TPC Express Benchmark™ IoT
Full Disclosure Report

TimechoDB 2.0.2.1
Based on Apache IoTDB

running on

IEIT Systems NF3280G7 Server

with

KeyarchOS 5.8SP2 64-bit

TPCx-IoT Version	2.1.2
Report Edition	First
Report Submitted	April 3rd, 2025

First Edition – April 2025

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The pricing information in this document is believed to accurately reflect the current prices as of the publication date. However, the Sponsor provides no warranty of the pricing information in this document.

Benchmark results are highly dependent upon workload, specific application requirements, and system design and implementation. Relative system performance will vary because of these and other factors.

Therefore, the TPC Express Benchmark™ should not be used as a substitute for a specific customer application benchmark when critical capacity planning and/or product evaluation decisions are contemplated.

All performance data contained in this report was obtained in a rigorously controlled environment. Results obtained in other operating environments may vary significantly. No warranty of system performance or price/performance is expressed or implied in this report.

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Abstract

Timecho conducted the TPC Express Benchmark™ IoT (TPCx-IoT) on a 4-node TimechoDB cluster with two-way replication, with each node deployed on a separate IEIT Systems server instance. The software used included TimechoDB 2.0.2.1. This report provides full disclosure of the methodology and results. All testing was conducted in conformance with the requirements of the TPCx-IoT Standard Specification, Revision 2.1.2. The benchmark results are summarized below.

Configuration Summary

Sponsor	Cluster Nodes	Storage Software	Operating System
Timecho	IEIT Systems NF3280G7 Server	TimechoDB 2.0.2.1 based on Apache IoTDB	KeyarchOS 5.8SP2 64-bit

TPC Express Benchmark™ IoT Metrics

Total System Cost (USD)	IoTps	USD/KIoTps	Availability Date
227,926.00	22,713,531.53	10.03	April 3rd, 2025

Executive Summary

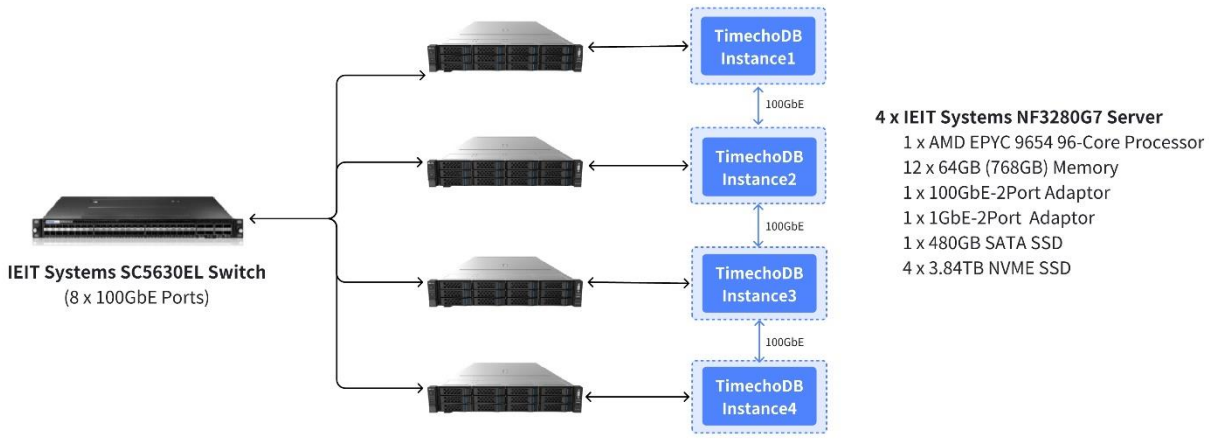
The Executive Summary follows on the next several pages.

timecho	**TimechoDB 2.0.2.1 based on Apache IoTDB**	TPCx-IoT 2.1.2 TPC Pricing 2.9.0 Report Date April 3rd, 2025

Total System Cost	TPCx-IoT Performance Metric	Price/Performance
227,926.00 USD	**22,713,531.53 IoTps**	**10.03 USD/kIoTps**

Servers	Operating System	Other Software	Avaliability Date
IEIT Systems NF3280G7	KeyarchOS 5.8SP2 64-bit	None	April 3rd, 2025

System Under Test Configuration Overview



Total Servers:		4x IEIT Systems NF3280G7 Server
Total Processors/Cores/Threads		4/384/768
Each Server Configuration	1x TimechoDB Instance	
	Processor	1x AMD EPYC 9654 96-Core Processor
	Memory	12x SK hynix 64GB DDR5-4800MHz ECC Memory (768G)
	Storage Device	1x 480GB SATA SSD
		4x Samsung PM9A3 3.84TB NVME SSD
	Network Controller	1x 1Gbps Dual-Port I350
		1x 100Gbps Dual-Port Nvidia CX6DX
Connectivity	IEIT Systems SC5630EL 100GbE Switch	

timecho	**TimechoDB 2.0.2.1 based on Apache IoTDB**	TPCx-IoT 2.1.2 TPC Pricing 2.9.0 Report Date April 3rd, 2025

Description	Part Number	Source	List Price (USD)	Qty	Extended Price (USD)	3 yr. Maint. Price (USD)
Licensed Compute Services						
IEIT Systems NF3280G7 Server		1	17,429.00	4	69,716.00	
IEIT Systems SC5630EL Switch		1	4,970.00	1	4,970.00	
					Sub-Total	74,686.00 USD
Licensed Software Services						
KeyarchOS V5		1	510.00	4	2,040.00	
3-Year TimechoDB 2.0.2.1 License (incl. 1-year 24*7 Support)		2	135,000.00	1	135,000.00	
1-Year TimechoDB 24*7 Support		2	27,000,00	2	54,000.00	
					Sub-Total	191,040.00 USD
Discounts*						
3-Year TimechoDB 2.0.2.1 License		2	(27,000.00)	1	(27,000.00)	
1-Year TimechoDB 24*7 Support		2	(5,400.00)	2	(10,800.00)	
					Sub-Total	(37,800.00 USD)
					Total	**227,926.00 USD**

Price Sources:
1) IEIT Systems 2) Timecho
*20% OFF discount is based on list price for the deployment of small clusters of TimechoDB.

Three-Year Cost of Ownership:	**227,926.00 USD**
IoTps:	**22,713,531.53**
USD/kIoTps:	**10.03 USD/kIoTps**

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

timecho	TimechoDB 2.0.2.1 based on Apache IoTDB	TPCx-IoT 2.1.2 TPC Pricing 2.9.0 Report Date April 3rd, 2025

Numerical Quantities

Scale Factor	42,000,000,000

Performance Run (Run1)

Warmup Run Start Time	2025-04-02 22:23:42.000
Warmup Run End Time	2025-04-02 22:56:50.000
Warmup Run Elapsed Time	1,987.117
Measured Run Start Time	2025-04-02 22:56:52.000
Measured Run End Time	2025-04-02 23:27:13.000
Measured Run Elapsed Time	1,820.976
Performance Metric (IoTps)	23,064,554.39

Repeatability Run (Run2)

Warmup Run Start Time	2025-04-02 23:28:29.000
Warmup Run End Time	2025-04-03 00:03:10.000
Warmup Run Elapsed Time	2,080.375
Measured Run Start Time	2025-04-03 00:03:12.000
Measured Run End Time	2025-04-03 00:34:02.000
Measured Run Elapsed Time	1,849.118
Performance Metric (IoTps)	22,713,531.53

timecho	**TimechoDB 2.0.2.1 based on Apache IoTDB**	TPCx-IoT 2.1.2 TPC Pricing 2.9.0 Report Date April 3rd, 2025

Performance Run Report (Run1)

==========

TPCx-IoT Performance Metric (IoTps) Report
Test Run1 details Total Time for Warmup Run in Seconds = 1,987.117
Test Run1 details Total Time in Seconds = 1,820.976
Total Number of Records = 42,000,000,000

TPCx-IoT Performance Metric (IoTps): 23,064,554.39

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Repeatability Run Report (Run2)

==========

Test Run2 details Total Time for Warmup Run in Seconds = 2,080.375
Test Run2 details Total Time in Seconds = 1,849.118
Total Number of Records = 42,000,000,000

TPCx-IoT Performance Metric (IoTps): 22,713,531.53

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timecho	**TimechoDB 2.0.2.1 based on Apache IoTDB**	TPCx-IoT 2.1.2 TPC Pricing 2.9.0 Report Date April 3rd, 2025

Revision History

Date	Edition	Description
April 3rd, 2025	First	Initial Publication

Table of Contents

Clause 0 Preamble

0.1 TPC Express Benchmark™ IoT Overview

TPC Express Benchmark™ IoT (TPCx-IoT) was developed to provide an objective measure of hardware, operating system and commercial NoSQL database software distributions, and to provide the industry with verifiable performance, price-performance and availability metrics. The benchmark models a continuous system availability of 24 hours a day, 7 days a week.

Even though the modeled application is simple, the results are highly relevant to hardware and software dealing with IoT gateway systems in general. TPCx-IoT stresses both hardware and software including database APIs and network connections to the database. This workload can be used to assess a broad range of NoSQL databases. TPCx-IoT can be used to assess a range of NoSQL implementations in a technically rigorous and directly comparable and vendor-neutral manner. The metric effectively represents the total number of records that can be inserted into a NoSQL database per second while running queries against the database.

The TPCx-IoT kit is available from the TPC (See www.tpc.org/tpcx-iot for more information). Users must sign up and agree to the TPCx-IoT User Licensing Agreement (ULA) to download the kit. Re-distribution of the kit is prohibited. All related work (such as collaterals, papers, derivatives) must acknowledge the TPC and include TPCx-IoT copyright. The TPCx-IoT Kit includes: the TPCx-IoT Specification document, the TPCx-IoT Users Guide document, shell scripts to set up the benchmark environment and Java code to execute the benchmark load.

The purpose of TPC benchmarks is to provide relevant, objective performance data to industry users. To achieve that purpose, TPC benchmark specifications require that benchmark tests be implemented with systems, products, technologies and pricing that:

- Are generally available to users;
- Are relevant to the market segment that the individual TPC benchmark models or represents (e.g., TPCx- IoT models and represents a NoSQL database mimicking an IoT gateway system)
- Would plausibly be implemented by a significant number of users in the market segment the benchmark models or represents.

The use of new systems, products, technologies (hardware or software) and pricing is encouraged so long as they meet the requirements above. Specifically prohibited are benchmark systems, products, technologies or pricing (hereafter referred to as "implementations") whose primary purpose is performance optimization of TPC benchmark results without any corresponding applicability to real-world applications and environments. In other words, all "benchmark special" implementations that improve benchmark results but not real-world performance or pricing, are prohibited.

The rules for pricing are included in the TPC Pricing Specification. Further information is available at www.tpc.org.

Clause 1 General Items

1.1 Test Sponsor

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

This benchmark was sponsored by Timecho Technology (Beijing) Co. Ltd.

1.2 Parameter Settings

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

- *Configuration parameters and options for server, storage, network and other hardware component incorporated into the pricing structure;*
- *Configuration parameters and options for operating system and file system component incorporated into the pricing structure;*
- *Configuration parameters and options for any other software component incorporated into the pricing structure;*
- *Compiler optimization options.*

Comment 1: In the event that some parameters and options are set multiple times, it must be easily discernible by an interested reader when the parameter or option was modified and what new value it received each time.

Comment 2: This requirement can be satisfied by providing a full list of all parameters and options, as long as all those that have been modified from their default values have been clearly identified and these parameters and options are only set once.

The Supporting Files contain all configuration parameters of the components involved in the benchmark.

1.3 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:

- *Total number of nodes used*
- *Total number and type of processors used/total number of cores used/total number of threads used (including sizes of L2 and L3 caches)*
- *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 (for example, Ethernet) connections and speed for switches and other hardware components physically used in the test or are incorporated into the pricing structure*
- *Type and the run-time execution location of software components*

1.3.1 Measured Configuration

Figure 1-1 shows the measured configuration.

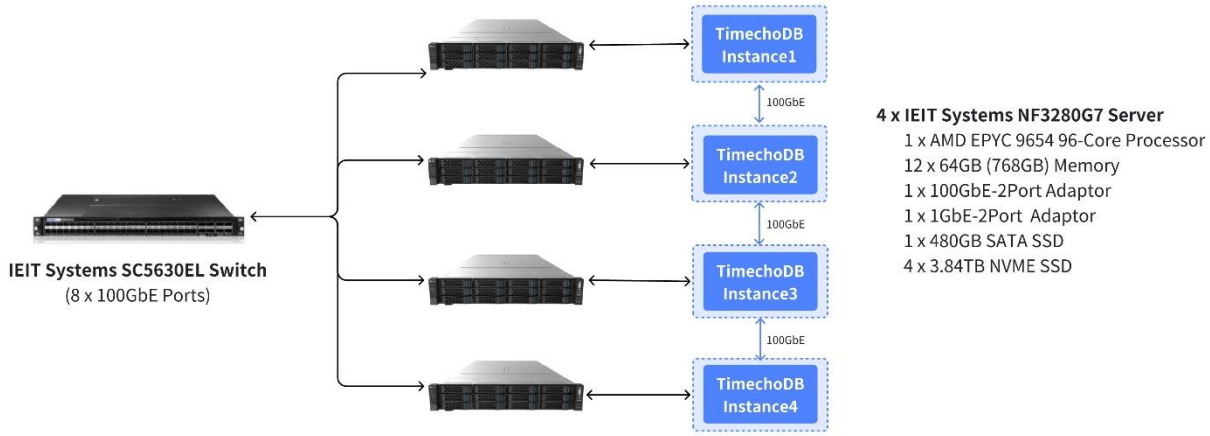

Figure 1-1 Measured Configuration

The measured configuration consisted of:

Total Nodes:	4
Total Processors/Cores/Threads:	4/384/768
Total Memory:	3,072GB
Total Number of Storage Devices:	16
Total Storage Capacity:	64,834.56GB
Connectivity:	IEIT Systems SC5630EL 100GbE Switch
Each Server Configuration:	1x NF3280G7 with 1x TimechoDB Instance
Processors/Cores/Threads:	1/96/192
Processor Model:	1x AMD EPYC 9654 96-Core Processor
Memory:	12x SK hynix 64GB DDR5-4800MHz ECCMemory (768G)
Storage Devices:	1x 480GB SATA SSD 4x Samsung PM9A3 3.84TB NVME SSD
Network Controller	1x 1Gbps Dual-Port I350 1x 100Gbps Dual-Port Nvidia CX6DX

The distribution of software components over server nodes is detailed in section 1.5.

1.3.2 Priced Configuration

There are no differences between the priced configuration and the measured configuration.

1.4 Dataset Distribution

The distribution of dataset across all media must be explicitly described.

Table 1-1 describes the distribution of the dataset across all storage media in the system.

Server	Storage	Disk Drive	Description of Content
1-4	System Storage	1x 480GB SATA SSD	Operating System, Swap, Root, Temp
	Data Storage	4x Samsung PM9A3 3.84TB NVME SSD	TimechoDB Data

Table 1-1 Dataset Distribution Across Storage Media

1.5 Software Component Distribution

The distribution of various software components across the system must be explicitly described.

Table describes the distribution of the software components across the system.

Server	TimechoDB ConfigNode	TimechoDB DataNode
1	X	X
2		X
3		X
4		X

Table 1-2 Software Component Distribution Across Nodes

The storage system software used was TimechoDB 2.0.2.1.

Clause 2 Workload Related Items

2.1 Hardware and Software Tunable Parameters

Script or text used to set all hardware and software tunable parameters must be reported.

The Supporting Files Archive contains the parameters used to configure the components involved in this benchmark

2.2 Run Report

The run report generated by the TPCx-IoT Kit for Performance Run and Repeatability Run must be reported.

The Supporting Files Archive contains the full run report. The following excerpts from the run report summarize the Performance Run and the Repeatability Run.

Performance Run Report (Run1)

```
================================================================================
        TPCx-IoT Performance Metric (IoTps) Report
        Test Run1 details           Total Time for Warmup Run in Seconds = 1,987.117
        Test Run1 details           Total Time in Seconds = 1,820.976
                                    Total Number of Records = 42,000,000,000

        TPCx-IoT Performance Metric (IoTps): 23,064,554.39
================================================================================
```

Repeatability Run Report (Run2)

```
        Test Run2 details           Total Time for Warmup Run in Seconds = 2,080.375
        Test Run2 details           Total Time in Seconds = 1,849.118
                                    Total Number of Records = 42,000,000,000

        TPCx-IoT Performance Metric (IoTps): 22,713,531.53
================================================================================
```

2.3 Benchmark Kit Identification

The version of the TPCx-IoT kit and checksums for key files are listed below.

TPCx-IoT Kit Version	2.1.2

File	MD5
TPC-IoT-master.sh	cc24620cfdee08290d771c5471a8d1ee
tpcx-iot/timechodb-binding/lib/core-0.13.0-SNAPSHOT.jar	00c117fb139465e59a0e829b78f8431a
IoT_cluster_validate_suite.sh	b2342754095f973ce27f43c28d3ca0ae

2.4 Benchmark Kit Changes

No modifications were made to the TPC provided kit.

Clause 3 Scale Factor and Metrics

3.1 Scale Factor, Performance, Price-Performance

The metrics for Run 1 and Run 2 are summarized below.

	Run1	Run2
Scale Factor	42,000,000,000	42,000,000,000
Measured Run Time (seconds)	1,820.976	1,849.118
IoTps	23,064,554.39	22,713,531.53

Run2 Price-Performance: 10.03 USD/kIoTps

Third-Party Price Quotes

IEIT Systems NF3280G7 Server

Vendor

IEIT Systems, https://en.ieisystem.com/

Quotation

The server configuration is as detailed below:

Item	Configuration
Processor	1x AMD EPYC 9654 96-Core Processor
Memory	12x SK hynix 64GB DDR5-4800MHz ECC Memory (768G)
Storage Device	1x 480GB SATA SSD
	4x Samsung PM9A3 3.84TB NVME SSD
Network Controller	1x 1Gbps Dual-Port I350
	1x 100Gbps Dual-Port Nvidia CX6DX

Notes:

The price includes VAT.

浪潮信息

IEIT Systems Product Quotation

IEIT Systems Co., Ltd.

April 2, 2025

浪潮信息

1.Server products					
1.1	NF3280G7 Server				
No.	**Product**	**Specification Description**	**Qty.**	**Unit Price**	**Total Price**
1.1.1	NF3280G7 Server	NF3280G7 Server supports 1 AMD EPYC™ 9004 series processor, up to 128 cores, up to 384 MB L3 cache, supports up to 24 DDR5 memory modules, maximum memory capacity of 6TB CPU：AMD EPYC 9654 96-core Processor*1 MEM：SK hynix 64GB DDR5-4800MHz ECC Memory*12 I/O：480GB SATA SSD*1 I/O：Samsung PM9A3 3.84TB NVME SSD*4 NIC：100Gbps Dual-Port Nvidia CX6DX*1 NIC：1Gbps Dual-Port I350*1 PowerSupply 1300W Platinum 220V*2 3-Year 7×24 Premium Maintenance Service	4	$17,429.00	$69,716.00
2.Network products					
2.1	SC5630EL Switch				
No.	**Product**	**Specification Description**	**Qty.**	**Unit Price**	**Total Price**
2.1.1	SC5630EL Switch	SC5630EL supports 48×10/25GE ports, 8×40/100GE ports, dual power supplies, hot-swappable fans, 3+1 redundancy Includes system software and 4×100G cables 3-Year 7×24 Premium Maintenance Service	1	$4,970.00	$4,970.00
3.Operating System					
No.	**Product**	**Specification Description**	**Qty.**	**Unit Price**	**Total Price**
3.1	KeyarchOS V5	KeyarchOS independently developed based on the Linux kernel, supporting mainstream architecture processors such as x86 and ARM, compatible with traditional CentOS, and supporting key features such as cluster high availability, memory tiering management, I/O resource control, and visual migration 3-Year 7×24 Premium Maintenance Service	4	$510.00	$2,040.00

Notes

1. This price is valid from April 2, 2025, to June 2, 2025.
2. The price includes VAT.

Timecho, TimechoDB 3-Year Subscription

timecho

Company Name		Quote No.:	PPxxxxxxxx
Contact Person		Date:	2025-04-01
E-Mail		Customer ID:	xxxxxxxx
Company Address			
Zip code and City		Contact:	xxxxxxxx
		E-Mail:	contact@timecho.com
		Telefon:	+86 (0) 10-62780978
			+49 (0) 711-81048763

Quote No. PPxxxxxxxx

Dear Sir or Madam,

Thank you for your inquiry. We offer our products and services exclusively under the following conditions. The offer is based on the data and requirements available at the time of the offer.

No.	Product	Qty	List Price	Supply Price	Total Price
01	**TimechoDB v2.0.2.1 based on Apache IoTDB** *- 4-Node Cluster with 2 Replicas* *- Timecho Monitoring Dashboard* *- Timecho Workbench* *- OpsKit (Cluster Management Tool)* *- AINode with Large Time Series Model*	1	135,000	108,000	108,000 USD
02	**Maintenance** *Support 24*7 inkl. remote troubleshooting, debug, updates, data migration tools, etc.*	2	27,000	21,600	43,200 USD
			Total:		151,200 USD

Notes:

Quotation: TimechoDB Cluster Edition License (2 Replicas) and 3 Years of Maintenance. The license includes one year of free maintenance. Starting from the second year, an annual maintenance fee of 20% of the license price will apply.

Payment Terms: Payment is due within 21 days from the date of invoice without deductions.

Taxes and Duties: All prices are tax-inclusive, unless otherwise specified.

Quotation Validity: This quotation is valid for 90 days from the date of issuance.

Best regards,

Timecho Team

Supporting File Index

Clause	Description	Archive Pathname
Clause 1	Parameters and options used to configure and tune the SUT	/Clause1
Clause 2	Configuration scripts and Run Report	/Clause2
Clause 3	System configuration details	/Clause3