Alibaba Cloud

Alibaba Cloud Computing Ltd.

TPC Express Benchmark™ Big Bench (TPCx-BB)

Full Disclosure Report

for

Alibaba Cloud MaxCompute

(with 15x Worker Nodes, 3x Master Nodes)

using

MaxCompute v3.31

and

Alibaba Group Enterprise Linux Server 7.2 (Paladin)

First Edition

September 18, 2019

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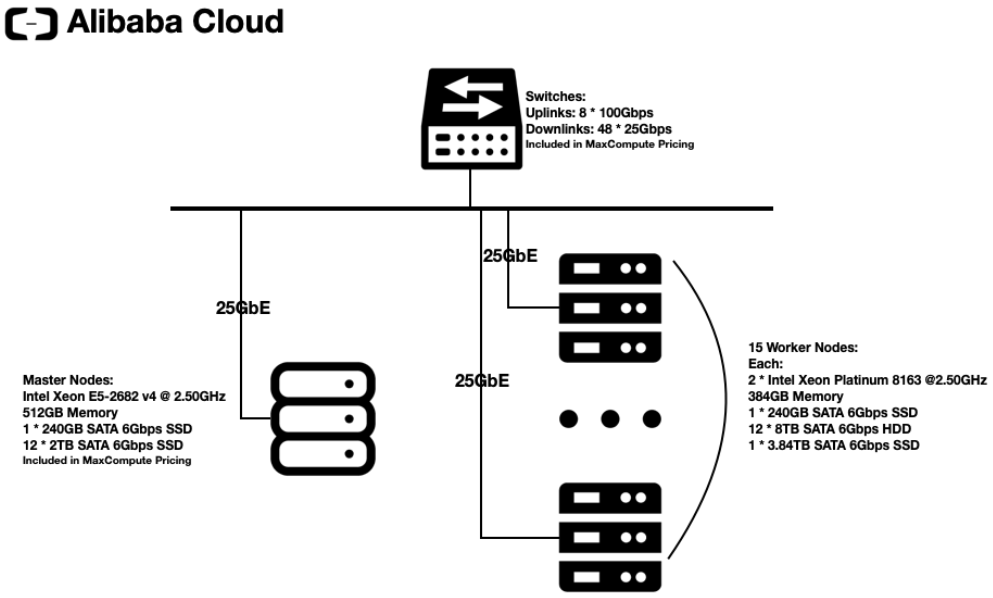
Alibaba Cloud	**Alibaba Cloud MaxCompute**	TPCx-BB Rev. v1.3.0 TPC-Pricing Rev. v2.4.0 Report Date: September 18, 2019
Total System Cost	TPCx-BB Performance Metric	Price/Performance
1,091,148 USD	**6,427.86** BBQpm@30000	**169.76 USD** $/BBQpm@30000

Framework	Operating System	Other Software	Availability Date	Scale Factor	Streams
MaxCompute v3.31	Alibaba Group Enterprise Linux Server 7.2 (Paladin)	None	September 18, 2019	30000	2

System Configuration



Physical Storage/Scale Factor: 52.46	Scale Factor/Physical Memory: 4.11

Servers: Total Processors/Cores/Threads	15x Worker Node, 3x Master Node 36/816/1,632	
Server Configuration: Processors Memory Storage Controller Storage Device Network	**Per Worker Node:** 2x Intel® Xeon® Platinum 8163 @ 2.50GHz 384 GB Onboard SATA controller 1x 240GB SATA 6Gbps SSD 1x 3.84TB SATA 6Gbps SSD 12x 8TB SATA 6Gbps HDD Mellanox MT27710 ConnectX-4 Lx	**Per Master Node:** 2x Intel® Xeon® E5-2682 v4 @ 2.50GHz 512 GB Onboard SATA controller 1x 240GB SATA 6Gbps SSD 12x 2TB SATA 6Gbps SSD Mellanox MT27710 ConnectX-4 Lx
Connectivity:	1x Network Switch (8x100Gbps Up; 48x25Gbps Down)	

Alibaba Cloud	**Alibaba Cloud MaxCompute**	TPCx-BB Rev. v1.3.0 TPC-Pricing Rev. v2.4.0 Report Date: September 18, 2019

Description	Part Number	Source	Unit Price	Qty	Ext. Price	3-Year Maint.
License Compute and Software Services						
MaxCompute Annual Subscription (1,425 CU)	Asia Pacific SE 1 (Singapore)	1	$376,200.00	3	$1,128,600.00	
Worker Node				15		
Intel(R) Xeon(R) Platinum 8163 CPU @ 2.50GHz				2		
32 GB Memory				12		
Master Node				3		
Intel(R) Xeon(R) CPU E5-2682 v4 @ 2.50GHz				2		
32 GB Memory				16		
Network Switches (8x100Gbps Up; 48x25Gbps Down)				3		
1-Year Annual Subscription Discount (30%)			-$112,860.00	3	-$338,580.00	
MaxCompute Storage for 1 year		1	$3,076.95	3	$9,230.85	
30000 Scale Factor (6.15 TB compressed)						
MaxCompute Enterprise Service for 1 year		1	$96,000.00	3		$288,000.00
24x7, 4 hour response						
	License Compute and Software Services Sub-Total				**$799,250.85**	**$288,000.00**
Other Components						
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

[1] 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 of InfoSizing

Three-Year Cost of Ownership	**$1,091,148**
BBQpm@30000	**6,427.86**
$/BBQpm@30000	**$ 169.76**

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 pricing@tpc.org. Thank you.

Numerical Quantities

Scale Factor	30000
Streams	2
SUT Validation Test	PASS

Performance Run (Run 2)

Overall Run Start Time	2019-09-01 12:41:33.273
Overall Run End Time	2019-09-01 23:40:54.575
Overall Run Elapsed Time	39,561.302
Load Test Start Time	2019-09-01 12:41:33.273
Load Test End Time	2019-09-01 13:11:32.580
Load Test Elapsed Time	1,799.307
Power Test Start Time	2019-09-01 13:11:32.582
Power Test End Time	2019-09-01 17:46:26.867
Power Test Elapsed Time	16,494.285
Throughput Test Start Time	2019-09-01 17:46:26.868
Throughput Test End Time	2019-09-01 23:40:54.574
Throughput Test Elapsed Time	21,267.706
Performance Metric (BBQpm@ 30000)	6,427.86

Repeatability Run (Run 1)

Overall Run Start Time	2019-09-01 00:40:44.561
Overall Run End Time	2019-09-01 11:37:15.168
Overall Run Elapsed Time	39,390.607
Load Test Start Time	2019-09-01 00:40:44.561
Load Test End Time	2019-09-01 01:10:26.215
Load Test Elapsed Time	1,781.654
Power Test Start Time	2019-09-01 01:10:26.216
Power Test End Time	2019-09-01 05:48:02.626
Power Test Elapsed Time	16,656.410
Throughput Test Start Time	2019-09-01 05:48:02.627
Throughput Test End Time	2019-09-01 11:37:15.168
Throughput Test Elapsed Time	20,952.541
Performance Metric (BBQpm@ 30000)	6,472.77

Performance Run Report (Run 2)

```
************
TPCx-BB
Result
v1.3.0
************
INFO: T_LOAD = 1799.307
INFO: T_LD = 0.1 * T_LOAD: 179.9307
INFO: T_PT = 6355.6274823179
INFO: T_T_PUT = 21267.706
INFO: T_TT = 10633.853
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 = 6427.86075553866
```

Repeatability Run Report (Run 1)

```
************
TPCx-BB
Result
v1.3.0
************
INFO: T_LOAD = 1781.654
INFO: T_LD = 0.1 * T_LOAD: 178.1654
INFO: T_PT = 6362.82168526351
INFO: T_T_PUT = 20952.541
INFO: T_TT = 10476.2705
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 = 6472.77141703629
```

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 17
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
PROVISIONING COMPUTE SERVICES 24
THIRD PARTY PRICE QUOTES 25
APPLE 25
SUPPORTING FILE INDEX 26

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 v1.3.0.

The test was conducted at a Scale Factor of 30000 with 15 nodes (Worker Nodes) running MaxCompute v3.31 on Alibaba Group Enterprise Linux Server 7.2 (Paladin).

Measured Configuration

Company Name	Cluster Node	Virtualization	Operating System
Alibaba Cloud Computing Ltd.	15x Worker Nodes 3x Master 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
1,091,148 USD	6,427.86	169.76 USD	September 18, 2019

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 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

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.

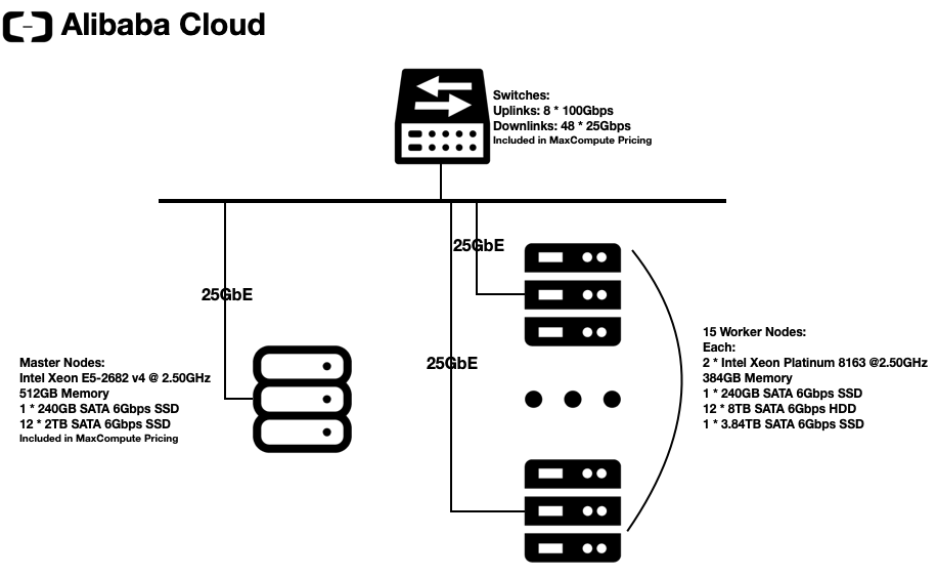
The Supporting Files Archive contains the parameters and options used to configure the components involved in this benchmark.

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: 18
- Total Processors/Cores/Threads: 36/816/1,632
- Total Memory: 7,296
- Total Number of Storage Drives/Devices: 249
- Total Storage Capacity: 1,573,920
- Network: 1x Network Switch (8x100Gbps Up; 48x25Gbps Down)

15x Worker Node, each with:

- Processors/Cores/Threads: 2/45/91
- Processor Model: 2x Intel® Xeon® Platinum 8163 @ 2.50GHz
- Memory: 384 GB
- Controller: Onboard SATA controller
- Drives:
    - 1x 240GB SATA 6Gbps SSD
    - 1x 3.84TB SATA 6Gbps SSD
    - 12x 8TB SATA 6Gbps HDD
- Network: Mellanox MT27710 ConnectX-4 Lx

3x Master Node, each with:

- Processors/Cores/Threads:
- Processor Model: 2x Intel® Xeon® E5-2682 v4 @ 2.50GHz
- Memory: 512 GB
- Controller: Onboard SATA controller
- Drives:
    - 1x 240GB SATA 6Gbps SSD
    - 12x 2TB SATA 6Gbps SSD
- Network: 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	g90a11178.cloud.et93	Intel Xeon E5-2682 v4 @ 2.50GHz 512GB Memory 1 * 240GB SATA 6Gbps SSD 12 * 2TB SATA 6Gbps SSD 2 * 25Gb OS: Linux 3.10.0-327.ali2008.odps.alios7.x86_64 Apsara: 1.11_u32	OS: 1 * 240GB SATA 6Gbps SSD Data Drive: 12 * 2TB SATA 6Gbps SSD
Maxcompute Master Node2	Pangu master Fuxi Master Nuwa	1	N	g90a07374.cloud.et93	Intel Xeon E5-2682 v4 @ 2.50GHz 512GB Memory 1 * 240GB SATA 6Gbps SSD 12 * 2TB SATA 6Gbps SSD 2 * 25Gb OS: Linux 3.10.0-327.ali2008.odps.alios7.x86_64 Apsara: 1.11_u32	OS: 1 * 240GB SATA 6Gbps SSD Data Drive: 12 * 2TB SATA 6Gbps SSD
Maxcompute Master Node3	Pangu master Fuxi Master Nuwa	1	N	g90a11177.cloud.et93	Intel Xeon E5-2682 v4 @ 2.50GHz 512GB Memory 1 * 240GB SATA 6Gbps SSD 12 * 2TB SATA 6Gbps SSD 2 * 25Gb OS: Linux 3.10.0-327.ali2008.odps.alios7.x86_64 Apsara: 1.11_u32	OS: 1 * 240GB SATA 6Gbps SSD Data Drive: 12 * 2TB SATA 6Gbps SSD
Maxcompute Worker Nodes	Fuxi tubo Pangu ChunkServer	15	N	See nodelist.txt in Suporting Files	2 * Intel Xeon Platinum 8163 @2.50GHz 384GB Memory 1 * 240GB SATA 6Gbps SSD 12 * 8TB SATA 6Gbps HDD 1 * 3.84TB SATA 6Gbps SSD 2 * 25Gb OS: Linux 3.10.0-327.ali2008.odps.alios7.x86_64 Apsara: 1.11_u32	OS: 1 * 240GB SATA 6Gbps SSD Data Drive: 12 * 8TB SATA 6Gbps HDD 1 * 3.84TB SATA 6Gbps SSD

2.2 Distributed File System Implementation

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

MaxCompute v3.31.

2.3 Engine Implementation

The Engine implementation and corresponding version must be disclosed.

Component	Version
MaxCompute	3.31

2.4 Frameworks

Frameworks and Engine used in the benchmark should be disclosed.

Framework	Version
MaxCompute	3.31

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.

TPCx-BB Kit Version
v1.3.0

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
v1.3.0
**********
INFO: T_LOAD = 1781.654
INFO: T_LD = 0.1 * T_LOAD: 178.1654
INFO: T_PT = 6362.82168526351
INFO: T_T_PUT = 20952.541
INFO: T_TT = 10476.2705
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 = 6472.77141703629
```

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

```
**********
TPCx-BB
Result
v1.3.0
**********
INFO: T_LOAD = 1799.307
INFO: T_LD = 0.1 * T_LOAD: 179.9307
INFO: T_PT = 6355.6274823179
INFO: T_T_PUT = 21267.706
INFO: T_TT = 10633.853
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 = 6427.86075553866
```

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
Structured	1	41.990	44.024	41.306
	6	89.836	103.965	98.712
	7	66.612	104.799	226.970
	9	50.021	50.560	65.652
	11	34.952	36.515	94.895
	13	60.522	366.511	390.855
	14	47.253	40.838	42.880
	15	46.292	72.521	63.332
	16	144.754	486.585	661.445
	17	64.824	157.904	62.153
	20	171.607	202.543	336.786
	21	1,111.830	1,142.165	1,406.361
	22	32.709	33.956	35.049
	23	72.108	186.675	197.598
	24	2,027.611	2,023.018	2,045.610
	25	223.298	214.155	241.170
	26	267.723	382.748	267.841
	29	107.241	104.448	304.970
Semi-structured	2	2,338.837	3,343.887	2,409.386
	3	681.749	826.696	667.010
	4	1,694.727	1,954.462	2,699.419
	5	487.587	474.151	1,030.867
	8	332.738	514.132	419.121
	12	441.758	871.292	461.747
	30	1,919.755	3,195.663	2,230.215
Unstructured	10	417.761	427.794	553.109
	18	1,821.328	1,911.596	2,142.617
	19	1,533.626	1,638.075	1,773.081
	27	33.672	32.040	52.599
	28	129.531	149.345	244.937

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 form 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)
18	1	240	4,320
15	12	8,000	1,440,000
15	1	3,840	57,600
3	12	2,000	72,000

Total Storage (GB)	1,573,920
Scale Factor	30000
Data Storage Ratio	52.46

4.5 Scale Factor to Memory Ratio

The Scale Factor to memory ratio must be disclosed.

Nodes	Memory (GiB)	Total (GiB)
15	384	5,760
3	512	1,536

Scale Factor	30000
Total Memory (GiB)	7,296
SF / Memory Ratio	4.11

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 6,427.86

5.2 Repeatability Run Metric

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

Repeatability Run
BBQpm@30000 6,472.77

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 169.76

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
2

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 10:56:30.607	39,390.607
Run 2	00 10:59:21.302	39,561.302

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	1,799.307	1,781.654
Power Test	16,494.285	16,656.410
Throughput Test	21,267.706	20,952.541

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.

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

InfoSizing
The Right Metric For Sizing IT

TPC Transaction Processing Performance Council
Certified Auditors

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

September 13, 2019

I verified the TPC Express Benchmark™ BB v1.3.0 performance of the following configuration:

Platform:	Alibaba Cloud Cluster (w/ 15x Worker Nodes, 3x Master Nodes)
Operating System:	Alibaba Group Enterprise Linux Server 7.2 (Paladin)
Framework:	MaxCompute v3.31

The results were:

Performance Metric	**6,427.86 BBQpm@30000**
Run Elapsed Time	00 10:59:21.302 (39,561.302 Seconds)

Cluster — **15x Worker Nodes, 3x Master Nodes**

CPUs	2x Intel® Xeon® Platinum 8163 (2.50 GHz, 24-core, 33 MB L3) (Worker Nodes) 2x Intel® Xeon® E5-2682 v4 (2.50 GHz, 16-core, 40 MB L3) (Master Nodes)		
Memory	384GiB (Worker nodes), 512GiB (Master nodes)		
Storage	***Qty***	***Size***	***Type***
	1	240GB	6G SATA SSD (All nodes)
	1	3.84TB	6G SATA SSD (Worker Nodes)
	12	8TB	6G SATA HDD (Worker Nodes)
	12	2TB	6G SATA SSD (Master 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 v1.3.0
- 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

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

- 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,

Doug Johnson, TPC Auditor

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Provisioning Compute Services

发件人：韦海青(海清) <haiqing.whq@alibaba-inc.com>
发送时间：2019年9月11日(星期三) 19:53
收件人：戴谢宁 <xiening.dai@alibaba-inc.com>; 路璐(杜撰) <lu.lu@alibaba-inc.com>
主　题：tpcxbb Maxcompute cu price quote

To Xiening Dai,

Here is the information you requested regarding pricing for Alibaba Cloud Maxcompute.
All pricing shown is in US Dollars($) and can be pre-paid.

Product Name	Region	Resource Quota(cu)	Unit Price($)	1 Year Price($)	discount	1 Year Price after discount ($)
Alibaba Cloud MaxCompute CU	Asia Pacific SE 1 (Singapore)	1,425	22 $/cu/month	376,200.0	112,860.0	263,340.0

- 376,200= 1,425 (cu) * 22 ($/cu/month) * 12 (month)

Product Name	Region	Size(TB)	Unit Price($)	1 Year Price after discount ($)
Alibaba Cloud MaxCompute Storage	Asia Pacific SE 1 (Singapore)	6.15	8.43 $/day	3076.95

- 8.43 ($/day) = (100 - 1) * 0.0028 //1GB-100GB
  + (1,024 - 100) * 0.0014 // 100GB - 1TB
  + (6.15 * 1,024 - 1,024) * 0.0013 // 1TB - 6.15TB

If you have any quessions about this price quote, please contact our sales via the link:https://common-buy-intl.aliyun.com/?commodityCode=odpsplus_intl#/buy

Haiqing Wei (Alibaba Colud Product Manager)
(haiqing.whq@alibaba-inc.com)

Third Party Price Quotes

Apple

MacBook Pro

Overview macOS Tech Specs

Add a trade-in

Get a refund of up to $1400 when you trade in an eligible computer, or recycle it for free.*

Get started

Customize your 13-inch MacBook Pro - Space Gray

1.4GHz quad-core 8th-generation Intel Core i5 processor, Turbo Boost up to 3.9GHz

8GB 2133MHz LPDDR3 memory

128GB SSD storage

Retina display with True Tone

Intel Iris Plus Graphics 645

Two Thunderbolt 3 ports

Touch Bar and Touch ID

Backlit Keyboard - US English

Pickup:
Today at Apple Infinite Loop
Check another store

Order by 5pm, delivers:
Tomorrow – Fastest
Fri, Aug 30 – Free
Delivery options for 01453''

$1,299.00 Add to Bag

Get 3% Daily Cash with Apple Card, or get special financing ›

Supporting File Index

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

Description	Archive File Pathname
Clause 1 - General Items	
The Supporting Files Archive contains the parameters and options used to configure the components involved in this benchmark	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB
Validation Run Files	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Validation-Run-logs-20190901-000936-sql-sf30000
Performance Run Files	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Performance-Run-logs-20190901-120530-sql-sf30000
Repeatability Run Files	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Repeatability-Run-logs-20190902-001205-sql-sf30000
Clause 3 - Workload Related Items	
Benchmark Generic Parameters	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Performance-Run-logs-20190901-120530-sql-sf30000/bigBench-configs/conf/userSettings.conf
Query Parameters used in the benchmark execution Settings	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Performance-Run-logs-20190901-120530-sql-sf30000/bigBench-configs/sql/conf/queryParameters.sql
Benchmark Global Framework Parameters Settings	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Performance-Run-logs-20190901-120530-sql-sf30000/bigBench-configs/sql/conf/engineSettings.sql
Benchmark Global Framework Parameters Settings	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Performance-Run-logs-20190901-120530-sql-sf30000/bigBench-configs/sql/conf/engineSettings.conf
Load Test script	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Performance-Run-logs-20190901-120530-sql-sf30000/bigBench-configs/sql/population/odpsCreateLoad.sql
Queries specific optimization parameters settings	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Performance-Run-logs-20190901-120530-sql-sf30000/bigBench-configs/sql/queries/q[01-30]/engineLocalSettings.conf
Queries specific optimization parameters settings	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Performance-Run-logs-20190901-120530-sql-sf30000/bigBench-configs/sql/queries/q[01-30]/engineLocalSettings.sql
Clause 4 - SUT Related Items	
Data Redundancy report	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/pangu_redundant_info_20190901-120706.txt
Benchmark execution script	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/publication-runs.sh
Hardware and Software Report from a representative node	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/envInfo-g72l05118.cloud.et93/envInfo.log
Clause 5 - Metric and Scale Factor Related Items	
Benchmark Performance Report	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Performance-Run-logs-20190901-120530-sql-sf30000/run-logs/BigBenchResult.log
Validation Test Report	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/Validation-Run-logs-20190901-000936-sql-sf30000/run-logs/BigBenchResult.log
Extra – worker node name list	Support-Files-for-Alibaba-Maxcompute-15nodes-30TB/nodelist.txt