Purpose of the Exam Preparation Guide

The intent of this guide is to set expectations about the content and the context of the exam and to help you prepare for the exam. In this guide, you will find references to resources that will assist you in preparing for the exam. 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 Tru64 UNIX V5 TruCluster Implementation and Support exam is intended for Service Engineers, Pre-Sales Technical Support Engineers, and HP customers who have advanced level knowledge of TruCluster systems.

HP strongly recommends that candidates acquire at least 6 months of hands-on experience with this technology before taking the exam. The specific competencies to be acquired are outlined in this document.

Exam Registration

This exam is available at Prometric. This exam is available at Promissor.

Exam Details

- Number of questions: 57
- Time allotted to take the exam: 60 minutes (plus 15 minutes for survey)
- Passing score: 61%
- No on-line or hard copy sources may be referenced during the exam.
Major Competencies

Exam candidates should be able to apply knowledge of high availability concepts, and TruCluster Server technology and functionality, to propose, plan, configure, administer, and support TruCluster solutions.

Specifically, candidates should be able to:
- Convert customers’ high availability requirements to TruCluster Server configuration requirements
- Select an appropriate TruCluster configuration to meet customer requirements
- Evaluate the appropriateness of implementing LSM in a TruCluster v5.0 environment
- Install a TruCluster, set the appropriate configuration parameters to implement a customer solution, and verify the installation
- Install and configure a SCSI bus and devices within a TruCluster environment
- Configure a RAID subsystem within a TruCluster environment
- Install and configure a Memory Channel interconnect within a TruCluster environment
- Add members to a TruCluster
- Resolve migration issues and upgrade to a TruCluster v5.0 cluster
- Migrate applications to a TruCluster v5.0 cluster
- Select and use appropriate tools to manage a TruCluster
- Define and manage highly available applications
- Use appropriate procedures and tools to troubleshoot TruCluster problems

Major Technologies and Concepts

Exam candidates should have advanced level knowledge of the following TruCluster-related technologies, architectures, and concepts:
- Role of TruClusters in the HP NonStop™ strategy and e-business domains
- High availability markets
- High availability approaches (Failover, Replication, DISA, Storage Redundancy, HPTC)
- Disaster tolerance
- Disaster recovery
- No-single-point-of-failure cluster
- Automatic load balancing
- TruCluster security
- Single-system image
- Single-instance and multi-instance applications
- Memory Channel
- Memory Channel Interconnect
- Cluster File System and CDSLs
- Quorum
- DRD
- DLM
- CLSM
- FC/SCSI (buses, devices, cables, and connectors)
- RAID
- Cluster-wide disks/ Single-member cluster
- Available applications
- Cluster networking
- Virtual Hub and Hub
- TruCluster configuration
- TruCluster management/ SysMan Station
- Cluster Alias
- Cluster Application Availability (CAA)
- Connection Manager
- EVM

Exam Objectives

Use the exam objectives listed in this section to guide your study and to check your readiness for the exam. The exam measures your attainment of these objectives. The approximate percentage of exam questions dedicated to each major category of objectives is included in parenthesis.

Describe Industry High Availability Concepts, Methodologies, and Technologies (12%)

- Describe various approaches for achieving high availability and differentiate between high availability technologies
  - Explain, compare and contrast: Failover, Replication, DISA, Storage Redundancy, and HPTC
  - Explain basic implications for applications that are deployed in high availability environments
  - Identify and describe characteristics of high availability systems
  - Describe the metrics, measurements and comparisons used for high availability
    - Differentiate between and explain single system and multi-system availability.
    - Differentiate between and explain “no single point of failure” and NonStop.
- Identify and describe key clustering issues like the challenge of cluster management.
- Identify market opportunities for high availability solutions.
  - Identify and describe appropriate business uses for high availability solutions.
  - Describe the strengths of HP’s high availability solutions.
- Differentiate between and describe disaster tolerance and disaster recovery methodologies, and relate these concepts to clusters.

Explain and Apply TruCluster Terms and Concepts (25%)

- Describe the TruCluster Server product and when it should be
used.

- Describe the concept and advantages of automatic load balancing.
- Identify and describe features and benefits of TruCluster Server, including security, single-system image, management, and resource management.
- Explain the history of the TruCluster product, and describe planned improvements as specified in its roadmap.
- Explain Cluster Application Availability and the difference between single instance and multi-instance applications.
  - Explain how to use Cluster Application Availability.
- Explain the purpose and function of a cluster interconnect, and differentiate Memory Channel, 100/1000 Ethernet, ServerNet, and InfiniBand.
- Explain the purpose and function of Direct and Remote Device access, and differentiate 4.0 and 5.0 “DRD.”
- Explain the purpose and advantages of DLM.
- Explain the purpose and function of CLSM.
- Explain the purpose and function of Cluster Alias.
- Explain Cluster Networking and how it is deployed, including routing, ports, and ReArp.
- Describe the purpose and function of the connection manager.
- Describe the Cluster File System and explain how it works
  - Describe the purpose of CDSLs and how they are set up.
- Describe the concept of quorum and how it is applied in a TruCluster environment.

Size and Plan the Configuration of a TruCluster (9%)

- Identify the minimum hardware and software requirements for a TruCluster.
  - Describe the requirements for a no-single-point-of-failure cluster.
- Identify and describe the supported hardware configurations for a TruCluster environment.
  - Identify resources and locations that contain information about supported TruCluster configurations.
- Map customer requirements to an appropriate TruCluster configuration.
  - Identify and describe clustered storage options, including the strengths and weaknesses of the options.
- Describe the use of LSM in a TruCluster v5.0 environment, including key factors to be considered, such as advantages and disadvantages.

Explain How to Install a TruCluster (19%)

- Describe how to install the hardware components of a TruCluster system.
  - Describe how to configure storage and devices in a TruCluster environment.
- Describe how to configure storage and devices in a TruCluster environment.
  - Explain how to install and configure FC/SCSI devices.
  - Explain how to configure a FC/SCSI bus and how to terminate a SCSI bus.
  - Identify and select appropriate cable types and connectors, and describe cable length requirements.
- Describe how to configure a RAID subsystem.
- Describe how to install cluster interconnects, including a Memory Channel interconnect.
  - Differentiate between a virtual hub and a hub.
  - Explain how to verify firmware requirements, and perform configuration procedures.
  - Identify and explain network configuration rules for Memory Channel.
  - Identify and explain licensing requirements for Memory Channel.
  - Explain how to upgrade a Memory Channel configuration.
- Describe how to set up the cluster on the first member.
  - Identify and describe requirements for the operating system installation.
  - Identify the services that must be configured before proceeding.
  - Explain how to create the cluster wide disks, or a single-member cluster using clu_create.
- Explain how to add members using clu_add_member.
- Explain how to verify a cluster installation.
  - Explain when and how to use clu_check_config, mc_cable, mc_diag.
- Identify Cluster Ready Apps that ship with Mail, NFS, ASU, Web Server.

Describe How to Upgrade and Migrate to a TruCluster V5 cluster (12%)
- Describe how to upgrade to a TruCluster v5.0 cluster, including requirements and restrictions that must be observed.
- Describe how to migrate applications to a TruCluster v5.0 cluster.

Describe How to Manage a TruCluster (23%)
- Identify cluster management tools, and explain how and when to
- Explain when to use cluster alias, and how to create and manage
cluster alias.

- Describe how to manage cluster members.
  - Identify command and member-specific configuration files.
  - Explain how to manage votes and quorum.
  - Explain how to shut down the cluster or individual members.
- Explain how to manage highly available applications (caa_*).
  - Explain when to use CAA rather than a cluster alias.
  - Explain how to set up an available application.
  - Explain how to relocate an application.
- Explain how to analyze and isolate hardware and software mis-configuration problems in a TruCluster environment.
  - Identify appropriate tools and describe their use in fault isolation procedures.
  - Identify and interpret log files and EVM reports.
- Explain how to analyze and isolate network problems in a TruCluster environment.
- Explain how to analyze and isolate failover problems in a TruCluster environment.
- Identify resources and tools for configuring, managing and supporting TruClusters.

Training Courses and Documents

This section lists training courses and documents that can help you gain the knowledge and skills needed to pass the exam. You are not required to take the courses before taking the exam, however HP strongly recommends that you attend classes, participate in class labs, and thoroughly review all course materials and reference documents before taking the exam. In addition, you should have about 6 months practical experience with clustered AlphaServer systems running HP Tru64 UNIX, which should include each major competency cited in the previous section.

Instructor-Led Training

The HP courses that support this exam include:

- HP Tru64 UNIX V5 TruCluster V5.0 (or later) Configuration and Management (5 days)
- TruCluster V5 Differences (1 day seminar for individuals with previous cluster experience.)
- TruCluster V5 Differences Labs (1 day for individuals with previous cluster experience.)
- HP TruCluster Migration Workshop (5 days – candidate option)
HP has selected independent training providers to deliver these courses. To identify the independent training provider(s) in your area, refer to your country’s HP Training Catalog [http://www.compaq.com/training/cd-os.html].

Self-Paced Training

This section lists the relevant self-paced courseware available from HP. If you are not able to attend an instructor-led course, then consider these self-paced alternatives.

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To order self-paced courseware, refer to your country’s HP Training Catalog [http://www.compaq.com/training/cd-os.html].

Documentation and References

This section lists reference documents that describe the major competencies, technologies, and concepts covered in the exam. HP strongly recommends that you review, at minimum, the specific sections listed for each document. Use the exam objectives listed in this publication to guide your study, since some sections may describe topics in more depth than is required for the exam, or sections may not be listed.

References are listed in random order, so the sequence does not imply importance. You can access the TruCluster V5.0 documentation at [http://www.tru64unix.compaq.com/docs/cluster_doc/cluster_50/TCR50_DOC.HTM](http://www.tru64unix.compaq.com/docs/cluster_doc/cluster_50/TCR50_DOC.HTM). The locations of all other references are shown in the table.

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Sample Exam Questions

Sample Exam Questions

This set of sample exam questions will help you become familiar with the types of questions on the exam. This set of questions is not intended to test your readiness for the exam, since the questions do not cover every test objective. None of these questions is contained on the actual exam. The actual exam questions may be more or less difficult than this set of questions.

After answering these questions, check your responses using the answer key provided at the end of this section.

Section One: Describe Industry High Availability Concepts

1. Which high availability method detects, isolates, and bypasses a hardware error?
   
   A. RAID 0
   
   B. replication
   
   C. backup and restore
   
   D. fault tolerance

2. Which is needed in building a cluster-aware application?
   
   A. tuning configuration files for controlled, automatic load balancing of the application
   
   B. registering the application with a keep-alive daemon to provide application failover
   
   C. running multiple copies of the application on individual nodes
   
   D. revising the application to work in a parallel environment
3. How does TruCluster Server single-system management reduce cost-of-ownership? Select TWO.
   A. supports flexible configurations
   B. provides automated load balancing
   C. install software only once for the entire cluster
   D. several nodes can share and boot off a single system disk
   E. high-speed tape drives and other expensive resources can be shared by all nodes in the cluster

4. What capability does disaster tolerance provide that is not provided by high availability?
   A. detect, isolate, and bypass a fault through hardware
   B. survive catastrophic failures
   C. withstand faults and errors while continuing to provide the required services
   D. reconfigure itself to use a working component when a similar component fails

Section Two: Explain/Apply TruCluster concepts and definitions

5. Which best describes TruCluster Server?
   A. AlphaServer systems and storage devices that operate as a single system
   B. Intel systems and storage devices that operate as a single system
   C. AlphaServer systems and network devices that operate as a single system
   D. AlphaServer systems and storage devices that operate as independent systems

6. Which component facilitates the single-system image?
   A. DFS
   B. NFS
   C. CFS
   D. CAA
7. Which are benefits of implementing CLSM in a TruCluster Server environment? Select TWO.
   A. the CLSM volume performs better than the regular device
   B. CLSM behavior in a cluster is identical to LSM on a single system
   C. ease of online storage management
   D. CLSM can be used to mirror the quorum disk for high availability
   E. CLSM is an inexpensive RAID solution

8. How can a Cluster Alias be implemented? Select TWO.
   A. IP alias
   B. CAA alias
   C. Common subnet
   D. Virtual subnet
   E. Logical subnet

9. What is the alias router?
   A. member that makes the Cluster Alias address known to the network and receives incoming packets for that alias
   B. dedicated member that receives all traffic addressed to the Cluster Alias
   C. member that raises and lowers the routing priority of other members producing an even distribution of received incoming packets among all members
   D. member that aliases its own interface to advertise the Cluster Alias to external systems

10. Which is NOT a responsibility of the connection manager?
    A. maintaining quorum
    B. tracking which cluster members are active
    C. removing members
    D. detecting and resolving cluster partitions
Section Three: Size and Configure (identify components of, not set up) a TruCluster

11. What is the minimum memory required for TruCluster Server V5?
   A. 64 MB
   B. 128 MB
   C. 256 MB
   D. 512 MB

12. Which types of network adapters are supported with TruCluster Server? Select TWO.
   A. ATM
   B. SONET
   C. Ethernet
   D. Token Ring
   E. Frame Relay

13. A customer has an AlphaServer 800, an AlphaServer 1000, and an AlphaServer 2100 each with 3 internal 4GB disk drives.
    What advice should you give the customer about forming these systems into a V5 cluster?
    A. AlphaServer 1000 is not supported on TruCluster V5
    B. AlphaServer 2100 must be upgraded to AlphaServer 2100A
    C. external shared storage and Memory Channel cards are required
    D. other than Memory Channel cards, no other hardware is necessary

14. How do you configure software RAID 5 in a TruCluster Server?
   A. software RAID 5 is not supported
   B. install Hardware RAID 5 and run volsetup
   C. install the LSM software and run volsetup
   D. install TruCluster Server software and run lsm_setup
Section Four: Explain how to install a TruCluster

15. Which component list is required to create a no-single-point-of-failure fibre channel storage configuration for a two-node cluster? (Assume the appropriate cables are included.)

A. four fibre channel host adapters, one fibre channel switch, two enterprise storage arrays with redundant HSG80s

B. two fibre channel host adapters, two fiber channel switches and two enterprise storage arrays with redundant HSG80s

C. four fibre channel host adapters, two fibre channel switches, one enterprise storage array with redundant HSG80s

D. two fibre channel host adapters, one fibre channel switch, and one enterprise storage array with redundant HSG80s

16. What is the minimum number of IP addresses you need for each member of a cluster with redundant Memory Channel interfaces?

A. 2

B. 3

C. 4

D. 5

17. Which console parameters should be set on the second node of a cluster before adding the node to the cluster? Select TWO.

A. set auto_action halt

B. set bootdef_dev <device name>

C. set bus_probe_algorithm off

D. set boot_file vmunix

E. set bootdef_dev ""

18. In a virtual hub configuration, Memory Channel adapters are installed in both nodes and connected through an appropriate link cable. Which SRM console command verifies the Memory Channel link?

A. mc_diag

B. link_init

C. mc_cable

D. mc_link
Section Five: Explain upgrade/migration issues

19. Which additional hardware option is required when migrating from TruCluster Available Server V1.x to TruCluster Server V5.x?

A. secondary (or tertiary) network adapter
B. local storage
C. shared SCSI
D. cluster interconnect

20. What is the recommended procedure when testing an application to run in a TruCluster Server environment?

A. Test the application in a non-clustered environment, then move it into the TruCluster Server environment.
B. Test the application in the cluster failsafe mode.
C. Testing is not required since all applications run in a TruCluster Server environment.
D. Test the application at a HP Benchmark Center using a TruCluster evaluation mode simulator to qualify the application.

Section Six: Explain and perform cluster management

21. Which command gathers distributed device attributes?

A. get_drd
B. show_drd
C. drdmgr
D. hwmgr -view device

22. To which cluster service does the concept of load balancing apply?

A. TCP/IP
B. ASE
C. network
D. in_multi
23. What is the cluster quorum value in a three-member cluster when each member has one vote and the quorum disk has zero votes?

A. 0
B. 1
C. 2
D. 3

24. Which type of CAA resource profile allows use of a required resource?

A. application
B. changer
C. network
D. tape

Answer Key

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**Conclusion**

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