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WHITE PAPER

CERTIFIED 2U ULTRA REFERENCE ARCHITECTURES FOR DATA WAREHOUSE USING MICROSOFT SQL SERVER

Supermicro has partnered with Microsoft to deliver industry's best performing, certified reference architecture for SQL Server® Data Warehouse Fast Track (DWFT) based on the 2U Ultra dual-socket server systems, and utilizing low latency and high throughput NVMe SSDs.

Microsoft® Data Warehouse Fast Track (DWFT) for SQL Server 2016 is designed to provide customers optimized and validated system architectures for addressing data warehouse workload challenges including exponential growth of data, demands of lower data latency and faster query response times.

White Paper
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Supermicro recommends Windows.





Benefits of Supermicro Turn-key Solutions

- **Evident savings** of time and money from the process in hardware validation, performance tuning and software parameter configurations.
- **Upgrade** process is made simple and flexible as Supermicro regularly releases new certified solutions validated by Microsoft on newer generations of hardware.
- **Turn-key** solutions can minimize risks, surprises and maximize return of investment.

The **Supermicro 2U Ultra** is a platform optimized for data warehouse workloads that is **certified by Microsoft DWFT program** for SQL Server 2014 and 2016, which are designed as **turnkey solutions** suitable for data warehouse of **all sizes**.

HOW TO CHOOSE EXACTLY THE BEST SUPERMICRO DWFT REFERENCE ARCHITECTURE?

Supermicro offers three reference architectures (RAs) in the 2U dual-processor category, that are certified for Microsoft DWFT for SQL Server 2014 and 2016 based on the 2U Ultra 2028U-TNR4T+ and 2028U-TN24R4T+ SuperServer platforms, at 22TB, 40TB and 70TB rated user data capacity tiers.

The baseline performance for each certified RA is validated by Microsoft. Some key performance merits that should be considered are as follows,

- **Rated User Data Capacity** (in terabytes, higher is better)
Calculated from formulas used by Microsoft with coefficients derived from the throughput performance, it does not indicate raw disk capacity.
- **Row Store Relative Throughput**
(relative to Microsoft's reference configuration*, higher is better)
- **Column Store Relative Throughput**
(relative to Microsoft's reference configuration*, higher is better)

Apart from the primary metrics above, a certificate also includes measured throughputs in *Queries/Hour/Terabyte*, physical and logical scan rates, raw I/O throughput, and CPU utilization for both row and column store for comparing with customer's own results.

ENTERPRISE DATA WAREHOUSING IS EVOLVING RAPIDLY

Due to the complexity, cost and scale of designing and deploying data warehousing solutions, many IT managers, only after wasting a lot of time and money, usually found a poorly performed system at execution time. This frustration is mainly attributed to the lack of knowledge on the baseline performance and capabilities of the underlying hardware platforms, in addition to the optimal software parameter, with regards to data warehouse specific workloads.

With today's rapid growth in size and complexity of data that require fast and timely analytics and reporting driven by mobile computing, the overall performance and responsiveness of a data warehousing system can greatly delay on-the-spot critical business decisions, and ultimately affect revenue and customer expectations in a negative way.

Fortunately IT managers now only need to focus on designing their database workload when deploying new data warehousing instances with absolute confidence that the validated query performance baselines can be met immediately after the system is put online. Supermicro and Microsoft have collaborated extensively in the lab to fine-tune each part of the system to its optimal state. Thus, DWFT reference architectures can save IT managers days if not



weeks spent previously on solving the performance puzzles resulting from various hardware combinations and software packages.

Key features of 2U Ultra

- Best performance-per-watt with dual Intel® Xeon® processor E5-2600 v4/v3 product families with up to 3TB ECC DD4 memory to support the most demanding workloads.
- Up to 24 high-throughput, low-latency NVMe SSDs with industry's first-to-market true hot-swap capabilities for better query response times and data capacities (optional SAS3 support via add-on-card for balanced dollar per gigabyte and IOPs).
- 2 PCI-E 3.0 x16 slots and 1 PCI-E 3.0 x8 slots for storage add-on-cards or 100Gb/s or 40GB/s network interface cards in addition to the 4 onboard 10GBase-T ports.
- Fully support Microsoft Windows Server 2016 and SQL Server 2016.

SUPERMICRO 2U ULTRA SERVER PLATFORM

Supermicro's certified SQL Server solutions are based on the highly efficient and highly expandable Ultra Server platform, one of the most popular 2U dual-processor platforms that Supermicro offers today. In terms of versatility, the 2U Ultra is thermally optimized for the best-in-class compute performance and stability supporting the latest generation of Intel® Xeon® processors and 24 DDR4-2400MHz DIMM slots. This ensures sustained low latency querying performance in 24/7 environments under high utilizations.

In addition, the 2U Ultra is also known for its storage and I/O expansion capabilities. The latest SYS-2028U-TN24R4T+ model supports up to 24 hot-swap NVMe SSDs, plus additional 2 hot-swap SATA3 drive bays located on the back of chassis for log files or operating system (2 SATA DOM ports are also present on the motherboard).



Figure 1. Supermicro 2U Ultra SuperServer 2028U-TN24R4T+. Featuring 24 hot-swap NVMe/SAS3 hybrid drive bays.

There are 4 onboard 10 Gigabit Ethernet LAN ports, and 4 PCI-E 3.0 slots for storage add-on-cards and network interface cards.



Figure 2. Back of SYS-2028U-TN24R4T+. Featuring 2 hot-swap SATA3 drive bays, redundant Titanium-level power supplies, 2 PCI-E 3.0 x16 slots and 1 PCI-E 3.0 x8 LP slot, 4x 10GBase-T ports, 2 USB 3.0 ports, a dedicated IPMI LAN port, a serial port and a VGA port.



2U ULTRA FOR SQL SERVER REFERENCE PERFORMANCE

The 2U Ultra DWFT certified RAs offer exactly the best solutions to match each customer's unique requirements by providing 22TB, 40TB and the highest 70TB rated capacities tiers. Each capacity tier implies not only the scale of the data warehouse instance that can be hosted, but also the relative row and column store performance merits.

DWFT Certification #2016-006	Supermicro 2028U-TN24R4T+ DWFT Reference Architecture		Report Date: 8/12/2016		
DWFT Rev. 5.4					
System Provider	System Name	Processor Type	Memory		
	Supermicro 2028U-TN24R4T+	Intel Xeon E5-2690 v4 2.6 GHz (25/28C/56T)	1024 GB		
Operating System		SQL Server Edition			
Windows Server 2012 R2		SQL Server 2014 Enterprise Edition			
Storage Provider	Storage Information				
	10x 3.2TB NVMe for data and 1x 2TB 24 400 GB SAS for OS (RAID 10) 4x 2 TB SAS for RAID 10				
Primary Metrics					
Rated User Data Capacity ¹ (TB)	Row Store Relative Throughput ²	Column Store Relative Throughput ³	Maximum User Data Capacity ⁴ (TB)		
70	225	339	339		
Row Store					
Relative Throughput ¹	Measured Scan Rate Physical (MB/Sec)	Measured Scan Rate Logical (MB/Sec)	Measured I/O Throughput (MB/Sec)	Measured CPU (Avg.) (%)	
75	5,274	7,409	6,634	92	
Column Store					
Relative Throughput ¹	Measured Throughput (Queries/Hr/TB)	Measured Scan Rate Physical (MB/Sec)	Measured Scan Rate Logical (MB/Sec)	Measured I/O Throughput (MB/Sec)	Measured CPU (Avg.) (%)
339	2,206	3,033	N/A	N/A	100

The reference configuration is a 2 socket system rated for 25TB using SQL Server 2014 and the DWFT V4 methodology.
¹ Assumes a data compression ratio of 5:1.
² Percent ratio of the throughput to the row store throughput of the reference configuration.
³ Percent ratio of the throughput to the column store throughput of the reference configuration.
 Reported metrics are based on the qualification configuration which specifies database size and SQL Server memory.

Figure 3. Certificate for 70TB rated user capacity on 2U Ultra by Microsoft.

RA	RATED USER DATA CAPACITY ¹	ROW STORE RELATIVE THROUGHPUT ²	COLUMN STORE RELATIVE THROUGHPUT ³
Good	22TB	166	196
Better	40TB	210	213
Best	70TB	225	339

The performance, expandability and upgradeability of the 2U Ultra platform provides customers the freedom and flexibility to acquire best hardware and software combinations matching their growing business needs, whether with the all-flash NVMe model or the hybrid NVMe/SAS storage option, customers can enjoy proven SQL Server data warehouse solutions out of the box for lower startup cost and better return-on-investment in a longer term.

1. Rated User Data Capacity

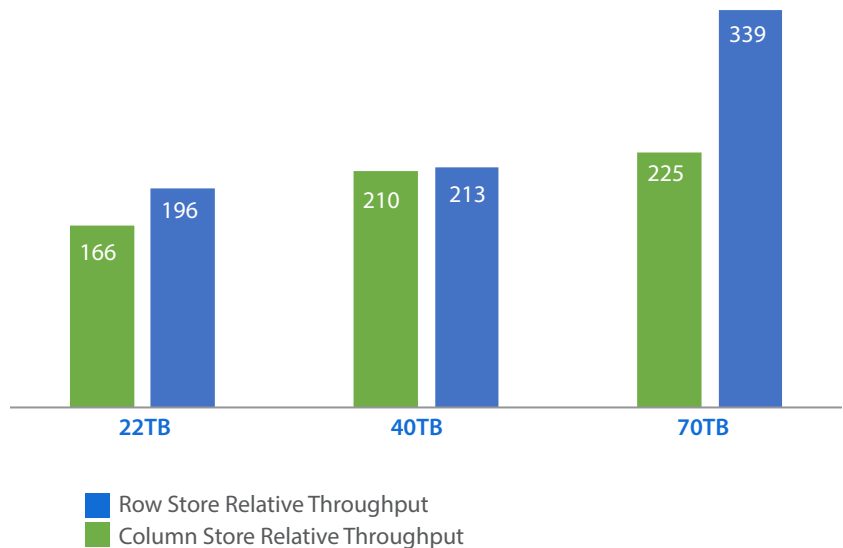
In terabytes, higher is better. This is calculated from a formula used by Microsoft with coefficients derived from the throughput performance, it does not reflect directly to raw disk capacity.

2. Row Store Relative Throughput

Percent ratio of the throughput to the row store throughput of Microsoft's reference configuration. Higher is better.

3. Column Store Relative Throughput

Percent ratio of the throughput to the column store throughput of Microsoft's reference configuration. Higher is better.





FOR MORE INFORMATION

Supermicro® SuperServer®
SYS-2028U-TNR4T+ Hybrid Datasheet
[www.supermicro.com/products/
system/2u/2028/sys-2028u-tnr4t.cfm](http://www.supermicro.com/products/system/2u/2028/sys-2028u-tnr4t.cfm)

Supermicro® SuperServer®
SYS-2028U-TN24R4T+ All-Flash Datasheet
[www.supermicro.com/products/
system/2u/2028/SYS-2028U-TN24R4T.cfm](http://www.supermicro.com/products/system/2u/2028/SYS-2028U-TN24R4T.cfm)

Microsoft Data Warehouse FastTrack
[www.microsoft.com/en-us/cloud-platform/
data-warehouse-fast-track](http://www.microsoft.com/en-us/cloud-platform/data-warehouse-fast-track)

Microsoft SQL Server 2016
[www.microsoft.com/en-us/cloud-platform/
sql-server](http://www.microsoft.com/en-us/cloud-platform/sql-server)

Microsoft Windows Server 2016
[www.microsoft.com/en-us/cloud-platform/
windows-server](http://www.microsoft.com/en-us/cloud-platform/windows-server)

Intel® Xeon® Processor E5-2600 v4 Product
Family
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processors/xeon/xeon-e5-solutions.html](http://www.intel.com/content/www/us/en/processors/xeon/xeon-e5-solutions.html)

Intel® NVMe SSDs
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state-drives/solid-state-drives-ssd.html](http://www.intel.com/content/www/us/en/solid-state-drives/solid-state-drives-ssd.html)

SUPERMICRO MICROSOFT CERTIFIED SOLUTIONS

Supermicro and Microsoft have partnered together to deliver industry leading "fully certified solutions" on highly optimized and flexible Supermicro server and storage Systems. Supermicro systems are designed to provide significant advantage in the areas of power efficiency, performance and overall system optimization. These design principles coupled with bringing innovative technologies at an accelerated pace drives time to market value for Microsoft Solutions. In case of some of these disruptive technologies like NVMe, Supermicro is an established leader with the broadest range of products that customers can choose from.

Microsoft Certified Solutions running on Supermicro hardware include Windows Server, SQL Server Data Warehouse, Exchange Server, Hyper converged solutions like Storage Spaces Direct, Storage Server and Azure Stack. These solutions are optimized for Enterprise, Hybrid Cloud, Private and Public Cloud markets. We also deliver the Windows operating system software preloaded for fast growing SMB and Enterprise customers.

Supermicro has consistently innovated in the areas of designing server boards, chassis, highly efficient power supplies, networking equipments and storage systems. The building block approach is one of the key innovations to server system architecture. This vertically integrated design approach accelerates the delivery of application optimized Microsoft Solutions based on customer requirements.

SUPERMICRO SQL DWFT CERTIFIED REFERENCE ARCHITECTURES

Drive impact in your business using the power of a robust, cloud-enabled SQL Server 2016 database solution that offers enhanced performance, robust security, cloud enablement, and deeper insights across multiple types of data.

- 70TB DWFT For Microsoft SQL Server 2016 Using 2U Ultra 2028U All NVMe
www.supermicro.com/white_paper/70TB_DWFT.pdf
- 40TB DWFT For Microsoft SQL Server 2014 Using 2U Ultra 2028U All NVMe
www.supermicro.com/white_paper/40TB_DWFT.pdf
- 22TB DWFT For Microsoft SQL Server 2014 Using 2U Ultra 2028U Hybrid NVMe/SAS
www.supermicro.com/white_paper/22TB_DWFT.pdf

About Super Micro Computer, Inc.

Supermicro® (NASDAQ: SMCI), the leading innovator in high-performance, high-efficiency server technology is a premier provider of advanced server Building Block Solutions® for Data Center, Cloud Computing, Enterprise IT, Hadoop/Big Data, HPC and Embedded Systems worldwide. Supermicro is committed to protecting the environment through its “We Keep IT Green®” initiative and provides customers with the most energy-efficient, environmentally-friendly solutions available on the market.

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