Dell EMC SAP HANA Appliance Backup and Restore Performance with Dell EMC Data Domain
Performance testing results using Dell EMC Data Domain DD6300 and Data Domain Boost for Enterprise Applications

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White Paper

Abstract
This white paper describes backup and restore performance tests that Dell EMC conducted on Dell EMC Ready Solution for SAP HANA Appliance with Data Domain DD6300 and Data Domain Boost for Enterprise Applications and presents the results of those tests.

Dell EMC Solutions
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Executive summary

Introduction

Data protection for back-office operations, reporting, data analytics, and other business functions that use databases is more critical than ever due to today’s larger data volumes and increasing security threats. SAP HANA customers have told Dell EMC that our Ready Solutions must include an integrated and supported data protection option. Based on this feedback, our Ready Solutions for SAP HANA now offer supported integration with Data Domain deduplication storage systems. Our SAP HANA solutions provide a single-vendor, comprehensive offering that addresses both database and data protection design and performance. All of our Ready Solutions for SAP have been thoroughly tested and validated to meet SAP HANA certification standards. Dell EMC engineers now test the Ready Solution for SAP HANA with Data Domain extensively to ensure that customers receive an optimized and modern solution that accelerates time-to-value and protects their databases.

Dell EMC has a long history of protecting mission-critical data and is a leader on Gartner's 2017 Magic Quadrant for Data Center Backup and Recovery Solutions. Dell EMC Data Domain backup appliances reduce the amount of disk storage that is needed to retain and protect data by ratios of 10 to 55 times and greater. Data Domain systems make it possible to complete more backups in less time and provide faster, more reliable restores.

Data Domain Boost (DD Boost) software enables backup protection for your SAP HANA data to our Data Domain systems. The DD Boost application agent integrates with the SAP HANA Backint interface to enable SAP HANA database data and redo log backups and restores. SAP Basis administrators continue to use the supported SAP HANA tools to perform backup, recover, inquire, and delete operations by running:

- SAP HANA command line interface with the hdsq1 command
- SAP HANA Studio UI
- SAP DBA Cockpit in the Computing Center Management System (CCMS) UI

SAP Basis administrators can perform the following SAP HANA operations on both single database containers and multitenant database containers:

- Online backups
- Full database backups
- Redo log backups
- Delta (incremental and differential) backups
- Scheduled full backups and delta backups with SAP HANA SPS 12 or later
- Recovery of the database to the most recent state, a specific point-in-time, a specific data backup, or a log position
- Recovery to the original host or to an alternate host with SAP HANA SPS 12 or later.

Document purpose

The goal of this white paper is to show how organizations can trust Dell EMC Ready Solutions to manage data protection for mission-critical SAP HANA systems efficiently.
Executive summary

and with greater consolidation so that they can focus more resources on driving innovation. We encourage you to contact your Dell EMC representative with any questions about your specific business environment and requirements.

We value your feedback

Dell EMC and the authors of this guide welcome your feedback on the solution and the solution documentation. Contact the Dell EMC Solutions team with your comments.

Authors: Quocdat Nguyen, Sam Lucido, Phil Hummel, Aighne Kearney
Protection objectives and test methodology

Dell EMC engineers tested the ease of use and performance of a Data Domain 6300 appliance with DD Boost for Enterprise Applications (DDBEA) using near real-world use cases. We simulated data growth between backups by inserting new records. Our goals for this testing were to show the ability of the solutions to meet the critical performance metrics that are important to our customers:

- **Fast and efficient backups**—Our protection tests show the backup duration for three complete data backups.

- **Minimal CPU usage**—Our protection tests capture additional server CPU usage during backups to show how running DDBEA on the production servers has a minimal impact.

- **Low network throughput**—Minimizing network throughput for multiple parallel backups run during specified off-business time windows by using a shared data network.

- **Fast database recovery**—Our tests show the ability to quickly recover mission-critical databases to minimize the impact of unplanned outages.

Customers have also told us that they want to centralize data protection management and keep more backups available for longer periods of time before having to archive the data. Data Domain consolidation savings enable an IT organization to meet these objectives. To show the consolidation capabilities of Data Domain, we collected metrics for:

- **Compression savings**—Backups on Data Domain appliances are compressed to save space. Our tests capture the post-compression size of the backups to give insight into possible space savings for SAP HANA customers.

- **Compression ratio**—The compression ratio indicates the overall savings that are achieved across all three backups. Our goal is to show a compression ratio that increases after each backup to show greater consolidation savings.

We performed three complete data backups of the SAP HANA database on a Dell EMC Ready Node and a Ready Solution Scale-out. Our expectations were as follows:

- **First backup**—Data in the first backup is 100 percent unique and therefore deduplication is minimal. We expect the first complete data backup to use the most network throughput, have the longest backup duration, and the smallest backup compression ratio. The test engineers increase the SAP HANA database by 3 to 4 percent of unique data after each backup.

- **Second backup**—We expect the second complete data backup to show the value of using DDBEA client-side deduplication by lowering the network throughput and backup duration. The client-side deduplication is also expected to increase our compression savings, meaning that our total compression increases.

- **Third backup**—We expect the third and final backup to have a backup duration time that is similar to the second backup because the data growth is similar. We expect the total compression ratio to significantly increase because of the client-side deduplication savings.
Protection objectives and test methodology

We used two different SAP HANA configurations for the data protection tests.

The first test used a Dell EMC Ready Node for SAP HANA. The Ready Node for SAP HANA enables customers to choose between the Dell EMC PowerEdge R740xd server and the more powerful PowerEdge R940 server. Both PowerEdge servers have been validated, tested, and certified for SAP HANA. In our protection tests, we chose the PowerEdge R940 because of its capability to scale from 192 GB up to 3 TB for analytic workloads and up to 6 TB for transaction workloads such as the SAP HANA Business Suite on SAP HANA. Appendix: Ready Solution configuration details provides the specifications.

The following figure shows our test configuration for the Ready Node for SAP HANA.

![Ready Node for SAP HANA Test Configuration](image)

**Figure 1. Ready Node for SAP HANA test configuration**

The second test used a ReadySolution for SAP HANA Scale-out configuration. The Ready Solution for SAP HANA Scale-out integrates PowerEdge servers, Dell EMC networking switches, and Compellent storage arrays. The solution can scale from 2 to 16 compute nodes with up to 48 TB of memory. For these data protection tests, we used two PowerEdge R940 servers. Appendix: Ready Solution configuration details provides the specifications.

The following figure shows our test configuration for the Ready Solution for SAP HANA Scale-out.
Protection objectives and test methodology

All our tests shared a single Data Domain 6300 system as the final destination for the SAP HANA backups. We used Dell EMC 10 GbE S4048 switches to provide a redundant network fabric and configured them with Virtual Link Trunking (VLT) domains to implement an active-backup bonded network on the SAP HANA servers.

We configured two 10 GbE network interface cards (NICs) on the Data Domain 6300 in a dynamic interface group for each SAP node. The dynamic interface group feature is part of the DDBEA API. The dynamic interface group is recommended for efficient load-balancing, failover, and other advanced features that are not available with a standard Link Aggregation Control Protocol (LACP) configuration.

DDBEA integrates with enterprise applications such as SAP HANA, Oracle, and more, enabling application owners to have control and visibility of their own backups to the Data Domain system by using their native tools. For example, we managed all backups and restores using the SAP HANA Studio UI. When the SAP HANA Basis administrators have control of the recovery process, they can bypass the Backup Admin, enabling faster recovery. DDBEA performs client-side deduplication, which reduces network bandwidth requirements and can accelerate backups. DD Boost supports both Ethernet and Fibre Channel protocols. Dell EMC engineers configured DDBEA to use the Ethernet protocol over multiple 10 GbE NICs that were part of the dynamic interface groups for Data Domain.
Protection objectives and test methodology

The following figure depicts DDBEA protection:

![DDBEA protection figure](image)

**Figure 3. DDBEA protection**

Users can configure multiple channels between the host and the Data Domain appliance to reduce backup times. By default, SAP HANA uses one out of a maximum of 32 channels for data backup. After testing several configurations, Dell EMC engineers used four channels per 10 GbE NIC for each SAP HANA node.

The following table shows the number of backup channels that are required for the Ready Node and Ready Solution.

**Table 1. Backup channel requirements by solution**

<table>
<thead>
<tr>
<th>Ready Solution</th>
<th>Number of SAP nodes</th>
<th>Number of NICs</th>
<th>Total number of channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready Node for SAP HANA</td>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Ready Solution for SAP HANA Scale-out</td>
<td>2</td>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

Each channel requires an I/O buffer of 512 MB. For the Ready Node, this means 4,096 MB (8 x 512 MB) for one node or 8,192 MB for two nodes. The Ready Solution requires 8,192 MB for two nodes. The settings that we used are as follows:

**Ready Node:**

```
parallel_data_backup_init_channels = 8
data_backup_buffer_size = 4,096
```

**Ready Solution node:**

```
parallel_data_backup_init_channels = 8
data_backup_buffer_size = 4,096
```
Ready Node for SAP HANA test results

Overview
We collected the results from testing performed by Dell EMC engineers using a Data Domain 6300 system with DDBEA to back up a 1.3 TB SAP HANA database.

Backup duration findings
Because DDBEA had to back up the entire database of unique data, the first full data backup had the longest duration at 36.8 minutes. DDBEA cannot perform client-side deduplication on the initial backup because there is no data for comparison on the backup appliance.

The following figure shows the backup duration times for all three backups that were performed in this test.

![Figure 4. Ready Node for SAP HANA backup duration times](image)

The second and third backups show the benefit of the client-side deduplication. The second backup took 12 minutes and the third backup took 12.7 minutes. The backup durations were similar because the data growth of 3 to 4 percent after each backup meant that the amount of unique data was similar. DDBEA was able to identify all the previously protected blocks, providing a time savings that was three times greater than the first full data backup.

Network throughput findings
As expected, the first full data backup of the SAP HANA database required the most network throughput, as Figure 5 shows. The first backup consisted of unique data. Therefore almost the entire database was transferred over the network to the DD 6300 system. We included the backup duration times in the graph to show the relationship between network throughput and backup times. In this case, the first backup used on average 507 MB/s to protect a 1.3 TB database in 36.8 minutes.
The following figure shows the network throughput with the backup duration times.

![Network Throughput with Backup Duration](image)

**Figure 5.** Network throughput with backup duration times for the Ready Node

The first backup shows that Data Domain can back up large new data sets very quickly. Because IT organizations commonly provision new databases on-demand, they must have the agility to protect the new environments quickly.

The second and third backups show the bandwidth reduction value of DDBEA client-side deduplication. For the second backup, the network throughput falls to 109 MB/s and the backup duration falls to 12 minutes. For the third and final backup, the network throughput is 80 MB/s and the backup time is 12.7 minutes. The second and third backups use only 20 percent (5X reduction) of the network throughput of the first backup. The network throughput savings enable the IT organization to back up more databases in parallel.

Dell EMC engineering monitored incremental CPU usage over the duration of the backup on the PowerEdge R940 servers. The findings show consistent CPU usage of between 2.5 percent to 3.3 percent during the backups.

The following table shows the average additional CPU usage during backups.

**Table 2. Average CPU usage during backups**

<table>
<thead>
<tr>
<th>Backup (TB)</th>
<th>Average additional CPU usage (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First backup of 1.3 TB SAP HANA database</td>
<td>2.5</td>
</tr>
<tr>
<td>Second backup of 1.39 TB SAP HANA database</td>
<td>3.3</td>
</tr>
</tbody>
</table>
For each SAP HANA database, the entire server was dedicated to supporting the database, which is consistent with standard practice in production environments. Therefore, the average CPU usage was across 112 physical cores in the server during the backup. While every customer environment is different, our findings show a low average CPU usage during the backups.

Data Domain compression calculations compare the amount of data that is received to data that is already stored on disks. Duplicate data from the host does not need to be stored again, while new data is locally compressed before being written to disk. Our results show that the first complete backup achieved a compression savings of approximately 201 MB (1,330 - 1,129) on Data Domain.

The following figure shows our Data Domain compression findings.

Because SAP HANA achieves higher data compression with columnar tables, the initial backup does not show significant savings. The space savings are substantial for the second and third backups because the client-side deduplication provides the Data Domain compression. The second full data backup takes up 81 MB and the third backup takes up 62 MB on the Data Domain system.

In all three tests, the Dell EMC engineers used full data backups of the SAP HANA database. Working with full backups is a benefit to the organization because they are...
faster to restore than a combination of full and incremental jobs. Full backups have no
dependency on prior backups. Restores are faster because the database only has to read
from the full backup and not from prior backups. The capability to perform a full database
backup and take a minimum amount of space on the Data Domain system means that the
organization can keep more backups online without having to archive data.

Total compression is the total amount of compression the Data Domain system performs
with the data it receives. The first backup in our testing is entirely unique data and thus
has the lowest total compression ratio (TCR) of 1.3.

The following figure shows the TCR that we observed in our testing.

![Total Compression Ratio](image)

**Figure 7.** Total compression ratio results for the Ready Node for SAP HANA

A higher TCR means a greater savings on Data Domain. The second backup had a TCR
of 19 and the third backup had a TCR of 30.4. The TCR shows a substantial Data Domain
space savings over backups. Technologies such as deduplication and compression
enable the IT organization to do more with their investment in Data Domain data
protection.

The final test that our engineers performed was a full recovery of the 1.43 TB SAP HANA
database (its final size) from Data Domain to the Ready Node. The restore duration was
23 minutes and the average additional CPU utilization during the restore was 1.74
percent. Fast recovery of an SAP HANA database minimizes operational loss to the
organization and enables lower Recovery Time Objectives (RTOs).
Did integrating Data Domain into the Ready Node for SAP HANA meet our goals in protecting the SAP HANA database?

- **Faster backups**—Using Data Domain with DDBEA delivered faster backups. The first full data backup took 36.8 minutes while our second and third backups took, respectively, 12 minutes and 12.7 minutes, a time savings of 3X compared to our first backup.

- **Minimal CPU usage**—The additional average CPU usage never went above 3.3 percent on our Ready Node. The results show that DDBEA had a minimal CPU impact during our backups.

- **Low network throughput**—The first full data backup took an average of 507 MB/s, while the throughput dropped to 109 MB/s and 80 MB/s for the second and third backups. DDBEA client-side deduplication offers a substantial network throughput savings.

- **Data Domain compression**—The first full data backup provided a savings of 201 MB on the Data Domain appliance. However, the value of Data Domain compression is highlighted with the second and third backups, which took 81 MB and 62 MB respectively.

- **Total compression ratio**—The higher the TCR, the greater the increase in space savings on Data Domain. The first full data backup had a total compression ratio of 1.3, while the second and third backups showed the ongoing value of Data Domain with ratios of 19 and 30.4.

- **Fast SAP HANA recovery**—Dell EMC engineers were able to recover the 1.43 TB SAP HANA database in 23 minutes using Data Domain with SAP HANA Studio. Fast database recovery minimizes the impact of the unplanned outage to the organization.

Data Domain protection provides a substantial benefit to data protection operations because it can back up new SAP HANA databases quickly and provides long-term benefits by lowering network throughput and delivering a significant space savings through deduplication and compression.
Ready Solution for SAP HANA Scale-out test results

Overview

We collected the results from testing performed by Dell EMC engineers using a Data Domain 6300 system with DDBEA to back up a 2.7 TB SAP HANA database.

Backup duration findings

Because DDBEA had to back up the entire database, the first full data backup had the longest duration at 56.5 minutes. DDBEA cannot perform client-side deduplication on the initial backup because there is no data for comparison on the backup appliance.

The following figure shows the backup duration times for all three backups that were performed in this test.

![Backup Duration for Ready Solution for SAP HANA Scale-out (mins)](image)

Figure 8. Ready Solution for SAP HANA Scale-out backup duration times

The second and third backups show the benefit of the client-side deduplication. The second backup took 14 minutes and the third backup took 13.8 minutes. The backup durations for the second and third backups were similar because the data growth of 3 to 4 percent after each backup meant that the amount of unique data was similar. DDBEA was able to identify all the previously protected blocks, providing a time savings that was three times greater than the first full backup.

Network throughput findings

As expected, the first full data backup of the SAP HANA database required the most network throughput, as Figure 9 shows. The first backup consisted of unique data. Therefore almost the entire database was transferred over the network to the DD 6300 system. We included the backup duration times in the graph to show the relationship between network throughput and backup times. In this case, the first backup used on average 704 MB/s to protect a 2.7 TB database in 56.5 minutes.
The following figure shows the network throughput with the backup duration times.

![Network Throughput with Backup Duration](image)

**Figure 9. Network throughput with backup duration times for the scale-out appliance**

The first backup shows that Data Domain can back up large new data sets very quickly. Because IT organizations commonly provision new databases on-demand, they must have the agility to protect the new environments quickly.

The second and third backups show the value of DDBEA client-side deduplication. For the second backup, the network throughput falls to 183 MB/s and the backup duration falls to 14 minutes. For the third and final backup, the network throughput is 117 MB/s and the backup time is 13.8 minutes. The second and third backups use less than 3.5 times the network throughput of the first backup. The network throughput savings enable the IT organization to back up more databases in parallel.

**CPU usage findings**

Dell EMC engineers monitored additional CPU usage over the duration of the backup on the PowerEdge R940 servers. The findings show consistent CPU usage of 2.5 percent to 3.3 percent during the backups.

The following table shows the average additional CPU usage during backups.

<table>
<thead>
<tr>
<th>Backup</th>
<th>Average CPU usage (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First backup of 1.3 TB SAP HANA database</td>
<td>2.5</td>
</tr>
<tr>
<td>Second backup of 1.39 TB SAP HANA database</td>
<td>3.3</td>
</tr>
</tbody>
</table>
For each SAP HANA database, the entire server was dedicated to supporting the database, which is consistent with standard practice in production environments. Therefore, the average CPU usage was across 112 physical cores in the server during the backup. While every customer environment is different, our findings show a low average additional CPU usage during the backups.

Data Domain compression calculations compare the amount of data that is received to data that is already stored on disks. Duplicate data from the host does not need to be stored again, while new data is locally compressed before being written to disk. Our results show that the first complete backup achieved a compression savings of approximately 353.5 MB (2,396.5 - 2.770) on the Data Domain system.

The following figure shows our Data Domain compression findings.

![Data Domain Compression Figure](image)

**Figure 10.** Data Domain compression findings for the Ready Solution Scale-out

Because SAP HANA achieves higher data compression with columnar tables, the initial backup does not show significant savings. The space savings are substantial for the second and third backups because the client-side deduplication provides the Data Domain compression. The second full data backup takes up 158.4 MB and the third backup takes 99.6 MB on the Data Domain system.
In all three tests, the Dell EMC engineers used complete data backups of the SAP HANA database. Working with full backups is a benefit to the organization because they are faster to restore than a combination of full and incremental jobs. Full backups have no dependency on prior backups. Restores are faster because the database only has to read from the full backup and not from prior backups. The capability to perform a full database backup and take a minimum amount of space on the Data Domain system means that the organization can keep more backups online without having to archive data.

Total compression is the total amount of compression the Data Domain system performs with the data it receives. The first backup in our testing is entirely unique data and thus has the lowest total compression ratio (TCR) of 1.3.

The following figure shows the TCR that we observed in our testing.

![Total Compression Ratio](image)

A higher TCR means a greater savings on the Data Domain system. The second backup had a TCR of 21.3 and the third backup had a TCR of 36.9. The TCR shows a substantial Data Domain space savings over backups. Technologies such as deduplication and compression enable the IT organization to do more with their investment in Data Domain protection.

The final test that our engineers performed was a full recovery of the 2.96 TB SAP HANA database from Data Domain to the Ready Solution node. The restore duration was 35 minutes and the average CPU utilization during the restore was 0.75 percent. Fast recovery of an SAP HANA database minimizes operational loss to the organization and enables lower RTOs.
Did integrating Data Domain into the Ready Solution for SAP HANA Scale-out meet our goals in protecting the HANA database?

- **Faster Backups**—Using Data Domain with DDBEA delivered faster backups. The first full data backup took 56.5 minutes while our second and third backups took, respectively, 14 minutes and 13.8 minutes, a time savings of 3X compared to our first backup.

- **Minimal CPU usage**—The average additional CPU usage never went above 2.7 percent on our Ready Solution for SAP HANA Scale-out. The results show that DDBEA had a minimal CPU impact during our backups.

- **Low network throughput**—The first full data backup took an average of 704 MB/s, while the throughput dropped to 183 MB/s and 117 MB/s for the second and third backups. DDBEA client-side deduplication offers a substantial network throughput savings.

- **Data Domain compression**—The first full data backup provided a savings of 353.5 MB on the Data Domain appliance. However, the value of Data Domain compression is highlighted with the second and third backups, which took 158.4 MB and 99.6 MB respectively.

- **Total compression ratio**—The higher the TCR, the greater the increase in space savings on the Data Domain system. The first full data backup had a total compression ratio of 1.3, while the second and third backups showed the ongoing value of Data Domain with ratios of 21.3 and 36.9.

- **Fast SAP HANA recovery**—Dell EMC engineers were able to recover the 2.96 TB SAP HANA database in 35 minutes by using Data Domain with SAP HANA Studio. Fast database recovery minimizes the impact of the unplanned outage to the organization.

Data Domain protection provides a substantial benefit to data protection operations because it can back up new SAP HANA databases quickly and provides long-term benefits by lowering network throughput and delivering a significant space savings through deduplication and compression.
Conclusion

Dell EMC differentiates our solutions through testing and publishing proof points that show the value of our solutions. When used with Data Domain systems, both the Ready Node for SAP HANA and the Ready Solution for SAP HANA Scale-out provide customers with a comprehensive modern platform that includes performance and protection.

Dell EMC data protection tests show that customers using Data Domain with DDBEA can achieve faster backups, low network throughput, low CPU utilization, and substantial space savings with advanced technologies like variable-length deduplication and compression. In addition, our test results show the efficiency of Data Domain for data storage protection in the following ways:

- With variable-length deduplication, less storage is required to protect a solution.
- With less data to replicate, a disaster recovery (DR) site requires less network bandwidth and less storage.

Go to the Dell EMC Ready Solutions website to learn about SAP HANA world records for performance and to find out more about Dell EMC solutions like Ready Nodes and Ready Solutions.
Appendix: Ready Solution configuration details

This section describes the configurations that Dell EMC engineers used for data protection testing with Data Domain.

Ready Node for SAP HANA test configuration

The following tables show the test configuration for the Ready Node for SAP HANA:

Table 4. R940 server configuration details

<table>
<thead>
<tr>
<th>R940 server</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>4 x 28-core Intel Xeon Skylake Platinum 8180 M CPU, 2.50 GHz, Total: 224 CPU cores (hyper-core enabled)</td>
</tr>
<tr>
<td>Memory</td>
<td>1.5 TB RAM, 24 x 64 GB DDR4 2666 MHz synchronous LRDIMM</td>
</tr>
<tr>
<td>Network</td>
<td>2 x 10 GB NICs (Intel X710 Quad Port 10 Gb DA/SFP+ Ethernet)</td>
</tr>
<tr>
<td>Disk sizing</td>
<td>OS+SAP+LOG—5 x 1.8 TB SAS + 1 hot spare configured as RAID 5, DATA volume—4 x 1.6 SAS SSD + 1 hot spare configured as RAID 5</td>
</tr>
<tr>
<td>Operating system</td>
<td>SUSE Linux Enterprise Server (SLES) 12 SP2</td>
</tr>
</tbody>
</table>

Table 5. SAP HANA configuration details

<table>
<thead>
<tr>
<th>SAP HANA configuration</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP HANA Database</td>
<td>SAP HANA HDB server: 1.00.122.13.1507793622</td>
</tr>
<tr>
<td>Backup settings</td>
<td>Parallel_data_backup_backint_channels: 8, Data_backup_buffer_size: 8 x 512 MB</td>
</tr>
<tr>
<td>Database size</td>
<td>SAP HANA database size for a full data backup: 1.33 TB</td>
</tr>
</tbody>
</table>

Table 6. Data Domain 6300 configuration details

<table>
<thead>
<tr>
<th>DD6300 system</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Domain operating system</td>
<td>6.0.2.9-579709</td>
</tr>
<tr>
<td>emodbappagent for SAP HANA</td>
<td>4.5.1.0-1</td>
</tr>
<tr>
<td>Network</td>
<td>2 x 10 GB connections - dynamic interface group</td>
</tr>
</tbody>
</table>
Ready Solution for SAP HANA Scale-out test configuration

The following tables show the testing configuration for the scale-out appliance.

Table 7. Scale-out appliance testing configuration

<table>
<thead>
<tr>
<th>R940 server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
</tr>
<tr>
<td>4 x 28-core Intel Xeon Platinum 8180 M CPU, 2.50 GHz</td>
</tr>
<tr>
<td>Total: 224 CPU cores (hyper-core enabled)</td>
</tr>
<tr>
<td>Memory</td>
</tr>
<tr>
<td>1.5 TB RAM</td>
</tr>
<tr>
<td>24 x 64 GB DDR-4 2666 MHz synchronous LRDIMM</td>
</tr>
<tr>
<td>Network</td>
</tr>
<tr>
<td>2 x 10 GB NICs (Intel X710 Quad Port 10 Gb DA/SFP + Ethernet)</td>
</tr>
<tr>
<td>Disk sizing</td>
</tr>
<tr>
<td>Compellent SC5020 in a SAN FC16 fabric</td>
</tr>
<tr>
<td>Operating system</td>
</tr>
<tr>
<td>SLES 12 SP2</td>
</tr>
</tbody>
</table>

Table 6. SAP HANA configuration details

<table>
<thead>
<tr>
<th>SAP HANA configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP HANA database</td>
</tr>
<tr>
<td>SAP HANA database server: 1.00.122.13.1507793622</td>
</tr>
<tr>
<td>Backup settings</td>
</tr>
<tr>
<td>Parallel_data_backup_backint_channels: 8 per SAP HANA node</td>
</tr>
<tr>
<td>Data_backup_buffer_size: 8 x 512 MB per SAP HANA node</td>
</tr>
<tr>
<td>Database size</td>
</tr>
<tr>
<td>SAP HANA database size for a full data backup: 2.77 TB</td>
</tr>
</tbody>
</table>

Table 8. Data Domain 6300 configuration details

<table>
<thead>
<tr>
<th>DD6300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system</td>
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<td>Network</td>
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<td>4 x 10 G connections - dynamic interface group</td>
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References

Dell EMC documentation

The following documentation on Dell EMC.com or Dell EMC Online Support provides additional and relevant information. Access to these documents depends on your login credentials. If you do not have access to a document, contact your Dell EMC representative.

- Data Domain Invulnerability Architecture: Enhancing Data Integrity and Recoverability
- Dell EMC Data Domain SISL Scaling Architecture
- The Business Value of Data Domain Boost
- Dell EMC Data Domain Boost and Dynamic Interface Groups
- Dell EMC Data Domain Deduplication Storage Systems Spec Sheet