

# Lenovo Database Configuration

for Microsoft SQL Server Standard Edition DWFT – 9TB

**Reduce time to value with pretested hardware configurations**

## Data Warehouse problem and a solution

The rapid growth of technology means that the amount of available data and the ability to collect that data increased to a level unthinkable as little as five years ago. As the volume and velocity of data increased, however, extracting meaningful insight in a timely manner became more complex. Therefore, opportunities are being missed and effort is being wasted. To compete, businesses in the 21st century are demanding the tools to derive true value from their data.

This Microsoft Data Warehouse Fast Track (DWFT) configuration for SQL Server 2017 Standard Edition improves time-to-value for data warehousing needs with a new scalable architecture. This is a cost effective solution in the Lenovo portfolio using the 1U Lenovo ThinkSystem SR630 server combined with Lenovo SATA SSDs to solve SQL data warehouse needs up to 9 TB in size.

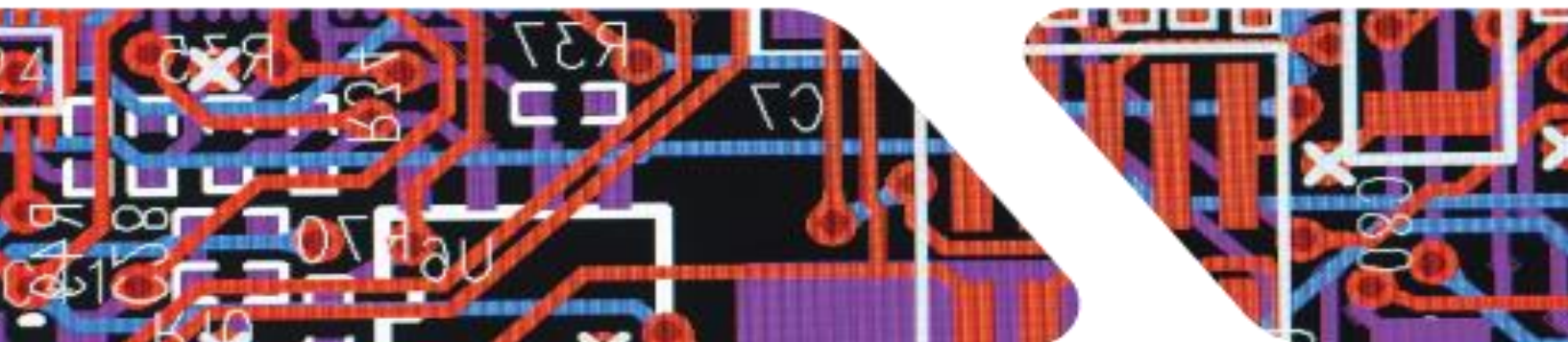
## Enterprise data warehouse with faster time-to-value

DWFT for SQL Server 2017 for Lenovo solution offerings are methodically tested and tuned to save you months of configuration, setup, testing, and tuning. With these offerings from Lenovo, you can now complete the following tasks:

- Buy all the hardware that you need from only one vendor including servers, storage, and networking
- Pre-optimized system tuned and tested with Microsoft certification and deploy with confidence for your demanding data warehouse performance needs
- Select from different levels of performance, scalability, and price to suit your business needs
- Run targeted query workloads patterned for large sequential data sets rather than small random transactions
- Eliminate bottlenecks with optimized rapid data reads and query aggregations

## Highlights

- Reduce time to value with pretested hardware configurations
- Microsoft Certified solution with detailed performance data
- Reduce TCO through better performance, rapid deployment and advanced hardware
- Optimize cost and performance with pretested ThinkSystem SR630 configurations and SQL Server Standard Edition – You can cut costs to 1/4<sup>th</sup> of other solutions using SQL Server Enterprise Edition.
- Consolidate storage and match IT investment-to-information-value with Lenovo NVMe Enterprise Mainstream Flash Adapters



# MICROSOFT SQL SERVER 2017

With Microsoft® SQL Server 2017, several features which were only available in Enterprise edition have now been made available in Standard Edition. There are significant improvements in data warehousing technologies and performance, including column-store features as well as many other improvements. Column-store indices offer great advantages over traditional row stores for analytics and data warehousing queries. They are ideally suited for the star schemas, and tables with billions of rows which are commonly seen. Among advantages for analytics are:

- Up to 10X compression in data size - Data warehouses are very large by nature, and the compression offered by column store index technologies offers both space and cost savings, but also significantly increased performance, due to the dramatically reduced IO requirements given by the compression, coupled by the ability to only scan the specific columns required by each query. Compression also reduces the amount of memory required to hold a given number of rows from the source data warehouse.

- Additional Indices – Microsoft SQL Server 2017 adds the capability to add additional (B-Tree) indices to column store-based tables, which enables efficient single-row lookup.

In addition to these architectural features, query processing in column-store indices is further optimized in the following ways:

- Operator Pushdown - Pushdown refers to moving both filter and aggregation query operations closer to the data, so that many of the filters and calculations can be done in the scan operators, dramatically reducing the volume of data which needs to be handled further on in query processing.
- Batch Mode Processing – Microsoft SQL Server 2017 includes enhancements in batch-mode processing which processes many rows at a time rather than serially doing calculations on each individual row. These batch operations are further optimized by leveraging Single Instruction Multiple Data (SIMD) vector processing CPU instructions in the Intel® architectures.

This configuration features the following main components:

- Server: Lenovo ThinkSystem SR650
- Processor: Intel Xeon Gold 6142 16C 140W 2.6GHz
- Memory: 128 GB of TRUDDR4 memory
- Storage: Eight Entry level SATA 480GB SSDs for data and tempdb
- OS Storage: Two 128GB M.2 SATA SSDs for the operating system (RAID 1)
- Logging: Two 800 GB SAS SSDs for log (RAID 10)
- Software:
- Microsoft Windows Server 2016 Standard Edition
- Microsoft SQL Server 2017 Standard Edition

This data warehouse solution with [Microsoft SQL Server 2017 Standard Edition](#) features the Lenovo Entry level SATA SSDs. These SSDs help build a cost effective solution which still pack quite a performance punch.



**High Performance at low cost with Lenovo ThinkSystem SR630 servers and Lenovo PM863a Enterprise Entry SATA SSDs**

## Best practices for Data Warehouse Fast Track

For a balanced and optimized Data Warehouse configuration:

- Configure UEFI settings to set Operating mode to Maximum performance.
- Configure high availability for the OS with 2-disk Raid-1.
- Configure high availability for the log drive with 2-disk Raid-1 or Raid-10 with more disks based on performance needs.
- Data files and tempdb can be on Raid 0 drives. Spread data and tempdb files evenly across all data drives for even performance.
- Configure more than one tempdb files; at least one file per data drive.
- Enable lock pages in memory option using Windows Group policy tool to prevent paging of data.
- If the server is dedicated to data warehousing:
  - Set processor affinity for SQL Server to use all the processors in the system.
  - Set SQL Server Maximum Server Memory to 90% of the total memory available on the server.
- Add -E to SQL Server Startup parameters.



## Solution Benefits

- **Basic 9 TB SQL DWFT solution from Lenovo**
- **Balanced and optimized configuration**
- **A cost effective solution with entry level SSDs and SQL Server Standard Edition instead of Enterprise Edition**
- **Reduced time to value**





## Bill of Materials

| Feature Code | Description   | Qty |
|--------------|---|-----|
| 7X02-CTO1WW  | ThinkSystem SR630 - 3yr Warranty                                | 1   |
| AUW1         | ThinkSystem MS 1U 10x2.5" Chassis                               | 1   |
| AWDW         | Intel Xeon Gold 6142 16C 150W 2.6GHz Processor                  | 1   |
| AUNB         | ThinkSystem 16GB TruDDR4 2666 MHz (1Rx4 1.2V) RDIMM             | 12  |
| AUW9         | Lenovo ThinkSystem SR630 2.5" Anybay 10-Bay Backplane Kit       | 1   |
| AUNK         | ThinkSystem RAID 930-16i 4GB Flash PCIe 12Gb Adapter            | 1   |
| AUMD         | ThinkSystem 2.5" PM1635a 800GB Mainstream SAS 12Gb Hot Swap SSD | 2   |
| AUM9         | ThinkSystem 2.5" PM863a 480GB Entry SATA 6Gb Hot Swap SSD       | 8   |
| AUMV         | ThinkSystem M.2 with Mirroring Enablement Kit                   | 1   |
| AXCA         | ThinkSystem Toolless Slide Rail                                 | 1   |
| AVWA         | ThinkSystem 750W(230/115V) Platinum Hot-Swap Power Supply       | 2   |
| 6311         | 2.8m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable         | 2   |
| AUNP         | FBU345 SuperCap   | 1   |
| AURN         | Lenovo ThinkSystem Super Cap Box                                | 1   |
| AUUV         | ThinkSystem M.2 CV3 128GB SATA 6Gbps Non-Hot Swap SSD           | 2   |
| 5977         | Select Storage devices - no configured RAID required            | 1   |
| AUK7         | Enable TPM 2.0 and Secure Boot                                  | 1   |
| BOML         | Enable TPM on MB  | 1   |
| AUW3         | Lenovo ThinkSystem Mainstream MB - 1U                           | 1   |
| AUS6         | Lenovo ThinkSystem 1U height CPU HS Dummy                       | 1   |
| AVWK         | ThinkSystem EIA plate with Lenovo logo                          | 1   |
| AUWM         | Lenovo ThinkSystem 1U LP+LP BF Riser Dummy                      | 1   |
| AUWG         | Lenovo ThinkSystem 1U VGA Filler                                | 1   |
| AUWL         | Lenovo ThinkSystem 1U LP Riser Dummy                            | 1   |
| AUWK         | Lenovo ThinkSystem 4056 Fan Dummy                               | 1   |
| AVJ2         | ThinkSystem 4R CPU HS Clip                                      | 1   |
| AURY         | Lenovo ThinkSystem PHY Module Dummy                             | 1   |
| AUTA         | XCC Network Access Label  | 1   |
| AUTQ         | ThinkSystem small Lenovo Label for 24x2.5"/12x3.5"/10x2.5"      | 1   |
| AUX0         | ThinkSystem Package for SR630                                   | 1   |
| AVWJ         | 750W Platinum RDN PSU Caution Label                             | 1   |
| 9206         | No Generic Preload Specify                                      | 1   |
| 9205         | Drop-in-the-Box Specify   | 1   |
| AUTJ         | ThinkSystem common Intel Label                                  | 1   |
| AUTC         | ThinkSystem SR630 Lenovo Agency label                           | 1   |
| AUX3         | ThinkSystem SR630 Model Number Label                            | 1   |
| AULQ         | ThinkSystem 1U CPU Performance Heatsink                         | 1   |
| AUWV         | 10x2.5" Cable Kit (1U)  | 1   |
| AV00         | Super Cap Cable-680mm   | 1   |
| AVKG         | ThinkSystem SR630 MB to 10x2.5" HDD BP NVME cable               | 1   |
| AWF9         | ThinkSystem Response time Service label LI                      | 1   |
| AWGE         | ThinkSystem SR630 WW Lenovo LPK                                 | 1   |
| AUX4         | MS 1U Service label LI  | 1   |
| 5731-W16     | Windows Server 2016   | 1   |
| 5731-SQL     | Microsoft SQL Server 2016                                       | 1   |
| AW94         | Microsoft SQL Server 2016 Standard - English                    | 1   |

## Configuration Certification

|   |   |   |   |                           |                     |
|---|---|---|---|---------------------------|---------------------|
| DWFT Certification<br>#2017-002   | <b>Lenovo ThinkSystem SR630 - 9TB</b><br>DWFT Reference Architecture                    |   |   | Report Date:<br>9/20/2017 |                     |
| DWFT Rev. 5.4   |   |   |   |                           |                     |
| <b>System Provider</b>  | <b>System Name</b>  | <b>Processor Type</b>                         | <b>Memory</b>                           |                           |                     |
| <b>Lenovo</b>   | Lenovo ThinkSystem SR630  | Intel Xeon Platinum 8176<br>(1/16/32) 2.1 GHz | 128 GB                                  |                           |                     |
| <b>Operating System</b>   |   |   | <b>SQL Server Edition</b>               |                           |                     |
| Windows Server 2016   |   |   | SQL Server 2017 Enterprise Edition      |                           |                     |
| <b>Storage Provider</b>   | <b>Storage Information</b>  |   |   |                           |                     |
| <b>Lenovo</b>   | 2x 128GB M.2 SSD for OS<br>2x 800 GB SSD for logs<br>8 x 480 GB SSD for data and tempdb |   |   |                           |                     |
| <b>Primary Metrics</b>  |   |   |   |                           |                     |
| Rated User Data Capacity <sup>1</sup>   | Row Store Relative Throughput <sup>2</sup>  | Column Store Relative Throughput <sup>3</sup> | Maximum User Data Capacity <sup>1</sup> |                           |                     |
| (TB)  |   |   | (TB)                                    |                           |                     |
| 9   | 91  | 183   | 12                                      |                           |                     |
| <b>Row Store</b>  |   |   |   |                           |                     |
| Relative Throughput <sup>2</sup>  | Measured Throughput   | Measured Scan Rate Physical                   | Measured Scan Rate Logical              | Measured I/O Throughput   | Measured CPU (Avg.) |
|   | (Queries/Hr/TB)   | (MB/Sec)                                      | (MB/Sec)                                | (MB/Sec)                  | (%)                 |
| 91  | 103   | 2,308   | 3,083                                   | 2,695                     | 99                  |
| <b>Column Store</b>   |   |   |   |                           |                     |
| Relative Throughput <sup>2</sup>  | Measured Throughput   | Measured Scan Rate Physical                   | Measured Scan Rate Logical              | Measured I/O Throughput   | Measured CPU (Avg.) |
|   | (Queries/Hr/TB)   | (MB/Sec)                                      | (MB/Sec)                                | (MB/Sec)                  | (%)                 |
| 183   | 1,269   | 946   | N/A                                     | N/A                       | 97                  |
| <p>The reference configuration is a 2 socket system rated for 25TB using SQL Server 2014 and the DWFT V4 methodology</p> <p><sup>1</sup> Assumes a data compression ratio of 5:1</p> <p><sup>2</sup> Percent ratio of the throughput to the row store throughput of the reference configuration.</p> <p><sup>3</sup> Percent ratio of the throughput to the column store throughput of the reference configuration.</p> <p>* Reported metrics are based on the qualification configuration which specifies database size and SQL Server memory.</p> |   |   |   |                           |                     |

**Cost effective solution with the Lenovo ThinkSystem SR630 server, Lenovo entry level SATA SSDs and Microsoft SQL Server 2017 Standard Edition**



## 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 the Lenovo Database Configuration for Microsoft SQL Server DWFT – 9TB, contact your Lenovo Business Partner or visit:

[www.lenovo.com/systems/solutions](http://www.lenovo.com/systems/solutions)

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