Purpose of the exam prep guide

The intent of this guide is to set expectations about the content and the context of the exam and to help candidates prepare for the exam. In this guide, you will find recommended HP training courses, reference and study material help you achieve a successful passing score.

Studies conducted by HP and Prometric show that a combination of course attendance and self-study maximizes the likelihood of passing the exam on the first attempt.

Audience

The Advanced Backup Troubleshooting and Tuning exam is for engineers who support nearline storage products.

Examples of job roles:
- HP ASE engineer
- HP Services field engineers, call center personnel, and other field personnel who provide installation and/or operational support assistance
- HP Channel Partners supporting HP nearline storage products (e.g., engineers who perform warranty and installation services)

General areas of content include:
- Storage Technologies and their Implications.
- HP Product and Solution Set.
- Solution validation.
- Implementation & Usage of Tools.
- Troubleshooting & Performance Tuning.

Certification requirements

The Advanced Backup Troubleshooting and Tuning (HP0-244) exam is one of the core requirements to be certified as an Accredited Systems Engineer for StorageWorks Nearline.
Prerequisites

- Accredited Integration Specialist - StorageWorks certification
- Basic knowledge of tape technologies and standalone tape drives, including magneto optical storage, entry-level tape automation products, and mid-range and Enterprise level tape libraries
- Basic knowledge of Library and Tape Tools (L&TT)
- SAN connectivity foundations

Exam details
At the beginning of the exam, you will be asked to answer several survey questions. The survey has been designed to assist the exam development team in accurately profiling test results and to improve future exams.

- **Number of items:** 64
- **Item types:** Multiple choice and drag-and-drop.
- **Passing Score:** 64% (raw score of 41)
- **Time commitment:** 90 minutes
- **Reference Material:** No on-line or hard copy reference material will be allowed at the testing site.

Comments on the exam
During the exam, participants can make specific comments about the items (i.e., accuracy, appropriateness to audience, etc). HP welcomes these comments as part of our continuous improvement process.

Exam Registration
This exam is available at [Prometric](https://www.prometric.com).

Exam content
The following testing objectives represent the specific areas of content covered in the exam. Use this outline to guide your study and to check your readiness for the exam. The exam measures your understanding of these areas.

**Advanced Backup Troubleshooting and Tuning (HP0-244) Exam Content**

1. **Storage Technologies and Implications**
   Given a storage requirement compare and contrast the various storage technologies that will meet customer needs.
   - Describe RAID levels - pros & cons
     - Explain the available RAID levels and their implications
• Explain how & when to use specific RAID levels
  □ Identify and describe fibre channel (FC) technology and networking technologies as applied to storage
    • Identify and describe FC port types
    • Identify and describe FC cable types
    • Identify and describe FC connector types
    • Identify and describe FC distance considerations
    • Explain FC addressing schemes
    • Explain when and how these schemes are used
    • Explain Public vs. Private Loop devices
    • Explain benefits vs. drawbacks of Loops & Fabrics
    • Explain how ALPA's work
    • Explain what WW IDs are and what types there are
    • Explain considerations needed when using fibre cabling (bend radius, signal loss, attenuation)
    • Explain causes of attenuation
    • Explain considerations and factors involved in FC interconnects (DWDM, FCIP, ATM, etc…)
    • Explain the LIP process
    • Explain RSCN and its impact to the Fabric
    • Explain types of Zoning (Hard, Soft)
    • Explain service considerations when changing HBAs
    • Explain Fibre Channel Fabric topologies - feature/benefits of each
  □ Describe/position infrastructure interoperability
    • Explain interoperability between vendor technologies (Brocade, McData, Cisco)
  □ Describe SCSI Technology
    • Identify and describe SCSI revisions (Ultra Wide, Ultra Wide 2, etc…)
    • Identify and describe connector types (68pin, 50pin, VHDCI, etc…)
    • Identify and describe cable length restrictions
    • Identify and describe # of devices supported per bus
    • Explain SCSI addressing & service considerations (i.e. when adding/removing devices, LUNs/targets)
    • Explain SCSI termination
• Explain differences between LVD & HVD & SE
• Explain various SCSI signaling methods & compatibility issues (i.e. mixing SE & LVD)
• Explain SCSI protocol (commands, signaling)
• Explain AWRE (SCSI automatic error detection and correction)

- Explain "new" storage technologies
  • Identify current "new" technologies
    - iSCSI
    - SATA/SAS
    - FCIP
  • Identify areas/uses for these technologies

- Describe tape storage technologies
  • List available tape drive technologies (LTO, DLT, SDLT, DAT, AIT, etc.)
  • Explain advantages & disadvantages of recording technologies
    - Helical Scan recording
    - Linear recording
  • Explain how & when to use certain type of tape drives
  • Explain features of tape drive technologies, e.g.
    - SDLT: POS, tape path etc
    - LTO: Adaptive Tape Speed, PCB cooling etc.
  • Explain connectivity options
    - Direct attached SCSI
    - Storage routers
    - Direct attached FC libraries
  • Describe the service considerations associated with each technology
  • Describe the difference between the following technologies
    - Standalone tape devices
    - Autoloaders
    - Libraries
  • Describe the various cleaning methods and implications, per drive technology
- Describe tape media issues, per technology (DLT, Ultrium...), media life expectancy
- Describe S.M.A.R.T. (Self Monitoring Analysis and Reporting Technology)
  - Describe S.M.A.R.T. functionality
- Describe SAN Virtualization technologies
  - Identify and describe the available solutions
  - Identify the levels at which Virtualization can be done (host, fabric, array)
  - Explain features of Virtualization technology
    - Virtualization benefits over traditional array based systems
    - Benefits of controller-based virtualization
    - Differences between In-Band & Out-of-Band Virtualization
    - Features/differences between Host, Fabric, & Array based Virtualization
- Describe various LUN security technologies
  - List methods used to implement LUN security (SSP, LUN Masking, physical separation, etc.)
  - Recognize LUN Masking/SSP when present
  - Describe when its required
  - Explain how to configure SSP (MA, MSA, EVA)
  - Explain how to configure LUN Mapping for tape backup storage (NSR)
- Describe Business Continuity technologies
  - List available Business Continuance solutions (clones/snapclones/replication, backup)
  - Explain advantages & disadvantages of H/W Mirroring vs S/W Mirroring and when to use each one
  - Explain benefits and differences of SAN based backup and LAN based backup
  - Explain benefits and differences of disk based backup and tape based backups
  - Explain MultiPath requirements of different OS platforms (i.e. require additional S/W vs built-in)
- Describe NAS technologies
  - Explain NAS vs SAN vs DAS - benefits/drawbacks of each
• Explain SAN/NAS fusion
• Recognize a NAS solution when it's on the customer site and describe the service considerations and limitations when encountering NAS

2.0 HP Product and Solution Sets
Describe the HP product portfolio and their target markets/applications

■ List, describe HP Storage "Open Distribution" products
  • Match the appropriate products to customer mainstream requirements
  • Recognize products when encountered
  • Recognize whether the customer requirement is out of scope for your role and how to escalate/engage appropriate resource

■ List HP Storage "Select" products
  • Match the appropriate products to customer mainstream requirements
  • Recognize products when encountered
  • Recognize whether the customer requirement is out of scope for your role and how to escalate/engage appropriate resource

■ List HP Storage "Enterprise" products
  • Match the appropriate products to customer enterprise requirements
  • Recognize products when encountered
  • Describe service considerations of products

Given a customer requirement, present relevant storage solution options to meet the customer’s business needs.

■ Explain How HP products and solutions can be integrated into existing heterogeneous environments.
  • Describe where to find HP online resources
  • Verify interoperability using the EBS compatibility matrix

3.0 Solution Supported, Validated and Meets the Requirements
Ensure solution is supported

■ Verify solution components for the respective vendors
  • Verify solution against vendor support criteria (HCL, SAN Design Guide).
• Implement vendor changes if necessary (Patches, SW-Updates)

Validate design

■ Validate against documentations
  • Design Guides
  • Release Notes
  • Installation Guides
  • Support Databases (FAQs)

■ Provide details of upgrade paths
  • Describe the possible upgrade paths

4.0 Tools - Implementation & Usage

Functionality of HP Library and Tape Tools (L&TT)

■ Explain supported OS and storage devices
  • Check for OS dependencies
  • Check for storage devices

■ Describe methods for L&TT installation
  • Where to get L&TT
  • Supported Operating Systems
  • Types of installation
    • OS-Installed versions
    • CD-Installed versions
  • User Interfaces (GUI, Command Line Interface (CLI))

Using HP Library and Tape Tools (L&TT)

■ Describe the different application settings for L&TT
  • Different I/O modes (ASPI, Miniport)
  • Preferences setup
  • L&TT event logs
  • Process of device detection
  • Setup of web locations

■ Demonstrate the proper use of L&TT
  • Demonstrate the ability to execute the Virtual Frontpanel
  • Demonstrate the ability to verify the host to drive/library connection
  • Demonstrate the ability to execute the Format utility
• Demonstrate the ability to execute the Read/Write test utility
• Demonstrate the ability to check for new scripts
• Demonstrate the ability to execute Firmware upgrade or downgrade
• Demonstrate the ability to use the operators console to check the robotics operation
• Demonstrate the ability to run a tape drive test
• Demonstrate the ability to draft and e-mail a Support ticket
• Describe the difference between standard L&TT tests and script-based tests
• Execute the acceptance test
• Execute the device analysis test

**Functionality of Text Formatter 2 (TF2)**
- Describe TF2 and its purpose
  - Describe what TF2 is and how it is accessed
  - Describe the target audience
  - Describe the purpose and the benefits of TF2
  - Describe current limitations of TF2 (e.g. amount of characters per input screen)
  - Describe the reporting functionality

**Using TF2**
- Demonstrate the proper use of TF2 and how to enter data
  - Demonstrate the ability to list available reports
  - Demonstrate the ability to administer TF2
  - Demonstrate the ability to create a case and enter troubleshooting details
  - Demonstrate the ability to submit case data to the database
  - Demonstrate the ability to review and update cases
  - Demonstrate the ability to provide on-line feedback

**5.0 Troubleshooting - Performance Tuning**
Support solution (maintain and provide proactive support)
- Schedule updates with customer as necessary (FW/SW upgrades)
  - Identify necessary updates
  - Describe updates to customer and why they are needed
Identify problem

- Identify customer stated problem
- Initiate troubleshooting
  - Determine helpful additional information (site maps, event logs, histories, workload change, applications).
  - List sources of additional information not covered by the problem statement (host - OS log, application log; visual inspection infrastructure - switch show, SAN map; storage - based logs, LUN status, usage).
  - Determine the scope of the problem (single vs. multiple host, more then one application affected).

Troubleshoot problem

- Host
  - Check OS event/error logs and message files
  - Check OS driver revisions and settings/status
  - Check adapter firmware revisions
  - Check OS patch levels
  - Visually inspect and check indicators, cabling, mechanics, etc.
  - Check supported setup configuration settings
  - Use diagnostic tools
- Infrastructure
  - Check error counters
  - Visually inspect and check indicators, cabling, mechanics, etc.
  - Check supported setup configuration settings
  - Check OS event/error logs and message files
  - Use diagnostic tools (SAN, direct attached, Ethernet network)
  - Identify interoperability issues between various SAN components
- Online Storage (Disk)
  - Visually inspect and check indicators, cabling, mechanics, etc.
  - Check OS/storage event logs
  - Check supported firmware setup/configuration settings
  - Use diagnostic tools
- Nearline Storage (EBS/Tape)
  - Visually inspect and check indicators, cabling, mechanics, etc.
• Check supported firmware setup/configuration settings
• Check event logs
• Check error counters
• Use diagnostic tools

• Application/OS/Software
  • Verify versions and patch levels
  • Check OS/application event logs and messages
  • Check compatibility with hardware configuration
  • Use diagnostic tools
  • Verify that the OS configuration is appropriate for the ISV software requirements

Performance tuning

  ■ Describe the tape and backup performance basics
    • Describe the difference between Feed speed and Write speed
    • Describe the problems that can occur when compressing compressed files
    • Describe the tuning parameters for tape drives (buffer size, block sizes, buffer counts, high water counts, transfer size)
    • Describe the function of Push Agents
    • Describe the potential negative impact of non-streaming
    • List the factors that influence backup/restore performance
      • File-by-File or Image Backup
      • Network
      • Fragmentation
      • Host parameters (CPU, File System parameters, Memory...)
      • File sizes, amount of files, directory structure, tree depth
      • Multiple data streams
      • Array ability to rebuild data
    • Calculation of transfer rates and compression factors

  ■ Given an operational environment, analyze connectivity to ensure optimal performance
    • Explain the rules for the amount of tape drives per SCSI bus
    • List appropriate HBAs/FCAs for given tape devices
    • Explain the rules for connecting disks and tapes
Define optimization criteria (application, array, infrastructure, etc.)
- Identify potential performance bottlenecks
  - Applications
  - host component configuration
  - fabric and network infrastructure
  - storage (disk/tape)
  - interoperability issues
  - backup application
  - operating system

Collect performance data
- Identify and document configuration of potential problem areas
- Identify/use tools to generate numbers
  - Disk (PAT, HPReadData, HPCreateData)
  - Tape (HPTapePerf, L&TT)
  - Host (Perfmon, OpenView)
  - Network (OpenView, LAN Analyzer, Sniffer)
  - Fabric (Fabric Managers, OpenView SAM, 3rd party Switch Management Tools)
  - FCAs/HBAs (Fibre Analyzer, SCSI Analyzer)

Analyze collected performance data
- Use your knowledge of the system architecture to "walk through" the data path to isolate the problem to a specific area
  - Describe all the components in the data path, and their performance attributes (saturation point), from start to finish
- Compare actual capabilities vs. theoretical or ideal maximums
  - Identify the bottleneck in the backup or restore data path

Adjust parameters (cache settings, RAID array parameters, timeout)
- Apply your expertise to identify if parameters or configuration changes will relieve bottleneck or if device/component change is need?
  - Adapt/modify buffers (HW, SW)
  - Modify Network/Fabric topology (add ISLs, distribute devices over different switches)
  - Modify disk subsystem (add drives for more IO/s)
  - Modify tape subsystem (NSR connectivity, drives, block sizes, mapping)
• Change host connectivity (add additional HBA's/FCA's, distribute HBA's/FCA's over different PCI busses)
• Explain proper IRQ assignment for PCI adapters
• Explain proper PCI slot usage/assignment

■ Test/verify changed parameters
• Compare changes to original numbers to see if problem is resolved or pushed to next component/device in the data path
• Check health logs, create trend analysis reports, and define/monitor thresholds
• Test operability of solution after changes

■ Update configuration document
• Document changes
• Keep older versions of the document for safety

Recommended training and study references

This section lists training courses and documents that can help you acquire a majority of the knowledge and skills needed to pass the exam. You must also gain the practical experience outlined in this guide.

You are not required to take the courses listed in this section. However, HP strongly recommends that you attend the classes, participate in class labs, and thoroughly review all course material and documents before taking the exam, even if you believe you have sufficient on-the-job experience.

Instructor-led training

Use the information in this guide and the practical experience you have gained to determine your need for the instructor-led training.

<table>
<thead>
<tr>
<th>Title</th>
<th>Course Number</th>
<th>How to Enroll</th>
</tr>
</thead>
</table>
| Advanced Backup Troubleshooting & Tuning (ATT) | 15723          | Internal 
Web-based training

Self-paced training and technical documentation may provide appropriate learning alternatives to instructor-led training for more experienced candidates.

<table>
<thead>
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<th>Title</th>
<th>How to Order/Obtain</th>
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<tbody>
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Documentation (Internal only)

<table>
<thead>
<tr>
<th>Title</th>
<th>Section Title</th>
<th>Source/Order Number</th>
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<tbody>
<tr>
<td>Various titles</td>
<td></td>
<td>An internal website has been established to house all of the learning product documents. <a href="http://storage.inet.cpqcorp.net/Techdocs/hpL">http://storage.inet.cpqcorp.net/Techdocs/hpL</a> P/Greeley/MSL.htm</td>
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Sample Test Items

Sample test items give you a preview of what the actual test items will look like. These items ARE NOT on the exam; however, they represent actual items and should help you become familiar with the format and complexity of the test items.

1. A Fibre Channel fabric uses _____.
   - A. 24-bit addresses assigned by the factory every time a device is connected to the fabric
   - B. 24-bit addresses assigned by the service engineer during installation
   - C. fixed AL_PA IDs assigned by the switches during initialization of the fabric
   - D. fixed AL_PA IDs assigned by the service engineer during installation

2. Where do you find the recommended power-on sequence for an EBS environment?
   - A. SAN Design Reference Guide
   - B. EBS Compatibility Matrix
   - C. ISV Quick Start Guide
   - D. EBS Design Guide
3. Which type of interconnect is required for an external standalone Ultrium460 tape drive for best performance?

A. S-ATA
B. Wide Ultra-3 SCSI
C. Wide Ultra-3 SCSI SE
D. Wide Ultra-2 SCSI
4. Text Formatter 2 is expected to reduce _____.
   A. remote resolution
   B. product quality issues
   C. on-site customer support
   D. use of Library and Tape Tools

5. When making an initial analysis of a customer stated problem, which printed document is most useful to understand the environment?
   A. EBS Support Matrix
   B. Tape Compatibility Matrix
   C. site map showing the network and SAN infrastructure
   D. SAN Troubleshooting Guide

6. SCSI sense codes are standardized or device specific codes _____.
   A. which enable device sharing in a Fibre Channel environment
   B. used to configure SCSI IDs for tape devices
   C. that report status information of SCSI devices to aid diagnosis
   D. that are not required for tape operations

7. A tape device has been replaced and now no longer functions correctly with the backup software. What is the most likely cause?
   A. Cartridges need to be reformatted with the new drive before backups can begin.
   B. Tape calibration needs to be performed before backups can begin.
   C. The replacement tape device needs cleaning before backups can begin.
   D. The new firmware on the replacement tape device is not compatible with the Independent Software Vendor supported devices list.

8. An external Ultrium 230 drive with a cartridge loaded fails to respond. It is not possible to reboot the host at this time. What must you do to resolve the problem?
   A. Power off the drive, disconnect it from the SCSI bus, manually remove the cartridge and reconnect the drive to the SCSI bus.
   B. Without powering off the drive or disconnecting it from the SCSI bus, reboot the tape drive.
   C. Without powering off the drive or host, use the emergency reset button on the front of the drive, and wait up to 7 minutes for the drive to get to the loaded position.
D. Power off the drive, disconnect it from the SCSI bus and replace it with a new one.

9. Which software tool do you use to gather detailed diagnostic information when troubleshooting tape devices?
   A. Lib diags
   B. Insight Manager
   C. media robot utility
   D. Library and Tape Tools

10. The front panel LEDs of an HP StorageWorks DAT 72 drive display: Tape = flashing slowly, Clean = OFF. What does this represent?
    A. cartridge loaded, drive ready
    B. cartridge loaded, self-test in progress
    C. tape in disaster recovery mode
    D. hard error during power-on self test

11. To measure disk performance, disk counters must first be enabled on Windows systems since they are disabled by default because they may slow down performance. Which command enables disk counters?
    A. diskperf –n
    B. diskperf –enable
    C. diskperf –y
    D. perfdisk –yes

12. Which parameters, accessible from the Data Protector backup application, do you use to improve the backup performance. Select TWO.
    A. disk agent buffers
    B. tape agent buffers
    C. block size
    D. writeback cache enabled/disabled
    E. Data_Push_Throughput
ANSWERS:

|---|------|------|------|------|------|------|------|------|------|------|------|--------|

Conclusion

HP wishes you success in the HP Certified Professional Program and in passing the exam for which you are preparing.