

# **Alibaba Cloud Computing Ltd.**

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TPC Express Benchmark™ Big Bench (TPCx-BB)

Full Disclosure Report

for

Alibaba Cloud MaxCompute

(with 14x Compute Nodes,

3x Storage Nodes,

3x Master Nodes)

using

MaxCompute v3.35

and

Alibaba Group Enterprise Linux Server 7.2 (Paladin)

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**First Edition**

**September 25, 2020**

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		Alibaba Cloud MaxCompute		TPCx-BB Rev. v1.3.1 TPC-Pricing Rev. v2.6.0	
				Report Date: September 25, 2020	
Total System Cost		TPCx-BB Performance Metric		Price/Performance	
1,075,657 USD		9,296.45 BBQpm@30000		115.71 USD \$/BBQpm@30000	
Framework	Operating System	Other Software	Availability Date	Scale Factor	Streams
MaxCompute v3.35	Alibaba Group Enterprise Linux Server 7.2 (Paladin)	None	September 1, 2020	30000	3






Switches:  
Uplinks: 8 \* 100Gbps  
Downlinks: 48 \* 25Gbps  
Included in MaxCompute Pricing



25GbE


3 Master Nodes:  
2 \* Intel Xeon Platinum 8163 @2.50GHz  
384GB Memory  
1 \* 240GB SATA 6Gbps SSD  
1 \* 3.84TB NVMe SSD  
Included in MaxCompute Pricing



25GbE

25GbE


14 Compute Nodes:  
Each:  
2 \* Intel Xeon Platinum 8269CY @2.50GHz  
768GB Memory  
1 \* 240GB SATA 6Gbps SSD  
1 \* 960GB NVMe SSD



25GbE

3 Storage Nodes:  
2 \* Intel Xeon Platinum 8163 @2.50GHz  
256GB Memory  
2 \* 240GB SATA 6Gbps SSD  
76 \* 8TB SATA 6Gbps HDD  
Included in MaxCompute Storage Pricing

Physical Storage/Scale Factor: 61.82		Scale Factor/Physical Memory: 2.37	
Servers:		3x Master Nodes / 14x Compute Nodes / 3x Storage Nodes	
Total Processors/Cores/Threads		40/1,016/2,032	
<b>3x Master Node:</b> 2x Intel® Xeon® Platinum 8163 CPU @ 2.50GHz 384 GiB Onboard SATA Controller 1x 240 GB SATA 6 Gbps SSD 1x 3.84 TB NVMe SSD Mellanox MT27710 ConnectX-4 Lx		<b>14x Compute Node:</b> 2x Intel(R) Xeon(R) Platinum 8269CY CPU @ 2.50GHz 768 GiB Onboard SATA Controller 1x 240 GB SATA 6 Gbps SSD 1x 960 GB NVMe SSD Mellanox MT27710 ConnectX-4 Lx	
<b>3x Storage Node:</b> 2x Intel(R) Xeon(R) Platinum 8163 CPU @ 2.50GHz 256 GiB Onboard SATA Controller 2x 240 GB SATA 6 Gbps SSD 76x 8 TB SATA 6 Gbps HDD Mellanox MT27710 ConnectX-4 Lx			
Connectivity:		Network Switches (8x 100 Gbps Up; 48x 25 Gbps Down)	

	Alibaba Cloud MaxCompute	TPCx-BB Rev. v1.3.1 TPC-Pricing Rev. v2.6.0				
		Report Date: September 25, 2020				
Description	Part Number	Source	Unit Price	Qty	Ext. Price	3-Year Maint.
<b>License Compute and Software Services</b>						
<u>MaxCompute Annual Subscription (1,400 CU)</u>	Asia Pacific SE 1 (Singapore)	1	\$369,600.00	3	\$1,108,800.00	
Master Node				3		
Intel® Xeon® Platinum 8163 @ 2.50 GHz				2		
32 GB Memory				12		
240 GB SATA 6 Gbps SSD				1		
3.84 NVMe SSD				1		
Compute Node				14		
Intel® Xeon® Platinum 8269CY @ 2.50 GHz				2		
32 GB Memory				24		
240 GB SATA 6 Gbps SSD				1		
960 GB NVMe SSD				1		
Storage Node				3		
Intel® Xeon® Platinum 8163 @ 2.50 GHz				2		
32 GB Memory				8		
240 GB SATA 6 Gbps SSD				2		
8 TB SATA 6 Gbps HDD				76		
Network Switches (8x100Gbps Up; 48x25Gbps Down)				NA		
1-Year Annual Subscription Discount (30%)			-\$110,880.00	3	-\$332,640.00	
<u>MaxCompute Storage for 1 year</u>		1	\$2,533.10	3	\$7,599.30	
30000 Scale Factor (6.16 TB compressed)						
<u>MaxCompute Enterprise Service for 1 year</u>		1	\$96,000.00	3		\$288,000.00
24x7, 4 hour response						
License Compute and Software Services Sub-Total					\$783,759.30	\$288,000.00
<b>Other Components</b>						
13-inch MacBook Pro 1.4GHz (includes 2 spares)		2	\$1,299.00	3	\$3,897.00	
Other Components Sub-Total					\$3,897.00	\$0.00
Pricing:1 = Alibaba; 2 = Apple.com				Three-Year Cost of Ownership \$1,075,657		
<sup>(1)</sup> All discounts are based on US list prices and for similar quantities and configurations. The discounts are based on the overall specific components pricing from respective vendors in this single quotation. Discounts for similarly sized configurations will be similar to those quoted here but may vary based on the components in the configuration.  Audited by Doug Johnson, InfoSizing				BBQpm@30000 9,296.45		
				\$/BBQpm@30000 \$ 115.71		
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 at <a href="mailto:pricing@tpc.org">pricing@tpc.org</a> . Thank you.						

### Numerical Quantities

Scale Factor	30000
Streams	3
SUT Validation Test	PASS

### Performance Run (Run 2)

Overall Run Start Time	2020-09-19 00:57:43.355
Overall Run End Time	2020-09-19 10:01:55.021
Overall Run Elapsed Time	32,651.666
Load Test Start Time	2020-09-19 00:57:43.355
Load Test End Time	2020-09-19 01:31:45.443
Load Test Elapsed Time	2,042.088
Power Test Start Time	2020-09-19 01:31:45.444
Power Test End Time	2020-09-19 04:25:47.309
Power Test Elapsed Time	10,441.865
Throughput Test Start Time	2020-09-19 04:25:47.310
Throughput Test End Time	2020-09-19 10:01:55.021
Throughput Test Elapsed Time	20,167.711
Performance Metric (BBQpm@ 30000)	9,296.45

### Repeatability Run (Run 1)

Overall Run Start Time	2020-09-18 15:17:05.349
Overall Run End Time	2020-09-18 23:58:47.898
Overall Run Elapsed Time	31,302.549
Load Test Start Time	2020-09-18 15:17:05.349
Load Test End Time	2020-09-18 15:48:23.630
Load Test Elapsed Time	1,878.281
Power Test Start Time	2020-09-18 15:48:23.632
Power Test End Time	2020-09-18 18:36:02.356
Power Test Elapsed Time	10,058.724
Throughput Test Start Time	2020-09-18 18:36:02.356
Throughput Test End Time	2020-09-18 23:58:47.898
Throughput Test Elapsed Time	19,365.542
Performance Metric (BBQpm@ 30000)	9,399.58

## Performance Run Report (Run 2)

\*\*\*\*\*

TPCx-BB

Result

v1.3.1

\*\*\*\*\*

INFO: T\_LOAD = 2042.088

INFO: T\_LD = 0.1 \* T\_LOAD: 204.2088

INFO: T\_PT = 4672.31599274995

INFO: T\_T\_PUT = 20167.711

INFO: T\_TT = 6722.57033333333

INFO: === Checking validity of the final result ===

INFO: OK: All required BigBench phases were performed.

INFO: OK: All 30 queries were running in the power test.

INFO: OK: All 30 queries were running in the first throughput test.

INFO: OK: Pretend mode was inactive. All commands were executed.

INFO: === Final result ===

INFO: VALID BBQpm@30000 = 9296.45001959163

## Repeatability Run Report (Run 1)

\*\*\*\*\*

TPCx-BB

Result

v1.3.1

\*\*\*\*\*

INFO: T\_LOAD = 1878.281

INFO: T\_LD = 0.1 \* T\_LOAD: 187.8281

INFO: T\_PT = 4783.97401771894

INFO: T\_T\_PUT = 19365.542

INFO: T\_TT = 6455.18066666666

INFO: === Checking validity of the final result ===

INFO: OK: All required BigBench phases were performed.

INFO: OK: All 30 queries were running in the power test.

INFO: OK: All 30 queries were running in the first throughput test.

INFO: OK: Pretend mode was inactive. All commands were executed.

INFO: === Final result ===

INFO: VALID BBQpm@30000 = 9399.5871746194

Summary details of the run reports are shown above. For the complete run reports, see the Support Files Archive.

# Table of Contents

---

ABSTRACT .....	8
PREFACE .....	9
CLAUSE 1: GENERAL ITEMS .....	10
1.1 TEST SPONSOR .....	10
1.2 PARAMETER SETTINGS .....	10
1.3 CONFIGURATION DIAGRAMS .....	10
CLAUSE 2: SOFTWARE COMPONENTS AND DATASET DISTRIBUTION .....	12
2.1 ROLES AND DATASET DISTRIBUTION .....	12
2.2 DISTRIBUTED FILE SYSTEM IMPLEMENTATION .....	13
2.3 ENGINE IMPLEMENTATION .....	13
2.4 FRAMEWORKS .....	13
2.5 APPLIED PATCHES .....	13
CLAUSE 3: WORKLOAD RELATED ITEMS .....	14
3.1 HARDWARE & SOFTWARE TUNABLE .....	14
3.2 KIT VERSION .....	14
3.3 RUN REPORT .....	14
3.4 QUERY ELAPSED TIMES .....	15
3.5 VALIDATION TEST OUTPUT .....	16
3.6 GLOBAL FRAMEWORK PARAMETERS .....	16
3.7 KIT MODIFICATIONS .....	16
CLAUSE 4: SUT RELATED ITEMS .....	18
4.1 SPECIALIZED HARDWARE/SOFTWARE .....	18
4.2 FRAMEWORK CONFIGURATION FILES .....	18
4.3 SUT ENVIRONMENT INFORMATION .....	18
4.4 DATA STORAGE TO SCALE FACTOR RATIO .....	18
4.5 SCALE FACTOR TO MEMORY RATIO .....	18
CLAUSE 5: METRICS AND SCALE FACTORS .....	19
5.1 PERFORMANCE RUN METRIC .....	19
5.2 REPEATABILITY RUN METRIC .....	19
5.3 PRICE-PERFORMANCE METRIC .....	19
5.4 SCALE FACTOR .....	19
5.5 STREAM COUNT .....	19
5.6 ELAPSED RUN TIMES .....	20
5.7 ELAPSED TEST TIMES .....	20
AUDITORS' INFORMATION AND ATTESTATION LETTER .....	21
THIRD PARTY PRICE QUOTES .....	24
APPLE.COM .....	24
SUPPORTING FILE INDEX .....	25

# Abstract

This document contains the methodology and results of the TPC Express Benchmark™ Big Bench (TPCx-BB) test conducted in conformance with the requirements of the TPCx-BB Standard Specification, Revision v1.3.1.

The test was conducted at a Scale Factor of 30000 with 20 nodes (14x Compute Node, 3x Storage Node) running MaxCompute v3.35 on Alibaba Group Enterprise Linux Server 7.2 (Paladin).

## Measured Configuration

Company Name	Cluster Node	Virtualization	Operating System
Alibaba Cloud Computing Ltd.	3x Master Nodes 14x Compute Nodes 3x Storage Nodes	n/a	Alibaba Group Enterprise Linux Server 7.2 (Paladin)

## TPC Express Benchmark© Big Bench Metrics

Total System Cost	BBQpm@30000	Price/Performance	Availability Date
1,075,657 USD	9,296.45	115.71 USD	September 1, 2020



# Preface

## TPC Express Benchmark™ Big Bench Overview

*Big data analytics is a growing field of research and business. The significant decrease in the overall cost of hardware, the emergence of Open Source based analytics frameworks, along with the greater depth of data mining capabilities allows new types of data sources to be correlated with traditional data sources. For example, online retailers used to record only successful transactions on their website, whereas modern systems are capable of recording every interaction. The former allowed for simple shopping basket analysis techniques, while the current level of detail in monitoring makes detailed user modeling possible. The growing demands on data management systems and the new forms of analysis have led to the development of a new type of **Big Data Analytics Systems (BDAS)**.*

*Similar to the advent of **Database Management Systems**, there is a vastly growing ecosystem of diverse approaches to enabling Big Data Analytics Systems. This leads to a dilemma for customers of **BDAS**, as there are no realistic and proven measures to compare different **BDAS** solutions. To address this, TPC has developed TPCx-BB (BigBench), which is an express benchmark for comparing **BDAS** solutions. The TPCx-BB Benchmark was developed to cover essential functional and business aspects of big data use cases. The benchmark allows for an objective measurement of **BDAS** System under Test, and provides the industry with verifiable performance, price/performance, and availability metrics.*

*The TPCx-BB kit is available from the TPC website (see [www.tpc.org](http://www.tpc.org) for more information). Users must sign-up and agree to the TPCx-BB End User Licensing Agreement (EULA) to download the kit. All related work (such as collaterals, papers, derivatives) must acknowledge the TPC and include the TPCx-BB copyright. The TPCx-BB kit includes: TPCx-BB Specification document (this document), TPCx-BB Users Guide documentation, shell scripts to set up the benchmark environment, Java code to execute the benchmark workload, Data Generator, **Query** files, and Benchmark Driver.*

*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-BB models and represents a Big Data Analytics System such as Hadoop ecosystem or Hadoop File-system API compatible systems);*
- *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 and rules for energy measurement are included in the TPC Energy Specification.*

*Further information is available at [www.tpc.org](http://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 Alibaba Cloud Computing 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 components used by the SUT.*
- *Configuration parameters and options for Operating System and file system components used by the SUT.*
- *Configuration parameters and options for any other software components (e.g compiler optimization options) used by the SUT.*

*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.*

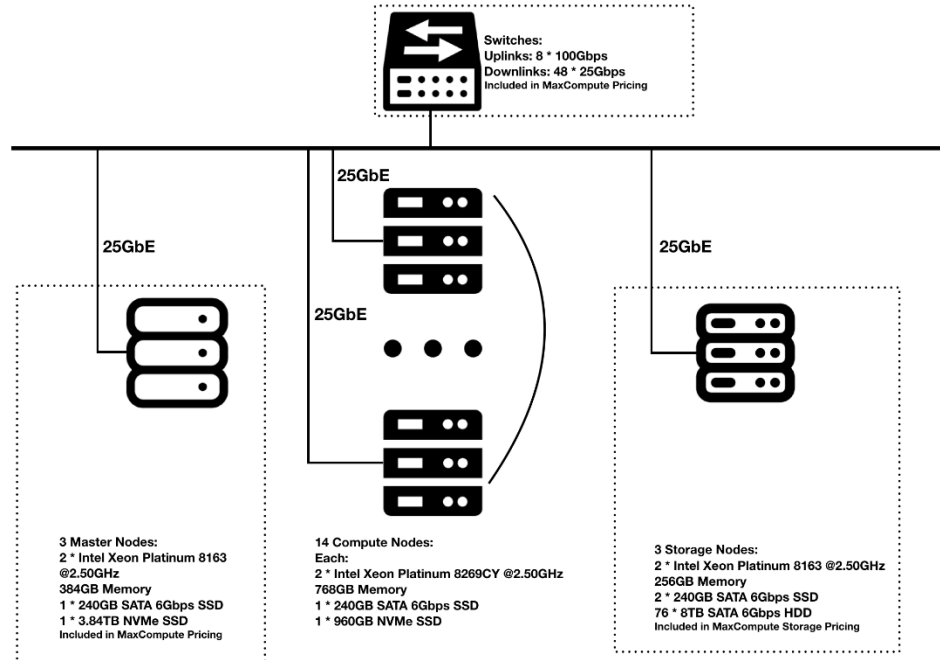
The Supporting Files Archive contains the parameters and options used to configure the components involved in this benchmark.

## 1.3 Configuration Diagrams

*7.4.4 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



The measured configuration consisted of:

Total Nodes:	20
Total Processors/Cores/Threads:	40/1,016/2,032
Total Memory:	12,672 GiB
Total Number of Storage Devices:	268
Total Storage Capacity:	1,854,480

Network: Network Switch (8x 100 Gbps Up; 48x 25 Gbps Down)

### 3x Master Nodes each with:

2/52/96 (processors/cores/threads)  
2x Intel(R) Xeon(R) Platinum 8163 CPU @ 2.50GHz  
384 GiB  
Onboard SATA Controller  
1x 240 GB SATA 6 Gbps SSD  
1x 3.84 TB NVMe SSD  
Mellanox MT27710 ConnectX-4 Lx

### 14x Compute Nodes each with:

2/52/104  
2x Intel(R) Xeon(R) Platinum 8269CY CPU @ 2.50GHz  
768 GiB  
Onboard SATA Controller  
1x 240 GB SATA 6 Gbps SSD  
1x 960 GB NVMe SSD  
Mellanox MT27710 ConnectX-4 Lx

### 3x Storage Nodes each with:

2/52/96  
2x Intel(R) Xeon(R) Platinum 8163 CPU @ 2.50GHz  
256 GiB  
Onboard SATA Controller  
2x 240 GB SATA 6 Gbps SSD  
76x 8 TB SATA 6 Gbps HDD  
Mellanox MT27710 ConnectX-4 Lx

The distribution of software components over server nodes is detailed in section 2.1.

## Priced Configuration

There are no differences between the priced and measured configurations.

# Clause 2: Software Components and Dataset Distribution

## 2.1 Roles and Dataset Distribution

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

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

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

**Table 1.4: Software Components and Dataset Distribution**

Server	Role(s)	Count	Virtual	Host Names	HW/SW Configuration	Storage Setup
Maxcompute Master Node1	Pangu master Fuxi Master Nuwa	1	N	k63l01135.cloud.nm125	Intel(R) Xeon(R) Platinum 8163 CPU @ 2.50GHz 384GB Memory 1 * 240GB SATA 6Gbps SSD 1 * 3.84TB NVMe SSD 2 * 25Gb OS: Linux 3.10.0-327.ali2014.alios7.x86_64 Apsara: 1.11_u32	OS: 1 * 240GB SATA 6Gbps SSD Data Drive: 1 * 3.84TB NVMe SSD
Maxcompute Master Node2	Pangu master Fuxi Master Nuwa	1	N	k63m02175.cloud.nm125	Intel(R) Xeon(R) Platinum 8163 CPU @ 2.50GHz 384GB Memory 1 * 240GB SATA 6Gbps SSD 1 * 3.84TB NVMe SSD 2 * 25Gb OS: Linux 3.10.0-327.ali2014.alios7.x86_64 Apsara: 1.11_u32	OS: 1 * 240GB SATA 6Gbps SSD Data Drive: 1 * 3.84TB NVMe SSD
Maxcompute Master Node3	Pangu master Fuxi Master Nuwa	1	N	k63m02200.cloud.nm125	Intel(R) Xeon(R) Platinum 8163 CPU @ 2.50GHz 384GB Memory 1 * 240GB SATA 6Gbps SSD 1 * 3.84TB NVMe SSD 2 * 25Gb OS: Linux 3.10.0-327.ali2014.alios7.x86_64 Apsara: 1.11_u32	OS: 1 * 240GB SATA 6Gbps SSD Data Drive: 1 * 3.84TB NVMe SSD
Maxcompute Storage Nodes	Pangu ChunkServer	1	N	k22j04481.cloud.nm125	2 * Intel Xeon Platinum 8163 @2.50GHz 256GB Memory 2 * 240GB SATA 6Gbps SSD 76 * 8TB SATA 6Gbps HDD OS: Linux 3.10.0-327.ali2010.rc7.alios7.x86_64 Apsara: 1.11_u32	OS: 2 * 240GB SATA 6Gbps SSD Data Drive: 76 * 8TB SATA 6Gbps HD
Maxcompute Storage Nodes	Pangu ChunkServer	1	N	k22j04484.cloud.nm125	2 * Intel Xeon Platinum 8163 @2.50GHz 256GB Memory 2 * 240GB SATA 6Gbps SSD 76 * 8TB SATA 6Gbps HDD OS: Linux 3.10.0-327.ali2010.rc7.alios7.x86_64 Apsara: 1.11_u32	OS: 2 * 240GB SATA 6Gbps SSD Data Drive: 76 * 8TB SATA 6Gbps HD
Maxcompute Storage Nodes	Pangu ChunkServer	1	N	k22j04485.cloud.nm125	2 * Intel Xeon Platinum 8163 @2.50GHz 256GB Memory 2 * 240GB SATA 6Gbps SSD 76 * 8TB SATA 6Gbps HDD OS: Linux 3.10.0-327.ali2010.rc7.alios7.x86_64 Apsara: 1.11_u32	OS: 2 * 240GB SATA 6Gbps SSD Data Drive: 76 * 8TB SATA 6Gbps HD
Maxcompute Compute Nodes	Fuxi tubo	14	N	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/nodelist.txt	2 * Intel Xeon Platinum 8269CY @2.50GHz 768GB Memory 1 * 240GB SATA 6Gbps SSD 1 * 960GB NVMe SSD 2 * 25Gb OS: Linux 3.10.0-327.ali2016.alios7.x86_64 Apsara: 1.11_u32	OS: 1 * 240GB SATA 6Gbps SSD Data Drive: 1 * 960GB NVMe SSD

## 2.2 Distributed File System Implementation

*Distributed file system implementation and corresponding Hadoop File System API version must be disclosed.*

MaxCompute v3.35.

## 2.3 Engine Implementation

*The Engine implementation and corresponding version must be disclosed.*

Component	Version
MaxCompute	3.35

## 2.4 Frameworks

*Frameworks and Engine used in the benchmark should be disclosed.*

Framework	Version
MaxCompute	3.35

## 2.5 Applied Patches

*Any additional vendor supported patches applied to the SUT should be disclosed.*

No additional patches were applied.

# Clause 3: Workload Related Items

## 3.1 Hardware & Software Tunable

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

The Supporting Files Archive contains all configuration scripts.

## 3.2 Kit Version

*Version number of the TPCx-BB kit must be included in the Report.*

<b>TPCx-BB Kit Version</b>
----------------------------

v1.3.1
--------

## 3.3 Run Report

*The run report generated by TPCx-BB benchmark kit must be included in the Report.*

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

- **Run1 Report Summary (Repeatability Run)**

```
*****
TPCx-BB
Result
v1.3.1
*****
INFO: T_LOAD = 1878.281
INFO: T_LD = 0.1 * T_LOAD: 187.8281
INFO: T_PT = 4783.97401771894
INFO: T_T_PUT = 19365.542
INFO: T_TT = 6455.180666666666
INFO: === Checking validity of the final result ===
INFO: OK: All required BigBench phases were performed.
INFO: OK: All 30 queries were running in the power test.
INFO: OK: All 30 queries were running in the first throughput test.
INFO: OK: Pretend mode was inactive. All commands were executed.
INFO: === Final result ===
INFO: VALID BBQpm@30000 = 9399.5871746194
```

- **Run2 Report Summary (Performance Run)**

```
*****
TPCx-BB
Result
v1.3.1
*****
INFO: T_LOAD = 2042.088
INFO: T_LD = 0.1 * T_LOAD: 204.2088
INFO: T_PT = 4672.31599274995
INFO: T_T_PUT = 20167.711
INFO: T_TT = 6722.570333333333
INFO: === Checking validity of the final result ===
INFO: OK: All required BigBench phases were performed.
INFO: OK: All 30 queries were running in the power test.
INFO: OK: All 30 queries were running in the first throughput test.
INFO: OK: Pretend mode was inactive. All commands were executed.
INFO: === Final result ===
INFO: VALID BBQpm@30000 = 9296.45001959163
```

### 3.4 Query Elapsed Times

*Elapsed times of all power and throughput Queries needs to be reported from the Performance Run, grouped respectively as Structured, semi-structured and unstructured buckets.*

Type	Query	Power	Stream 1	Stream 2	Stream 3
Structured	1	58.503	52.454	62.673	123.593
	6	66.837	81.639	140.329	60.333
	7	85.141	89.042	70.578	95.656
	9	30.932	61.559	35.357	126.371
	11	29.575	31.231	39.604	96.651
	13	62.669	1,177.080	205.475	217.171
	14	32.774	255.531	35.004	60.592
	15	43.254	78.046	46.083	42.333
	16	113.867	378.681	116.737	151.816
	17	66.446	71.117	665.120	1,069.832
	20	171.416	196.876	199.002	162.909
	21	191.710	315.122	204.756	697.310
	22	30.560	146.580	55.964	641.528
	23	69.629	76.775	467.031	498.686
	24	62.567	86.243	157.178	63.989
	25	205.184	275.108	225.019	430.126
	26	583.796	724.677	306.932	530.404
	29	84.054	777.305	174.341	77.278
Semi-structured	2	1,652.253	3,051.128	3,181.130	3,743.967
	3	948.471	1,631.871	1,122.608	936.411
	4	1,007.655	1,214.616	896.092	1,999.357
	5	478.716	461.397	1,040.090	458.747
	8	325.065	663.616	913.799	1,486.948
	12	120.131	772.832	168.116	791.681
	30	1,545.386	3,675.982	3,158.479	1,744.770
Unstructured	10	220.088	217.963	898.750	414.751
	18	1,325.336	1,961.825	3,964.553	1,684.071
	19	586.259	1,299.468	617.145	571.272
	27	41.688	115.543	360.747	41.918
	28	201.866	226.384	235.831	740.726

### 3.5 Validation Test Output

*Output report from successful SUT Validation test must be included in the Report.*

Query Number	Query Execution	Output Validation
1	PASS	PASS
2	PASS	PASS
3	PASS	PASS
4	PASS	PASS
5	PASS	PASS
6	PASS	PASS
7	PASS	PASS
8	PASS	PASS
9	PASS	PASS
10	PASS	PASS
11	PASS	PASS
12	PASS	PASS
13	PASS	PASS
14	PASS	PASS
15	PASS	PASS
16	PASS	PASS
17	PASS	PASS
18	PASS	PASS
19	PASS	PASS
20	PASS	PASS
21	PASS	PASS
22	PASS	PASS
23	PASS	PASS
24	PASS	PASS
25	PASS	PASS
26	PASS	PASS
27	PASS	PASS
28	PASS	PASS
29	PASS	PASS
30	PASS	PASS

### 3.6 Global Framework Parameters

*Global Framework parameter settings files must be included in the Report.*

The Supporting File Archive contains the global framework parameter settings files.

### 3.7 Kit Modifications

*Test Sponsor kit modifications files must be included in the Report.*

The following files were modified by the Test Sponsor to facilitate system, platform and Framework differences.



- bigBench-configs/conf/bigBench.properties
- bigBench-configs/conf/userSettings.conf
- bigBench-configs/sql/conf/engineSettings.conf
- bigBench-configs/sql/conf/engineSettings.sql
- bigBench-configs/sql/queries/q01/engineLocalSettings.sql
- bigBench-configs/sql/queries/q02/engineLocalSettings.sql
- bigBench-configs/sql/queries/q03/engineLocalSettings.sql
- bigBench-configs/sql/queries/q04/engineLocalSettings.sql
- bigBench-configs/sql/queries/q05/engineLocalSettings.sql
- bigBench-configs/sql/queries/q06/engineLocalSettings.sql
- bigBench-configs/sql/queries/q07/engineLocalSettings.sql
- bigBench-configs/sql/queries/q08/engineLocalSettings.sql
- bigBench-configs/sql/queries/q09/engineLocalSettings.sql
- bigBench-configs/sql/queries/q10/engineLocalSettings.sql
- bigBench-configs/sql/queries/q11/engineLocalSettings.sql
- bigBench-configs/sql/queries/q12/engineLocalSettings.sql
- bigBench-configs/sql/queries/q13/engineLocalSettings.sql
- bigBench-configs/sql/queries/q14/engineLocalSettings.sql
- bigBench-configs/sql/queries/q15/engineLocalSettings.sql
- bigBench-configs/sql/queries/q16/engineLocalSettings.sql
- bigBench-configs/sql/queries/q17/engineLocalSettings.sql
- bigBench-configs/sql/queries/q18/engineLocalSettings.sql
- bigBench-configs/sql/queries/q19/engineLocalSettings.sql
- bigBench-configs/sql/queries/q20/engineLocalSettings.sql
- bigBench-configs/sql/queries/q21/engineLocalSettings.sql
- bigBench-configs/sql/queries/q22/engineLocalSettings.sql
- bigBench-configs/sql/queries/q23/engineLocalSettings.sql
- bigBench-configs/sql/queries/q24/engineLocalSettings.sql
- bigBench-configs/sql/queries/q25/engineLocalSettings.sql
- bigBench-configs/sql/queries/q26/engineLocalSettings.sql
- bigBench-configs/sql/queries/q27/engineLocalSettings.sql
- bigBench-configs/sql/queries/q28/engineLocalSettings.sql
- bigBench-configs/sql/queries/q29/engineLocalSettings.sql
- bigBench-configs/sql/queries/q30/engineLocalSettings.sql

# Clause 4: SUT Related Items

## 4.1 Specialized Hardware/Software

*Specialized Hardware/Software used in the SUT must be included.*

No specialized hardware or software was used.

## 4.2 Framework Configuration Files

*All Framework configuration files from SUT, for the performance run.*

All Framework configuration files are included in the Supporting Files Archive.

## 4.3 SUT Environment Information

*SUT environment info in form of envinfo.log from a representative worker node from every role in the server.*

All envinfo.log files are included in the Supporting Files Archive.

## 4.4 Data Storage to Scale Factor Ratio

*The data storage ratio must be disclosed.*

Nodes	Disks	Size (GB)	Total (GB)
17	1	240	4,080
3	2	240	1,440
3	1	3,840	11,520
14	1	960	13,440
3	76	8,000	1,824,000

Total Storage (GB)	1,854,480
Scale Factor	30000
Data Storage Ratio	61.82

## 4.5 Scale Factor to Memory Ratio

*The Scale Factor to memory ratio must be disclosed.*

Nodes	Memory (GB)	Total (GB)
3	384	1,152
14	768	10,752
3	256	768

Scale Factor	30000
Total Memory (GB)	12,672
SF / Memory Ratio	2.37

# Clause 5: Metrics and Scale Factors

## 5.1 Performance Run Metric

*The Reported Performance Metric (BBQpm@SF for the Performance Run) must be disclosed in the Report.*

Performance Run
BBQpm@30000 9,296.45

## 5.2 Repeatability Run Metric

*The Performance Metric (BBQpm@SF) for the Repeatability Run must be disclosed in the Report.*

Repeatability Run
BBQpm@30000 9,399.58

## 5.3 Price-Performance Metric

*The Reported Performance Metric (BBQpm@SF for the Performance Run) must be disclosed in the Report.*

Price / Performance
\$BBQpm@30000 115.71

## 5.4 Scale Factor

*The Scale Factor used for the Result must be disclosed in the Report.*

Scale Factor
30000

## 5.5 Stream Count

*The number of streams in the throughput run used for the Result must be disclosed in the Report.*

Streams
3

## 5.6 Elapsed Run Times

*The total elapsed time for the execution of the Performance Run and Repeatability Run must be disclosed in the Report.*

Run	Elapsed Time	Seconds
Run 1	00 08:41:42.549	31,302.549
Run 2	00 09:04:11.666	32,651.666

## 5.7 Elapsed Test Times

*The total time for each of the three tests must be disclosed for the Performance Run and the Repeatability Run.*

Test	Performance Run	Repeatability Run
Load Test	2,042.088	1,878.281
Power Test	10,441.865	10,058.724
Throughput Test	20,167.711	19,365.542

# Auditors' Information and Attestation Letter

*The auditor's agency name, address, phone number, and Attestation letter 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 Doug Johnson, InfoSizing.

www.sizing.com  
63 Lourdes Drive  
Leominster, MA 01453  
978-343-6562.

This benchmark's Full Disclosure Report (FDR) can be downloaded from [www.tpc.org](http://www.tpc.org).

A copy of the auditor's attestation letter is included in the next two pages.

Xiening Dai  
 Senior Staff Engineer  
 500 108<sup>th</sup> Ave NE, Suite 800  
 Bellevue, WA 98004

September 21, 2020

I verified the TPC Express Benchmark™ BB v1.3.1 performance of the following configuration:

Platform: Alibaba Cloud MaxCompute  
 (w/ 3x Master Nodes, 14x Compute Nodes, 3 Storage Nodes)  
 Operating System: Alibaba Group Enterprise Linux Server 7.2 (Paladin)  
 Framework: MaxCompute v3.35

The results were:

**Performance Metric**      **9,296.45 BBQpm@30000**  
**Run Elapsed Time**        00 09:04:11.666 (32,651.666 Seconds)

**Cluster**                      **3x Master Nodes, 14x Compute Nodes, 3x Storage Nodes**

CPU	2x Intel® Xeon® Platinum 8163 (2.50 GHz, 24-core, 33 MB L3) (Master, Storage nodes)		
	2x Intel® Xeon® Platinum 8269CY (2.50 GHz, 18-core, 35.75 MB L3) (Compute nodes)		
Memory	384GiB (Master nodes), 768GiB (Compute nodes), 256GiB (Storage nodes)		
Storage	<b>Qty</b>	<b>Size</b>	<b>Type</b>
	1	240GB	6G SATA SSD (Master, Compute nodes)
	2	240GB	6G SATA SSD (Storage nodes)
	1	3.84TB	NVMe SSD (Master nodes)
	1	960GB	NVMe SSD (Compute nodes)
	76	8TB	6G SATA HDD (Storage nodes)

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:

- All TPC-provided components were verified to be v1.3.1
- No modifications were made to any of the Java code
- Any and all modifications to shell scripts were reviewed for compliance

- The tested Scale Factor (30000GB) was confirmed to be valid for publication
- All validation queries executed successfully and produced compliant results
- No errors were reported during the run
- The elapsed times for all phases and runs were correctly measured and reported
- The Storage and Memory Ratios were correctly calculated and reported
- 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,

A handwritten signature in dark ink, appearing to read "Doug Johnson", with a long, sweeping horizontal line extending to the right.

Doug Johnson, TPC Auditor

63 Lourdes Dr. | Leominster, MA 01453 | 978-343-6562 | [www.sizing.com](http://www.sizing.com)

# Third Party Price Quotes

## Apple.com

apple.com/shop/buy-mac/macbook-pro/13-inch-space-gray-1.4ghz-quad-core-processor-with-turbo-boost-up-to-3.9ghz-256gb#


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# Supporting File Index

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

Description	Archive File Pathname
<b>Clause 1 - General Items</b>	
The Supporting Files Archive contains the parameters and options used to configure the components involved in this benchmark	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB
Validation Run Files	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Validation-Run-logs-20200918-142624-sql-sf30000
Performance Run Files	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Performance-Run-logs-20200919-001321-sql-sf30000
Repeatability Run Files	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Repeatability-Run-logs-20200919-101654-sql-sf30000
<b>Clause 3 - Workload Related Items</b>	
Benchmark Generic Parameters	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Performance-Run-logs-20200919-001321-sql-sf30000/bigBench-configs/conf/userSettings.conf
Query Parameters used in the benchmark execution Settings	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Performance-Run-logs-20200919-001321-sql-sf30000/bigBench-configs/sql/conf/queryParameters.sql
Benchmark Global Framework Parameters Settings	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Performance-Run-logs-20200919-001321-sql-sf30000/bigBench-configs/sql/conf/engineSettings.sql
Benchmark Global Framework Parameters Settings	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Performance-Run-logs-20200919-001321-sql-sf30000/bigBench-configs/sql/conf/engineSettings.conf
Load Test script	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Performance-Run-logs-20200919-001321-sql-sf30000/bigBench-configs/sql/population/odpsCreateLoad.sql
Queries specific optimization parameters settings	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Performance-Run-logs-20200919-001321-sql-sf30000/bigBench-configs/sql/queries/q[01-30]/engineLocalSettings.conf
Queries specific optimization parameters settings	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Performance-Run-logs-20200919-001321-sql-sf30000/bigBench-configs/sql/queries/q[01-30]/engineLocalSettings.sql
<b>Clause 4 - SUT Related Items</b>	
Data Redundancy report	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/pangu_redundant_info_20200919-102821.txt
Benchmark execution script	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/TPCxBB_FullBenchmark_sequence_run.sh
"Hardware and Software Report from a representative compute node"	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/envInfo-k22f04330.cloud.nm125/envInfo.log
	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/envInfo-k22j04481.cloud.nm125/envInfo.log
<b>Clause 5 - Metric and Scale Factor Related Items</b>	
Benchmark Performance Report	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Performance-Run-logs-20200919-001321-sql-sf30000/run-logs/BigBenchResult.log
Validation Test Report	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/Validation-Run-logs-20200918-142624-sql-sf30000/run-logs/BigBenchResult.log
<b>Clause 6 – Other Items</b>	
compute Nodes	Support-Files-for-Alibaba-Maxcompute-14nodes-30TB/nodelist.txt