.

The optimal “NOOP” scheduler is described at <https://www.suse.com/c/sles-1112-os-tuning-optimisation-guide-part-1/>

The most current version of this report is available at [https://demartek.principledtechnologies.com/Demartek Broadcom Emulex NVMe over Fibre Channel Database Evaluation 2018-10.html](https://demartek.principledtechnologies.com/Demartek_Broadcom_Emulex_NVMe_over_Fibre_Channel_Database_Evaluation_2018-10.html) on the Demartek website.

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