



# Designing and Implementing HPE Cloud Solutions using 3PAR HL034S (00299816)

<b>HPE course number</b>	HL034S
<b>Course length</b>	4 days
<b>Delivery mode</b>	ILT
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This is an ILT/vILT course designed to teach the correct skill requirements for Storage Pre-sales focused individuals that have the right knowledge to support the sales representatives at the customer site and prepare a complete and supported 3PAR solution for a customer.

## Exam

HPO-J49 Designing and Implementing HPE Cloud Solutions using HPE 3PAR

## Audience

Technical consultants who support sales representatives in the Sales cycle and have the ability to document a HPE product-based solution, based on listening and understanding what the customers' business needs are.

Technical consultants who do not need in-depth knowledge around installation, startup and troubleshooting but do need technical HPE 3PAR Storage System product and solutions understanding to design and plan an effective storage solution that will solve customer business needs. Technical consultants, who can sell a fully functional HPE 3PAR Storage System solution.

## Certifications and related examinations

HPE ASE—StorageWorks Integration (2011)  
HPE ASE—StorageWorks Integration (2011)-Upgrade from ASE—HPE StorageWorks (2008)

## Prerequisites

- Storage Technologies
- Server Technologies
- SAN Fundamentals
- HPE Storage full-line Technical WBT
- A working knowledge of path failover capabilities and the HPE failover options

## Course objectives

- Identify the HPE 3PAR Storage System solution business challenges and strategy of HPE
- Describe the business opportunity of the HPE 3PAR Storage System solution within the utility/cloud storage market segment
- Describe the HPE 3PAR Storage System solutions and the competitive advantages for utility computing
- Present the HPE 3PAR Storage System technology

- Architect an HPE 3PAR Storage System solution for customers understanding the customer's business needs and translating them into an HPE solution speaking the customer's language
- Display a basic understanding of the HPE tools used during the HPE 3PAR Storage System solution design phase
- Demonstrate an understanding of the InServ Hardware Architecture
- Demonstrate an understanding of the InForm OS functionality
- Demonstrate an understanding of the HPE 3PAR Thin Technology
- Demonstrate an understanding of the HPE 3PAR Virtual Copy software
- Demonstrate an understanding of the Dynamic and Adaptive Optimization feature
- Demonstrate an understanding of the HPE 3PAR Virtual Domains
- Demonstrate an understanding of the HPE 3PAR Scheduler and the Virtual Lock by using CLI
- Display an understanding of the HPE 3PAR Remote Copy feature
- Demonstrate an understanding of the performance aspects of a HPE 3PAR Storage System solution
- Demonstrate an understanding of the HPE 3PAR System Reporter
- Understand the HPE 3PAR VMware solution set
- Understand the Installation and Setup process

## **Policies**

Cancellation fees may apply. Contact your HPE Authorized Training Center or HPE Education Services for their respective policies.

## Detailed course outline

<b>Module 1: 3PAR Solution Overview</b>	<p>HPE: Leading storage innovations in high growth market segments</p> <ul style="list-style-type: none"> <li>• Service providers are growing fast and are powered by HPE</li> <li>• Enterprise customers are looking for utility storage</li> <li>• 3PAR</li> <li>• Providing competitive advantage for utility computing</li> <li>• SW architecture: rapid, tailored provisioning</li> <li>• 3PAR combines the best attributes of modular and monolithic storage arrays</li> <li>• Hardware based performance</li> </ul>	<ul style="list-style-type: none"> <li>• Mixed workload: ready for any application</li> <li>• Only what you need, when you need it</li> <li>• One operating environment spans mid to high</li> <li>• 3PAR InForm software</li> <li>• 3PAR resilience: build for multi-tenancy</li> <li>• Storage tiers: dynamic optimization</li> <li>• Application copies and DR</li> <li>• 3PAR direct manageability</li> <li>• Adaptive optimization: automatic tiering and savings</li> </ul>
<b>Module 2: Positioning 3PAR Solutions</b>	<p>Management costs are the key</p> <ul style="list-style-type: none"> <li>• Virtualization as a means of storage consolidation</li> <li>• Virtualization benefits</li> <li>• Virtualized storage pools</li> <li>• Disk array management comparison</li> <li>• HPE Storage online portfolio</li> <li>• Concept of the EVA</li> <li>• Comprehensive, granular load distribution</li> </ul>	<ul style="list-style-type: none"> <li>• Storage requirements for the “cloud”</li> <li>• HPE 3PAR “cloud storage in a box”</li> <li>• Efficiency</li> <li>• Start   get   stay thin with 3PAR</li> <li>• Autonomous</li> <li>• Multi-tenancy</li> <li>• 3PAR virtual domains</li> <li>• 3PAR key advantages</li> </ul>
<b>Module 3: Hardware Overview and Architecture</b>	<p>3PAR InServ hardware agenda</p> <ul style="list-style-type: none"> <li>• 3PAR InServ storage servers</li> <li>• 3PAR T-Series InServ components (1 of 2)</li> <li>• 3PAR F-Series InServ components (2 of 2)</li> <li>• 3PAR InSpire architecture: T-class controller node (1 of 2)</li> <li>• 3PAR InSpire architecture: T-Class controller node (2 of 2)</li> <li>• 3PAR InSpire architecture: F-Class controller node (1of 2)</li> <li>• 3PAR InSpire architecture: F-Class controller node (1 of 2)</li> <li>• Hardware architecture: Traditional tradeoffs</li> <li>• 3PAR hardware architecture: Scale without tradeoffs (1 of 2)</li> <li>• 3PAR hardware architecture: Scale without tradeoffs (2 of 2)</li> <li>• Evolution: bus to switch to full mesh progression</li> <li>• Connectivity: host to node/ASIC to drive</li> </ul>	<ul style="list-style-type: none"> <li>• Redundant power (T-series)</li> <li>• Redundant power (F-series)</li> <li>• 3PAR InSpire architecture: T-series drive chassis (DC4)</li> <li>• 3PAR InSpire architecture: F-Series drive chassis (DC3)</li> <li>• InSpire architecture: data flow</li> <li>• Local write</li> <li>• Remote write</li> <li>• Local read data in cache</li> <li>• Remote read</li> <li>• InServ numbering systems</li> <li>• Node numbering</li> <li>• Fibre channel and PCI slot numbering T Class</li> <li>• Fibre channel and PCI slot numbering F Class</li> </ul>
<b>Module 4: InForm OS</b>	<p>InSpire architectural differentiators</p> <ul style="list-style-type: none"> <li>• 3PAR InServ virtual volume</li> <li>• Every disk array is “virtualized” to some degree</li> <li>• First things first How to build a VV (Virtual Volume)</li> <li>• Physical disk: chunklets (256 MB)</li> <li>• What is a chunklet</li> <li>• 3PAR InServ data layout (1 of 8)</li> <li>• 3PAR InServ data layout (2 of 8)</li> <li>• 3PAR InServ data layout (3 of 8)</li> <li>• 3PAR InServ data layout (4 of 8)</li> <li>• 3PAR InServ data layout (5 of 8)</li> <li>• 3PAR InServ data layout (6 of 8)</li> <li>• 3PAR InServ data layout (7 of 8)</li> <li>• 3PAR InServ data layout (8 of 8)</li> <li>• Designing and Implementing HPE Cloud Solutions using 3PAR</li> </ul>	<p>3PAR wide striping completely and finely load balanced</p> <ul style="list-style-type: none"> <li>• Chunklet groups</li> <li>• Why are chunklets so important?</li> <li>• Several layers of virtualization to go from PD to VLUN</li> <li>• Common Provisioning Groups (CPG)</li> <li>• High Availability</li> <li>• 3PAR RAID levels</li> <li>• 3PAR RAID 10 concepts</li> <li>• 3PAR RAID 5 concepts (1 of 2)</li> <li>• 3PAR RAID 5 concepts (2 of 2)</li> <li>• 3PAR RAID Multi Parity (MP) concepts</li> <li>• Usage: meaning of “-ha cage” for RAID MP</li> <li>• Virtual Volume step size</li> <li>• 3PAR Host Definition</li> <li>• 3PAR Autonomic Groups eliminates repetitive error-prone tasks</li> </ul>

<b>Module 5: HPE 3PAR Thin Technologies</b>	<p>Overview</p> <ul style="list-style-type: none"> <li>• Common Provisioning Group (CPG)</li> <li>• Thin Provision Virtual Volumes (TPVV)</li> <li>• Get Thin</li> <li>• Thin conversion</li> <li>• Stay Thin</li> <li>• The challenge with writes that are soon deleted</li> <li>• HPE 3PAR Thin Persistence</li> <li>• Thin Persistence</li> <li>• Thin copy reclamation</li> <li>• Thin Persistence in Veritas storage foundation environments</li> </ul>	<ul style="list-style-type: none"> <li>• Thin reclamation for Veritas</li> <li>• Thin Persistence in Oracle environments</li> <li>• Thin Persistence in VMware environments</li> <li>• Thin Persistence and VMware</li> <li>• Increased performance and efficiency: Bulk zero (write_same)</li> <li>• Plug-in for VMware fast copy (xcopy)</li> <li>• Creating CPG and TPW</li> <li>• CLI example: creating a CPG</li> <li>• CLI examples: creating a TPVV</li> <li>• Removing a CPG</li> </ul>
<b>Module 6: HPE 3PAR Virtual Copy Software</b>	<p>HPE 3PAR virtual copy</p> <ul style="list-style-type: none"> <li>• Copy-on-write function (data written)</li> <li>• Virtual copy benefits</li> <li>• Designing and Implementing HPE Cloud Solutions using 3PAR</li> </ul>	<p>Virtual copy limits</p> <ul style="list-style-type: none"> <li>• Dual snapshot data space</li> <li>• Virtual copy relationships</li> <li>• Virtual copy promotion</li> <li>• Creating a virtual copy using CLI</li> <li>• Creating a virtual copy using GUI</li> <li>• InForm GUI view of virtual copies</li> </ul>
<b>Module 7: HPE 3PAR Dynamic Optimization</b>	<p>HPE 3PAR Dynamic Optimization</p> <ul style="list-style-type: none"> <li>• Data service level control</li> <li>• Potential uses)</li> <li>• Customer example</li> </ul>	<ul style="list-style-type: none"> <li>• Dynamic optimization using the CLI</li> <li>• Dynamic Optimization using the GUI</li> <li>• Performance tuning/migration results</li> </ul>
<b>Module 8: HPE 3PAR Virtual Domains</b>	<p>What are HPE 3PAR Virtual Domains?</p> <ul style="list-style-type: none"> <li>• Domain objects</li> <li>• Object and domain association rules</li> <li>• Domain types</li> <li>• Domain type example</li> <li>• Local user classes</li> <li>• Domain user classes</li> </ul>	<ul style="list-style-type: none"> <li>• Domain user privileges</li> <li>• Default and current domains</li> <li>• Creating a Virtual Domain</li> <li>• Creating a Domain Object</li> <li>• Managing domains</li> <li>• Removing a domain</li> </ul>
<b>Module 9: HPE 3PAR Scheduler and Virtual Lock with CLI</b>	<p>CLI online HELP</p> <ul style="list-style-type: none"> <li>• Overview</li> <li>• Scheduler commands</li> <li>• Designing and Implementing HPE Cloud Solutions using 3PAR</li> </ul> <p>Create a new task</p> <ul style="list-style-type: none"> <li>• Scheduler commands</li> <li>• System scheduler: Usage</li> </ul>	<ul style="list-style-type: none"> <li>• “Canceltask” command</li> <li>• Virtual lock</li> <li>• CLI commands</li> <li>• Virtual lock</li> <li>• Retention time rules</li> <li>• Retention time and IMC</li> <li>• Retention time rules: domains</li> </ul>
<b>Module 10: HPE 3PAR Remote Copy</b>	<p>Protect and share data affordably</p> <ul style="list-style-type: none"> <li>• Thin provisioning aware</li> <li>• Active/active links</li> <li>• Asynchronous periodic mode</li> <li>• Synchronous mode</li> <li>• Synchronous long distance mode</li> <li>• Synchronous LD requires 4+ nodes in the InServ array.</li> <li>• Failure scenario: controller</li> <li>• Failure scenario: link failure</li> </ul>	<ul style="list-style-type: none"> <li>• Failure scenario: primary site</li> <li>• Data integrity</li> <li>• Topology features</li> <li>• Many-to-one</li> <li>• One-to-many</li> <li>• Distances and latencies</li> <li>• HPE 3PAR replication adapter for VMware Site Recovery Manager</li> <li>• Common reasons customers choose RC</li> </ul>

<b>Module 11: HPE 3PAR System Reporter</b>	<p>System reporter is a historical reporting tool</p> <ul style="list-style-type: none"> <li>• SR and user interface components</li> <li>• System reporter requirements</li> <li>• System reporter report types</li> <li>• System reporter web interface</li> <li>• Quick reports</li> <li>• Scheduled Reports</li> <li>• Designing and Implementing HPE Cloud Solutions using 3PAR</li> </ul> <p>Custom reports</p> <ul style="list-style-type: none"> <li>• Generate report</li> <li>• Daily VLUN performance</li> <li>• Compare systems—VLUN</li> <li>• Hourly VLUN performance at time</li> <li>• VLUN performance—histogram</li> <li>• Hourly VV cache performance</li> </ul>	<ul style="list-style-type: none"> <li>• PD performance</li> <li>• Hourly PD performance at time</li> <li>• High-res port performance vs. time</li> <li>• High-res Id performance vs. time</li> <li>• High-res pd space usage vs. time</li> <li>• VLUNs by IOP and BW</li> <li>• VLUN service by time and IO size</li> <li>• VLUN queue length</li> <li>• Hourly port performance</li> <li>• High-res summary</li> <li>• PD service at time</li> <li>• System reporter database sizing</li> <li>• Configuring email alerts</li> <li>• Add Alert Rule</li> <li>• Available documentation</li> </ul>
<b>Module 12: HPE 3PAR Storage System Performance</b>	<p>Component performance</p> <ul style="list-style-type: none"> <li>• Why do R6 writes have a 6.66 overhead?</li> <li>• High level caching algorithm</li> <li>• Read-ahead algorithm</li> <li>• Published HPE 3PAR benchmark results</li> <li>• Benchmarks configuration</li> <li>• Benchmarks configuration—load generators</li> <li>• FC host port considerations</li> </ul>	<ul style="list-style-type: none"> <li>• Performance equations</li> <li>• Performance equations—RAID1</li> <li>• Performance equations—RAID5</li> <li>• Designing and Implementing HPE Cloud Solutions using 3PAR</li> <li>• Performance equations—RAID6</li> <li>• Cache memory performance</li> <li>• Stat commands that are useful</li> </ul>
<b>Module 13: HPE 3PAR T &amp; F-Class storage systems Green Zone Configuration</b>	<p>Why correct configuration is important</p> <ul style="list-style-type: none"> <li>• Simple building blocks</li> <li>• Models and capabilities</li> <li>• Performance considerations</li> <li>• F-Class node</li> <li>• Connectivity options: per F-Class node pair</li> <li>• F drive chassis (DC3 or SBOD)</li> <li>• P200 or F400 configuration rules (1 of 2)</li> <li>• F200 and F400 configuration rules (2 of 2)</li> <li>• F400 configuration rules</li> <li>• T-Class controller node</li> </ul>	<ul style="list-style-type: none"> <li>• T Node port example configuration</li> <li>• T-Class drive chassis</li> <li>• T400 configuration examples (2 of 3)</li> <li>• T400 configuration examples (3 of 3)</li> <li>• T800 fully configured</li> <li>• HPE 3PAR InForm software—product structure</li> <li>• 3PAR spindle-based software pricing</li> <li>• 3PAR customer configuration scenarios</li> <li>• Customer configuraton problems</li> <li>• Configuration example 2</li> <li>• Ala carte menu: T400</li> </ul>
<b>Module 14: HPE 3PAR/VMware Solutions</b>	<p>Utility storage complements VMware</p> <ul style="list-style-type: none"> <li>• HPE 3PAR utility storage for virtual server environments</li> <li>• Virtualization reality: Memory limitations make storage a precious VMware® ESX® resource</li> <li>• Virtualization issue #1</li> <li>• Virtualization issue #2</li> <li>• Solution to caching and configuring the storage array—wide striping</li> <li>• Virtualization issue #3</li> <li>• Solution to SAN recommendations—Thin Provisioning</li> <li>• Virtualization issue #4</li> <li>• Solution to difficulty in changing storage configurations online</li> <li>• Adaptive optimization: sub-volume tiering</li> <li>• Virtualization issue #5</li> <li>• Designing and Implementing HPE Cloud Solutions using 3PAR</li> <li>• HPE 3PAR integration with VMware adaptive queue depth algorithm</li> </ul>	<ul style="list-style-type: none"> <li>• Enhanced multipathing: pluggable storage architecture</li> <li>• HPE 3PAR management plug-in for VMware® vCenter™</li> <li>• Recovery Manager for VMware (RMV) 1.1</li> <li>• Virtual Copy: HPE 3PAR snapshots</li> <li>• HPE 3PAR supports VMware VAAI in VMware vSphere® 4.1</li> <li>• Hardware assisted locking: atomic test and set</li> <li>• Full copy offload: XCOPY</li> <li>• Block zero offload: write_same</li> <li>• VMware Site Recovery Manager</li> <li>• HPE 3PAR Replication Adapter for VMware SRM</li> <li>• Remote Copy: HPE 3PAR replication</li> <li>• Thin Technologies 2.0</li> <li>• HPE 3PAR Thin Persistence and VMware EZT</li> <li>• HPE 3PAR/VMware resources</li> <li>• Things that draw customer to HPE 3PAR</li> <li>• HPE 3PAR also supports</li> </ul>

## Course data sheet

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<b>Module 15: HPE 3PAR Qualifying an Opportunity</b>	<p>Ideal HPE 3PAR environments</p> <ul style="list-style-type: none"><li>• Qualifying a customer</li><li>• How big do I go</li><li>• It is important to consider the following points</li></ul>	<ul style="list-style-type: none"><li>• Determining capacity needs</li><li>• Determining IOP requirements</li><li>• Tools available to help determine IOPS</li><li>• Key utility storage differentiators</li></ul>
<b>Module 16: HPE 3PAR Storage System Installation and Setup</b>	<p>Steps to install and setup the HPE 3PAR Storage system</p> <ul style="list-style-type: none"><li>• Storage server components for InServ T400 and T800</li><li>• Numbering of drive chassis components (DC4)</li><li>• Pattern for loading initial drive magazines into the drive chassis (DC4)</li><li>• Storage server components for InServ F200 and F400</li><li>• Drive magazines are loaded in the following ordered pairs</li><li>• Storage server and service processor on the customer network</li><li>• IP communication (used ports)</li><li>• Connecting to a controller node</li><li>• Service Processor</li><li>• Connecting to Service Processor</li><li>• Designing and Implementing HPE Cloud Solutions using 3PAR</li></ul>	<ul style="list-style-type: none"><li>• SP to 3PAR central relationship in SP mode</li><li>• SP to 3PAR central relationship in Secure Network mode</li><li>• Service Processor Onsite Customer Care (SPOCC)</li><li>• SPMAINT and CPMAINT</li><li>• Using a secure shell protocol to access SPMAINT</li><li>• Setting up the storage server</li><li>• Setting up the Service Processor</li><li>• Configuring the SP with SP MODE</li><li>• Installing 3PAR InForm OS TPD files</li><li>• Describe power on/off procedures</li><li>• Battery backup unit</li><li>• Guided maintenance</li></ul>

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## Next steps

- SAN Infrastructure and Solutions Rev. 11.11 HH703 (00308530)
- Implementing HPE StorageWorks Enterprise Virtual Array Solutions v.9.21 HH705 (00110364)
- Implementing HPE StorageWorks Enterprise Virtual Array Solutions v.9.21 HH705 (00110364)

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