Lenovo Database Configuration

for SQL Server 2019 on ThinkSystem SR650 with Persistent Memory

Reduce time to value with pretested hardware configurations

Driving data center efficiency

Starting with SQL Server 2017 Microsoft has supported running SQL Server on Linux OS in addition to the Windows Server OS. Microsoft SQL Server can now be deployed on the following Linux OS platforms: Red Hat Enterprise Linux (RHEL), SUSE Linux Enterprise Server and Ubuntu Server. Business may also deploy SQL Server within a Docker container. This means it is now possible to run Microsoft SQL Server on Linux, Mac or Windows platforms.

With the release of SQL Server 2019 on Linux, Microsoft has introduced support for persistent memory (PMEM) when it is deployed on support on any of the three Linux operation systems . This is an exciting development, as previous versions of SQL Server on Linux didn't support PMEM. SQL Server 2016 introduced support for Non-Volatile DIMMs and an optimization capability knows as Tail of the Log Caching on NVDIMM. Details of tail of log can be found at this link. These earlier enhancements leveraged Windows Server direct access to a persistent memory device in DAX mode to reduce the number of operations needed to harden a log buffer to enable persistent storage.

Microsoft SQL Server 2019 extends the support for PMEM devices to Linux, providing full enlightenment of data and transaction logs which may now be stored on PMEM. Enlightenment is a way to access the PMEM device using efficient user-space memcpy operations. To reduce latency, rather than going through the file system and storage stack, SQL Server leverages DAX support on Linux to place data directly into the PMEM device. For the solution in this document, Lenovo ThinkSystem Intel Optane DCPMM was used in App Direct mode.

Standard database solutions with faster time-to-value

Microsoft SQL Server OLTP on Linux for Lenovo database solution offerings are methodically tested and tuned to save you months of configuration, setup, testing, and tuning. With this offering from Lenovo, business can now achieve the following:

- Buy all the hardware and software you need from only one vendor including servers, storage & networking
- Obtain pre-optimized systems, tuned and tested with SQL Server 2019 on Red Hat Enterprise Linux 7.6 so you can deploy with confidence for your demanding transactional database performance needs
- Run mission critical transactional workloads with small random IOPs and low latency requirements

Highlights

- Reduce time to value with pretested and certified hardware configurations
- SQL Server on Linux is provides the latest features like Always On, High Availability, Disaster recovery
- Containers are compact and highly portable programs which don't have any external dependencies
- Reduce TCO through better performance, rapid deployment and advanced hardware
- Optimize performance with pretested ThinkSystem SR650 hardware configurations

Intel® Xeon® Processor

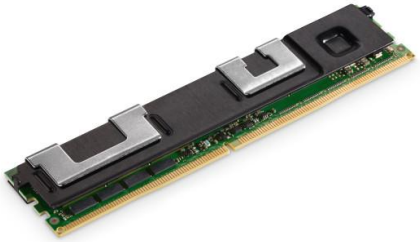
MICROSOFT SQL SERVER 2019 ON LINUX

SQL Server 2019 runs on Linux. It's the same SQL Server database engine, with many similar features and services regardless of your operating system. SQL Server 2019 builds on previous releases to grow SQL Server as a platform that gives you choices of development languages, data types, on-premises or cloud environments, and operating systems.

The SQL Server 2019 database engine includes performance and scale improvements in diverse areas of functionality. Support for Persistent Memory (PMEM) devices is improved in this release. When deployed on a server configured with PMEM, any SQL Server file that is placed on a PMEM device operates in enlightened mode. SQL Server directly accesses the device, bypassing the storage stack of the operating system. In this operating configuration, PMEM is considered storage class memory (SCM).

Another new feature in Microsoft SQL Server 2019 is support for a hybrid buffer pool. This feature of the SQL Server Database Engine enables a database to be directly accessed when required pages sitting on a database file are placed on a persistent memory (PMEM) device.

Also included in Microsoft SQL Server 2019 are several features to improve the performance of columnstore indexes, such as automated columnstore index maintenance, improved columnstore metadata memory management, a low-memory load path for columnstore tables, and improved performance for bulk loading to columnstore indexes. Additionally, the server startup boot time has also been reduced for databases that use in-memory columnstore tables for hybrid transactional and analytical processing (HTAP).



This configuration features the following main components:

- **Server**: Lenovo ThinkSystem SR650
- **Processor**: 2x Intel(R) Xeon(R) Gold 6230 CPU @ 2.10GHz
- **Memory**:
- 384 GB TRUDDR4 memory,
- 1.5TB Intel Optane DCPMM
- **Storage:**
- 8x P4510 1.92TB NVMe U.2 SSDs for data and tempdb files
- 4x 800GB mainstreeam SAS SSDs for log (RAID 1)
- **OS Storage**: 2x 480GB M.2 SATA SSDs for the operating system (RAID 1)
- **Software**:
  - Red Hat Enterprise Linux 7.6 version
  - Microsoft SQL Server 2019 Standard Edition for Linux

Intel™ DCPMM is based on **Intel® Optane™ Memory** technology and provides the ability to keep more data, closer to the CPU for faster processing (or that is, "warmer"). **DCPMM** is designed for use with the Second-Generation **Intel®** Xeon® Scalable Platform processors code-named Cascade Lake

Intel Optane™ DC persistent memory (PMEM) employed by the SR650 in this solution represents a new class of memory and storage technology explicitly architected for data center usage.

Cost effective Microsoft SQL Server 2019 Standard Edition on Linux solution with ThinkSystem SR650 server and Intel DCPMM from Lenovo

Microsoft SQL Server on Linux

- When Microsoft SQL Server is deployed on Linux now has application and database compatibility with Windows. Backup a database on Windows and restore it on Linux with no application changes. SQL Server 2019 continues the Linux journey by offering new capabilities such as Replication, Distributed Transactions, Polybase, and Machine Learning Services.
- Businesses now see the benefit of using Microsoft SQL Server with PMEM in production. SQL Server 2019 embraces this need by offering performance enhancements on Linux.

Why Lenovo?

Lenovo is a leading provider of x86 servers for the data center. Featuring rack, tower, blade, dense and converged systems, the Lenovo server portfolio provides excellent performance, reliability and security. Lenovo also offers a full range of networking, storage, software, solutions, and comprehensive services supporting business needs throughout the IT lifecycle. With options for planning, deployment, and support, Lenovo offers expertise and services needed to deliver better service-level agreements and generate greater end-user satisfaction.

For More Information

To learn more about this Lenovo Database Configuration for Microsoft SQL Server on Red Hat Linux 7.6, contact your Lenovo Business Partner or visit:
www.lenovo.com/systems/solutions

References:
Installation guidance for SQL Server on Linux:
https://docs.microsoft.com/en-us/sql/linux/sql-server-linux-setup?view=sql-server-ver15

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Key benefits of investing in a Microsoft SQL Server on Linux Solution from Lenovo include:

- Simplified evaluation.
- Fast and easy deployment. With pre-defined settings and rigorous system-wide tuning, SQL on Linux Solutions are designed to increase efficiency in IT's testing process, speed time to service delivery, and increase confidence in solution performance.
- Workload-optimized performance.

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