TPC Benchmark™ H

Full Disclosure Report

First Edition

1–Feb–2024

Using

Microsoft SQL Server 2019 Enterprise Edition

on

SYSGEAR M50CYP2UR208_6334

First Edition: February 2024

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Abstract

This report documents the methodology and results of the TPC Benchmark™ H (TPC-H) test conducted by TTA on Microsoft SQL Server 2019 Enterprise Edition on SYSGEAR M50CYP2UR208_6334.

Note that the Microsoft SQL Server 2019 was installed on the Virtual Machine run on SYSGEAR M50CYP2UR208_6334. The Virtual Machine is powered by SEMS software, which is a Software Defined Memory Solution producted by SYSGEAR Inc.

Microsoft SQL Server 2019 Enterprise Edition on SYSGEAR M50CYP2UR208_6334

Company Name	System Name	Database Software	Opeating System
Telecommunications Technology Association	SYSGEAR M50CYP2UR208_6334	Microsoft SQL Server 2019 Enterprise Edition (64bit)	RedHat Enterprise Linux 7.3

TPC Benchmark™ H Metrics

Total System Cost	Composite Metric	Price/Performance	Availability Date
158,573,900₩ (KRW)	181,448.9 QphH@3,000GB	839,991.10₩/kQphH@3,000GB	Available Now

	Microsoft SQL Server 2019 on SYSGEAR M50CYP2UR208_6334	TPC-H Rev. 3.0.1 TPC-Pricing Rev. 2.9.0 Report Date: Feb 1, 2024
Total System Cost	**Composite Query per Hour Metric**	**Price / Performance**
158,573,900₩	**181,448.9 QphH@3,000GB**	**839,991.10₩/kQphH@3,000GB**

Database Size	Database Manager	Operating System	Other Software	Availability Date
3,000GB	Microsoft SQL Server 2019 Enterprise Edition	RHEL 7.3	None	Available Now

Database Load Time = **00d 08h 30m 33s**	**Storage Redundancy Level**	
Load included backup: **Y**	Base Tables and Auxiliary Data Structures, DBMS Temporary Space	**No RAID**
Total Data Storage/Database Size = **17.04**	OS and DBMS Software	**No RAID**
Memory/Database Size = **68.3%**	Log	**RAID 10**

System Components	**System Total**
Nodes	1
Intel(R) Xeon(R) Gold 6334 CPU @ 3.60GHz	2
Cores/Threads:	16/32
Memory:	2,048 GiB
4TB NVMe Drives	7
3.84TB SAS SSD:	7
Total Storage	**54.88 TB** (51,110.98 GiB)

	Microsoft SQL Server 2019 on SYSGEAR M50CYP2UR208_6334	TPC-H Rev. 3.0.1 TPC-Pricing Rev. 2.9.0 Report Date: Feb 1, 2024

Description	Key	Unit Price(₩)	Qty	Price(₩)	3-Yr. Maint. Price(₩)
Hardware					
Intel® Server System M50CYP2UR208, 2U	1	2,100,000	1	2,100,000	
Intel® Xeon® Gold 6334 Processor (8-Core 3.6GHz/18MB)	1	3,450,000	2	6,900,000	
(Samsung) DDR4 64GB M393A8G40AB2-CWE	1	138,000	32	4,416,000	
(Seagate) Nytro XS3840SE70124 3.8TB	1	1,000,000	7	7,000,000	
(Seagate) FireCuda 530 ZP4000GM30013 4TB	1	410,000	7	2,870,000	
Quad M.2 NVMe PCIe 4.0x4 PCIe x16	1	114,000	2	228,000	
Intel® Ethernet Network Adapter X710-T2L for OCP 3.0	1	390,000	1	390,000	
1300W Power Supply	1	290,000	2	580,000	
2U Riser#1 w/ x16 DW slot	1	115,000	1	115,000	
2U Riser #2 w/ x16 DW slot	1	115,000	1	115,000	
2U 2 slots Riser #3	1	110,000	1	110,000	
Cable kit for 2U SB to 8 x 2.5" drives if 8 drives	1	110,000	1	110,000	
Intel® Cable kit CYPCBLHDHDXXX1, Single	1	40,000	1	40,000	
2U GPGPU Kit (includes airducts, bracket, power cables)	1	100,000	1	100,000	
2U Bezel	1	55,000	1	55,000	
Half extension rail kit	1	65,000	1	65,000	
Heat Sink tall (1U or 2U capable)	1	85,000	2	170,000	
Intel® RAID Adapter RS3DC080	1	430,000	1	430,000	
24-Inch Monitor	1	150,000	1	150,000	
Mouse	1	20,000	1	20,000	
M50CYP2UR208 6334 3-Yr. maint(7x24x4)	1				4,828,200
Hardware Sub Total				**25,964,000**	**4,828,200**
Software					
SQL Server 2019 Enterprise Core - 2 Core License Pack	1	13,786,500	8	110,292,000	
Microsoft Problem Resolution Services(3Y, 7x24x4)	1				336,700
Red Hat Enterprise Linux Operating System Platform	2	4,089,000	1	4,089,000	
Rockplace Support Carepack - Linux Premium 3Year	2				9,000,000
SMES 1T(3Y, 7x24x4)	1	3,900,000	3	11,700,000	
Software Sub Total				**126,081,000**	**9,336,700**
Discount					
HW Discount - M50CYP2UR208 6334	1			-6,158,440	
SW Discount – RHEL	2			-1,636,000	
SW Support Discount - RHEL	2				-6,000,000
Discount Sub Total				**-7,794,440**	**-6,000,000**
Total				**144,250,560**	**8,164,900**

* All discounts are based on Korea list prices and for similar quantities and configurations. Discounts for similarly sized configurations will be similar to those quoted here, but may vary based on the components in the configuration.

Pricing Key	**3 Yr. cost of ownership KRW(₩):**	**152,415,460₩**
1) SYSGEAR Inc. 2) RockPlace Inc.	**QphH@3,000GB:**	**181,448.9**
All of the prices are based on South Korea's currency, KRW (₩, Korean Won) and excluded VAT.	**₩/kQphH@3,000GB:**	**839,991.10₩/kQphH**

Benchmark implementation and results independantly audited by Doug Johnson of InfoSizing (www.sizing.com)

Prices used in TPC benchmarks reflect the actual prices a customer would pay for a one-time purchase of the stated components. Individually negotiated discounts are not permitted. Special prices based on assumptions about past or future purchases are not permitted. All discounts reflect standard pricing policies for the listed components. For complete details, see the pricing sections of the TPC benchmark pricing specifications. If you find that the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org. Thank you.

Numerical Quantities

Measurement Results:

Database Scale Factor	=	3,000GB
Total Data Storage / Database Size	=	17.04
Start of database load time	=	2023-12-07 9:37:55 AM
End of database load time	=	2023-12-07 6:08:28 PM
Database Load Time	=	00d 08h 30m 33s
Query Streams for Throughput Test	=	8
TPC-H Power	=	312,243.4
TPC-H Throughput	=	105,442,4
TPC-H Composite Query-per-Hour Rating (QphH@3,000GB)	=	181,448.9
Total System Price Over 3 Years (₩, KRW)	=	158,573,900
TPC-H Price/Performance Metric (₩/kQphH@3,000GB)	=	839,991.10

Measurement Intervals:

Measurement Interval in Throughput Test (Ts)	=	18,026.91 seconds

Duration of Stream Execution:

Power Run	Seed	Query Start Time Query End Time	Total Time (hh:mm:ss)	RF1 Start Time RF1 End Time	RF2 Start Time RF2 End Time
	1207180828	2023-12-08 07:12:59 2023-12-08 07:37:11	00:24:12	2023-12-08 07:12:01 2023-12-08 07:12:46	2023-12-08 07:37:24 2023-12-08 07:40:33
Throughput Stream	**Seed**	**Query Start Time Query End Time**	**Total Time (hh:mm:ss)**	**RF1 Start Time RF1 End Time**	**RF2 Start Time RF2 End Time**
1	1207180829	2023-12-08 07:40:33 2023-12-08 12:12:00	04:31:27	2023-12-08 12:12:11 2023-12-08 12:12:58	2023-12-08 12:12:58 2023-12-08 12:16:00
2	1207180830	2023-12-08 07:40:33 2023-12-08 12:10:28	04:29:55	2023-12-08 12:16:01 2023-12-08 12:16:45	2023-12-08 12:16:45 2023-12-08 12:19:18
3	1207180831	2023-12-08 07:40:33 2023-12-08 12:06:49	04:26:16	2023-12-08 12:19:18 2023-12-08 12:20:02	2023-12-08 12:20:02 2023-12-08 12:22:42
4	1207180832	2023-12-08 07:40:33 2023-12-08 12:10:21	04:29:48	2023-12-08 12:22:42 2023-12-08 12:23:29	2023-12-08 12:23:29 2023-12-08 12:26:17
5	1207180833	2023-12-08 07:40:33 2023-12-08 12:11:04	04:30:31	2023-12-08 12:26:17 2023-12-08 12:27:01	2023-12-08 12:27:01 2023-12-08 12:29:53
6	1207180834	2023-12-08 07:40:33 2023-12-08 12:10:32	04:29:59	2023-12-08 12:29:53 2023-12-08 12:30:38	2023-12-08 12:30:38 2023-12-08 12:33:38
7	1207180835	2023-12-08 07:40:33 2023-12-08 12:11:59	04:31:26	2023-12-08 12:33:38 2023-12-08 12:34:24	2023-12-08 12:34:24 2023-12-08 12:37:12
8	1207180836	2023-12-08 07:40:33 2023-12-08 12:02:19	04:21:46	2023-12-08 12:37:12 2023-12-08 12:37:58	2023-12-08 12:37:58 2023-12-08 12:41:01

Query Execution Times (Query1~Query12):

Stream ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
0	22.32	3.47	70.42	77.04	92.99	1.58	38.54	45.40	234.14	38.14	23.43	23.61
1	161.02	50.32	799.44	336.07	976.43	7.45	406.43	687.91	2,782.15	503.13	66.33	255.80
2	178.55	41.95	643.14	606.45	1,042.84	8.71	483.62	665.64	2,975.85	586.92	68.29	246.50
3	172.69	74.81	703.13	675.02	912.44	8.84	520.26	649.20	2,676.77	414.33	78.55	268.26
4	172.28	28.28	713.30	783.33	991.00	7.51	496.70	521.17	2,870.78	380.75	72.37	230.69
5	189.33	48.26	817.30	798.42	955.14	9.33	481.26	613.88	2,699.82	397.45	61.37	172.07
6	183.00	48.43	809.23	656.53	904.61	8.05	493.75	651.35	2,836.31	541.71	85.00	271.29
7	160.67	46.08	823.17	781.46	911.82	6.93	457.52	682.88	2,700.64	526.95	61.77	63.29
8	196.02	38.10	775.83	713.02	926.96	8.28	493.55	690.30	2,810.09	390.25	97.14	203.58
Ql Min	**22.32**	**3.47**	**70.42**	**77.04**	**92.99**	**1.58**	**38.54**	**45.40**	**234.14**	**38.14**	**23.43**	**23.61**
Ql Avg	**159.54**	**42.19**	**683.88**	**603.04**	**857.14**	**7.41**	**430.18**	**578.64**	**2,509.62**	**419.96**	**68.25**	**192.79**
Ql Max	**196.02**	**74.81**	**823.17**	**798.42**	**1,042.84**	**9.33**	**520.26**	**690.30**	**2,975.85**	**586.92**	**97.14**	**271.29**

Query Execution Times (Query13~Query22, RF1, RF2):

Stream ID	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
0	178.34	8.94	6.60	65.50	14.89	246.18	6.31	18.36	203.98	31.82	44.79	189.33
1	1,832.28	103.43	57.66	578.68	150.03	3,131.94	55.22	181.57	2,808.38	354.75	46.21	181.85
2	1,701.63	116.07	54.84	594.72	250.11	2,957.74	68.14	185.39	2,390.48	326.33	44.80	152.28
3	1,672.15	85.51	51.98	666.46	211.21	3,135.69	49.55	205.42	2,398.05	344.66	44.25	159.45
4	1,642.48	91.32	61.57	558.93	161.43	3,111.66	84.08	205.75	2,630.54	371.62	46.75	167.81
5	1,697.53	94.66	59.48	665.31	170.24	3,158.76	75.13	180.95	2,599.78	284.92	44.44	171.25
6	1,922.30	82.15	64.08	552.06	161.39	2,895.97	57.72	221.00	2,481.27	271.49	44.98	180.05
7	1,776.63	68.35	23.08	518.68	212.56	3,303.83	81.93	212.00	2,552.63	312.53	45.91	167.65
8	1,616.05	81.51	85.54	581.47	183.11	2,991.15	66.41	207.08	2,289.07	260.14	45.62	182.54
Ql Min	**178.34**	**8.94**	**6.60**	**65.50**	**14.89**	**246.18**	**6.31**	**18.36**	**203.98**	**31.82**	**44.25**	**152.28**
Ql Avg	**1,559.93**	**81.33**	**51.65**	**531.31**	**168.33**	**2,770.32**	**60.50**	**179.72**	**2,261.58**	**284.25**	**45.31**	**172.47**
Ql Max	**1,922.30**	**116.07**	**85.54**	**666.46**	**250.11**	**3,303.83**	**84.08**	**221.00**	**2,808.38**	**371.62**	**46.75**	**189.33**

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TPC Benchmark H Overview

The TPC Benchmark™ H (TPC-H) is a Decision Support benchmark. It is a suite of business-oriented ad-hoc queries and concurrent modifications. The queries and the data populating the database have been chosen to have broad industry-wide relevance while maintaining a sufficient degree of ease of implementation. This benchmark illustrates Decision Support systems that:

- Examine large volumes of data
- Execute queries with a high degree of complexity
- Give answers to critical business questions

TPC-H evaluates the performance of various Decision Support systems by the execution of sets of queries against a standard database under controlled conditions. The TPC-H queries:

- Give answers to real-world business questions
- Simulate generated ad-hoc queries
- Are far more complex than most OLTP transactions
- Include a rich breadth of operators and selectivity constraints
- Generate intensive activity on the part of the database server component of the system under test
- Are executed against a database complying to specific population and scaling requirements
- Are implemented with constraints derived from staying closely synchronized with an on-line production database

0. General Items

0.1 Benchmark Sponsor

A statement identifying the benchmark sponsor(s) and other participating companies must be provided.

This benchmark was sponsored by Telecommunications Technology Association(TTA). The implementation was developed and engineered in partnership with Microsoft Corp. and SYSGEAR Inc.

0.2 Parameter Settings

Settings must be provided for all customer-tunable parameters and options that have been changed from the defaults found in actual products, including but not limited to:

- *Database Tuning Options*
- *Optimizer/Query execution options*
- *Query processing tool/language configuration parameters*
- *Recovery/commit options*
- *Consistency/locking options*
- *Operating system and configuration parameters*
- *Configuration parameters and options for any other software component incorporated into the pricing structure*
- *Compiler optimization options*

This requirement can be satisfied by providing a full list of all parameters and options, as long as all those which have been modified from their default values have been clearly identified and these parameters and options are only set once.

The Supporting Files Archive contains the database and OS parameters used in this benchmark.

0.3 Configuration Diagrams

Diagrams of both measured and priced configurations must be provided, accompanied by a description of the differences. This includes, but is not limited to:

- *Number and type of processors.*
- *Size of allocated memory, and any specific mapping/partitioning of memory unique to the test.*
- *Number and type of disk units (and controllers, if applicable).*
- *Number of channels or bus connections to disk units, including their protocol type.*
- *Number of LAN (e.g. Ethernet) Connections, including routers, workstations, terminals, etc., that were physically used in the test or are incorporated into the pricing structure.*
- *Type and the run-time execution location of software components (e.g., DBMS, query processing tools/languages, middle-ware components, software drivers, etc.).*

The configuration diagram for both the tested and priced system is depicted in Figure 0.1. There is no difference between the priced and tested configurations.

Figure 0.1: Benchmarked and Priced Configuration

Database Server

Physical Machine:
1 x SYSGEAR M50CYP2UR208_6334
2 – Intel® Xeon® Gold 6334 CPU @3.60GHz
8/16 cores/threads per processor, 18M Cache
2 TiB Main memory
7 x 3.84 TB 12Gbps SAS SSD
7 x 4 TB NVMe SSD

Virtual Machine:
1 x SYSALIGN.SEMS(Software Defined Memory Solution)
1 – Intel® Xeon® Gold 6334 CPU @3.60GHz
30 cores/thread
3 TiB Main memory
1 x 3.84 TB 12Gbps SAS SSD (OS Disk – RAID 0)
4 x 3.84 TB 12Gbps SAS SSD (Log Disk – RAID 10)
2 x 3.84 TB 12Gbps SAS SSD (Backup Disk – RAID 0)
3 x 4 TB NVMe SSD (Data Disk)
RedHat Enterprise Linux 7.3
Microsoft SQL Server 2019 Enterprise Edition

Clause 1: Logical Database Design

1.1 Database Definition Statements

Listings must be provided for all table definition statements and all other statements used to set up the test and qualification databases.

The Supporting Files Archive contains the build scripts that create, populate, index and analyze the tables for the TPC-H database.

1.2 Physical Organization

The physical organization of tables and indices within the test and qualification databases must be disclosed. If the column ordering of any table is different from that specified in Clause 1.4, it must be noted.

No column reordering was used.

1.3 Horizontal Partitioning

Horizontal partitioning of tables and rows in the test and qualification databases (see Clause 1.5.4) must be disclosed.

Horizontal partitioning is used on LINEITEM and ORDERS tables and the partitioning columns are L_SHIPDATE and O_ORDERDATE. The partition granularity is by week.

1.4 Replication

Any replication of physical objects must be disclosed and must conform to the requirements of Clause 1.5.7.

No replication was used.

Clause 2: Queries and Refresh Functions

2.1 Query Language

The query language used to implement the queries must be identified.

SQL was the query language used.

2.2 Random Number Generation

The method of verification for the random number generation must be described unless the supplied DBGEN and QGEN were used.

The TPC source based DBGEN and QGEN version 3.0.0 was used to generate all database populations.

2.3 Substitution Parameters Generation

The method used to generate values for substitution parameters must be disclosed. If QGEN is not used for this purpose, then the source code of any non-commercial tool used must be disclosed. If QGEN is used, the version number, release number, modification number and patch level of QGEN must be disclosed.

The TPC source based QGEN version 3.0.0 was used to generate the substitution parameters.

2.4 Query Text and Output Data from Database

The executable query text used for query validation must be disclosed along with the corresponding output data generated during the execution of the query text against the qualification database. If minor modifications (see Clause 2.2.3) have been applied to any functional query definitions or approved variants in order to obtain executable query text, these modifications must be disclosed and justified. The justification for a particular minor query modification can apply collectively to all queries for which it has been used. The output data for the power and throughput tests must be made available electronically upon request.

The Supporting Files Archive contains the query text and query output. The following modifications were used:

- The “dateadd” function is used to perform date arithmetic in Q1, Q4, Q5, Q6, Q10, Q12, Q14, Q15, and Q20.
- The “datepart” function is used to extract part of a date (“YY”) in Q7, Q8, and Q9.
- The “top” function is used to restrict the number of output rows in Q2, Q3, Q10, Q18, and Q21.
- The “count_big” function is used in place of “count” in Q1.

All the query substitution parameters used during the performance test must be disclosed in tabular format, along with the seeds used to generate these parameters.

The Supporting Files Archive contains the seed and query substitution parameters used.

2.6 Isolation Level

The isolation level used to run the queries must be disclosed. If the isolation level does not map closely to one of the isolation levels defined in Clause 3.4, additional descriptive detail must be provided.

The queries and transactions were run with isolation level “Read-Committed”.

2.7 Refresh Functions

The details of how the refresh functions were implemented must be disclosed.

The Supporting Files Archive contains the source code for the refresh functions.

Clause 3: Database System Properties

3.1 ACID Properties

The ACID (Atomicity, Consistency, Isolation, and Durability) properties of transaction processing systems must be supported by the system under test during the timed portion of this benchmark. Since TPC-H is not a transaction processing benchmark, the ACID properties must be evaluated outside the timed portion of the test..

All ACID tests were conducted according to specification. The Supporting Files Archive contains the source code of the ACID test scripts.

3.2 Atomicity Requirements

The system under test must guarantee that transactions are atomic; the system will either perform all individual operations on the data, or will assure that no partially-completed operations leave any effects on the data.

3.2.1 Atomicity of Completed Transactions

Perform the ACID Transaction for a randomly selected set of input data and verify that the appropriate rows have been changed in the ORDERS, LINEITEM, and HISTORY tables.

The following steps were performed to verify the atomicity of the completed ACID transactions:

1. The total price from the ORDERS table and the extended price from the LINEITEM table were retrieved for a randomly selected order key.
2. The ACID Transaction was performed using the order key from step 1.
3. The ACID Transaction was COMMITTED.
4. The total price from the ORDERS table and the extended price from the LINEITEM table were retrieved for the same order key. It was verified that the appropriate rows had been changed.

3.2.2 Atomicity of Aborted Transactions

Perform the ACID Transaction for a randomly selected set of input data, substituting a ROLLBACK of the transaction for the COMMIT of the transaction. Verify that the appropriate rows have not been changed in the ORDERS, LINEITEM, and HISTORY tables.

The following steps were performed to verify the atomicity of the aborted ACID transactions:

1. The total price from the ORDERS table and the extended price from the LINEITEM table were retrieved for a randomly selected order key.
2. The ACID Transaction was performed using the order key from step 1. The transaction was stopped prior to the commit.
3. The ACID Transaction was ROLLED BACK.
4. The total price from the ORDERS table and the extended price from the LINEITEM table were retrieved for the same order key. It was verified that the appropriate rows had not been changed.

3.3 Consistency Requirements

Consistency is the property of the application that requires any execution of transactions to take the database from one consistent state to another. A consistent state for the TPC-H database is defined to exist when:

*O_TOTALPRICE = SUM(trunc(trunc((L_EXTENDEDPRICE – L_DISCOUNT) * (1 + L_TAX)))*

for each ORDERS and LINEITEM defined by (O_ORDERKEY = L_ORDERKEY)

3.3.1 Consistency Test

Verify that ORDERS and LINEITEM tables are initially consistent as defined in Clause 3.3.2.1, based upon a random sample of at least 10 distinct values of O_ORDERKEY.

The following steps were performed to verify consistency:

1. The consistency of the ORDERS and LINEITEM tables was verified based on a sample of O_ORDERKEYs.
2. At least 100 ACID Transactions were submitted.
3. The consistency of the ORDERS and LINEITEM tables was re-verified.

The Consistency test was performed as part of the Durability test explained in Section 3.5:

3.4 Isolation Requirements

Operations of concurrent transactions must yield results which are indistinguishable from the results which would be obtained by forcing each transaction to be serially executed to completion in the some order.

3.4.1 Isolation Test 1 - Read-Write Conflict with Commit

Demonstrate isolation for the read-write conflict of a read-write transaction and a read-only transaction when the read-write transaction is committed.

The following steps were performed to satisfy the test of isolation for a read-only and a read-write committed transaction:

1. An ACID Transaction was started for a randomly selected O_KEY, L_KEY, and DELTA. The ACID Transaction was suspended prior to COMMIT.
2. An ACID Query was started for the same O_KEY used in step 1. The ACID query blocked and did not see any uncommitted changes made by the ACID Transaction.
3. The ACID Transaction was resumed and COMMITTED. The ACID query completed. It returned the data as committed by the ACID Transaction..

3.4.2 Isolation Test 2 - Read-Write Conflict with Rollback

Demonstrate isolation for the read-write conflict of a read-write transaction and a read-only transaction when the read-write transaction is rolled back.

The following steps were performed to satisfy the test of isolation for a read-only and a roll-backed read-write transaction:

1. An ACID Transaction was started for a randomly selected O_KEY, L_KEY, and DELTA. The ACID Transaction was suspended prior to ROLLBACK.
2. An ACID Query was started for the same O_KEY used in step 1. The ACID Query blocked and did not see the uncommitted changes made by the ACID Transaction.
3. The ACID Transaction was ROLLED BACK. The ACID Query completed.

3.4.3 Isolation Test 3 - Write-Write Conflict with Commit

Demonstrate isolation for the write-write conflict of two update transactions when the first transaction is committed.

The following steps were performed to verify isolation of two update transactions:

1. An ACID Transaction, T1, was started for a randomly selected O_KEY, L_KEY, and DELTA1. T1 was suspended prior to COMMIT.

2. Another ACID Transaction, T2, was started using the same O_KEY and L_KEY and a randomly selected DELTA2.
3. T2 was blocked by T1 and T2 waited.
4. The ACID Transaction T1 was allowed to COMMIT and T2 completed.
5. It was verified that: T2.L_EXTENDEDPRICE = T1.L_EXTENDEDPRICE + (DELTA1*(T1.L_EXTENDEDPRICE / T1.L_QUANTITY))

3.4.4 Isolation Test 4 - Write-Write Conflict with Rollback

Demonstrate isolation for the write-write conflict of two update transactions when the first transaction is rolled back.

The following steps were performed to verify isolation of two update transactions after the first one is rolled back:

1. An ACID Transaction, T1, was started for a randomly selected O_KEY, L_KEY, and DELTA1. T1 was suspended prior to ROLLBACK.
2. Another ACID Transaction, T2, was started using the same O_KEY and L_KEY and a randomly selected DELTA2.
3. T2 was blocked by T1. T2 waited.
4. T1 was allowed to ROLLBACK and T2 completed.
5. It was verified that T2.L_EXTENDEDPRICE = T1.L_EXTENDEDPRICE.

3.4.5 Isolation Test 5 - Concurrent Read and Write Transactions on Different Tables

Demonstrate the ability of read and write transactions affecting different database tables to make progress concurrently.

The following steps were performed to verify isolation of concurrent read and write transactions on different tables:

1. An ACID Transaction, T1, was started for a randomly selected O_KEY, L_KEY, and DELTA. The ACID Transaction, T1, was suspended prior to COMMIT.
2. Another ACID Transaction, T2, was started using random values of PS_PARTKEY and PS_SUPPKEY.
3. T2 completed.
4. T1 was allowed to COMMIT.
5. It was verified that appropriate rows in ORDERS, LINEITEM and HISTORY tables were changed.

3.4.6 Isolation Test 6 – Update Transaction during Continuous Read-Only Query Stream

Demonstrate that the continuous submission of arbitrary (read-only) queries against one or more tables of the database does not indefinitely delay update transactions affecting those tables from making progress.

The following steps were performed to verify isolation of update transactions during continuous read-only query:

1. An ACID Transaction, T1, executing a modified Q1 against the qualification database, was started. The substitution parameter was chosen from the interval [0…2159] so that the query ran for a sufficient amount of time.
2. Before T1 completed, an ACID Transaction, T2, was started for a randomly selected O_KEY, L_KEY and DELTA.

3. T2 completed before T1 completed
4. Transaction T1 completed executing the query Q1.
5. It was verified that appropriate rows in ORDERS, LINEITEM and HISTORY tables were changed

3.5 Durability Requirements

The system under test must guarantee durability: the ability to preserve the effects of committed transactions and insure database consistency after recovery from any one of the failures listed in Clause 3.5.3.

3.5.1 System Crash / Memory Failure / Loss of External Power

System Crash: Guarantee the database and committed updates are preserved across an instantaneous interruption (system crash/system hang) in processing which requires the system to reboot to recover.

Memory Failure: Guarantee the database and committed updates are preserved across failure of all or part of memory (loss of contents).

Loss of External Power: Guarantee the database and committed updates are preserved during the loss of all external power for an indefinite time period

The durability of the system crash, memory failure, and loss of external power was tested together by the following steps:

1. The Consistency of the ORDERS and LINEITEM tables were verified.
2. Nine streams of ACID transactions were started. Each stream executed a minimum of 100 transactions.
3. While the streams of ACID transactions were running the System was powered off by pulling power plugs.
4. The power was restored the system booted.
5. Started the Virtual Machine and the SQL Database engine.
6. The database went through a recovery period. Rolled-forward, Rolled-backward transactions captured by the DB ERRORLOG file.
7. Recovery complete. The counts in the history table and success files were compared and verified, and the consistency of the ORDERS and LINEITEM tables was verified.

3.5.2 Failure of a Durable Medium

Guarantee the database and committed updates are preserved across a permanent irrecoverable failure of any single durable medium containing TPC-H database tables or recovery log tables.

The durability of the log and data disk failure was tested together by the following steps: (Note that the storage devices containing the TPC-H logs are mirrored across two pairs of SSDs, and the storage devices containing TPC-H tables and indexes are not mirrored.)

1. The complete database was backed up.
2. The Consistency of the ORDERS and LINEITEM tables were verified.
3. Nine streams of ACID transactions were started, with each stream executed a minimum of 100 transactions.
4. While the test was running, one of the RAID-10 configured log disks was removed.
5. It was determined that the test continued running, and the SQL Server did not generate an error.

6. While the test was running, one of the data disks (non-RAID) was removed.
7. The nine streams of ACID transactions failed and recorded the number of committed transactions in success files.
8. Stopped the SQL server.
9. Started the SQL server was with -f and -m option.
10. Backed up the database log and the database was dropped.
11. Stopped the SQL Server, and stopped the Virtual Machine.
12. The pulled disk was replaced with a new one.
13. Formatted the drive, and a new volume was created with same letter and file structure.
14. Started the Virtual Machine, and the SQL Server.
15. Restore the database.
16. When the database restore completed, a command was issued to apply the backed-up log file.
17. The counts in the history table and success files were compared and verified, and the consistency of the ORDERS and LINEITEM tables was verified.

Clause 4: Scaling and Database Population

4.1 Initial Cardinality of Tables

The cardinality (i.e., the number of rows) of each table of the test database, as it existed at the completion of the database load (see clause 4.2.5) must be disclosed.

The row count for each database table is shown in Table 4.1.

Table 4.1: Number of rows per table

Table	# of Rows
Lineitem	18,000,048,306
Orders	4,500,000,000
Partsupp	2,400,000,000
Part	600,000,000
Customer	450,000,000
Supplier	30,000,000
Nation	25
Region	5

4.2 Distribution of Tables and Logs Across Media

The distribution of tables and logs across all media must be explicitly described for the tested and priced systems.

The database server on the Virtual Machine contains seven 3.84TB SAS SSDs and three 4TB NVMe SSDs. One SAS SSD is used to install the OS and DBMS, and the four others are configured as a RAID 10 to store the DBMS log. The remaining two SAS SSDs are configured as a RAID 0 volumes to store backups. The three NVMe SSDs are configured to store Test DB table data and temporaray database (TempDB). Table 4.2 below shows the configuration of the database server.

Table 4.2: Distribution of Tables and Logs Across Media

# of Disks	Drive Description	RAID Format	Size (GB)	Driver Letter	Content
1	3.84TB SSD SAS 12Gbps	No RAID	3,840	/var/opt/mssql	OS, SQL, DB root
1	4TB NVMe SSD	No RAID	4,000	/opt/db/data1	DB & TempDB
1	4TB NVMe SSD	No RAID	4,000	/opt/db/data2	DB & TempDB
1	4TB NVMe SSD	No RAID	4,000	/opt/db/data3	DB & TempDB
4	3.84TB SSD SAS 12Gbps	RAID 10	3,840	/opt/db/log	DB Log
2	3.84TB SSD SAS 12Gbps	RAID 0	3,840	/opt/db/backup	Backup

4.3 Database partition/replication mapping

The mapping of database partitions/replications must be explicitly described.

Horizontal partitioning is used on LINEITEM and ORDERS tables and the partitioning columns are L_SHIPDATE and O_ORDERDATE. The database partitions are evenly distributed across 3 NVMe drives.

4.4 Data redundancy mechanisms

Implementations may use data redundancy mechanism(s). The type of data redundancy mechanisms(s) and any configuration parameters, i.e., RAID level must be disclosed for each device.

The database tables were hosted on three 4TB NVMe drives. The temporary files were hosted on the same drives as the database tables. The database log files resided on a RAID-10 array of four 3.84TB SAS SSDs. The database backup was hosted on another RAID-0 array made of two 3.84TB SSDs.

4.5 Modifications to the DBGEN

*The version number, release number, modification number, and patch level of **DBGEN** must be disclosed. Any modifications to the **DBGEN** (see Clause 4.2.1) source code must be disclosed. If a program other than DBGEN was used to populate the database, it must be disclosed in its entirety.*

DBGEN version 3.0.0 was used, no modifications were made.

4.6 Database Load Time

The database load time for the test database (see clause 4.3) must be disclosed.

The database load time was 00d 08h 30m 35s.

Load Test Times	
Load Start	2023-12-07 09:37:55
Load End	2023-12-07 18:08:28
Load Delay	00d 00h 00m 00s
Load Time	00d 08h 30m 33s

4.7 Data Storage Ratio

The data storage ratio must be disclosed. It is computed by dividing the total data storage of the priced configuration (expressed in GB) by the size chosen for the test database as defined in 4.1.3.1. The ratio must be reported to the nearest 1/100th, rounded up. For the reporting of configured disk capacity, gigabyte (GB) is defined to be 2^30 bytes.

The computation of the data storage ratio is shown in Table 4.3 and 4.4.

Table 4.3: Data Storage Ratio Computation of Physical Server

Disk Type	GB per Disk*	# of disks	Total Space (GB)	Total Space (GiB)
SAS SSD	3,840 GB	7	26,880	25,033.95
NVMe SSD	4,000 GB	7	28,000	26,077.03
Total Storage				51,110.98
Data Storage Ratio				**17.04**

Table 4.4: Data Storage Ratio Computation of Virtual Server

Disk Type	GB per Disk*	# of disks	Total Space (GB)	Total Space (GiB)
SAS SSD	3,840 GB	7	26,880	25,033.96
NVMe SSD	4,000 GB	3	12,000	11,175.87
Total Storage				36,209.83
Data Storage Ratio				**12.07**

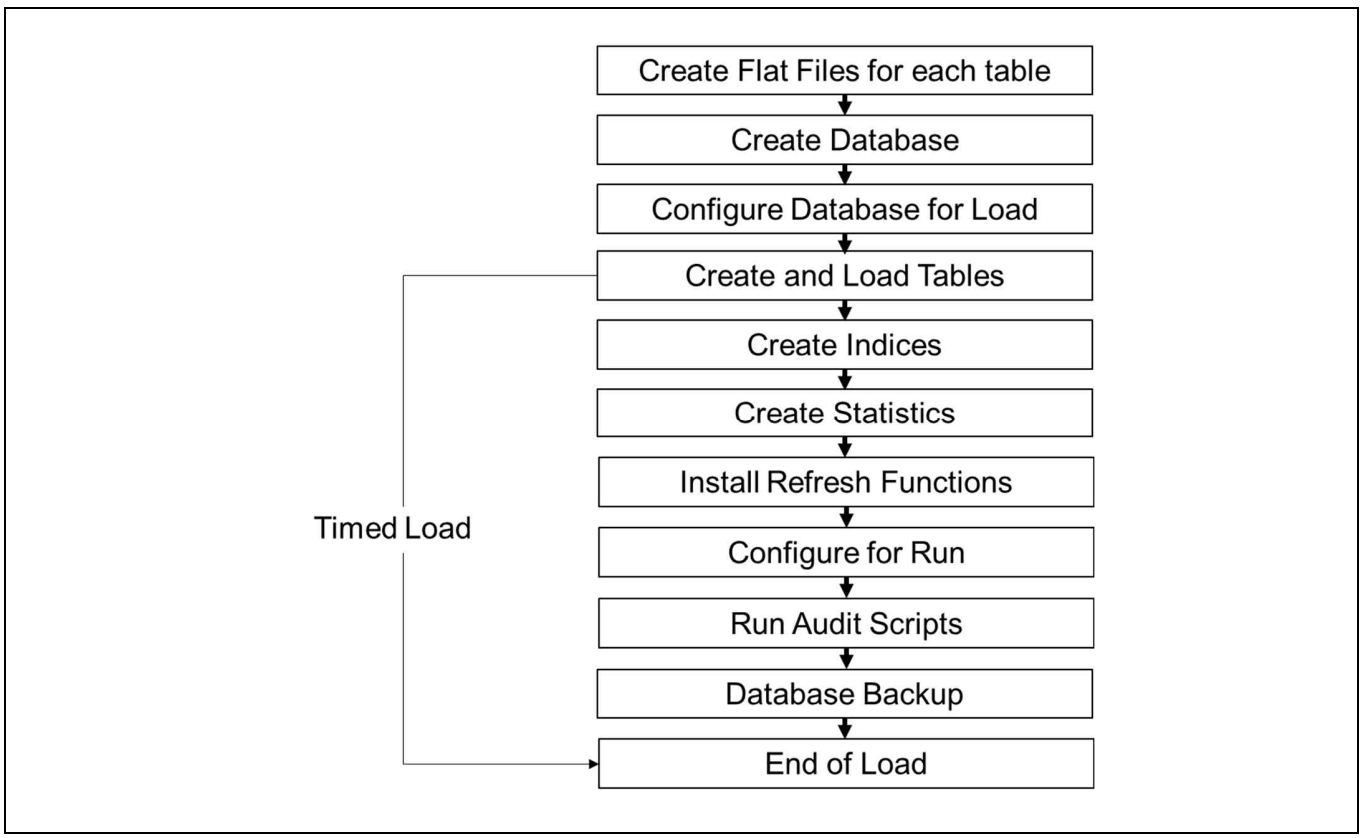
4.8 Database Load Mechanism Details and Illustration

The details of the database load must be reported in the supporting files archive . Disclosure of the load procedure includes all steps, scripts, input and configuration files required to completely reproduce the test and qualification databases. A block diagram illustrating the overall process must be disclosed.

The database was loaded using data generated by DBGEN and stored in flat files located on the OS partition of the system disk, as shown in Table 4.2.

The database load mechanism is depicted in Figure 4.5.

Figure 4.5: Block Diagram of Database Load Process



4.9 Qualification Database Configuration

Any differences between the configuration of the qualification database and the test database must be disclosed.

The qualification database used identical scripts to create and load the data with changes to adjust for the database scale factor.

4.10 Memory Ratio

The memory to database size ratio must be disclosed.

The computation of the percentage of memory to database size is shown in Table 4.6 and 4.7.

Table 4.6: Percentage of Physical Memory Computation

Memory Size (GiB)	2,048
Scale Factor (SF)	3,000
Percentage of Memory	68.3%

Table 4.7: Percentage of Virtual Memory Computation

Memory Size (GiB)	3,072
Scale Factor (SF)	3,000
Percentage of Memory	102.4%

Clause 5: Performance Metrics

5.1 System Activity Between Load and Performance Tests

Any system activity on the SUT that takes place between the conclusion of the load test and the beginning of the performance test must be fully disclosed including listings of scripts, command logs and system activity .

There was no system activity on the SUT between the conclusion of the load and the beginning of the performance test.

5.2 Steps in the Power Test

The details of the steps followed to implement the power test (.e.g., system boot, database restart, etc.) must be disclosed.

The following steps were used to implement the power test:

1. RF1 Refresh Function by refresh stream
2. Stream 0 Execution by query stream
3. RF2 Refresh Function by refresh stream

5.3 Timing Intervals for Each Query and Refresh Functions

The timing intervals (see Clause 5.3.7) for each query and for both refresh functions must be reported for the power test.

The timing intervals for each query and for both refresh functions are contained in the Numerical Quantities section of the Executive Summar at the beginning of this report..

5.4 Number of Streams for the Throughput Test

The number of execution streams used for the throughput test must be disclosed.

8 query streams were used for the throughput test.

5.5 Start and End Date/Times for Each Query Stream

The start time and finish time for each query stream for the throughput test must be disclosed.

The throughput test start time and finish time for each stream are contained in the Numerical Quantities section of the Executive Summary at the beginning of this report.

5.6 Total Elapsed Time of the Measurement Interval

The total elapsed time of the measurement interval (see Clause 5.3.6) must be reported for the throughput test.

The total elapsed time of the throughput test is contained in the Numerical Quantities section of Executive Summary at the beginning of this report.

5.7 Refresh Function Start Date/Time and Finish Date/Time

The start time and, finish time for each refresh function in the refresh stream for the throughput test must be disclosed.

The start and finish times for each refresh function in the refresh stream are contained in the Numerical Quantities section of the Executive Summary at the beginning of this report.

5.8 Timing Intervals for Each Query and Each Refresh Function for Each Stream

The timing intervals (see Clause 5.3.6) for each query of each stream and for each update function must be reported for the throughput test.

The timing intervals for each query and each refresh function for each stream are contained in the Numerical Quantities section of the Executive Summary at the beginning of this report.

5.9 Performance Metrics

The computed performance metric, related numerical quantities and price performance metric must be reported.

The performance metrics, and the numbers on which they are based, are contained in the Numerical Quantities section of the Executive Summary at the beginning of this report.

5.10 The Performance Metric and Numerical Quantities from Both Runs

A description of the method used to determine the reproducibility of the measurement results must be reported. This must include the performance metrics (QppH and QthH) from the reproducibility runs

Performance results from the first two executions of the TPC-H benchmark is shown in Table 5.1.

Table 5.1: Performance results for both runs

Run ID	QppH@3000GB	QthH@3000GB	QphH@3000GB
Run1	312,243.4	105,442.4	181,448.9
Run2	328,986.5	111,157.8	191,231.3

5.11 System Activity Between Performance Tests

Any activity on the SUT that takes place between the conclusion of Run1 and the beginning of Run2 must be fully disclosed including system activity, listings of scripts or command logs along with any system reboots or database restarts.

There was no activity on the SUT between Run1 and Run 2.

5.12 Documentation to satisfy Clause 5.2.7

All documentation necessary to satisfy Clause 5.2.7 must be made available upon request..

The Supporting Files Archive contains the documentation.

5.13 Query Output Validation

The output of the Query Output Validation Test must reported in the supporting files archive.

The Supporting Files Archive contains the output of the query validation test.

Clause 6: SUT and Driver Implementation

6.1 Driver

A detailed description of how the driver performs its functions must be supplied, including any related source code or scripts. This description should allow an independent reconstruction of the driver.

The TPC-H benchmark was implemented using a Microsoft tool called StepMaster. StepMaster is a generalpurpose test tool which can drive ODBC and shell commands. Within StepMaster, the user designs a workspace corresponding to the sequence of operations (or steps) to be executed. When the workspace is executed, StepMaster records information about the run into a database as well as a log file for later analysis.

StepMaster provides a mechanism for creating parallel streams of execution. This is used in the throughput tests to drive the query and refresh streams. Each step is timed using a millisecond resolution timer. A timestamp T1 is taken before beginning the operation and a timestamp T2 is taken after completing the operation. These times are recorded in a database as well as a log file for later analysis.

Two types of ODBC connections are supported. A dynamic connection is used to execute a single operation and is closed when the operation finishes. A static connection is held open until the run completes and may be used to execute more than one step. A connection (either static or dynamic) can only have one outstanding operation at any time.

In TPC-H, static connections are used for the query streams in the power and throughput tests. StepMaster reads an Access database to determine the sequence of steps to execute. These commands are represented as the Implementation Specific Layer. StepMaster records its execution history, including all timings, in the Access database. Additionally, StepMaster writes a textual log file of execution for each run.

The stream refresh functions were executed using multiple batch scripts. The initial script is invoked by

StepMaster, subsequent scripts are called from within the scripts.

The source for StepMaster and the RF Scripts is disclosed in the supported file archive.

6.2 Implementation Specific Layer(ISL)

If an implementation specific layer is used, then a detailed description of how it performs its functions must be supplied, including any related source code or scripts. This description should allow an independent reconstruction of the implementation-specific layer.

See Section 6.1 for details

6.3 Profile-Directed Optimization

If profile-directed optimization as described in Clause 5.2.9 is used, such use must be disclosed.

Profile-directed optimization was not used.

Clause 7: Pricing

7.1 Hardware and Software Used

A detailed list of hardware and software used in the priced system must be reported. Each item must have a vendor part number, description, and release/revision level, and indicate general availability status or committed delivery date. If package-pricing is used, contents of the package must be disclosed. Pricing source(s) and effective date(s) of price(s) must be reported.

A detailed list of all hardware and sofrware used in the priced system is in the Executive Summary section at the beginning of this report. The price quotations are included in the APPENDIX A.

7.2 Three-Year Cost of System Configuration

The total 3-year price of the entire configuration must be reported, including: hardware, software, and maintenance charges. Separate component pricing is required.

A detailed list of all hardware and sofrware, including 3-year maintenance and applicable discounts, is in the Executive Summary section at the beginning of this report. The price quotations are included in the APPENDIX A.

7.3 Availability Dates

The committed delivery date for general availability (availability date) of products used in the price calculations must be reported. When the priced system includes the product with different availability, the single availability date reported on the first page of the the Executive Summary must be the date by which all components are committed to being available. The full disclosure report must report availability dates individually for at least each of the categories for which a pricing subtotal must be provided.

The total system is available now.

Clause 8: Supproting Files Index Table

An index for all files included in the supporting files archive as required by Clause 8.3.2 through 8.3.8 must be provided in the report.

Table 8.1: File list per each Clause

Clause	Description	Archive File
Clause 1	OS and DB parameter settings	SupportingFilesArchive\Clause1
Clause 2	DB creation scripts	SupportingFilesArchive\Clause2
Clause 3	ACID scripts, ACID output	SupportingFilesArchive\Clause3
Clause 4	DB Load scripts, Qualification output	SupportingFilesArchive\Clause4
Clause 5	Query output results	SupportingFilesArchive\Clause5
Clause 6	Implementation Specific layer source code	SupportingFilesArchive\Clause6
Clause 7	There are no files to be included for Clause 7	SupportingFilesArchive\Clause7
Clause 8	Query substitution parameters, RF function source	SupportingFilesArchive\Clause8

Clause 9: Auditor Attestation

9.1 Auditor Information

The auditor's agency name, address, phone number, and Attestation letter with a brief audit summary report indicating compliance must be included in the full disclosure report. A statement should be included specifying who to contact in order to obtain further information regarding the audit process.

This benchmark was audited by:

InfoSizing

Doug Johnson
63 Lourdes Drive
Leominster, MA 01453-6709

Phone: +1 (978) 343-6262

www.sizing.com

9.2 Attestation Letter

The auditor's attestation letter is included in the following pages.

Attestation Letter

InfoSizing

TPC Certified Auditor

Benchmark sponsor: Hyo-Sil Kim
Telecommunications Technology Association
47, Bundang-ro, Bundang-gu, Seongnam-city
Gyeonggi-do, 13591, Republic of Korea

January 31, 2024

I verified the TPC Benchmark H (TPC-H™ v3.0.1) performance of the following configuration:

Platform:	SYSGEAR M50CYP2UR208_6334
Operating System:	Red Hat Enterprise Linux 7.3
Database Manager:	Microsoft SQL Server 2019 Enterprise Edition
Other Software:	SEMS (Software Defined Memory Solution)

The results were:

Performance Metric	**181,448.9 QphH@3,000GB**
TPC-H Power	312,243.4
TPC-H Throughput	105,442.4
Database Load Time	00d 08h 30m 33s

Server	**SYSGEAR M50CYP2UR208_6334, with:**		
CPUs	2x Intel® Xeon® gold 6334 (3.6 GHz, 8-Core, 18 MB Cache)		
Memory	2,048 GiB		
Disks	***Qty***	***Size***	***Type***
	7	3.84 TB	SAS SSD
	7	4 TB	NVMe

In my opinion, these performance results were produced in compliance with the TPC requirements for the benchmark.

The following verification items were given special attention:

- The database records were defined with the proper layout and size.
- The database population was generated using DBGen.
- The database was properly scaled to 3,000GB and populated accordingly.
- The compliance of the database auxiliary data structures was verified.
- The database load time was correctly measured and reported.
- The required ACID properties were verified and met.

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- The query input variables were generated by QGen.
- The query text was produced using minor modifications and no query variant.
- The execution of the queries against the SF1 database produced compliant answers.
- A compliant implementation specific layer was used to drive the tests.
- The throughput tests involved 8 query streams.
- The ratio between the longest and the shortest query was such that no query timings were adjusted.
- The execution times for queries and refresh functions were correctly measured and reported.
- The repeatability of the measured results was verified.
- The system pricing was verified for major components and maintenance.
- The major pages from the FDR were verified for accuracy.

Additional Audit Notes:

None.

Respectfully Yours,

Doug Johnson, TPC Certified Auditor

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APPENDIX A: Price Quotations

Server (SYSGEAR M50CYP2UR208_6334 Hardware and 3-Year Maintenance)

견 적 서

주식회사 시스기어

Sysgear

견적번호: 고객번호: 견적작성일자: 영업담당자:

전화번호 +82 (2) 1522 9888

고객: 견적유효기간

TTA 귀중 120 days

안녕하세요 담당자님

Sysgear 를 찾아주셔서 감사합니다. 해당 문서는 고객님께서 요청하신제품의 견적서입니다.

사양 및 가격 관련한 자세한 문의는 언제든지 조영훈 실장에게 연락주시거나 또는 Sysgear 공식홈페이지 ai.sysgear.co.kr , neomsg@sysgear.co.kr 메일로 문의 부탁드립니다.

주문을 원하시면 고객서명란에 회사직인 및 명판을 찍어 neomsg@sysgear.co.kr 로 보내주시기 바랍니다.

감사합니다.

조영훈 드림

Sysgear 서울특별시 성동구 성수일로4길25 서울숲코오롱디지털타워1차 303
(우편번호: 04781)
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페이지 1 of 3

영업담당자: Younghoon Cho
(전화번호 +82 (2) 1522 9888)

1 Price Summary

Description	Qty	Unit Price Ex Vat	Total Price
M50CYP2UR208_6334	1	153,120,900	153,120,900
Discount	1	6,158,440	-6,158,440

Subtotal	₩	146,962,460
VAT : 10%	₩	14,696,246
Total	**₩**	**161,658,706**

Quote No:	Customoer No:	Payment Term:	End User Name:
		선입금	주식회사 시스기어

Billing Address:	Shipping Address:		

Customer PO Number:	Customer Signature:

본 제품의 무상 보증기간은 1년,유상 2년 입니다.
제품 보증기간 경과 후 발생하는 고장에 대해서는 유상으로 청구됩니다.
본 제품은 전자파 적합성 평가를 받은 구성품으로 제작되었으며 완성품에 대해서는 평가를 받지 않은 제품입니다.
본 제품은 결제 확인 후 제작 및 발송 되며 서울,경기 지역은 무상으로 배송됩니다.

시스기어 결제정보

현금입금시 아래의 계좌정보를 참고하여 주시기 바랍니다.
• 계좌번호 : 기업은행 480 - 051366 - 01 - 015 예금주 : ㈜시스기어

영업담당자: Younghoon Cho
(전화번호 +82 (2) 1522 9888)

2 Quote Detailes

M50CYP2UR208_6334	Qty:	Unit Price Ex VAT:	Total Price:
	1	153,120,900	153,120,900

Components

Qty	Description	Extended Price
1	Intel® Server System M50CYP2UR208, 2U	2,100,000
2	Intel® Xeon® Gold 6334 Processor (8-Core 3.6GHz/18MB)	6,900,000
32	(Samsung) DDR4 64G M393A8G40AB2-CWE	4,416,000
7	(Seagate) Nitro XS3840SE70124 3.8TB	7,000,000
7	(Seagate) FireCuda 530 ZP4000GM30013 4TB	2,870,000
2	Quad M.2 NVMe PCIe 4.0x4 PCIe x16	226,000
1	Intel® Ethernet Network Adapter X710-T2L for OCP 3.0	390,000
2	1300W Power Supply	580,000
1	2U Riser#1 w/ x16 DW slot	115,000
1	2U Riser #2 w/ x16 DW slot	115,000
1	2U 2 slots Riser #3	110,000
1	Cable kit for 2U SB to 8 x 2.5" drives if 8 drives	110,000
1	Intel® Cable kit CYPCBLHDHDXXX1, Single	40,000
1	2U GPGPU Kit (includes airducts, bracket, power cables)	100,000
1	2U Bezel	55,000
1	Half extension rail kit	65,000
2	Heat Sink tall (1U or 2U capable)	170,000
1	Intel® RAID Adapter RS3DC080	430,000
1	24-Inch Monitor	150,000
1	Mouse	20,000

Software

8	SQL Server 2019 Enterprise Core - 2 Core License Pack	110,292,000
1	Microsoft Problem Resolution Services(3Y, 7x24x4)	336,700
3	SMES 1T(3Y, 7x24x4)	11,700,000

Service

1	M50CYP2UR208_6334_3-Yr. maint(7x24x4)	4,828,200

Sysgear 서울특별시 성동구 성수일로4길25 서울숲코오롱디지털타워1차 303
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Linux OS (Red Hat Enterprise Linux Operation System Platform)

rockPLACE
(주)락플레이스 www.rockplace.co.kr

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03129 서울시 종로구 종로 33길 15 (연지동 연강빌딩 5층) Tel : 02-6251-7788 Fax : 02-6499-1478

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Metanet

견 적 서

REF No.	: 2024RPI01-2211			TERMS AND CONDITION	
DATE	: 2024. 01. 22.				
COMPANY	: TTA			납 기	: 발주후 4주이내
ATTN	: 서병준 책임 귀하	TEL	: 010-5110-5598	유지보수	:
Email	: sbj8388@tta.or.kr			결제조건	: 납품 검수 후 30일
FROM	: ㈜락플레이스 허 윤 범 차장	TEL	: 010-6605-2146	유효기간	: 견적일로부터 3개월

下記와 같이 見積합니다.

㈜ 락플레이스
대표이사 김 재 준, 김 연 수

ITEM DESCRIPTION (VAT 별도, 단위 : 원)

Part No.	Description	수량	소비자가	공급단가	공급합계
OS	*Red Hat Enterprise Linux Operating System Platform*				
RH00004	Red Hat Enterprise Linux Server, Standard (Physical or Virtual Nodes) 3Year support : Easy ISOs: OS, Source, Documentation ISO Images 가상화 Guest OS : 2guests Red Hat Network 서비스 : 3Year Phone,email Support : 09:00 – 17:00 Scope of Coverage : Standard Maximum Memory Support: Unlimited	1	4,089,000	2,453,000	2,453,000
Maintenance	*Rockplace Support Carepack*				
RP-CPS(OS)	Rockplace Support Carepack - Linux Premium 3Year 3 Year, 24x7 4hr response Support : 원격지원, 현장지원 서비스 현장지원 - **Total Support(3년)** - Installation & Startup Service Included - Problem tracking/Emergency assistance - 방문 정기 점검 : 월 방문 정기점검 및 보고서 전달(고객 요청 시) - Update, Patch 작업 지원 - 서비스, 시스템 환경, 네트워크 환경 설정 변경 지원 - 인수 시험, 성능 시험, 비상 복구 훈련 지원	1	9,000,000	3,000,000	3,000,000
소 계 금 액					5,453,000

합 계	5,453,000
부가세	545,300
합 계(부가세포함)	5,998,300

Remarks

1. 년간 Subscription 제품이며, 기간이 만료되신 경우 Renewal을 하셔야합니다. (유상 유지보수율 100%)
2. 발주 시에는 반드시 고객정보(엔드유저명, 담당자, 연락처, Email)가 있어야 합니다.
3. 원격/현장지원 등 기술지원이 필요하실 경우에는 케어팩을 구매하셔야 합니다.