NonStop Remote Database Facility (RDF) - Level 2
Exam HP0-782
Exam Preparation Guide

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 candidates prepare for the exam. In this guide, you will find recommended HP training courses, reference and study material to 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

This exam is targeted for the following audience, with a minimum of three to five years’ experience on the NonStop S-Series platforms running the G-Series NonStop Kernel Operating System. Examples of job roles:

- Application Architects, System Management and Database Administrators.
- Professional Services personnel who assist NonStop customers.
- Global Customer Support Center (GCSC) personnel, who may have specialized technical expertise in the operating system and NonStop applications and serve as support for both field support technicians and customers.
- Analyst SEs or Pre-Sales Technical Support (PSTS) personnel, who perform pre-sales consulting and technical account support.
- NonStop Technical Consultants (both internal and external), System Integrators and Consultant Partners, Authorized Service Channel Partners and Distributors, Customers authorized to service their own equipment.

General areas of content include: NonStop Relational Database (RDB) Concepts, Architecture, Planning, Configuration, Management, Management of RDF Protected Database, and Problem Resolution.

Certification Requirements

The NonStop Remote Database Facility (RDF) Exam HP0-782 is an elective for certification as an Accredited System Engineer (ASE) in the HP NonStop S-series Systems track. It is also an elective for the HP NonStop Kernel Certified Systems Engineer (CSE) in the HP Operating System certification.
Prerequisites

Successful completion of the Accredited Integration Specialist (AIS) - Level 1 is required for the Accredited System Engineer (ASE) - Level 2 certification. One mandatory exam and three electives, totaling four exams, are required for ASE certification. For NonStop Systems track requirements, visit the website at http://education.nonstop.compaq.com/us/cert/certtrak.pdf or http://www.hp.com/go/certification

The NonStop Level 2 mandatory exam is:

- NonStop Kernel Advanced Exam HP0-760

The Level 2 electives are based on the participant’s certification goals.

Note that three to five years’ experience or more is highly recommended for ASE certification. “Hands on” experience with the NonStop S-series system is essential.

Exam Details

HP0-782 NonStop Remote Database Facility (RDF) is a live exam. You will receive a score report with your results after testing is complete. You can use the report to identify areas of strength and learn about areas to improve, if necessary.

If you do not pass this exam, refer to your percentages for each core competency shown on your score sheet. Use these results to guide you in areas where you need to study or review more than other competencies.

Test Information

- **Number of test items:** 77
- **Item type:** multiple choice
- **Exam time:** 105 minutes
- **Passing score:** 55%
- **Reference material:** No online or hard copy reference material will be allowed at the testing site.
Exam Content
The following outline represents 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. The approximate percentage of exam questions dedicated to each major content area is included in parenthesis. Typically, the higher the percentage, the more questions will be on the exam.

1) RDF Concepts (6%)
   1.1 Explain the purpose of disaster recovery solution
       • Contrast the differences between disaster recovery and replication
         o recovery time, data integrity, distance, target system
   1.2 Explain other purposes for replicated databases
       • Describe workload distribution
         o read-only applications
         o database maintenance (backups)
       • Describe possible migration strategies
   1.3 Compare and contrast characteristics of RDF
       • Contrast the differences between RDF and Nomadic Disk
         o distance limitations, data integrity, operational differences
       • Contrast RDF with enterprise storage solutions
   1.4 Explain the impact of RDF on applications
       • Define the impact when the application uses an audited database
       • Define the impact when the application uses unaudited database

2) Architecture (14%)
   2.1 Describe the RDF components and their functionality
       • Monitor, Extractor, Receiver, Updater, Purger, RDFCOM
   2.2 Name the files used by RDF
       • Locate an RDF control subvolume
       • Describe the contents of control subvolume
         o RDFLOCK, CONTEXT, CONFIG, RDFTKOV, exception files, ZTXUNDO, ZNETUNDO, ZRDFLCMT, ZRFNMTX, ZRDFNMT2, ZFILEINC, ZFILUNDO
       • Describe exception files (naming, contents)
       • Identify the types of image trails (master, auxiliary, contents)
2.3 Recognize the dependency of RDF on TMF

- Demonstrate knowledge of TMF
  - Network transactions
  - types of audit trails (master, auxiliary)
  - audit trail contents (before images, after images, control information)
  - PINing of audit trails
  - auditdump
  - backout
  - file recovery
  - volume recovery
  - online dumps
- Configure TMF on primary and backup systems
  - Describe the configuration issues
  - Explain issues related to configuration of AUDITDUMP (ON vs OFF)
  - State the benefits of segregated audit trail(s) for RDF protected volumes

2.4 Contrast the different products of RDF

- Contrast RDF/IMP versus RDF/IMPX
  - available features on each
- Identify the migration issues moving from SUT-based version RDF/MP(X) to RDF/IMP(X)

2.5 Describe the topologies that are supported on RDF

- reciprocal, one to many, many to one, loopback, one to one
- triple contingency (distinguish from multiple backup systems), RDF Network

3) Planning RDF (9%)

3.1 Size the RDF on the primary system

- processor resources, I/O resources, memory and AUDITTRAILBUFFER

3.2 Size the RDF backup system

- other backup system uses, number of processors, number of disks, target performance after takeover, 4K cache, AUDITTRAILBUFFER

3.3 Consider EXPAND configuration issues relating to RDF

- Calculate the bandwidth requirements
- Benefits of setting of EXPAND parameters
  - PATHPACKETBYTES, CONGCTRL, PATHBLOCKBYTES
- Explain how to set remote passwords
• Describe implications of using SuperPath on RDF component placement
• Fault tolerant Expand topology

3.4 Consider physical database design issues relating to RDF
• Consider issues related to placement of Enscribe files
  replicated files vs non replicated files, where filtering occurs
• Consider issues related to placement of Nonstop SQL/MP objects
  o Nonstop SQL/MP catalogs, ODBC catalogs, replicated tables vs non replicated tables, view, where filtering occurs
• Consider issues related to placement of Nonstop SQL/MX objects
  o Nonstop SQL/MX catalogs, replicated tables vs non replicated tables, view, where filtering occurs
• Consider file/table/index attributes setting
  o auditcompress, audit flag, keytag, equal blocksize, file compression, DCOMPRESS

4) Configuring RDF (25%)
4.1 Install RDF
• List steps required to install RDF
• Identify files associated with RDF installation (RDFINST, license file), SOFTWARELOC
• Describe how to integrate RDF templates with current EMS templates
• Describe RDF owner and security

4.2 Demonstrate consideration of DP-2 configuration issues related to RDF
• Describe the purpose and function of the SYSGEN parameter AUDITTRAILBUFFER, number of disk processes, cache

4.3 Initialize RDF
• List steps required to install RDF
• State the options used when initializing RDF
  o Explain initialization to TMF Shutdown Timestamp
  o Explain initialization to MAT sequence 1
  o Explain initialization for online database synchronization (complete and partial)
  o Explain initialization with INITTIME (and different uses)
     ~ State the reasons when to use a certain initialization

4.4 Configure RDF components
• Identify the issues related to setting RDF global parameters
  PRIMARYSWAP, BACKUPSWAP, LOGFILE, SOFTWARELOC
  UPDATERDELAY, UPDATERXTIME, UPDATERRTDWARNING,
  UPDATEROPEN, NETWORK, NETWORKMASTER,
  UPDATEREXCEPTION, REPLICATEPURGE, LOCKSTEPVOL

• Identify the issues related to setting Monitor parameters
  o CPU, PRIORITY, PROCESS (name)

• Identify the issues related to setting Extractor parameters
  o CPU, PRIORITY, RTDWARNING, ATINDEX
  o difference between Master Extractor and Auxiliary Extractors

• Identify the issues related to setting Receiver parameters
  o CPU, PRIORITY, RDFVOLUME, EXTENTS, SLOWMODE, ATINDEX
    ~ Contrast the differences between Master Receiver and Auxiliary
      Receiver (roles)
    ~ State the limits on size and number of image trails
  o Identify the issues related to setting ImageTrail parameters
    ~ ATINDEX
  o Identify the issues related to setting Updater parameters
    ~ CPU, PRIORITY, UPDATEVOLUME, IMAGEVOLUME,
      ATINDEX, SYNCH

  ♦ State the issues related to volume mapping
    • know limits on volumes mapped

  ♦ Apply the INCLUDE/EXCLUDE lists
    • use/format of/limits of/ramifications of sequence
    • reciprocal databases
    • implications on EXTRACTOR, of RESET VOLUME

  ♦ Recognize the implications of using SMF on primary and
    backup system

  ♦ DCOMPRESS1 and DCOMPRESS2
• Protected versus shared (benefits of each, online dump, reload)

• Updater idle file handling (closing, number of opens)

• Identify the issues related to setting Purger parameters
  • CPU, PRIORITY, RETAINCOUNT, PURGETIME

• Describe when image files are purged (ramification of file incompletes and long running transactions)

The issues relating to setting up an RDF Network

• Identify the issues related to setting the RDFNET parameters
  • CPUS, PRIORITY, PROCESS, PNETTXVOLUME, RETAINCOUNT

• Describe the configuration differences for Network Master and a non-network master in the NETwork object
  • PRIMARYSYSTEM, BACKUPSYSTEM, PNETTXVOLUME, REMOTECONTROLSUBVOL

• Reinitializing within an RDF Network

The issues relating to setting up a triple contingency environment

• limitation with aux audit and RDF Network, RETAINCOUNT

Validate configuration

4.5 Describe the RDF process LOCKSTEP Operation
  • Describe the RDF DoLockstep Procedure
  • Describe the Lockstep Gateway Process
  • Describe process Lockstep performance implications
  • Describe architectural and application considerations

5) Managing RDF (21%)

5.1 Demonstrate knowledge of physical database attributes
  • Start RDF
ramifications of UPDATE ON or OFF

5.2 Stop RDF

- Consider implications to environment, and database consistency issues
  - Describe when to use STOP RDF
  - Describe when to use STOP TMF
  - Describe when to use STOP UPDATE
  - Describe when to use STOP UPDATE, TIMESTAMP
    - all volumes are available
  - Describe when to use STATUS, PROG $SYSTEM.RDF.*, STOP
    - Describe considerations with Shared DDL operations

5.3 Monitor RDF

- Interpret a STATUS TMF (display)
- Interpret a STATUS RDF display
  - understanding what RTD represents
- Interpret a STATUS RTDWARNING display
- Describe the integration with Event Management System (EMS)
- Describe the integration with ASAP

5.4 Plan for "planned outage" (switchover)

- Describe when a planned outage would be appropriate
  - all volumes enabled
- List the steps that are required to switch roles
  - end reporting
- Demonstrate how to switch back to original primary role

5.5 Plan for "planned outage" (switchover)

- Describe when an unplanned outage should be declared
  - When should takeover be declared, implications of the TAKEOVER (database sync)
- List the steps that are required to have the backup system takeover
  - primary system unavailable, TAKEOVER end reporting (724, MAT)
    - Identify the effects of undoing network transactions
      ♦ RETAINCOUNT
    - Identify the effects of triple contingency
      ♦ COPYAUDIT, RETAINCOUNT
• List the steps that are required to reestablish the original primary system as primary
  o recover files to MAT position
• Explain function of exception files
  o Describe why exception files are needed (incomplete transaction, auxiliary audit)
  o Describe where exception files are located
  o Describe the exception file contents
  o Demonstrate how to review contents (RDFSNOOP)
• Describe function of ZTXUNDO, ZNETUNDO, ZFILUNDO
  o Describe the contents of ZTXUNDO, ZNETUNDO, ZFILUNDO
• Describe the phases of TAKEOVER (undo passes - local, file, network)

5.6 List other issues related to the RDF environment.
• List the issues associated with the availability of source code, object files, obey files
• List considerations when designing an RDF supported application
  List the issues associated with the availability of source code, object files, obey files
  List considerations when designing an RDF supported application
  ~ Recognize issues related to hard-coding of system names
  ~ Describe the how to use ASSIGNS and DEFINES
  Identify the benefits of AutoSYNC

6) Managing RDF Protected Database (17%)

6.1 Synchronize a database
• Demonstrate how to perform offline synchronization
  o List the steps required for synchronizing a database
  o List the steps required for synchronizing a volume
  o List the steps required for synchronizing a file
  o List the available methods (Backup/Restore, FUP/SQLCI DUP/LOAD - NOCOMPACT on R) and considerations
  o List the considerations for Enscribe files (queue files)
    ~ alternate keys, partitions, keytag
  o List the considerations for SQL files
    ~ catalogs, secondary indexes, partitions, keytag
6.2 Maintaining a database in an RDF environment

- State the impact of maintenance on an Enscribe database
  - State the impact of DDL operations (CREATE, PURGEDATA, ALTER MAXEXTENTS, PURGE)
  - maxextents (blocksplit on backup)
- Describe the impact of turning AUDIT on and off
- Describe the impact of TMF Recover Files

- State the impact of maintenance on an Enscribe database
  - State the impact of DDL operations (CREATE, PURGEDATA, ALTER MAXEXTENTS, PURGE)
  - State the impact of Nonstop Availability option (SHARED ACCESS DDL)
    - Coordination in RDF Network
  - State the impact on partition split operations (with/without SHARED ACCESS)
  - Describe the impact of TMF Recover Files

7) Resolving Problems (8%)

7.1 Use available RDF tools
- RDFSCAN, RDFCHEK, RDIMAGE, RDFSNOOP, READLIST

7.2 Diagnose/resolve communications line failure
- Diagnose/resolve transient communications line failure
- Diagnose/resolve extended communications line failure
- Describe the impact on TMF (held audit trails, UNPINAUDIT)
- Describe the impact AUDITDUMP configuration has on steps taken

7.3 Diagnose/resolve TMF problems

7.4 Diagnose/resolve data volume failure on primary and backup systems
- on primary, on backup

7.5 Diagnose/resolve RDF process failure
• Monitor, Extractor, Receiver, Updater, Purger, RDFNet

7.6 Diagnose/resolve file system errors
• 10, 11, 12, 45, 43, 71 etc.
**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 HP instructor-led training.

The HP Certified Professional Program (Level 2) includes references to a variety of materials that provide information included on this certification exam. Completion of these HP courses and review of materials is recommended, but not required, for success on this exam.

Note that soon you will be able to participate in NonStop courses in a virtual classroom environment (RAIL). Refer to the [http://www.hp.com/education/sections/nonstop.html](http://www.hp.com/education/sections/nonstop.html).

**Recommended Minimum Courses**

<table>
<thead>
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<th>Course Title</th>
<th>Part Number</th>
<th>Type</th>
<th>Length</th>
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<tr>
<td>NonStop Remote Database Facility (RDF) Workshop</td>
<td>U4146S</td>
<td>ILT/OST</td>
<td>4 days</td>
</tr>
</tbody>
</table>

ILT = Instructor-Led Training
OST = Onsite Dedicated Training

**Courses Descriptions**

Check web site course descriptions for prerequisites at:

To register in HP NonStop courses, go to:
[http://www.hp.com/cgi-bin/education/regform.cgi](http://www.hp.com/cgi-bin/education/regform.cgi)

You can also call 1 (800) 472-5277 in North America, to speak with an education consultant or register for courses. If you are in Canada, call 1 (800) 563-5089 for information, or contact your local education and training resource. For other locations, refer to the HP certification web page for your geography and your regional or local contacts.

Or, you can send an email to nonstop.training@hp.com

**Additional Recommended Reference Materials for This Exam**

References for exam questions are found in the web-based HP NonStop Technical Library (NTL). Technical documentation previously found on TIM (Total Information Manager)
collections now resides on NTL, which is now the single interface to all NonStop documentation and support information. The NTL can be accessed from these URLs:

Internal: http://techlibrary.cac.cpqcorp.net/ntl/.

External: www.hp.com/go/ntl

Note that this exam preparation guide typically references the latest documentation release available.
**Documentation**

The information in this exam preparation guide is current as of release G06.20. However, you may find the information in earlier or later versions of the HP NonStop Technical Library (NTL) documentation as well. Page numbers of specific references are provided below.

- NonStop AutoSYNC Software User’s Guide (522580-001) (all)
- NonStop RDF/IMP and IMPX System Management Manual (429600-001)
  - Preparing the RDF Environment
    - Specifying SYSGEN Parameters for RDF Data Blocks
- NonStop RDF/IMP and IMPX System Management Manual (522204-001)
  - Additional Reference Information
    - RDFLOCK File
    - RDF System Files
  - Auxiliary Audit Trails (all)
    - Configuring Extractors and Receivers
    - Usage of Master and Auxiliary Audit Trails
  - Entering RDFCOM Commands
    - ATINDEX audittrail-index-number
    - Command Overview
      - Set RDF
        - LOGFILE ems-collector-name
        - EXTENTS ( primary-extent, secondary-extent )
        - INFO VOLUME Command
        - RDF STATE requirement
        - RETAINCOUNT num
        - SET PURGER
        - UNPINAUDIT
    - Usage Guidelines
    - RDFVOLUME $volume
    - RTDWARNING rtd-time
    - SLOWMODE {ON OFF}
    - Set Receiver
    - UPDATEREXCEPTION {ON OFF}
    - UPDATEROPEN access – mode
    - VALIDATE CONFIGURATION (all)
- Entering RDFSCAN Commands
  - About the EMS Log
- Installing and Configuring RDF
  - Determining a Valid `initime` Value
  - Initializing and Configuring RDF
    - To a TMF Shutdown Timestamp
  - Installing RDF
    - RDF/IMP (T0346) Product Components
  - SOFTWARELOC Parameter
  - Preparing the Backup System
  - Preparing the Primary System
  - Preparing the Tables and Files
    - Compressing Audit Data for Tables and Files
  - Security Guidelines
  - Setting Individual Process Parameters
    - Image Trails
- Introducing RDF (read introductory statement)
  - Available Types of Replication to Multiple Backup Systems
  - Configuring an SMF Environment on the Primary System
  - Configuring an SMF Environment on the Backup RDF System
  - Extractor Process
  - Features
  - Online Product Initialization
  - Purger Process
  - RDF Control Subvolume
    - Features
  - RDF Operations
    - Extractor Process
  - RDF Processes
  - RDF Subsystem Overview
  - Reading Image Data
  - Receiver Process
  - Updater Processes
- Managing RDF
  - Breaking Up Image Trail Files
- Handling Disk Space Problems
- Issuing the TAKEOVER Command
- Making Online Dumps Without Updaters Running
- RDF and SQL DDL Operations (introduction)
  - Performing Non-Shared Access DDL Operations
- RDF Takeovers Within a Network Environment
- Running RDFSCAN
- Updater Failure
- Volume Recovery Processing
  - Maintaining the Databases
    - Catalog Changes
    - DDL Operations
    - Enscribe Databases
    - Multiple Indexes On a Single Base Table
    - Resynchronizing Databases (all)
    - Understanding Database States
  - Messages
    - 705
    - 736
    - 739
    - 744
    - 755
    - 813
    - 831
    - 833
    - 871
    - 873
    - 874
    - Initialize RDF Aborted
  - Network Transactions
    - Configuration Changes (all)
      - PNNETTXVOLUME Network Attribute
    - Network Validation and Considerations
  - Online Database Synchronization (read all)
    - CREATE/LOAD Issues
- SYNCHDBTIME Issues
- Synchronizing Entire Databases Online
- When Is Online Database Synchronization Complete?
  - Updater Messages
- Operating and Monitoring RDF
  - Reading Log Messages
- Preparing the RDF Environment
  - Preparing Databases for RDF Protection
  - Preparing Software and Database Files for RDF Operations
    - Configuring TMF for RDF Operations
    - Data Communication (Expand) Resources
    - Preparing Databases for RDF Protection
  - Synchronizing the Primary and Backup Databases
    - Re-Creating an Empty Database With an OBEY Command
    - Synchronizing Databases With SQLCI Commands
- RDF Subsystem Overview
  - Features
    - Subvolume- and File-Level Replication
      - EXCLUDE Clauses
      - INCLUDE Clauses
      - Performance Ramifications
- NonStop TMF Operations and Recovery Guide (422843-001)
  - Recovery Methods
    - File Recovery
    - Volume Recovery
  - Routine Maintenance
    - Why Audit Trail Files Stay Pinned on a Volume
- DSM Template Services Manual (427187-003)
  - Template Installation Program (Introduction)
- Hotstuff HS02720
  - NSK OPN T0346A01-A03 RDF/IMP (X)
- Hotstuff HS02731
  - NSK OPN T0346A01-A03 RDF/IMP (X)
- HP NonStop RDF/IMP and IMPX System Management Manual (524388-001)
  - Additional Reference Information
    - Note the bullets in the introductory material
- RDF System Files
  - Exception Files
  - UNDO List files
- Auxiliary Audit Trails
  - Takeover Ramifications
- Entering RDFCOM Commands
  - START RDF
- Introducing RDF
  - RDF Operations (introduction)
  - Receivers
  - Tasks
- Installing and Configuring RDF
  - Determining a Valid *initime* Value
  - Extractor Process
  - UPDATER Processes
- Maintaining the Databases
  - Resynchronizing Databases
- Managing RDF
  - Carrying Out a Planned Switchover (introduction)
    - Standard Configurations for Switchover
    - Reciprocal Configurations
  - Checking Exception Records for Uncommitted Transactions
  - Processor Failures
  - Takeover Operations
    - The RDF Takeover Operation
  - Stopping RDF
- Messages
  - About the Message Descriptions (read the introductory information)
    - 724
    - 776
    - 778
    - 862
- Network Transactions
- Online Database Synchronization
  - Overview
    - Synchronizing Entire Databases
o Triple Contingency
   ▪ What Is It?
   ▪ The RETAINCOUNT Configuration Parameter
   ▪ The COPYAUDIT Command
   ▪ COPYAUDIT Restartability
     o Summary

o Using ASAP
   • HP NonStop SQL/MX Quick Start (523724-001) (all)
   • HP NonStop TMF Operations and Recovery Guide (522417-002)
     o Routine Maintenance
       ▪ Verifying that New Transactions Can Start
   • NonStop RDF System Management Manual (133547)
     o Entering RDFCOM Commands
       ▪ RDF State Requirement
     o Introduction to the RDF Subsystem
       ▪ Sorted Image Trails
   • SCF Reference Manual for the Storage Subsystem (523408-001)
     o Storage Subsystem Commands
       ▪ AUDITTRAILBUFFER number
   • ServerNet Nomadic Disk (Release 2) User’s Guide (523968-001)
     o ServerNet Nomadic Disk Overview
       ▪ Remote Disk Drive Mirroring
       ▪ Physically Switching Disk Drives Between Modes
   • TMF Configuration and Planning Guide (422914-001)
     o Configuring the TMF Subsystem for Backup and Recovery
       ▪ Configuration Options for Backup and Recovery
         o Turning Audit Dumping On or Off
     o Reconfiguring Audit Trails
       ▪ Changing the Audit Trail Configuration
       ▪ Using Auxiliary Audit Trails

Other References

These references refer to manuals available as part of courses taught by NonStop Education.

• Remote Database Facility Workshop (U4146S)
Conclusion

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

Samples

The following examples represent the types of items and question formats that you could see on the exam. These are generic samples and do not reflect the content being tested.

1. Which planet is closest to the Earth?
   A. Mars
   B. Pluto
   C. Venus
   D. Saturn

2. Which planets are “inner planets” — planets found within the asteroid belt? Select TWO.
   A. Pluto
   B. Earth
   C. Neptune
   D. Mercury
   E. Venus
3. Click the Exhibit button.

What is this constellation called?
A. Leo
B. Aries
C. Orion
D. Taurus
E. Gemini
F. Pleiades
G. Ursa Minor
H. Ursa Major
I. Andromeda

4. Click the Task button.

Place the planets in order of closest to farthest from the planet Earth.
5. Click the Task button.

Review the picture of the planets and click on Saturn.