HP StoreOnce Product Line

The HP StoreOnce product line was first announced in early 2007, providing both disk-to disk and VTL backup. In June 2010, the line was updated to include HP StoreOnce deduplication technology. In November 2011 HP introduced the B6200 StoreOnce Backup system for the enterprise data center with high-availability. In June 2012 HP added StoreOnce Catalyst with improved performance, application integration and distributed deduplication. HP StoreOnce Backup systems are positioned for entry level, midrange, and enterprise disk backup markets supporting a number of interfaces and protocols.

Highlights

- Enterprise, Midrange, and Entry level disk backup target
  - Enterprise: B6200 system, from 2 – 8 HA nodes
  - Midrange: 4106, 4112, 4312 and 4324
  - Entry-level 2502 and 2504 systems
- Each StoreOnce system provides consolidated, disk based data protection
  - Dual power and cooling
  - RAID 5 (i.e. 2502 and 2504) or RAID 6 support
  - StoreOnce 4000 products may be upgraded
- Data deduplication, using StoreOnce inline deduplication
- High Capacity
  - With 20 : 1 dedupe, up to 10 PB logical capacity on B6200
- Multiple Logical Interfaces
  - Block VTL, over FC
  - NAS, both NFS and CIFS
  - HP StoreOnce Catalyst and Symantec OST interface
- Data Replication
  - Many to one replication to support centralized backup
  - Site-to-site replication for DR capability
  - Multi-hop replication and multi-path replication
  - Provides dedupe aware replication, enables low bandwidth replication
- Integrated Management
  - Management Web GUI for configuration
  - Additional multi-system management with HP Replication manager
  - Compatible with HP SIM – System Insight Manager
  - Remote office / Branch office (ROBO) and HP Integrated Lights-Out 2 (iLO2) remote management
- Multiple Support options
  - 24 x 7 remote monitoring
  - 1 year warranty, 24x7 next business day response
  - Service uplifts available
Overview

The HP StoreOnce Backup systems, including the StoreOnce2500, StoreOnce4000 and new B6200 StoreOnce Backup system are designed using a modular approach leveraging HP’s extensive server and storage hardware and software portfolio. All HP StoreOnce Backup systems utilize an HP ProLiant server chassis, combined with dedicated hardware RAID offload and a customized disk backup software environment dedicated to providing integrated, disk-to-disk and VTL features. HP StoreOnce Backup was originally known as the HP StoreOnce line.

Evaluator Group Comments: Evaluator Group performed extensive testing of the HP StoreOnce B6200 in a lab validation. Testing focused on scale-up performance, performance utilizing offloading through StoreOnce Catalyst, and the B6200’s HA capabilities. See the results on pages 3 and 4 in table 1.

Provided below in Figures 1, are pictures of the StoreOnce Backup series products.

Figure 1: (Counter Clockwise from top left) HP StoreOnce 4312, 4106i, 2500, and B6200
### Detailed Model Description:

<table>
<thead>
<tr>
<th>Model</th>
<th>B6200</th>
<th>StoreOnce 4000</th>
<th>StoreOnce 2500</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Host Interface protocols</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NAS: File: CIFS / NFS</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>SAN: Block: FC</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SAN: Block: iSCSI</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>VTL</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>OST</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Simultaneous OST/NAS/VTL protocols</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

| **Storage Appliances** |       |                |                |
| Nodes (Ctlr) / common repository | 8     | 1              | 1              |
| Raw capacity range (TB)  | 48 - 768 | 6TB - 96TB     | 2 - 4          |
| Useable capacity range (TB) | 32 - 512 | 4 TB - 72 TB    | 1.5TB-3TB      |
| HA Failover           | Yes   | No             | No             |
| Disk Types           | NL SAS| SATA           | SATA           |
| RAID levels          | 6     | 6              | 5              |
| Internal disk connectivity | SAS  | 2 x 6 Gb SAS   | 2 x 6Gb SAS    |

| **Host Interfaces / node** |       |                |                |
| FC              | 16 x 8 Gb FC | 2 x 8 Gb FC   | 0              |
| Ethernet        | 16 X 10 + 16x1 | 2 x 10 Gb    | 2 x 1Gb        |
| Optional Expansion | N/A       | N/A           | N/A            |

| **Dedupe Details** |       |                |                |
| External or Integrated Dedupe | Integrated | Integrated | Integrated |
| When Dedupe       | Inline | Inline        | Inline        |
| Global Dedupe     | Within a couplet | No       | No           |
| Dedupe Algorithm  | SHA-1 hash | SHA-1 hash | SHA-1 hash |
| Byte compare (resolve hash dupe) | No | No | No |
| Fixed or Variable Chunk | Variable | Variable | Variable |
| Smallest Chunk Size or range | 4K | 4K | 4K |
## VTL Features (per node / all nodes)

<table>
<thead>
<tr>
<th>Feature</th>
<th>All Nodes</th>
<th>Nodes</th>
<th>Virtual Libraries</th>
<th>Virtual Drives</th>
<th>Virtual Tapes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Virtual Libraries</td>
<td>24 / 384</td>
<td>50</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Virtual Drives</td>
<td>192 / 1,536</td>
<td>1024</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Virtual Tapes</td>
<td>786 K / 6.3 M</td>
<td>51,200</td>
<td>384</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Attach Tape Port</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export to Tape</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Replication

<table>
<thead>
<tr>
<th>Feature</th>
<th>Target</th>
<th>Target</th>
<th>by Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licensing (by source or target)</td>
<td>VTL</td>
<td>VTL</td>
<td>by target</td>
</tr>
<tr>
<td>Control Granularity</td>
<td>VTL / Share/Catalyst Store</td>
<td>VTL / Share</td>
<td>VTL / Share</td>
</tr>
<tr>
<td>Restart from Checkpoints</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Replication Port</td>
<td>IP</td>
<td>IP</td>
<td>IP</td>
</tr>
<tr>
<td>Many to 1</td>
<td>384</td>
<td>50</td>
<td>4 - 8</td>
</tr>
<tr>
<td>Multi Hop / Cascade</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Throttling / Scheduling</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

## Encryption

<table>
<thead>
<tr>
<th>Feature</th>
<th>No</th>
<th>No</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replication (inflight encryption)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>At Rest (on media)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Crypto Shred</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

## Performance (TB / hr)

<table>
<thead>
<tr>
<th>Feature</th>
<th>5TB/node</th>
<th>Not specified</th>
<th>0.45</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTL max ingest / node with dedupe</td>
<td>4.0</td>
<td>Not specified</td>
<td>0.45</td>
</tr>
<tr>
<td>NAS max ingest / node with dedupe</td>
<td>2.4</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>OST max ingest / node with dedupe</td>
<td>100.0</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Max VTL ingest with dedupe all nodes</td>
<td>40.0</td>
<td>4.0</td>
<td>0.45</td>
</tr>
<tr>
<td>Max total distributed dedupe (all nodes) with StoreOnce Catalyst</td>
<td>100.0</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Max Streams</td>
<td>384</td>
<td>64</td>
<td>24</td>
</tr>
<tr>
<td>Max Dedupe in 24 hours (TB)</td>
<td>2,400.0</td>
<td>96.0</td>
<td>10.8</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Max Egress (deduped restore)</th>
<th>40 TB/hour</th>
<th>At least 80% of ingest performance</th>
<th>Not specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Install Wizards</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Task Based Wizards</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Remote Lights Out Mgmt. (ILO)</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Type of GUI</td>
<td>Web based</td>
<td>Web based</td>
<td>Web based</td>
</tr>
<tr>
<td>CLI</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Logging</td>
<td>Yes</td>
<td>Limited</td>
<td>Limited</td>
</tr>
<tr>
<td>Usage Reports</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Trend Reports</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 1: HP StoreOnce Family Features
Product Architecture

The HP StoreOnce Backup systems leverage HP’s ProLiant server hardware, hardware RAID controller technology and JBOD disk enclosures. These hardware components are then combined with a custom storage application stack developed specifically for the secondary storage market.

The software stack runs on an embedded Linux kernel, consisting of RAID management and storage pooling, along with multiple host protocols including VTL, NAS and StoreOnce Catalyst. The StoreOnce in-line deduplication technology developed by HP Labs is now in its third major release.

Evaluator Group Comment: HP has chosen to leverage their server management software capabilities, which adds significant value to the resulting product. HP’s “converged infrastructure” is enabled by converged hardware and software elements managed by common software applications.

The VTL, CIFS, NFS and StoreOnce inline deduplication have been shipping for over three years along with the integrated management features. Most recently the HP IBRIX cluster filesystem has been leveraged to enable a federated cluster of nodes with high-availability capabilities. HP’s IBRIX software, along with StoreOnce deduplication and HP hardware are integrated to enable high-availability (HA) across multiple platforms. Additionally, the StoreOnce Catalyst API has been enhanced to support offloaded, distributed deduplication.

Evaluator Group Comment: The B6200 StoreOnce Backup has several significant enhancements over HP’s previous D2D lineup. The scale-out capabilities of the new B6200 combined with high-availability and the common StoreOnce federated deduplication are all significant enhancements to HP’s line of StoreOnce systems. HP is the only vendor offering a high-availability deduplication system supporting HA for both VTL and NAS protocols. The B6200 has established a new bar for enterprise backup availability and performance.

StoreOnce Hardware

The specific hardware utilized is model dependent. The series 4000 systems utilize an HP SAS RAID card to offload RAID functions from the primary system. The B6200 StoreOnce Backup systems leverage HP P2000 arrays via SAS connectivity. Host connectivity is provided through standard PCI-E cards for FC and IP connectivity. In general, data deduplication is a very resource intensive operation and high performance requires significant CPU, memory, and I/O capabilities.

Data deduplication requires extensive CPU and memory capabilities along with moderate disk I/O capabilities. CPU, memory and disk configurations are model dependent. The HP ProLiant servers all utilize the latest generation Intel Nehalem processors.

Evaluator Group Comment: The system resources used in the StoreOnce line should not be seen as an either a feature, or a limiter. Most competing disk-to-disk backup targets using in-line deduplication require significant CPU, memory and I/O capabilities as well.
A design point for HP’s StoreOnce Backup systems is an architecture that is bounded by CPU and memory, rather than one that is I/O bound. This is significant because CPU and memory capabilities have been increasing significantly faster than disk I/O rates since the inception of computing. Thus, HP’s design has been able to increase performance at the same pace as CPU enhancements, rather than the much slower pace of disk drive performance. Additionally, HP has continued to improve their StoreOnce deduplication algorithm and enable distributed deduplication that has led to additional performance gains.

RAID Control

The B6200 Backup systems use a flexible RAID 6 configuration, supporting various configurations of drives and utilizing backend P2000 arrays.

All HP StoreOnce series 4000 systems utilize RAID 6 in a 9 + 2 + 1 configuration (9 data drives, 2 parity and 1 hot spare). The configuration of the RAID groups is not configurable and capacity must be purchased in increments of a full drive tray. The HP StoreOnce 2000 systems utilize RAID 5 and do not include a hot spare in the configuration.

Features include:

- Automated capacity pooling
- Dynamic capacity expansion
- Dynamic volume expansion

Evaluator Group Comments: The use of RAID 6 is an important aspect to both reduce administrative actions and increase availability and reliability. In particular, with the use of large 1 TB disk drives, the use of RAID 6 is important to mitigate data loss from dual drive failure within a RAID set.

Overall, the limitation of control over RAID levels, configurations, striping and other factors should be considered an advantage in most aspects. It significantly reduces the complexity and the chances for a configuration problem to either effect availability or performance. The instances where a knowledgeable storage administrator can add value through configuration are limited on a single purpose appliance with a relatively small number of disk drives. Thus, HP’s design choice is a good approach for this product type.

Disk Spares

The HP StoreOnce 4000 series systems have a hot standby available at all times for a spare. There is no user configurable option for allocation of a hot spare, the system configures and uses the spare automatically. Spare disk drives are allocated only from within the chassis where a drive failure occurs.

The HP StoreOnce B6200 series do not include a hot spare, all data is configured in a 4 + 2 RAID 6 configuration, with up to 96 drives per couplet (384 drives in 64 RAID groups for a fully configured 4 couplet B6200 system).
LUN Management
There is no direct management of volumes or LUNs as with traditional arrays. Since the StoreOnce Backup system is designed as an appliance, pools, volumes, striping and other traditional storage management features are hidden from users and automated.

Both VTL and NAS interfaces are automatically stripped across multiple internal volumes for maximum performance.

Load Balancing
Load balancing is not available from a host on either a NAS share or a VTL device within the StoreOnce appliance. However, path failover for both IP and FC based protocols is possible on the host and network that connect to the StoreOnce Backup system.

Cluster
The HP B6200 StoreOnce series provide clustering, scaling from a single 2-node HA couplet up to an 8 node federated cluster.
RAS Features

Reliability, availability, and serviceability

The RAS characteristics of the StoreOnce line include both hardware redundancy combined with hardware RAID features and software RAS features.

HP StoreOnce Backup systems maintain data integrity and provide data availability via the following mechanisms:

- RAID 5 or RAID 6 protection of disk devices
- Hot standby drive (only with the 4000 series systems)
- Automated drive rebuilds
- Redundancy of active components (power and cooling)
- Firmware upgrades

Deduplication RAS

Reliability of deduplicated data is maintained via two mechanisms. The first is that SHA-1 hashing is performed which stores 160 bits of information for each block. In addition, HP utilizes a second CRC check that provides data integrity and hash collision enhancement.

The mathematical probability of SHA-1 collision provides less than 1 incorrectly identified duplicate block out of $1 \times 2^{-160}$. A Petabyte of storage contains $10^{15}$ bytes of data and an Exabyte ($10^{18}$ bytes). If data is stored as 4 Kbyte blocks, there are on the order of $10^{14}$ blocks stored. Using the SHA-1 hash function, the probability of a collision for $10^{14}$ blocks is less than $10^{-20}$. This level of protection is over 1,000 times better than enterprise tape (typically $10^{-17}$), and over 100,000 times better than enterprise disk drives.

Evaluator Group Comments: HP's level of protection utilizes the industries best protection. By utilizing SHA-1, along with an additional hash, a system would need to store approximately 50 EB (Exabyte’s) of data using a 4K chunk size in order to have the same risk of data loss as a single LTO tape drive ($1 \times 10^{-27}$).
Connectivity Options

HP’s StoreOnce Backup systems provide physical Ethernet connectivity on all models. In addition, HP StoreOnce 4000 and B6200 series systems provide FC connectivity.

Operating System Support

The StoreOnce Backup systems support multiple operating systems. The current list of supported OSs is listed in Table 2.

<table>
<thead>
<tr>
<th>Supported OS Environments</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ HP-UX 11i v2 and 11i v3</td>
</tr>
<tr>
<td>▪ Microsoft Windows Server, 2003 and 2008</td>
</tr>
<tr>
<td>▪ Red Hat Enterprise Linux, versions 4 and 5</td>
</tr>
<tr>
<td>▪ Novell SuSE Enterprise Linux, versions 9, 10 and 11</td>
</tr>
<tr>
<td>▪ Sun Solaris 9 and 10 (SPARC and x86)</td>
</tr>
<tr>
<td>▪ VMware ESX</td>
</tr>
</tbody>
</table>

Table 2: HP StoreOnce OS Support

FC VTL

The HP StoreOnce 4000 series products support FC VTL connectivity. Specifically the StoreOnce Backup system provides FC Tape connections, which are the same connection used for physical tape drives. The FC tape specification uses fibre channel connectivity but utilizes tape volumes rather than raw data blocks. Physical host connectivity is provided through PCI-E card-based FC connections. Specific ports and speeds are model dependent.

HP StoreOnce 2000 series does not support FC connections and thus do not support FC VTL.

An important note: In order to provide multi-pathing, FC switches and hosts must support the fibre channel N port ID virtualization (or NPIV).

iSCSI VTL

All of HP’s StoreOnce Backup systems, except for the B6200, support iSCSI VTL connectivity. Specifically the StoreOnce system provides SCSI Tape connections over the iSCSI protocol using the same high level SCSI protocol as used with FC tape drives. The primary difference is that the iSCSI VTL connection utilizes IP to transport the SCSI Tape protocols. Like FC, the iSCSI VTL interface utilizes tape volumes rather than raw data blocks. Physical host connectivity is provided through either on board 1 Gb Ethernet ports or PCI-E card-based connections. Specific ports and speeds are model dependent.

The iSCSI multiple connection session protocol is not supported currently.

HP StoreOnce systems support the following iSCSI connection options:
- iSNS (iSCSI Name Service)
- CHAP authentication
- Access control lists
- Data Digest
- Header Digest

**NFS**

The new generation of HP StoreOnce 2000 and 4000 series products support NFS connectivity. Administrators configure an NFS export for use by backup systems to mount. Authentication and permissions are set on a system to system basis, as typical with other NFS implementations. NFS is a commonly used with UNIX and Linux based systems and provides a file based protocol interface to the StoreOnce system.

Physical connectivity is through the included 1 Gb Ethernet connections or PCI-E card-based 10 Gb Ethernet connections on the StoreOnce4324. Ethernet-based NIC teaming and port bonding are available to increase throughput and network availability.

HP supports jumbo frames up to 9000 bytes and both in-order and out-of-order NFS packets.

**CIFS**

All of the new generations of HP StoreOnce systems support CIFS connectivity. Permission controls are available on a per share basis based upon user credentials. Permissions include the following options:

- Utilize MS Active Directory for user permissions and authentication
- Utilize local user lists

Physical connectivity is through the included 1 Gb Ethernet connections or PCI-E card-based 10 Gb Ethernet connections on the StoreOnce StoreOnce43124. Ethernet based NIC teaming and port bonding are available, to increase throughput and network availability.

**OST**

The HP StoreOnce OST plug-in provides integration with Symantec backup applications. This provides the ability for Symantec OST enabled products to interact with HP StoreOnce systems as intelligent storage devices. When combined with StoreOnce replication, OST allows an HP StoreOnce system to notify Symantec applications about the existence of replicated copies of data.

**HP Catalyst**

The HP StoreOnce Catalyst interface is an API developed by HP. This provides a common architecture and connection method for other API interfaces such as Symantec OST. HP utilizes StoreOnce Catalyst as a connection option for HP Data Protector v7 and later. Catalyst also serves as an API interface for Symantec OST.
Data Deduplication

HP StoreOnce deduplication software is designed to be deployed across an IT infrastructure for both primary and secondary data. The majority of data deduplication products today are used either with backup software or as a disk-based target for backup data. After evaluating the market, HP has initially released StoreOnce as a disk based backup target that can be used with both NAS and VTL interfaces.

Within the StoreOnce appliance, StoreOnce uses HP Labs-developed sparse index algorithms to maximize performance while minimizing management and hardware overhead. HP StoreOnce deduplication software uses an in-line method of identifying and removing duplicate data.

StoreOnce uses a SHA-1 hash algorithm on approximately 4 KB variable-length blocks. By using a subset of key values stored in memory, StoreOnce determines a small number of sequences already stored on disk that are similar to any given input sequence. Each input sequence is only deduplicated against data in a particular sequence.

This approach is referred to as “Sparse Indexing” by HP, and serves to minimize disk IO for both backup and restoration operations at the expense of storing some redundant information. StoreOnce minimizes data fragmentation by maintaining data locally within an index set. This significantly improves recovery speed, with a slight decrease in the overall deduplication efficiency.

Additionally, HP’s StoreOnce Replication software option leverages StoreOnce deduplication to replicate only changed data in to the remote system.

Global Deduplication

Global deduplication is available using the same terminology employed by several of HP’s competitors. While data is not deduplicated across multiple nodes for scale out data deduplication, data is globally deduplicated when replicated from multiple remote systems to one central StoreOnce system in many-to-one deployments. The primary site system will store only the globally unique data once providing global deduplication in this scenario.

Evaluator Group Comments: The design of StoreOnce is a critical aspect to the current and future enterprise wide deduplication capabilities it enables. While the current HP StoreOnce system is able to compete head to head with other leading backup targets, the ability to scale StoreOnce to other locations provides a strong foundation to efficiently store and manage deduplicated data across an enterprise.

Offloaded - Distributed Deduplication

HP refers to their offloaded and distributed deduplication as “Catalyst low bandwidth”. This method utilizes the HP StoreOnce Catalyst API to enable additional backup servers to perform deduplication. Currently the HP StoreOnce Catalyst API works with both Symantec OST and HP Data Protector.

Using the StoreOnce Catalyst API, HP’s StoreOnce Backup systems are able to support offloading and distributing the data deduplication function. This has the benefit of increasing the number of
deduplication engines, and offloads the network by sending a significantly reduced amount of data as shown below in Figure 2.

**Evaluator Group Comments:** The new HP Catalyst API offers significant benefits for users. Similar in concept to EMC Data Domain’s Boost and Quantum’s Accent, HP Catalyst enables media / backup servers to operate as distributed deduplication engines. HP is currently the only vendor that supports distributed deduplication with different backup applications. By supporting both Symantec OST and HP Data Protector interfaces, HP StoreOnce is able to support distributed offloaded deduplication with several backup applications, including Symantec NetBackup, HP Data Protector v7 and others in the later part of 2012.

By deduplicating data prior to sending over the network, a common network bottleneck between the media servers and the backup disk appliance is eliminated. StoreOnce Catalyst low-bandwidth option.
Finally, the StoreOnce deduplication capabilities may also operate on the source system, or backup client. This enables the same deduplication engine to operate on the source-side client, the backup media server or the at the StoreOnce Backup target, all using the StoreOnce deduplication engine.

System Management

Management of the HP StoreOnce system is provided through the web based GUI. Additional management products are available including iLO (Integrated Lights Out management) and replication management through Replication Manager. Additionally, integration with HP Systems Insight Manager (SIM) is provided to monitor errors and alerts of critical hardware components of HP StoreOnce systems.

The StoreOnce System Manager provides administration from any point on the network via the Web GUI. The System Manager is designed to manage a single device with multiple device management and reporting available in a limited fashion using Replication Manager.

The seven primary tabs provided by element manager include the following:

- **Home** – Displays high level asset information and status summary
- **VTL** – Configurations and settings for both FC and iSCSI VTL devices
- **NAS** – Configurations and settings for both NFS and CIFS NAS devices
- **Configuration** – displays historical statistical information
- **Status** – Displays capacity, deduplication and other status metrics
- Replication – Configuration options for replication between systems
- Administration – Displays historical statistical information

The System Manager GUI is included with all HP StoreOnce systems at no additional charge.

**Evaluator Group Comments:** The design of StoreOnce System Manager GUI provides an easy-to-use administrative interface into the HP StoreOnce systems. Unlike some competing alternatives, all configuration options are accessible through the GUI.

**Replication Manager (included with Replication license)**

HP’s Replication Manager serves two roles. It is the primary means used to manage on-going replication between two or more StoreOnce systems. First, it allows customers with a large number of remote StoreOnce sites to centrally manage the replication of these sites to a centralized target site. Supporting as many as 384 remote sites, Replication Manager provides real-time and trend-based analysis on capacity utilization and dedupe ratio per site and helps administrators quickly flag problem sites. Additionally, Replication Manager provides multi-system alerting and reporting of errors.

**SMI-S**

Currently HP’s StoreOnce system manager does not provide integration through the Storage Management Industry Standard (SMI-S). However, the StoreOnce GUI manager does support SNMP traps for integration with enterprise management frameworks including HP SIM, HP OpenView and others.

**Evaluator Group Comments:** The lack of support for SMI-S is becoming less critical. Currently no other disk-based backup vendor supports SMI-S, thus this should not be a concern.

**CLI**

The entry and midrange HP StoreOnce Backup systems do not provide a command line interface (CLI), with configuration and monitoring performed through the GUI. The B6200 StoreOnce Backup system provides both a CLI and GUI functions.

**Other Management**

iLO, HP’s Integrated Lights Out management, provides remote hardware and initial configuration of systems. This uses a vKVM, or virtual Keyboard, Video and Mouse capability. The view is similar to that provided if an administrator were sitting at the local console. The iLO interface is independent of the system and system management. Thus, iLO is useful for initial configuration or in cases where software or hardware errors prevent normal administrative actions through the system manager interface.

HP SIM, or Systems Insight Manager, provides consolidated monitoring and alert reporting for HP server systems. HP SIM supports alerting and reporting of critical hardware components in the HP StoreOnce system including power, fans, CPU, memory and major I/O interfaces.
Remote Replication (optional feature)

Remote replication is an optional feature. Replication is licensed on the target system only. A replication license includes the Replication Manager web GUI to configure and manage multiple systems. Data replicated between StoreOnce systems is deduplicated prior to being sent to the remote system.

Replication is supported from multiple source StoreOnce systems. The number of simultaneous replication streams available is model dependent as follows:

- StoreOnce B6200 target supports up to 384 source StoreOnce appliances
- StoreOnce 4312/4324 target supports up to 50 source StoreOnce appliances
- StoreOnce 4112 target supports up to 24 source StoreOnce appliances
- StoreOnce 4106i and StoreOnce 4106fc targets support up to 24 source StoreOnce appliances
- StoreOnce 2504i target supports up to 8 source StoreOnce appliances
- StoreOnce 2502i target supports up to 4 source StoreOnce appliances

_Evaluator Group Comment: HP’s design for remote replication replicates only deduplicated data and supports many-to-one replication scenarios which fits well with distributed and ROBO environments._

_One significant feature that is easily overlooked is the licensing model HP uses. Unlike many competing systems, HP licenses replication only on the target system. This not only reduces licensing costs but also significantly enhances the ease of deployment, particularly in remote office environments._

Local Data Copies

As a secondary copy of data, HP’s StoreOnce systems do not provide snapshots, clones, mirrors, or point-in-time copies of data as a feature of the system.

Multi-Path I/O

Multi-Path I/O is supported via the native FC SCSI drivers and HBAs on the host systems. The following platforms have qualified their multi-pathing drivers with the HP StoreOnce series:

- Red Hat Enterprise Linux
- SuSE Enterprise Linux Server
- VMware ESX Server
- Microsoft Windows Server

Thin Provisioning

Thin provisioning is not explicitly provided. However, capacity for tape cartridges within a VTL is not allocated until needed. Thus, capacity is not reserved or consumed for VTL tape cartridges and in this regard, HP’s StoreOnce systems do provide thin provisioning.
Performance

There are no standardized tests currently available to compare disk-to-disk backup on VTL appliances.

Evaluator Group has conducted extensive testing of the HP StoreOnce product line. Specifically, the following quantitative results were measured:

- Performance of each interface (NFS, CIFS, iSCSI VTL, FC VTL)
- Performance of interfaces with single and multiple jobs or streams
- Performance of interfaces with various levels of duplicate data
- Performance of the StoreOnce system in comparison with published specifications
- Performance of the HP StoreOnce system in comparison to a competing system

For detailed information, please refer to the Evaluator Group Lab report of the HP B6200¹.

Evaluator Group Comments: Currently, the HP B6200 system has the highest performance of any system tested by Evaluator Group, and has the highest performance of any StoreOnce in-line deduplication systems (with the exception of 35 node or larger configurations of NEC HydraStor). The HP B6200 has a nearly 3X performance advantage over EMC Data Domain’s highest performing system (see Lab Validation of HP B6200 for detailed performance comparison).

Combined with the competitive pricing, HP StoreOnce backup systems also provide a significant price / performance advantage over the leading competing system in its class.

These results are significant and indicate the HP StoreOnce product line is one of the best performing, systems available. Combined with ease of use, high availability features and its significant cost to advantage, the HP StoreOnce system is clearly one of the top products in the StoreOnce market today.

¹ Evaluator Group Lab Validation of HP B6200 – Performed May 2012
## Announcement History

<table>
<thead>
<tr>
<th>Date</th>
<th>Product/Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>June, 2012</td>
<td>StoreOnce Catalyst API – distributed dedupe with OST and HP DP</td>
</tr>
<tr>
<td>November, 2011</td>
<td>HP B6200 – scale-out enterprise deduplication appliance</td>
</tr>
<tr>
<td>June, 2010</td>
<td>StoreOnce deduplication added, along with NFS and additional scalability and OST and Replication Manager</td>
</tr>
<tr>
<td>October, 2009</td>
<td>CIFS added to StoreOnce product line</td>
</tr>
<tr>
<td>February, 2009</td>
<td>Remote replication added (previously known as LBR)</td>
</tr>
<tr>
<td>June, 2008</td>
<td>New StoreOnce 2500 and StoreOnce 4000 models announced, FC VTL added</td>
</tr>
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</table>

Table 3: HP StoreOnce Major Announcement History
Evaluator Group Comments

The HP StoreOnce product line was previously a highly competitive product line in the midrange and entry-level StoreOnce market. With the addition of the new B6200 product, HP’s portfolio provides industry-leading performance, features, and cost. HP is the only vendor supporting the same deduplication code within the client, the backup server, and the backup target, which was the concept behind “StoreOnce” when HP announced StoreOnce in 2010.

As with many technologies, data deduplication has been deployed as multiple point solutions throughout enterprises. However, data deduplication is a critical infrastructure technology that is best leveraged when data deduplication is compatible across enterprise deployments. The next phase of deduplication deployments will require interoperable data deduplication that can be deployed in both scale out and scale up configurations. Currently HP’s StoreOnce deduplication stack is the only product from a major system or storage vendor designed to be deployed in multiple locations and in both scale up and scale out deployments.

A common deduplication infrastructure is critical to efficiency and performance in enterprise data centers. Point solutions will require deduped data to be expanded (aka re-hydrated) before it is moved and sent to another point deduplication solution where a different, incompatible deduplication mechanism will again deduplicate the data. The architecture commonality of HP’s StoreOnce means these deployments can extend across the WAN and in ROBO environments without requiring data to be rehydrated and then deduplicated multiple times.

Perceived Strengths:

The HP StoreOnce product line is highly scalable which provides for more flexibility within a model than many competing systems. Rather than having to upgrade an entire system to add capacity, most models offer significant capacity expansion in comparison to competing vendor solutions.

The new scale-out / scale-up capabilities of the B6200 is a significant addition to HP’s StoreOnce backup product line. By establishing a 3X performance advantage over the industries leading competitor, HP’s federated deduplication architecture

New strengths include the enterprise capabilities of the StoreOnce B6200 Backup system. The high-availability features are industry leading, as are the federated scale out features. High availability is a critical feature for large, enterprise backup systems despite claims from competitors that these features are unnecessary.

Finally, performance is critical for a backup system for a variety of reasons; one of the most important being the fixed backup window available for data protection. For this reason, any disk-to-disk backup system must be able to meet the performance metrics required. HP StoreOnce systems not only exceeded the claimed performance in testing, but significantly outperformed systems that claimed to be competing according to published specifications.

Overall, the combination of excellent ease of use; high performance and reliability; and innovative StoreOnce deduplication delivers a system that is easily one of the best in its class.
Potential Concerns:

There are only a few areas of concern noted with HP’s StoreOnce systems.

Previously Evaluator Group listed the lack of a large HA system as a weakness for HP’s StoreOnce line. This has been completely addressed by the B6200 system and now represents a significant strength for HP.

A minor issue is the limited ability to graphically show the active state of the system or directly monitor backup jobs running against the StoreOnce system. While tools are available to measure the momentary performance of the system, these are indirect measurements and do not provide the immediate feedback an administrator may be looking for when troubleshooting.

Finally, the management tools differ somewhat between the entry/midrange products and the new enterprise B6200. Consolidation of the interface would be beneficial for customers managing multiple systems across their enterprise. The addition of a CLI to the midrange and entry level StoreOnce Backup line could also be beneficial for users.

Other than these minor concerns, the HP StoreOnce system is clearly a well polished, industry leading disk-to-disk backup system that should receive serious consideration for a wide variety of backup scenarios.

More detailed information is available at http://evaluatoregroup.com

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