Executive Summary

Backup applications are a critical component of backup, recovery and disaster preparedness strategies. But as data continues to grow unabatedly, traditional approaches no longer deliver the efficient data protection and disaster recovery (DR) organizations need.

This paper presents a better alternative: using EMC Data Domain systems with Data Domain Boost (DD Boost) technology together with NetVault® Backup. Used together, these two solutions deliver an efficient, high-performance and robust solution for backing up and recovering data in virtual and physical environments.
In this paper, we will show how you can use these tools to effectively manage data growth through deduplication. Specifically, we will:

- Review the capabilities of the EMC Data Domain deduplication storage system
- See how Data Domain Boost further enhances Data Domain systems
- See how NetVault Backup can be used with Data Domain Boost

**EMC Data Domain**

The EMC Data Domain deduplication storage system offers an attractive alternative to traditional backup approaches. Data Domain systems are easy to integrate with existing backup software, and they allow organizations to enjoy the retention and recovery benefits of inline deduplication as well as the offsite disaster recovery protection of replication over a wide area network (WAN).

**Aggressive inline data deduplication for 10—30x data reduction**

The Data Domain operating system (DD OS) offers aggressive inline data deduplication for backup and recovery of data, averaging 10—30x data reduction. As data is written to an EMC Data Domain deduplication storage system, it is quickly scanned for patterns that have been stored before. Large patterns across the history of all data stored are identified in the Data Domain file system, regardless of application or workload. The DD OS stores each unique data sequence only once, saving significant physical storage capacity by substituting small references for each identical redundant sequence. Local compression scans the unique data sequence for small strings across a local small window of comparison, like a tape drive. The combination of both deduplication and compression provides the resulting optimized data reduction.

**Extended local and offsite retention**

DD OS supports petabytes of storage for a typical enterprise dataset and backup policy. For organizations that need to retain backups for long periods of time to meet compliance and regulatory requirements, multiple months of retention on disk is now possible using the same number of “floor tiles” that would normally provide only a couple days of disk staging. Snapshot technology further enables extended local and offsite retention on disk.

Once a backup is performed to a Data Domain system running DD OS, it is easy and cost-effective to use the system for local retention and to limit the use of tape, providing offsite and archive support. DD OS protects the data with network-efficient and encrypted replication, which provides remote office data protection and enables multi-site tape consolidation.

**Replicating changes only reduces bandwidth use up to 99 percent**

Data Domain systems replicate only the deduplicated and compressed unique changes across any IP network, resulting in up to 99 percent bandwidth reduction. A Data Domain system facilitates a copy of the entire retained dataset, online and disaster-protected. If multiple systems replicate to the same destination, the destination will only store each segment uniquely across all inbound replication streams, further minimizing bandwidth and storage. If confidentiality is required, deduplicated and compressed data can be encrypted in-flight when being replicated between Data Domain systems, independent of the replication topology used.

**Data Domain Boost (DD Boost)**

**Increases throughput and reduces data transferred over the network**

Without DD Boost, the backup server will send all data, unique or redundant, to a Data Domain system for deduplication processing. With DD Boost, parts of the deduplication process are distributed to the backup server or application clients, enabling it to send only unique data segments to a Data Domain system. This dramatically increases the aggregate throughput, up to 31.0 TB/hour, and reduces the amount of data transferred.

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**Used together**

EMC Data Domain systems with Data Domain Boost (DD Boost) technology and NetVault Backup deliver an efficient, high-performance and robust solution for backing up and recovering data in virtual and physical environments.
over the network by 80 to 99 percent. These efficiencies can help eliminate future costs by leveraging existing backup servers and Ethernet networks.

Faster restart and completion of failed backups
DD Boost also increases the speed of restart and completion of failed backups. Since only unique data is sent over the network, once a failed job restarts, the data that has already been sent to the Data Domain system for a given backup job does not need to be sent again. This not only reduces the load on the network substantially, but also improves the overall throughput for the failed backups upon retry.

Key benefits
Overall, DD Boost increases aggregate throughput, substantially reduces backup windows, and improves backup server and application client efficiency. The following are the key benefits of DD Boost:

- **Seamless integration with NetVault Backup**—DD Boost integrates seamlessly with NetVault Backup because the distributed segment processing is handled by the DD Boost Library on the NetVault Client or NetVault Backup Server. Simple configuration and management is available from within the NetVault console.
- **Scalability**—Deduplication is distributed across the NetVault Client and NetVault Backup Server for enhanced scalability.
- **Significant reduction in backup time:**
  - Up to 31.0 TB/hr aggregate throughput performance
  - Distributed deduplication process, which dramatically increases throughput
  - Reduced network bandwidth utilization
  - Faster restarts of failed backup jobs
- **Advanced load balancing and link failover:**
  - Scalable link aggregation at the application layer
  - Simplified backup application configuration
  - Seamless load balancing of jobs among available ports
  - Link failover to keep backups operational

**NetVault Backup**

**Flexible and scalable protection for both physical and virtual environments**
With NetVault® Backup, organizations can safeguard their data and applications in both physical and virtual environments from one intuitive console. With this scalable solution, you can protect a huge number of servers containing petabytes of data.

NetVault Backup supports a wide range of operating systems, messaging and database applications, and networked storage devices; NetVault plug-ins enable you to select the best backup method to protect each system or application. The solution also supports a variety of target storage systems, and allows you decide when and where to encrypt, so you can reduce backup windows while still meeting regulatory requirements. And with NetVault SmartClients, you have the freedom to attach storage devices locally to any protected server within the NetVault domain.

The following are the key components of NetVault Backup:

**NetVault Backup Server**
The NetVault Backup Server is the main component of the NetVault solution. It provides a variety of backup management functionality, including job management, media management, device management, client management, reporting, notifications, and logging functions. The NetVault Backup Server maintains a history of backups in the NetVault database, so you can quickly identify one or more objects you want to restore. Target disk storage and physical or virtual tape libraries can be attached directly to the NetVault Backup Server.

**NetVault Console**
The NetVault Console enables remote administration of a NetVault Backup Server from any Windows or Linux workstation on your network. It provides access to the NetVault Backup Server on
your local machine, and allows you to perform NetVault operations in the same way you would while accessing the NetVault Backup Server locally.

**NetVault Clients**

NetVault Clients are the machines that will be protected by NetVault Backup. The NetVault Client software is installed on each machine designated as a NetVault Client. There are two types of NetVault Clients:

- NetVault Heterogeneous Clients are used to protect any server, such as file servers, database servers, email servers, application servers or web servers, which may be running on Windows, Linux, Solaris, Mac OS X, HP-UX, AIX or FreeBSD, and typically administered by the IT department. The NetVault Heterogeneous Client includes the plug-ins for file system, consolidation, data copy, databases and raw devices. The NetVault Heterogeneous Client can be installed on employees’ desktop and laptop computers.
- NetVault SmartClients give users the freedom to attach storage wherever they like. Both virtual and physical tape libraries can be easily distributed throughout the backup environment. Backup data no longer needs to pass over the network and through a NetVault Backup Server in order to be written to a target storage device.

**NetVault plug-ins**

NetVault offers a range of plug-ins, including the following:

- **NetVault plug-ins for database servers and mail servers**—These plug-ins allow you to ensure continuous availability of business-critical applications such as Oracle, SQL Server, Exchange, SharePoint, DB2, MySQL, PostgreSQL, Lotus Notes/Domino, Informix, SAP, and Sybase—without requiring your team members to be experts. The NetVault plug-ins complement native options offered by these applications without time-consuming integration efforts, so you can protect your investments.
- **Virtualization plug-ins**—NetVault Backup also offers protection for VMware and Hyper-V environments. Easy to deploy and use, the NetVault plug-ins for virtualization reduce complexity by enabling consistent, reliable point-and-click backup and restore activities without requiring your team to be experts.
- **NetVault Plug-in for NDMP**—This plug-in protects NAS devices by sending data via the Network Data Management Protocol (NDMP), which is designed to efficiently transfer large blocks of data directly to a locally attached SCSI device, a SAN-attached storage device or a storage device elsewhere on the network. The plug-in offers advanced NDMP features such as Browsable Volume and Direct Access Restore (DAR) support, which increases restore speeds with fast positioning to the right section of the tape.

**Target storage devices**

NetVault Backup supports a wide range of targets for storing backups, including different types of disk-based devices, virtual tape libraries (VTLs) and shared virtual tape libraries (SVTLs), as well as third-party deduplication appliances, virtual and physical tape libraries, autoloaders and tape drives.

Physical backup devices can be configured for single or shared use, and can be connected through SCSI, iSCSI, IP, SAS or Fibre Channel SAN interfaces. These devices can be connected to the NetVault Backup Server, any NetVault SmartClient or any NAS filer within a NetVault domain.

**Joint Solution: NetVault Backup and EMC Data Domain with DD Boost**

Easy, seamless integration EMC Data Domain systems integrate with NetVault Backup via EMC Data Domain Boost. With the joint solution, you’ll benefit from NetVault Backup’s simplicity and cross-platform support and Data Domain systems’ scale and performance.

**Licensing**

Data Domain Boost is licensed separately by EMC, and you must obtain the license required to enable DD Boost on the Data Domain system from EMC. The DD Boost license allows you to back
The NetVault Backup Server maintains a history of backups in the NetVault database, so you can quickly identify one or more objects you want to restore.

Figure 1. NetVault Backup integrates with DD Boost for efficient backups that target your Data Domain appliance.
Encryption
Although NetVault Backups offers native encryption, this option is unavailable with a Data Domain Boost repository as it will result in reduced performance. Therefore, users who need the security are advised to turn on the encryption feature provided by the Data Domain appliance.

Best practices
Best practices for the joint solution include the following:
• Make sure that you are running NetVault Backup with DD Boost over at least a 1 GB/s link.
• Use the Data Domain Sizing Tool to size the Data Domain component of the solution.
• Ensure the firmware and software in the Data Domain Backup System are fully up to date.
• Remember that the backup is to deduplicated disk, not to general-purpose disk, so configure time for the Data Domain housekeeping process to run every day.
• Understand the settings that can be tuned for best performance and test the configuration in a non-production environment before implementation.

Conclusion
Together, EMC Data Domain systems with Data Domain Boost technology and NetVault Backup deliver an efficient, high-performance and robust solution for backup and recovery of physical and virtual environments. The joint solution integrates seamlessly and is easy to set up and manage.

For More Information
For Data Domain documentation, see https://my.datadomain.com/documentation.

For NetVault Backup documentation, visit http://www.quest.com/netvault-backup/#docs

Appendix 1: Test Results
Methodology
The tests described in this section show the benefits that Data Domain Boost can provide; of course, results can vary depending on the data and type of backups in the environment. The test was performed using full backups to DD Boost repositories on the same Data Domain device, with datasets added to or deleted from source servers between each backup to simulate a certain amount of data change.

Setup
The test setup was as follows:
NetVault Backup configuration
• NetVault Backup 9.0
• NetVault Backup Server configuration:
  • Operating system: One of the following:
    ◦ Windows 2008 R2 64-bit, standard NTFS file system
    ◦ SLES 10 32-bit (hybrid), standard ext3 file system
  • CPU: Dual-core 1.8 GHz
  • RAM: 8 GB
• LAN: Gigabit Ethernet
• Transport: Managed file replication
• Data Domain configuration
• Appliance: Data Domain DD860 appliance
• OS Version: 5.1, 5.2
• NetVault Client environment
• Operating system: One of the following:
  ◦ Windows 2003 x86 32/64 bit
  ◦ Windows 2008 x86 32/64 bit
  ◦ Windows 2008 R2 64 bit
  ◦ RHEL 4.5 x86 32/64 bit
  ◦ SLES 10.11 x86 32/64 bit
  ◦ Solaris 9.10 (SPARC) 32/64 bit
  ◦ AIX 5.3, 6.1 32/64 bit (Power PC)
  ◦ HPUX 11.23, 11.31 32/64 bit (PA-RISC)
• Disk size:
  ◦ 250 GB 7200 SATA disk running OS
  ◦ 2 TB 7200 SATA disk with stored data

Selected results
Result 1
• NetVault Backup on Windows 2008 R2 64-bit, standard NTFS file system
• Data Domain DD860 appliance
### Selected results

**Result 1**
- NetVault Backup on Windows 2008 R2 64-bit, standard NTFS file system
- Data Domain DD860 appliance

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Backup Duration</th>
<th>Average Backup Rate (KB/sec)</th>
<th>Backup Size (MBytes)</th>
<th>Backup Item Count</th>
<th>Restore Duration</th>
<th>Average Restore Rate (KB/sec)</th>
<th>Restore Size (MBytes)</th>
<th>Restore Item Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC Small</td>
<td>1 minute 37 seconds</td>
<td>32748</td>
<td>2438.842</td>
<td>2 directories 10 files</td>
<td>1 minute 37 seconds</td>
<td>2441.421</td>
<td>directory 10 files</td>
<td></td>
</tr>
<tr>
<td>EMC Medium</td>
<td>52 minutes 33 seconds</td>
<td>31732</td>
<td>97656.28</td>
<td>2 directories 10 files</td>
<td>26 minutes 23 seconds</td>
<td>62368</td>
<td>97656.26</td>
<td>1 directory 10 files</td>
</tr>
<tr>
<td>EMC Large</td>
<td>10 hours 36 minutes 84 seconds</td>
<td>119140</td>
<td>317355.94</td>
<td>3 directories 10 files</td>
<td>6 hours 20 minutes 24 seconds</td>
<td>117857.01</td>
<td>3 directories 10 files</td>
<td></td>
</tr>
</tbody>
</table>

**Result 2**
- NetVault Backup on SLES 10 32-bit (hybrid), standard ext3 file system
- Data Domain DD860 appliance

**Result 3**
- With and without DSP (distributed segment processing) enabled
- NetVault Windows 2008 R2 64-bit, standard NTFS file system
- Data Domain DD860 appliance

### Summary of results
In our lab tests, using NetVault Backup with DD Boost reduced job runtime by 50% or more, on average.
For More Information

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