Abstract
This white paper explains the improved hardware assisted compression in Dell EMC PowerProtect DD series appliances DD6900, DD9400, and DD9900 with DDOS 7.2.

June 2020
Revisions

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>June 2020</td>
<td>Initial release</td>
</tr>
</tbody>
</table>

Acknowledgements

This paper was produced by the following:

Author: Vinod Kumar Kumaresan
Table of Contents

Revisions ................................................................................................................................. 2
Acknowledgements .................................................................................................................. 2
Executive Summary ................................................................................................................ 4
Audience .................................................................................................................................. 4
Technology Overview ............................................................................................................. 4
Benefits ................................................................................................................................... 5
Compatibility .......................................................................................................................... 7
Dell EMC PowerProtect DD Hardware .................................................................................... 8
Configuration .......................................................................................................................... 8
DDOS Installation, Upgrade and Licenses ............................................................................... 8
Conclusion ............................................................................................................................... 9
References ............................................................................................................................... 9
Executive Summary

Dell EMC PowerProtect DD series appliances reduce the amount of data stored by the process of deduplication and compression. Prior generation appliances compressed data using the default lz algorithm. Other types of compression algorithms such as gzfast and gz were also available. These algorithms offered higher compression at the cost of higher CPU load thereby providing a trade-off between performance and space utilization.

The DD9900, DD9400 and DD9000 are equipped with hardware assisted compression that allows for higher compression using gzfast as the default algorithm without trading off on performance.

Audience

This technical white paper is intended for Dell EMC customers, partners and employees who would like to understand the improved hardware assisted compression available with Dell EMC PowerProtect DD series appliances.

Technology Overview

PowerProtect DD series appliances use hardware assisted technology that delivers higher compression at higher performance than previous generation appliances. This new technology results in increases in logical capacity stored by up to 30% and reduces customers backup and restore windows.

PowerProtect DD6900, DD9400, and DD9900 appliances are equipped with a hardware accelerator card that is used for compression. This allows the DDOS to offload compression and decompression processes to the hardware accelerator and free up CPU resources to improve appliance performance. The gzfast compression algorithm is the default local compression method used on all DD6900, DD9400, and DD9900 appliances. No additional configuration is required. This algorithm yields higher compression compared to the previous generation of Data Domain which by default uses the lz algorithm. To obtain this benefit, no additional configuration is required.
Benefits

- Up to 30% more logical capacity compared to previous Data Domain appliances
  - Previous DD appliances use lz as the default local compression algorithms
  - DD6900/DD9400/DD9900 use gzfast by default – delivering up to 30% better compression ratio than lz when compared to the previous generation of Data Domain
- Performance improvement
  - 5% ~ 25% performance improvement depending on workload – restore, NFS/CIFS/VTL ingest
  - No performance regression for other workloads -- pure DDBOost ingest, GC, and replication workload
- Product usage
  - Enabled by default on all PowerProtect DD series appliances-DD6900/DD9400/DD9900
- PowerProtect DD: Faster Networking Options
  - Up to 10x the throughput of the previous generation
  - Allows more backup streams to be aggregated with fewer network connections
Improved Compression with PowerProtect DD

Dell EMC telemetry data shows that customers with Data Domain appliances that move to PowerProtect DD with hardware assisted compression using gzip will experience higher compression ratios compared to the previous generations of Data Domain that utilized the lz compression method. The data shows that local compression ratio will on average improve by 23% for non-database workloads and 15-16% for MS SQL and Oracle workloads. These figures assume workloads are not already pre-compressed or encrypted.

### Workload Improvement

<table>
<thead>
<tr>
<th>Workload</th>
<th>Average Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-database (Filesystem, email, etc)</td>
<td>23%</td>
</tr>
<tr>
<td>MS SQL</td>
<td>15%</td>
</tr>
<tr>
<td>Oracle</td>
<td>16%</td>
</tr>
</tbody>
</table>

**Note:** The improvement values mentioned in the above table are the average improvement noticed in customer workloads and may be revised in future as we aggregate more data. Note that the MS SQL and Oracle traditionally have seen higher compression ratios with lz, hence the relative benefit of gzip over lz is not as high for these workloads. Actual results may vary.
Compatibility

DDBoostr

✓ DDBoostr clients can continue to operate without any changes or performance impact with both PowerProtect DD and previous generation DD appliances

✓ DDBoostr clients are transparent to the compression process within the PowerProtect DD appliances. However, will benefit from the performance improvements during backup and restore

Replication

✓ Replication between previous generation DD appliances and PowerProtect DD appliances continue to be supported

✓ There is no performance impact due to different compression algorithms used to DD appliances without hardware assisted compression when replicating to or from PowerProtect DD appliances

Cloud Tier

✓ PowerProtect DD appliances use same default compression (gzfast) for the long-term retention data in the cloud

Controller upgrade to DD6900/DD9400/DD9900 appliances

✓ All new data ingested is stored using the new default compression (gzfast) by leveraging the hardware assisted compression

✓ All data previously ingested and stored using the previous default compression (lz) will be uncompressed using CPU during restore

✓ All data previously compressed by lz will be converted to gzfast during the regularly scheduled cleaning cycle as part of the space reclamation process. The conversion of all the data compressed in lz will require multiple regular cleaning cycles before it is fully converted. Note that aggressive scheduling of cleaning cycles will not expedite the conversion as reclamation may not occur

✓ All data tiered using the previous default compression will remain in that format until space is reclaimed in the cloud. No conversion will occur for the data in the cloud
Dell EMC PowerProtect DD Hardware

**Configuration**

No manual configuration procedures required

<table>
<thead>
<tr>
<th>Appliance</th>
<th>Hardware Assist Card Slot Number</th>
<th>PCIe LnkSta</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD6900</td>
<td>4</td>
<td>LnkSta: Speed 8GT/s, Width x16</td>
</tr>
<tr>
<td>DD9400</td>
<td>4</td>
<td>LnkSta: Speed 8GT/s, Width x16</td>
</tr>
<tr>
<td>DD9900</td>
<td>2 &amp; 7</td>
<td>LnkSta: Speed 8GT/s, Width x16</td>
</tr>
</tbody>
</table>

**DDOS Installation, Upgrade and Licenses**

**DD6900/DD9400/DD9900**

- No license required
- By default, installed/enabled for all newer PowerProtect DD appliances (DD6900/DD9400/DD9900)

**Previous appliances with new version DDOS 7.2**

- No hardware assist device available/supported
- No impact to DDOS upgrade process
- DDOS automatically detect platform model number
Conclusion

In Summary, PowerProtect DD series appliances DD6900/DD9400/DD9900 with DDOS 7.2 provide improved compression (gzfast) by default with higher performance by offloading compression workloads from CPU to hardware accelerators.

References

Dell EMC PowerProtect DD Series Appliances:

Dell EMC PowerProtect DDOS 7.2
Release Notes:
https://dl.dell.com/content/docu98358_DD_OS,_PowerProtect_DDMC,_and_PowerProtect_DDVE_7.2.0.5_Release_Notes.pdf?language=en_US&source=Coveo

Administration Guide:
https://dl.dell.com/content/docu98500_DD_Virtual_Edition_5.0_with_DD_OS_7.2.0.5_on_Premise_Installation_and_Administration_Guide.pdf?language=en_US&source=Coveo