HP 3PAR storage solutions
Agenda

• HP 3PAR StoreServ 3PAR architecture
• 3PAR StoreServ Flash optimizations
• 2015 news
  – Recovery Manager Central
  – 3PAR File Persona
3PAR introduction and architecture
Data layout comparison

Traditional Array

- The performance of a single LUN is limited by the number of disks of the RAID Group it belongs to
- A lot of pre-planning is necessary – RAD groups/pools have to be configured in advance
- Capacity is wasted due to multiple capacity silos

3PAR

- Each LUN can achieve the performance of all disks in the disk group. Priorities can be controlled with Priority Optimization feature
- No pre planning – dynamically adjust RAID layout
- No wasted capacity
Service Levels with 3PAR Priority optimization

Limit max performance with thresholds
At an application or tenant level

Features
Min/Max threshold for front-end IOPS and Bandwidth
LUN priorities
Latency goals
Configurable thresholds by:
  • Volume Set (proxy for application)
  • Virtual domain
  • Hierarchical with over-provisioning in each hierarchy

Enforcement in real-time: Seconds or Sub-seconds
Ability for nesting rules

Benefit
Service level certainty and predictability for app/tenants
Autonomic workload balancing across controllers and disks

<table>
<thead>
<tr>
<th>Traditional Controllers</th>
<th>Mesh-Active Controllers</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Each volume is active on only one controller – really “Active-Passive”</td>
<td>– Each volume is active on all controllers – true “Active-Active”</td>
</tr>
<tr>
<td>– Volume is restricted to drives behind a single controller</td>
<td>– Volume is evenly spread across all resources</td>
</tr>
<tr>
<td>– Manual planning and load balancing for each controller</td>
<td>• drives</td>
</tr>
<tr>
<td>– Cache not necessarily shared</td>
<td>• controllers</td>
</tr>
<tr>
<td></td>
<td>• cache</td>
</tr>
<tr>
<td></td>
<td>• IO</td>
</tr>
<tr>
<td></td>
<td>– Autonomically provisioned</td>
</tr>
<tr>
<td></td>
<td>– Cache Coherent</td>
</tr>
</tbody>
</table>
**HP 3PAR Storeserv 7000 - Enterprise storage at midrange price point**

The only true active-active **multicontroller** design in midrange space.

**Traditional Modular Storage**
- Cost-efficient but scalability and resiliency limited by dual-controller design.

**Traditional Monolithic Storage**
- Scalable and resilient but costly. Does not meet multi-tenant requirements efficiently.

**Legend**
- Host Connectivity
- Data Cache
- Disk Connectivity
- Passive Backplane

Cost-effective, scalable and resilient architecture. Meets cloud-computing requirements for efficiency, multi-tenancy and autonomic management.
Industry unique hardware-based RAID calculation and Thin Technologies

- Fast RAID 10, 50 & 60
- Rapid RAID Rebuild
- Integrated XOR Engine
- Thin Built in Zero Detect
- Data deduplication
- Tightly-Coupled Cluster
  - High Bandwidth, Low Latency Interconnect
3PAR Flash optimizations
# HDD vs Flash

HDD vs SSD characteristics, and the architectural implications of their differences

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Spinning media/HDDs</th>
<th>Flash media/SSDs</th>
<th>Architectural implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical latencies</td>
<td>In milliseconds</td>
<td>In tens of microseconds</td>
<td>Read/Write cache management</td>
</tr>
<tr>
<td>IOPS density (IOPS/GB)</td>
<td>0.2 IOPS/GB (e.g., 180 IOPS with 900 GB 10K drive)</td>
<td>100 IOPS/GB (e.g., -40,000 IOPS in 400 GB)</td>
<td>Performance scalability</td>
</tr>
<tr>
<td>$/GB</td>
<td>$0.8–$1/GB</td>
<td>5-10X HDDs (raw $/GB)</td>
<td>Storage efficiency</td>
</tr>
<tr>
<td>Media write cycle</td>
<td>Virtually unlimited hundreds of millions)</td>
<td>5,000 to 15,000 write cycles</td>
<td>Wear handling</td>
</tr>
<tr>
<td>Failure modes</td>
<td>Mechanical/Electronic</td>
<td>Electronic/Flash</td>
<td>Failure handling and reconstruction</td>
</tr>
</tbody>
</table>
What is necessary to successfully implement flash

**Very high performance storage architecture.**
Multiple (>=2) controllers, preferably with additional hardware acceleration. High performance data storage media is worthless if there is no enough controller power to send the transactions to servers at the performance rate of media itself.

HP 3PAR offers multiple (2-8) controllers, each with dedicated HW accelerator (ASIC)

**Technology that acknowledges and solves Flash endurance issue.**
A technology that does not rely on traditional RAID group / pool concepts that leaves some storage pools/media underutilized and the other media overutilized, but a technology that uses all media equally. HP 3PAR is optimized for equal media utilization

**A technology that efficiently stores the data,** reducing/amortizing the impact of higher cost of Flash media comparing to traditional media.
HP 3PAR controller based ASIC provides Thin Provisioning and Thin Deduplication to optimize capacity consumption
HP 3PAR Thin Deduplication

Efficiency and Innovation on HP 3PAR StoreServ 7450 – HW offloaded deduplication

1. hash signatures generated inline by the ASIC

2. bit-to-bit compare on match offloaded to ASIC

3. only unique data is written to SSD
# HP 3PAR StoreServ Storage

The only storage architecture you’ll ever need

<table>
<thead>
<tr>
<th></th>
<th>7200c</th>
<th>7400c</th>
<th>7440c</th>
<th>7450c</th>
<th>10400 (aka P10000 V400)</th>
<th>10800 (aka P10000 V800)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller nodes</td>
<td>2</td>
<td>2–4</td>
<td>2–4</td>
<td>2–4</td>
<td>2–4</td>
<td>2–8</td>
</tr>
<tr>
<td>8Gb Fibre Channel Host Ports</td>
<td>4–12</td>
<td>4–24</td>
<td>4–24</td>
<td>4–24</td>
<td>0–96</td>
<td>0–192</td>
</tr>
<tr>
<td>16Gb Fibre Channel Host Ports</td>
<td>0–4</td>
<td>0–8</td>
<td>0–8</td>
<td>0–8</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>10Gb iSCSI/FCoE Ports</td>
<td>0–4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0–8</td>
<td>0–16</td>
</tr>
<tr>
<td>Built-in IP Remote Copy Ports</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2–4</td>
<td>2–8</td>
</tr>
<tr>
<td>Total Cache</td>
<td>40</td>
<td>48-96</td>
<td>96-192</td>
<td>96-192</td>
<td>96–384</td>
<td>192–786</td>
</tr>
<tr>
<td>Max Drives (SSD, 15k, 10k, 7.2k)</td>
<td>8–240</td>
<td>8–576</td>
<td>8–960</td>
<td>8–240 SSD only</td>
<td>16 - 960</td>
<td>16 - 1920</td>
</tr>
<tr>
<td>Max RAW capacity</td>
<td>500 TB</td>
<td>1600 TB</td>
<td>2000 TB</td>
<td>460.8 TB</td>
<td>1600 TB</td>
<td>3200 TB</td>
</tr>
</tbody>
</table>

Same firmware, same features, same flash optimizations
3PAR Hybrid storage optimizations

Adaptive Flash Cache
- Leverages portion of SSD capacity as Read Cache extension
- Does not require dedicated SSD disks
- Can be simulated

Adaptive Optimization
- subLUN level tiering
- Can use up to 3 tiers
- You can schedule data movements and performance monitoring periods
- Can be simulated
3PAR news 2015

StoreOnce integration with 3PAR – Recovery Manager Central
HP StoreOnce Recovery Manager Central 1.0

End-to-end availability and protection for VMware environments

More agility
Easy snapshot management, backup and recovery from within VMware vCenter

More performance
Rapid online recovery of VMs and datastores with consistent, non-disruptive, time/space efficient snapshots

More efficiency
Reduce cost and complexity with Express Protect direct from 3PAR to StoreOnce

Less risk
Ensure reliable and cost effective retention and recovery of deduplicated backups with StoreOnce
Recovery Manager Central concepts & components

Recovery Manager Central Appliance is the data mover and runs in a VM. A Catalyst client 'moves' the snapshot data to the StoreOnce Systems which deduplicated the data.

VCenter Administrator

VCenter server

VMware ESXi

Host Server Hardware

FC

HB

NIC

REST (calls RMC functions to mount Snapshots on RMC appliance)

Catalyst API – data movement

Block level SCSI commands

CoFC protocol

FC SAN

Management IF

iSCSI (optional)

Fibre Channel

Virtual volumes

Snapshots

StoreServ Disk Array

StoreOnce Backup System

RMC GUI

IP NIC
Efficient Data Protection

Reduces TCO compared to traditional backup processes

Features:

Full or Incremental/Synthetic full Backups:
With Incremental / Synthetic, only deltas between current and previous snapshots are moved during backup. RMC creates Synthetic full backups without additional overhead.

Backups are deduplicated to save space

Benefits:

Provides efficient alternative to costly/complex ISV backup infrastructure
Increase storage efficiency with cost effective backup retention

![Diagram showing full and delta backups over a week with deduplication and RMC]
3PAR news 2015

File Persona
HP 3PAR File Persona Software Suite

What is it?

A licensed feature of the 3PAR OS
Includes:
A rich set of file protocols
An Object Access API (REST)
File data services
File Persona use cases

Take the *File Services Use Case Fundamentals* training course for more details

**Home Directory Consolidation**

- A home directory contains a user’s:
  - Folders and files
  - Application configuration data
- Consolidation allows home directories of multiple users to be stored on one network-accessible file share
- Can be configured to enabled data access even when disconnected from the network

**Group and Corporate Share**

- **Group/department share** supports shared access to a network location for all members of an authentication group
  - Files could be read/writeable by all, or could be read-only for some and read/write for others
  - e.g., \Server\Finance’ share
- Collaboration is coordinated through file locking to prevent contention
- **Corporate share** is an organization-wide share typically used as a read-only repository for reference information or as an application software distribution point

**Custom Cloud Applications**

- **Cloud-connected** devices such as mobile scanners and equipment sensors upload data through stateless REST protocol
- Data may move through **public** or **private cloud**
- Software applications are able to directly access data through **converged protocol**
Thank you