DELL EMC

Dell Inc.

TPC Express Benchmark™ IoT Full Disclosure Report for Dell PowerEdge R7515

(with 8x Dell PowerEdge R7515 Servers)

Using

HBase 2.2.3 on Cloudera Distribution for Apache Hadoop Enterprise Edition 7.1.4

and

SuSE Enterprise Linux Server Release 12 SP5

TPCx-IoT Version	V1.0.5
Report Edition	First
Report Submitted	March 15, 2021

First Edition – March 2021

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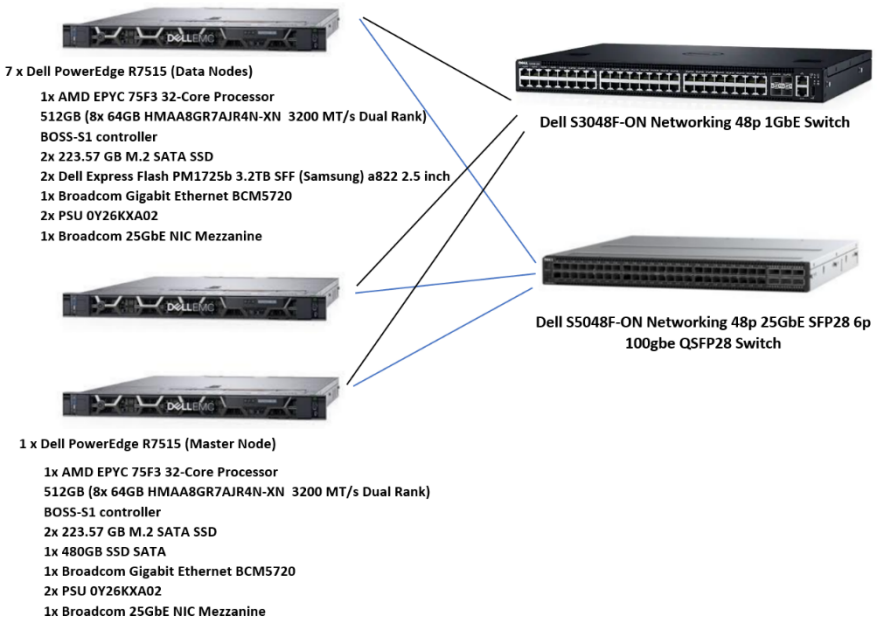
DELL EMC	**Dell PowerEdge R7515**	TPCx-IoT v1.0.5 TPC-Pricing v2.6.0 Report Date: March 15, 2021

Total System Cost	TPCx-IoT Performance Metric	Price/Performance
$533,385.29 USD	**1,617,545.46**	**$0.33 USD/IoTps**

Number of Records	DBMS Software	Operating System	Other Software	Availability Date
1,728 Million	HBase 2.2.3 on CDP 7.1.4	SuSE Enterprise Linux Server Release 12 SP5	None	Apr 15, 2021

System Configuration



Total Number of Servers:		8x Dell PowerEdge R7515
Total Processors/Cores/Threads:		8/256/512
Server Configuration (each)	Processors	1x AMD EPYC 75F3 2.3GHz 32-Core
	Memory	512GB
	Storage Controller	BOSS-S1 controller
	Storage Device	2x 240GB SSD SATA (all nodes) 1x 480GB SATA 6Gbps SSD (Master Node)
	7x	2x Dell 3.2TB NVMe (Data Nodes)
	Network	1x Broadcom 25GbE Mezzanine NIC 1x Broadcom Gigabit Ethernet BCM5720 NIC
	Connectivity:	Dell S-Series S5048F-ON, S3048F Network Switch
Total Rack Units:		(8xR7515)+(1xS5048F)+(1xS3048F) = (8x2) + (1x1) + (1x1) = 18RU

DELL EMC	**Dell PowerEdge R7515**	TPCx-IoT v1.0.5 TPC-Pricing v2.6.0 Report Date: March 15, 2021

Description	Part Number	Key	Unit Price	Qty	Extended Price
HARDWARE COMPONENTS					
PowerEdge R7515 - Data Nodes		1	$55,550.70	7	$388,854.90
2.5 Chassis	379-BDTF	1		7	
SAS/SATA/NVMe Capable Backplane	379-BDSX	1		7	
PowerEdge R7515 Server	210-ASVQ	1		7	
No Trusted Platform Module	461-AADZ	1		7	
Chassis with up to 24 x 2.5" Hard Drives Including Maximum of 24 NVME Drives	321-BERW	1		7	
AMD EPYC 75F3 3.3GHz, 32C/64T, 256M Cache (280W) DDR4-3200	338-BZRK	1		7	
Standard Heatsink	412-AASE	1		7	
Performance Optimized	370-AAIP	1		7	
3200MT/s RDIMMs	370-AEVR	1		7	
C30, No RAID for NVMe Chassis	780-BCDO	1		7	
No Controller	405-AACD	1		7	
CFI, STANDARD OPTION NOT SELECTED	692-BBBB	1		7	
Performance BIOS Settings	384-BBBL	1		7	
UEFI BIOS Boot Mode with GPT Partition	800-BBDM	1		7	
No Additional Mid Fan	384-BBSO	1		7	
Dual, Hot-plug, Redundant Power Supply (1+1), 1100W	450-ADWM	1		7	
Riser Config 2, 2 x 16 FH + 2 x 16 LP PCIe slot	330-BBNL	1		7	
PowerEdge R7515 Motherboard, with 2 x 1Gb Onboard LOM (BCM5720) V2	384-BCNR	1		7	
iDRAC9,Enterprise x5	385-BBOT	1		7	
PowerEdge 2U Standard Bezel	350-BBWP	1		7	
BOSS controller card + with 2 M.2 Sticks 240G (RAID 1),FH	403-BCHP	1		7	
No Quick Sync	350-BBKU	1		7	
iDRAC,Legacy Password	379-BCSG	1		7	
iDRAC Group Manager, Enabled	379-BCQV	1		7	
Enterprise Linux OS, Non Factory Installed, Requires Subscription Selection	605-BBFL	1		7	
No Media Required	605-BBFN	1		7	
ReadyRails Sliding Rails	770-BBBQ	1		7	
No Internal Optical Drive	429-AAIQ	1		7	
No Systems Documentation, No OpenManage DVD Kit	631-AACK	1		7	
PowerEdge R7515 Shipping	340-CMZG	1		7	
PowerEdge R7515 Ship Material	340-CODN	1		7	
PowerEdge R7515 CCC Marking, No CE Marking	343-BBPQ	1		7	
GCP Operations Management	929-8509	1		7	
Basic Next Business Day 36 Months	709-BBFM	1		7	
Prosupport Plus and 4Hr Mission Critical Initial, 36 Month(s)	865-BBNF	1		7	
On-Site Installation Declined	900-9997	1		7	
64GB RDIMM, 3200MT/s, Dual Rank	370-AEVP	1		56	
Dell 3.2TB, NVMe, Mixed Use Express Flash, 2.5 SFF Drive, U.2, PM1725b with Carrier	400-BEFE	1		14	

DELL EMC	**Dell PowerEdge R7515**	TPCx-IoT v1.0.5 TPC-Pricing v2.6.0 Report Date: March 15, 2021

Description	Part Number	Key	Unit Price	Qty	Extended Price
Jumper Cord - C13/C14, 4M, 250V, 12A (North America, Guam, North Marianas, Philippines, Samoa)	492-BBDV	1		14	
Mellanox ConnectX-5 EX Dual Port 40/100GbE QSFP28 Adapter, PCIe Low Profile	540-BCIX	1		7	
SUSE Linux Enterprise Server, 1-2 SKT w Unlimited VMs, L3 Subscription, 3 Year, Digitally Fulfilled	528-CHFF	1		7	
PowerEdge R7515 - Master Node		1	$48,575.72	1	$48,575.72
2.5 Chassis	379-BDTF	1		1	
SAS/SATA/NVMe Capable Backplane	379-BDSW	1		1	
PowerEdge R7515 Server	210-ASVQ	1		1	
No Trusted Platform Module	461-AADZ	1		1	
Chassis with up to 24 x 2.5" Hard Drives Including Maximum of 12 NVME Drives	321-BERS	1		1	
AMD EPYC 75F3 3.3GHz, 32C/64T, 256M Cache (280W) DDR4-3200	338-BZRK	1		1	
Standard Heatsink	412-AASE	1		1	
Performance Optimized	370-AAIP	1		1	
3200MT/s RDIMMs	370-AEVR	1		1	
Unconfigured RAID	780-BCDS	1		1	
PERC H740P RAID Controller, 8GB NV Cache, Mini card	405-AAMS	1		1	
Performance BIOS Settings	384-BBBL	1		1	
UEFI BIOS Boot Mode with GPT Partition	800-BBDM	1		1	
High Performance Fan	750-AAWT	1		1	
Dual, Hot-plug, Redundant Power Supply (1+1), 1100W	450-ADWM	1		1	
Riser Config 2, 2 x 16 FH + 2 x 16 LP PCIe slot	330-BBNL	1		1	
PowerEdge R7515 Motherboard, with 2 x 1Gb Onboard LOM (BCM5720) V2	384-BCNR	1		1	
iDRAC9,Enterprise x5	385-BBOT	1		1	
Broadcom 57414 Dual Port 25GbE SFP28 LOM Mezz Card	540-BCKU				
PowerEdge 2U Standard Bezel	350-BBWP	1		1	
BOSS controller card + with 2 M.2 Sticks 240G (RAID 1),FH	403-BCHP	1		1	
No Quick Sync	350-BBKU	1		1	
iDRAC,Legacy Password	379-BCSG	1		1	
iDRAC Group Manager, Enabled	379-BCQV	1		1	
Enterprise Linux OS, Non Factory Installed, Requires Subscription Selection	605-BBFL	1		1	
No Media Required	605-BBFN	1		1	
ReadyRails Sliding Rails	770-BBBQ	1		1	
No Internal Optical Drive	429-AAIQ	1		1	
No Systems Documentation, No OpenManage DVD Kit	631-AACK	1		1	

DELL EMC	**Dell PowerEdge R7515**	TPCx-IoT v1.0.5 TPC-Pricing v2.6.0 Report Date: March 15, 2021

Description	Part Number	Key	Unit Price	Qty	Extended Price
PowerEdge R7515 Shipping	340-CMZG	1		1	
PowerEdge R7515 Ship Material	340-CODN	1		1	
PowerEdge R7515 CCC Marking, No CE Marking	343-BBPQ	1		1	
GCP Operations Management	929-8509	1		1	
Basic Next Business Day 36 Months	709-BBFM	1		1	
Prosupport Plus and 4Hr Mission Critical Initial, 36 Month(s)	865-BBNF	1		1	
On-Site Installation Declined	900-9997	1		1	
64GB RDIMM, 3200MT/s, Dual Rank	370-AEVP	1		8	
480GB SSD SATA Read Intensive 6Gbps 512 2.5in Hot-plug AG Drive, 1 DWPD, 876 TBW	400-AXTV	1		1	
Jumper Cord - C13/C14, 4M, 250V, 12A (North America, Guam, North Marianas, Philippines, Samoa)	492-BBDV	1		2	
Mellanox ConnectX-5 EX Dual Port 40/100GbE QSFP28 Adapter, PCIe Low Profile	540-BCIX	1		1	
SUSE Linux Enterprise Server, 1-2 SKT w Unlimited VMs, L3 Subscription, 3 Year, Digitally Fulfilled	528-CHFF	1		1	
PowerSwitch S5248-ON - [amer_s5248-on_12922]		1	$39,234.37	1	$39,234.37
Dell EMC S5248F-ON Switch, 48x25GbE SFP28, 4x100GbE QSFP28, 2x100GbE QSFP-DD, IO to PSU, 2xPSU, OS10	210-APEX				
Dell EMC S52XX-ON Series User Guide	343-BBLP				
OS10 Enterprise, S5248F-ON	634-BRUN				
Dell Hardware Limited Warranty 1 Year	818-4856				
ProSupport Plus:Mission Critical 4-Hour 7x24 On-Site Service with Emergency Dispatch,1 Year	818-4898				
ProSupport Plus Mission Critical:7x24 HW/SW Technical Support and Assistance, 3 Years	818-4901				
ProSupport Plus:Mission Critical 4-Hour 7x24 On-Site Service with Emergency Dispatch, 2 Years Extended	818-4902				
Thank you for choosing Dell ProSupport Plus. For tech support, visit //www.dell.com/contactdell	951-2015				
Dell Limited Hardware Warranty Extended Year(s)	975-3461				
Info 3rd Party Software Warranty provided by Vendor	997-6306				
On-Site Installation Declined	900-9997				
Power Cord, 125V, 15A, 10 Feet, NEMA 5-15/C13	450-AAFH				
Power Cord, 125V, 15A, 10 Feet, NEMA 5-15/C13	450-AAFH				
Mellanox® Passive Copper cable , ETH 100GbE, 100Gb/s, QSFP28, 2m, Black, 30AWG, CA-N	AA319963		$96.67	4	$386.68
APC NetShelter SX Deep Enclosure - Rack - cabinet - black - 24U - 19-inch	A7522217	1	$1,129.99	1	$1,129.99
APC Basic Rack PDU AP9567 - 0U - 120V NEMA 5-15 Input / (14) NEMA 5-15 Output	A7541364	1	$189.99	1	$189.99
ASUS VE248Q 24 Inch LED monitor - Widescreen Full HD Monitor	A6732050	1	$136.99	3	$410.97

DELL EMC	**Dell PowerEdge R7515**	TPCx-IoT v1.0.5 TPC-Pricing v2.6.0 Report Date: March 15, 2021

Description	Part Number	Key	Unit Price	Qty	Extended Price
Logitech MK200 Media Keyboard and Mouse Combo	A6859396	1	$24.99	3	$74.97
C2G 6ft Cat6 Snagless Unshielded (UTP) Ethernet Network Patch Cable - Black - patch cable - 6 ft - black	A7052140	1	$5.99	9	$53.91
Dell C13 to C14, PDU Style, 250 V Power Cord, North America - 6.5 feet	450-ACHI	1	$11.93	18	$214.74
PowerSwitch S3048-ON		1	$15,066.51	1	$15,066.51
Dell Networking S3048-ON, 48x 1GbE, 4x SFP+ 10GbE ports, Stacking, IO to PSU air, 1x AC PSU, DNOS 9	210-AEDM	1		1	
ProSupport Plus: Mission Critical 4-Hour 7x24 On-Site Service with Emergency Dispatch, Initial Year	802-7419	1		1	
ProSupport Plus: 7x24 HW/SW Tech Support and Assistance, 3 Year	802-7434	1		1	
ProSupport Plus: Mission Critical 4-Hour 7x24 On-Site Service with Emergency Dispatch, 2 Year Extended	802-7435	1		1	
HARDWARE COMPONENTS				**Subtotal**	$494,192.75
SOFTWARE COMPONENTS					
Cloudera CDP - 3 year 24x7 support		1	$40,800.00	8	$326,400.00
SOFTWARE COMPONENTS				**Subtotal**	$326,400.00
Total					**$820,592.75**
Large Purchase Discount (35%)*					-287,207.46

Pricing: 1 - Dell	**Three-Year Cost of Ownership:**	**$533,385.29**
	IoTps :	**1,617,545.46**
* Discount based upon total system cost as purchased by a regular customer.	**$ / IoTps:**	**0.33**

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.

DELL EMC	**Dell PowerEdge R7515**	TPCx-IoT v1.0.5 TPC-Pricing v2.6.0 Report Date: March 15, 2021

Measurement Results for Performance Run	
Total Number of Records	2,112 Million
Warmup Run - Start Time	2021-02-26 12:15:02
Warmup Run - End Time	2021-02-26 12:53:59
Warmup Run Elapsed Time in Seconds	2,335.884
Measured Run Start Time	2021-02-26 12:54:00
Measured Run End Time	2021-02-26 13:14:31
Total Time In Seconds	1,230.240

Measurement Results for Repeatability Run	
Total Number of Records	2,112 Million
Warmup Run Start Time	2021-02-26 13:40:09
Warmup Run End Time	2021-02-26 14:12:41
Warmup Run Elapsed Time in Seconds	1,950.826
Measured Run Start Time	2021-02-26 14:12:42
Measured Run End Time	2021-02-26 14:34:29
Total Time In Seconds	1,305.682

DELL EMC	**Dell PowerEdge R7415**	TPCx-IoT v1.0.5 TPC-Pricing v2.6.0 Report Date: March 15, 2021

Run Report for Performance Run

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TPCx-IoT Performance Metric (IoTps) Report


Total Time For Warmup Run In Seconds = 2,335.88

Total Time In Seconds = 1,230.24

Total Number of Records = 2,112 Million


TPCx-IoT Performance Metric (IoTps): 1,716,738.19

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Run Report for Repeatability Run

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TPCx-IoT Performance Metric (IoTps) Report


Total Time For Warmup Run In Seconds = 1,950.82

Total Time In Seconds = 1,305.68

Total Number of Records = 2,112 Millions


TPCx-IoT Performance Metric (IoTps): 1,617,545.46

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Table of Contents

Abstract

This document contains the methodology and results of the TPC Express BenchmarkTM IoT (TPCx-IoT) test conducted in conformance with the requirements of the TPCx-IoT Standard Specification, Revision 1.0.5.

The test was conducted for a Scale Factor of 2,112 million records with 8 Dell R7515 Servers running HBase 2.2.3 on Cloudera Distribution for Apache Hadoop Edition 7.1.4 on SuSE Enterprise Linux Server Release 12 SP5.

This benchmark is now submitted for the Peer Review Board consisting of members of the TPCx-IoT sub-committee.

Measured Configuration

Company Name	Cluster Node	Virtualization	Operating System
Dell Inc.	Dell R7515 Server	Not Used	SuSE Enterprise Linux Server Release 12 SP5

TPC Express Benchmark© IoT Metrics

Total System Cost	IoTps	Price/Performance	Availability Date
$533,385.29 USD	1,617,545.46	$0.33 USD	April 15, 2021

Preface

TPC Express Benchmark™ IoT Overview

TPC Express BenchmarkTM 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 atwww.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 Dell 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:

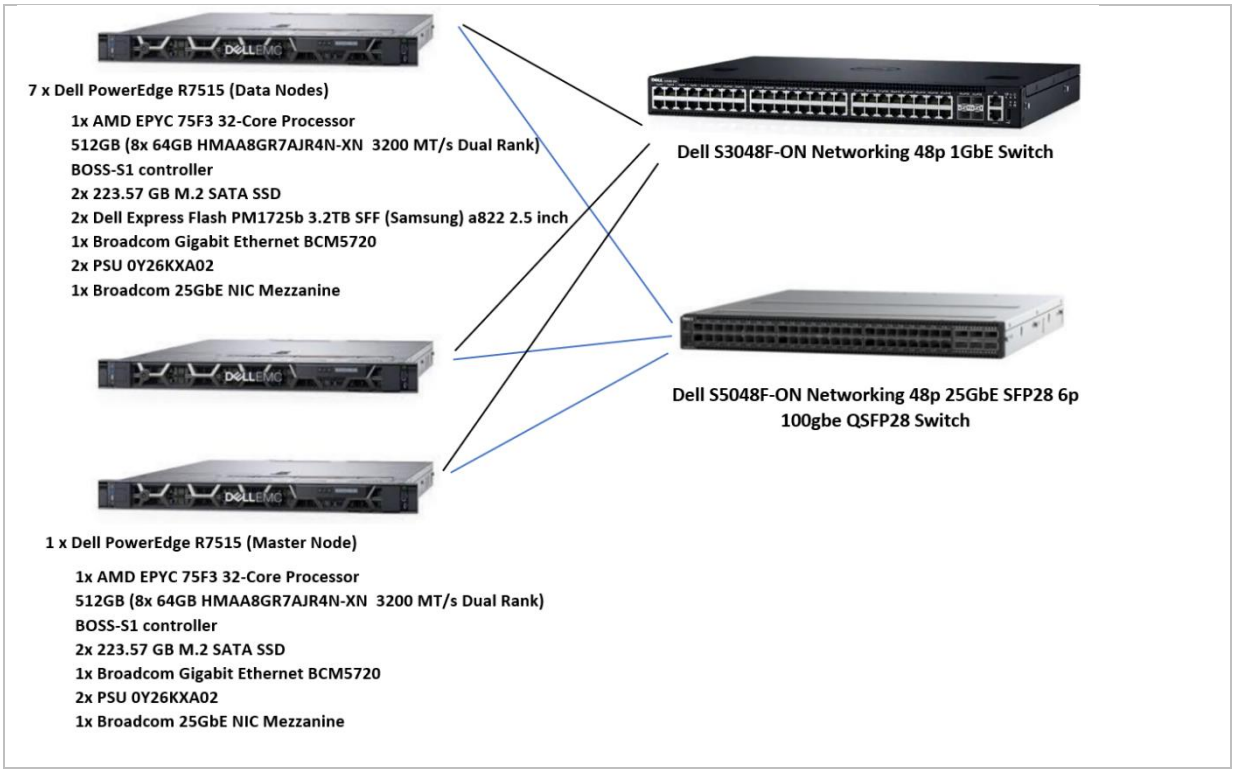

Figure 1-1 Measured Configuration

The measured configuration consisted of

- Total Nodes: 8
- Total Processor/Cores/Threads:8/256/512
- Total Memory: 4.096TB
- Total Number of Storage Devices: 30
- Total Storage Capacity: 48.64TB

Server node details:

- 8x Dell PowerEdge R7515 Servers, each with:
  - Processors/Cores/Threads: 1/32/64
  - Processor Model: 1x AMD EPYC™ 75F3 2.8GHz 32-core
  - Memory: 512GB (8 x 64GB RDIMM 3200MT/s Dual Rank)
  - Drives: 2x 240GB SSD SATA (for all Servers)
    2x Dell 3.2TB NVMe (for all Data Node Servers)
  - Network: 1x Broadcom 25GbE Mezzanine NIC
    1x Broadcom Gigabit Ethernet BCM5720 NIC

Priced Configuration:

Priced configuration includes "480GB SSD SATA Read Intensive 6Gbps 512 2.5in Hot-plug AG Drive, 1 DWPD, 876 TBW" disk storage on master node, but this component was neither present nor used in the measured configuration. Other than this, there no other differences between the priced and measured configurations.

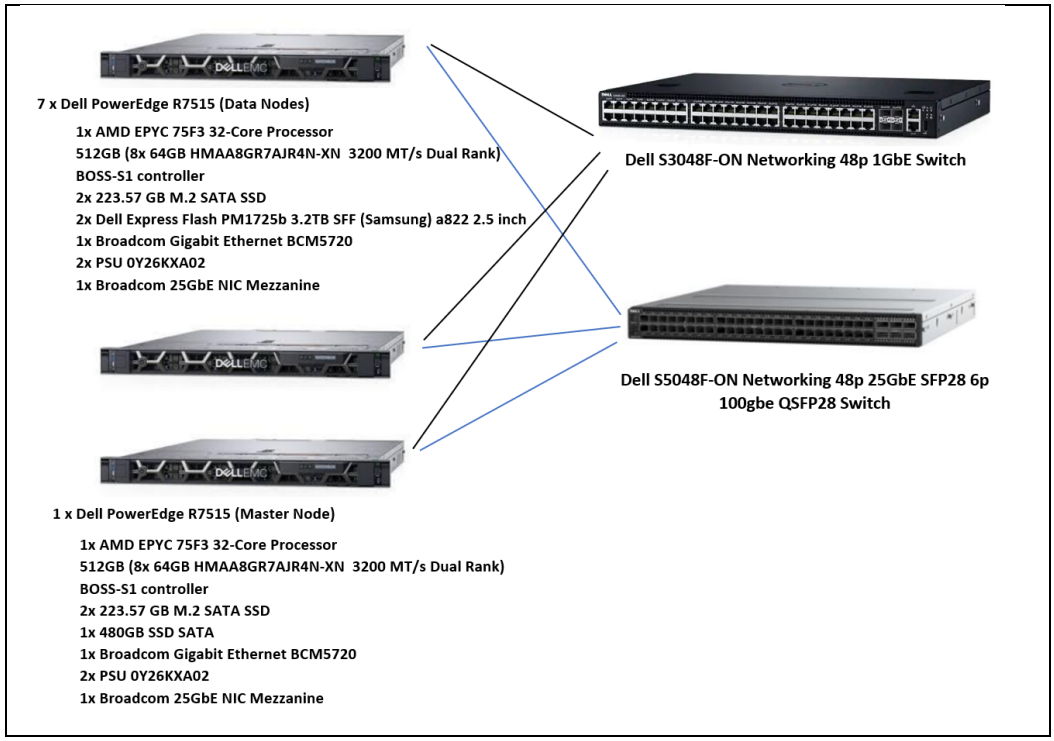

Figure 1-1 Priced Configuration

The measured configuration consisted of

- Total Nodes: 8
- Total Processor/Cores/Threads:8/256/512
- Total Memory: 4.096TB
- Total Number of Storage Devices: 31
- Total Storage Capacity: 49.12TB

Server node details:

- 8x Dell PowerEdge R7515 Servers, each with:
  - Processors/Cores/Threads: 1/32/64
  - Processor Model: 1x AMD EPYC™ 75F3 2.8GHz 32-core
  - Memory: 512GB (8 x 64GB RDIMM 3200MT/s Dual Rank)
  - Drives: 2x 240GB SSD SATA (for all Servers)
    1x 480GB SATA 6Gbps SSD (Master Node)
    2x Dell 3.2TB NVMe (for all Data Node Servers)
  - Network: 1x Broadcom 25GbE Mezzanine NIC
    1x Broadcom Gigabit Ethernet BCM5720 NIC

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	Controller	Disk Drive	Description of Content
1	BOSS-S1 controller	2 (SSD)	Operating System, Swap, Hadoop Master, Root, Temp
2-8	BOSS-S1 controller	2 (SSD)	Operating System, Swap, Root, Temp
2-8	NVMe	NVMe0n1 NVMe1n0	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

	HDFS		HBase		YARN		Zoo Keeper
Node	**NameNode**	**DataNode**	**Master**	**Region Server**	**Resource Manager**	**Node Manager**	
1	X		X		X		X
2-5		X		X		X	X
6-8		X		X		X	

NoSQL Database version must be disclosed.

HBase -2.2.3 on Cloudera Distribution for Apache Hadoop 7.1.4

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

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TPCx-IoT Performance Metric (IoTps) Report

Total Time For Warmup Run In Seconds = 2,335.884
Total Time In Seconds = 1,230.24
Total Number of Records = 2,112 Million

TPCx-IoT Performance Metric (IoTps): 1,716,738.19

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Run Report for Repeatability Run

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TPCx-IoT Performance Metric (IoTps) Report

Total Time For Warmup Run In Seconds = 1,950.82
Total Time In Seconds = 1,305.68
Total Number of Records = 2,112 Millions

TPCx-IoT Performance Metric (IoTps): 1,617,545.46

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2.3 Benchmark Kit Identification

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

TPCx-IoT Kit Version 1.0.5

File	MD5
TPC-IoT-master.sh	db0bbedc8f203fcb66a68e2b60ee34c5
TPC-IoT-master.sh-org	aabeca02709f778295fcd1891ce3f74e
IoT_cluster_validate_suite.sh-org	1d85705dc67fb3c767d7a1fe8775275f
IoT_cluster_validate_suite.sh	65a5c4473564e74dc1b3224b02824306
tpcx-iot/hbase12-binding/lib/core-0.13.0-SNAPSHOT.jar	f305190e4a4106ad4b7f41c52d63239f

2.4 Benchmark Kit changes

No modifications were made to the TPC provided kit other than the following fixes made in these three scripts:.

- TPC-IoT-master.sh
- TPC-IoT-client.sh
- TPC-IoT-instances.sh
- IoT_cluster_validate_suite.sh

TPCx-IoT kit did not generate tpc_iot_instanceNN_workload files with correct values for benchmark tests that involved multiple client (driver) nodes.

```
# diff TPC-IoT-master.sh org/TPC-IoT-master.sh
132c132
<     insertstart=$(echo "$insertstart+$num_records_per_client" | bc)
---
>     insertstart=$(echo "$insertstart+$num_records_per_client+1" | bc)
```

```
# diff TPC-IoT-client.sh org/TPC-IoT-client.sh
35c35
< OPERATION_COUNT=$(echo $operation_count_string | cut -d'=' -f2)
---
> DATABASE_RECORDS_COUNT=$(echo $operation_count_string | cut -d'=' -f2)
38,39c38,39
< echo ">>>>>>>> $PWD/TPC-IoT-instances.sh $DATABASE_RECORDS_COUNT $OPERATION_COUNT
$NUM_INSTANCES $NUM_THREADS $INSERT_START $clientId $DATABASE_CLIENT $LOGFILE_NAME"
< $PWD/TPC-IoT-instances.sh $DATABASE_RECORDS_COUNT $OPERATION_COUNT $NUM_INSTANCES
$NUM_THREADS $INSERT_START $clientId $DATABASE_CLIENT $PWD $SUT_PARAMETERS $LOGFILE_NAME
---
```

```
> echo ">>>>>>>>> $PWD/TPC-IoT-instances.sh $DATABASE_RECORDS_COUNT $NUM_INSTANCES
$NUM_THREADS $INSERT_START $clientId $DATABASE_CLIENT $LOGFILE_NAME"
> $PWD/TPC-IoT-instances.sh $DATABASE_RECORDS_COUNT $NUM_INSTANCES $NUM_THREADS
$INSERT_START $clientId $DATABASE_CLIENT $PWD $SUT_PARAMETERS $LOGFILE_NAME
```

 # diff TPC-IoT-instances.sh org/TPC-IoT-instances.sh

```
10,18c10,17
< totalOperationCount=$2
< numInstances=$3
< threadCount=$4
< start=$5
< clientID=$6
< DATABASE_CLIENT=$7
< PWD=$8
< SUT_PARAMETERS=$9
< RUN_TYPE=$10
---
> numInstances=$2
> threadCount=$3
> start=$4
> clientID=$5
> DATABASE_CLIENT=$6
> PWD=$7
> SUT_PARAMETERS=$8
> RUN_TYPE=$9
20c19
< operationCount=$((totalOperationCount / numInstances))  # Improve this to be total of
record count
---
> operationCount=$((recordCount / numInstances))  # Improve this to be total of record
count
53c52
< start=$((operationCount + start))
---
> start=$((operationCount * counter))
```

 # diff org/IoT_cluster_validate_suite.sh IoT_cluster_validate_suite.sh

```
153,154c153,154
< eval $CHECK_STATS_DB #for Machbase
< #echo $CHECK_STATS_DB | $SUT_SHELL # for HBase
---
> #eval $CHECK_STATS_DB #for Machbase
> echo $CHECK_STATS_DB | $SUT_SHELL # for HBase
```

Clause 3: Scale Factors and Metrics

3.1 Total Run Time

	Run 1	Run 2
Total Run Time	1,230.24	1,305.68

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	1,716,738.19	1,617,545.46

$/IoTps	**$0.33**

3.3 System Configuration Information

Storage System Software	Operating System	Other Software	System Availability Date
	SuSE Enterprise Linux Server Release 15 SP5		April 15, 2021

Cloudera Enterprise 7.1.4	
Component	**Package Version**
Apache Hadoop	hadoop-3.1.1
HBase	hbase-2.2.3
YARN	yarn-3.1.1
Zookeeper	zookeeper-3.5.5

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