



Super Micro Computer, Inc

TPC Express Benchmark™ IoT
Full Disclosure Report
for
Supermicro A+ Server AS-2124BT-HTR
(BigTwin™ with 4x H12DST-B Nodes)

Using

HBase 2.0.0 on
Cloudera Distribution for Apache Hadoop
Enterprise Edition 6.0.1
and
Red Hat Enterprise Linux Server Release 7.6

TPCx-IoT Version
Report Edition
Report Submitted

V1.0.3
First
August 07, 2019

First Edition - August 2019

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		Supermicro A+ Server AS-2124BT-HTR		TPCx-IoT: v1.0.3
				TPC-Pricing: v2.4.0
Total System Cost		TPCx-IoT Performance Metric		Report Date: Aug 07, 2019
137,424 USD		253,178 IoTps		0.54 USD \$/IoTps
Number of Records	DBMS Software	Operating System	Other Software	Availability Date
400 Million	HBase 2.0.0 on Cloudera Distribution for Apache Hadoop 6.0.1	Red Hat Enterprise Linux Server Release 7.6	None	Aug 31, 2019
System Configuration				
<p>1x Supermicro A+ Server AS-2124BT-HTR BigTwin™ with 4x H12DST-B Nodes, each with: 1x AMD EPYC 7502P 32-Core Processor 256 GB (8x 32GB RDIMM 2666MT/s Dual Rank) 1x 960GB M.2 PCIe Gen3 1x Mellanox Dual Port 25GbE SFP28 NIC 2x Micron 5200 PRO 2.5 SSD 1920GB (Data Nodes)</p>				
		 <p>Mellanox SN2410 Network Switch (48-port 25GbE + 8-port 100GbE)</p>		
Total Number of Servers:		1x Supermicro A+ Server AS-2124BT-HTR (BigTwin™ with 4x H12DST-B Nodes)		
Total Processors/Cores/Threads:		4/128/256		
Server Configuration (each)	Processors	1x AMD EPYC 7502P 2.5GHz 32-Core		
	Memory	256GB		
	Storage Device	1x 960GB M.2 PCIe Gen3 (all nodes) 2x Micron 5200 PRO 2.5 SSD 1920GB (Data Nodes)		
	Network	1x Supermicro AOC-MH25G-m2S2T Dual Port 25GbE SFP28 NIC		
	Connectivity:	Mellanox SN2410 Network Switch		
Total Rack Units:		(2x217BH-22H12) + (1xSN2410) = (2x1) + (1x1) = 3RU		



Supermicro A+ Server AS-2124BT-HTR

TPCx-IoT: v1.0.3

TPC-Pricing: v2.4.0

Report Date: Aug 07,2019

Description	Part Number	Key	Unit Price	Qty	Extended Price	3 yr. Maint. Price
HARDWARE COMPONENTS						
Supermicro Model 217BH-22H12 - Rail, Power Cord (included)	AS-2124BT-HTR		1 \$4,999.00	1	\$4,999.00	
AMD EPYC™ 7502P 2.5GHz/3.35GHz, 32C/64T 180W	PSE-ROM7502P-0045		1 \$2,296.00	4	\$9,184.00	
SK hynix 32GB 2Rx4 PC4-2666V-RB2-II HMA84GR7AFR4N-VK	HMA84GR7AFR4N-VK		1 \$148.50	32	\$4,752.00	
M.2 Model : MZ-1LW9600	MZ1LW960HMJP-00003		1 \$148.00	4	\$592.00	
Micron 5200 PRO 2.5 SSD 1920GB	MTFDDAK1T9TDD-1A1TIZABYY		1 \$272.50	6	\$2,180.00	
25GbE Network Adapter	AOC-MH25G-m2S2TM		1 \$249.90	4	\$999.60	
4-hour 7x24 On-site Service 3years	OS4HR3		1 \$1,281.64	1		\$1,281.64
Mellanox SN2410 Switch	MSN2410-CB2F		2 \$25,387.00	1	\$25,387.00	
Mellanox Tech Support and Warranty - Silver 3 years with 4 Hours On-Site Support for SN2000 Series Switch	SUP-SN2000-3S-4H		2 \$2,475.00	1		\$2,475.00
Mellanox MCP2M00-A001E30N Ethernet Passive Copper Cable 25GbE SFP28 1m Black 30AWG CA-N	MCP2M00-A001E30N		2 \$52.00	5	\$260.00	
12U Open Frame Server Rack - Adjustable Depth - 4-Post Data Rack	4POSTRACK12U		2 \$195.99	1	\$195.99	
NEMA 5-15P to IEC320 C15 14AWG 125V/15A	P515C15-15ABE-10		2 \$10.00	1	\$10.00	
24" LED Monitor			2 \$79.00	1	\$79.00	
Keyboard and Mouse			2 \$14.56	1	\$14.56	
Subtotal					\$48,653.15	\$3,756.64
HARDWARE COMPONENTS			Subtotal		\$48,653.15	\$3,756.64



Supermicro A+ Server AS-2124BT-HTR

TPCx-IoT: v1.0.3

TPC-Pricing: v2.4.0

Report Date: Aug 07, 2019

Description	Part Number	Key	Unit Price	Qty	Extended Price	3 yr. Maint. Price	
SOFTWARE COMPONENTS							
Cloudera Enterprise Operational DB Edition, Node License, 24x7, 1YR		2	\$6,000.00	12		\$72,000.00	
Red Hat Enterprise Linux 7.6, 3yr Premium Subscription		1	\$3,276.86	4		\$13,107.44	
SOFTWARE COMPONENTS					Subtotal	\$0.00	\$85,107.44
Total						\$48,653.15	\$88,864.08
					Three-Year Cost of Ownership :		\$137,517
Pricing : 1 Supermicro (based upon total system cost as purchased by a regular customer)					IoTps :		253,178.82
Pricing : 2 Obtained from third-party or online					\$ / IoTps :		\$0.54

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 specifications. If you find that the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org.



**Supermicro A+ Server
AS-2124BT-HTR**

TPCx-IoT: v1.0.3

TPC-Pricing: v2.4.0

Report Date: Aug 07, 2019

Measurement Results for Performance Run

Total Number of Records	400 Million
Warmup Run - Start Time	2019-07-08 10:22:29
Warmup Run - End Time	2019-07-08 11:02:46
Warmup Run Elapsed Time in Seconds	2,415.396
Measured Run Start Time	2019-07-08 11:02:46
Measured Run End Time	2019-07-08 11:29:07
Total Time In Seconds	1,579.911

Measurement Results for Repeatability Run

Total Number of Records	400 Million
Warmup Run Start Time	2019-07-08 11:44:18
Warmup Run End Time	2019-07-08 12:14:37
Warmup Run Elapsed Time in Seconds	1,819.021
Measured Run Start Time	2019-07-08 12:14:37
Measured Run End Time	2019-07-08 12:40:38
Total Time In Seconds	1,560.441



**Supermicro A+ Server
AS-2124BT-HTR**

TPCx-IoT: v1.0.3

TPC-Pricing: v2.4.0

Report Date: Aug 07, 2019

Run Report for Performance Run

=====
TPCx-IoT Performance Metric (IoTps) Report

Total Time For Warmup Run In Seconds = 2,415.396

Total Time In Seconds = 1,579.911

Total Number of Records = 400 Million

TPCx-IoT Performance Metric (IoTps): 253,178.8183

Run Report for Repeatability Run

=====
TPCx-IoT Performance Metric (IoTps) Report

Total Time For Warmup Run In Seconds = 1,819.021

Total Time In Seconds = 1,560.441

Total Number of Records = 400 Million

TPCx-IoT Performance Metric (IoTps): 256,337.7916

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Abstract

This document contains the methodology and results of the TPC Express Benchmark™ IoT (TPCx-IoT) test conducted in conformance with the requirements of the TPCx-IoT Standard Specification, Revision 1.0.3.

The test was conducted for a Scale Factor of 400 Million records with Supermicro A+ Server AS-2124BT-HTR with 4x H12DST-B Nodes running HBase 2.0.0 on Cloudera Distribution for Apache Hadoop Edition 6.0.1 on Red Hat Enterprise Linux Server Release 7.6.

Measured Configuration

Company Name	Cluster Node	Virtualization	Operating System
Super Micro Computer, Inc	Supermicro A+ Server AS-2124BT-HTR	Not Used	Red Hat Enterprise Linux Server Release 7.6

TPC Express Benchmark® IoT Metrics

Total System Cost	IoTps	Price/Performance	Availability Date
137,424 USD	253,178.82	0.54 USD	Aug 31, 2019

Preface

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. The 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. The 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: TPCx-IoT Specification document, TPCx-IoT Users Guide documentation, 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 Super Micro Computer, Inc.

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 the parameters and options used to configure the components involved in this 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 (e.g., 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.*

Measured Configuration:

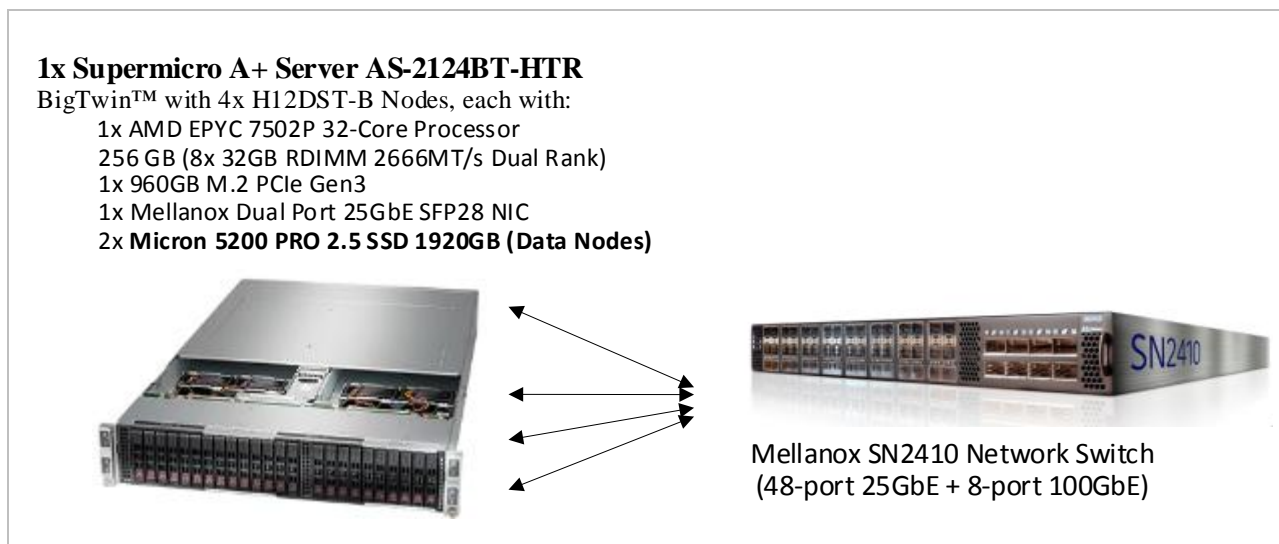


Figure 1-1 Measured Configuration

The measured configuration consisted of

- Total Nodes: 4
- Total Processor/Cores/Threads: 4/128/256
- Total Memory: 1.02TB
- Total Number of Storage Devices: 7
- Total Storage Capacity: 15.36TB

Server nodes details:

- Supermicro A+ Server AS-2124BT-HTR, BigTwin™ with 4x H12DST-B Nodes, each with:
 - Processors/Cores/Threads: 1/32/64
 - Processor Model: 1x AMD EPYC™ 7502P 2.5GHz 32-core
 - Memory: 256GB (8 x 32GB RDIMM 2666MT/s Dual Rank)
 - Drives: 1x 960GB M.2 PCIe Gen3 (for all Servers)
1x Micron 5200 PRO 2.5 SSD 1920GB (for all Data Node Servers)
 - Network: 1x Supermicro AOC-MH25G-m2S2T Dual Port 25GbE SFP28 NIC

Priced Configuration:

There are no differences between the priced and measured configurations.

1.4 Dataset Distribution

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

Table 1.4 describes the distribution of the dataset across all media in the system.

Table 1.4: Dataset Distribution

Server Node	Storage	Disk Drive	Description of Content
1	M.2 PCIe Gen3	NVMe0n1	Operating System, Swap, Hadoop Master, Root, Temp
2-4	SATA3 (6Gbps) via AMD EPYC	2 (SSD)	Operating System, Swap, Root, Temp
2-4	SATA3 (6Gbps) via AMD EPYC	2 (SSD)	Data, Temp

1.5 Software Components Distribution

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

Table 1.5 describes the distribution of the software components across the system.

Table 1.5: Software Component Distribution

Node	HDFS		HBase		YARN		Zoo Keeper
	NameNode	DataNode	Master	Region Server	Resource Manager	Node Manager	
1	X		X		X		X
2-3		X		X		X	X
4		X		X		X	

NoSQL Database version must be disclosed.

HBase -2.0.0 on Cloudera Distribution for Apache Hadoop 6.0.1

Clause 2: Workload Related Items

2.1 Hardware & Software Tunable

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

The Supporting File Archive contains all configuration scripts.

2.2 Run Report

The run report generated by TPCx-IoT benchmark kit must be reported.

The Supporting File Archive contains the full run report. Following are extracts from the run report that lists the performance summary for both runs.

Run Report for Performance Run

```
=====
TPCx-IoT Performance Metric (IoTps) Report

Total Time For Warmup Run In Seconds = 2,415.396
Total Time In Seconds = 1,579.911
Total Number of Records = 400 Million

TPCx-IoT Performance Metric (IoTps): 253,178.8183
=====
```

Run Report for Repeatability Run

```
=====
TPCx-IoT Performance Metric (IoTps) Report

Total Time For Warmup Run In Seconds = 1,819.021
Total Time In Seconds = 1,560.441
Total Number of Records = 400 Million

TPCx-IoT Performance Metric (IoTps): 256,337.7916
=====
```

2.3 Benchmark Kit Identification

Version number of TPCx-IoT kit and checksum for the jar file and master Programs must be reported.

Kit Version	1.0.3
24d1e8079cfdd240f266041bca0333b5	./TPC-IoT-master.sh
68379f9375c7b584fc3253dfe9c4f7a6	./tpcx-iot/lib/core-0.13.0-SNAPSHOT.jar
7bebf1e17d5c2b380df575fad160d7f8	./IoT_cluster_validate_suite.sh

2.4 Benchmark Kit changes

No Modifications were made to the TPC provided kit.

Clause 3: Scale Factors and Metrics

3.1 Total Run Time

	Run 1	Run 2
Total Run Time	1,579.91	1,560.44

3.2 Performance and Price Performance

The performance metric (IoTps) must be disclosed for Run1 and Run2. Price-performance metric (\$/IoTps) must be disclosed for the performance run.

	Run 1	Run 2
IoTps	253,178.81	256,337.79

\$/IoTps	\$0.54
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3.3 System Configuration Information

Storage System Software	Operating System	Other Software	System Availability Date
	Red Hat Enterprise Linux Server Release 7.6		Aug 31, 2019

Cloudera 6.0.1	
Component	Package Version
Apache Hadoop	hadoop-3.0.0+cdh6.0.1
HBase	hbase-2.0.0+cdh6.0.1
YARN	yarn-3.0.0+cdh6.0.1
Zookeeper	zookeeper-3.4.5+cdh6.0.1

Supporting File Index

The following index outlines the information included in the supporting file archive.

Storage System Software	Operating System	System Availability Date
Clause 1	Parameters and options used to configure and tune the SUT	Supporting Files Archive/Clause1
Clause 2	Configuration Scripts and Run Report	Supporting Files Archive/Clause2
Clause 3	System Configuration Details	Supporting Files Archive/Clause3