



Technical Research Study

 PROWESS

# Dell™ PowerEdge™ R760 Servers Ace SAP HANA® Benchmark Performance Tests

New Dell PowerEdge servers outperformed competitors on SAP® BW edition for SAP HANA Standard Application Benchmarks for load time, query executions per hour, and complex query runtimes.

It's not unusual to see a new server appear on the [SAP® Standard Application Benchmarks](#) directory and have it outperform earlier servers. When the Dell™ PowerEdge™ R760 server showed up on that list recently, however, its superior performance caught our attention. Not only does the two-socket PowerEdge R760 server outperform all other two-socket servers, but it also outperforms four-socket and eight-socket servers that have twice or four times the number of processors.<sup>1</sup> Some of this can be explained by the fact that the PowerEdge R760 server is using the latest 4th Gen Intel® Xeon® Scalable processors, whereas the four-socket and eight-socket servers are using 2nd Gen Intel Xeon Scalable processors. But even when we compared the results to other 4th Gen Intel Xeon Scalable processor–powered server results, such as for the two-socket Fujitsu® PRIMERGY® RX2540 M7 server, the Dell™ system still came out ahead.

SAP HANA® users who are considering upgrading or expanding their server infrastructure are keenly interested in getting the best available performance, so Prowess Consulting decided to take a closer look at these results. The analysis in this report should prove useful in SAP HANA users' server-selection process.

## About the Benchmark

SAP publishes the results of standardized benchmark tests to assist customers in comparing the performance of different servers when running SAP HANA. These results can be found in the [SAP Standard Application Benchmarks](#) directory.

The SAP® BW edition for SAP HANA benchmark scenario represents a typical mid-size customer scenario and volumes for SAP® Business Warehouse (BW) running on the SAP HANA platform. The benchmark simulates a variety of users with different analytical requirements, and it measures the key performance indicators (KPIs) relevant to each of three benchmark phases:

- **Phase 1:** Data load phase, testing data latency and load performance
- **Phase 2:** Query throughput phase, testing query throughput with moderately complex queries
- **Phase 3:** Query runtime phase, testing the performance of running very complex queries

## Best Two-Socket Server Performance

The new PowerEdge R760 server outperformed its predecessor, the PowerEdge R750, across 1.3, 2.6, and 3.9 billion initial records by up to 47.6 percent in Phase 1, by up to 75.7 percent in Phase 2, and by up to 27.7 percent in Phase 3.<sup>1,2</sup> It's worth noting that the earlier PowerEdge R750 server was never benchmarked above 3.9 billion initial records, whereas the new one was benchmarked at 5.2 and 6.5 billion records, indicating a generational improvement in the ability to process ever-larger amounts of data.

The two-socket PowerEdge R760 server outperformed the second-place two-socket performer on benchmarks using 1.3, 2.6, and 3.9 billion initial records. The second-place servers were the Lenovo® ThinkSystem™ SR650 v3 server (at 1.3B records) and the Fujitsu® PRIMERGY® RX2540 M7 server (at 2.6B and 3.9B records). Figures 1–3 show normalized benchmark results, with the PowerEdge R760 server outperforming the second-place server in eight out of nine comparison points.<sup>1,3</sup>

### Normalized Performance Metrics for SAP® Benchmarks with 1.3 Billion Initial Records:

Two-socket Dell™ PowerEdge™ R760 Server vs. Two-Socket Lenovo® ThinkSystem™ SR650 v3 Server

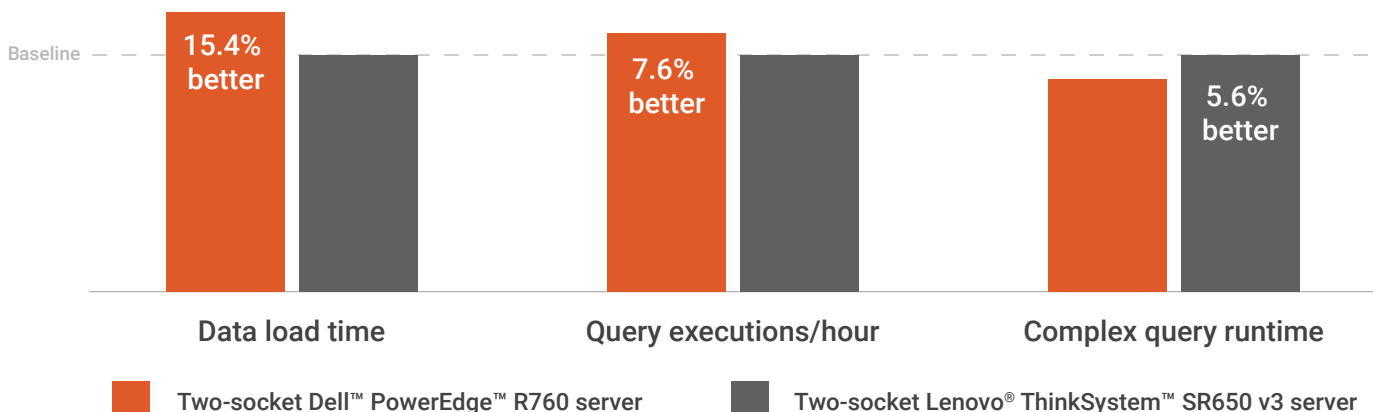


Figure 1 | The two-socket Dell™ PowerEdge™ R760 server performed better than the two-socket Lenovo® ThinkSystem™ SR650 v3 server on all three benchmark metrics when processing 1.3B records<sup>1,4</sup>

### Normalized Performance Metrics for SAP® Benchmarks with 2.6 Billion Initial Records: Two-Socket Dell™ PowerEdge™ R760 Server vs. Two-Socket Fujitsu® PRIMERGY® RX2540 M7 Server

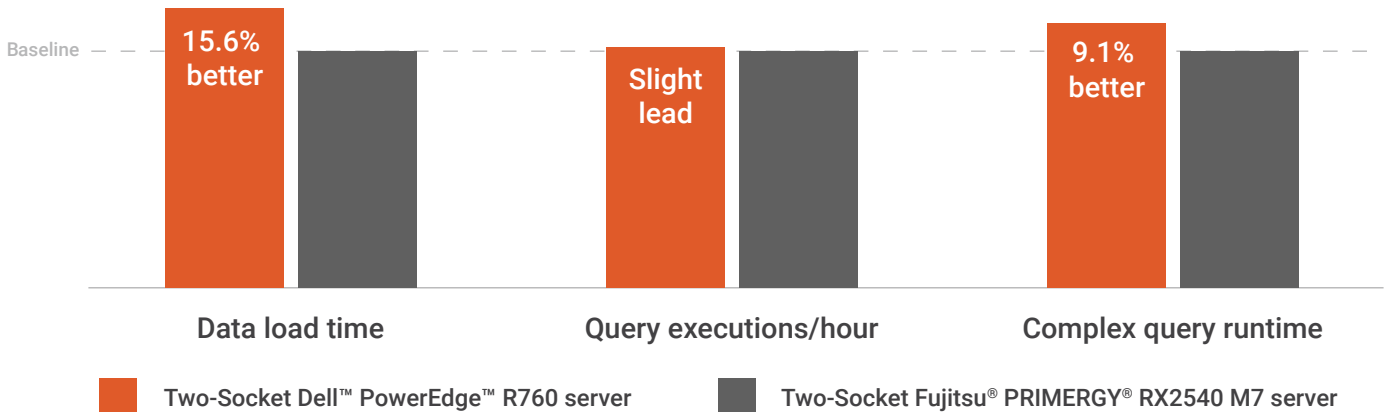


Figure 2 | The two-socket Dell™ PowerEdge™ R760 server performed better than the two-socket Fujitsu® PRIMERGY® RX2540 M7 server on all three benchmark metrics when processing 2.6B records<sup>1,3</sup>

### Normalized Performance Metrics for SAP® Benchmarks with 3.9 Billion Initial Records: Two-Socket Dell™ PowerEdge™ R760 Server vs. Two-Socket Fujitsu® PRIMERGY® RX2540 M7 Server

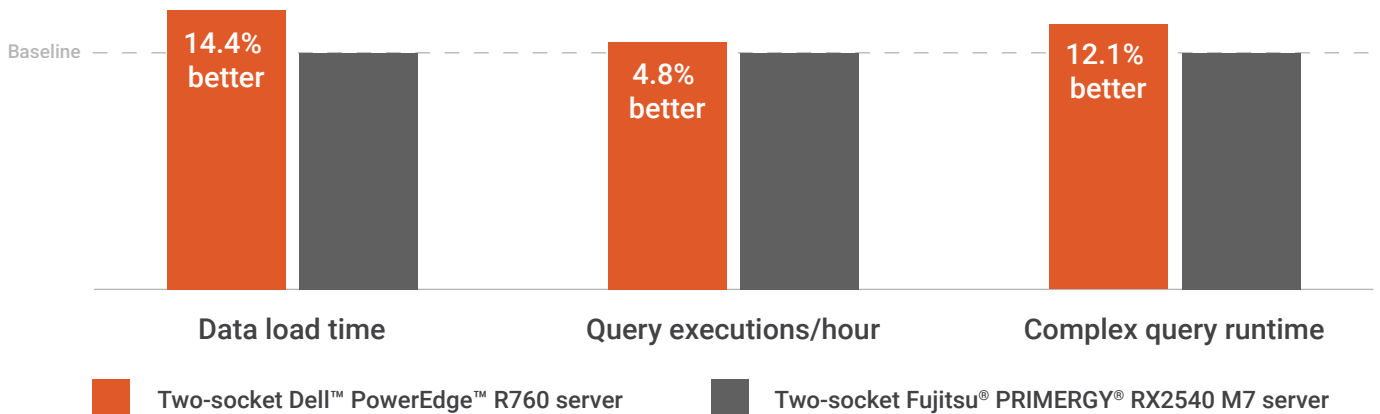


Figure 3 | The two-socket Dell™ PowerEdge™ R760 server performed better than the two-socket Fujitsu® PRIMERGY® RX2540 M7 server on all three benchmark metrics when processing 3.9B records<sup>1,3</sup>

It's interesting to note that the two-socket servers from Dell Technologies and Fujitsu both use the same processors and are configured with the same amount of memory. This makes the Dell server's performance advantage across all three metrics quite an accomplishment.

## Better Performance than Four-Socket and Eight-Socket Servers

The PowerEdge R760 server—the only two-socket server benchmarked at 6.5 billion initial records—bested the second-place server, the two-socket Fujitsu PRIMERGY RX4770 M6, in all three phases of testing, as shown in Figure 4.<sup>1,5</sup>

### Normalized Performance Metrics for SAP® Benchmarks with 6.5 Billion Initial Records: Two-Socket Dell™ PowerEdge™ R760 Server vs. Four-Socket Fujitsu® PRIMERGY® RX4770 M6 Server

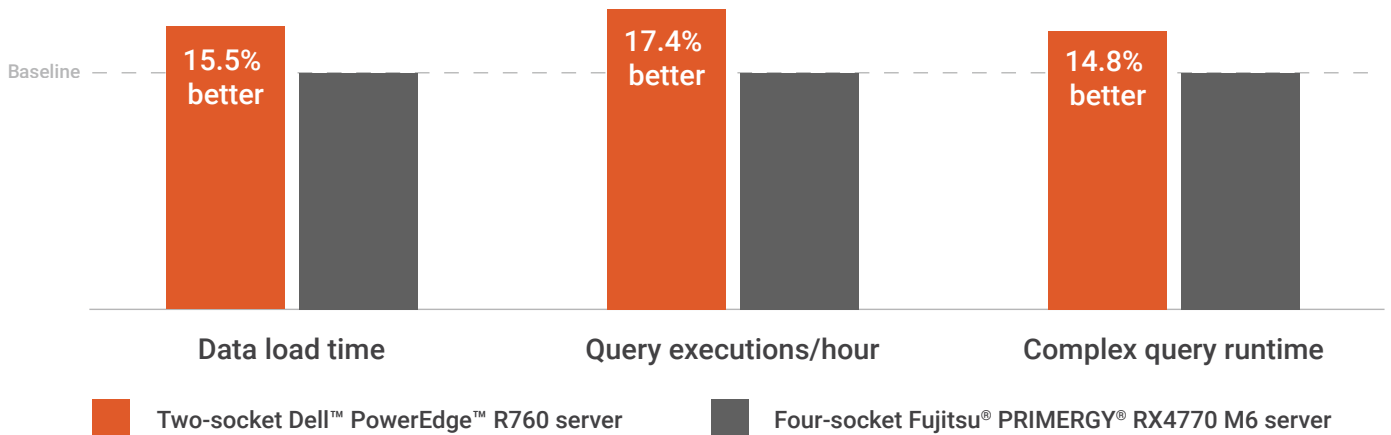


Figure 4 | The two-socket Dell™ PowerEdge™ R760 server performed better than the four-socket Fujitsu® PRIMERGY® RX4770 M6 server on all three benchmarks when processing 6.5B records<sup>1,5</sup>

Moreover, the two-socket PowerEdge server even outperformed the eight-socket Fujitsu® PRIMEQUEST® 3800B2 server in two out of three phases of testing with 5.2B records (see Figure 5).<sup>1,6</sup>

### Normalized Performance Metrics for SAP® Benchmarks with 5.2 Billion Initial Records: Two-Socket Dell™ PowerEdge™ R760 Servers vs. Eight-Socket Fujitsu® PRIMEQUEST® 3800B2 Server



Figure 5 | The two-socket Dell™ PowerEdge™ R760 server performed better than the eight-socket Fujitsu® PRIMEQUEST® 3800B2 server on two out of three benchmark metrics when processing 5.2B records<sup>1,6</sup>

While it's unlikely that a customer would be choosing between an eight-socket server and a two-socket server due to the importance of scale-up features, we nonetheless find it impressive that the two-socket PowerEdge R760 server can surpass the eight-socket Fujitsu server on two out of three performance comparisons.

## Methodology

All the data used in this research study is publicly available in the [SAP Standard Application Benchmarks](#) directory. This section provides some quick tips on how to navigate that site to replicate our findings.

When you first visit the site, you'll see a long list of server certifications—a total of 156 as of May 2023. The list is sorted by default to show the newest certification first, which in this case is the PowerEdge R760 server processing 1.3B initial records.

Certification Date	Certification Number	Technology Partner	Server(s)	Operating System Release	Database Release	Benchmark Version	Configuration	Initial Records (billions)	Phase 1: Data Load (seconds)	Phase 2: Query Executions per Hour	Phase 3: Runtime of complex query phase (seconds)
2023-04-17	2023017	Dell	Dell PowerEdge R760	Red Hat Enterprise Linux 8.6	SAP HANA 2.0	Version 3	Scale-Up	1.3	6.815	15,198	67

Figure 6 | Excerpt from the SAP® Standard Application Benchmarks website

Use the **Filter by** tabs to narrow the list down to the certifications of interest to you, as shown in Figure 7. To see the list of competitive certifications analyzed by this study, click **More** to expand the **Filter** menu, and then follow these steps:

1. Click **Benchmark Version**, and then select **Version 3.0**. This is important because results must not be compared across benchmark versions.
2. Click **Initial Records**, and then select **1.3, 2.6, 3.9, 5.2, and 6.5**. These are the sizes (in billions) of initial records for which the PowerEdge R760 server was benchmarked.

Filter by	Technology Partner	CPU	Operating System	DB	More
Environment					<input checked="" type="checkbox"/> 1.3 (52) <input checked="" type="checkbox"/> 2.6 (52) <input checked="" type="checkbox"/> 3.9 (52)
Software Release					<input checked="" type="checkbox"/> 5.2 (52) <input checked="" type="checkbox"/> 6.5 (52) <input type="checkbox"/> 7.8 (52)
Initial Records					<input type="checkbox"/> 9.1 (53) <input type="checkbox"/> 10.4 (58) <input type="checkbox"/> 11.7 (65) <input type="checkbox"/> 13 (56) <input type="checkbox"/> 14.3 (53) <input type="checkbox"/> 15.6 (53)
Benchmark Version					<input type="checkbox"/> 16.9 (53) <input type="checkbox"/> 18.2 (53) <input type="checkbox"/> 20.8 (60)
BWHConfiguration					<input type="checkbox"/> 23.4 (52) <input type="checkbox"/> 24.7 (54) <input type="checkbox"/> 31.2 (56)
Memory Type					<input type="checkbox"/> 41.6 (62) <input type="checkbox"/> 46.8 (52) <input type="checkbox"/> 49.4 (53)
Processors					<input type="checkbox"/> 61.1 (53) <input type="checkbox"/> 81.9 (53) <input type="checkbox"/> 100.1 (54)
					<input type="checkbox"/> 184.6 (53) <input type="checkbox"/> 205.4 (53)

Figure 7 | Filter for the relevant database sizes

The following optional steps can help you find the most convenient view for making specific comparisons:

1. To view results for only one database size, select only that size under **Initial Records** (see Figure 7).
2. To view only results for two-socket servers, on the **More** menu, click **Processors**, and then select **2**.
3. To sort the view to group all results with the same database size together, change the **sorted by** selection (shown in Figure 6) to **Initial Records**.
4. To save or share your preferred view, you can copy the URL. For example, here's a link to a convenient view of all the server certifications considered in this study: [filtered sorted view](#)

## Conclusion

It's no surprise that new servers running on 4th Gen Intel Xeon Scalable processors will outperform their predecessors with older processors. But it's remarkable that the PowerEdge R760 also outperforms other new servers running with the same Intel® processors and the same memory, such as the Lenovo ThinkSystem SR650 v3 and Fujitsu PRIMERGY RX2540 M7 servers.

One likely explanation for the better performance versus same-generation competitors is the ability of the Integrated Dell™ Remote Access Controller (iDRAC) to micromanage the power and cooling for the system. This enables optimum performance while staying within the design parameters of the CPU.

The results of this study make clear that companies looking for high-performance servers to run SAP HANA workloads would be wise to consider the PowerEdge R760 server, given its superior performance when tested against all competitors in all database sizes up to 6.5 billion initial records.

Learn more about the [PowerEdge R760](#) server and what it can do for your data center.

## Appendix: Raw Performance Data of First- and Second-Place Servers in Each Size of Initial Records

Table 1 | Raw performance data of servers analyzed in this study<sup>1</sup>

Initial Records (Billions)	Server	Phase 1: Data Load (Seconds)	Phase 2: Query Executions per Hour	Phase 3: Complex Query Runtime (Seconds)
1.3	Dell™ PowerEdge™ R760	6,815	15,198	66.6
	Lenovo® ThinkSystem™ SR650 v3	8,053	14,118	63.0
2.6	PowerEdge R760	7,385	11,648	70.9
	Fujitsu® PRIMERGY® RX2540 M7	8,750	11,560	78.0
3.9	PowerEdge R760	8,136	9,699	73.8
	Fujitsu PRIMERGY RX2540 M7	9,500	9,251	84.0
5.2	PowerEdge R760	9,269	7,600	76.4
	Fujitsu® PRIMEQUEST® 3800B2 (eight-socket)	13,530	10,164	95.0
6.5	PowerEdge R760	10,532	6,030	81.8
	Fujitsu PRIMERGY RX4770 M6 (four-socket)	12,463	5,136	96.0

<sup>1</sup> All performance data in this abstract is from results published by SAP. Source: SAP. "SAP Standard Application Benchmarks & Certified Hardware for SAP Solutions on Microsoft Windows." Accessed April 19, 2023. [www.sap.com/dmc/exp/2018-benchmark-directory/#/bwh](https://www.sap.com/dmc/exp/2018-benchmark-directory/#/bwh)

<sup>2</sup> Based on the published results for 1.3, 2.6, and 3.9 billion records for the Dell™ PowerEdge™ R750 server using SAP® BW edition for SAP HANA® Standard Application Benchmark version 3 under certification numbers: 2021063 and 2021064 published on 09-16-2021 with 2 x Intel® Xeon® Platinum 8380 processors running at 2.3 GHz with 80 cores and 160 threads and 1,024 GB of memory in a scale-up configuration running Red Hat® Enterprise Linux® 8.4, SAP HANA 2.0, and SAP NetWeaver® 7.50, or running SUSE® Linux Enterprise Server 15, SAP HANA 2.0, and SAP NetWeaver 7.50 and certification numbers: 2021066, 2021067, 2021068, and 2021069 published on 10-04-2021 with 2 x Intel Xeon Platinum 8380 processors running at 2.3 GHz with 80 cores and 160 threads and 2,048 GB of memory in a scale-up configuration running Red Hat Enterprise Linux 8.4, SAP HANA 2.0, and SAP NetWeaver 7.50, or running SUSE Linux Enterprise Server 15, SAP HANA 2.0, and SAP NetWeaver 7.50, comparing against the results for 1.3, 2.6, and 3.9 billion records for the PowerEdge R760 server using SAP BW edition for SAP HANA Standard Application Benchmark version 3 under certification numbers: 2023011 and 2023012, published on 03-01-2023 with 2 x Intel Xeon Platinum 8480+ processors running at 2.0 GHz with 112 cores and 224 threads and 2,048 GB of memory in a scale-up configuration running Red Hat Enterprise Linux 8.6, SAP HANA 2.0, and SAP NetWeaver 7.50, and certification number: 2023017, published on 04-17-2023 with 2 x Intel Xeon Platinum 8480+ processors running at 2.0 GHz with 112 cores and 224 threads and 1,024 GB of memory in a scale-up configuration running Red Hat Enterprise Linux 8.6, SAP HANA 2.0, and SAP NetWeaver 7.50.

<sup>3</sup> Based on the published results for 2.6 and 3.9 billion records for the Dell™ PowerEdge™ R760 server using SAP® BW edition for SAP HANA® Standard Application Benchmark version 3 under certification numbers: 2023011 and 2023012 published on 03-01-2023 with 2 x Intel® Xeon® Platinum 8480+ processors running at 2.0 GHz with 112 cores and 224 threads and 2,048 GB of memory in a scale-up configuration running Red Hat® Enterprise Linux® 8.6, SAP HANA 2.0, and SAP NetWeaver® 7.50, comparing against the results for 2.6 and 3.9 billion records for the Fujitsu® PRIMERGY® RX2540 M7 server using SAP BW edition for SAP HANA Standard Application Benchmark version 3 under certification numbers: 2023001 and 2023006 published on 01-10-2023 and 01-20-2023, respectively, with 2 x Intel Xeon Platinum 8480+ processors running at 2.0 GHz with 112 cores and 224 threads and 2,048 GB of memory in a scale-up configuration running SUSE® Linux Enterprise Server 15, SAP HANA 2.0, and SAP NetWeaver 7.50.

<sup>4</sup> Based on the published results for 1.3 billion records for the Dell™ PowerEdge™ R760 server using SAP® BW edition for SAP HANA® Standard Application Benchmark version 3 under certification number: 2023017, published on 04-17-2023 with 2 x Intel® Xeon® Platinum 8480+ processors running at 2.0 GHz with 112 cores and 224 threads and 1,024 GB of memory in a scale-up configuration running Red Hat® Enterprise Linux® 8.6, SAP HANA 2.0, and SAP NetWeaver® 7.50, comparing against the results for 1.3 billion records for the Lenovo® ThinkSystem™ SR650 server using SAP BW edition for SAP HANA Standard Application Benchmark version 3 under certification number: 2023003, published on 01-10-2023 with 2 x Intel Xeon Platinum 8490 processors running at 1.9 GHz with 120 cores and 240 threads and 1,024 GB of memory in a scale-up configuration running SUSE® Linux Enterprise Server 15, SAP HANA 2.0, and SAP NetWeaver 7.50.

<sup>5</sup> Based on the published results for 6.5 billion records for the Dell™ PowerEdge™ R760 server using SAP® BW edition for SAP HANA® Standard Application Benchmark version 3 under certification number: 2023014 published on 03-01-2023 with 2 x Intel® Xeon® Platinum 8480+ processors running at 2.0 GHz with 112 cores and 224 threads and 2,048 GB of memory in a scale-up configuration running Red Hat® Enterprise Linux® 8.6, SAP HANA 2.0, and SAP NetWeaver® 7.50, comparing against the results for 6.5 billion records for the Fujitsu® PRIMERGY® RX4770 M6 server using SAP BW edition for SAP HANA Standard Application Benchmark version 3 under certification number: 2020039 published on 10-23-2020 with 4 x Intel Xeon Platinum 8380HL processors running at 2.9 GHz with 112 cores and 224 threads and 768 GB DRAM and 3,072 GB of persistent memory in a scale-up configuration running SUSE® Linux Enterprise Server 15, SAP HANA 2.0, and SAP NetWeaver 7.50.

<sup>6</sup> Based on the published results for 5.2 billion records for the Dell™ PowerEdge™ R760 server using SAP® BW edition for SAP HANA® Standard Application Benchmark version 3 under certification number: #2023013 published on 03-01-2023 with 2 x Intel® Xeon® Platinum 8480+ processors running at 2.0 GHz with 112 cores and 224 threads and 2,048 GB of memory in a scale-up configuration running Red Hat® Enterprise Linux® 8.6, SAP HANA 2.0, and SAP NetWeaver® 7.50, comparing against the results for 5.2 billion records for the Fujitsu® PRIMEQUEST® 3800B2 server using SAP BW edition for SAP HANA Standard Application Benchmark version 3 under certification number: 2019052 published on 10-16-2019 with 8 x Intel Xeon Platinum 8280 processors running at 2.70 GHz with 224 cores and 448 threads and 3,072 GB of memory in a scale-up configuration running SUSE® Linux Enterprise Server 12, SAP HANA 2.0, and SAP NetWeaver 7.50.



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