Veritas NetBackup™ Security and Encryption Guide

UNIX, Windows, and Linux

Release 8.1
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## Chapter 1

**Increasing NetBackup security**

- About NetBackup security and encryption ........................................... 15
- NetBackup security implementation levels ........................................... 15
- World-level security ........................................................................ 16
- Enterprise-level security ................................................................. 17
- Datacenter-level security overview .................................................... 19
- NetBackup Access Control (NBAC) ................................................... 19
- Combined world, enterprise, and data center levels ........................... 24
- NetBackup security implementation types ........................................... 25
- Operating system security ............................................................... 27
- NetBackup security vulnerabilities ..................................................... 27
- Standard NetBackup security .......................................................... 28
- Media Server Encryption Option (MSEO) security ............................... 29
- Client side encryption security ......................................................... 30
- NBAC on master, media server, and graphical user interface security .......................... 33
- NBAC complete security .................................................................. 34
- All NetBackup security .................................................................... 35

## Chapter 2

**Security deployment models**

- Workgroups ....................................................................................... 39
- Single datacenters ............................................................................ 39
- Multi-datacenters ............................................................................. 39
- Workgroup with NetBackup ............................................................. 40
- Single datacenter with standard NetBackup ........................................ 43
- Single datacenter with Media Server Encryption Option (MSEO) ....... 46
- Single datacenter with client side encryption ..................................... 49
- Single datacenter with NBAC on master and media servers ............... 51
- Single datacenter with NBAC complete ............................................. 55
- Single datacenter with all security implemented .................................. 58
- Multi-datacenter with standard NetBackup ........................................ 62
- Multi-datacenter with Media Server Encryption Option (MSEO) ....... 66
- Multi-datacenter with client side encryption ..................................... 71
- Multi-datacenter with NBAC on master and media servers ............... 76
- Multi-datacenter with NBAC complete ............................................. 82
Chapter 3  Port security

About NetBackup TCP/IP ports ........................................... 95
About NetBackup daemons, ports, and communication .......... 97
  Standard NetBackup ports .......................................... 97
  NetBackup master server outgoing ports .......................... 98
  NetBackup media server outgoing ports ........................... 99
  NetBackup enterprise media management (EMM) server outgoing ports ........................................ 100
  Client outgoing ports ................................................. 101
  Java server outgoing ports .......................................... 101
  Java console outgoing ports ........................................ 102
  About MSDP port usage ............................................ 102
  About Cloud port usage ............................................. 103
  Additional port information for products that interoperate with NetBackup ........................................... 103
  About configuring ports ............................................. 105
    Enabling or disabling random port assignments ................ 105
    Editing port information in configuration files ................. 108
    Updating client connection options ............................. 109
    Updating port settings for the Media Manager in the vm.conf file .................................................. 109

  Port requirements for NDMP backups ................................ 110
  Known firewall problems encountered when using NetBackup with third-party robotic products .................. 111

Chapter 4  Auditing NetBackup operations

About NetBackup auditing .................................................. 113
Viewing the current audit settings ..................................... 115
Configuring auditing on a NetBackup master server ............... 116
User identity in the audit report ........................................ 119
About Enhanced Auditing ............................................... 119
Enabling Enhanced Auditing ......................................... 120
Configuring Enhanced Auditing ....................................... 121
  Connecting to a media server with Enhanced Auditing ........ 121
  Changing a server across NetBackup domains ................. 122
  Configuration requirements if using Change Server with NBAC or Enhanced Auditing ..................... 124
Disabling Enhanced Auditing ......................................... 125
Auditing host property changes ....................................... 125
Retaining and backing up audit trail records ....................... 126
Chapter 5  Access control security ............................................................. 135

About access control in NetBackup ..................................................... 135
User management .............................................................................. 142
User authentication ........................................................................... 143
Impact of Access Control via Enhanced Auditing on Java interface
authorization ...................................................................................... 143

Chapter 6  NetBackup Access Control Security (NBAC) ........... 145

About using NetBackup Access Control (NBAC) ......................... 145
NetBackup access management administration .............................. 148
About NetBackup Access Control (NBAC) configuration .............. 149
Configuring NetBackup Access Control (NBAC) ......................... 149
  NBAC configuration overview ......................................................... 150
  Configuring NetBackup Access Control (NBAC) on standalone
  master servers .................................................................................. 151
  Installing the NetBackup master server highly available on a cluster
........................................................................................................ 151
  Configuring NetBackup Access Control (NBAC) on a clustered
  master server ................................................................................. 152
  Configuring NetBackup Access Control (NBAC) on media servers
........................................................................................................ 153
  Installing and configuring access control on clients ...................... 155
About including authentication and authorization databases in the
NetBackup hot catalog backups ....................................................... 155
NBAC configure commands summary .............................................. 155
Unifying NetBackup Management infrastructures with the
setuptrust command ......................................................................... 160
Using the setuptrust command .......................................................... 161
Configuring Access Control host properties for the master and media
server ............................................................................................... 162
  Authentication Domain tab .................................................................. 163
  Authorization Service tab ........................................................................ 165
  Network Attributes tab ........................................................................ 166
Access Control host properties dialog for the client ..................... 166
  Authentication Domain tab for the client ............................................. 167
  Network Attributes tab for the client ................................................... 168
Troubleshooting Access Management .............................................. 169
Troubleshooting NBAC issues .......................................................... 170
Configuration and troubleshooting topics for NetBackup
  Authentication and Authorization ............................................... 171
Windows verification points ............................................................ 178
UNIX verification points ................................................................. 187
Verification points in a mixed environment with a UNIX master
  server .................................................................................. 194
Verification points in a mixed environment with a Windows master
  server .................................................................................. 200
About the nbac_cron utility ........................................................... 207
Using the nbac_cron utility ........................................................... 207
Using the Access Management utility ............................................. 209
About determining who can access NetBackup ............................... 210
  Individual users .................................................................... 211
  User groups ......................................................................... 211
  NetBackup default user groups ............................................... 213
  Configuring user groups ......................................................... 214
About defining a user group and users ......................................... 216
Viewing specific user permissions for NetBackup user groups .......... 220
  Granting permissions ............................................................. 221
  Authorization objects ............................................................ 222
  Media authorization object permissions ................................... 223
  Policy authorization object permissions .................................... 223
  Drive authorization object permissions ..................................... 224
  Report authorization object permissions ................................... 225
  NBU_Catalog authorization object permissions ......................... 225
  Robot authorization object permissions .................................... 226
  Storage unit authorization object permissions ......................... 226
  DiskPool authorization object permissions ............................... 226
  BUAndRest authorization object permissions ............................ 227
  Job authorization object permissions ....................................... 228
  Service authorization object permissions ................................ 228
  HostProperties authorization object permissions .................... 230
  License authorization object permissions .................................. 230
  Volume group authorization object permissions ....................... 230
  VolumePool authorization object permissions ......................... 231
  DevHost authorization object permissions .............................. 231
  Security authorization object permissions .............................. 232
  Fat server authorization object permissions ............................ 232
  Fat client authorization object permissions ............................ 233
  Vault authorization object permissions ................................... 233
  Server group authorization object permissions ......................... 234
Chapter 7 Security management in NetBackup

Overview of security certificates in NetBackup .................................................. 242
About secure communication in NetBackup ...................................................... 242
About the Security Management utilities ......................................................... 243
About login activity ............................................................................................ 246
About audit events ............................................................................................ 247
Viewing audit events .......................................................................................... 247
Audit Events tab .................................................................................................. 247
Viewing audit event details ................................................................................. 248
Audit Events Details dialog box ......................................................................... 249
Viewing audit event status .................................................................................. 250
Troubleshooting auditing issues related to the Access History tab ................. 251
About host management ...................................................................................... 251
Hosts tab ................................................................................................................. 251
Adding host ID to host name mappings ............................................................... 252
Add or Remove Host Mappings dialog box ......................................................... 254
Removing host ID to host name mappings .......................................................... 255
Mappings for Approval tab .................................................................................. 256
Viewing auto-discovered mappings ................................................................... 256
Mapping Details dialog box ............................................................................... 257
Approving host ID to host name mappings ......................................................... 258
Rejecting host ID to host name mappings ............................................................ 259
Adding shared or cluster mappings ................................................................... 259
Add Shared or Cluster Mappings dialog box ....................................................... 261
Resetting NetBackup host attributes ................................................................. 262
Adding or deleting comment for a host ............................................................... 263
About global security settings ............................................................................. 264
About secure communication settings ............................................................... 264
Disabling insecure communication ..................................................................... 266
About insecure communication with 8.0 and earlier hosts ............................... 267
About communication with 8.0 or earlier host in multiple NetBackup domains .................................................................................................................... 267
Automatically mapping host ID to host names and IP addresses .................... 268
About disaster recovery settings ......................................................................... 269
Setting a passphrase to encrypt disaster recovery packages ........ 270
Disaster recovery packages ........................................................... 272
About host name-based certificates .............................................. 272
Deploying host name-based certificates ....................................... 273
About host ID-based certificates .................................................. 274
Web login requirements for nbcertcmd command options .......... 275
Using the Certificate Management utility to issue and deploy host
ID-based certificates ................................................................... 276
About certificate deployment security levels ............................... 279
Automatic host ID-based certificate deployment ......................... 282
Deploying host ID-based certificates .......................................... 282
Implication of clock skew on certificate validity ........................ 284
Setting up trust with the master server (Certificate Authority) ...... 285
Forcing or overwriting certificate deployment ............................. 289
Retaining host ID-based certificates when reinstalling NetBackup
on non-master hosts .................................................................... 290
Deploying certificates on a client that has no connectivity with the
master server ............................................................................. 291
About host ID-based certificate expiration and renewal .............. 291
Deleting sensitive certificates and keys from media servers and
clients .......................................................................................... 292
Cleaning host ID-based certificate information from a host before
cloning a virtual machine ............................................................ 293
About reissuing host ID-based certificates .................................... 294
About Token Management for host ID-based certificates .......... 298
Creating authorization tokens ...................................................... 299
Deleting authorization tokens ....................................................... 301
Viewing authorization token details ............................................. 301
About expired authorization tokens and cleanup ......................... 302
About the host ID-based certificate revocation list ....................... 303
Refreshing the CRL on a NetBackup host .................................... 304
About revoking host ID-based certificates .................................. 304
Removing trust between a host and a master server ................. 305
Revoking a host ID-based certificate .......................................... 307
Determining a NetBackup host's certificate state ...................... 309
Getting a list of NetBackup hosts that have revoked certificates
.............................................................................................. 311
Deleting host ID-based certificates .............................................. 311
Security certificate deployment in a clustered NetBackup setup .... 312
About deployment of a host ID-based certificate on a clustered
NetBackup host ......................................................................... 313
Deploying host ID-based certificates on cluster nodes .............. 314
Revoking a host ID-based certificate for a clustered NetBackup setup ........................................... 315
Deploying a host ID-based certificate on a clustered NetBackup setup using reissue token .......... 316
Creating a reissue token for a clustered NetBackup setup ......................................................... 316
Renewing a host ID-based certificate on a clustered NetBackup setup ....................................... 317
Viewing certificate details of a clustered NetBackup setup ....................................................... 317
Removing CA certificates from a clustered NetBackup setup .................................................... 318
Generating a certificate on a clustered master server after disaster recovery installation ............. 319
About the communication between a NetBackup client located in a demilitarized zone and a master server through an HTTP tunnel ................................................................. 320

Chapter 8 Data at rest encryption security ................................................................. 324
Data at rest encryption terminology ......................................................................................... 324
Data at rest encryption considerations .................................................................................... 325
Encryption security questions to consider ............................................................................. 326
Comparison of encryption options ......................................................................................... 327
About NetBackup client encryption ....................................................................................... 328
   Installation prerequisites for encryption security ............................................................. 328
   About running an encryption backup ................................................................................. 329
   NetBackup standard encryption restore process ............................................................. 331
   NetBackup legacy encryption restore process ................................................................. 332
Configuring standard encryption on clients ............................................................................ 333
   Managing standard encryption configuration options ...................................................... 333
   Managing the NetBackup encryption key file ................................................................. 334
   About configuring standard encryption from the server ................................................. 335
   Restoring an encrypted backup file to another client ....................................................... 338
   About configuring standard encryption directly on clients ............................................ 338
   Setting standard encryption attribute in policies ......................................................... 339
   Changing the client encryption settings from the NetBackup server ............................... 339
Configuring legacy encryption on clients ................................................................................ 340
   About configuring legacy encryption from the client ....................................................... 340
   About configuring legacy encryption from the server ...................................................... 344
   Restoring a legacy encrypted backup created on another client ......................................... 347
   About setting legacy encryption attribute in policies ...................................................... 347
   Changing client legacy encryption settings from the server ............................................. 348
   Additional legacy key file security for UNIX clients ......................................................... 348
Chapter 9  
Data at rest key management .................................... 352

Federal Information Processing Standards (FIPS) ............... 352
About FIPS enabled KMS ............................................... 353
About the Key Management Service (KMS) ......................... 355
  KMS considerations ...................................................... 355
  KMS principles of operation .......................................... 360
About writing an encrypted tape ..................................... 360
About reading an encrypted tape ..................................... 361
KMS terminology .......................................................... 361
Installing KMS ............................................................. 363
  Using KMS with NBAC .................................................. 367
About installing KMS with HA clustering ........................... 367
Enabling cluster use with the KMS service ......................... 368
Enabling the monitoring of the KMS service ....................... 368
Disabling the monitoring of the KMS service ....................... 369
Removing the KMS service from monitored list ................... 369
Configuring KMS .......................................................... 369
  Creating the key database ............................................ 370
About key groups and key records .................................... 371
Overview of key record states ....................................... 373
About backing up the KMS database files ......................... 376
About recovering KMS by restoring all data files ................. 377
Recovering KMS by restoring only the KMS data file .......... 377
Recovering KMS by regenerating the data encryption key ...... 377
Problems backing up the KMS data files ............................ 378
Solutions for backing up the KMS data files ....................... 379
Creating a key record .................................................... 379
Listing keys from a key group ........................................ 379
Configuring NetBackup to work with KMS ......................... 380
About using KMS for encryption ...................................... 384
About importing KMS encrypted images ............................ 384
Example of running an encrypted tape backup .................... 384
Example of verifying an encryption backup ......................... 385
KMS database constituents .............................................. 386
  Creating an empty KMS database .................................. 386
Importance of the KPK ID and HMK ID ............................... 386
About periodically updating the HMK and KPK .................... 387
Backing up the KMS keystore and administrator keys .......... 387
Command line interface (CLI) commands .......................... 387
CLI usage help ............................................................. 388
Chapter 10  Regenerating keys and certificates ................................. 406

About regenerating keys and certificates ........................................ 406
Regenerating NetBackup authentication broker keys and certificates ...
.............................................................................................................. 407
Regenerating host identity keys and certificates ................................ 407
Regenerating web service keys and certificates .............................. 407
Regenerating nbcertservice keys and certificates .......................... 408
Regenerating tomcat keys and certificates ................................. 408
Regenerating JWT keys ............................................................... 409
Regenerating NetBackup gateway certificates .............................. 409
Regenerating web trust store certificates ........................................ 409
Regenerating VMware vCenter plug-in certificates ...................... 410
Regenerating OpsCenter Administrator Console session certificates...
.............................................................................................................. 411
Regenerating OpsCenter keys and certificates ............................... 411
Regenerating NetBackup encryption key file ............................... 411
<table>
<thead>
<tr>
<th>Chapter 11</th>
<th>NetBackup web services account</th>
<th>412</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>About the NetBackup web services account</td>
<td>412</td>
</tr>
<tr>
<td></td>
<td>Changing the web service user account</td>
<td>413</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Index</th>
<th>415</th>
</tr>
</thead>
</table>

| Index      | 425 |
Increasing NetBackup security

This chapter includes the following topics:

- About NetBackup security and encryption
- NetBackup security implementation levels
- World-level security
- Enterprise-level security
- Datacenter-level security overview
- NetBackup Access Control (NBAC)
- Combined world, enterprise, and data center levels
- NetBackup security implementation types
- Operating system security
- NetBackup security vulnerabilities
- Standard NetBackup security
- Media Server Encryption Option (MSEO) security
- Client side encryption security
- NBAC on master, media server, and graphical user interface security
- NBAC complete security
- All NetBackup security
About NetBackup security and encryption

NetBackup security and encryption provide protection for all parts of NetBackup operations on NetBackup master servers, media servers, and attached clients. Also made secure are the operating systems on which the servers and clients are running. The backup data is protected through encryption processes and vaulting. NetBackup data that is sent over the network is protected by dedicated and secure network ports.

The various level and implementation of NetBackup security and encryption are included in the following topics.

See “NetBackup security implementation levels” on page 15.
See “NetBackup Access Control (NBAC)” on page 19.
See “Operating system security” on page 27.
See “Media Server Encryption Option (MSEO) security” on page 29.
See “Client side encryption security” on page 30.
See “NBAC on master, media server, and graphical user interface security” on page 33.
See “NBAC complete security” on page 34.
See “All NetBackup security” on page 35.

NetBackup security implementation levels

The NetBackup security implementation perspective begins in a very broad sense at the world level and becomes more detailed at the enterprise level. Security becomes very specific at the data center level.

Table 1-1 shows how NetBackup security levels can be implemented.

<table>
<thead>
<tr>
<th>Security level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>World level</td>
<td>Specifies the web server access and the encrypted tapes that are transported and vaulted</td>
</tr>
<tr>
<td>Enterprise level</td>
<td>Specifies internal users and security administrators</td>
</tr>
<tr>
<td>Datacenter level</td>
<td>Specifies NetBackup operations</td>
</tr>
</tbody>
</table>
World-level security

World-level security lets external users access corporate web servers behind firewalls and allows encrypted tapes to be transported and vaulted off site. World-level security encompasses the enterprise level and the data center level.

Figure 1-1 World-level security scope
<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>World-level external users</td>
<td>Specifies that external users can access web servers behind firewalls. External users cannot access or use NetBackup functionality from the Internet, because the external firewall prevents NetBackup ports from being accessed.</td>
</tr>
<tr>
<td>World-level Internet</td>
<td>Specifies a collection of interconnected computer networks that are linked by copper wires, fiber cables, and wireless connections. Corporate web servers can be accessed from the Internet by using HTTP ports through firewalls.</td>
</tr>
<tr>
<td>World-level WAN</td>
<td>The Wide Area Network (WAN) is not shown in the security overview illustration. The WAN is a dedicated high-speed connection used to link NetBackup data centers that are geographically distributed.</td>
</tr>
<tr>
<td>World-level transport</td>
<td>Specifies that a transport truck can move encrypted client tapes off-site to secure vault facilities.</td>
</tr>
<tr>
<td>World-level vault off-site</td>
<td>Specifies that encrypted tape can be vaulted at secure storage facilities other than the current data center.</td>
</tr>
</tbody>
</table>

**Enterprise-level security**

Enterprise-level security contains more tangible parts of the NetBackup security implementation. It encompasses internal users, security administrators, and the data center level.
Figure 1-2 Enterprise-level security scope

Security Overview

Enterprise Level

Data Center

Internal Users

Security Administrator

Increasing NetBackup security
Table 1-3  Types of enterprise-level security

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal users</td>
<td>Specifies the users who have permissions to access and use NetBackup functionality from within the data center. Internal users are typically a combination of individuals such as database administrators, backup administrators, operators, and general system users.</td>
</tr>
<tr>
<td>Security administrator</td>
<td>Specifies a user who has been granted administrator permissions to access and manage the NetBackup security functionality from within the data center.</td>
</tr>
</tbody>
</table>

Datacenter-level security overview

Datacenter-level security comprises the core of NetBackup security functionality. It can consist of a workgroup, a single data center, or a multi-datacenter.

Table 1-4 describes the deployment models unique to datacenter-level security.

Table 1-4  Deployment models for datacenter-level security

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workgroup</td>
<td>A small group of systems (less than 50) used with NetBackup in a wholly internal fashion.</td>
</tr>
<tr>
<td>Single datacenter</td>
<td>A medium-to-large group of hosts (greater than 50) and can back up hosts within the demilitarized zone (DMZ).</td>
</tr>
<tr>
<td>Multi-datacenter</td>
<td>Specifies a medium to large group of hosts (greater than 50) that span two or more geographic regions. They can connect by WAN. This configuration can also include hosts in the DMZ that are backed up.</td>
</tr>
</tbody>
</table>

See “NetBackup security implementation levels” on page 15.

NetBackup Access Control (NBAC)

The NetBackup Access Control (NBAC) functionality incorporates the NetBackup Product Authentication and Authorization into NetBackup, increasing security for the master servers, media servers, and clients.

See “About NetBackup security and encryption” on page 15.

Important points about NBAC include:

- Authentication and Authorization are used together
NBAC uses authentication identities from a trusted source to reliably identify involved parties. Access decisions can then be made for manipulation of NetBackup based on those identities. Note that NetBackup Security Services are now embedded.

The NetBackup Product Authentication and Authorization consist of the root broker, authentication broker, authorization engine, and the graphical user interface.

Oracle, Oracle Archiver, DB2, Informix, Sybase, SQL Server, SAP and EV Migrator are not supported with NBAC.

NBAC is not supported on Appliances.

The NetBackup catalog backup is supported with NBAC.

The following table describes the NetBackup components that are used in security.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root broker</td>
<td>The NetBackup master server is the root broker in a data center installation. There is no provision to use another root broker. The recommendation is to allow trust between root brokers. The root broker authenticates the authentication broker. The root broker does not authenticate clients.</td>
</tr>
<tr>
<td>Authentication broker</td>
<td>Authenticates the master server, media server, graphical user interface, and clients by establishing credentials with each one of them. The authentication broker also authenticates a user when operating a command prompt. There can be more than one authentication broker in a data center installation. The authentication broker can be combined with the root broker.</td>
</tr>
<tr>
<td>Authorization engine</td>
<td>Communicates with the master server and the media server to determine the permissions of an authenticated user. These permissions determine the functionality available to a given server. The authorization engine also stores user groups and permissions. Only one authorization engine is required in a data center installation. The authorization engine also communicates over the WAN to authorize other media servers in a multi-datacenter environment.</td>
</tr>
<tr>
<td>graphical user interface</td>
<td>Specifies a Remote Administration Console that receives credentials from the authentication brokers. The graphical user interface then may use the credentials to gain access to functionality on the clients, media, and master servers.</td>
</tr>
<tr>
<td>MSEO</td>
<td>Specifies the MSEO (media server Encryption Option) that is a software appliance that encrypts data written to tape by the media server (data at rest encryption). The MSEO is an alternative to the client side encryption that can reduce the CPU processing load on the client.</td>
</tr>
<tr>
<td>Component</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Master server</td>
<td>Communicates with the root broker and authentication broker, graphical user interface, authorization engine, media server, and clients.</td>
</tr>
<tr>
<td>NetBackup administrator</td>
<td>Specifies a user who has been granted administrator permissions to access and manage the NetBackup functionality from within the data center.</td>
</tr>
<tr>
<td>Media server</td>
<td>Communicates with the master server, root broker and authentication broker, authorization engine, MSEO, and clients 1 through 6. The media server writes unencrypted data to tape for client 5 and encrypted data to tape for client 6.</td>
</tr>
<tr>
<td>Clients</td>
<td>Specifies that clients 1 through 4 are standard NetBackup types. Client 5 is a web server type located in the DMZ. Client 6 is a client side encrypted type also located in the DMZ. All client types are managed by the master server and have their data backed up to tape through the media server. Clients 5 and 6 communicate to NetBackup using NetBackup only ports through the internal firewall. Client 5 also receives connections from the Internet using HTTP only ports through the external firewall.</td>
</tr>
</tbody>
</table>
| Tapes               | Specifies that the tape security in NetBackup can be increased by adding the following:  
  ■ Client side encryption  
  ■ MSEO (media server Encryption Option)  
  ■ Encryption of data at rest

Unencrypted and encrypted data tapes are produced in the data center. The unencrypted tape data is written for clients 1 through 5 and stored on-site at the data center. The encrypted tapes are written for client 6 and are transported off-site to a vault for disaster recovery protection. |
| Encryption          | Specifies that NetBackup encryption can increase security by providing the following:  
  ■ Greater data confidentiality  
  ■ The loss of physical tape is not as critical if all the data is effectively encrypted  
  ■ The best risk mitigation strategy

For more information about encryption:  
See “Encryption security questions to consider” on page 326. |
### Table 1-5 NetBackup components used in security (continued)

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
</table>
| Data over the wire security   | Includes the communication between master servers, media servers, clients, and communication using ports through firewalls and over WANs. For more information about ports:  
  See “About NetBackup TCP/IP ports” on page 95. 
  The data over the wire part of NetBackup can help increase security in the following ways: 
  - NetBackup Access Control (NBAC)  
  - Classic NetBackup daemons employ authentication when NBAC is enabled  
  - CORBA daemons use the fully encrypted channels that support confidentiality, and provide data integrity  
  - Firewalls  
  - Disabling the unused ports in NetBackup and in other products:  
    See “Enabling or disabling random port assignments” on page 107.  
  - PBX and VNETD dedicated ports provide increased NetBackup security  
  - Central set of ports to monitor and open through firewalls |
| Firewall security             | Specifies that the NetBackup firewall support can help increase security. Important points about firewall security include the following:  
  - Veritas recommends the use of firewall and intrusion detection protection for NetBackup  
  - Firewall protection relates to general network security from a NetBackup standpoint. It focuses on reducing the possible "door locks" for a thief to try to pick. It may be helpful to review the possibility of blocking NFS, telnet, FTP, email ports. They are not strictly needed for NetBackup use and can provide an "open door" for unwanted access.  
  - Secure the master server as much as possible  
  - Firewalls can include internal firewalls and external firewalls, as follows:  
    - Internal firewall - allows NetBackup to access web server client 5 and encrypted client 6 in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication through the internal firewall and into and out of the DMZ. The HTTP ports are open in the External Firewall and are not allowed to pass through the internal firewall.  
    - External firewall - allows external users to access the web server client 5 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for web server client 5 to communicate through the internal firewall to NetBackup. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of web server client 5 can pass through the external firewall to the Internet. |
Table 1-5  NetBackup components used in security (continued)

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demilitarized zone (DMZ)</td>
<td>Specifies that the demilitarized zone (DMZ) increases security as follows:</td>
</tr>
<tr>
<td></td>
<td>■ The DMZ is a restricted area in which the number of ports that are allowed for specific hosts is highly controlled</td>
</tr>
<tr>
<td></td>
<td>■ The DMZ exists between the external firewall and the internal firewall. The common area in this example is the web server. The external firewall blocks all ports except for the HTTP (standard) and HTTPS (secure) web ports. The internal firewall blocks all ports except for NetBackup and database ports. The DMZ eliminates the possibility of external Internet access to internal NetBackup server and database information.</td>
</tr>
<tr>
<td></td>
<td>The DMZ provides a &quot;safe&quot; area of operation for the web server client 5 and encrypted client 6 between the internal firewall and external firewall. The web server client 5 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The web server client 5 can also communicate through the external firewall to the Internet using only HTTP ports.</td>
</tr>
<tr>
<td></td>
<td><strong>Figure 1-3</strong> shows an example internal and external firewall with DMZ.</td>
</tr>
</tbody>
</table>

The following figure shows an example of the internal and the external firewall with DMZ.
Combined world, enterprise, and data center levels

The combined world, enterprise, and data center levels model is the area where typical full-functioning NetBackup operations occur. Through the outermost world level, external users can access corporate web servers behind firewalls and encrypted tapes are transported and vaulted off-site. At the next level deeper, the enterprise level, functions related to internal users, security administrators, and the data center level occur. At the deepest level, the data center level, the core NetBackup security functionality occurs through a workgroup, single data center, or multi-datacenter.

The following figure shows the combined world, enterprise, and data center levels model.
NetBackup security implementation types

The following table shows the NetBackup security implementation types, characteristics, complexity, and potential security deployment models.
<table>
<thead>
<tr>
<th>Security implementation type</th>
<th>Characteristics</th>
<th>Complexity</th>
<th>Security deployment models</th>
</tr>
</thead>
</table>
| See “Operating system security” on page 27. | ■ Operating system dependent  
■ Varies based on system components | Variable | Workgroup  
Single data center  
Multi-datacenter |
| See “Standard NetBackup security” on page 28. | ■ Manage as root or administrator  
■ Data is not encrypted | Low | Workgroup with NetBackup  
Single data center with standard NetBackup  
Multi-datacenter with standard NetBackup |
| See “Media Server Encryption Option (MSEO) security” on page 29. | ■ Media server encryption  
■ Client to media server traffic is not encrypted  
■ May affect CPU performance on the media server  
■ Location of keys | Low | Single data center with media server Encryption Option (MSEO)  
Multi-datacenter with media server Encryption Option (MSEO) |
| See “Client side encryption security” on page 30. | ■ Data is encrypted on the client  
■ Encrypted data is sent over the wire  
■ Can affect CPU performance on the client  
■ Location of keys | Medium | Single data center with client side encryption  
Multi-datacenter with client side encryption |
| See “NBAC on master, media server, and graphical user interface security” on page 33. | ■ NBAC gives authorization to access master and media servers  
■ Authenticates the system and users to access master and media servers | Medium | Single data center with NBAC on master and media servers  
Multi-datacenter with NBAC on master and media servers |
| See “NBAC complete security” on page 34. | ■ NBAC gives authorization throughout the system  
■ NBAC gives authentication throughout the entire system (servers, clients, and users) | High | Single data center with NBAC complete  
Multi-datacenter with NBAC complete |
Table 1-6 Security implementation types *(continued)*

<table>
<thead>
<tr>
<th>Security implementation type</th>
<th>Characteristics</th>
<th>Complexity</th>
<th>Security deployment models</th>
</tr>
</thead>
<tbody>
<tr>
<td>See “All NetBackup security” on page 35.</td>
<td>■ Incorporates all NetBackup security types ■ The example diagrams and documentation employ all security mechanisms together</td>
<td>Very High</td>
<td>Single data center with all security implemented Multi-datacenter with all NetBackup security</td>
</tr>
</tbody>
</table>

**Operating system security**

Operating system security can be enhanced for master servers, media servers, and clients by doing the following:

- Installing operating system patches
  Operating system patches include the upgrades applied to the operating system to keep it running at the highest level of system integrity. Upgrades and patches should be kept at the level that is specified by the vendor.
- Following safe firewall procedures
- Employing least privilege administration
- Limiting root users
- Applying the security protocol over IP (IPSEC) hardware
- Turning off unused ports of the outward facing applications
- Providing a secure base on which to run NetBackup
- Adding a first line of intelligence in an investigation to determine if the operating system has been compromised
- Making sure that security implementation is the same for all operating systems
- Adding full interoperability between various systems using NBAC in a heterogenous environment

**NetBackup security vulnerabilities**

Veritas suggests that protective measures are in place to guard against the rare instance of a possible NetBackup security vulnerability as follows:

- A full NetBackup update is provided with the next NetBackup maintenance patch
The importance of accumulative NetBackup updates

Use the Veritas website for information on possible security vulnerability issues: https://www.veritas.com/content/support/en_US/security.html, or http://www.veritas.com/security

Use email contacts for possible security vulnerability issues:
secure@veritas.com

Standard NetBackup security

The standard NetBackup security only includes the security that is offered by the operating system and the hardware components of the data center. The authorized NetBackup users administer as root or administrator. Client data is not encrypted. The master server, media server, and client are all run within a local enterprise data center. Unencrypted data is usually stored on site, presenting a relatively high risk for no disaster recovery plan. Data that is sent off-site could be subject to a violation of confidentiality if it is intercepted.

The following figure shows an example of the standard NetBackup configuration.
Media Server Encryption Option (MSEO) security

The media server encryption option (MSEO) security type provides a client level data encryption solution. Encrypted tape data is transported and stored in a vault off site lowering data loss risk in a total disaster recovery scenario. The master server, media server, MSEO, and client are all run within a local enterprise data center. The MSEO can relieve CPU intensive operations on the individual clients. This is comparing MSEO to client side encryption by moving encryption operations to the media server. However, MSEO can affect CPU performance on the media server. The MSEO to tape traffic is encrypted. Client to media server traffic is not encrypted. Keep the keys on the MSEO device so that encrypted data can be accessed in the future.
The following figure shows an example of the media server encryption option (MSEO) configuration.

**Figure 1-6** Media server encryption option (MSEO)

---

**Client side encryption security**

Client side encryption security is used to ensure data confidentiality across the wire as well as on tape. This encryption helps to mitigate the risk of passive wire tapping within the organization. The risk of data exposure is reduced as the tapes are moved off site. The encryption key is located on the client. Data communication is encrypted over the wire between the client and the media server. Data encryption by the client can be CPU intensive.

The following backup policy types support the use of the client encryption option.
The following backup policy types do not support the Client Encryption Option. You cannot select the encryption check box in the policy attributes interface for these policy types.

- FlashBackup
- FlashBackup-Windows
- NDMP
- NetWare
- OS/2
- Vault

The media server Encryption Option is applied at the point where data is written to tape and can be used with all of the policy types listed. The exceptions are NDMP policies which write data directly from NDMP servers in NDMP format. Media server Encryption Option is supported for Remote NDMP where the backup is written to tape using a regular media server.

Note that VMS and OpenVMS clients do not support the client encryption option. These clients use the Standard policy type.
The following figure shows an example of the client side encryption configuration.

**Figure 1-7** Client side encryption
The NBAC on master server, media server, and graphical user interface security method uses the authentication broker. The broker provides credentials to the master server, the media server, and the graphical user interface. This data center example uses the NetBackup Access Control on the master and the media servers to limit access to portions of NetBackup. Non-root administration of NetBackup can also be done using this example. NBAC is configured for use between the servers and the graphical user interfaces. Non-root users can log on to NetBackup using the operating system. Use the UNIX password or the Windows local domain to administer NetBackup. The global user repositories (NIS/NIS+ or Active Directory) can also be used to administer NetBackup. In addition, NBAC can be used to limit the level of access to NetBackup for certain individuals. For example, you can segregate day to day operational control from environmental configuration such as adding new policies, robots, etc.

The following figure shows an example NBAC on master and media server configuration.
The NBAC complete security method uses the authentication broker to provide credentials to the master server, media server, and client. This environment is very similar to the NBAC master, media server, and graphical user interface model. The main differences are that all hosts participating in the NetBackup environment are reliably identified using credentials. And non-root administrators have the ability to manage the NetBackup clients based on configurable levels of access. Note that user identities can exist in global repositories such as Active Directory in Windows.
or NIS in UNIX. Identities can also exist in local repositories (UNIX password, local Windows domain) on those hosts supporting an authentication broker.

The following figure shows an example of the NBAC complete configuration.

**Figure 1-9** NBAC complete

**All NetBackup security**

This combines all security models in NetBackup. It represents a very sophisticated environment in which there are different requirements for a variety of clients. The client requirements can necessitate using encryption off host (such as under powered host, or a database backup). Client requirements can also necessitate using encryption on host due to the sensitive nature of the data on the host. Adding NBAC
to the security mix allows segregation of administrators, operators, and users within NetBackup.

The following figure shows an example with all of the NetBackup security implemented.
Figure 1-10  All NetBackup security

Increasing NetBackup security
Security deployment models

This chapter includes the following topics:

- Workgroups
- Single datacenters
- Multi-datacenters
- Workgroup with NetBackup
- Single datacenter with standard NetBackup
- Single datacenter with Media Server Encryption Option (MSEO)
- Single datacenter with client side encryption
- Single datacenter with NBAC on master and media servers
- Single datacenter with NBAC complete
- Single datacenter with all security implemented
- Multi-datacenter with standard NetBackup
- Multi-datacenter with Media Server Encryption Option (MSEO)
- Multi-datacenter with client side encryption
- Multi-datacenter with NBAC on master and media servers
- Multi-datacenter with NBAC complete
- Multi-datacenter with all NetBackup security
Workgroups

A workgroup is a small group of systems (less than 50) that is used internally with NetBackup.

An example workgroup is shown as follows:

- See “Workgroup with NetBackup” on page 40.

Single datacenters

A single datacenter is defined as a medium to large group of hosts (greater than 50).

Example single datacenters are shown in the following list:

- See “Single datacenter with standard NetBackup” on page 43.
- See “Single datacenter with Media Server Encryption Option (MSEO)” on page 46.
- See “Single datacenter with client side encryption” on page 49.
- See “Single datacenter with NBAC on master and media servers” on page 51.
- See “Single datacenter with NBAC complete” on page 55.
- See “Single datacenter with all security implemented” on page 58.

Multi-datacenters

A multi-datacenter contains a medium to a large group of hosts (greater than 50). The hosts can span two or more geographic regions that are connected by a Wide Area Network (WAN).

Example multi-datacenters are shown in the following list:

- See “Multi-datacenter with standard NetBackup” on page 62.
- See “Multi-datacenter with Media Server Encryption Option (MSEO)” on page 66.
- See “Multi-datacenter with client side encryption” on page 71.
- See “Multi-datacenter with NBAC on master and media servers” on page 76.
- See “Multi-datacenter with NBAC complete” on page 82.
- See “Multi-datacenter with all NetBackup security” on page 88.
Workgroup with NetBackup

A workgroup with NetBackup is classified as a small group of systems (less than 50). The workgroup is used with NetBackup internally. Typically, this configuration does not have a unified naming service such as NIS or Active Directory. It may not have an authoritative host naming service such as DNS or WINS. This configuration is typically found in the test labs of large corporations, or as environments in small corporations.

The workgroup with NetBackup includes the following highlights:

■ Very few NetBackup servers
■ Small computer environments
■ No externally facing equipment involved

Figure 2-1 shows an example workgroup with NetBackup.
The following table describes the NetBackup parts that are used with the workgroup.
<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master server</td>
<td>Communicates with the media server and clients 1, 2, 3, and 4.</td>
</tr>
<tr>
<td>Media server</td>
<td>Communicates with the master server and clients 1, 2, 3, and 4. The media server manages the writing of unencrypted data to tape for clients 1, 2, 3 and 4.</td>
</tr>
<tr>
<td>Tape</td>
<td>Contains unencrypted backup data that is written for clients 1, 2, 3, and 4.</td>
</tr>
<tr>
<td>Clients</td>
<td>Specifies that clients 1, 2, 3, and 4 are Standard NetBackup clients managed by the master server. They have their unencrypted data backed up to tape by the media server.</td>
</tr>
<tr>
<td>Internal firewall</td>
<td>Allows NetBackup to have access to clients in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication into and out of the DMZ. HTTP ports that are open in the external firewall are not allowed to pass through the internal firewall from the Internet. The internal firewall is not used with the Workgroup deployment model. In this example, no clients access the internal firewall so the NetBackup ports should not be opened through it. Note: In this example, there are no clients beyond the internal firewall. So the NetBackup ports should not be open through the internal firewall.</td>
</tr>
<tr>
<td>Demilitarized Zone (DMZ)</td>
<td>Provides a “safe” area of operation for NetBackup clients existing between the internal firewall and external firewall. Possible clients operating in the DMZ include Web server NetBackup clients using either standard NetBackup clients or encrypted NetBackup clients. Clients in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. Web server NetBackup clients can receive connections from the external firewall to the Internet using typical HTTP ports. The DMZ is not accessible by clients in the Workgroup deployment model.</td>
</tr>
<tr>
<td>External firewall</td>
<td>Allows external users to access Web server NetBackup clients that are located in the DMZ from the Internet typically over HTTP ports. NetBackup ports open for clients to communicate through the internal firewall are not allowed to pass through the external firewall to the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies a collection of interconnected computer networks linked by copper wires, fiber-optic cables, and wireless connections. Clients do not use the Internet in the Workgroup deployment model. Caution: Customers should never put NetBackup clients outside the DMZ and directly in the Internet. You must use an external firewall to block the outside world from NetBackup ports at all times.</td>
</tr>
</tbody>
</table>
Single datacenter with standard NetBackup

A single datacenter with standard NetBackup is defined as a medium to large group of hosts (greater than 50). It includes the hosts that are both internal only and those that expand through the DMZ to the Internet. This configuration typically has centralized naming service for hosts (such as DNS or WINS). It also has a centralized naming service for users (such as NIS or Active Directory).

The single datacenter with standard NetBackup includes the following highlights:

- Externally facing hosts
- Centralized naming services typically exist
- Greater than 50 hosts in size
- Simplest to configure requiring only general NetBackup knowledge
- Typical configuration that is used for NetBackup customers
- Assumes no fear of passive data interception on the wire as the backup runs

Figure 2-2 shows an example single datacenter with standard NetBackup.
Figure 2-2  Single datacenter with standard NetBackup

Single data center – standard NetBackup

Master server

Media server

Unencrypted data for clients 4 and 5

Client 4
Standard NetBackup

Internal Firewall – NetBackup ports allowed

Client 5
Web Server

External Firewall – Only Https ports allowed

Internet

Single datacenter with standard NetBackup

44Security deployment models
The following table describes the NetBackup parts that are used for a single datacenter with standard NetBackup.

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master server</td>
<td>Communicates with the media server, standard NetBackup client 4 and Web server NetBackup client 5 in the DMZ.</td>
</tr>
<tr>
<td>Media server</td>
<td>Communicates with the master server, standard NetBackup client 4 and Web server NetBackup client 5 in the DMZ. The media server manages the writing of unencrypted data to tape for clients 4 and 5.</td>
</tr>
<tr>
<td>Tape</td>
<td>Contains unencrypted backup data that is written for clients 4 and 5.</td>
</tr>
<tr>
<td>Clients</td>
<td>Specifies that client 4 is a standard NetBackup type and client 5 is a Web server type. The master server manages both clients and have their unencrypted data backed up to tape by the media server. Client 4 exists in the datacenter. Client 5 exists in the DMZ. Client 5 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 5 receives connections from the Internet using HTTP only ports through the external firewall. Note that all NetBackup traffic for the lookup is sent unencrypted over the wire.</td>
</tr>
<tr>
<td>Internal firewall</td>
<td>Enables NetBackup to access Web server NetBackup client 5 in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication into and out of the DMZ. HTTP ports that are open in the external firewall cannot pass through the internal firewall from the Internet.</td>
</tr>
<tr>
<td>Demilitarized Zone (DMZ)</td>
<td>Provides a “safe” area of operation for NetBackup client 5, Web server, that exists between the internal firewall and external firewall. Client 5 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 5 can communicate through the external firewall to the Internet using HTTP ports.</td>
</tr>
<tr>
<td>External firewall</td>
<td>Allows external users to access the Web server client 5 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for client 5 to communicate through the internal firewall.</td>
</tr>
<tr>
<td>Caution:</td>
<td>NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports to client 5 are open in the external firewall to the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies a collection of interconnected computer networks that are linked by copper wires, fiber-optic cables and wireless connections. The Web server client 5 can receive connections over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>

Security deployment models

Single datacenter with standard NetBackup
Single datacenter with Media Server Encryption Option (MSEO)

This single datacenter with the Media Server Encryption Option (MSEO) example typically includes more than 50 hosts. All externally facing hosts make use of the Media Server Encryption Option (MSEO). In this example, clients use the MSEO option for all hosts.

The single datacenter with Media Server Encryption Option (MSEO) includes the following highlights:

- The MSEO is a newer option in NetBackup
- Protects data that is sent off-site
- Data is still sent from the client in the clear, implying that passive data interception off the wire is an acceptable risk
- Key management and encryption are managed in a central location equating to a single point of failure. Using the high availability cluster can help.
- Media server must be robust to handle multiple clients at once
- Useful where you need to send encrypted tapes off-site but want to off load encryption from the client, which is CPU intensive
- Must have keys to get data back. Lost keys mean lost data. (See information on key share backup in the Encryption Chapter).

Figure 2-3 shows an example single datacenter with MSEO.
Figure 2-3  Single datacenter with MSEO

- **Master Server**
- **Media Server**
- **MSEO for Clients 1, 2, 3, 5**
- **Encrypted Tape for Clients 1, 2, 3, 5**
- **Client 1 MSEO**
- **Client 2 MSEO**
- **Client 3 MSEO**
- **Client 5 MSEO (Web Server)**
- **DMZ**
- **Internal Firewall – NetBackup Ports allowed**
- **External Firewall – Only Http Ports allowed**
- **Internet**
- **Transport**
- **Vault off-site**

Security deployment models

Single datacenter with Media Server Encryption Option (MSEO)
The following table describes the NetBackup parts that are used for a single datacenter with MSEO.

**Table 2-3**  
NetBackup parts used for a single datacenter with MSEO

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Master server</strong></td>
<td>Communicates with the media server, MSEO clients 1, 2 and 3 and the MSEO Web server client 5 in the DMZ.</td>
</tr>
<tr>
<td><strong>Media server</strong></td>
<td>Communicates with the master server, MSEO clients 1, 2 and 3 and the MSEO Web server client 5 in the DMZ. The media server communicates with the MSEO device that enables the writing of encrypted data to tape for clients 1, 2, 3, and 5.</td>
</tr>
<tr>
<td><strong>MSEO</strong></td>
<td>Specifies that the MSEO hardware appliance off-loads encryption from individual clients and generates encrypted data for clients 1, 2, 3, and 5. That encrypted data is then written to tape. The individual client CPU performance is improved (relative to client side encryption) by using the MSEO appliance.</td>
</tr>
<tr>
<td><strong>Tape</strong></td>
<td>Contains MSEO encrypted backup data that is written for clients 1, 2, 3, and 5. The encrypted tape is transported off-site to a vault for disaster recovery protection.</td>
</tr>
<tr>
<td><strong>Note:</strong></td>
<td>To decrypt the data, the key(s) used to encrypt the data must be made available.</td>
</tr>
<tr>
<td><strong>Transport</strong></td>
<td>Specifies that the transport truck moves encrypted tapes off-site to a secure vault facility. If a tape is lost during transport, the datacenter manager has potentially reduced the risk of a data breach. Data breach has been reduced through the use of data encryption.</td>
</tr>
<tr>
<td><strong>Vault off-site</strong></td>
<td>Provides a safe storage facility at a different location than the datacenter that promotes disaster recovery protection.</td>
</tr>
<tr>
<td><strong>Clients</strong></td>
<td>Specifies that clients 1, 2, and 3 are the MSEO type and client 5 is a Web server type (also using the MSEO option). Both types can be managed by the master server and have their encrypted data backed up to tape. Backup is done through the media server attached MSEO hardware appliance. Clients 1, 2, and 3 exist in the datacenter. Client 5 exists in the DMZ. Client 5 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 5 receives connections from the Internet using HTTP only ports through the external firewall.</td>
</tr>
<tr>
<td><strong>Internal firewall</strong></td>
<td>Specifies that it is used by NetBackup to access client 5, Web server, in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication into and out of the DMZ. HTTP ports open in the external firewall cannot pass through the internal firewall.</td>
</tr>
<tr>
<td><strong>Demilitarized Zone (DMZ)</strong></td>
<td>Provides a &quot;safe&quot; area of operation for the Web server client 5 that exists between the internal firewall and external firewall. The Web server client 5 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 5 can also communicate through the external firewall to the Internet using only HTTP ports.</td>
</tr>
</tbody>
</table>
Table 2-3  NetBackup parts used for a single datacenter with MSEO
(continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External firewall</td>
<td>Allows external users to access the Web server client 5 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for Web server client 5 to communicate through the internal firewall to NetBackup. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 5 can pass through the external firewall to the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies a collection of interconnected computer networks that are linked by copper wires, fiber-optic cables and wireless connections. The Web server client 5 can communicate over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>

Single datacenter with client side encryption

This single datacenter with client side encryption example uses the client side encryption to ensure data confidentiality across the wire as well as on tape. The client side encryption mitigates the risk of passive wire tapping within the organization. The risk of data exposure is reduced as tapes are moved off site. This datacenter model assures a medium to large number (greater than 50) of managed hosts. Clients inside the datacenter as well as the DMZ can use centralized naming services for hosts and user identities.

The single datacenter with client side encryption includes the following highlights:

- Useful for protecting off-site data
- Data from client is encrypted and eliminates passive interception of the data on the wire
- Key management is de-centralized on to the clients
- The original NetBackup encryption option
- Client CPU is used to perform encryption
- Must have the key to get data back. A lost key means lost data.
- Useful when you need to scan tapes off-site and/or you need confidentiality on the wire

Figure 2-4 shows an example single datacenter with client side encryption.
The following table describes the NetBackup parts that are used for a single datacenter with client side encryption.
### Table 2-4
NetBackup parts for a single datacenter with client side encryption

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demilitarized Zone (DMZ)</td>
<td>Provides a &quot;safe&quot; area of operation for Web server client 5 and encrypted client 6. These clients exist between the internal firewall and external firewall. The Web server client 5 and encrypted client 6 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 5 and encrypted client 6 can communicate through the external firewall to the Internet using HTTP ports. The encrypted client 6 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports.</td>
</tr>
<tr>
<td>External firewall</td>
<td>Allows external users to access the Web server client 5 and encrypted client 6. These clients can be accessed in the DMZ from the Internet over HTTP ports. NetBackup ports are open for Web server client 5 and encrypted client 6 to communicate through the internal firewall. However, NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 5 and encrypted client 6 can pass through the external firewall to the Internet. The external firewall limits client 5 and 6 from bidirectional communication over the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies a collection of interconnected computer networks that are linked by copper wires, fiber-optic cables, and wireless connections. The Web server client 5 can communicate over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>

## Single datacenter with NBAC on master and media servers

The single datacenter with NBAC on master servers and media servers example uses the NetBackup Access Control on the master servers and media servers. This configuration limits access to portions of NetBackup and provides non-root administration of NetBackup. NBAC is configured for running between the servers and the GUIs. Non-root users can log in to NetBackup with operating system (UNIX password or Windows local domain) or global user repositories (NIS/NIS+ or Active Directory) to administer NetBackup. NBAC can be used to limit the level of access to NetBackup for certain individuals. For example, you can segregate day to day operational control from environmental configuration such as adding new policies, robots, etc.

The single datacenter with NBAC on master and media servers includes the following highlights:

- Administer non-root users
- Administer UNIX with a Windows User ID
- Administer Windows with a UNIX account
- Segregate and limit the actions of specific users
- Root or Administrator or client hosts can still do local client backups and restores
- Can be combined with other security-related options
- All servers must have the required NetBackup version

Figure 2-5 shows an example single datacenter with NBAC on master and media servers.
The following table describes the NetBackup parts that are used for a single datacenter with NBAC on the master and media servers.
<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
</table>
| Master server   | Communicates with the media server, root, and authentication broker. It also communicates with the authorization engine, clients 1, 2, 3, and client 5, Web server, in the DMZ. The master server also communicates with and receives a credential from the authentication broker.  
  When a CLI or GUI accesses a daemon on a master server, a credential is exchanged to identify the user. The authorization engine is then contacted to determine accessibility to the daemons functions. |
| Media server    | Communicates with the master server, clients 1, 2, 3, and client 5, Web server, in the DMZ. The media server also communicates with the authorization engine and receives a credential from the authentication broker. The media server enables the writing of unencrypted data to tape for clients 1, 2, 3, and 5.  
  When a CLI or GUI accesses a daemon on a media server, a credential is exchanged to identify the user. The authorization engine is then contacted to determine accessibility to the daemons functions. |
| GUI             | Specifies that this remote administration console GUI receives a credential from the authentication broker. The GUI then uses this credential to gain access to functionality on the media servers and master servers. |
| Root broker     | Authenticates the authentication broker but not the clients. In this example, the root broker and authentication broker are shown as the same component.                                                                 |
| Authentication broker | Authenticates the master server, media server, and GUI by establishing credentials with each. If a command prompt is used, the authentication broker also authenticates a user.                                      |
| Authorization engine | Communicates with the master server and media server to determine permissions of an authenticated user. These permissions determine the functionality available to the user. It also stores user groups and permissions. Only one authorization engine is needed.  
  **Note:** The authorization engine resides on the master server as a daemon process. It is shown in the figure as a separate image for the example only. |
| Tape            | Contains unencrypted backup data that is written for clients 1, 2, 3, and 5.                                                                                                                                  |
| Clients         | Specifies that clients 1, 2, and 3 are standard NetBackup types and client 5 is a Web server type. Both types are managed by the master server and have their unencrypted data backed up to tape through the media server. Clients 1, 2, and 3 exist in the datacenter. Client 5 exists in the DMZ. Client 5 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 5 receives connections from the Internet using HTTP only ports through the external firewall. |
Table 2-5  NetBackup parts for a single datacenter with NBAC on the master and media servers  (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal firewall</td>
<td>Allows NetBackup to access Web server Client 5 in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication into and out of the DMZ. HTTP ports that are open in the external firewall are not allowed to pass through the internal firewall.</td>
</tr>
<tr>
<td>Demilitarized Zone (DMZ)</td>
<td>Provides a &quot;safe&quot; area of operation for Web server client 5 that exists between the internal firewall and external firewall. The Web server client 5 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 5 can communicate through the external firewall to the Internet using HTTP ports.</td>
</tr>
<tr>
<td>External firewall</td>
<td>Allows external users to access the Web server client 5 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for client 5 to communicate through the internal firewall. NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of client 5 can pass through the external firewall to the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies a collection of interconnected computer networks, linked by copper wires, fiber-optic cables, and wireless connections. Client 5 can communicate over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>

Single datacenter with NBAC complete

The single datacenter with NBAC complete environment is very similar to the single datacenter with NBAC master and media server. The main differences are that all of the hosts that participate in the NetBackup environment are reliably identified using credentials. And non-root administrators can manage the NetBackup clients based on configurable levels of access. Note that user identities may exist in global repositories, such as Active Directory in Windows or NIS in UNIX. Identities can also exist in local repositories (UNIX passwd, local Windows domain) on those hosts that support an authentication broker.

The single datacenter with NBAC complete includes the following highlights:

- Similar to highlights for single datacenter with NBAC master and media server, except for root or administrator on client
- On client systems, non-root / administrator users may be configured to do local backup and restores (setup by default)
- The environment facilitates trusted identification of all hosts participating in NetBackup
- All hosts should have the required NetBackup version

Figure 2-6 shows an example single datacenter with NBAC complete.
Figure 2-6  Single datacenter with NBAC complete

- Root Broker & Authentication Broker
- GUI
- Authorization Engine
- Master Server
- Media Server
- Unencrypted Data for Clients 1, 2, 3, 5

- Client 1
- Client 2
- Client 3
- Client 5
- Web Server

- Internal Firewall – NetBackup Ports allowed
- DMZ

- External Firewall – Only Http Ports allowed

- Internet
The following table describes the NetBackup parts that are used with a single datacenter with NBAC complete.

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master server</td>
<td>Communicates with the media server, root broker, authentication broker. It also communicates with the authorization engine, clients 1, 2, 3, and client 5, Web server, in the DMZ. The master server further communicates with and receives a credential from the authentication broker. When a CLI or GUI accesses a daemon on a master server, a credential is exchanged to identify the user. The authorization engine is contacted to determine accessibility to the daemons functions.</td>
</tr>
<tr>
<td>Media server</td>
<td>Communicates with the master server, clients 1, 2, 3, and client 5, Web server, in the DMZ. The media server also communicates with the authorization engine and receives a credential from the authentication broker. The media server enables the writing of unencrypted data to tape for clients 1, 2, 3, and 5. When a CLI or GUI accesses a daemon on a media server, a credential is exchanged to identify the user. The authorization engine is contacted to determine accessibility to the daemons functions.</td>
</tr>
<tr>
<td>GUI</td>
<td>Specifies that the remote administration console, GUI, receives a credential from the authentication broker. The GUI then uses this credential to gain access to functionality on the media servers and master servers.</td>
</tr>
<tr>
<td>Root broker</td>
<td>Authenticates the authentication broker but not the clients. Figure 2-6, shows the root broker and the authentication broker as the same component.</td>
</tr>
<tr>
<td>Authentication broker</td>
<td>Authenticates the master server, media server, GUI, clients, and users by establishing credentials with each.</td>
</tr>
<tr>
<td>Authorization engine</td>
<td>Communicates with the master server and media server to determine permissions of an authenticated user. It also stores user groups and permissions. Only one authorization engine is needed. <strong>Note:</strong> The authorization engine resides on the master server as a daemon process. It is shown in the figure as a separate image for the example only.</td>
</tr>
<tr>
<td>Tape</td>
<td>Contains unencrypted backup data that is written for clients 1, 2, 3, and 5.</td>
</tr>
</tbody>
</table>
Table 2-6  NetBackup parts for a single datacenter with NBAC complete (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clients</td>
<td>Specifies that clients 1, 2, and 3 are standard NetBackup types and client 5 is a Web server type. When receiving credentials from the authentication broker, clients 1, 2, 3, and 5 are authenticated to the NetBackup Product Authentication Service domain. Both standard server and Web server types are managed by the master server and have their unencrypted data backed up to tape through the media server. Clients 1, 2, and 3 exist in the datacenter. Client 5 exists in the DMZ. Client 5 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 5 receives connections from the Internet using HTTP only ports through the external firewall.</td>
</tr>
<tr>
<td>Internal firewall</td>
<td>Allows NetBackup to access Web server client 5 in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication into and out of the DMZ. HTTP ports that are open in the external firewall cannot pass through the internal firewall.</td>
</tr>
<tr>
<td>Demilitarized Zone (DMZ)</td>
<td>Provides a &quot;safe&quot; area of operation for Web server client 5 that exists between the internal firewall and external firewall. The Web server client 5 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 5 can communicate through the external firewall to the Internet using HTTP ports.</td>
</tr>
<tr>
<td>External firewall</td>
<td>Allows external users to access the Web server client 5 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for client 5 to communicate through the internal firewall. NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of client 5 can pass through the external firewall to the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies a collection of interconnected computer networks, linked by copper wires, fiber-optic cables, and wireless connections. Client 5 can communicate over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>

**Single datacenter with all security implemented**

The example of a single datacenter with all security implemented combines all of the previous examples. It represents a very sophisticated environment in which there exists differing requirements for a variety of clients. Client requirements can necessitate using encryption off host (such as an underpowered host, or a database backup). Client requirements can also necessitate using encryption on host due to the sensitive nature of the data on the host. Adding NBAC to the security mix allows segregation of administrators, operators, and users within NetBackup.

The single datacenter with all security implemented includes the following highlights:

- See the previous single datacenter sections for individual option highlights
- Provides the most flexible and complex environment
Careful design following a similar model can let you use the strengths of each option.

Figure 2-7 shows an example single datacenter with all security implemented.
Figure 2-7  Single datacenter with all security implemented

- Root Broker & Authentication Broker
- Authorization Engine
- Master Server
- Media Server
- MSEO for Clients 1, 2, 3
- Encrypted Data for Client 6
- Unencrypted Data for Clients 4 & 5
- Transport
- Vault off-site
- Internal Firewall – NetBackup Ports allowed
- External Firewall – Only Http Ports allowed
- Internet

Client 1
MSEO

Client 2
MSEO

Client 3
MSEO

Client 4
Standard NBU

Client 5
Web Server

Client 6
Encryption

DMZ

Broker & Authentication
GUI
Authorization Engine

Internal Firewall – NetBackup Ports allowed

External Firewall – Only Http Ports allowed
The following table describes the NetBackup parts that are used with a single datacenter with all of security implemented.

**Table 2-7  NetBackup parts for a single datacenter with all security implemented**

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master server</td>
<td>Communicates with the media server, root broker, authentication broker, authorization engine, clients 1, 2, 3, and client 5, Web server, in the DMZ. The master server also communicates with and receives a credential from the authentication broker. When a CLI or GUI accesses a daemon on a master server, a credential is exchanged to identify the user. The authorization engine is contacted to determine accessibility to the daemons functions.</td>
</tr>
<tr>
<td>Media server</td>
<td>Communicates with the master server, clients 1, 2, 3 and client 5, Web server, in the DMZ. The media server also communicates with the authorization engine and receives a credential from the authentication broker. The media server enables the writing of unencrypted data to tape for clients 1, 2, 3, and 5. When a CLI or GUI accesses a daemon on a media server, a credential is exchanged to identify the user. The authorization engine is contacted to determine accessibility to the daemons functions.</td>
</tr>
<tr>
<td>GUI</td>
<td>Specifies that this remote administration console, GUI, receives a credential from the authentication broker. The GUI then uses this credential to gain access to functionality on the media servers and master servers.</td>
</tr>
<tr>
<td>Root broker</td>
<td>Authenticates the authentication broker but not clients. In the figure, the root broker and authentication broker are shown as the same component.</td>
</tr>
<tr>
<td>Authentication broker</td>
<td>Authenticates the master server, media server, GUI, clients, and users by establishing credentials with each.</td>
</tr>
<tr>
<td>Authorization engine</td>
<td>Communicates with the master server and media server to determine permissions of an authenticated user. It also stores user groups and permissions. Only one authorization engine is needed. <strong>Note:</strong> The authorization engine resides on the master server as a daemon process. It is shown in the figure as a separate image for example only.</td>
</tr>
<tr>
<td>Tapes</td>
<td>Specifies that the first tape contains encrypted MSEO backup data written for clients 1, 2, 3, and client encrypted data for client 6. The second tape contains unencrypted backup data that is written for clients 4 and 5.</td>
</tr>
<tr>
<td>Transport</td>
<td>Specifies that the transport truck moves encrypted tapes off-site to a secure vault facility. If a tape is lost during transport, the datacenter manager has mitigated the risk. The risk of data exposure has been mitigated through the use of encryption.</td>
</tr>
</tbody>
</table>
### Table 2-7  NetBackup parts for a single datacenter with all security implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vault off-site</td>
<td>Specifies that the vault off-site is a safe storage facility at a different location than the datacenter that promotes disaster recovery protection.</td>
</tr>
<tr>
<td>Clients</td>
<td>Specifies that clients 1, 2, 3, and 4 are standard NetBackup types. Client 5 is a Web server type. Client 6 uses client side encryption. Upon receiving credentials form the authentication broker, clients 1, 2, 3, 5, and 6 are authenticated to the NetBackup Product Authentication Service domain. Both standard server and Web server types can be managed by the master server and have their unencrypted data backed up to tape through the media server. Client 6 has its encrypted data that is backed up to tape through the media server. Clients 1, 2, and 3 exist in the datacenter. Clients 5 and 6 exists in the DMZ. They communicate to NetBackup using NetBackup only ports through the internal firewall. Client 5 and 6 communicate to the Internet using HTTP only ports through the external firewall.</td>
</tr>
<tr>
<td>Internal firewall</td>
<td>Specifies that the internal firewall lets NetBackup access Web server client 5 in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication into and out of the DMZ. HTTP ports that are open in the external firewall are not allowed to pass through the internal firewall.</td>
</tr>
<tr>
<td>Demilitarized Zone (DMZ)</td>
<td>Provides a &quot;safe&quot; area of operation for Web server client 5 and encrypted client 6. These clients exist between the internal firewall and external firewall. The Web server client 5 and encrypted client 6 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 5 and encrypted client 6 can communicate through the external firewall to the Internet using HTTP ports. The encrypted client 6 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports.</td>
</tr>
<tr>
<td>External firewall</td>
<td>Specifies that the external firewall lets external users access the Web server client 5 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for client 5 to communicate through the internal firewall. NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of client 5 can pass through the external firewall to the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies a collection of interconnected computer networks that are linked by copper wires, fiber-optic cables, and wireless connections. Client 5 can communicate over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>

### Multi-datacenter with standard NetBackup

A multi-datacenter with standard NetBackup is defined as a medium to large group of hosts (greater than 50). These hosts can span two or more geographic regions and can be connected by a Wide Area Network (WAN). In this example one
datacenter is located in London and the other datacenter is located in Tokyo. Both datacenters are connected through a dedicated WAN connection.

A multi-datacenter includes the hosts that are both internal only and those that expand through the DMZ to the Internet. This configuration typically has centralized naming service for hosts (such as DNS or WINS). It also has a centralized naming service for users (such as NIS or Active Directory).

The multi-datacenter with standard NetBackup includes the following highlights:

- NetBackup spans two or more geographic regions through a WAN
- Centralized naming services typically exist
- Greater than 50 hosts in size
- Simplest to configure; requires only general NetBackup knowledge
- Assumes no fear of passive data interception on the wire as the backup runs

Figure 2-8 shows an example multi-datacenter with standard NetBackup.
Figure 2-8 Multi-datacenter with standard NetBackup

- **London Data Center**
  - Master Server
  - Media Server 1
  - Client 4
  - Unencrypted Data for Client 4
  - Standard NetBackup
  - Internal Firewall (Not used)
  - DMZ (Not used)
  - External Firewall (Not used)

- **Tokyo Data Center**
  - Media Server 2
  - Client 10
  - Unencrypted Data for Client 10
  - Standard NetBackup
  - Internal Firewall (Not used)
  - DMZ (Not used)
  - External Firewall (Not used)

- **Internet** (Not used)
- **DMZ** (Not used)
- **WAN**
The following table describes the NetBackup parts that are used with a multi-datacenter that has implemented standard NetBackup.

### Table 2-8 NetBackup parts for a multi-datacenter with standard NetBackup implemented

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>London datacenter</td>
<td>Contains the master server, media server 1, client 4 standard NetBackup, and the unencrypted data tape for client 4. The London datacenter connects to the Tokyo datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Tokyo datacenter</td>
<td>Contains the media server 2, client 10 standard NetBackup, and the unencrypted data tape for client 10. The Tokyo datacenter connects to the London datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Wide Area Network (WAN)</td>
<td>Specifies the dedicated WAN link that connects the London datacenter to the Tokyo datacenter. The WAN provides connectivity between the master server and media server 2 and client 10.</td>
</tr>
<tr>
<td>Master server</td>
<td>Specifies that it is located in London and communicates with media server 1 in London. The master server also communicates over the WAN with the media server 2 in Tokyo. The master server communicates with standard NetBackup client 4 in London and client 10 over the WAN in Tokyo.</td>
</tr>
<tr>
<td>Media servers</td>
<td>Specifies that the multi-datacenter can have two media servers. One media server is in London and the other is in Tokyo. The media server 1 in London communicates with the master server and standard NetBackup client 4 also in London. Media server 1 manages the writing of unencrypted data to tape for client 4 in London. The media server 2 in Tokyo communicates with the master server in London and standard NetBackup client 10 in Tokyo. Media server 2 manages the writing of unencrypted data to tape for client 10 in Tokyo.</td>
</tr>
<tr>
<td>Tapes</td>
<td>Specifies that tapes are produced in both the London and Tokyo datacenters. The London tape contains unencrypted backup data that is written for client 4. The Tokyo tape contains unencrypted backup data that is written for client 10.</td>
</tr>
<tr>
<td>Clients</td>
<td>Specifies that the clients are located in both the London and Tokyo datacenters. Clients 4 and 10 are standard NetBackup types. Both clients can be managed by the master server that is located in London. Their unencrypted data is backed up to tape by the media server. Unencrypted data is written to both client 4 tape in London and client 10 tape in Tokyo. Note that all NetBackup traffic for client 10 lookup is sent unencrypted over the wire (WAN) from Tokyo to London.</td>
</tr>
<tr>
<td>Internal firewalls</td>
<td>Specifies that internal firewalls are not used at the London or Tokyo datacenter with standard NetBackup.</td>
</tr>
<tr>
<td>Demilitarized Zones (DMZs)</td>
<td>Specifies that DMZs are not used at the London or Tokyo datacenter with standard NetBackup.</td>
</tr>
</tbody>
</table>
Table 2-8  NetBackup parts for a multi-datacenter with standard NetBackup implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External firewalls</td>
<td>Specifies that external firewalls are not used at the London or Tokyo datacenter with standard NetBackup.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies that the Internet is not used at the London or Tokyo datacenter with standard NetBackup.</td>
</tr>
</tbody>
</table>

**Multi-datacenter with Media Server Encryption Option (MSEO)**

A multi-datacenter with Media Server Encryption Option (MSEO) is defined as a medium to large group of hosts (greater than 50) that span two or more geographic regions. The hosts are connected by a Wide Area Network (WAN). In this example, one datacenter is located in London and the other datacenter is located in Tokyo. Both datacenters are connected through a dedicated WAN connection.

This multi-datacenter example can typically include more than 50 hosts. All externally facing hosts use the Media Server Encryption Option (MSEO). In this example, clients use both encrypted backups for some clients and the MSEO option for other hosts. Data that is too sensitive to be archived off-site is "left at rest" in an unencrypted format.

The multi-datacenter with Media Server Encryption Option (MSEO) includes the following highlights:

- NetBackup spans two or more geographic regions through a WAN
- Newer option in NetBackup
- Useful for protecting off-site data
- Data is still sent from the client in the clear, implying that passive wire interception is an acceptable risk
- Key management and encryption are managed in a central location equating to a single point of failure. Using the high availability cluster can help.
- Media server needs to be robust to handle multiple clients at once
- Useful where you need to send encrypted tapes off-site but want to off load encryption from the client, which is CPU intensive
- Must have keys to get data back. Lost keys means lost data. (See information on key share backup in the Encryption Chapter.)
Figure 2-9 shows an example multi-datacenter with Media Server Encryption Option (MSEO).

**Figure 2-9** Multi-datacenter with Media Server Encryption Option (MSEO)
The following table describes the NetBackup parts that are used for a multi-datacenter with MSEO implemented.

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>London datacenter</td>
<td>Contains the master server, media server 1, MSEO 1, clients 1, 2, 3, and client 5 Web server in the DMZ. The London datacenter also contains the encrypted data tape for clients 1, 2, 3, and unencrypted data tape for client 5. The London datacenter connects to the Tokyo datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Tokyo datacenter</td>
<td>Contains the media server 2, MSEO 2, clients 8, 9 and client 11 Web server in the DMZ. The Tokyo datacenter also contains the encrypted data tape for clients 8, 9, and unencrypted data tape for client 11. The Tokyo datacenter connects to the London datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Wide Area Network (WAN)</td>
<td>Specifies that the dedicated WAN link connects the London datacenter to the Tokyo datacenter. The WAN provides connectivity between the master server in London to media server 2 with clients 8, 9, 11 in Tokyo.</td>
</tr>
<tr>
<td>Master server</td>
<td>Specifies that the master server that is located in the London datacenter, communicates with media server 1 and clients 1, 2, 3, and 5. The master server also uses the WAN to communicate with media server 2, and clients 8, 9, and 11 in Tokyo.</td>
</tr>
<tr>
<td>Media servers</td>
<td>Specifies that this multi-datacenter uses two media servers. Media server 1 is located in the London datacenter and media server 2 is located in the Tokyo datacenter. In London, media server 1 communicates with the master server, MSEO 1, and clients 1, 2, 3, and 5. Media server 1 writes unencrypted data to tape for client 5. Media server 1 also uses MSEO 1 to write encrypted data to tape for clients 1, 2, and 3. The encrypted tape is transported off-site to a vault in London. In Tokyo, media server 2 communicates with the master server in London through the WAN and clients 8, 9, and 11 in Tokyo. Media server 2 writes unencrypted data to tape for client 11. Media server 2 also uses MSEO 2 to write encrypted data to tape for clients 8 and 9. The encrypted tape is transported off-site to a vault in Tokyo.</td>
</tr>
<tr>
<td>MSEOs</td>
<td>Specifies that the two MSEO hardware appliances off-load encryption from individual clients. The individual client CPU performance is improved (relative to client side encryption) by using the MSEO appliance. The MSEO 1 is in the London datacenter and MSEO 2 is in the Tokyo datacenter. The MSEO 1 generates an encrypted data tape for clients 1, 2, and 3 that can be stored off-site in London. The MSEO 2 generates an encrypted data tape for clients 8 and 9 that can be stored off-site in Tokyo.</td>
</tr>
</tbody>
</table>
Table 2-9 NetBackup parts for a multi-datacenter with MSEO implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
</table>
| Tapes         | Specifies that both the unencrypted and encrypted data tapes are produced in the London datacenter and in the Tokyo datacenter. The encrypted tape contains MSEO encrypted backup data. In London, the unencrypted tape is written for client 5 and stored on-site at the London datacenter. The encrypted tape is written for clients 1, 2, and 3. The encrypted tape for clients 1, 2, and 3 is transported off-site to a vault in London for disaster recovery protection.  
In Tokyo, the unencrypted tape is written for client 11 and stored on-site at the Tokyo datacenter. The encrypted tape is written for clients 8 and 9. The encrypted tape for clients 8 and 9 is transported off-site to a vault in Tokyo for disaster recovery protection.  
**Note:** To decrypt the data, the key(s) used to encrypt the data must be made available. |
| Transports    | Specifies that there are two transports. One transport is located in London and the other is located in Tokyo. The transport truck in London moves the encrypted tape for clients 1, 2, and 3 off-site to a secure London vault facility. The transport truck in Tokyo moves the encrypted tape for clients 8 and 9 off-site to a secure Tokyo vault facility.  
**Note:** If a tape is lost during transport, the datacenter manager has potentially reduced the risk of a data breach. This breach has been reduced through the use of data encryption. |
| Vaults off-site| Specifies that there are two vaults that are located off-site. One vault is located in London and the other is located in Tokyo. Both vaults provide safe encrypted tape storage facilities off-site at different locations than the datacenters.  
**Note:** Good disaster recovery protection promotes having the encrypted tapes stored at locations separate from the datacenters. |
| Clients       | Specifies that clients are located in both the London and Tokyo datacenters. In London, clients 1, 2, and 3 are of the MSEO type and client 5 is a Web server type (not using MSEO) that is located in the DMZ. Both server types can be managed by the master server. And they can have their encrypted data backed up to tape through media server 1 attached MSEO hardware appliance. Client 5 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 5 receives connections from the Internet using HTTP only ports through the external firewall.  
Tokyo clients 8 and 9 are of the MSEO type. Client 11 is a Web server type (not using MSEO) located in the DMZ. Both server types can be managed by the master server located in London. And they can have their encrypted data backed up to tape through media server 2 attached MSEO hardware appliance. Client 11 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 5 receives connections from the Internet using HTTP only ports through the external firewall. |
Table 2-9  NetBackup parts for a multi-datacenter with MSEO implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal firewalls</td>
<td>Specifies that the multi-datacenter can use two internal firewalls. One internal firewall is located in London and the other is located in Tokyo. In London, the internal firewall can use NetBackup to access client 5, Web server, located in the DMZ. The Tokyo internal firewall can use NetBackup to access client 11, Web server, in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication into and out of the DMZ. Other HTTP ports can be open in the external firewall but cannot pass through the internal firewall.</td>
</tr>
<tr>
<td>Demilitarized Zones (DMZs)</td>
<td>Specifies that the multi-datacenter can use two DMZs. One DMZ is located in London and the other is located in Tokyo. In London, the DMZ provides a &quot;safe&quot; area of operation for the Web server client 5 that exists between the internal firewall and external firewall. The Web server client 5 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 5 can also communicate through the external firewall to the Internet using only HTTP ports. In Tokyo, the DMZ provides a &quot;safe&quot; area of operation for the Web server client 11 that exists between the internal firewall and external firewall. The Web server client 11 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 11 can also communicate through the external firewall to the Internet using only HTTP ports.</td>
</tr>
<tr>
<td>External firewalls</td>
<td>Specifies that the multi-datacenter with MSEO can use two external firewalls. One external firewall is located in London and the other is located in Tokyo. In London, the external firewall lets external users access the Web server client 5 located in the DMZ from the Internet over HTTP ports. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 5 can pass through the external firewall to the Internet. In Tokyo, the external firewall lets external users access the Web server client 11 located in the DMZ from the Internet over HTTP ports. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 11 can pass through the external firewall to the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies that there is only one Internet but two Internet connections in this multi-datacenter example. One Internet connection is located in London and the other is located in Tokyo. The Internet is a collection of interconnected computer networks that are linked by copper wires, fiber-optic cables, and wireless connections. In London, the Web server client 5 can communicate over the Internet using HTTP ports through the external firewall. In Tokyo, the Web server client 11 can communicate over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>
Multi-datacenter with client side encryption

A multi-datacenter with client side encryption option is defined as a medium to large group of hosts (greater than 50). These hosts can span two or more geographic regions and can be connected by a Wide Area Network (WAN). In this example one datacenter is located in London and the other datacenter is located in Tokyo. Both datacenters are connected through a dedicated WAN connection.

The example multi-datacenter can use client side encryption to ensure data confidentiality across the wire as well as on tape. This encryption helps to mitigate the risk of passive wire tapping within the organization. Risk of data exposure as the tapes are moved off site. This datacenter model assures a medium to large number (greater than 50) of managed hosts. Clients inside the datacenter as well as the DMZ, can have the potential for centralized naming services for hosts and user identities.

The multi-datacenter with client side encryption includes the following highlights:

- NetBackup spans two or more geographic regions through a WAN
- Useful for protecting off-site data
- Data from client is encrypted and eliminates the passive interception of the data on the wire
- Key management is de-centralized on to the clients
- The original NetBackup encryption option
- Client CPU is used to perform encryption
- Must have the key to get data back. A lost key means lost data.
- Useful when you need to scan tapes off-site or you need confidentiality on the wire

Figure 2-10 shows an example multi-datacenter with client side encryption.
The following table describes the NetBackup parts that are used for a multi-datacenter with client side encryption implemented.
### Table 2-10: NetBackup parts for a multi-datacenter with client side encryption implemented

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>London datacenter</td>
<td>Contains the master server, media server 1 and clients 4, 5, and 6. The London datacenter also contains the encrypted data tape for clients 6 and 7 and unencrypted data tape for clients 4 and 5. The London datacenter connects to the Tokyo datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Tokyo datacenter</td>
<td>Contains the media server 2 and clients 7, 10, 11, and 12. The Tokyo datacenter also contains the encrypted data tape for clients 7 and 12 and unencrypted data tape for clients 10 and 11. The Tokyo datacenter connects to the London datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Wide Area Network (WAN)</td>
<td>Specifies that the dedicated WAN link connects the London datacenter with the Tokyo datacenter. The WAN provides connectivity between the master server in London to media server 2 with clients 7, 10, 11, and 12 in Tokyo. The WAN also provides connectivity between media server 1 in London to client 7 in London.</td>
</tr>
<tr>
<td>Master server</td>
<td>Specifies that the master server is located in the London datacenter and communicates with media server 1 and clients 4, 5, and 6. The master server also uses the WAN to communicate with media server 2, and clients 7, 10, 11, and 12 in Tokyo.</td>
</tr>
<tr>
<td>Media servers</td>
<td>Specifies that the multi-datacenter uses two media servers. Media server 1 is located in the London datacenter and media server 2 is located in the Tokyo datacenter. In London, media server 1 communicates with the master server and clients 4, 5, and 6. Media server 1 also communicates with client 7 in Tokyo. Media server 1 writes unencrypted data to tape for clients 4 and 5. Media server 1 writes encrypted data to tape for clients 6 and 7. Note that client 7 is located in Tokyo but its tape backup is located in London. The encrypted tape for clients 6 and 7 is transported off-site to a vault in London. In Tokyo, media server 2 communicates with the master server in London through the WAN and clients 7, 10, 11, and 12 in Tokyo. Media server 2 writes unencrypted data to tape for clients 10 and 11. Media server 2 also writes encrypted data to tape for clients 7 and 12. Note that even though client 7 is located in Tokyo and is backed up in London, client 7 is also backed up in Tokyo. The encrypted tape for clients 7 and 12 is transported off-site to a vault in Tokyo.</td>
</tr>
<tr>
<td>Client side encryption</td>
<td>Specifies that the client side encryption (not shown in the figure) ensures data confidentiality across the wire as well as on tape.</td>
</tr>
</tbody>
</table>
## Table 2-10 NetBackup parts for a multi-datacenter with client side encryption implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tapes</td>
<td>Specifies that both unencrypted and encrypted data tapes are produced in the London datacenter and in the Tokyo datacenter. The encrypted tape contains client side encrypted backup data. In London, the unencrypted tape is written for clients 4 and 5 and stored on-site at the London datacenter. The encrypted tape is written for clients 6 and 7. The encrypted tape is transported off-site to a vault in London for disaster recovery protection. In Tokyo, the unencrypted tape is written for clients 10 and 11 and stored on-site at the Tokyo datacenter. The encrypted tape is written for clients 7 and 12. Note that even though client 7 is located in Tokyo and is backed up in Tokyo, client 7 is also backed up in London. The encrypted tape is transported off-site to a vault in Tokyo for disaster recovery protection. <strong>Note:</strong> To decrypt the data, the key(s) used to encrypt the data must be made available.</td>
</tr>
<tr>
<td>Transports</td>
<td>Specifies that the multi-datacenter uses two transports. One transport is located in London and the other is located in Tokyo. The transport truck in London moves the encrypted tape for clients 6 and 7 off-site to a secure London vault facility. The transport truck in Tokyo moves the encrypted tape for clients 7 and 12 off-site to a secure Tokyo vault facility. Note that a backup copy of client 7 is vaulted both in London and in Tokyo. <strong>Note:</strong> If in the remote case a tape is lost during transport, the datacenter manager has potentially reduced the risk of a data breach. The breach is reduced through the use of client side data encryption.</td>
</tr>
<tr>
<td>Vaults off-site</td>
<td>Specifies that the multi-datacenter uses two vaults off-site. One vault is located in London and the other is located in Tokyo. Both vaults provide safe encrypted tape storage facilities off-site at different locations than the datacenters. <strong>Note:</strong> Storing the encrypted tapes at locations separate from the datacenters promotes good disaster recovery protection.</td>
</tr>
</tbody>
</table>
Table 2-10  NetBackup parts for a multi-datacenter with client side encryption implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clients</td>
<td>Specifies that the clients are located in both the London and Tokyo datacenters. In London, client 4 is a standard NetBackup type. Client 5 is a Web server type located in the DMZ. Client 6 is client side encrypted and is also located in the DMZ. All client types can be managed by the master server and have their data backed up to tape through media server 1. Clients 5 and 6 communicate to NetBackup using NetBackup only ports through the internal firewall. Client 6 receives connections from the Internet using HTTP only ports through the external firewall. In Tokyo, client 7 is a client side encrypted client but outside of the DMZ. Client 10 is a standard NetBackup type. Client 11 is a Web server type located in the DMZ. Client 12 is client side encrypted also located in the DMZ. All client types can be managed by the master server in London. Client 7 data is backed up to tape through media server 1 and 2. Client 10, 11, and 12 data is backed up to tape through media server 2. Clients 11 and 12 communicate to NetBackup using NetBackup only ports through the internal firewall. Client 12 receives connections from the Internet using HTTP only ports through the external firewall.</td>
</tr>
<tr>
<td>Internal firewalls</td>
<td>Specifies that the multi-datacenter uses two internal firewalls. One internal firewall is located in London and the other is located in Tokyo. In London, the internal firewall allows NetBackup to access Web server client 5 and client side encrypted client 6 in the DMZ. In Tokyo, the internal firewall lets NetBackup access Web server client 11 and client side encrypted client 12 in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication into and out of the DMZ. HTTP ports that are open in the external firewall cannot pass through the internal firewall.</td>
</tr>
<tr>
<td>Demilitarized Zones (DMZs)</td>
<td>Specifies that the multi-datacenter uses two DMZs. One DMZ is located in London and the other is located in Tokyo. In London, the DMZ provides a &quot;safe&quot; area of operation for the Web server client 5 and client side encrypted client 6. That client exists between the internal firewall and the external firewall. The Web server client 5 and client side encrypted client 6 in the DMZ can communicate to NetBackup. Both clients communicate through the internal firewall using designated NetBackup ports. The Web server client 5 can also communicate through the external firewall to the Internet using only HTTP ports. In Tokyo, the DMZ provides a &quot;safe&quot; area of operation for the Web server client 11 and client side encrypted client 12. The client 12 exists between the internal firewall and external firewall. The Web server client 11 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 11 can also communicate through the external firewall to the Internet using only HTTP ports.</td>
</tr>
</tbody>
</table>
Table 2-10  NetBackup parts for a multi-datacenter with client side encryption implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External firewalls</td>
<td>Specifies that the multi-datacenter can use two external firewalls. One external firewall is located in London and the other is located in Tokyo. In London, the external firewall lets external users access the Web server client 5 located in the DMZ from the Internet over HTTP ports. The NetBackup ports are open for Web server client 5 to communicate through the internal firewall to NetBackup. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 5 can pass through the external firewall to the Internet. The client side encrypted client 6 cannot be accessed from the Internet. In Tokyo, the external firewall external users access the Web server client 11 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for Web server client 11 to communicate through the internal firewall to NetBackup. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 11 can pass through the external firewall to the Internet. The client side encrypted client 12 cannot be accessed from the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies that there is only one Internet but there are two Internet connections in this multi-datacenter example. One Internet connection is located in London and the other is located in Tokyo. The Internet is a collection of interconnected computer networks that are linked by copper wires, fiber-optic cables and wireless connections. In London, the Web server client 5 can communicate over the Internet using HTTP ports through the external firewall. In Tokyo, the Web server client 11 can communicate over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>

Multi-datacenter with NBAC on master and media servers

A multi-datacenter with NBAC on the master server and media server example is defined as a medium to large group of hosts (greater than 50). These hosts span two or more geographic regions and can be connected by a Wide Area Network (WAN). In this example one datacenter is located in London and the other datacenter is located in Tokyo. Both datacenters are connected through a dedicated WAN connection.

This datacenter example uses NetBackup Access Control on the master servers and media servers. The datacenter limits access to portions of NetBackup and can use non-root administration of NetBackup. Within this environment, NBAC is configured for use between the servers and the GUIs. Non-root users can log in to NetBackup using operating system (UNIX password or Windows local domain). Or global user repositories (NIS/NIS+ or Active Directory) can be used to administer
NetBackup. In addition, NBAC can be used to limit the level of access to NetBackup for certain individuals. For example, you can segregate day to day operational control from environmental configuration such as adding new policies, robots, etc.

The multi-datacenter with NBAC on master and media servers includes the following highlights:

- NetBackup spans two or more geographic regions through a WAN
- Administer as non-root users
- Administer UNIX with a Windows User ID.
- Administer Windows with a UNIX account.
- Segregate and limit the actions of specific users.
- Root or Administrator or client hosts can still perform local client backups and restores
- Can be combined with other security-related options
- All servers must be NetBackup version 7.7 or later.

Figure 2-11 shows an example multi-datacenter with NBAC on the master servers and media servers.
Figure 2-11 Multi-datacenter with NBAC on the master servers and media servers
The following table describes the NetBackup parts that are used for a multi-datacenter with NBAC on the master and media servers.

**Table 2-11** NetBackup parts used for a multi-datacenter with NBAC on the master and media servers

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>London datacenter</td>
<td>Specifies that the London datacenter contains the root broker, authentication broker 1, GUI 1, authorization engine, master server, media server 1, and clients 4 and 5. The London datacenter also contains the unencrypted data tape for clients 4 and 5. The London datacenter connects to the Tokyo datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Tokyo datacenter</td>
<td>Specifies that the Tokyo datacenter contains authentication broker 2, GUI 2, media server 2, and clients 10 and 11. The Tokyo datacenter also contains the unencrypted data tape for clients 10 and 11. The Tokyo datacenter connects to the London datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Wide Area Network (WAN)</td>
<td>Specifies that the dedicated WAN link connects the London datacenter with the Tokyo datacenter. The WAN provides connectivity between the root broker and authentication broker 1 and authentication broker 2. In addition, the WAN provides connectivity between the root broker and authentication broker 1 and GUI 2 along with media server 2. The WAN also connects the authorization engine to media server 2. Finally, the WAN connects the master server with GUI 2, media server 2, and clients 10 and 11.</td>
</tr>
<tr>
<td>Master server</td>
<td>Specifies that the master server, located in the London datacenter, communicates with the root broker and authentication broker 1. It also communicates with GUI 1, authorization engine, and media server 1. The master server communicates with clients 4 and 5 in London. The master server also communicates with GUI 2, media server 2, and clients 10 and 11 in Tokyo.</td>
</tr>
<tr>
<td>Media servers</td>
<td>Specifies that in this multi-datacenter example, there are two media servers. Media server 1 is located in the London datacenter and media server 2 is located in the Tokyo datacenter. In London, media server 1 communicates with the master server, root broker and authentication broker 1, authorization engine, and clients 4 and 5. Media server 1 writes unencrypted data to tape for clients 4 and 5. In Tokyo, media server 2 communicates with the master server and authorization engine in London through the WAN. Media server 2 also communicates with GUI 2 and clients 10 and 11 in Tokyo. Media server 2 writes unencrypted data to tape for clients 10 and 11.</td>
</tr>
</tbody>
</table>
Table 2-11  NetBackup parts used for a multi-datacenter with NBAC on the master and media servers (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUIs</td>
<td>Specifies that in this multi-datacenter example, there are two GUIs. The GUI 1 is in London and GUI 2 is in Tokyo. These remote administration console GUIs receive credentials from the authentication brokers. The GUIs then use the credentials to gain access to functionality on the media servers and master servers. In London, GUI 1 receives a credential from authentication broker 1. GUI 1 has access to functionality on the master server and media servers 1 and 2. In Tokyo, GUI 2 receives a credential from the authentication broker 2. GUI 2 has access to functionality on the master server and media servers 1 and 2.</td>
</tr>
<tr>
<td>Root broker</td>
<td>Specifies that in a multi-datacenter installation there is only one root broker required. Sometimes, the root broker is combined with the authentication broker. In this example, the root broker and authentication broker are shown as the same component and are located in the London datacenter. In London, the root broker authenticates the authentication broker 1 also in London and the authentication broker 2 in Tokyo. The root broker does not authenticate clients.</td>
</tr>
<tr>
<td>Authentication brokers</td>
<td>Specifies that there can be more than one authentication broker in a multi-datacenter installation. Sometimes the authentication broker can be combined with the root broker. In this datacenter installation, two authentication brokers are used. The authentication broker authenticates the master server, media server, and GUI by establishing credentials with each. The authentication broker also authenticates a user who specifies a command prompt. In London, authentication broker 1 authenticates a credential with the master server, media server 1, and GUI 1. All NetBackup servers and clients in Tokyo and London authenticate to authentication broker 1 in London. GUI 1 authenticates to authentication broker 1 in London. GUI 2 authenticates to authentication broker 2 in Tokyo.</td>
</tr>
<tr>
<td>Authorization engine</td>
<td>Specifies that in a multi-datacenter installation there is only one authorization engine required. The authorization engine communicates with the master server and media server to determine permissions of an authenticated user. These permissions determine the functionality available to the user. The authorization engine also stores user groups and permissions. The authorization engine resides in London and communicates with the master server, and media server 1. The authorization engine also communicates over the WAN to authorize access to media server 2 in Tokyo. <strong>Note:</strong> The authorization engine resides on the master server as a daemon process. It is shown in the figure as a separate image for example only.</td>
</tr>
<tr>
<td>Tapes</td>
<td>Specifies that unencrypted data tapes are produced in the London datacenter and in the Tokyo datacenter. In London, the unencrypted tape is written for clients 4 and 5 and stored on-site at the London datacenter. In Tokyo, the unencrypted tape is written for clients 10 and 11 and stored on-site at the Tokyo datacenter.</td>
</tr>
</tbody>
</table>
### Table 2-11  NetBackup parts used for a multi-datacenter with NBAC on the master and media servers (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clients</strong></td>
<td>Specifies that clients are located in both the London and Tokyo datacenters. In London, client 4 is a standard NetBackup type. Client 5 is a Web server type located in the DMZ. All client types can be managed by the master server and have their data backed up to tape through media server 1. Client 5 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 5 also receives connections from the Internet using HTTP only ports through the external firewall. In Tokyo, client 10 is a standard NetBackup type. Client 11 is a Web server type located in the DMZ. All client types can be managed by the master server and have their data backed up to tape through media server 2. Client 11 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 11 also receives connections from the Internet using HTTP only ports through the external firewall.</td>
</tr>
<tr>
<td><strong>Internal firewalls</strong></td>
<td>Specifies that in this multi-datacenter example there are two internal firewalls. One internal firewall is located in London and the other is located in Tokyo. In London, the internal firewall lets NetBackup access Web server client 5 in the DMZ. In Tokyo, the internal firewall lets NetBackup access Web server client 11 in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication through the internal firewall and into and out of the DMZ. HTTP ports that are open in the external firewall are not allowed to pass through the internal firewall.</td>
</tr>
<tr>
<td><strong>Demilitarized Zones (DMZs)</strong></td>
<td>Specifies that in this multi-datacenter example there are two DMZs. One DMZ is located in London and the other is located in Tokyo. In London, the DMZ provides a &quot;safe&quot; area of operation for the Web server client 5 that exists between the internal firewall and external firewall. The Web server client 5 and client side encrypted client 6 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 5 can also communicate through the external firewall to the Internet using only HTTP ports. In Tokyo, the DMZ provides a &quot;safe&quot; area of operation for the Web server client 11 that exists between the internal firewall and external firewall. The Web server client 11 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 11 can also communicate through the external firewall to the Internet using only HTTP ports.</td>
</tr>
</tbody>
</table>
Table 2-11  NetBackup parts used for a multi-datacenter with NBAC on the master and media servers (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External firewalls</td>
<td>Specifies that in this multi-datacenter example there are two external firewalls. One external firewall is located in London and the other is located in Tokyo. In London, the external firewall lets external users access the Web server client 5 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for Web server client 5 to communicate through the internal firewall to NetBackup. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 5 can pass through the external firewall to the Internet. In Tokyo, the external firewall lets external users access the Web server client 11 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for Web server client 11 to communicate through the internal firewall to NetBackup. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 11 can pass through the external firewall to the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies that there is only one Internet but two Internet connections in this multi-datacenter example. One Internet connection is located in London and the other is located in Tokyo. The Internet is a collection of interconnected computer networks, that are linked by copper wires, fiber-optic cables and wireless connections. In London, the Web server client 5 can communicate over the Internet using HTTP ports through the external firewall. In Tokyo, the Web server client 11 can communicate over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>

Multi-datacenter with NBAC complete

The multi-datacenter with NBAC complete example is defined as a medium to large group of hosts (greater than 50) that span two or more geographic regions and can be connected by a Wide Area Network (WAN). In this example, one datacenter is in London and the other datacenter is in Tokyo. Both datacenters are connected through a dedicated WAN connection.

This environment is very similar to the multi-datacenter with NBAC master and media server. The main differences are that all hosts participating in the NetBackup environment are reliably identified using credentials and non-root administrators can manage the NetBackup clients based on configurable levels of access. Note that user identities may exist in global repositories such as Active Directory in Windows or NIS in UNIX. Identities can also exist in local repositories (UNIX passwd, local Windows domain) on those hosts supporting an authentication broker.

The multi-datacenter with NBAC complete includes the following highlights:

- NetBackup spans two or more geographic regions through a WAN
Similar to highlights for multi-datacenter with NBAC master and media server except for root or administrator on client. The non-root administration of clients and servers is permitted in this configuration.

- On client systems, non-root / administrator users can be configured to perform local backup and restores (setup by default)
- The environment facilitates trusted identification of all hosts participating in NetBackup
- Requires all hosts to be at NetBackup version 7.7 or later.

Figure 2-12 shows an example multi-datacenter with NBAC complete.
Figure 2-12 Multi-datacenter with NBAC complete
The following table describes the NetBackup parts that are used for a multi-datacenter with NBAC complete implemented.

### Table 2-12 NetBackup parts used for a multi-datacenter with NBAC complete implemented

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>London datacenter</td>
<td>Specifies that the London datacenter contains the root broker, authentication broker 1, GUI 1, authorization engine, master server, media server 1, and clients 1 and 5. The London datacenter also contains the unencrypted data tape for clients 1, 5, and 10. The London datacenter connects to the Tokyo datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Tokyo datacenter</td>
<td>Specifies that the Tokyo datacenter contains the authentication broker 2, GUI 2, media server 2, and clients 10 and 11. The Tokyo datacenter also contains the unencrypted data tape for clients 10 and 11. The Tokyo datacenter connects to the London datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Wide Area Network (WAN)</td>
<td>Specifies that the dedicated WAN link connects the London datacenter with the Tokyo datacenter. The WAN provides connectivity between the root broker and authentication broker 1 and authentication broker 2. In addition, the WAN provides connectivity between the root broker and authentication broker 1 and GUI 2 along with media server 2. The WAN connects the authorization engine to media server 2. The WAN connects the master server to GUI 2, media server 2, and clients 10 and 11. Finally the WAN connects media server 1 to client 10.</td>
</tr>
<tr>
<td>Master server</td>
<td>Specifies that the master server, located in the London datacenter, communicates with the root broker and authentication broker 1. It also communicates with GUI 1, authorization engine, and media server 1. The master server further communicates with GUI 2 and media server 2, and clients 10 and 11 in Tokyo.</td>
</tr>
<tr>
<td>Media servers</td>
<td>Specifies that in this multi-datacenter example there are two media servers. Media server 1 is located in the London datacenter and media server 2 is located in the Tokyo datacenter. In London, media server 1 communicates with the master server, root broker and authentication broker 1, authorization engine, and clients 1, 5, and 10. Media server 1 writes unencrypted data to tape for clients 1, 5, and 10. In Tokyo, media server 2 communicates with the master server, root broker, and authentication broker 1 and authorization engine in London through the WAN. Media server 2 also communicates with GUI 2, and clients 10 and 11 in Tokyo. Media server 2 writes unencrypted data to tape for clients 10 and 11.</td>
</tr>
<tr>
<td>GUIs</td>
<td>Specifies that in this multi-datacenter example, there are two GUIs. GUI 1 is in London and GUI 2 is in Tokyo. These remote administration console GUIs receive credentials from the authentication brokers. The GUIs then use the credentials to gain access to functionality on the media servers and master servers. In London, GUI 1 receives a credential from the authentication broker 1. GUI 1 has access to functionality on the master server and media servers 1 and 2. In Tokyo, GUI 2 receives a credential from the authentication broker 2. GUI 2 has access to functionality on the master server and media servers 1 and 2.</td>
</tr>
</tbody>
</table>
### Table 2-12  NetBackup parts used for a multi-datacenter with NBAC complete implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root broker</td>
<td>Specifies that there is only one root broker required in a multi-datacenter installation. Sometimes the root broker is combined with the authentication broker. In this example the root broker and authentication broker are shown as the same component and are located in the London datacenter. In London, the root broker authenticates the authentication broker 1, also in London, and authentication broker 2 in Tokyo. The root broker does not authenticate clients.</td>
</tr>
<tr>
<td>Authentication brokers</td>
<td>Specifies that there can be more than one authentication broker in a datacenter installation. Sometimes the authentication broker can be combined with the root broker. In this datacenter installation, there are two authentication brokers. The authentication broker authenticates the master server, media server, GUI, and clients by establishing credentials with each. The authentication broker also authenticates a user through a command prompt. In London, authentication broker 1 authenticates a credential with the master server, media server 1, GUI 1, and clients 1 and 5. All NetBackup servers and clients in Tokyo and London authenticate to authentication broker 1 in London. GUI 1 authenticates to authentication broker 1 in London. GUI 2 authenticates to authentication broker 2 in Tokyo.</td>
</tr>
</tbody>
</table>
| Authorization engine | Specifies that there is only one authorization engine required in a datacenter installation. The authorization engine communicates with the master server and media server to determine permissions of an authenticated user. These permissions determine the functionality available to the user. The authorization engine also stores user groups and permissions. The authorization engine resides in London and communicates with the master server, and media server 1. The authorization engine also communicates over the WAN to authorize access to media server 2 in Tokyo.  
**Note:** The authorization engine resides on the master server as a daemon process. It is shown in the figure as a separate image for example only. |
| Tapes           | Specifies that the unencrypted data tapes are produced in both the London and Tokyo datacenters. In London, the unencrypted tape is written for clients 1, 5 and 10 and stored on-site at the London datacenter. In Tokyo, the unencrypted tape is written for clients 10 and 11 and stored on-site at the Tokyo datacenter. Note that even though client 10 is located in Tokyo and is backed up in Tokyo, client 10 is also backed up in London. |
Table 2-12  NetBackup parts used for a multi-datacenter with NBAC complete implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clients</td>
<td>Specifies that the clients are located in both the London and Tokyo datacenters. In London, client 1 is a standard NetBackup type. Client 5 is a Web server type located in the DMZ. All client types can be managed by the master server and have their data backed up to tape through media server 1. Client 5 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 5 also receives connections from the Internet using HTTP only ports through the external firewall. In Tokyo, client 10 is a standard NetBackup type. Client 11 is a Web server type located in the DMZ. All client types can be managed by the master server and have their data backed up to tape through media server 2. Client 11 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 11 also receives connections from the Internet using HTTP only ports through the external firewall.</td>
</tr>
<tr>
<td>Internal firewalls</td>
<td>Specifies that there can be two internal firewalls in this multi-datacenter example. One internal firewall is located in London and the other is located in Tokyo. In London, the internal firewall lets NetBackup access Web server client 5 in the DMZ. In Tokyo, the internal firewall lets NetBackup access Web server client 11 in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication through the internal firewall and into and out of the DMZ. HTTP ports that are open in the external firewall are not allowed to pass through the internal firewall.</td>
</tr>
<tr>
<td>Demilitarized Zones (DMZs)</td>
<td>Specifies that there can be two DMZs in this multi-datacenter example. One DMZ is located in London and the other is located in Tokyo. In London, the DMZ provides a &quot;safe&quot; area of operation for the Web server client 5 that exists between the internal firewall and external firewall. The Web server client 5 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 5 can also communicate through the external firewall to the Internet using only HTTP ports. In Tokyo, the DMZ provides a &quot;safe&quot; area of operation for the Web server client 11 that exists between the internal firewall and external firewall. The Web server client 11 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 11 can also communicate through the external firewall to the Internet using only HTTP ports.</td>
</tr>
</tbody>
</table>
Table 2-12  NetBackup parts used for a multi-datacenter with NBAC complete implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External firewalls</td>
<td>Specifies that there can be two external firewalls in this multi-datacenter example. One external firewall is located in London and the other is located in Tokyo. In London, the external firewall lets external users access the Web server client 5 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for Web server client 5 to communicate through the internal firewall to NetBackup. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 5 can pass through the external firewall to the Internet. In Tokyo, the external firewall lets external users access the Web server client 11 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for Web server client 11 to communicate through the internal firewall to NetBackup. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 11 can pass through the external firewall to the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies that there can be only one Internet but there are two Internet connections in this multi-datacenter example. One Internet connection is located in London and the other is located in Tokyo. The Internet is a collection of interconnected computer networks that are linked by copper wires, fiber-optic cables and wireless connections. In London, the Web server client 5 can communicate over the Internet using HTTP ports through the external firewall. In Tokyo, the Web server client 11 can communicate over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>

Multi-datacenter with all NetBackup security

A multi-datacenter that has all of the NetBackup security is defined as a medium to large group of hosts (greater than 50). These hosts can span two or more geographic regions and can be connected by a Wide Area Network (WAN). In this example one datacenter is located in London and the other datacenter is located in Tokyo. Both datacenters are connected through a dedicated WAN connection.

This example combines all the previous examples together. It represents a very sophisticated environment in which there can be different requirements for a variety of clients. Client requirements can necessitate using encryption off host (such as an underpowered host, or a database backup). Client requirements can also necessitate using encryption on host due to the sensitive nature of the data on the host. Adding NBAC to the security mix allows the segregation of administrators, operators, and users within NetBackup.

The multi-datacenter with all NetBackup security includes the following highlights:
- NetBackup spans two or more geographic regions through a WAN
- Please see the previous multi-datacenter sections for individual option highlights
Most flexible and complex environment

Careful design following a similar model can let you use the strengths of each option.

Figure 2-13 shows an example multi-datacenter with all NetBackup security.
The following table describes the NetBackup parts that are used for a multi-datacenter with all of the NetBackup security implemented.
<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>London datacenter</td>
<td>Contains the root broker, authentication broker 1, GUI 1. It also contains the authorization engine, master server, media server 1, MSEO 1, clients 1 through 6, transport and vault off-site. The London datacenter also contains the encrypted data tape for clients 1, 2, 3, 6, and 7 and the unencrypted data tape for clients 4 and 5. The London datacenter connects to the Tokyo datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Tokyo datacenter</td>
<td>Contains the authentication broker 2, GUI 2, media server 2, MSEO 2, clients 7 through 12, transport and vault off-site. The Tokyo datacenter also contains the encrypted data tape for clients 7, 8, 9, and 12 and the unencrypted data tape for clients 10 and 11. The Tokyo datacenter connects to the London datacenter through a dedicated WAN connection.</td>
</tr>
<tr>
<td>Wide Area Network (WAN)</td>
<td>Specifies that the dedicated WAN link connects the London datacenter with the Tokyo datacenter. The WAN provides connectivity between the root broker and authentication broker 1 and authentication broker 2. In addition, the WAN provides connectivity between the root broker and authentication broker 1 and GUI 2 along with media server 2. The WAN connects the authorization engine to media server 2. The WAN connects the master server to GUI 2, media server 2, and clients 7 through 12. Finally the WAN connects media server 1 to client 7.</td>
</tr>
<tr>
<td>Master server</td>
<td>Specifies that the master server, located in the London datacenter, communicates with the root broker and authentication broker 1, GUI 1, authorization engine, media server 1, and clients 1 through 6. The master server also communicates with GUI 2 and media server 2, and clients 7 through 12 in Tokyo.</td>
</tr>
</tbody>
</table>
| Media servers            | Specifies that there can be two media servers in this multi-datacenter example. Media server 1 is located in the London datacenter and media server 2 is located in the Tokyo datacenter. In London, media server 1 communicates with the master server, root broker and authentication broker 1. It also communicates with the authorization engine, MSEO 1, and clients 1 through 6, and 7. Media server 1 writes unencrypted data to tape for clients 4 and 5 and encrypted data to tape for clients 1 through 6.  

In Tokyo, media server 2 communicates with the master server, root broker, and authentication broker 1 and authorization engine in London through the WAN. Media server 2 also communicates with MSEO 2, GUI 2, and clients 7 through 12 in Tokyo. Media server 2 writes unencrypted data to tape for clients 10 and 11 and encrypted data to tape for clients 7, 8, 9, and 12. |
<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUIs</td>
<td>Specifies that there can be two GUIs in this multi-datacenter example. The GUI 1 is in London and GUI 2 is in Tokyo. These remote administration console GUIs receive credentials from the authentication brokers. The GUIs then use the credentials to gain access to functionality on the media servers and master servers. In London, GUI 1 receives a credential from authentication broker 1. GUI 1 has access to functionality on the master server and media servers 1 and 2. In Tokyo, GUI 2 receives a credential from the authentication broker 2. GUI 2 has access to functionality on the master server and media servers 1 and 2.</td>
</tr>
<tr>
<td>Root broker</td>
<td>Specifies that one root broker is required in a multi-datacenter installation. Sometimes the root broker is combined with the authentication broker. In this example, the root broker and authentication broker are shown as the same component and are located in the London datacenter. In London, the root broker authenticates the authentication broker 1 also in London and the authentication broker 2 in Tokyo. The root broker does not authenticate clients.</td>
</tr>
<tr>
<td>Authentication brokers</td>
<td>Specifies that there can be more than one authentication broker in a datacenter installation. Sometimes the authentication broker can be combined with the root broker. In this datacenter installation, there are two authentication brokers used. The authentication broker authenticates the master server, media server, GUI, and clients by establishing credentials with each. The authentication broker also authenticates a user with a command prompt. In London, authentication broker 1 authenticates a credential with the master server, media server 1, GUI 1, and clients 1 through 6. All NetBackup servers and clients in Tokyo and London authenticate to authentication broker 1 in London. GUI 1 authenticates to authentication broker 1 in London. GUI 2 authenticates to authentication broker 2 in Tokyo.</td>
</tr>
</tbody>
</table>
| Authorization engine | Specifies that only one authorization engine is required in a multi-datacenter installation. The authorization engine communicates with the master server and media servers to determine permissions of an authenticated user. These permissions determine the functionality available to the user. The authorization engine also stores user groups and permissions. The authorization engine resides in London and communicates with the master server, and media server 1. The authorization engine also communicates over the WAN to authorize access to media server 2 in Tokyo.  
  
  **Note:** The authorization engine resides on the master server as a daemon process. It is shown in the figure as a separate image for example only. |
<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
</table>
| Tapes       | Specifies that unencrypted and encrypted data tapes are produced in the London datacenter and in the Tokyo datacenter. In London, the unencrypted tape is written for clients 4 and 5 and stored on-site at the London datacenter. The encrypted tape is written for clients 1, 2, 3, 6, and 7, and is transported off-site to a vault in London for disaster recovery. In Tokyo, the unencrypted tape is written for clients 10 and 11 and stored on-site at the Tokyo datacenter. The encrypted tape is written for clients 7, 8, 9, and 12 and is transported off-site to a vault in Tokyo for disaster recovery protection. Even though client 7 is located in Tokyo and is backed up in Tokyo, client 7 is also backed up in London greater security and backup redundancy.  
**Note:** To decrypt the data, the key(s) used to encrypt the data must be made available. |
| Transports  | Specifies that there can be two transports. One transport is in London and the other is in Tokyo. The transport truck in London moves the encrypted tape for clients 1, 2, 3, 6, and 7 off-site to a secure London vault facility. The transport truck in Tokyo moves the encrypted tape for clients 7, 8, 9, and 12 off-site to a secure Tokyo vault facility. Note that a backup copy of client 7 is vaulted both in London and in Tokyo.  
**Note:** If a tape is lost during transport, the datacenter manager has potentially reduced the risk of a data breach by using client side data encryption. |
| Vaults off-site | Specifies that there can be two vaults off-site. One vault is in London and the other is in Tokyo. Both vaults provide safe encrypted tape storage facilities off-site at different locations than the datacenters.  
**Note:** Storing the encrypted tapes at a separate location from the datacenter promotes good disaster recovery protection. |
| Clients     | Specifies that clients are located in both the London and Tokyo datacenters. In London, clients 1 through 3 are MSEO encrypted types. Client 4 is a standard NetBackup type. Client 5 is a Web server type located in the DMZ. Client 6 is a client side encrypted type also located in the DMZ. All client types can be managed by the master server and have their data backed up to tape through media server 1. Client 5 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 5 also receives connections from the Internet using HTTP only ports through the external firewall.  
In Tokyo, clients 7 through 9 are MSEO encrypted types. Client 10 is a standard NetBackup type. Client 11 is a Web server type located in the DMZ. Client 12 is a client side encrypted type also located in the DMZ. All client types can be managed by the master server and have their data backed up to tape through media server 2. Note that client 7 can be managed by both media server 1 and 2. Client 11 communicates to NetBackup using NetBackup only ports through the internal firewall. Client 11 also receives connections from the Internet using HTTP only ports through the external firewall. |
Table 2-13  NetBackup parts used for a multi-datacenter with all NetBackup security implemented (continued)

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal firewalls</td>
<td>Specifies that there can be two internal firewalls in this multi-datacenter example. One internal firewall is located in London and the other is located in Tokyo. In London, the internal firewall lets NetBackup access Web server client 5 and encrypted client 6 in the DMZ. In Tokyo, the internal firewall NetBackup access Web server client 11 and encrypted client 12 in the DMZ. Only selected NetBackup ports and possibly other application ports are enabled for data communication through the internal firewall and into and out of the DMZ. HTTP ports that are open in the external firewall are not allowed to pass through the internal firewall.</td>
</tr>
<tr>
<td>Demilitarized Zones (DMZs)</td>
<td>Specifies that there can be two DMZs in this multi-datacenter example. One DMZ is located in London and the other is located in Tokyo. In London, the DMZ provides a &quot;safe&quot; area of operation for the Web server client 5 and encrypted client 6. These clients exist between the internal firewall and external firewall. The Web server client 5 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 5 can also communicate through the external firewall to the Internet using only HTTP ports. In Tokyo, the DMZ provides a &quot;safe&quot; area of operation for the Web server client 11 and encrypted client 12. These clients exist between the internal firewall and external firewall. The Web server client 11 in the DMZ can communicate to NetBackup through the internal firewall using designated NetBackup ports. The Web server client 11 can also communicate through the external firewall to the Internet using only HTTP ports.</td>
</tr>
<tr>
<td>External firewalls</td>
<td>Specifies that there can be two external firewalls in this multi-datacenter example. One external firewall is located in London and the other is located in Tokyo. In London, the external firewall external users access the Web server client 5 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for Web server client 5 to communicate through the internal firewall to NetBackup. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 5 can pass through the external firewall to the Internet. In Tokyo, the external firewall lets external users access the Web server client 11 located in the DMZ from the Internet over HTTP ports. NetBackup ports are open for Web server client 11 to communicate through the internal firewall to NetBackup. The NetBackup ports are not allowed to pass through the external firewall to the Internet. Only the HTTP ports of Web server client 11 can pass through the external firewall to the Internet.</td>
</tr>
<tr>
<td>Internet</td>
<td>Specifies that there can be only one Internet but there are two Internet connections in this multi-datacenter example. One Internet connection is located in London and the other is located in Tokyo. The Internet is a collection of interconnected computer networks that are linked by copper wires, fiber-optic cables and wireless connections. In London, the Web server client 5 can communicate over the Internet using HTTP ports through the external firewall. In Tokyo, the Web server client 11 can communicate over the Internet using HTTP ports through the external firewall.</td>
</tr>
</tbody>
</table>
Port security

This chapter includes the following topics:

- About NetBackup TCP/IP ports
- About NetBackup daemons, ports, and communication
- About configuring ports
- Port requirements for NDMP backups
- Known firewall problems encountered when using NetBackup with third-party robotic products

About NetBackup TCP/IP ports

Like other application software, NetBackup sends data packets to the network and receives data packets from the network. The operating system organizes these data packets into queues, which are known in TCP/IP terminology as ports. All NetBackup data communication uses the TCP/IP protocol.

NetBackup uses two classes of ports: reserved ports and non-reserved ports. These ports are as follows:

- **Reserved ports** are numbered less than 1024 and typically are accessible only to operating system components. NetBackup master servers use reserved ports to communicate with older revisions of NetBackup software that reside on clients, media servers, and other NetBackup components on the network. These are sometimes called back-rev connections. Callback is used only for back-rev connections.

- **Nonreserved ports** are numbered at 1024 and above. User applications can access these ports.
Some NetBackup ports are registered with the Internet Assigned Numbers Authority (IANA) and other NetBackup ports are assigned dynamically. Table 3-1 explains these ports.

### Table 3-1 Ports that NetBackup uses to enable TCP/IP connections

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
</table>
| Registered ports         | Specifies ports that are registered with the Internet Assigned Numbers Authority (IANA) and are assigned permanently to specific NetBackup services. For example, the port for the NetBackup client daemon, bpcd, is 13782. You can specify entries in the following files if you need to override the default port numbers:  
  - On UNIX systems, you can specify ports in the `/etc/services` file.  
  - On Windows systems, you can specify ports in the `%systemroot%\System32\drivers\etc\services` file. |
| Dynamically allocated ports | Specifies ports that are assigned from the ranges you specify on NetBackup clients and servers. You can configure NetBackup to select a port number at random from the allowed range, or you can configure NetBackup to start at the top of a range and use the first port available. |

**Caution:** Veritas recommends that you use the default port number settings for NetBackup services and internet service ports.

If you modify the port number for a daemon, ensure that the daemon’s port number is identical for all NetBackup master servers, media servers, and client systems that communicate with each other. If you ever need to contact Veritas Technical Services, inform the technical support representative of all nonstandard ports in your NetBackup environment.

The following other guides contain information about NetBackup ports:

- [NetBackup Administrator’s Guide, Volume I](#)
- [NetBackup Administrator’s Guide, Volume II](#)

The following topics contain information about NetBackup ports:

- See “About NetBackup daemons, ports, and communication” on page 97.
- See “About configuring ports” on page 107.
- See “Port requirements for NDMP backups” on page 110.
- See “Known firewall problems encountered when using NetBackup with third-party robotic products” on page 111.
About NetBackup daemons, ports, and communication

The following topics describe the ports that the NetBackup daemons use:

- See “Standard NetBackup ports” on page 97.
- See “NetBackup master server outgoing ports” on page 98.
- See “NetBackup media server outgoing ports” on page 99.
- See “NetBackup enterprise media management (EMM) server outgoing ports” on page 100.
- See “Client outgoing ports” on page 101.
- See “Java server outgoing ports” on page 101.
- See “Java console outgoing ports” on page 102.
- See “Additional port information for products that interoperate with NetBackup” on page 103.

Standard NetBackup ports

Table 3-2 shows the standard ports in a NetBackup environment. Some daemons are associated only with add-on products. The Notes column indicates the products that use the daemon.

<table>
<thead>
<tr>
<th>Source</th>
<th>Port name and/or number</th>
<th>Destination</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetBackup master server</td>
<td>VNETD / 13724</td>
<td>NetBackup master server, media server, or client</td>
<td>Network daemon, VNETD.</td>
</tr>
<tr>
<td>NetBackup media server</td>
<td>VNETD / 13724</td>
<td>NetBackup master server, media server, or client</td>
<td>Network daemon, VNETD.</td>
</tr>
<tr>
<td>Client</td>
<td>VNETD / 13724</td>
<td>NetBackup master server</td>
<td>Network daemon, VNETD.</td>
</tr>
<tr>
<td>NetBackup master server</td>
<td>veritas_pbx 1556</td>
<td>NetBackup master server, media server, or client</td>
<td>Veritas private branch exchange service, VxPBX.</td>
</tr>
<tr>
<td>NetBackup media server</td>
<td>veritas_pbx 1556</td>
<td>NetBackup master server, media server, or client</td>
<td>Veritas private branch exchange service, VxPBX.</td>
</tr>
</tbody>
</table>
Table 3-2  List of daemons and ports used in a standard NetBackup environment (continued)

<table>
<thead>
<tr>
<th>Source</th>
<th>Port name and/or number</th>
<th>Destination</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client</td>
<td>veritas_pbx 1556</td>
<td>NetBackup master server</td>
<td>Veritas private branch exchange service, VxPBX.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| NetBackup master server, media server, or client | 13783 | NetBackup master server | NetBackup authentication service, VxAT.  
NetBackup hosts connect using the PBX port. |
|        |                         |                      |                                                                      |
| NetBackup master server or media server | 13722 | NetBackup master server | NetBackup Authorization Service, VxAZ.  
NetBackup hosts connect using the PBX port. |

In a NetBackup environment, the source port number for connections to the well-known destination port numbers (provided in the table) is always derived from the source component's client port window or the client reserved port window. A typical NetBackup environment uses additional daemons and ports as described in the following topics:

**NetBackup master server outgoing ports**

*Table 3-3* shows the ports that the master server uses to connect to remote hosts.

<table>
<thead>
<tr>
<th>Port name and number</th>
<th>Destination</th>
<th>Notes</th>
</tr>
</thead>
</table>
| veritas_pbx 1556     | Media server | Connect-back for job information.  
Connect-back for resource information.  
Determines the NetBackup software release level on the media server.  
Starts bpbrm for backups and restores.  
Starts bptm to manage tape storage units.  
Starts bpstsinfo to manage disk storage units.  
Accesses or updates host properties for the media server. |
Table 3-3  NetBackup master server outbound ports and destinations (continued)

<table>
<thead>
<tr>
<th>Port name and number</th>
<th>Destination</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>veritas_pbx 1556</td>
<td>Enterprise media management (EMM) server</td>
<td>Determines the NetBackup software release level on the client. Accesses or information about the device, media, and storage databases. Obtains the list of mount points for multistreamed backups. Accesses or updates host properties for the client.</td>
</tr>
<tr>
<td>veritas_pbx 1556</td>
<td>Administrative console or Java server</td>
<td>Connect-back for Activity Monitor.</td>
</tr>
<tr>
<td>veritas_pbx 1556</td>
<td>Java console</td>
<td>Connect-back for job monitor.</td>
</tr>
</tbody>
</table>
| 13783                | Authentication server | Authenticates users and machines. Used only when the following are both true:  
  ■ NetBackup access control (NBAC) is enabled.  
  ■ Media servers and clients in the NetBackup environment host a NetBackup software release level that is lower than the release level on the master server. |
| 13722                | Authorization server | Authorizes a user for system administration. Used only when NBAC is enabled. |

NetBackup media server outgoing ports

Table 3-4 shows the ports that the media server uses to connect to remote hosts. The table shows the port name, port number, destination, and additional information.
### Table 3-4  
NetBackup media server outbound ports and destinations

<table>
<thead>
<tr>
<th>Port name and number</th>
<th>Destination</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>veritas_pbx 1556</td>
<td>Master server</td>
<td>Accesses legacy policy information from bpdbm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accesses legacy job information from bpjobd.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Updates image catalog information to bpdbm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Makes miscellaneous requests to bprd.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accesses job information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accesses resource information.</td>
</tr>
<tr>
<td>veritas_pbx 1556</td>
<td>Media server</td>
<td>Establishes sockets to other media servers for duplication, disk staging, and synthetics.</td>
</tr>
<tr>
<td>veritas_pbx 1556</td>
<td>Enterprise media management (EMM) server</td>
<td>Accesses information about device, media, and storage databases.</td>
</tr>
<tr>
<td>veritas_pbx 1556</td>
<td>Client</td>
<td>Determines the NetBackup software release level on the client and is used to backup or restore the client files or data.</td>
</tr>
<tr>
<td>13783</td>
<td>Authentication server</td>
<td>Authenticates users and machines.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used only when NetBackup access control (NBAC) is enabled.</td>
</tr>
<tr>
<td>13722</td>
<td>Authorization server</td>
<td>Authenticates a user for system administration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used only when NBAC is enabled.</td>
</tr>
</tbody>
</table>

### NetBackup enterprise media management (EMM) server outgoing ports

This information applies to remote EMM servers in the NetBackup setups.  
Table 3-5 shows the ports that the EMM server uses to connect to remote hosts.

### Table 3-5  
NetBackup EMM server outbound ports and destinations

<table>
<thead>
<tr>
<th>Port name and number</th>
<th>Destination</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>veritas_pbx 1556</td>
<td>Master server</td>
<td>Connect-back for information about device, media, and storage databases.</td>
</tr>
</tbody>
</table>
### Table 3-5 NetBackup EMM server outbound ports and destinations (continued)

<table>
<thead>
<tr>
<th>Port name and number</th>
<th>Destination</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>veritas_pbx 1556</td>
<td>Media server</td>
<td>Connect-back for information about device, media, and storage databases.</td>
</tr>
<tr>
<td>veritas_pbx 1556</td>
<td>Administrative console or Java server</td>
<td>Connect-back for information about device, media, and storage databases.</td>
</tr>
<tr>
<td>13783</td>
<td>Authentication server</td>
<td>Authenticates users and machines.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used only when the following are both true:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ NetBackup access control (NBAC) is enabled.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ Media servers and clients in the NetBackup environment host a NetBackup software release level that is lower than the release level on the master server.</td>
</tr>
<tr>
<td>13722</td>
<td>Authorization server</td>
<td>Authorizes a user for system administration.</td>
</tr>
</tbody>
</table>

### Client outgoing ports

*Table 3-6* shows the ports that clients use to connect to remote hosts.

<table>
<thead>
<tr>
<th>Port name and number</th>
<th>Destination</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>veritas_pbx 1556</td>
<td>Master server</td>
<td>Sends backup, restore, and other requests to bprd.</td>
</tr>
<tr>
<td>13783</td>
<td>Authentication server</td>
<td>Authenticates users or machines.</td>
</tr>
</tbody>
</table>

### Java server outgoing ports

*Table 3-7* shows the ports that the Java Server uses to connect to remote hosts.

The Java Server also uses outgoing ports to the NetBackup Product Authentication and Authorization Service (shown as VxSS Server).
### Table 3-7: Java server outbound ports and destinations

<table>
<thead>
<tr>
<th>Port name and number</th>
<th>Destination</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>veritas_pbx 1556</td>
<td>Master server</td>
<td>Accesses the jobs manager, nbjm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Manages policies.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Manages host properties.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Starts manual backups and restores.</td>
</tr>
<tr>
<td>veritas_pbx 1556</td>
<td>Media server</td>
<td>Accesses devices.</td>
</tr>
<tr>
<td>veritas_pbx 1556</td>
<td>Enterprise media management (EMM) server</td>
<td>Accesses devices, media, and storage unit databases.</td>
</tr>
<tr>
<td>13783</td>
<td>Authentication server</td>
<td>Establishes user credentials for administration.</td>
</tr>
</tbody>
</table>

### Java console outgoing ports

Table 3-8 shows the ports that the Administration Console uses to connect to remote hosts.

### Table 3-8: Administration Console outbound ports and destinations

<table>
<thead>
<tr>
<th>Port name and number</th>
<th>Destination</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>veritas_pbx 1556</td>
<td>Master server</td>
<td>Establishes sockets with the job manager, nbjm.</td>
</tr>
<tr>
<td>vnetd 13724</td>
<td>Master server</td>
<td>Establishes sockets with the legacy job manager, bpjobd.</td>
</tr>
<tr>
<td>vnetd 13724</td>
<td>Java server</td>
<td>Establishes sockets with the legacy Java server, bpjava.</td>
</tr>
</tbody>
</table>

### About MSDP port usage

The following table shows the ports that are used for NetBackup deduplication. If firewalls exist between the various deduplication hosts, open the indicated ports on the deduplication hosts. Deduplication hosts are the deduplication storage server, the load balancing servers, and the clients that deduplicate their own data.
If you have only a storage server and no load balancing servers or clients that deduplicate their own data, you do not have to open firewall ports.

**Table 3-9 Deduplication ports**

<table>
<thead>
<tr>
<th>Port</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>10082</td>
<td>The NetBackup Deduplication Engine (<em>spoold</em>). Open this port between the hosts that deduplicate data. Hosts include load balancing servers and clients that deduplicate their own data.</td>
</tr>
<tr>
<td>10102</td>
<td>The NetBackup Deduplication Manager (<em>spad</em>). Open this port between the hosts that deduplicate data. Hosts include load balancing servers and clients that deduplicate their own data.</td>
</tr>
<tr>
<td>443</td>
<td>The PureDisk Storage Pool Authority. Open this port between the NetBackup clients that deduplicate their own data and the PureDisk Storage Pool.</td>
</tr>
</tbody>
</table>

**About Cloud port usage**

NetBackup Cloud uses 5637 as the default port number for the nbcssc service.

**Additional port information for products that interoperate with NetBackup**

The following topics describe port information that is specific to OpsCenter, Backup Exec, and other products that interoperate with NetBackup:

**About communication ports and firewall considerations in OpsCenter**

*Figure 3-1* shows the key OpsCenter components and the communication ports that are used.
Figure 3-1 Key OpsCenter components and how they communicate

The following HTTPS ports are checked for availability in the specified sequence and the first available port is used as the default HTTPS port - Port 443, Port 8443, and Port 8553.

Ports required to communicate with backup products

This section provides information about the ports that OpsCenter Agent uses to communicate with backup products like Backup Exec and PureDisk.
Table 3-10 lists the ports that must be opened on OpsCenter Agent to collect data from various backup products.

<table>
<thead>
<tr>
<th>Backup product</th>
<th>Communication</th>
<th>Port number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backup Exec</td>
<td>OpsCenter (Backup Exec data collector) communicates with Backup Exec Server using Backup Exec API</td>
<td>6106</td>
</tr>
<tr>
<td>PureDisk</td>
<td>OpsCenter (PureDisk data collector) communicates with PureDisk SPA using atssl</td>
<td>443 (HTTPS), 2821 (AT)</td>
</tr>
</tbody>
</table>

Web browser to launch OpsCenter user interface

Web browsers use Secure hypertext transfer protocol (HTTPS) to communicate with the OpsCenter web graphical user interface. These protocols use TCP/IP.

Table 3-11 lists how the default HTTPS ports are selected.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>HTTPS port number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>443</td>
<td>Port 443 is checked for availability.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ If port 443 is available, it is used as the default HTTPS port.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ In case, some other application like a web server uses this port, then the next port is checked for availability.</td>
</tr>
<tr>
<td>2.</td>
<td>8443</td>
<td>Port 8443 is checked for availability.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ If port 8443 is available, port 8443 is used as the default HTTPS port.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ In case another application like VRTSWeb installed with VCS or any other product uses one or both ports, then the next port combination is checked for availability.</td>
</tr>
<tr>
<td>3.</td>
<td>8553</td>
<td>Port 8553 is checked for availability.</td>
</tr>
</tbody>
</table>

These HTTPS ports are opened only for input and are configurable using the command lines.
About OpsCenter user interface and OpsCenter server software communication

The OpsCenter web graphical user interface uses Veritas Private Branch Exchange (PBX) to communicate with the OpsCenter server software. The default port is 1556. The PBX port is opened for input and output traffic.

About OpsCenter server to NetBackup master server (NBSL) communication

OpsCenter requires the NetBackup Service Layer (NBSL) to be present on all managed master servers.

The OpsCenter server software collects data from NBSL in the following ways:

- Initial data load
- Listening for change notifications or events

Whenever OpsCenter server software starts, when data collection for a master server is enabled or when a master server is added in OpsCenter, the OpsCenter server starts collecting all the available data from NetBackup master server into the OpsCenter database using NBSL. The initial data load happens serially for each data type. As soon as the initial data load is complete, the OpsCenter server software listens to the notifications that are sent by NBSL for any change in NetBackup data. Then OpsCenter updates the OpsCenter database.

Veritas Private Branch Exchange (PBX) is used for communication and requires a port opened on the OpsCenter server and the NetBackup master server for input and output. The default PBX port is 1556.

About SNMP traps

SNMP trap protocol is used for outbound UDP traffic and requires a port that opens for output. The port number is 162.

About communication between OpsCenter and Sybase database

The OpsCenter web graphical user interface communicates with the OpsCenter Sybase SQL Anywhere database server by using the default port 13786.

The Sybase database server port is closed to all inbound connections. The database is available only to resident OpsCenter components on the OpsCenter server.
About email communication in OpsCenter

SMTP email server protocol is used for outgoing mail. The port number is defined when the user specifies the SMTP server port (see Settings > Configuration > SMTP Server in the OpsCenter console to specify this port). The port is opened for output only.

About configuring ports

NetBackup interfaces enable you to configure various nondefault ports in your environment to support firewalls and other network features.

The following topics explain how to set port configuration options:

- See “Enabling or disabling random port assignments” on page 107.
- See “Editing port information in configuration files” on page 108.
- See “Updating client connection options” on page 109.
- See “Updating port settings for the Media Manager in the vm.conf file” on page 109.

Enabling or disabling random port assignments

The Use random port assignments property specifies how the selected computer chooses a port when it communicates with NetBackup on other computers, as follows:

- When enabled, NetBackup chooses port numbers randomly from those that are free in the allowed range. For example, if the range is from 1023 through 5000, it chooses from the numbers in this range. This is the default behavior.

- When disabled, NetBackup chooses numbers sequentially, starting with the highest number that is available, in the allowed range. For example, if the range is from 1023 through 5000, NetBackup chooses 5000, assuming that it is free. If 5000 is used, NetBackup chooses port 4999.

The port selection scheme must be the same on the master server and on all media servers. By default, NetBackup assigns ports randomly. If you change one of your computers to use sequential port assignments, make sure to change all the computers in your environment to use sequential port assignments.

The following procedure explains how to specify port assignments.

To specify port assignments from the NetBackup Administration Console

1. In the NetBackup Administration Console, expand one of the following:
To specify a master server's port assignments, expand NetBackup Management > Host Properties > Master Servers

To specify a media server's port assignments, expand NetBackup Management > Host Properties > Media Servers

2 Double click the host you want to configure.

3 Click Port Ranges.

4 Check or clear Use random port assignments.

Make sure that the master server and the media servers in your environment are set identically. That is, make sure that Use random port assignments is cleared on both systems or that Use random port assignments is checked on both systems.

Editing port information in configuration files

NetBackup does not provide a graphical user interface for all port changes that you might need to make. For some settings, you need to edit the bp.conf file. The following are the bp.conf settings that you might want to change:

- ALLOW_NON_RESERVED_PORTS
- CLIENT_PORT_WINDOW
- CLIENT_RESERVED_PORT_WINDOW
- CONNECT_OPTIONS
- DEFAULT_CONNECT_OPTIONS
- RANDOM_PORTS
- SERVER_RESERVED_PORT_WINDOW
- SERVER_PORT_WINDOW

For information about the preceding settings, see the NetBackup Administrator's Guide, Volume I.

Veritas recommends that you do not change the bp.conf file directly. The following procedure uses general terms to explain how to use the bpgetconfig and bpsetconfig commands to change port information in the bp.conf file.
To change port settings in the bp.conf file

1  Type the `bpgetconfig` command from a NetBackup master server, NetBackup media server, or client.

   `bpgetconfig options > outputfile`

   For `options`, specify options from the `bpgetconfig` man page.

   For `outputfile`, specify the name of a text file.

2  Edit the output file you created to update port information.

   For example, on UNIX or Linux platform, you can use `vi(1)` to edit the file. On a Windows system, you can use Notepad to edit the file.

3  Type the `bpsetconfig` command to write the file back to NetBackup.

   For more information about configuration settings and ports, see the following:
   - NetBackup Administrator's Guide, Volume I
   - NetBackup Commands Reference Guide

Updating client connection options

NetBackup provides the following ways to specify client connection options:

- From the NetBackup administration console. Expand **Host Properties > Master Servers > Client Attributes > Connect Options**.

- From the command line. You can use the `bpclient` command to update a variety of client attributes.
  
  For example, you can use the `-connect_options` argument to the `bpclient` command to specify client port connection options.
  
  For more information about the command, see the **NetBackup Commands** manual.

Updating port settings for the Media Manager in the vm.conf file

The `vm.conf` file specifies Media Manager connection options. If you want to override the default connection options, you need to edit the `vm.conf` file. The NetBackup administration console does not provide a way to change these settings. The path to the `vm.conf` is as follows:

- On Linux or UNIX, the path is as follows:
  
  `/usr/openv/volmgr/vm.conf`

- On Windows systems, the path is as follows:
  
  `install_path\volmgr\vm.conf`
Table 3-12 shows the `vm.conf` file settings that affect ports.

Table 3-12 Port usage-related Media Manager configuration settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
</table>
| CLIENT_PORT_WINDOW | Specifies the range of source ports that can be used on outgoing Media Manager connections. The format is as follows:  

```
CLIENT_PORT_WINDOW = min max
```

The `min` argument defines the lowest source port number.  

The `max` argument defines the highest source port number.  

For `min` and `max`, specify 0 (zero) or specify integers from 1024 to 65535. If `min` is 0 or if `max` is less than `min`, then the operating system determines the source port number.  

By default, `CLIENT_PORT_WINDOW = 0 0`.  

For example, the following setting defines a source port range from 3000 to 8000:  

```
CLIENT_PORT_WINDOW = 3000 8000
```

| RANDOM_PORTS      | Specifies whether NetBackup chooses ports randomly or sequentially when it communicates with other NetBackup servers. The format is as follows:  

```
RANDOM_PORTS = YES | NO
```

If `RANDOM_PORTS = YES`, or if there is no `RANDOM_PORT` entry, NetBackup selects a random port from the range specified by the `CLIENT_PORT_WINDOW` setting in the `vm.conf` file.  

If `RANDOM_PORTS = NO`, the NetBackup attempts the connection with the highest source port number in the range. If the source port does not work, NetBackup tries the next highest source port number. The port number is chosen from the list until it finds a source port number that works.

---

**Port requirements for NDMP backups**

Network data management protocol (NDMP) storage unit backups require that specific ports be open in a firewall environment. The backup type determines the ports that need to be opened in the firewall.

The following table explains the ports requirements for NDMP backups.
Table 3-13  Ports requirements for NDMP backups

<table>
<thead>
<tr>
<th>Backup type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>For local operations, the Data Management Application (DMA) needs access to port 10000 on the NDMP server. In this case, the one NDMP server is both the NDMP tape server and the NDMP data server.</td>
</tr>
<tr>
<td>Three-way and remote NDMP</td>
<td>For three-way and remote NDMP, the DMA needs access to port 10000 on the NDMP tape server and the NDMP data server. There cannot be a firewall between the NDMP tape server and the NDMP data server. No firewall is needed because control is not required over the TCP/IP ports that are used for the data movement.</td>
</tr>
</tbody>
</table>

On UNIX systems, the NetBackup avrd process uses the Internet Control Message Protocol (ICMP) when it pings the NDMP hosts to verify network connectivity. If a ping fails, NetBackup skips this particular device, which leaves the status of the drive as up.

On Windows systems, NetBackup does not ping the NDMP device. It tries the connection. If the network experiences connectivity problems, this method can take longer as NetBackup waits for a timeout.

Known firewall problems encountered when using NetBackup with third-party robotic products

Communication between some third-party products and NetBackup occurs through undefined ports. NetBackup has no control over this communication, so there is no way to open firewall ports between a NetBackup media server and the following third-party servers:

- An automated cartridge system (ACS) server. A remote procedure call enables this communication. There is no common port.
- A Fujitsu library management facility (LMF) server.
- A tape library half-inch (TLH) IBM library manager server.
- A tape library multimedia (TLM) ADIC DAS/SDLC server.
Auditing NetBackup operations

This chapter includes the following topics:

- About NetBackup auditing
- Viewing the current audit settings
- Configuring auditing on a NetBackup master server
- User identity in the audit report
- About Enhanced Auditing
- Enabling Enhanced Auditing
- Configuring Enhanced Auditing
- Disabling Enhanced Auditing
- Auditing host property changes
- Retaining and backing up audit trail records
- Viewing the audit report
- Using the command line -reason or -r option
- nbaudit log behavior
- Audit alert notification for audit failures
About NetBackup auditing

An audit trail is a record of user-initiated actions in a NetBackup environment. Essentially, auditing gathers the information to help answer who changed what and when they changed it. Auditing NetBackup operations can help provide information in the following areas:

General tracking

Customers can gain insight from audit trails while they investigate unexpected changes in a NetBackup environment. For example, it might be found that the addition of a client or a backup path has caused a significant increase in backup times. The audit report can indicate that an adjustment to a schedule or to a storage unit configuration might be necessary to accommodate the policy change.

Regulatory compliance

Auditing creates a record of who changed what and when it was changed. The record complies with guidelines such as those required by the Sarbanes-Oxley Act (SOX).

Corporate change management

For customers who must adhere to internal change management policies, NetBackup auditing offers a method to adhere to such policies.

Troubleshooting

The information from NetBackup auditing helps NetBackup Support to troubleshoot problems for customers.

About the NetBackup Audit Manager

The NetBackup Audit Manager (nbaudit) runs on the master server and audit records are maintained in the Enterprise Media Manager (EMM) database. By default, auditing is enabled.

The Audit Manager provides the mechanism to query and report on auditing information. For example, an administrator can search specifically for information based on the following:

- When an action occurred
- The actions that a specific user performed
- The actions that were performed in a specific content area
- Changes to the audit configuration

Actions that NetBackup audits

You can view the actions NetBackup audits with the nbauditreport command or in NetBackup OpsCenter.

See “Viewing the audit report” on page 126.

When auditing is enabled, NetBackup records the following user-initiated actions.
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policies actions</td>
<td>Adding, deleting, or updating policy attributes, clients, schedules, and backup selections lists.</td>
</tr>
<tr>
<td>Activity monitor actions</td>
<td>Canceling, suspending, resuming, restarting, or deleting any type of job creates an audit record.</td>
</tr>
<tr>
<td>Storage units actions</td>
<td>Adding, deleting, or updating storage units.</td>
</tr>
<tr>
<td><strong>Note:</strong> Actions that are related to <strong>Storage Lifecycle Policies</strong> are not audited.</td>
<td></td>
</tr>
<tr>
<td>Storage servers actions</td>
<td>Adding, deleting, or updating storage servers.</td>
</tr>
<tr>
<td>Disk pools and Volume pools actions</td>
<td>Adding, deleting, or updating disk or volume pools.</td>
</tr>
<tr>
<td>(Conditional) Host properties actions</td>
<td>Updates to the host properties. You must enable NetBackup Access Control (NBAC) to audit these changes.</td>
</tr>
</tbody>
</table>
| Catalog information              | ■ Verifying and expiring images.  
■ Read requests sent for the front-end usage data.                                                                                                                                                 |
| Certificate management           | Creating, revoking, renewing, and deploying of certificates and specific certificate failures.                                                                                                              |
| Certificate Verification Failures (CVFs) | Any failed connection attempts that involve SSL handshake errors, revoked certificates, or hostname validation failures.                                                                                   |
| Token management                 | Creating, deleting, and cleanup of tokens and specific token issuing failures.                                                                                                                               |
| User management                  | Adding and deleting users in the Enhanced Auditing mode.                                                                                                                                                     |
| Hold operations                  | Creating, modifying, and deleting hold operations.                                                                                                                                                           |
| Host database                    | NetBackup host database related operations.                                                                                                                                                                 |
| Login attempts                   | Any successful or failed login attempts for NetBackup Administration Console and NetBackup API.                                                                                                             |
| Security configuration           | Information related to changes made to the security configuration settings.                                                                                                                                   |
| Starting a restore job           | NetBackup does not audit when other types of jobs begin. For example, NetBackup does not audit when a backup job begins.                                                                                     |
| Enabling or disabling NetBackup Auditing |                                                                                                                                                                                                           |
| Starting and stopping the NetBackup Audit Manager (nbaudit) | Starting and stopping of the nbaudit manager is always audited, even if auditing is disabled.                                                                                                               |
| User action that fails to create an audit record | If auditing is enabled but a user action fails to create an audit record, the audit failure is captured in the nbaudit log.                                                                                |
To audit changes to the `bp.conf` file or the registry, you must enable NetBackup Access Control (NBAC). Manual changes to the `bp.conf` file or the registry are not audited.

See “Auditing host property changes” on page 125.

See “Configuring NetBackup Access Control (NBAC)” on page 149.

Authorization failure

- When you enable Enhanced Auditing, authorization failure is audited.

See "About Enhanced Auditing" on page 119.

Actions that NetBackup does not audit

The following actions are not audited and do not display in the audit report:

Any failed actions. NetBackup logs failed actions in NetBackup error logs. Failed actions do not display in audit reports because a failed attempt does not bring about a change in the NetBackup system state.

The effect of a configuration change. The results of a change to the NetBackup configuration are not audited. For example, the creation of a policy is audited, but the jobs that result from its creation are not.

The completion status of a manually initiated restore job. While the act of initiating a restore job is audited, the completion status of the job is not audited. Nor is the completion status of any other job type, whether initiated manually or not. The completion status is displayed in the Activity Monitor.

Internally initiated actions. NetBackup-initiated internal actions are not audited. For example, the scheduled deletion of expired images, scheduled backups, or periodic image database cleanup is not audited.

Storage Lifecycle Policy actions Actions that are related to Storage Lifecycle Policies are not audited.

Viewing the current audit settings

To view the current audit configuration, use either the `nbemmcmd` command on a NetBackup master server or view the settings using OpsCenter.

For directions about how to use OpsCenter to configure auditing, see the NetBackup OpsCenter Administrator's Guide.

To view the current audit settings

1. From a command prompt, locate the `nbemmcmd` command on the master server in the following directory:

   - On Windows: `Install_path\Veritas\NetBackup\bin\admincmd`
On UNIX:
/usr/openv/netbackup/bin/admincmd

Enter the nbemmcmd command using the following syntax:

```
nbemmcmd -listsettings -machinename masterserver
```

Where `masterserver` is the master server in question.

**Note:** The options are case-sensitive.

The output lists many configuration settings. Among them are the following:

- **AUDIT="ENABLED"**
  Indicates that auditing is turned on.

- **AUDIT="DISABLED"**
  Indicates that auditing is turned off.

- **AUDIT_RETENTION_PERIOD="90"**
  Indicates that if auditing is enabled, the records are retained for this length of time (in days) and then deleted. The default audit retention period is 90 days. A value of 0 (zero) indicates that the records are never deleted.

## Configuring auditing on a NetBackup master server

Auditing is enabled by default in new installations. However, the default may be enabled or disabled after an upgrade, depending on the setting before the upgrade.

NetBackup auditing can be configured directly on a NetBackup master server or by using OpsCenter.

The master server settings for enabling or disabling audit logging and setting the retention period are configured in the **Manage > Hosts** section of OpsCenter. Within OpsCenter, the expiration setting for Audit logs is configured under **Settings > Purge**.

See the **NetBackup OpsCenter Administrator’s Guide** for more details.

To configure auditing on a master server, use the `nbemmcmd` command with the `-changesetting` option.
To configure NetBackup auditing on a master server

1. From a command prompt, locate the nbemmcmd command on the master server in the following directory:
   - On Windows:
     \Install_path\Veritas\NetBackup\bin\admincmd
   - On UNIX:
     /usr/openv/netbackup/bin/admincmd

2. Enter the nbemmcmd command using the following syntax:
   ```
   nbemmcmd -changesetting -AUDIT DISABLED -machinename masterserver
   ```
   Where -AUDIT DISABLED turns off auditing on the master server that is indicated.

   __Note:__ The options are case-sensitive.

   In the following example, auditing has been turned off for server1.
   For example:
   ```
   nbemmcmd -changesetting -AUDIT DISABLED -machinename server1
   ```
Configure the audit retention period using the following syntax:

```
nbemmcmd -changesetting -AUDIT_RETENTION_PERIOD
number_of_days -machinename masterserver
```

Where `number_of_days` indicates (in days) how long audit records are to be retained for the audit report. If no retention period is indicated, the default audit retention period is 90 days.

**Note:** An audit retention period value of 0 (zero) indicates that the records are never deleted.

OpsCenter downloads the audit records periodically and retains them for a period of time that is configurable in OpsCenter. Retaining the audit records on the master server is only necessary if you want to view audit reports using the command line on the master server.

See the following topic for more information.

See "Retaining and backing up audit trail records" on page 126.

In the following example, the records of user actions are to be retained for 30 days and then deleted.

```
nbemmcmd -changesetting -AUDIT_RETENTION_PERIOD 30
    -machinename server1
```

The two options can be combined in one command line, as in the following example:

```
nbemmcmd -changesetting -AUDIT ENABLED -machinename server1
    -AUDIT_RETENTION_PERIOD 30
```

Run `nbauditreport` to display a report of the audited information.

**Note:** When a back level media server connects to an 8.0 master server, the `nbauditreport` operation fails. Upgrade the media server to 8.0 to successfully run the `nbauditreport` operation.

See “Viewing the audit report” on page 126.
User identity in the audit report

The audit report lists the identity of the user who performed a specific action. The identity includes the user name, the domain, and the domain type of the authenticated user.

The user name that is captured in the audit report, depends on the following:

- By default, only a root or an administrator user can perform NetBackup operations through a command-line interface as well as through the NetBackup Administration Console. The root or the administrator are hence audited with root or administrator user name.

- When either Enhanced Auditing or NBAC is enabled, the actual name of the user who performed NetBackup operations through the command-line interface or through the NetBackup Administration Console are recorded in the audit report.

- For certain actions that are performed through web services, the user cannot be identified. For example: nbcertcmd -getCertificate. NetBackup attributes these actions to <anonymous> user. The audit report shows <anonymous> as the user for such actions or commands.

- All tasks are audited as root or administrator when neither Enhanced Auditing nor NBAC is enabled.

See “About using NetBackup Access Control (NBAC)” on page 145.

See “About Enhanced Auditing” on page 119.

About Enhanced Auditing

With Enhanced Auditing, NetBackup administrators can delegate NetBackup administrator privileges to other designated users. The feature thus allows non-root users to administer NetBackup. The audit logs capture information about the actual user who makes changes to the NetBackup environment. Enhanced Auditing helps organizations track key information about the user activity that is important for audit compliance requirements. In particular, it is a feature that customers in highly regulated industries find useful.

**Note:** Any authorization failure is also audited with Enhanced Auditing.

By default, only a root or administrator can perform NetBackup operations through the command-line interface. However, with NetBackup configured for Enhanced Auditing and with the right NetBackup Administrator privileges, users can perform
NetBackup operations through the command-line interface. Enhanced Auditing provides coarse access control where the user is either an administrator or not one. Enhanced Auditing is not supported on the NetBackup Appliances.

**Note:** NBAC and Enhanced Auditing are mutually exclusive features.

**Note:** For now, Enhanced Auditing support is available for user operations such as NetBackup Policies, Jobs, Storage Units, Disk Pools, Storage Servers, Catalogs, and Host Properties, certificate deployment, and token generation.

The following table lists the commands where user actions are audited with Enhanced Auditing:

### Table 4-1 Commands and categories supported for Enhanced Auditing

<table>
<thead>
<tr>
<th>Category</th>
<th>Commands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy</td>
<td>bpplcatdrinfo, bpplclients, bppldelete, bpplincluder, bpplinfo, bpplist, bpplsched, bpplschedrep, bpplschedwin, bpplvalid, bppolicynew</td>
</tr>
<tr>
<td>Jobs</td>
<td>bpdbjobs</td>
</tr>
<tr>
<td>Storage Unit</td>
<td>bpstuadd, bpstuddel, bpsturep, bpstulist</td>
</tr>
<tr>
<td>Disk Pool</td>
<td>nbdevconfig and nbdevquery</td>
</tr>
<tr>
<td>Storage Servers</td>
<td>nbdevconfig and nbdevquery</td>
</tr>
<tr>
<td>Catalogs</td>
<td>bpexpdate, bpclist, bpimmedia, bpimagerlist, bpverify, and nbdeployutil</td>
</tr>
<tr>
<td>Host Properties</td>
<td>bpconfig, bpsetconfig, bpgetconfig, nbsetconfig, nbgetconfig, and nbemmcmd</td>
</tr>
<tr>
<td>Security tokens</td>
<td>createToken, deleteToken, and cleanupToken</td>
</tr>
<tr>
<td>Certificates</td>
<td>getCertificate, revokeCertificate, signCertificate, and renewCertificate</td>
</tr>
</tbody>
</table>

**Enabling Enhanced Auditing**

Use the following procedure to enable Enhanced Auditing.
To configure NetBackup for Enhanced Auditing

1. Run the `bpbaz -SetupExAudit` command on the master server.

   **Note:** In a clustered NetBackup setup, while you configure NetBackup to enable Enhanced Auditing, you need to run the `bpbaz -SetupExAudit` command only on the active node.

2. Restart the NetBackup services.

   See “Disabling Enhanced Auditing” on page 125.

   See “Configuring Enhanced Auditing” on page 121.

### Configuring Enhanced Auditing

You must perform a few additional configuration steps for certain scenarios for Enhanced Auditing. These steps are applicable when you perform a change server operation.

- A security certificate is mandatory when you connect to a media server through the NetBackup Administration Console.
  
  See “Connecting to a media server with Enhanced Auditing” on page 121.

- When you do a change server from a master server to another master server, you have to execute additional steps on the master server.
  
  See “Changing a server across NetBackup domains” on page 122.

### Connecting to a media server with Enhanced Auditing

For Enhanced Auditing, a security certificate is mandatory when a user wants to connect to a media server through the NetBackup Administration Console. Additional steps must be executed on the master server to get the certificate for each media server. Refer to the following procedure for details:
To generate a security certificate for a server

1. Run the `bpnbaz -ProvisionCert target.server.com` command on the master server. Here the `target.server.com` is the media server name.

   Sample usage: `acme.domain.mycompany.com` is a media server to which a user wants to do a change server

   Run the command `bpnbaz -ProvisionCert acme.domain.mycompany.com` on the master server.

   The following is the output:

   ```
   bpnbaz -ProvisionCert acme.domain.mycompany.com
   Setting up security on target host: acme.domain.mycompany.com
   Certificate deployed successfully
   Operation completed successfully.
   ```

2. Always restart the services on the media servers after generating a certificate.

   **Note:** Generating a security certificate is a one-time activity.

Changing a server across NetBackup domains

For Enhanced Auditing, when you perform a Change Server operation from a master or media server in one NetBackup domain to a host (master or media server or client) in another NetBackup domain, you must execute additional steps on each NetBackup server. You must also set up a trust on both master servers.

   **Note:** Executing these steps is a one-time activity.

The following steps help you to change the server and set up the trust on both master servers.

**To change server from a master to master server**

1. We have two NetBackup domains, NetBackup Domain 1 and NetBackup Domain 2.

   Consider two master servers, `Master_nbu_dom1` and `Master_nbu_dom2`. `Master_nbu_dom1` has media servers `Media1_nbu_dom1, Media2_nbu_dom1, MediaN_nbu_dom1, and a set of clients. Similarly, `Master_nbu_dom2` has media servers `Media1_nbu_dom2, Media2_nbu_dom2, MediaM_nbu_dom2, and a set of clients as shown in the image:
The user is connected to one of the servers in NetBackup Domain 1 (either master or media), for example, Master_server_nbu_dom1, and wants to do a change server to one of the hosts on NetBackup Domain 2, for example Host_nbu_dom2. It is mandatory that both the master servers (Master_nbu_dom1 and Master_nbu_dom2 here) establish a trust. Host_nbu_dom2 must set up a trust with Master_server_nbu_dom1.

2 To set up the trust, you must invoke a set of commands on UNIX and Windows:

On UNIX and Linux:

```
/usr/openv/netbackup/sec/at/bin/vssat setuptrust -b Master_server_nbu_dom1:1556:nbatd -s high on Host_nbu_dom2.
```

On Windows:

```
InstallPath\Veritas\NetBackup\sec\at\bin\vssat.bat
```

3 You must add an additional server entry in Host_nbu_dom2 for the Master_server_nbu_dom1 in the bp.conf file. Run the following command:

```
SERVER = Master_server_nbu_dom1 /*this should __not__ be the first SERVER entry*/
```
You can also add the additional server entry by connecting to the target master server through the NetBackup Administration Console.

4. The host that has the NetBackup Administration Console or the remote Java Administration console is also required to trust the X.509 NBATD certificate on the `Master_server_nbu_dom2`.

The trust can be set up by directly connecting to the `Master_server_nbu_dom2` master server through the GUI.

You can also invoke `/usr/openv/java/sec/at/bin/vssat setuptrust -b Master_server_nbu_dom2:1556:nbatd -s high` on the NetBackup Administration Console host.

Configuration requirements if using Change Server with NBAC or Enhanced Auditing

Additional configuration is required to perform the Change Server operation if NetBackup Access Control or Enhanced Auditing is used.

The following steps assume that NBAC or Enhanced Auditing is already configured.

**Configuration to support the Change Server operation:**

*fromServer* -> *toServer*

- Add *fromServer* to the host properties Additional Servers list on *toServer*.
- If *fromServer* and *toServer* are from different NetBackup domains (media servers of different master servers):
  - Use the `vssat` command to set up trust between the master servers of *fromServer* and *toServer*. (See “Changing a server across NetBackup domains” on page 122. Refer to step 2 in the procedure.)
  - Add the master server of *fromServer* to the host properties Additional Servers list on *toServer*.
- If *fromServer* or *toServer* are media servers:
  - Use the `bpnbaz -ProvisionCert` command to deploy the security (Machine) certificate if needed. (See “Connecting to a media server with Enhanced Auditing” on page 121.)

**Additional configuration steps**

To use the auth.conf file:

- Add the USER entry to the auth.conf file on each server.
If NBAC is enabled, run the `nbsetconfig` on each server to add the entry:

```
USE_AUTH_CONF_NBAC = YES
```

To use the Remote Administration Console:

- Set up trust with each master server by using either the `vssat` command or explicitly log on to each server at least once. (See “Changing a server across NetBackup domains” on page 122. Refer to step 2 in the procedure.)

To troubleshoot the configuration after setup, use `nslookup` and `bptestnetconn -a -s` to check server communications.

**Disabling Enhanced Auditing**

When you enable Enhanced Auditing, the `USE_AUTHENTICATION` option is set to ON.

To disable Enhanced Auditing, you must set the `USE_AUTHENTICATION` option to OFF. The following steps help you:

**To disable Enhanced Auditing**

1. Run the `bnpbaz -DisableExAudit` command.
2. Restart the NetBackup services.

**Auditing host property changes**

NetBackup audits host property changes if the administrator uses either the `bpsetconfig` or the `nbsetconfig` commands, or the equivalent property in the Host Properties utility.

The following criteria must be met for auditing to take place:

- The environment must be configured for NetBackup Access Control (NBAC).
- The host on which the `bp.conf` file or the registry changes are made must be at NetBackup 7.1 or later.
- The administrator must use either the `bpsetconfig` or the `nbsetconfig` commands, or the equivalent property in the Host Properties utility for auditing to occur. Changes that are made directly to the `bp.conf` file or to the registry are not audited. That is, the changes that are made without `bpsetconfig` or `nbsetconfig`.

For example, taking a client offline is not performed using the `bpsetconfig` or the `nbsetconfig` command, so this operation would not show up in the audit log.
Retaining and backing up audit trail records

By default, audit records are kept for 90 days. To change the default, use the `nbemmcmd -changesetting` command with the `-AUDIT_RETENTION_PERIOD` option.

See “Configuring auditing on a NetBackup master server” on page 116.

Based on the configured retention setting, the NetBackup Audit Service (nbaudit) deletes expired audit records once every 24 hours at 12:00 A.M. (local time).

The audit records are kept in audit tables that are part of the NetBackup database. The tables are retained for as long as the `-AUDIT_RETENTION_PERIOD` indicates and are backed up as part of the NetBackup catalog backup.

To make sure that audit records are not missed from a catalog backup, configure the catalog backup frequency to be less frequent or equal to the `-AUDIT_RETENTION_PERIOD`.

NetBackup OpsCenter downloads the audit records periodically from the EMM database. OpsCenter retains the records for a period of time that is configured within OpsCenter. Therefore, retaining the audit records on the NetBackup master server is only necessary if you want to view audit reports using the command line on the master server. Audit records can also be exported from OpsCenter.

Viewing the audit report

To view the audit report, use either the `nbauditreport` command on a NetBackup master server or view the settings using NetBackup OpsCenter.

Within OpsCenter, the Monitor > Audit Trails section provides the details of the Audit logs and lets you export that information to Excel or save as a .pdf file.

See the Veritas NetBackup OpsCenter Administrator’s Guide for more details.

If auditing is enabled but a user action fails to create an audit record, the audit failure is captured in the nbaudit log.

The Alert Notification button in the NetBackup Administration Console can notify administrators when an audit failure occurs.

See “Audit alert notification for audit failures” on page 133.

The failure to create an audit record has no effect on the user action that was performed.

If the user action succeeds, an exit code is returned that reflects the successful action. If auditing of the action fails, NetBackup status code 108 is returned (Action succeeded but auditing failed).
Note: The NetBackup Administration Console (Windows and UNIX (jnbSA)) does not return an exit status code 108 when auditing fails.

To view the NetBackup audit report

1 From a command prompt, locate the `nbauditreport` command on the master server in the following directory:
   - On Windows:
     \Install_path\Veritas\NetBackup\bin\admincmd
   - On UNIX:
     /usr/openv/netbackup/bin/admincmd

2 In its simplest form, enter the `nbauditreport` command using the following syntax:

   nbauditreport

The `nbauditreport` can also be used with a number of options.

Note: The options are case-sensitive.

- `-help`
  Use for assistance with the command at the command prompt.

- `-sdate` `<"MM/DD/YY [HH:[MM[:SS]]]"`
  Use to indicate the start date and time of the report data you want to view.

- `-edate` `<"MM/DD/YY [HH:[MM[:SS]]]"`
  Use to indicate the end date and time of the report data you want to view.

- `-ctgy POLICY`
  Use `-ctgy POLICY` to display information pertaining to policy changes.

- `-ctgy JOB`
  Use `-ctgy JOB` to display information pertaining to jobs.

- `-ctgy STU`
  Use `-ctgy STU` to display information pertaining to storage units.

- `-ctgy STORAGESRV`
  Use `-ctgy STORAGESRV` to display information pertaining to storage servers.

- `-ctgy POOL`
  Use `-ctgy POOL` to display information pertaining to storage pools.
Use `-ctgy AUDITCFG` to display information pertaining to audit configuration changes.

Use `-ctgy AUDITSVC` to display information pertaining to the starting and stopping of the NetBackup Audit service (`nbaudit`).

Use `-ctgy BPCONF` to display information pertaining to changes in the `bp.conf` file.

Use `-ctgy CERT` to display information pertaining to changes in certificate deployment.

Use `-ctgy LOGIN` to display information related to NetBackup Administration Console and NetBackup API login attempts.

Use `-ctgy TOKEN` to display information related to authorization tokens.

Use `-ctgy SEC_CONFIG` to display information related to changes made to the security configuration settings.

Use `-ctgy HOLD` to display information related to creating, modifying, and deleting hold operations.

Use `-ctgy AZFAILURE` to display information related to authorization failure when Enhanced Auditing is enabled.

Use `-ctgy CATALOG` to display information related to verifying and expiring images; and read requests sent for the front-end usage data.

Use `-ctgy HOST` to display NetBackup host database related operations.

Use `-ctgy CONNECTION` to display information about the host connections that were dropped.

Use the `-ctgy USER` to display information pertaining to addition and deletion of users in the Enhanced Auditing mode.
-user

<username[:domainname]>

Use to indicate the name of the user for whom you'd like to display audit information.

-fmt SUMMARY

If no report output format option (-fmt) is specified, the SUMMARY option is used by default.

-fmt DETAIL

The -fmt DETAIL option displays a comprehensive list of audit information. For example, when a policy is changed, this view lists the name of the attribute, the old value, and the new value.

-fmt PARSABLE

The -fmt PARSABLE option displays the same set of information as the DETAIL report but in a parsable format. The report uses the pipe character (|) as the parsing token between the audit report data.

[-notruncate]

Use the -notruncate option to display the old and new values of a changed attribute on separate lines in the details section of the report.

Note: -notruncate is valid only with the -fmt DETAIL option.

[-pagewidth <NNN>]

Use the -pagewidth option to set the page width for the details section of the report.

Note: -pagewidth is valid only with the -fmt DETAIL option.

[-order]

The -order option is valid only with -fmt PARSABLE. Use it to indicate the order in which the information appears.

Use the following parameters:

- D (Description)
- T (Timestamp)
- U (User)

3 The audit report contains the following details:
The details of the action that was performed. The details include the new values that are given to a modified object and the new values of all attributes for a newly created object. The details also include the identification of any deleted objects.

The identity of the user who performed the action. The identity includes the user name, the domain, and the domain type of the authenticated user.

See “User identity in the audit report” on page 119.

The time that the action was performed. The time is given in Coordinated Universal Time (UTC) and indicated in seconds. (For example, 12/06/11 10:32:48.)

**Note:** For certificate verification failures (CVFs) that involve SSL handshakes and revoked certificates, the timestamp indicates when the audit record is posted to the master server rather than when an individual certificate verification fails. A CVF audit record represents a group of CVF events over a time period. The record details provide the start and end times of the time period as well as the total number of CVFs that occurred in that period.

The category of user action that was performed. The CATEGORY displays only with the -fmt DETAIL|PARSABLE options.

Examples include the following:
- AUDITSVC START, AUDITSVC STOP
- POLICY CREATE, POLICY MODIFY, POLICY DELETE

The action that was performed. The ACTION displays only with the -fmt DETAIL|PARSABLE options.

Examples include the following:
- START, STOP
- CREATE, MODIFY, DELETE

The reason that the action was performed. A reason displays if a reason was specified in the command that created the change. The bpsetconfig and the nbsetconfig commands accept the -r option.

See “Using the command line -reason or -r option” on page 131.

The reason displays only with the -fmt DETAIL|PARSABLE options.
DETAILS  An account of all of the changes, listing the old values and the new values. Displays only with the -fmt DETAIL|PARSABLE options.

If an exit status appears in the output, look up the code in the NetBackup Administration Console (Troubleshooter), the online Help, or the Status Codes Reference Guide.

Figure 4-1 shows the default contents of an audit report that was run on server1.

Figure 4-1  Summary audit report example

[root@server1 admincmd]# ./nbauditreport
TIMESTAMP USER DESCRIPTION
09/23/2010 14:40:54 root@server1 Policy 'test_pol_1' was created
09/23/2010 14:40:54 root@server1 Schedule 'full' was added to Policy 'test_pol_1'
09/22/2010 17:10:23 root@server1 Audit setting(s) of master server 'server1' were modified

Audit records fetched: 3

Using the command line -reason or -r option

Many commands offer the -reason option for administrators to use to indicate why the action was performed. The reason displays in the audit report.

The -reason string must be no more than 512 characters. Command lines that accept the -reason option display an error if the string is over 512 characters.

Note that the audit reason cannot begin with a dash character (-). The reason cannot contain a single quotation mark (').

The following commands accept the -reason option (or -r option in the case of bpsetconfig or nbsetconfig):

- bpdbjobs
- bpplcatdrinfo
- bpplclients
- bppldelete
- bpplinclude
- bpplinfo
- bpplsched
Note: The `bpsetconfig` and `nbsetconfig` commands accept the `-r` option instead of the `-reason` option.

For more information on using the commands, see the NetBackup Commands Reference Guide.

**nbaudit log behavior**

The `nbaudit` log is found in the following location:

- **On Windows:**
  
  `Install_path\Veritas\NetBackup\logs\nbaudit`

- **On UNIX:**
  
  `/usr/openv/logs/nbaudit`

If auditing is enabled but a user action fails to create an audit record, the audit failure is captured in the `nbaudit` log.

The **Alert Notification** button in the NetBackup Administration Console can notify administrators when an audit failure occurs.

The `nbaudit` service behaves in the following manner when it creates audit records:

- The audit record limits the details of an entry to a maximum of 4096 characters. (For example, the Policy name.) The remaining characters are truncated while stored in the audit database.
The audit record limits the restore image IDs to a maximum of 1024 characters. The remaining characters are truncated while stored in the audit database.

Rollback operations are not audited. Some operations are carried out as multiple steps. For example, creating an MSDP-based storage server consists of multiple steps. Every successful step is audited. Failure in any of the steps results in a rollback, or rather, the successful steps may need to be undone. The audit record does not contain details about rollback operations.

Audit alert notification for audit failures

The Alert Notification option is located in the status bar at the bottom of the NetBackup Administration Console. If it is configured to do so, the option can indicate when an auditable action has failed to create an audit record. For example, if a policy attribute is changed but the NetBackup Audit Manager (nbaudit) is not running.

To configure Audit alert notification, right-click the Alert Notification option in the status bar:

Table 4-2 Audit alert notification settings

<p>| Turn on | When it is set to Turn on, a pop-up message displays in the following situation: Auditing is enabled, but an auditable action is performed in the NetBackup Administration Console and has failed to create an audit record. A pop-up message appears to alert the administrator about the failure. |
| Blink   | When it is set to Blink, the option blinks in the event of an auditing failure. Click the option to display the failure message. |</p>
<table>
<thead>
<tr>
<th>Table 4-2</th>
<th>Audit alert notification settings (continued)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn off</td>
<td>When it is set to <strong>Turn off</strong>, an auditing failure does not display a notification. The option appears as gray.</td>
</tr>
</tbody>
</table>

**Note:** **Turn off** does not mean that auditing is disabled. Auditing continues, but audit failure messages in the **NetBackup Administration Console** are disabled.
Access control security

This chapter includes the following topics:

■ About access control in NetBackup
■ User management
■ User authentication
■ Impact of Access Control via Enhanced Auditing on Java interface authorization

About access control in NetBackup

NetBackup provides the following types of access control:

■ The NetBackup Admin Console (default).
  Access control is limited to the NetBackup Administration Console. (Interfaces like the Backup, Archive, and Restore client and the NetBackup MS SQL Client are not affected.) Any non-root or non-administrator user can access the NetBackup Administration Console. Access control is view-based, not role-based. The auth.conf defines the NetBackup applications that users can access. A user must be a root user or administrator to perform NetBackup operations with the CLI.
  For detailed information about access control with the NetBackup Administration Console, refer to the NetBackup Administrator’s Guide, Volume I.

■ Enhanced Auditing.
  This feature allows a non-root user or a non-administrator to perform all the NetBackup operations through a command line interface or the NetBackup Administration Console. The user is authorized to either perform all operations or no operations. This feature does not offer role-based access control.
  See “About Enhanced Auditing” on page 119.

■ NetBackup Access Control (NBAC)
NBAC is the role-based access control provided with NetBackup. It provides access control for master servers, media servers, and clients in situations where you want to:

- Use a set of permissions for different levels of administrators for an application. A backup application can have operators (to monitor jobs) or administrators (with full permission to access, configure, and operate any NetBackup authorization object). You can also have Security administrators who can only configure access control.

- Separate the administrators, so that root or administrator permissions are not required to administer the system. You can have separate administrators for the systems other than administrators for applications.

See “About using NetBackup Access Control (NBAC)” on page 145.

Refer to the following table for key differences between the access control methods:

<table>
<thead>
<tr>
<th>Access and auditing</th>
<th>NetBackup Admin Console and auth.conf</th>
<th>Enhanced Auditing</th>
<th>NBAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who can use the NetBackup Admin Console?</td>
<td>Root users and administrators have full access to the Admin Console. Non-root users or non-administrators are limited to the Backup, Archive, and Restore application by default. Otherwise, these users can access the applications defined for them in the auth.conf file.</td>
<td>Root users, administrators, and NetBackup administrators have full access to the Admin Console. Non-root users or non-administrators are limited to the Backup, Archive, and Restore application by default.</td>
<td>Root users and administrators have full access to the Admin Console. A user’s NBAC group membership determines which applications they are authorized to use.</td>
</tr>
<tr>
<td>Who can use the CLI?</td>
<td>Root users and administrators have full access to the CLI.</td>
<td>Root users, administrators, and NetBackup administrators have full access to the CLI.</td>
<td>Root users or administrators have full access to the CLI. Users authorized by NBAC can use the CLI. Their NBAC group membership determines which commands they are authorized to use.</td>
</tr>
<tr>
<td>How is a user audited?</td>
<td>As root or administrator</td>
<td>With the real user name</td>
<td>With the real user name</td>
</tr>
<tr>
<td>Access and auditing</td>
<td>NetBackup Admin Console and auth.conf</td>
<td>Enhanced Auditing</td>
<td>NBAC</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------------------</td>
<td>------------------</td>
<td>------</td>
</tr>
<tr>
<td>Compatibility with other features</td>
<td>Enhanced Auditing</td>
<td>NBAC works independently.</td>
<td>NetBackup Admin Console and auth.conf Enhanced Auditing is not compatible with NBAC.</td>
</tr>
</tbody>
</table>

Refer to the following flowcharts for details about the different access control methods.
Figure 5-1  Access control for CLI users with Enhanced Auditing

Start

Enhanced Auditing?

Root or Administrator

Process request

Error msg

Auditing

Is the user authenticated to VxAT?

Is the user a NetBackup administrator (binary AZ)?

End

Y

No

Y

No

Yes

Y

No

Yes

Error msg

No

Y

No

Yes

No
Figure 5-2  Access control for NetBackup-Java based users with Enhanced Auditing enabled

Start

- Does the auth.conf file exist?
  - Yes
    - Enhanced Auditing?
      - Yes
        - Root/Administrator?
          - Yes
            - Has full NetBackup Java Console access
          - No
            - BAR GUI
        - No
          - Perform operation
          - Audit
          - End
      - No
        - Root/Administrator?
          - Yes
            - Has full NetBackup Java Console access
          - No
            - BAR GUI
    - No
      - Is user entry present in the auth.conf file?
        - Yes
          - Yes
            - Has full NetBackup Java Console access
          - No
            - BAR GUI
        - No
          - Perform operation
          - Audit
          - End
Figure 5-3  Access control for CLI users with NBAC

Start

NBAC enabled? Yes  AUTOMATIC/REQUIRED
No

Root or Administrator? No  AUTOMATIC
Yes

Is the user authenticated through VxAT? No  REQUIRED
Yes

Is the user authorized through VxAZ? No
Yes

Process request

Error msg
Auditing
Error msg
End
Figure 5-4  Access control for NetBackup-Java based users with NBAC
User management

With NetBackup configured for Enhanced Auditing, the administrator can:

- Grant and revoke NetBackup administrator privileges to users.
- Look up a user who has NetBackup administrator privileges.
- List users with NetBackup administrator privileges.

**Note:** Only a user with NetBackup administrator privileges can perform user management tasks.

Use the `bpnbaz` command to perform user management tasks. The add, delete, lookup, and lists users commands must be run with the following options:

```bash
bpnbaz -[AddUser | DelUser] Domain_Type:Domain_Name:User_Name [-M server] [-credfile][-reason]
```

The following table lists information about each command:

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
<th>Example usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>-AddUser</td>
<td>Helps the user to grant NetBackup administrator privileges.</td>
<td><code>bpnbaz -AddUser unixpwd:v-123790b.punin.sen.veritas.com:Debbie</code></td>
</tr>
<tr>
<td>-DelUser</td>
<td>Helps the user to revoke NetBackup administrator privileges.</td>
<td><code>bpnbaz -DelUser unixpwd:v-123790b.punin.sen.veritas.com:Debbie</code></td>
</tr>
<tr>
<td>-LookupUser</td>
<td>Helps the user to search for user or to look up users who have administrative privileges.</td>
<td><code>bpnbaz -LookupUser unixpwd:v-123790b.punin.sen.veritas.com:Debbie</code></td>
</tr>
<tr>
<td>-ListUsers</td>
<td>Helps the user to list the users with NetBackup administrator privileges.</td>
<td><code>bpnbaz -ListUsers</code></td>
</tr>
</tbody>
</table>
For more information about the `bpnbaz` command, see the [NetBackup Commands Reference Guide](#).

### User authentication

By default, NetBackup does not mandate user authentication. However, when NetBackup is configured for Enhanced Auditing, user authentication from master server is mandatory.

The user should use the `bpnbaz -login` command for authentication.

The log in process for UNIX and Windows users varies.

**UNIX**

- Running the `bpnbaz -login` command is mandatory for all users except the root user.

**Windows**

- The administrator logs in automatically through the Single Sign On (SSO) option.
- A standard user also logs in through the SSO option. But if the SSO fails, the user must run the `bpnbaz -login` command. The user can also run the `bpnbaz -GetBrokerCert` command to establish a trust with the server.

### Impact of Access Control via Enhanced Auditing on Java interface authorization

Command line and Java interface access works differently when you configure Enhanced Auditing. Entries in the `auth.conf` file supersede the access control for the NetBackup Administration Console.

See “User management” on page 142.

If a user is assigned administrator privileges, the user can perform all auditable NetBackup operations through the command line. Refer to the following table for information about user access:

<table>
<thead>
<tr>
<th>Table 5-3</th>
<th>User access</th>
</tr>
</thead>
<tbody>
<tr>
<td>auth.conf entry</td>
<td>CLI access</td>
</tr>
<tr>
<td>Debbie has an entry in the auth.conf file.</td>
<td>No access</td>
</tr>
</tbody>
</table>
## Table 5-3

User access *(continued)*

<table>
<thead>
<tr>
<th>auth.conf entry</th>
<th>CLI access</th>
<th>Java interface access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debbie has NetBackup administrator privileges, but has no entry in the auth.conf file.</td>
<td>Complete access</td>
<td>Complete access</td>
</tr>
<tr>
<td>Debbie has NetBackup administrator privileges and also has entry in the auth.conf file.</td>
<td>Complete access</td>
<td>Access as specified in the auth.conf file</td>
</tr>
<tr>
<td>Debbie does not have an entry in the auth.conf file and also does not have NetBackup administrator privileges.</td>
<td>No access</td>
<td>No access</td>
</tr>
</tbody>
</table>
NetBackup Access Control
Security (NBAC)

This chapter includes the following topics:

- About using NetBackup Access Control (NBAC)
- NetBackup access management administration
- About NetBackup Access Control (NBAC) configuration
- Configuring NetBackup Access Control (NBAC)
- Configuring Access Control host properties for the master and media server
- Access Control host properties dialog for the client
- Troubleshooting Access Management
- Using the Access Management utility
- About determining who can access NetBackup
- Viewing specific user permissions for NetBackup user groups
- Upgrading NetBackup Access Control (NBAC)
- Upgrading NetBackup when an older version of NetBackup is using a root broker installed on a remote machine

About using NetBackup Access Control (NBAC)

The NetBackup Access Control (NBAC) is the role-based access control that is used for master servers, media servers, and clients. NBAC can be used in situations where you want to:
Use a set of permissions for different levels of administrators for an application.
A backup application can have operators (perhaps load and unload tapes). It
can have local administrators (manage the application within one facility). It can
also have overall administrators who may have responsibility for multiple sites
and determine backup policy. Note that this feature is very useful in preventing
user errors. If junior level administrators are restricted from certain operations,
they are prevented from making inadvertent mistakes.

Separate administrators so that root permission to the system is not required
to administer the system. You can then separate the administrators for the
systems themselves from the ones who administer the applications.

The following table lists the NBAC considerations.

<table>
<thead>
<tr>
<th>Table 6-1</th>
<th>Description or resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consideration or issue</strong></td>
<td><strong>Description or resolution</strong></td>
</tr>
</tbody>
</table>
| Prerequisites before you configure NBAC | This prerequisites list can help you before you start to configure NBAC. These items ensure an easier installation. The following list contains the information for this installation:
  - User name or password for master server (root or administrator permission).
  - Name of master server
  - Name of all media servers that are connected to the master server
  - Name of all clients to be backed up
  - Host name or IP address
  - Use the `ping` or `traceroute` command as one of the tools to ensure that you can see the hosts. Using these commands ensures that you have not configured a firewall or other obstruction to block access.
| Note: Host names should be resolvable to a valid IP address.

| Determine if the master server, media server, or client is to be upgraded | Determine if the master server, media server, or client is to be upgraded as follows:
  - Some features are provided by upgrading master servers, some by media servers, and some from upgrading clients.
  - NetBackup works with a higher revision master server and lower revision clients and media servers.
  - Feature content determines what is deployed.
  - Deployment can be step wise if required. |
<table>
<thead>
<tr>
<th>Consideration or issue</th>
<th>Description or resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information about roles</td>
<td>Determine the roles in the configuration as follows:</td>
</tr>
<tr>
<td></td>
<td>■ Who administers the hosts (root permission on master server equals head administrator).</td>
</tr>
<tr>
<td></td>
<td>■ Determine roles to start and then add on the roles as required.</td>
</tr>
<tr>
<td>NBAC license requirements</td>
<td>No license is required to turn on the access controls.</td>
</tr>
<tr>
<td>NBAC and KMS permissions</td>
<td>Typically when using NBAC and when the <code>Setupmaster</code> command is run, the NetBackup related group permissions (for example, NBU_Admin and KMS_Admin) are created. The default root and administrator users are also added to those groups. In some cases the root and administrator users are not added to the KMS group when NetBackup is upgraded. The solution is to grant the root and the administrator users NBU_Admin and KMS_Admin permissions manually.</td>
</tr>
<tr>
<td>Windows Server Failover Clustering (WSFC) error messages while unhooking shared security services from PBX</td>
<td>In WSFC environments running the <code>bpbaz -UnhookSharedSecSvcsWithPBX &lt;virtualhostname&gt;</code> command can trigger error messages. However the shared Authentication and Authorization services are successfully unhooked from PBX and the errors can be ignored.</td>
</tr>
<tr>
<td>Possible cluster node errors</td>
<td>In a clustered environment when the command <code>bpbaz -setupmaster</code> is run in the context of local Administrator the <code>AUTHENTICATION_DOMAIN</code> entries may not contain the other cluster node entries. In such case these entries must be manually added from Host Properties into the <code>bp.conf</code> file.</td>
</tr>
<tr>
<td>Catalog recovery fails when NBAC is set to REQUIRED mode</td>
<td>If NBAC is running in REQUIRED mode and a catalog recovery was performed, NBAC needs to be reset back from PROHIBITED mode to REQUIRED mode.</td>
</tr>
<tr>
<td>Policy validation fails in NBAC mode (USE_VXSS = REQUIRED)</td>
<td>Back up, restore, and verification of policy for snapshot can fail in NBAC enabled mode if one of the following has been done.</td>
</tr>
<tr>
<td></td>
<td>■ Authenticated Principle is removed from the NBAC group: NBU_Users group</td>
</tr>
<tr>
<td></td>
<td>■ Back up and restore permissions of NBU_User group have been removed.</td>
</tr>
</tbody>
</table>
Table 6-1  NBAC considerations (continued)

<table>
<thead>
<tr>
<th>Consideration or issue</th>
<th>Description or resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The <code>bpnbaz -setupmaster</code> command fails with an error &quot;Unable to contact Authorization Service&quot;</td>
<td>If a user other than an Administrator tries to modify NetBackup security, the <code>bpnbaz -setupmaster</code> fails. Only a user 'Administrator' who is a part of the Administrator’s group has permissions to modify the NetBackup security and enable NBAC.</td>
</tr>
<tr>
<td>Failure of authentication broker configuration during installation.</td>
<td>Invalid domain name configuration of the system causes failure during configuration of authentication broker. To correct this problem, use the <code>bpnbaz -configureauth</code> command to configure the authentication broker. For information about the <code>bpnbaz</code> command, see the NetBackup Commands Reference Guide.</td>
</tr>
<tr>
<td>NetBackup GUI errors may occur if NBAC is enabled on a system that previously had Enhanced Auditing enabled.</td>
<td>When switching the NetBackup server from Enhanced Auditing to NBAC, make sure that all directories that are named after users are deleted in the following directory: Windows: <code>install_path\NetBackup\logs\user_ops</code> UNIX, Linux: <code>/usr/openv/netbackup/logs/user_ops</code> The following topic contains more details: See “Troubleshooting NBAC issues” on page 170.</td>
</tr>
</tbody>
</table>

**NetBackup access management administration**

The access to NetBackup can be controlled by defining the user groups and granting explicit permissions to these groups. You can configure the user groups and assign permissions. Select **Access Management** in the **NetBackup Administration Console**.

**Note:** In order for the **NetBackup Administration Console** to function, the user must have permission to log on to the system remotely.

**Note:** If some media servers are not configured with access control, non-root/non-administrator users cannot manage those servers.
About NetBackup Access Control (NBAC) configuration

Note: NBAC is already installed as part of the NetBackup installation. Only the NBAC configuration is required for this release.

The NBAC configuration instructions are for an NBAC configuration in non-HA environments. NetBackup supports a wide variety of HA environments across AIX, HP-UX, Linux, Solaris, and Windows environments. The NBAC configuration is as follows:

- If required, build a cluster for the master server. HA information is described in the NetBackup in Highly Available Environments Administrator's Guide for replication and disaster recovery. Clustering information is described in the NetBackup Clustered Master Server Administrator's Guide.
- Configure NBAC for operation by using the instructions provided.
  See “Configuring NetBackup Access Control (NBAC)” on page 149.

Configuring NetBackup Access Control (NBAC)

Note: The manual authentication and authorization client installs need to be done for older media servers and client hosts. NetBackup has the authentication clients and authorization clients that are embedded in them. No authentication servers and authorization servers are needed on media servers and clients.

For information on the NBAC configuration sequence, see the following procedure.
Configuring NetBackup Access Control (NBAC)

1 Configure the master server for NetBackup Access Control (NBAC).

See “Configuring NetBackup Access Control (NBAC) on standalone master servers” on page 151.

**Note:** The master server can be installed in a standalone mode or in a highly available configuration on a cluster.

2 Configure media servers for NBAC.

See “Configuring NetBackup Access Control (NBAC) on media servers” on page 153.

3 Configure clients for NBAC.

See “Installing and configuring access control on clients” on page 155.

**NBAC configuration overview**

This topic contains recommendations for configuring NetBackup Access Control (NBAC) using the `bpnbaz` command. This command is available under the `NETBACKUP_INSTALL_PATH/bin/admincmd` directory.

The `bpnbaz` utility is required to configure NBAC on the master servers, media servers, and clients. This tool also configures NBAC for all the back revision media’s and client’s hosts. See the following topic for a summary of the `bpnbaz` command: See “NBAC configure commands summary” on page 155. This topic provides an example of how to use these commands with specific details on recommended usage. Note that the services should be restarted on each of the servers and clients after configuration.

Since the configuration is done from the master server, ensure that operational communications links exist between the master server, the media servers, and the clients. To review the prerequisites list: See “About using NetBackup Access Control (NBAC)” on page 145. Review the list to ensure that you have noted all the associated media servers, clients, and the addresses to communicate with them.

See the following topic for troubleshooting information: See “Configuration and troubleshooting topics for NetBackup Authentication and Authorization” on page 171. A set of OS commands and one NetBackup command is useful for the first level of troubleshooting. The OS commands are `ping`, `traceroute`, and `telnet`. The NetBackup command is `bpclntcmd`. Use these commands to establish that the hosts can communicate with each other.
Configuring NetBackup Access Control (NBAC) on standalone master servers

The following procedures describe how to configure NetBackup Access Control (NBAC) on the master servers that are installed on a single computer. A master server requires an authentication server and authorization server.

The following table describes the host names for the NBAC configuration examples.

Table 6-2  Example host names

<table>
<thead>
<tr>
<th>Host name</th>
<th>Windows</th>
<th>UNIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master servers</td>
<td>win_master</td>
<td>unix_master</td>
</tr>
<tr>
<td>Media servers</td>
<td>win_media</td>
<td>unix_media</td>
</tr>
<tr>
<td>Clients</td>
<td>win_client</td>
<td>unix_client</td>
</tr>
</tbody>
</table>

The following procedure describes how to configure NBAC on standalone master servers.

**Note:** Use `-setupmaster` and set `USE_VXSS = AUTOMATIC` on the master server. If `USE_VXSS = REQUIRED` is set on the master server and an attempt is made to configure NBAC on media server, the following error can occur: NetBackup master server is configured in **REQU**ired Mode. Please change the mode to **AUTOMAT**IC to complete configuration of the media server.

**Configuring NBAC on standalone master servers**

1. Complete all of the NetBackup master server installations or upgrades.
2. Run the `bpnbaz -setupmaster` command.
   
Enter `y`. The system begins to gather configuration information. Then, the system begins to set up the authorization information.
3. Restart the NetBackup services on this computer after the `bpnbaz -setupmaster` command completes successfully.
4. Proceed to set up the media servers. See “Configuring NetBackup Access Control (NBAC) on media servers” on page 153.

Installing the NetBackup master server highly available on a cluster

You can use the following procedure to install the NetBackup master server highly available on a cluster.
Installing NetBackup with clustering

1. Configure the cluster system on which the NetBackup master server is to be installed.
2. Install the NetBackup master server on all nodes of the cluster.
3. Cluster the NetBackup master server.

HA information for replication and disaster recovery is described in the NetBackup in Highly Available Environments Administrator's Guide. Clustering information is described in the NetBackup Clustered Master Server Administrator's Guide.

4. Do a test backup to ensure that it works within the NetBackup domain without having NBAC enabled.

Configuring NetBackup Access Control (NBAC) on a clustered master server

**Note:** In a Windows clustered environment, after setup master is run, the AUTHENTICATION_DOMAIN entry in the passive nodes can be the same as the active node name. This is not acceptable. After a failover on a passive node, when MFC UI is launched (using <[local machine name] > \[Administrator user]), an authentication-related pop-up error message is displayed. The work-around for this issue is to add the local node name as authentication domain into the AUTHENTICATION_DOMAIN on passive nodes after setup master (before failover).

Before updating the value of AUTHENTICATION_DOMAIN, get the current value using the C:\Program Files\Veritas\NetBackup\bin\admincmd\bpgetconfig command. Then add the local node name as authentication domain in the existing domain list using the C:\Program Files\Veritas\NetBackup\bin\admincmd\bpsetconfig command. To exit and save from the bpsetconfig command prompt press Ctrl + Z and then press the Enter key.
**Note:** Reverting the NBAC mode from **REQUIRED** to **PROHIBITED** on the active node of a cluster, can lead the cluster into a faulted state. The workaround for this issue is to do the following. On an active node run the `bpclusterutil -disableSvc nbazd` command followed by the `bpclusterutil -disableSvc nbatd` command. Change the `bp.conf USE_VXSS=AUTOMATIC` or `REQUIRED` value to **PROHIBITED** using the `bpsetconfig` command. Run the `bpclusterutil -enableSvc nbazd` command followed by the `bpclusterutil -enableSvc nbatd` command on the active node while turning NBAC to **REQUIRED** mode to monitor the security services.

You can use the following procedure to configure NetBackup Access Control (NBAC) on a clustered master server.

**Configuring NetBackup Access Control (NBAC) on a clustered master server**

1. Log on to the primary cluster node.
2. If you use Windows, open a command console.
3. For UNIX, change the directory to `/usr/openv/netbackup/bin/admincmd`. For Windows, change the directory to `C:\Program Files\Veritas\NetBackup\bin\admincmd`.
4. Run `bpnbaz -setupmaster` on the active node.
5. Log on to the master server console GUI.
6. Restart the NetBackup services to ensure that the NBAC settings take place.

**Configuring NetBackup Access Control (NBAC) on media servers**

The following procedure describes how to configure NetBackup Access Control (NBAC) on media servers in a NetBackup configuration. These steps are needed for the media servers that are not co-located with the master server.

**Note:** Use `-setupmedia set USE_VXSS = AUTOMATIC` on the master server. If `USE_VXSS = REQUIRED` is set on the master server and an attempt is made to configure NBAC on media server, the following error can occur: NetBackup master server is configured in **REQUIRED** Mode. Please change the mode to **AUTOMATIC** to complete configuration of the media server.
Configuring access control on media servers

1. Log on to the master server computer.
2. Run the `bpnb -login` command.

Make sure that you run the `bpnb -login` command before the `bpnb -setupmedia` command to avoid a command failure.

The `bpnb -setupmedia` command has a number of options. This command does not work without an extension for either the individual host, or the `-all` option.

See “NBAC configure commands summary” on page 155.

It is recommended to do a dry run of the configuration first, with the `-dryrun` option. It can be used with both `-all` and a single-server configuration. By default, the discovered host list is written to the file `SetupMedia.nbac`. You can also provide your own output file name using the `-out <output file>` option. If you use your own output file, then it should be passed for the subsequent runs with the `-file` option. The dry-run command would look something like the following:

```bash
bpnb -SetupMedia -all -dryrun [-out <outfile>] or
bpnb -SetupMedia <media.server.com> -dryrun [-out <outfile>].
```

If all of the media servers that you want to update are in the log file, use the `-dryrun` option. You can proceed with the `-all` command to do them all at once. For example, you can use:

```bash
bpnb -SetupMedia -all or
bpnb -SetupMedia -file <progress file>.
```

Note that the `-all` option updates all of the media servers seen each time it runs. If you want to run it for a selected set of media servers, you can do it. Keep only the media server host names that you wanted to configure in a file, and pass that file using the `-file` option. This input file would either be `SetupMedia.nbac` or the custom file name you provided with the `-out` option in the previous dry run. For example, you may have used: `- bpnb -SetupMedia -file SetupMedia.nbac.

To configure a single media server, specify the media server host name as the option. For example, use:

```bash
bpnb -SetupMedia <media.server.com>.
```
3 Restart the NetBackup services on the target media servers after the command completes successfully. It sets up NBAC on the target hosts. If the configuration of some target hosts did not complete, you can check the output file. Proceed to the access control configuration for the client hosts after this step. See “Installing and configuring access control on clients” on page 155.

Installing and configuring access control on clients

The following steps describe installing and configuring NetBackup Access Control on clients in a NetBackup configuration. A client requires authentication client software.

Use the following procedure to install and configure access control on clients.

1 Make sure that no backups are currently running.
2 To set up the client, run the following command on the master server:

   `bnpbaz -setupClient`

About including authentication and authorization databases in the NetBackup hot catalog backups

If you have a NetBackup environment that uses the online hot catalog backup method, no additional configuration is needed to include the NetBackup Authentication and Authorization databases in the catalog backup.

NBAC configure commands summary

The following table summarizes the commands that are used in the NBAC quick configure sequences.

The following conventions are frequently used in the synopsis of command usage.

Brackets [ ] indicate that the enclosed command-line component is optional.

Vertical bar or pipe (|) -indicate separates optional arguments to choose from. For example, when a command has the format: `command arg1|arg2` you can select either the `arg1` or `arg2` variable.
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bpnbaz -GetConfiguredHosts [target.server.com [-out file]</td>
<td>- all [-outfile]</td>
</tr>
<tr>
<td></td>
<td>The syntax is:</td>
</tr>
<tr>
<td></td>
<td>- <code>target.server.com</code> is the name of a single target host. If for example you want to find out NBAC status on single host, then use this option.</td>
</tr>
<tr>
<td></td>
<td>- <code>-out</code> option is used to specify a custom output file name. By default, the output is written to the <code>SetupMedia.nbac</code> file. This option can be used with <code>-all</code> and the single host configuration options.</td>
</tr>
<tr>
<td></td>
<td>- <code>-all</code> is an option that goes through all the policies and collects all unique host names. These host names are found in the policies. It also collects all configured media server(s) and captures the NBAC status of each host in <code>ConfiguredHosts.nbac</code> file.</td>
</tr>
<tr>
<td></td>
<td>- <code>-file</code> <code>progress.file</code> is an option used to specify host name(s) to be read from <code>progress_file</code>. This option expects one host name per line in the <code>progress_file</code>. CLI updates the <code>progress_file</code> with the host's NBAC status. It appends <code>#</code> after <code>hostname</code> followed by the NBAC status.</td>
</tr>
<tr>
<td></td>
<td>- When used with <code>target.server.com</code> or <code>-all</code> option, status of the host(s) is captured in the <code>ConfiguredHosts.nbac</code> file.</td>
</tr>
</tbody>
</table>
Table 6-3  NBAC configure commands summary (continued)

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
</table>
| bpnbaz -SetupMaster [-fsa [domain type]:[domain name]:]<user name> | The bpnbaz -SetupMaster command is run to set up the master server for using NBAC. The authorization server and authentication broker are expected to be installed and running on the master server.

Use the bpnbaz -SetupMaster -fsa command with the First Security Administrator option to provision a particular OS user as NBU Administrator.

The syntax is:

- `-fsa` option is used for provisioning a specific OS user as NBU Administrator. When using this option you are asked for the password for your current OS user identity.
- `domain type` is the type of network domain you are using. For example the bpnbaz -SetupMaster -fsa nt:ENTERPRISE:jdoe command provisions the Windows enterprise domain user jdoe as NBU Administer.
- `domain name` is the name of the particular domain you are using. For example the bpnbaz -SetupMaster -fsa jdoe command takes the current logged on user domain type (Windows/UNIXPWD), domain name, and provisions jdoe user in that domain.
- `user name` is the particular OS user name you are designating as an NBU Administrator.

**Note:** The user is verified for the existence in the specified domain. Existing behavior of provisioning the logged-on Administrator or root as NBU Admin is preserved.
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
</table>
| `bpnbaz -SetupMedia [media.server.com [-out file] | -all [-out file] | -file progress.file ] [-dryrun] [-disable]` | The `bpnbaz -SetupMedia` command is run by an NBU_Administrator group member on the master server. It should not be run until a `bpnbaz -SetupMaster` has been completed successfully. It expects connectivity between the master server and target media server systems. Either the `-all` or `target.server.com` options are required for this command. The syntax is:

- `media.server.com` is the name of a single target host. Use this option to add a single additional host for use with NBAC.
- `-out` option is used to specify a custom output file name. By default, the output is written to the `SetupMedia.nbac` file. This option can be used with `-all` and the single host configuration options.
- `-all` goes through all the storage units and collect all unique host names that are found in the storage unites. These can be tried in a sorted order. The results are written to the progress file.
- `-file progress_file` option is used to specify an input file with a specific set of media server host names. After the run, status for each media server is updated in the progress file. Successfully completed ones are commented out for the subsequent runs. This command can be repeated until all the media servers in the input file are successfully configured.
- `-dryrun` can generate the list of media server names and write them to the log. This option can work with `media.server.com` but it is intended to be used with the `-all` option.
- `-disable option` can disable NBAC (`USE_VXSS = PROHIBITED` ) on targeted hosts. |
Table 6-3

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
</table>
| `bpnbaz -SetupClient [client.server.com [-out file] | -all [-images] [-out file] | -file progress.file ] [-dryrun] [-disable]` | The `bpnbaz -SetupClient` command is used for setting up NBAC on the clients. It should not be run until the `bpnbaz -SetupMaster` command has been completed successfully. The `bpnbaz -SetupClient` needs to run from the master server. It expects connectivity between the master server and target client systems. Either the `-all` or `target.server.com` options are required for this command. The syntax is:

- `client.server.com` is the name of a single target host. If for example you wished to add a single additional host for use with NBAC, then this name is the option for you.
- `-out` is an option that is used to specify a custom output file name. By default, the output is written to the `SetupClient.nbac` file. This option can be used with `-all` and the single host configuration options. The `-out` option is used to specify a custom output file name. By default, the output is written to the `SetupClient.nbac` file. This option can be used with `-all` and the single host configuration options.
- `-all` is an option that goes through all the policies and collects all unique host names that are found within the policies. The policies are tried in a sorted order. The results are written to the progress file.
- `-images` is an option that searches all images for unique host names. This option cannot be recommended for customers with large catalogs unless they add the `-dryrun` option. This option yields all unique clients that are contained in the image catalog. Older catalogs can contain a larger number of decommissioned hosts, hosts that are moved to new masters, or are renamed. Run time of the command can increase as attempts are made to contact unreachable hosts.
- `-dryrun` is an option that generates the list of client names and writes them to the log. It does not result in actual configuration of the target systems.
- `-disable` is an option that disables NBAC (`USE_VXSS = PROHIBITED`) on targeted hosts.
- `-file progress.file` is an option used to specify a different file name for the progress log. The CLI reads the host names from the `progress_file`. The status is appended next to each host name with a `[# separated value]`. Successfully completed ones are commented out. This command can be run multiple times until all the clients in the `progress_file` are successfully configured. |
Unifying NetBackup Management infrastructures with the setuptrust command

**Note:** This is done automatically when the OpsCenter server name is provided during install time. If not, there is a command that adds OpsCenter server name to the NetBackup master server. That establishes the trust from the NetBackup side.

The Veritas products management servers need to communicate so that an administrator for one product has permission to administer another product. This communication ensures that application processes in one management server work with another server. One way of ensuring that communication is to use a common independent security server called a root broker. If all of the management servers point to a common root broker, the permission for each server is based on a common certificate. Another way of ensuring communication is to use the `setuptrust` command. This command is used to establish trust between the two management servers. The command is issued from the management server that needs to trust another management server. The security information is transferred from that host to the one requesting the trust establishment. A one-way trust is established. Setting up two way (mutual) trust is performed by issuing the `setuptrust` command from each of the two servers involved. For example, a NetBackup configuration may consist of one OpsCenter server (OPS) and three master servers (A, B, and C). Each of the master servers has connected to them the NBAC policies and management for the clients and the media servers.

The first step is to have the OpsCenter server (OPS) setup trust with each of the master servers (A, B, and C). This trust ensures that the Veritas OpsCenter server receives secure communications from each of the master servers, the clients and the media servers connected to each of the master servers. A sequence of these events is as follows:

- The OPS sets up trust with master server A.
- The OPS sets up trust with master server B.
- The OPS sets up trust with master server C.

If Veritas OpsCenter is set up to perform actions on the individual master servers, a trust relationship needs to be set up from each of the master servers to the OpsCenter server (OPS). A sequence of these events is as follows. In this case, the `setuptrust` command is run six times.

- The master server A sets up trust with Veritas OpsCenter server (OPS).
- The master server B sets up trust with Veritas OpsCenter server (OPS).
- The master server C sets up trust with Veritas OpsCenter server (OPS).
The Veritas OpsCenter server OPS sets up trust with master server A.

The Veritas OpsCenter server OPS sets up trust with master server B.

The Veritas OpsCenter server OPS sets up trust with master server C.

**Note:** NetBackup and OpsCenter establish trust automatically. You may need to do these `setuptrust` operations manually with older NetBackup master servers. At the end of the NetBackup master server installation, there is a question on the OpsCenter host name. With that, the master server can initiate a two-way trust setup.

Details on the `setuptrust` command are described in the NetBackup Commands Reference Guide. See “Using the setuptrust command” on page 161.

**Using the setuptrust command**

You can use the `setuptrust` command to contact the broker to be trusted, obtain its certificate or details over the wire, and add to the trust repository if the furnished details are trustworthy. The security administrator can configure one of the following levels of security for distributing root certificates:

- **High security (2):** If a previously untrusted root is acquired from the peer (that is, if no certificate with the same signature exists in our trust store), the user is prompted to verify the hash.

- **Medium security (1):** The first authentication broker is trusted without prompting. Any attempts to trust subsequent authentication brokers causes the user to be prompted for a hash verification before the certificate is added to the trusted store.

- **Low security (0):** The authentication broker certificate is always trusted without any prompting. The `vssat` CLI is located in the authentication service ‘bin’ directory.

The `setuptrust` command uses the following syntax:

```
vssat setuptrust --broker <host[:port]> --securitylevel high
```

The `setuptrust` command uses the following arguments:

The `broker`, `host`, and `port` arguments are first. The host and port of the broker to be trusted. The registered port for Authentication is 2821. If the broker has been configured with another port number, consult your security administrator for information.
Configuring Access Control host properties for the master and media server

To configure the access control host properties for the master server or media server, expand NetBackup Management > Host Properties > Master Servers or Media Servers > server name > Access Control.

Set NetBackup Product Authentication and Authorization to either Required or Automatic. A setting of Automatic takes into account that there may be hosts within the configuration that are not yet configured for NBAC. The server attempts to negotiate the most secure connection possible when it communicates to other NetBackup systems. The Automatic setting should be used until all of the clients and servers are configured for NBAC.

Figure 6-1 shows the Access Control host properties dialog box.
When **Automatic** is selected, you can specify computers or the domains required to use **NetBackup Product Authentication and Authorization**. Otherwise, you can specify the computers that are prohibited from using the **NetBackup Product Authentication and Authorization**.

**Authentication Domain tab**

The **Authentication Domain** tab is used to define the following:

- Which authentication servers support which authentication mechanisms
- What each domain supports.

Add the domain that you want users to authenticate against.

The following examples contain six authentication domains.
Figure 6-2 shows the Authentication Domain tab.

Note: When a UNIX authentication domain is used, enter the fully qualified domain name of the host that performed the authentication.

Note: The authentication types that are supported are NIS, NISPLUS, WINDOWS, vx, and unixpwd (unixpwd is default).
Authorization Service tab

**Note:** No changes are allowed from this tab. It is read only.

Within the **Access Control** host properties, on the **Authorization Service** tab, you can see the host name. All of this information is grayed out because it is read only. You cannot make any changes to this screen.

**Figure 6-3** shows the authorization service tab.

**Figure 6-3** Authorization Service tab
Network Attributes tab

View the **Access Control** host properties on the **Network Attributes** tab. Add the master server to the **Networks** list. Then, set the **NetBackup Product Authentication and Authorization** to **Required**.

Each new NetBackup client or media server that is added to the NetBackup master needs to have the **Access Control** properties configured. These properties are configured on both itself and the master. This configuration can be done through the host properties on the master server.

Access Control host properties dialog for the client

Select the NetBackup client in the host properties. (On the master server, in the **NetBackup Administration Console**, expand **NetBackup Management > Host Properties > Clients > Selected clients > Access Control**.)

The following figure shows the **Access Control** host properties for the client.
Set the **NetBackup Product Authentication and Authorization** to **Required** or **Automatic**. In this example, **Automatic** is selected.

**Authentication Domain tab for the client**

Select the NetBackup client in the host properties. It can be used to control which systems require or prohibit the use of NetBackup Product Authentication and Authorization on a per-machine basis. Note that both systems must have matching settings to communicate.
Within the **Access Control** host properties, on the **Authentication Domain** tab, add the list of domains a client can use to authenticate. You can click **Find** to get a list of available authentication domains. Then, click **Add** to create a list of selected authentication domains.

**Figure 6-5** shows the **Authentication Domain** tab and the selected authentication domains.

**Figure 6-5**  Authentication Domain tab for client

Within the **Access Control** host properties, on the **Network Attributes** tab, add the list of networks that the client can use to authenticate.
Figure 6-6 shows the **Network Attributes** tab for the client.

**Figure 6-6** Network Attributes tab for the client

Troubleshooting Access Management

To troubleshoot access management and to determine if certain processes and functionality are operating correctly:

See “Configuration and troubleshooting topics for NetBackup Authentication and Authorization” on page 171.

These verification points include:

- Windows verification points
  
  See “Windows verification points” on page 178.
Troubleshooting NBAC issues

The following table lists the issues and solutions that are related to NBAC:

Table 6-4  NBAC issues

<table>
<thead>
<tr>
<th>Issue and Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A user directed backup or restore fails</strong></td>
<td>Configure the Windows interface to support the setup.</td>
</tr>
<tr>
<td>A user-directed backup or restore fails with NBAC in the automated mode. The Backup, Archive, and Restore interface shows some errors in the Windows interface when NBAC is configured.</td>
<td>There should be at least one Microsoft Windows system that acts as an Authentication Broker to authenticate users from the Active Directory domain. Refer to the TECH199281 for steps to configure the Windows interface to make use of existing users from Active Directory to manage or operate or use a NetBackup environment that is primarily on UNIX/Linux platforms. After you correctly configure the setup run the <code>bnpbat -logout</code> command to log out from the setup before you restart the interface.</td>
</tr>
<tr>
<td><strong>Authentication failure with error 116</strong></td>
<td>Check whether NBAC authentication is configured correctly and also if you have a valid usable credential for the target host.</td>
</tr>
<tr>
<td>The authentication fails with 'error 116-VxSS authentication' when you try to set up NBAC on a target host.</td>
<td></td>
</tr>
<tr>
<td><strong>Error when a non-admin user from the NBU_Operator group tries to use Access Management</strong></td>
<td>The users from the NBU_Operator group have limited permissions.</td>
</tr>
<tr>
<td>A non-admin user is added to the NBU_Operator group. Read, Browse, and Configure permissions are assigned along with the permission to configure the Host Properties. However, when the user tries to open the Access Management utility, an error displays.</td>
<td>The user would require a different set of permissions to use the Access Management utility. For the required permissions, add the user to the NBU_Security_Admin group. For more information about user groups: See “NetBackup default user groups” on page 213.</td>
</tr>
</tbody>
</table>
For the auth.conf file to work in an NBAC-enabled environment, use the `nbgetconfig` and `nbsetconfig` commands to add the `USE_AUTH_CONF_NBAC` entry to the Windows registry or the `bp.conf` file on UNIX. The entry must be set to `YES`, as follows:

```plaintext
USE_AUTH_CONF_NBAC = YES
```

For more details about the auth.conf file, refer to the NetBackup Administrators Guide, Volume I.

### Error when switching NetBackup server from Enhanced Auditing to NBAC

The NetBackup Administration Console creates user directories with `user name` as directory name, in `netbackup/logs/user_ops`. For Enhanced Auditing, these directories are used by NetBackup processes that run with root privileges. For NBAC, these directories are used by NetBackup processes that run without root privileges.

NetBackup GUI errors may occur in the following case:

- The user directories that were created when Enhanced Auditing was enabled still exist when NBAC is enabled, and
- Any of those users do not have root privileges.

Some examples of errors:

- In the Backup, Archive, and Restore interface, no jobs appear on the `Task Progress` tab.
- For a VMware VM restore, the pre-recovery check reports error 12.

| 1 | On each NetBackup server that the users log on to by means of the GUI, delete the user directories in the following directory:

  - Windows: `install_path\NetBackup\logs\user_ops`
  - UNIX, Linux: `/usr/openv/netbackup/logs/user_ops`

| 2 | When the directories are deleted, restart the NetBackup GUI.

---

### Configuration and Troubleshooting Topics for NetBackup Authentication and Authorization

The following table lists helpful configuration and troubleshooting topics and tips for **NetBackup Authentication and Authorization**. In addition, the table also contains information about a few known issues and tips to resolve them:
## Configuration and troubleshooting topics and tips for NetBackup Authentication and Authorization

<table>
<thead>
<tr>
<th>Topic</th>
<th>Configuration tips</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Verifying master server settings</strong></td>
<td>Running <code>bpnbat -whoami</code> and specifying the computer credentials, tells in what domain a host is registered and the name of the computer the certificate represents.</td>
</tr>
<tr>
<td></td>
<td>```</td>
</tr>
<tr>
<td></td>
<td><code>bpnbat -whoami -cf</code></td>
</tr>
<tr>
<td></td>
<td>&quot;c:\program</td>
</tr>
<tr>
<td></td>
<td>Files\veritas\netbackup\var\vxss\credentials\master.company.com</td>
</tr>
<tr>
<td></td>
<td>&quot;Name: master.company.com</td>
</tr>
<tr>
<td></td>
<td>Domain: <a href="mailto:NBU_Machines@master.company.com">NBU_Machines@master.company.com</a></td>
</tr>
<tr>
<td></td>
<td>Issued by: /CN=broker/OU=<a href="mailto:root@master.company.com">root@master.company.com</a>/O=vx</td>
</tr>
<tr>
<td></td>
<td>Expiry Date: Oct 31 20:17:51 2007 GMT</td>
</tr>
<tr>
<td></td>
<td>Authentication method: Veritas Private Security</td>
</tr>
<tr>
<td></td>
<td>Operation completed successfully.</td>
</tr>
<tr>
<td></td>
<td>If the domain listed is not <a href="mailto:NBU_Machines@master.company.com">NBU_Machines@master.company.com</a>, consider running <code>bpnbat -addmachine</code> for the name in question (master). The command is run on the computer that serves the NBU_Machines domain (master). Then, on the computer where you want to place the credentials, run <code>bpnbat -loginmachine</code></td>
</tr>
<tr>
<td><strong>Establishing root credentials</strong></td>
<td>If you have problems setting up either the authentication server or authorization server, and the application complains about your credentials as root: ensure that the $HOME environmental variable is correct for root. Use the following command to detect the current value:</td>
</tr>
<tr>
<td></td>
<td>```</td>
</tr>
<tr>
<td></td>
<td><code>echo $HOME</code></td>
</tr>
<tr>
<td></td>
<td>This value should agree with root’s home directory, which can be typically found in the /etc/passwd file. Note that when switching to root, you may need to use:</td>
</tr>
<tr>
<td></td>
<td>```</td>
</tr>
<tr>
<td></td>
<td><code>su -</code></td>
</tr>
<tr>
<td></td>
<td>instead of only su to correctly condition the root environment variables.</td>
</tr>
<tr>
<td><strong>Expired credentials message</strong></td>
<td>If your credential has expired or is incorrect, you may receive the following message while running a bpnbaz or bpnbat command:</td>
</tr>
<tr>
<td></td>
<td>```</td>
</tr>
<tr>
<td></td>
<td>Supplied credential is expired or incorrect. Please reauthenticate and try again.</td>
</tr>
<tr>
<td></td>
<td>Run <code>bpnbat -Login</code> to update an expired credential.</td>
</tr>
</tbody>
</table>
### Table 6-5
Configuration and troubleshooting topics and tips for NetBackup Authentication and Authorization (continued)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Configuration tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Useful debug logs</td>
<td>The following logs are useful to debug NetBackup Access Control:</td>
</tr>
<tr>
<td></td>
<td><strong>On the master:</strong> <code>admin</code>, <code>bpcd</code>, <code>bprd</code>, <code>bpdbm</code>, <code>bpjobd</code>, <code>bpsched</code></td>
</tr>
<tr>
<td></td>
<td><strong>On the client:</strong> <code>admin</code>, <code>bpcd</code></td>
</tr>
<tr>
<td></td>
<td><strong>Access control:</strong> <code>nbatd</code>, <code>nbazd</code>.</td>
</tr>
<tr>
<td></td>
<td>See the <a href="#">NetBackup Troubleshooting Guide</a> for instructions on proper logging.</td>
</tr>
<tr>
<td>Uninstalling NetBackup Authentication and Authorization Shared Services</td>
<td>On UNIX:</td>
</tr>
<tr>
<td></td>
<td>Using <code>installics</code>, select the option for uninstalling authentication and authorization. The following directories should be empty after uninstalling:</td>
</tr>
<tr>
<td></td>
<td><code>/opt/VRTSat</code> and <code>/opt/VRTSaz</code></td>
</tr>
<tr>
<td></td>
<td><code>/etc/vx/vss</code></td>
</tr>
<tr>
<td></td>
<td><code>/var/VRTSat</code> and <code>/var/VRTSaz</code></td>
</tr>
<tr>
<td></td>
<td>On Windows:</td>
</tr>
<tr>
<td></td>
<td>Use the Windows Add/Remove Programs panel from the Control Menu to uninstall authentication and authorization. The <code>\Veritas\Security</code> directory should be empty after uninstalling.</td>
</tr>
<tr>
<td>Unhooking Shared AT from PBX</td>
<td>When NetBackup is upgraded and NBAC was already enabled in a previous setup, the old Shared AT should be unhooked from PBX.</td>
</tr>
<tr>
<td></td>
<td>To unhook shared AT, run following command.</td>
</tr>
<tr>
<td></td>
<td><strong>On UNIX platforms,</strong> run <code>/opt/VRTSat/bin/vssat setispbxexchflag --disable</code>.</td>
</tr>
<tr>
<td></td>
<td><strong>On Windows x86,</strong> run <code>C:\Program Files\VERITAS\Security\Authentication\bin\vssat setispbxexchflag --disable</code>.</td>
</tr>
<tr>
<td></td>
<td><strong>On Windows x64,</strong> run <code>C:\Program Files(x86)\VERITAS\Security\Authentication\bin\vssat setispbxexchflag --disable</code>.</td>
</tr>
</tbody>
</table>
### Table 6-5

**Configuration and troubleshooting topics and tips for NetBackup Authentication and Authorization (continued)**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Configuration tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where credentials are stored</td>
<td>The NetBackup Authentication and Authorization credentials are stored in the following directories:</td>
</tr>
<tr>
<td></td>
<td>UNIX:</td>
</tr>
<tr>
<td></td>
<td>User credentials: $HOME/.vxss</td>
</tr>
<tr>
<td></td>
<td>Computer credentials: /usr/openv/var/vxss/credentials/</td>
</tr>
<tr>
<td></td>
<td>Windows:</td>
</tr>
<tr>
<td></td>
<td>&lt;user_home_dir&gt;\Application Data\VERITAS\VSS</td>
</tr>
<tr>
<td>How system time affects access control</td>
<td>Credentials have a birth time and death time. Computers with large discrepancies in system clock time view credentials as being created in the future or prematurely expired. Consider synchronizing system time if you have trouble communicating between systems.</td>
</tr>
<tr>
<td>NetBackup Authentication and Authorization ports</td>
<td>The NetBackup Authentication and Authorization daemon services use ports 13783 and 13722 for back-level media server and clients. The services use PBX connections. The processes are listening with the following commands:</td>
</tr>
<tr>
<td></td>
<td>Authentication:</td>
</tr>
<tr>
<td></td>
<td>UNIX</td>
</tr>
<tr>
<td></td>
<td>netstat -an</td>
</tr>
<tr>
<td></td>
<td>Windows</td>
</tr>
<tr>
<td></td>
<td>netstat -a -n</td>
</tr>
<tr>
<td></td>
<td>Authorization:</td>
</tr>
<tr>
<td></td>
<td>UNIX</td>
</tr>
<tr>
<td></td>
<td>netstat -an</td>
</tr>
<tr>
<td></td>
<td>Windows</td>
</tr>
<tr>
<td></td>
<td>netstat -a -n</td>
</tr>
</tbody>
</table>
Table 6-5  Configuration and troubleshooting topics and tips for NetBackup Authentication and Authorization *(continued)*

<table>
<thead>
<tr>
<th>Topic</th>
<th>Configuration tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stopping NetBackup Authentication and Authorization daemons for Shared Services</td>
<td>When the NetBackup Authentication and Authorization services are stopped, stop authorization first, then stop authentication.</td>
</tr>
<tr>
<td></td>
<td>UNIX -Use the following commands.</td>
</tr>
<tr>
<td></td>
<td>To stop authorization use the term signal as shown in the example:</td>
</tr>
<tr>
<td></td>
<td># ps - fed</td>
</tr>
<tr>
<td></td>
<td>root 17018 1 4 08:47:35 ? 0:01 ./nbazd</td>
</tr>
<tr>
<td></td>
<td>root 17019 16011 0 08:47:39 pts/2 0:00 grep nbazd</td>
</tr>
<tr>
<td></td>
<td># kill 17018</td>
</tr>
<tr>
<td></td>
<td>To stop authentication use the term signal as shown in the example:</td>
</tr>
<tr>
<td></td>
<td># ps - fed</td>
</tr>
<tr>
<td></td>
<td>root 16018 1 4 08:47:35 ? 0:01 ./nbatd</td>
</tr>
<tr>
<td></td>
<td>root 16019 16011 0 08:47:39 pts/2 0:00 grep nbatd</td>
</tr>
<tr>
<td></td>
<td># kill 16018</td>
</tr>
<tr>
<td>Windows</td>
<td>Use the Services utility that Windows provides, since these services do not appear in the NetBackup Activity Monitor.</td>
</tr>
<tr>
<td>If you lock yourself out of NetBackup</td>
<td>You can lock yourself out of the <strong>NetBackup Administration Console</strong> if access control is incorrectly configured.</td>
</tr>
<tr>
<td></td>
<td>If this lockout occurs, use <code>vi</code> to read the bp.conf entries (UNIX) or <code>regedit</code> (Windows) to view the Windows registry in the following location:</td>
</tr>
<tr>
<td></td>
<td>HKEY_LOCAL_MACHINE\Software\Veritas\NetBackup\CurrentVersion\config</td>
</tr>
<tr>
<td></td>
<td>You can look to see if the following entries are set correctly: AUTHORIZATION_SERVICE, AUTHENTICATION_DOMAIN, and USE_VXSS.</td>
</tr>
<tr>
<td></td>
<td>The administrator may not want to use NetBackup Access Control or does not have the authorization libraries installed. Make certain that the USE_VXSS entry is set to Prohibited, or is deleted entirely.</td>
</tr>
<tr>
<td>Backups of storage units on media servers might not work in an NBAC environment</td>
<td>The host name of a system in NetBackup domain (master server, media server, or client) and host name that is specified in the bp.conf file should be the same.</td>
</tr>
</tbody>
</table>
### Table 6-5  Configuration and troubleshooting topics and tips for NetBackup Authentication and Authorization (continued)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Configuration tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the nbac_cron utility</td>
<td>Use the nbac_cron.exe utility to create identities under which to run cron or at jobs. For more information about the nbac_cron utility: See “About the nbac_cron utility” on page 207. nbac_cron.exe is found in the following location: UNIX - /opt/openv/netbackup/bin/goodies/nbac_cron Windows - Install_path\Veritas\netbackup\bin\goodies\nbac_cron.exe For detailed information about using the nbac_cron utility: See “Using the nbac_cron utility” on page 207.</td>
</tr>
</tbody>
</table>
| Enabling NBAC after a recovery on Windows  | Use the following procedure to manually enable NBAC after a recovery on Windows.  
  - Add AUTHENTICATION_DOMAIN, AUTHORIZATION_SERVICE, and USE_VXSS entries in Registry.  
  - Change the service type of NetBackup Authentication and Authorization services to AUTOMATIC.  
  - Restart the NetBackup services.  
  - Verify that the nbatd and nbazd services are running.  
  **Note:** On a cluster run the bpclusterutil -enableSvc nbatd and bpclusterutil -enable nbazd commands. |
<p>| In cluster installations the setupmaster might fail | A known issue exists in the case of cluster installations, where the configuration file is on a shared disk, the setupmaster might fail.                                                                                                                                                                                                 |
| Known issue on a cluster if shared security services (vxatd or vxazd) are clustered along with the master server | A known issue exists on a cluster if shared security services (vxatd or vxazd) are clustered along with the master server. When executing the bpnbaz -SetupMaster command and setting up security (NBAC), freeze the shared security services service groups persistently where applicable or offline the services (but make sure their shared disk is online), and run the setupmaster command. |</p>
<table>
<thead>
<tr>
<th>Topic</th>
<th>Configuration tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Known issue in a clustered master server upgrade with NBAC, that all the AUTHENTICATION_DOMAIN entries in the bp.conf file are updated with the master server virtual name as the authentication broker</td>
<td>A known issue exists where in a clustered master server upgrade with NBAC, all the AUTHENTICATION_DOMAIN entries in the bp.conf file are updated with the master server virtual name as the authentication broker. If any domain entry is present that refers to a different authentication broker other than the master server (and the master server does not service that domain), that entry needs to be manually removed from the bp.conf file.</td>
</tr>
</tbody>
</table>

Known issue relating to access control failures and short and long host names | A known issue exists that includes failures with respect to access control. Determine if the short and long host names are properly resolvable and are resolving to the same IP address. |

Known issue in a cluster upgrade with NBAC when the broker profile has ClusterName set to the virtual name of AT | A known issue exists in a cluster upgrade with NBAC when the broker profile has ClusterName set to the virtual name of AT. This is migrated as-is to the embedded broker. The embedded broker has UseClusterNameAsBrokerName set to 1 in its profile. When a request is sent for broker domain maps, it uses the virtual name of the shared AT as the broker name. The bpnbaz -GetDomainInfosFromAuthBroker returns none. In upgrades, the bp.conf file is updated to have the NetBackup virtual name. |

Known issue of multiple instances of bpcd causing a possible error       | A known issue exists where the bpnbaz -SetupMedia command, bprd uses the AT_LOGINMACHINE_RQST protocol to talk with bpcd on the destination box. A new instance of bpcd is spawned. After the command completes it tries to free a char array as a regular pointer possibly causing bpcd to core dump on the client side. Functionality should not be lost as this bpcd instance is only created temporarily and exits normally. The parent bpcd is unaffected. |

Known issue with clusters using shared AT with configuration files on the shared drive | A known issue exists with clusters that use a shared AT with configuration files on the shared drive. Unhooking shared services only works on the node where this shared drive is accessible. Unhook fails on the remaining nodes. The implication of this is that while doing a bpnbaz -SetupMaster to manage remote broker parts fail. You will have to manually configure passive nodes. Run bpnbaz -SetupMedia for each passive node. |

Known issue relating to database utilities supporting NBAZDB           | A known issue exists in which some database utilities support NBAZDB and other database utilities do not. The following database utilities support NBAZDB: nbdb_backup, nbdb_move, nbdb_ping, nbdb_restore, and nbdb_admin. The following utilities do not support NBAZDB: nbdb_unload and dbadm. |
Windows verification points

The following configuration procedures can help you verify that the master server, media server, and client are configured correctly for access control.

These Windows verification points include:

- See “Master server verification points for Windows” on page 179.
- See “Media server verification points for Windows” on page 183.
- See “Client verification points for Windows” on page 185.

Figure 6-7 shows an example configuration containing Windows systems only.

Figure 6-7 Example configuration containing Windows systems only

Note:
Each machine has a private domain account that is created for it. Using these accounts allows NetBackup to more reliably identify machines as they communicate with each other.
Master server verification points for Windows

The following topics describe procedures to:

- Verify Windows master server settings.
- Verify which computers are permitted to perform authorization lookups.
- Verify that the database is configured correctly.
- Verify that the `nbatd` and `nbazd` processes are running.
- Verify that the host properties are configured correctly.

The following table describes the master server verification procedures for Windows.
Table 6-6  Master server verification procedures for Windows

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
</table>
| Verify Windows master server settings | You can determine the domain in which a host is registered (where the primary authentication broker resides). Or you can determine the name of the computer the certificate represents. Run `bpnbat` with `-whoami` and specify the host credential file. The server credentials are located in the `c:\Program Files\Veritas\Netbackup\var\vxss\credentials\...` directory. For example:  
   
   
   `bpnbat -whoami -cf "c:\Program Files\Veritas\Netbackup\var\vxss\credentials\ win_master"
Name: win_master.company.com
Domain: NBU_Machines@win_master.company.com
Issued by: /CN=broker/OU=root@win_master.company.com/
O=vx
Expiry Date: Oct 31 20:17:51 2007 GMT
Authentication method: Veritas Private Security
Operation completed successfully.

   If the domain listed is not `NBU_Machines@win_master.company.com`, consider running `bpnbat -addmachine` for the name in question (win_master). This command is run on the computer with the authentication broker that serves the NBU_Machines domain (win_master).

   Then, on the computer where we want to place the certificate (win_master), run:

   `bpnbat -loginmachine`

   **Note:** As you determine when a user’s credentials expire, keep in mind that the output displays the expiration time in GMT, not local time.

   **Note:** For the remaining procedures in this verification section, assume that the commands are performed from a console window. And that the user identity in question has run `bpnbat -login` from that window. The user is an identity that is a member of NBU_Security Admin. This identity is usually the first identity with which the security was set up. |
### Table 6-6 Master server verification procedures for Windows *(continued)*

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify which computers are present in</td>
<td>To verify which computers are present in the authentication broker, log on as a member of the Administrators group and run the following command:</td>
</tr>
<tr>
<td>the authentication broker</td>
<td>bpnbat -ShowMachines</td>
</tr>
<tr>
<td></td>
<td>This command shows the computers for which you have run bpnbat -AddMachine.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> If a host is not on the list, run bpnbat -AddMachine from the master. Then run bpnbat -loginMachine from the host in question.</td>
</tr>
<tr>
<td>Verify which computers are permitted</td>
<td>To verify which computers are permitted to perform authorization lookups, log on as a member of the Administrators group and run the following command:</td>
</tr>
<tr>
<td>to perform authorization lookups</td>
<td>bpnbaz -ShowAuthorizers</td>
</tr>
<tr>
<td></td>
<td>This command shows that win_master and win_media (master and media servers) are permitted to perform authorization lookups. Note that both servers are authenticated against the same Private Domain (domain type vx), <a href="mailto:NBU_Machines@win_master.company.com">NBU_Machines@win_master.company.com</a>.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Run this command by local administrator or by root. The local administrator must be a member of the NBU_Security Admin user group.</td>
</tr>
<tr>
<td></td>
<td>bpnbaz -ShowAuthorizers</td>
</tr>
<tr>
<td></td>
<td>=========</td>
</tr>
<tr>
<td></td>
<td>Type: User</td>
</tr>
<tr>
<td></td>
<td>Domain Type: vx</td>
</tr>
<tr>
<td></td>
<td>Domain: <a href="mailto:NBU_Machines@win_master.company.com">NBU_Machines@win_master.company.com</a></td>
</tr>
<tr>
<td></td>
<td>Name: win_master.company.com</td>
</tr>
<tr>
<td></td>
<td>=========</td>
</tr>
<tr>
<td></td>
<td>Type: User</td>
</tr>
<tr>
<td></td>
<td>Domain Type: vx</td>
</tr>
<tr>
<td></td>
<td>Domain: <a href="mailto:NBU_Machines@win_master.company.com">NBU_Machines@win_master.company.com</a></td>
</tr>
<tr>
<td></td>
<td>Name: win_media.company.com</td>
</tr>
<tr>
<td></td>
<td>Operation completed successfully.</td>
</tr>
<tr>
<td></td>
<td>If a master server or media server is not on the list of authorized computers, run bpnbaz -allowauthorization server_name to add the missing computer.</td>
</tr>
</tbody>
</table>
Table 6-6  Master server verification procedures for Windows (continued)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify that the database is configured correctly</td>
<td>To make sure that the database is configured correctly, run <code>bpnbaz -listgroups</code>:</td>
</tr>
<tr>
<td></td>
<td>- <code>bpnbaz -listgroups</code></td>
</tr>
<tr>
<td></td>
<td>- NBU_Operator</td>
</tr>
<tr>
<td></td>
<td>- NBU_Admin</td>
</tr>
<tr>
<td></td>
<td>- NBU_SAN Admin</td>
</tr>
<tr>
<td></td>
<td>- NBU_User</td>
</tr>
<tr>
<td></td>
<td>- NBU_Security Admin</td>
</tr>
<tr>
<td></td>
<td>- Vault_Operator</td>
</tr>
<tr>
<td></td>
<td>Operation completed successfully.</td>
</tr>
<tr>
<td></td>
<td>If the groups do not appear, or if <code>bpnbaz -listmainobjects</code> does not return data, you may need</td>
</tr>
<tr>
<td></td>
<td>to run <code>bpnbaz -SetupSecurity</code>.</td>
</tr>
<tr>
<td>Verify that the <code>nbatd</code> and <code>nbazd</code> processes are running</td>
<td>Use the Windows Task Manager to make sure that <code>nbatd.exe</code> and <code>nbazd.exe</code> are running on the</td>
</tr>
<tr>
<td></td>
<td>designated host. If necessary, start them.</td>
</tr>
<tr>
<td>Verify that the host properties are configured correctly</td>
<td>In the access control host properties, verify that the NetBackup Authentication and Authorization</td>
</tr>
<tr>
<td></td>
<td>property is set correctly. (The setting should be either Automatic or Required, depending on</td>
</tr>
<tr>
<td></td>
<td>whether all computers use NetBackup Authentication and Authorization or not. If all computers</td>
</tr>
<tr>
<td></td>
<td>do not use NetBackup Authentication and Authorization, set it to Automatic.</td>
</tr>
<tr>
<td></td>
<td>The host properties can also be verified by looking at USE_VXSS in the registry at:</td>
</tr>
<tr>
<td></td>
<td><code>HKEY_LOCAL_MACHINE\Software\Veritas\NetBackup\CurrentVersion\config</code>.</td>
</tr>
<tr>
<td></td>
<td><em>Figure 6-8</em> shows an example of the host properties settings on the <strong>Authentication</strong> domain</td>
</tr>
<tr>
<td></td>
<td>tab.</td>
</tr>
<tr>
<td></td>
<td>In the <strong>Access Control</strong> host properties, verify that the listed authentication domains</td>
</tr>
<tr>
<td></td>
<td>are spelled correctly and point to the proper servers (valid authentication brokers). If all</td>
</tr>
<tr>
<td></td>
<td>of the domains are Windows-based, they should point to a Windows computer that runs the</td>
</tr>
<tr>
<td></td>
<td>authentication broker.</td>
</tr>
</tbody>
</table>

The following figure shows the host properties settings on the **Authentication** domain tab.
Media server verification points for Windows

The following topics describe the media server verification procedures for Windows:

- Verify the media server.
- Verify that the server has access to the authorization database.
- Unable to load library message

The following table describes the media server verification procedures for Windows.
Table 6-7  Media server verification procedures for Windows

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
</table>
| Verify the media server       | To determine which authentication broker the media server is authenticated against, run `bpnb -whoami` with `cf` for the media server's credential file. The server credentials are located in the c:\Program Files\Veritas\Netbackup\var\vxss\credentials\... directory. For example:  

```
bpnb --whoami cf "c:\Program Files\Veritas\Netbackup\var\vxss\credentials\win_media.company.com"
```

Name: win_media.company.com  
Domain: NBU_Machines@win_master.company.com  
Issued by: /CN=broker/OU=root@win_master.company.com/  
O=vx  
Expiry Date: Oct 31 20:11:40 2007 GMT  
Authentication method: Veritas Private Security  
Operation completed successfully.  

If the domain listed is not NBU_Machines@win_master.company.com, consider running `bpnb -addmachine` for the name in question (win_media). This command is run on the computer with the authentication broker that serves the NBU_Machines domain (win_master).  

Then, on the computer where we want to place the certificate (win_media), run:  

```
bpnb -loginmachine
```
Table 6-7  Media server verification procedures for Windows (continued)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
</table>
| Verify that the server has access to the authorization database | To make sure that the media server is able to access the authorization database as it needs, run `bpnbaz -ListGroups -CredFile "machine_credential_file"` For example:  
  
  `bpnbaz -ListGroups -CredFile "C:\Program Files\Veritas\NetBackup\var\vxss\credentials\win_media.company.com"
NBU_Operator
NBU_Admin
NBU_SAN Admin
NBU_User
NBU_Security Admin
Vault_Operator
Operation completed successfully.  
If this command fails, run `bpnbaz -AllowAuthorization` on the master server that is the authorization server (win_master.company.com). |
| Unable to load library message                          | Verify the media server and that it has access to the proper database. This verification indirectly informs you that the NetBackup Authentication and Authorization client libraries for both authentication and authorization are properly installed. If either of these procedures fail with a message "unable to load libraries": Check to make certain the authentication client libraries and authorization client libraries are installed. You may also verify that the authentication domains are correct by viewing the access control host properties for this media server. |

Client verification points for Windows
The following topics describe the client verification procedures for Windows:

- Verify the credential for the client.
- Verify that the authentication client libraries are installed.
- Verify correct authentication domains.

The following table describes the client verification procedures for Windows.
### Table 6-8  Client verification procedures for Windows

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify the credential for the client</td>
<td>Check that the credential for the client is indeed for the correct client and comes from the</td>
</tr>
<tr>
<td></td>
<td>correct domain. Run <code>bpnbat -whoami</code> with <code>-cf</code> for the client’s credential file.</td>
</tr>
<tr>
<td></td>
<td>For example:</td>
</tr>
<tr>
<td></td>
<td>```</td>
</tr>
<tr>
<td></td>
<td>bpnbat -whoami -cf &quot;c:\Program</td>
</tr>
<tr>
<td></td>
<td>Files\Veritas\Netbackup\var\vxss\credentials\</td>
</tr>
<tr>
<td></td>
<td>win_client.company.com</td>
</tr>
<tr>
<td></td>
<td>&quot;</td>
</tr>
<tr>
<td></td>
<td>Name: win_client.company.com</td>
</tr>
<tr>
<td></td>
<td>Domain: <a href="mailto:NBU_Machines@win_master.company.com">NBU_Machines@win_master.company.com</a></td>
</tr>
<tr>
<td></td>
<td>Issued by: /CN=broker/OU=<a href="mailto:root@win_master.company.com">root@win_master.company.com</a>/</td>
</tr>
<tr>
<td></td>
<td>O=vx</td>
</tr>
<tr>
<td></td>
<td>Expiry Date: Oct 31 20:11:45 2007 GMT</td>
</tr>
<tr>
<td></td>
<td>Authentication method: Veritas Private Security</td>
</tr>
<tr>
<td></td>
<td>Operation completed successfully.</td>
</tr>
<tr>
<td></td>
<td>If the domain listed is not <a href="mailto:NBU_Machines@win_master.company.com">NBU_Machines@win_master.company.com</a>, consider running `bpnbat</td>
</tr>
<tr>
<td></td>
<td>-addmachine for the name in question (win_client). This command is run on the computer with</td>
</tr>
<tr>
<td></td>
<td>the authentication broker that serves the NBU_Machines domain (win_master).</td>
</tr>
<tr>
<td></td>
<td>Then, on the computer where we want to place the certificate (win_client), run:</td>
</tr>
<tr>
<td></td>
<td>bpnbat -loginmachine</td>
</tr>
<tr>
<td>Verify that the authentication client libraries</td>
<td>Note: Run <code>bpnbat -login</code> on the client to verify that the authentication client libraries are</td>
</tr>
<tr>
<td>libraries are installed</td>
<td>installed.</td>
</tr>
<tr>
<td></td>
<td>```</td>
</tr>
<tr>
<td></td>
<td>bpnbat -login</td>
</tr>
<tr>
<td></td>
<td>Authentication Broker: win_master</td>
</tr>
<tr>
<td></td>
<td>Authentication port [Enter = default]:</td>
</tr>
<tr>
<td></td>
<td>Authentication type (NIS, NIS+, WINDOWS, vx, unixpwd)</td>
</tr>
<tr>
<td></td>
<td>: WINDOWS</td>
</tr>
<tr>
<td></td>
<td>Domain: ENTERPRISE</td>
</tr>
<tr>
<td></td>
<td>Name: Smith</td>
</tr>
<tr>
<td></td>
<td>Password:Operation completed successfully.</td>
</tr>
<tr>
<td></td>
<td>If the libraries are not installed, a message displays: The NetBackup Authentication and</td>
</tr>
<tr>
<td></td>
<td>Authorization libraries are not installed. This verification can also be done by looking at the</td>
</tr>
<tr>
<td></td>
<td>Windows Add/Remove Programs.</td>
</tr>
</tbody>
</table>

NetBackup Access Control Security (NBAC)  
Troubleshooting Access Management  
186
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify correct authentication domains</td>
<td>Check that any defined authentication domains for the client are correct either in the Access Control host properties or by using regedit. Ensure that the domains are spelled correctly. Ensure that the authentication brokers that are listed for each of the domains is valid for that domain type.</td>
</tr>
</tbody>
</table>

**UNIX verification points**

Use the following procedures (and the following figure) to verify that the UNIX master server, media server, and client are configured correctly for access control:

- UNIX master server verification
  See “UNIX master server verification” on page 188.

- UNIX media server verification
  See “UNIX media server verification” on page 191.

- UNIX client verification
  See “UNIX client verification” on page 193.

The following example shows an example configuration that contains UNIX systems only.
UNIX master server verification

Use the following procedures to verify the UNIX master server:

- Verify UNIX master server settings.
- Verify which computers are permitted to perform authorization lookups.
- Verify that the database is configured correctly.
- Verify that the `nbtd` and `nbazd` processes are running.
- Verify that the host properties are configured correctly.

The following table describes the verification process for the UNIX master server.
Table 6-9  Verification process for the UNIX master server

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify UNIX master server settings</td>
<td>Determine in what domain a host is registered (where the primary authentication broker resides), and determine the name of the computer the certificate represents. Run <code>bpnbat -whoami -cf</code> for the master server’s credential file. The server credentials are located in the <code>/usr/openv/var/vxss/credentials/</code> directory.</td>
</tr>
<tr>
<td></td>
<td>For example:</td>
</tr>
<tr>
<td></td>
<td><code>bpnbat -whoami -cf</code></td>
</tr>
<tr>
<td></td>
<td><code>/usr/openv/var/vxss/credentials/unix_master.company.com</code></td>
</tr>
<tr>
<td></td>
<td>Name: <code>unix_master.company.com</code></td>
</tr>
<tr>
<td></td>
<td>Domain: <code>NBU_Machines@unix_master.company.com</code></td>
</tr>
<tr>
<td></td>
<td>Issued by: <code>/CN=broker/OU=root@unix_master/O=vx</code></td>
</tr>
<tr>
<td></td>
<td>Expiry Date: <code>Oct 31 15:44:30 2007 GMT</code></td>
</tr>
<tr>
<td></td>
<td>Authentication method: <code>Veritas Private Security</code></td>
</tr>
<tr>
<td></td>
<td>Operation completed successfully.</td>
</tr>
<tr>
<td></td>
<td>If the domain listed is not <code>NBU_Machines@unix_master.company.com</code>, or the file does not exist, consider running <code>bpnbat -addmachine</code> for the name in question (unix_master). Run this command on the computer that serves the NBU_Machines domain (unix_master).</td>
</tr>
<tr>
<td></td>
<td>Then, on the computer where we want to place the certificate (unix_master), run: <code>bpnbat -loginmachine</code></td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> When determining if a credential has expired, remember that the output displays the expiration time in GMT, not local time.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> For the remaining procedures in this verification topic, assume that the commands are performed from a console window. The window in which the user identity is in question has run <code>bpnbat -login</code> using an identity that is a member of NBU_Security Admin. This identity is usually the first identity with which the security was set up.</td>
</tr>
<tr>
<td>Verify which computers are present in the authentication broker</td>
<td>To verify which computers are present in the authentication broker, log on as a member of the Administrators group and run the following command: <code>bpnbat -ShowMachines</code></td>
</tr>
<tr>
<td></td>
<td>The following command shows which computers you have run: <code>bpnbat -AddMachine</code></td>
</tr>
<tr>
<td>Process</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Verify which computers are permitted to perform authorization lookups | To verify which computers can perform authorization lookups, log on as root on the authorization broker and run the following command:  
  
  bpnbaz -ShowAuthorizers  
  ===========  
  Type: User  
  Domain Type: vx  
  Domain:NBU_Machines@unix_master.company.com  
  Name: unix_master.company.com  
  ===========  
  Type: User  
  Domain Type: vx  
  Domain:NBU_Machines@unix_master.company.com  
  Name: unix_media.company.com  

  
  Operation completed successfully.  
  
  This command shows that unix_master and unix_media are permitted to perform authorization lookups. Note that both servers are authenticated against the same vx (Veritas Private Domain) Domain, NBU_Machines@unix_master.company.com.  
  
  If a master server or media server is not part of the list of authorized computers, run bpnbaz -allowauthorization <server_name> to add the missing computer. |
| Verify that the database is configured correctly | To make sure that the database is configured correctly, run bpnbaz -listgroups:  
  
  bpnbaz -listgroups  
  NBU_Operator  
  NBU_Admin  
  NBU_SAN Admin  
  NBU_User  
  NBU_Security Admin  
  Vault_Operator  
  Operation completed successfully.  
  
  If the groups do not appear, or if bpnbaz -listmainobjects does not return data, run bpnbaz -SetupSecurity. |
Table 6-9  Verification process for the UNIX master server (continued)

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
</table>
| Verify that the nbatd and nbazd processes are running                  | Run the `ps` command to ensure that the `nbatd` and `nbazd` processes are running on the designated host. If necessary, start them. For example: `ps -fed |grep vx`
|                                                                        | root 10716 1 0 Dec 14 ? 0:02 /usr/openv/netbackup/bin/private/nbatd
|                                                                        | root 10721 1 0 Dec 14 ? 4:17 /usr/openv/netbackup/bin/private/nbazd                                                                                                                                 |
| Verify that the host properties are configured correctly               | In the Access Control host properties, verify that the NetBackup Authentication and Authorization property is set correctly. (The setting should be either Automatic or Required, depending on whether all of the computers use NetBackup Authentication and Authorization or not. If all computers do not use NetBackup Authentication and Authorization, set it to Automatic.
|                                                                        | In the Access Control host properties, verify that the authentication domains on the list are spelled correctly. Also make sure that they point to the proper servers (valid authentication brokers). If all domains are UNIX-based, they should point to a UNIX machine that is running the authentication broker.
|                                                                        | This process can also be verified in `bp.conf` using `cat`.                                                                                                                                                  |
|                                                                        | `cat bp.conf`<br>`SERVER = unix_master`
|                                                                        | `SERVER = unix_media`
|                                                                        | `CLIENT_NAME = unix_master`
|                                                                        | `AUTHENTICATION_DOMAIN = company.com "default company NIS namespace"`
|                                                                        | `NIS unix_master 0`
|                                                                        | `AUTHENTICATION_DOMAIN = unix_master "unix_master password file"`
|                                                                        | `PASSWD unix_master 0`
|                                                                        | `AUTHORIZATION_SERVICE = unix_master.company.com 0`
|                                                                        | `USE_VXSS = AUTOMATIC`<br> #

**UNIX media server verification**

Perform the following to verify the UNIX media server:

- Verify the media server.
- Verify that the server has access to the authorization database.
- Understand the unable to load library message.

The following table describes the verification procedures for the UNIX media server.
<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
</table>
| Verify the media server | To determine which authentication broker the media server is authenticated against, run `bpnbat -whoami -cf` for the media server’s credential file. The server credentials are located in the `/usr/openv/var/vxss/credentials/` directory. For example:  

```
bpnbat -whoami -cf
/usr/openv/var/vxss/credentials/unix_media.company.com
Name: unix_media.company.com
Domain: NBU_Machines@unix_master.company.com
Issued by: /CN=broker/OU=root@unix_master.company.com/0=vx
Expiry Date: Oct 31 14:48:08 2007 GMT
Authentication method: Veritas Private Security
Operation completed successfully.
```

If the domain listed is not NBU_Machines@unix_master.company.com, consider running `bpnbat -addmachine` for the name in question (unix_media). This command is run on the computer with the authentication broker that serves the NBU_Machines domain (unix_master).

Then, on the computer where we want to place the certificate, run (unix_master): 

```
bpnbat -loginmachine
```

| Verify that the server has access to the authorization database | To make sure that the media server is able to access the authorization database as it needs, run `bpnbaz -ListGroups "machine_credential_file"`  

For example:  

```
bpnbaz -ListGroups -CredFile
/usr/openv/var/vxss/credentials/unix_media.company.com
NBU_User
NBU_Operator
NBU_Admin
NBU_Security Admin
Vault_Operator
Operation completed successfully.
```

If this command fails, run `bpnbaz -AllowAuthorization` on the master server that is the authorization server (unix_master). Note that you need to run as root or administrator. |
Table 6-10 Verification process for the UNIX media server (continued)

<table>
<thead>
<tr>
<th>Process</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to load library message</td>
<td>Verify the media server and that it has access to the proper database. This verification indirectly informs us that the NetBackup Authentication and Authorization client libraries for both authentication and authorization are properly installed. If either of these procedures fail with the message “unable to load libraries,” check to make certain the Authentication and Authorization client libraries are installed. You may also verify that the authentication domains are correct. Do this verification viewing the access control host properties for this media server, or by <code>cat(1)</code>ing the <code>bp.conf</code> file.</td>
</tr>
</tbody>
</table>

### UNIX client verification

The following procedures are used to verify the UNIX client:

- Verify the credential for the UNIX client.
- Verify that the authentication client libraries are installed.
- Verify correct authentication domains.

The following table describes the verification procedures for the UNIX client.

Table 6-11 Verification procedures for the UNIX client

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Description</th>
</tr>
</thead>
</table>
| Verify the credential for the UNIX client | Check that the credential for the client is indeed for the correct client and comes from the correct domain. Run `bnpbat -whoami -cf` for the client's credential file. For example:  

```
   bnpbat -whoami -cf  
   /usr/openv/var/vxss/credentials/unix_client.company.com  
   Name: unix_client.company.com  
   Domain: NBU_Machines@unix_master.company.com  
   Issued by: /CN=broker/OU=root@unix_master.company.com/O=vx  
   Expiry Date: Oct 31 14:49:00 2007 GMT  
   Authentication method: Veritas Private Security  
   Operation completed successfully.
```

If the domain listed is not `NBU_Machines@unix_master.company.com`, consider running `bnpbat -addmachine` for the name in question (unix_client). This command is run on the computer with the authentication broker that serves the NBU_Machines domain (unix_master).

Then, on the computer where we want to place the certificate (unix_client), run: `bnpbat -loginmachine`
Table 6-11 Verification procedures for the UNIX client (continued)

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify that the authentication client libraries are installed</td>
<td>Run <code>bpnbat -login</code> on the client to verify that the authentication client libraries are installed.</td>
</tr>
<tr>
<td></td>
<td><code>bpnbat -login</code></td>
</tr>
<tr>
<td></td>
<td>Authentication Broker: unix_master.company.com</td>
</tr>
<tr>
<td></td>
<td>Authentication port [Enter = default]:</td>
</tr>
<tr>
<td></td>
<td>Authentication type (NIS, NIS+, WINDOWS, vx, unixpwd): NIS</td>
</tr>
<tr>
<td></td>
<td>Domain: min.com</td>
</tr>
<tr>
<td></td>
<td>Name: Smith</td>
</tr>
<tr>
<td></td>
<td>Password:</td>
</tr>
<tr>
<td></td>
<td>Operation completed successfully.</td>
</tr>
<tr>
<td>Verify correct authentication domains</td>
<td>Check that any defined authentication domains for the client are correct in the Access Control host properties or by using <code>cat(1)</code>. Ensure that the domains are spelled correctly. Also ensure that the authentication brokers on the list for each of the domains are valid for that domain type.</td>
</tr>
<tr>
<td></td>
<td>This process can also be verified in <code>bp.conf</code> using <code>cat(1)</code>.</td>
</tr>
<tr>
<td></td>
<td><code>cat bp.conf</code></td>
</tr>
<tr>
<td></td>
<td><code>SERVER = unix_master</code></td>
</tr>
<tr>
<td></td>
<td><code>SERVER = unix_media</code></td>
</tr>
<tr>
<td></td>
<td><code>CLIENT_NAME = unix_master</code></td>
</tr>
<tr>
<td></td>
<td><code>AUTHENTICATION_DOMAIN = min.com &quot;default company NIS namespace&quot;</code></td>
</tr>
<tr>
<td></td>
<td><code>NIS unix_master 0</code></td>
</tr>
<tr>
<td></td>
<td><code>AUTHENTICATION_DOMAIN = unix_master.company.com &quot;unix_master password file&quot; PASSWD unix_master 0</code></td>
</tr>
<tr>
<td></td>
<td><code>AUTHORIZATION_SERVICE = unix_master.company.com 0</code></td>
</tr>
<tr>
<td></td>
<td><code>USE_VXSS = AUTOMATIC</code></td>
</tr>
</tbody>
</table>

Verification points in a mixed environment with a UNIX master server

The following procedures can help you verify that the master server, media server, and client are configured correctly. These should be configured for a heterogeneous NetBackup Access Control environment. The master server is a UNIX machine.

- Master server verification points for mixed UNIX master
- Media server verification points for mixed UNIX master
- Client verification points for mixed UNIX master
**Figure 6-10** is an example of a mixed configuration that contains a UNIX master server.

Each machine has a private domain account. Using these accounts allows NetBackup to more reliably identify machines as they communicate with each other.
Master server verification points for a mixed UNIX master server

See the following topic for the verification procedure for a UNIX master server:
See “UNIX master server verification” on page 188.

Media server verification points for a mixed UNIX master server

The following table describes the media server verification procedures for a mixed UNIX master server.

Table 6-12 Verification procedures for a mixed UNIX master server

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
</table>
| Verify the UNIX media server                   | See the following topic for the verification procedure for a UNIX media server:  
|                                                | See “UNIX media server verification” on page 191.                            |
| Verify the Windows media server                | Check that the computer certificate comes from the root authentication broker,  
|                                                | which is found on the UNIX master server (unix_master).                     |
|                                                | If there is a missing certificate, run the following commands to correct the  
|                                                | problem:                                                                    |
|                                                | ■ bpnbat -addmachine on the root authentication broker (in this example,     
|                                                | unix_master)                                                                |
|                                                | ■ bpnbat -loginmachine (in this example, win_media)                         |
|                                                | For example:                                                                |
|                                                | bpnbat -whoami -cf "C:\Program Files\Veritas\Netbackup\var\vxss\credentials\  
|                                                | win_media.company.com"                                                      |
|                                                | Name: win_media.company.com                                                 |
|                                                | Domain: NBU_Machines@unix_master.company.com                                |
|                                                | Issued by: /CN=broker/OU=root@unix_master.company.com/O=vx                  |
|                                                | Expiry Date: Oct 31 20:11:04 2007 GMT                                       |
|                                                | Authentication method: Veritas Private Security                             |
|                                                | Operation completed successfully.                                          |
Table 6-12  Verification procedures for a mixed UNIX master server (continued)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify that a media server is permitted to perform authorization lookups</td>
<td>Ensure that the media server is allowed to perform authorization checks by running <code>bnpbaz -listgroups -CredFile</code>. For example:</td>
</tr>
<tr>
<td></td>
<td><code>bnpbaz -listgroups -CredFile &quot;C:\Program Files\Veritas\Netbackup\var\vxss\credentials\win_media.company.com&quot;</code></td>
</tr>
<tr>
<td></td>
<td>NBU_User</td>
</tr>
<tr>
<td></td>
<td>NBU_Operator</td>
</tr>
<tr>
<td></td>
<td>NBU_Admin</td>
</tr>
<tr>
<td></td>
<td>NBU_Security Admin</td>
</tr>
<tr>
<td></td>
<td>Vault_Operator</td>
</tr>
<tr>
<td></td>
<td>Operation completed successfully.</td>
</tr>
<tr>
<td></td>
<td>If the media server is not allowed to perform authorization checks, run <code>bnpbaz -allowauthorization</code> on the master server for the media server name in question.</td>
</tr>
</tbody>
</table>

| Unable to load library message                                           | Verify the Windows media server and that it can perform authorization checks indirectly. This verification informs us that the NetBackup Authentication and Authorization client libraries for both authentication and authorization are properly installed. If either of these procedures fail with a message "unable to load libraries," make certain the authentication client libraries and authorization client libraries are installed. |

<table>
<thead>
<tr>
<th>Verify authentication domains</th>
<th>Verify that the authentication domains are correct by viewing the access control host properties for this media server. You can also use <code>regedit</code> (or <code>regedit32</code>) directly on the media server in the following location:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HKEY_LOCAL_MACHINE\Software\Veritas\NetBackup\CurrentVersion\config\AUTHENTICATION_DOMAIN</td>
</tr>
<tr>
<td>Procedure</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Cross platform authentication domains</td>
<td>Take extra care in mixed environments to ensure that the appropriate domain types point to the correct authentication brokers. The example Authentication domain tab shows available authentication Windows domains that can be added to the Windows broker. In this case, it is not a mixed environment as both systems are Windows based. If there were a combination of Windows and UNIX domains it is important to match the brokers to the most useful authentication domains. Figure 6-11 for a display on how to match the platform to the most useful authentication domains.</td>
</tr>
</tbody>
</table>
Figure 6-11  Cross platform authentication domains

Client verification points for a mixed UNIX master server

See the following topic for procedures to verify the UNIX client computers:

See “UNIX client verification” on page 193.

The following table describes the procedures to verify Windows clients.
### Table 6-13: Procedures to verify Windows clients

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify the credential for the Windows client</td>
<td>Check that the credential for the client is indeed for the correct client and comes from the correct domain. Run <code>bnpbat -whoami</code> with <code>-cf</code> for the client's credential file.</td>
</tr>
<tr>
<td></td>
<td>For example:</td>
</tr>
</tbody>
</table>
|                                                      | bpnbat -whoami -cf "c:\Program Files\Veritas\Netbackup\var\vxss\credentials\win_client.company.com  
Name: win_client.company.com  
Domain: NBU_Machines@unix_master.company.com  
Issued by: /CN=broker/OU=root@unix_master.company.com/  
O=vx  
Expiry Date: Oct 31 19:50:50 2007 GMT  
Authentication method: Veritas Private Security  
Operation completed successfully. |
| Verify that the authentication client libraries are installed | Run `bnpbat -login` on the client to verify that the authentication client libraries are installed.                              |
|                                                      | For example:                                                                                                                                 |
|                                                      | bpnbat -login  
Authentication Broker: unix_master.company.com  
Authentication port [Enter = default]:  
Authentication type (NIS, NIS+, WINDOWS, vx, unixpwd) : NIS  
Domain: min.com  
Name: Smith  
Password:  
Operation completed successfully. |
| Verify the Windows authentication broker             | Ensure that the Windows authentication broker has mutual trust with the main UNIX authentication broker. Also, make sure that the broker uses the UNIX broker as its root broker. |

### Verification points in a mixed environment with a Windows master server

The following procedures can help you verify that the master server, media server, and client are configured correctly. They should be configured for a heterogeneous NetBackup Access Control environment. The master server is a Windows computer.
■ Master server verification points for mixed Windows master
  See “Master server verification points for a mixed Windows master server” on page 203.

■ Media server verification points for mixed Windows master
  See “Media server verification points for a mixed Windows master server” on page 203.

■ Client verification points for mixed Windows master
  See “Client verification points for a mixed Windows master server” on page 205.

Figure 6-12 is an example configuration that contains a Windows master server.
Figure 6-12  Example mixed configuration containing a Windows master server

authentication NBU master server (Windows) win_master.min.com

authorization server

Root Broker

Authentication Broker

Authorization Service

Private Veritas Product Authentication and Authorization domain called NBU_Machines@win_server.min.com contains the following credentials:

- win_master.min.com
- unix_media2.min.com
- unix_media.min.com
- unix_client.min.com
- win_media.min.com
- win_client.min.com

MediaServer (UNIX) unix_media2_min.com

authentication server

unix_media2.min.com

UNIX user accounts authenticate via UNIX Authentication Broker

Media server (UNIX) unix_media.min.com

authentication client, authorization client

unix_media.min.com

Client (UNIX) unix_client.min.com

authentication client

unix_client.min.com

Media server (Windows) win_media.min.com

authentication client, authorization client

win_media.min.com

Client (Windows) win_client.min.com

authentication client

win_client.min.com

Note:
Each machine has a private domain account. Using these accounts allows NetBackup to more reliably identify machines as they communicate with each other.
Master server verification points for a mixed Windows master server

See the following topic for the verification procedures for a mixed Windows master:
See “Master server verification points for Windows” on page 179.

Media server verification points for a mixed Windows master server

The following table describes the media server verification procedures for a mixed Windows master server.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify the Windows media server for a mixed Windows master server</td>
<td>See the following topic for the verification procedures for a Windows media server: See “Media server verification points for Windows” on page 183.</td>
</tr>
<tr>
<td>Verify the UNIX media server</td>
<td>Check that the computer certificate is issued from the root authentication broker, found on the Windows master server (win_master). To determine which authentication broker the media server is authenticated against, run <code>bnpbat -whoami</code> with <code>-cf</code> for the media server’s credential file. For example:</td>
</tr>
</tbody>
</table>

```
```
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
</table>
| Verify that the server has access to the authorization database | To make sure that the media server is able to access the authorization database it needs to perform authorization checks. Run `bpnbaz -ListGroups -CredFile "/usr/openv/var/vxss/credentials/<hostname>"`  
For example:  

`bpnbaz -ListGroups -CredFile\  
/usr/openv/var/vxss/credentials/unix_media.company.com  
NBU_Operator  
NBU_AdminNBU_SAN Admin  
NBU_UserNBU_Security Admin  
Vault_Operator  
Operation completed successfully.`  

If the media server is not allowed to perform authorization checks, run `bpnbaz -allowauthorization` on the master server for the media server name in question. |
| Unable to load library message                  | Verify the media server and that it has access to the proper database indirectly. This verification informs us that the NetBackup Authentication and Authorization client libraries for both authentication and authorization are properly installed. If either of these procedures fail with a message "unable to load libraries": Check to make certain the authentication client libraries and authorization client libraries are installed. |
Table 6-14  Media server verification procedures for a mixed Windows master server (continued)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
</table>
| Cross platform authentication domains | You may also verify that the authentication domains are correct by viewing the access control host properties for this media server. Or, you may also verify by `cat(1)`ing the `bp.conf` file.  
  Take extra care in mixed environments to ensure that the appropriate domain types point to the correct authentication brokers.  
  In the example, note that the PASSWD domains and NIS domains point to `unix_media2.company.com`, which, in this example, is the UNIX authentication broker: |
|                            | `cat bp.conf`  
  SERVER = win_master.company.com  
  MEDIA_SERVER = unix_media.company.com  
  MEDIA_SERVER = unix_media2.company.com  
  CLIENT_NAME = unix_media  
  AUTHENTICATION_DOMAIN = win_master "win_master domain"  
  WINDOWS win_master.company.com 0  
  AUTHENTICATION_DOMAIN = enterprise "enterprise domain"  
  WINDOWS win_master.company.com 0  
  AUTHENTICATION_DOMAIN = unix_media2.company.com "local unix_media2 domain" PASSWD unix_media2.company.com 0  
  AUTHENTICATION_DOMAIN = min.com "NIS domain" NIS unix_media.company.com 0  
  AUTHORIZATION_SERVICE = win_master.company.com 0  
  USE_VXSS = AUTOMATIC |

Client verification points for a mixed Windows master server

The following table describes the client verification procedures for a mixed Windows master server.

Table 6-15  Verification procedures for a mixed Windows master server

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
</table>
| Verify the credential for the Windows client | See the following topic for the verification procedures for Windows clients:  
  See "Client verification points for Windows" on page 185. |
Table 6-15  Verification procedures for a mixed Windows master server  
(continued)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify the credential for the UNIX client</td>
<td>Check that the credential for the client is indeed for the correct client and comes from the correct domain. Run <code>bpnbat -whoami</code> with <code>-cf</code> for the client's credential file. For example:</td>
</tr>
<tr>
<td></td>
<td>`bpnbat -whoami -cf \</td>
</tr>
<tr>
<td></td>
<td>&quot;/usr/openv/var/vxss/credentials/</td>
</tr>
<tr>
<td></td>
<td>unix_client.company.com</td>
</tr>
<tr>
<td></td>
<td>Name: unix_client.company.com</td>
</tr>
<tr>
<td></td>
<td>Domain: <a href="mailto:NBU_Machines@win_master.company.com">NBU_Machines@win_master.company.com</a></td>
</tr>
<tr>
<td></td>
<td>Issued by: /CN=broker/OU=root@</td>
</tr>
<tr>
<td></td>
<td>win_master.company.com/O=vx</td>
</tr>
<tr>
<td></td>
<td>Expiry Date: Oct 31 21:16:01 2007 GMT</td>
</tr>
<tr>
<td></td>
<td>Authentication method: Veritas Private Security</td>
</tr>
<tr>
<td></td>
<td>Operation completed successfully.</td>
</tr>
<tr>
<td>Verify that the authentication client libraries are installed</td>
<td>Run <code>bpnbat -login</code> on the client to verify that the authentication client libraries are installed.</td>
</tr>
<tr>
<td></td>
<td><code>bpnbat -login</code></td>
</tr>
<tr>
<td></td>
<td>Authentication Broker: unix_media2.company.com</td>
</tr>
<tr>
<td></td>
<td>Authentication port [Enter = default]:</td>
</tr>
<tr>
<td></td>
<td>Authentication type (NIS, NIS+, WINDOWS, vx, unixpwd)</td>
</tr>
<tr>
<td></td>
<td>: NIS</td>
</tr>
<tr>
<td></td>
<td>Domain: min.com</td>
</tr>
<tr>
<td></td>
<td>Name: Smith</td>
</tr>
<tr>
<td></td>
<td>Password:</td>
</tr>
<tr>
<td></td>
<td>You do not currently trust the server:</td>
</tr>
<tr>
<td></td>
<td>unix_media.company.com, do</td>
</tr>
<tr>
<td></td>
<td>you wish to trust it? (y/n):</td>
</tr>
<tr>
<td></td>
<td>y</td>
</tr>
<tr>
<td></td>
<td>Operation completed successfully.</td>
</tr>
<tr>
<td>Verify the UNIX authentication broker</td>
<td>Ensure that the UNIX authentication broker has mutual trust with the main Windows authentication broker or ensure that it uses the Windows broker as its root broker.</td>
</tr>
</tbody>
</table>
About the nbac_cron utility

NetBackup operations can be performed as scheduled jobs by using the cron utility. When NBAC is enabled, these jobs can be run in the context of an OS user who has the privileges to run the required commands. You can use the nbac_cron.exe utility to create the credentials that are needed to run cron or AT jobs. These credentials are valid for a longer period of time as compared to the credentials that are obtained when a user performs a `bpnbat logon`. Here the validity is a year.

The utility is found in the following location:

```
-./opt/openv/netbackup/bin/goodies/nbac_cron
```

For detailed steps to configure the nbac_cron utility and run a cron job, see the following topic:

See “Using the nbac_cron utility” on page 207.

Using the nbac_cron utility

The following steps help you to create credentials to execute cron jobs.

**Using the nbac_cron utility to run cron jobs**

1. Run the command `nbac_cron-addCron` as root or administrator on the master server.

```
root@amp# /usr/openv/netbackup/bin/goodies/nbac_cron -AddCron

# nbac_cron -AddCron
```

This application will generate a Veritas private domain identity that can be used in order to run unattended cron and/or at jobs.

User name to create account for (e.g. root, JSmith etc.): Dan

Password:******

Password:******

Access control group to add this account to [NBU_Admin]:

Do you wish to register this account locally for root(Y/N) ? N

In order to use the account created please login as the OS identity that will run the at or cron jobs. Then run `nbac_cron -setupcron` or `nbac_cron -setupat`. When `nbac_cron -setupcron` or `nbac_cron -setupat` is run the user name, password and authentication broker will need to be supplied. Please make note of the user name, password, and authentication broker. You may
rerun this command at a later date to change the password for an account.

Operation completed successfully.

If you do not explicitly specify an access control group (for example, NBU_Operator or Vault_Operator) to add the user to, the cron user (Dan here), is added to the NBU_Admin group.

If you respond with a 'Yes' to register the account locally for root, the nbac_cron -SetupCron command is automatically executed for the cron_user as root. If you plan to run the cron jobs as a non-root OS user then you should say 'No' here and manually run the nbac_cron -SetupCron command as that non-root OS user.

An identity is generated in the Veritas private domain. This identity can be used to run the cron jobs.

2

Now, run the nbac_cron-SetupCron command as the OS user who wants to execute the cron jobs to obtain credentials for this identity.

[dan@amp ~]$ /usr/openv/netbackup/bin/goodies/nbac_cron -SetupCron
This application will now create your cron and/or at identity.

Authentication Broker: amp.sec.punin.sen.veritas.com
Name: Dan
Password:*****

You do not currently trust the server:
amp.sec.punin.sen.veritas.com, do you wish to trust it? (Y/N): Y

Created cron and/or at account information. To use this account in your own cron or at jobs make sure that the environment variable VXSS_CREDENTIAL_PATH is set to 
"/home/dan/.vxss/credentials.crat"

Operation completed successfully.

The 'You do not currently trust' the server message is only shown once if you have not already trusted the broker.

The credential is created in the user’s home directory
at user/.vxss/credentials.crat. The credential is valid for a year from the time when it is generated.

If required, you can check the credential details as shown:

dan@amp-]$_$ /usr/openv/netbackup/bin/bpnbat -whoami -cf -dan/.vxss/credentials.crat
Name: CronAt_dan

Domain: CronAtUsers@amp.sec.punin.sen.veritas.com

Issued by: /CN=broker/OU=amp.sec.punin.sen.veritas.com

Expiry Date: Feb 4 13:36:08 2016 GMT

Authentication method: Veritas Private Domain

Operation completed successfully.

You must re-run the SetupCron operation (Step 2) to renew the credential before it expires.

You can now create your own cron jobs. Ensure that the VXSS_CREDENTIAL_PATH path is set to point to the credentials you created above before you schedule any new job.

Using the Access Management utility

The users that are assigned to the NetBackup Security Administrator user group have access to the Access Management node in the NetBackup Administration Console. The users and the NetBackup Administrators who are assigned to any other user group can see the Access Management node. This node is visible in the NetBackup Administration Console, but you cannot expand it.

If a user other than a Security Administrator tries to select Access Management, an error message displays. The toolbar options and menu items that are specific to Access Management are not displayed.

Upon successful completion, the default NetBackup user groups should display in the NetBackup Administration Console > Access Management > NBU user groups window.

To list the groups on the command line, run the bpnbaz -ListGroups command on the computer where the authorization server software is installed.

UNIX

bpnbaz is located in directory /usr/openv/netbackup/bin/admincmd

Windows

bpnbaz is located in directory Install_path\Veritas\NetBackup\bin\admincmd

(You must be logged on as the Security Administrator by using bpnbat -login)

bpnbaz -ListGroups
NBU_User
NBU_Operator
The NetBackup user groups are listed. This process verifies that the Security Administrator can access the user groups.

About determining who can access NetBackup

The Access Management utility allows only one user group. By default, the NBU_SecurityAdmin user group defines the following aspects of NetBackup Access Management:

- The permissions of individual users.
  See “Individual users” on page 211.
- The creation of user groups.
  See “User groups” on page 211.

First, determine which NetBackup resources your users need to access. For resources and associated permissions:

See “Viewing specific user permissions for NetBackup user groups” on page 220.

The Security Administrator may want to first consider what different users have in common, then create user groups with the permissions that these users require. User groups generally correspond to a role, such as administrators, operators, or end users.

Consider basing user groups on one or more of the following criteria:

- Functional units in your organization (UNIX administration, for example)
- NetBackup resources (drives, policies, for example)
- Location (East Coast or West coast, for example)
- Individual responsibilities (tape operator, for example)

Note that permissions are granted to individuals in user groups, not to individuals on a per-host basis. They can only operate to the extent that they are authorized to do so. No restrictions are based on computer names.
Individual users

The NetBackup **Access Management** utility uses your existing OS-defined users, groups, and domains. The **Access Management** utility maintains no list of users and passwords. When members of groups are defined, the Security Administrator specifies existing OS users as members of user groups.

Every authenticated user belongs to at least one authorization user group. By default, every user belongs to the user group NBU_Users, which contains all of the authenticated users.

**Figure 6-13** shows individual authenticated users.

**Figure 6-13** Individual users

![Image of individual users](image.png)

All authenticated users are implicit members of the NBU_Users user group. All other groups must have members defined explicitly. The NetBackup Security Administrator can delete a manually added member to other groups. However, the Security Administrator may not delete the predefined implicit members of the NBU_Security Admin groups. The OS groups and OS users can be added to an authorization group.

User groups

NetBackup **Access Management** can be configured by assigning permissions to user groups and then assigning users to the user groups. Assigning permissions to groups is done rather than assigning permissions directly to individual users.

**Figure 6-14** show a list of user groups.
Upon successful installation, NetBackup provides default user groups that complement how sites often manage the duties of NetBackup operation. The user groups are listed under Access Management > NBU User Groups. The contents
of Access Management are only visible to members of the NBU_Security Admin group.

The Security Administrator can use the default NetBackup user groups or create custom user groups.

### NetBackup default user groups

The users that are granted permissions in each of the default user groups relate directly to the group name. Essentially, an authorization object correlates to a node in the NetBackup Administration Console tree.

The following table describes each NetBackup default user group.

<table>
<thead>
<tr>
<th>Default user group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator (NBU_Operator)</td>
<td>The main task of the NBU_Operator user group is to monitor jobs. For example, members of the NBU_Operator user group might monitor jobs and notify a NetBackup administrator if there is a problem. Then, the administrator can address the problem. Using the default permissions, a member of the NBU_Operator user group would probably not have enough access to address larger problems. Members of the NBU_Operator user group have the permissions that allow them to perform tasks such as moving tapes, operating drives, and inventorying robots.</td>
</tr>
<tr>
<td>Administrator (NBU_Admin)</td>
<td>Members of the NBU_Admin user group have full permission to access, configure, and operate any NetBackup authorization object. Some exceptions exist for SAN Administrators. In other words, members have all of the capabilities that are currently available to administrators without Access Management in place. However, as members of this group, you do not necessarily log on as root or administrator in the OS. <strong>Note:</strong> Members of the NBU_Admin user group cannot see the contents of Access Management, and therefore, cannot ascribe permissions to other user groups.</td>
</tr>
<tr>
<td>SAN Administrator (NBU_SAN Admin)</td>
<td>By default, members of the NBU_SAN Admin user group have full permissions to browse, read, operate, and configure disk pools and host properties. These permissions let you configure the SAN environment and NetBackup’s interaction with it.</td>
</tr>
</tbody>
</table>
### Table 6-16: NetBackup default user groups (continued)

<table>
<thead>
<tr>
<th>Default user group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User (NBU_User)</td>
<td>The NBU_User user group is the default NetBackup user group with the fewest permissions. Members of the NBU_User user group can only back up, restore, and archive files on their local host. NBU_User user group members have access to the functionality of the NetBackup client interface (BAR).</td>
</tr>
</tbody>
</table>
| Security administrator (NBU_Security Admin) | Usually very few members exist in the NBU_Security Admin user group. The only permission that the Security Administrator has, by default, is to configure access control within Access Management. Configuring access control includes the following abilities:  
  - To see the contents of Access Management in the NetBackup Administration Console  
  - To create, modify, and delete users and user groups  
  - To assign users to user groups  
  - To assign permissions to user groups |
| Vault operator (Vault_Operator)     | The Vault_Operator user group is the default user group that contains permissions to perform the operator actions necessary for the Vault process. |
| KMS Administrator (NBU_KMS Admin)   | By default, members of the NBU_KMS Admin user group have full permissions to browse, read, operate and configure encryption key management properties. These permissions make sure that you can configure the KMS environment and NetBackup’s interaction with it. |
| Additional user groups              | The Security Administrator (member of NBU_Security Admin or equivalent) can create user groups as needed. The default user groups can be selected, changed, and saved. Veritas recommends that the groups be copied, renamed, and then saved to retain the default settings for future reference. |

### Configuring user groups

The Security Administrator can create new user groups. Expand **Access Management > Actions > New Group** or select an existing user group and expand **Access Management > Actions > Copy to New Group**.

### Creating a new user group

You can use the following procedure to create a new user group.
To create a new user group

1. As a member of the NBU_Security Admin user group (or equivalent), expand Access Management > NBU User Groups.


3. Type the name of the new group in the Name field, then click the Users tab.

4. Select the defined users that you want to assign to this new user group. Then click Assign. Or, to include all the defined users in the group, click Assign All. To remove users from the assigned users list, select the user name, then click Remove.

5. Click the Permissions tab.

6. Select a resource from the Resources list and an Authorization Object. Then select the permissions for the object.

7. Click OK to save the user group and the group permissions.

Creating a new user group by copying an existing user group

You can use the following procedure to create a new user group by copying an existing user group.

To create a new user group by copying an existing user group

1. As a member of the NBU_Security Admin user group (or equivalent), expand Access Management > NBU User Groups.

2. Select an existing user group in the Details pane. (The pane on the left side of the NetBackup Administration Console.)

3. Select Actions > Copy to New User Group. A dialog that is based on the selected user group displays, opened to the General tab.

4. Type the name of the new group in the Name field, then click the Users tab.

5. Select the defined users that you want to assign to this new user group. Then click Assign. Or, to include all the defined users in the group, click Assign All. To remove users from the assigned users list, select the user name, then click Remove.

6. Click the Permissions tab.

7. Select a resource from the Resources list and Authorization Object, then select the permissions for the object.

8. Click OK to save the user group and the group permissions. The new name for the user group appears in the Details pane.
Renaming a user group

Once a NetBackup user group has been created, the user group cannot be renamed. The alternative to directly renaming a user group is to follow these steps: copy the user group, give the copy a new name, ensure the same membership as the original, then delete the original NetBackup user group.

Adding a new user to the user group

Click New User to add a user to the Defined Users list. After you add a user, the name appears in the Defined Users list and the Security Administrator can assign the user to the user group.

See “Assigning a user to a user group” on page 217.

About defining a user group and users

NetBackup authenticates existing users of the operating system instead of requiring that NetBackup users be created with a NetBackup password and profile.

Users can belong to more than one user group and have the combined access of both groups.

Figure 6-15 shows defining a user group.

Figure 6-15  Defining a user group

Users can belong in more than one user group

Users can be members of multiple user groups simultaneously, but NetBackup does not allow user groups to be nested. For example, members of a user group can belong to more than one user group, but a user group cannot belong to another user group.

The following figure shows that nested user groups are not allowed.
Logging on as a new user

You can use the following procedure to log on as a new user.

To log on as a new user

* Expand File > Login as New User (Windows). This option is only available on computers that are configured for access control. It is useful to employ the concept of operating with least privileges and an individual needs to switch to using an account with greater privilege.

Assigning a user to a user group

You can use the following procedure to assign a user to a user group. A user is assigned from a pre-existing name space (NIS, Windows, etc.) to an NBU user group. No new user accounts are created in this procedure.

To add a user to a user group

1. As a member of the NBU_Security Admin user group (or equivalent), expand Access Management > NBU User Groups.
2. Double-click on the user group to which you want to add a user.
3 Select the **Users** tab and click **Add User**.

A display similar to the following appears:

![Add User dialog box]

4 Enter the user name and the authentication domain. Select the domain type of the user: NIS, NIS+, PASSWD, Windows, or Vx.

5 Select the **Domain Type** of the user:

   - NIS
     Network Information Services
   - NIS+
     Network Information Services Plus
   - PASSWD
     UNIX password file on the authentication server
   - Windows
     Primary domain controller or Active Directory
   - Vx
     Veritas private database

6 For the **User Type**, select whether the user is an individual user or an OS domain.

7 Click **OK**. The name is added to the **Assigned Users** list.
About authorization objects and permissions

In general, an authorization object correlates to a node in the NetBackup Administration Console tree.

The following figure shows the authorization objects.

Figure 6-17    Authorization objects

The Authorization Objects pane contains the NetBackup objects to which permissions can be granted.
The Permissions for "DevHost" pane indicates the permission sets for which the selected user group is configured.

An authorization object may be granted one of these permission sets:

- Browse/Read
- Operate
- Configure

A lowercase letter in the Permissions for "DevHost" column indicates some (but not all) of the permissions in a permission set. Permissions have been granted for the object.

Viewing specific user permissions for NetBackup user groups

The permissions that are granted to each of the NBU user groups correlate to the name of the authorization object. The NBU default user groups include the NBU_Operator, NBU_Admin, NBU_SAN Admin, NBU_User, NBU_Security Admin, and Vault_Operator.

Due to the complexities of interdependencies between resources, in some places it is not possible to map access to a resource or to a single permission. There might be multiple underlying permissions across resources that need to be evaluated to make an access check decision. This mix of permissions can cause some discrepancies between resource permissions and resource access. This possible discrepancy is mostly limited to read access. For example, a Security_Admin might not have permissions to list or browse policies. The administrator needs access to policies as they contain client information that is required to configure security for clients.

---

**Note:** There can be a permissions anomaly. The NBU_User, NBU_KMS_Admin, NBU_SAN Admin, and Vault_Operator users are not able to access host properties from the Java GUI. To fetch data for host properties reference is made to the policy object as well. This anomaly means that to access the host properties the user requires Read/Browse access on the policy object. Manually giving read access to the policy object resolves the issue.

---

**Note:** More information on this subject can be found by referring to the Veritas technical support site.
To View specific user permissions

1. In the NetBackup Administration Console, expand Access Management > NBU User Groups.
3. In the NBU_Operator window, select the Permissions tab.
4. In the Authorization Objects pane, select the desired authorization object. The Permissions pane displays the permissions for that authorization object.

Granting permissions

You can use the following procedure to grant a permission to the members of a user group.

To grant a permission to the members of a user group

1. Select an authorization object.
2. Then place a check in front of a permission that you want to grant the members of the user group currently selected.

When a user group is copied to create a new user group, the permission settings are also copied.

The following figure shows an example of a permissions list.
Authorization objects

The following tables show the authorization objects in the order that they appear in the NetBackup Administration Console, NBU_Operator window.

The tables also show the relationships between the authorization objects and default permissions for each of the NBU user groups as follows:
The "X" indicates that the specified user group has permission to perform the activity.

The "---" indicates that the specified user group does not have permission to perform the activity.

Media authorization object permissions

The following table shows the permissions that are associated with the Media authorization object.

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN_Admin</th>
<th>NBU_User</th>
<th>NBU_Security_Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS_Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Update barcodes</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Eject</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Move</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Assign</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Deassign</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Update Database</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Expire</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
</tbody>
</table>

Policy authorization object permissions

The following table shows the permissions that are associated with the Policy authorization object.
Table 6-18  Policy authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Back up</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Activate</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Deactivate</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Up</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Down</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Reset</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Assign</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Deassign</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Drive authorization object permissions

The following table shows the permissions that are associated with the Drive authorization object.

Table 6-19  Drive authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Up</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Down</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Reset</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Assign</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Deassign</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
Report authorization object permissions

The following table shows the permissions that are associated with the Report authorization object. Reports include only the Access permission set, and do not include a Configure or Operate permission set.

Table 6-20 Report authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
</tbody>
</table>

NBU_Catalog authorization object permissions

The following table shows the permissions that are associated with the NetBackup catalog authorization object.

Table 6-21 NBU_Catalog authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Back up</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Restore</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Verify</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Duplicate</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Expire</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Read</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Configuration Set</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
Robot authorization object permissions

The following table shows the permissions that are associated with the robot authorization object.

Table 6-22  Robot authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Inventory</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Conﬁgure</td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
</tbody>
</table>

Storage unit authorization object permissions

The following table shows the permissions that are associated with the storage unit authorization object.

Table 6-23  Storage unit authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Conﬁgure</td>
<td>Assign</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

DiskPool authorization object permissions

The following table shows the permissions that are associated with the disk pool authorization object.
Table 6-24  DiskPool authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Modify</td>
<td>---</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Mount</td>
<td>---</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Unmount</td>
<td>---</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Read</td>
<td>---</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Configuration Set</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

BUAndRest authorization object permissions

The following table shows the permissions that are associated with the backup and restore authorization object.

Table 6-25  BUAndRest authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
</tbody>
</table>
Table 6-25  BUAndRest authorization object permissions (continued)

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate</td>
<td>Back up</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Restore</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Alternate Client</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Alternate Server</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Admin Access</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Database Agent</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>List</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Job authorization object permissions

The following table shows the permissions that are associated with the Job authorization object.

Table 6-26  Job authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Suspend</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Resume</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Cancel</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Restart</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>New</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
</tbody>
</table>

Service authorization object permissions

The following table shows the permissions that are associated with the Service authorization object.
<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN_Admin</th>
<th>NBU_User</th>
<th>NBU_Security_Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS_Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Stop</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

The Read and Browse permissions do not have an effect on the Daemons tab. This information is harvested from the server using user level calls. The calls are used to access the process task list and is displayed to all users for informational purposes.

If a user is not a member of the NBU_Admin user group, but is logged on as an OS administrator (Administrator or root), then:

- The user is able to restart a service from within the NetBackup Administration Console or from the command line.
- The user is able to stop a service from within the NetBackup Administration Console but not from the command line.

If a user is not a member of the NBU_Admin user group, but is logged on as an OS administrator (root). That user is able to restart a daemon from the command line only:

```
/etc/init.d/netbackup start
```

If a user is a member of the NBU_Admin user group, but is not logged on as an OS administrator (Administrator), then:

- The user is not able to restart a service from within the NetBackup Administration Console or from the command line.
- The user is not able to stop a service from within the NetBackup Administration Console but the user can use the command line.
  (For example, bprdreq -terminate, bpdbm -terminate, or stopltid.)

If a user is a member of the NBU_Admin user group, but is not logged on as an OS administrator (root). That user is not able to restart a daemon from the NetBackup Administration Console or from the command line.
HostProperties authorization object permissions

The following table shows the permissions that are associated with the host properties authorization object.

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Configure</td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

License authorization object permissions

The following table shows the permissions that are associated with the License authorization object.

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Configure</td>
<td>Assign</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Volume group authorization object permissions

The following table shows the permissions that are associated with the volume group authorization object.
Table 6-30  Volume group authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_OPERATOR</th>
<th>NBU_KMS_Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

VolumePool authorization object permissions

The following table shows the permissions that are associated with the volume pool authorization object.

Table 6-31  VolumePool authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_OPERATOR</th>
<th>NBU_KMS_Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Assign</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

DevHost authorization object permissions

The following table shows the permissions that are associated with the device host authorization object.

Note: The DevHost object controls access to the Media and Device Management > Credentials node.
### Security authorization object permissions

The following table shows the permissions that are associated with the security authorization object.

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Stop</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Synchronize</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

### Fat server authorization object permissions

The following table shows the permissions that are associated with the Fat server authorization object.

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>
Table 6-34  Fat server authorization object permissions (continued)

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure</td>
<td>Modify</td>
<td>---</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Modify SAN Configuration</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Fat client authorization object permissions

The following table shows the permissions that are associated with the Fat client authorization object.

Table 6-35  Fat client authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Discover</td>
<td>---</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure</td>
<td>Modify</td>
<td>---</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Vault authorization object permissions

The following table shows the permissions that are associated with the vault authorization object.

Table 6-36  Vault authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Manage Containers</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Operate</td>
<td>Run Reports</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
</tbody>
</table>

NetBackup Access Control Security (NBAC)
### Table 6-36  
Vault authorization object permissions (continued)

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure Modify</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure Run Sessions</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

### Server group authorization object permissions

The following table shows the permissions that are associated with the server group authorization object.

### Table 6-37  
Server group authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>X</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Configure New</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure Delete</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Configure Modify</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

### Key management system (kms) group authorization object permissions

The following table shows the permissions that are associated with the Key management system group authorization object.

### Table 6-38  
Key management system group authorization object permissions

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
</tr>
</tbody>
</table>
Table 6-38  Key management system group authorization object permissions (continued)

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_SAN Admin</th>
<th>NBU_User</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure</td>
<td>New</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Delete</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Modify</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
</tbody>
</table>

Upgrading NetBackup Access Control (NBAC)

Note: If NBAC is enabled, it is upgraded as part of the NetBackup upgrade. Refer to the NetBackup Upgrade Guide for instructions about how to upgrade NetBackup. Make sure that current AT and AZ services are running when the upgrade is performed. If NetBackup is running in a cluster server, make sure that both services are running in the active node where NetBackup is running and the upgrade is performed.

The following procedure describes how to upgrade NetBackup Access Control (NBAC).

Upgrading NetBackup Access Control (NBAC)

1. On the master server, stop NetBackup.
2. Upgrade NetBackup.

On the media servers and client computers, first stop NetBackup and then upgrade NetBackup. Note that the shared authentication and authorization packages are no longer used on media servers and client computers. These products can be removed if no other Veritas product uses them.

Upgrading NetBackup when an older version of NetBackup is using a root broker installed on a remote machine

You can use the following steps for upgrading NetBackup when an older version of NetBackup is using a root broker installed on a remote computer.
Upgrading NetBackup when an older version of NetBackup is using a root broker installed on a remote machine

1. Before upgrading to NetBackup, stop the NetBackup services and disable NBAC by setting `USE_VXSS=PROHIBITED`. To set the new value for `USE_VXSS`, run the following command. Then start the NetBackup upgrade.

   On UNIX platforms, use
   
   `/usr/openv/netbackup/bin/admincmd/bpsetconfig
   bpsetconfig> USE_VXSS=PROHIBITED
   bpsetconfig> Crtl + D (to save and quit).

   On Windows, use
   
   `C:\Program Files\Veritas\NetBackup\bin\admincmd\bpsetconfig
   bpsetconfig> USE_VXSS=PROHIBITED
   bpsetconfig> Crtl + Z + Enter (to save and quit).

2. Once the NetBackup upgrade is completed then migrates the remote root broker (RB) and local shared authentication broker (AB) into NetBackup by using the `atutil` tool which is shipped with NetBackup.

3. Copy the `atutil` utility from the NetBackup computer to the root broker computer.

   On UNIX Platforms, copy the `/usr/openv/netbackup/sec/at/bin/atutil` file from NetBackup computer to the root broker computer.

   On Windows, copy the `C:\Program Files\Veritas\NetBackup\sec\at\bin\atutil.exe` file from NetBackup computer to the root broker computer.

4. Change directory to where the `atutil` command was copied. Then export the root broker by running the `atutil export -r -f <RB output xml file> -p <password>` command.

5. Copy the exported file to NetBackup computer.
6  Import the root broker into the NetBackup computer by executing the following command.

   On UNIX platforms, execute  
   /usr/openv/netbackup/sec/at/bin/atutil  
   import -z /usr/openv/var/global/vxss/eab/data/ -f <RB output xml file> -p <password>

   On Windows, execute  
   C:\Program Files\Veritas\NetBackup\sec\at\bin\atutil import -z C:\Program Files\Veritas\NetBackup\var\global\vxss\eab\data -f <RB output xml file> -p <password>

   On cluster computers, the -z option should point to the shared drive.

7  Configure the NetBackup authentication service in R+AB mode by running the following command.

   On UNIX platforms, run  
   /usr/openv/netbackup/sec/at/bin/vssregctl -s -f  
   /usr/openv/var/global/vxss/eab/data/root/.VRTSat/profile/VRTSatlocal.conf -b "Security\Authentication\Authentication Broker" -k Mode -t int -v 3

   On Windows, run  
   C:\Program Files\Veritas\NetBackup\sec\at\bin\vssregctl -s -f C:\Program Files\VERITAS\NetBackup\var\global\vxss\eab\data\systemprofile\VRTSatlocal.conf -b "Security\Authentication\Authentication Broker" -k Mode -t int -v 3

   On cluster computers set the –f option to point to the shared drive.

8  Set the value of USE_VXSS to AUTOMATIC to start the authentication service.  
To set a new value for USE_VXSS run following command.

   On UNIX platforms,

   /usr/openv/netbackup/bin/admincmd/bpsetconfig  
   bpsetconfig> USE_VXSS=AUTOMATIC  
   bpsetconfig> Crtl + D (to save and quit).

   On Windows,

   C:\Program Files\Veritas\NetBackup\bin\admincmd\bpsetconfig  
   bpsetconfig> USE_VXSS=AUTOMATIC  
   bpsetconfig> Crtl + Z + Enter (to save and quit).
Start the NetBackup authentication service by running the following command.

On UNIX platforms, run `/usr/openv/netbackup/bin/nbatd`.
On Windows, run `net start nbatd`.

Reset the value of USE_VXSS to PROHIBITED.

On UNIX platforms manually edit the `/usr/openv/netbackup/bp.conf` file and set `USE_VXSS` to PROHIBITED.
On Windows, open the registry entry for `HKEY_LOCAL_MACHINE\SOFTWARE\Veritas\NetBackup\CurrentVersion\Config` and set the value of `USE_VXSS` to PROHIBITED.

Export the shared AB domain and import it into NetBackup by running the following command.

On UNIX platforms, execute the following commands in sequence.

```
/usr/openv/netbackup/sec/at/bin/atutil export -t ab -f <AB output xml file> -p <password>
/usr/openv/netbackup/sec/at/bin/atutil import -z /usr/openv/var/global/vxss/eab/data/ -f <AB output xml file> -p <password>.
```

On Windows, execute the following commands in sequence.

```
C:\Program Files\Veritas\NetBackup\sec\at\bin\atutil export -t ab -d broker -f <AB output xml file> -p <password>
C:\Program Files\Veritas\NetBackup\sec\at\bin\atutil import -z C:\Program Files\Veritas\NetBackup\var\global\vxss\eab\data -f <AB output xml file> -p <password>
```

On cluster computers the `–z` option should point to the shared drive.

Start the NetBackup authorization service by executing the following commands.

On UNIX platforms, run `/usr/openv/netbackup/bin/nbazd -f`.
On Windows, run `net start nbazd`.
13 Log on to the shared AZ service.

On UNIX platforms, run `/opt/VRTSaz/bin/vssaz login --domain localhost`.

On Windows x86 platforms, run `C:\Program Files\VERITAS\Security\Authorization\bin\ vssaz login --domain localhost`.

On Windows X64 platforms, run `C:\Program Files (x86)\VERITAS\Security\Authorization\bin\ vssaz login --domain localhost`.

14 Find the NetBackup APS name from the shared AZ using the following command.

On UNIX platforms, run `/opt/VRTSaz/bin/vssaz listaps`.

On Windows x86 platforms, run `C:\Program Files\VERITAS\Security\Authorization\bin\ vssaz listaps`.

On Windows X64 platforms, run `C:\Program Files (x86)\VERITAS\Security\Authorization\bin\ vssaz listaps`.

15 Export the NetBackup resource collection from the shared AZ by running the following command.

On UNIX platforms, run `/opt/VRTSaz/bin/vssaz rcexport --toplevelrcname <NBU APS name>`.

On Windows x86 platforms, run `C:\Program Files\VERITAS\Security\Authorization\bin\vssaz rcexport --toplevelrcname <NBU APS name>`.

On Windows X64 platforms, run `C:\Program Files (x86)\VERITAS\Security\Authorization\bin\vssaz rcexport --toplevelrcname <NBU APS name>`.

16 Log out from the shared AZ using the following command.

On UNIX platforms, run `/opt/VRTSaz/bin/vssaz logout`.

On Windows x86 platforms, run `C:\Program Files\VERITAS\Security\Authorization\bin\ vssaz logout`.

On Windows X64 platforms, run `C:\Program Files (x86)\VERITAS\Security\Authorization\bin\ vssaz logout`.
17 Log on to NetBackup AZ using the following command.
   On UNIX platforms, run `/usr/openv/netbackup/sec/az/bin/vssaz login --domain localhost`.
   On Windows, run `C:\Program Files\Veritas\NetBackup\sec\az\bin\vssaz login --domain localhost`.

18 Import the NetBackup resource collection from shared AZ into NetBackup using the following command.
   On UNIX platforms, run `/usr/openv/netbackup/sec/az/bin/vssaz rcimport --location /var/VRTSaz/objdb/export/<OID>/rc_<OID>.xml`.
   On Windows x86 platforms, run `C:\Program Files\Veritas\NetBackup\sec\az\bin\vssaz rcimport --location C:\Program Files\VERITAS\Security\Authorization\data\objdb\export \<OID>\rc_<OID>.xml`.
   On Windows x64 platforms, run `C:\Program Files\Veritas\NetBackup\sec\az\bin\vssaz rcimport --location C:\Program Files\VERITAS\Security\Authorization\data\objdb\export \<OID>\rc_<OID>.xml`.

19 Restart the NetBackup service in `USE_VXSS = PROHIBITED` mode.

20 Run the `setupmaster` command.

21 Restart the NetBackup service.
Security management in NetBackup

This chapter includes the following topics:

- Overview of security certificates in NetBackup
- About secure communication in NetBackup
- About the Security Management utilities
- About audit events
- About host management
- About global security settings
- About host name-based certificates
- About host ID-based certificates
- About Token Management for host ID-based certificates
- About the host ID-based certificate revocation list
- About revoking host ID-based certificates
- Deleting host ID-based certificates
- Security certificate deployment in a clustered NetBackup setup
- About the communication between a NetBackup client located in a demilitarized zone and a master server through an HTTP tunnel
Overview of security certificates in NetBackup

NetBackup uses security certificates to authenticate NetBackup hosts. The security certificates conform to the X.509 Public Key Infrastructure (PKI) standard. A master server acts as the Certificate Authority (CA) and issues digital certificates to hosts.

Any security certificates that were generated before NetBackup 8.0 are referred to as host name-based certificates. NetBackup is in the process of replacing these older certificates with newer host ID-based certificates. The transition will be completed in future releases and the use of host name-based certificates will be eliminated.

However, the transition is ongoing and NetBackup continues to require the older host name-based certificates for some operations. The following table lists various operations where host name-based certificate is required.

Note: All NetBackup 8.1 hosts must have a host ID-based certificate.

<table>
<thead>
<tr>
<th>Operation or component</th>
<th>Type of certificate required</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetBackup Access Control (NBAC)</td>
<td>If NBAC is enabled on a NetBackup host, the host requires a host name-based certificate. These are automatically deployed when NBAC is enabled.</td>
</tr>
<tr>
<td>Enhanced Auditing operations</td>
<td>Enhanced Auditing operations require that the hosts have host name-based certificates. See &quot;Deploying host name-based certificates&quot; on page 273.</td>
</tr>
<tr>
<td>Cloud storage</td>
<td>The NetBackup CloudStore Service Container requires that the host name-based certificate be installed on the media server. If one is not installed, the Service Container cannot start. See &quot;Deploying host name-based certificates&quot; on page 273. For more information, see the NetBackup Cloud Administrator's Guide.</td>
</tr>
</tbody>
</table>

Note: If you have NetBackup hosts earlier than 8.1 in your environment, refer to the respective version of the NetBackup Security and Encryption Guide for the host name-based certificate requirements.

About secure communication in NetBackup

This section provides information on various configuration options that are added for secure communication between NetBackup hosts.
NetBackup 8.1 hosts can communicate with each other only in a secure mode. NetBackup 8.1 hosts must have a Certificate Authority (CA) certificate and a host ID-based certificate for successful communication.

NetBackup uses Transport Layer Security (TLS) protocol for host communication where each host needs to present its security certificate and validate the peer host's certificate against the Certificate Authority (CA) certificate.

For more details, refer to the Read This First for Secure Communications document. https://www.veritas.com/docs/DOC5332

Two new nodes on the NetBackup Administration Console provide secure communication settings: Host Management and Global Security Settings.

See “About host management” on page 251.

See “Adding host ID to host name mappings” on page 252.

See “About global security settings” on page 264.

See “About secure communication settings” on page 264.

See “About disaster recovery settings” on page 269.

Two new commands, nbhostmgmt and nbhostidentity, along with enhancements to nbcertcmd and nbseccmd, provide options to manage certificate deployment and other security settings.

If you have NetBackup 8.0 or earlier hosts in your environment, you can allow insecure communication with them.

See “About insecure communication with 8.0 and earlier hosts” on page 267.

About the Security Management utilities

The NetBackup Administration Console > Security Management node is visible only to administrators on the NetBackup master server. (An exception to this is NetBackup Access Control administrators. They do not see the Security Management node.)
Security Management contains the following utilities to view login activity, manage host ID-based certificates, and configure secure communications in the domain.

- Use Security Events to view the login details about the current administrator and the user-initiated changes that are made to certificates, tokens, hosts, and security configurations. You can also view details about host connections.

The **Security Events** utility contains the following tabs:

- The **Access History** tab displays details about the login activities that the current user has performed. The details include successful and unsuccessful login attempts and information about the hosts that the user has tried to access.

  See "About login activity" on page 246.

  The **Accessed from** field displays the component that the user has used to login: **NetBackup Administration Console** or **NetBackup API**.
Note: NetBackup requires the `bprd` service to be running to display the audit details of the users who are logged in using the NetBackup Administration Console.

- The **Audit Events** tab displays audit events according to the audit categories that you have selected, such as Certificate, Host, Security Configuration and so on.

- Use the **Host Management** node to carry out NetBackup host operations, such as adding or approving host ID to host name mappings, resetting host, or adding comments for a host.
  
  See “Hosts tab” on page 251.

  The **Host Management** node contains the following tabs:

  - The **Hosts** tab displays host information such as, host IDs and host ID to host name mappings.
  
  - The **Mappings for Approval** tab displays host ID to host name mappings that need approval.

- Use the **Certificate Management** node to carry out operations specific to certificates such as viewing, revoking, or reissuing.
  
  See “Using the Certificate Management utility to issue and deploy host ID-based certificates” on page 276.

  - **Certificate Management** contains the **Token Management** node. Use the **Token Management** utility to create, delete, and view the tokens.
    
    See “About Token Management for host ID-based certificates” on page 298.

- Use the **Global Security Settings** node to configure security settings like enable insecure communication, disaster recovery package passphrase, certificate deployment level and so on.
  
  The **Global Security Settings** node contains the following tabs:

  - The **Secure Communication** tab provides NetBackup security settings that you can configure.
  
  - The **Disaster recovery** tab lets you configure the disaster recovery package passphrase that you need to get the master server host identity back after a disaster.

- Use **Access Management** if NetBackup Access Control (NBAC) is configured.  
  **Access Management** contains options to define who can access NetBackup and the functions that they can perform.
  
  See “About using NetBackup Access Control (NBAC)” on page 145.
About login activity

NetBackup captures information about the access history of users and keeps a track of when a user's password will expire. The information is displayed in the **My Recent Login Activity** window at the top right corner of the **NetBackup Administration Console**.

The **My Recent Login Activity** window closes after you begin to use the **NetBackup Administration Console**.

The password expiration information is not available in the following scenarios:

- If you have remotely logged in to the master server using the Single Sign-on (SSO) feature of the **NetBackup Administration Console**
- If you have logged in to the UNIX or Linux master server using the **NetBackup Administration Console**

**Note:** The login and the password expiration details are displayed only after the first successful login and logout from the **NetBackup Administration Console**.

The login details are not automatically refreshed. You must log off from the **NetBackup Administration Console** and log in again to view the latest information about the last login details.

This information is also displayed in **Security Events** on the **Access History** tab.
About audit events

Events specific to the following security parameters are audited in the **NetBackup Administration Console**:

- Certificate
- Connection
- Host
- Login
- Security Configuration
- Token

See “Viewing the audit report” on page 126.

Viewing audit events

NetBackup records a number of events that occur while you work with the product. For example, a security certificate is issued to a host, an authorization token is deleted, connection between hosts is established and so on.

See “Viewing audit event details” on page 248.

See “Audit Events Details dialog box” on page 249.

See “Viewing audit event status” on page 250.

**To view audit events**

1. In the **NetBackup Administration Console**, expand **Security Management > Security Events**.

2. In the details pane, click the **Audit Events** tab.

See “Audit Events tab” on page 247.

Audit Events tab

The Audit Events tab displays NetBackup events according to the audit categories that you select. NetBackup records a number of events that occur while you work with the product. For example, a security certificate is issued to a host, an authorization token is deleted, connection between hosts is established and so on.

The following information is displayed on the tab:
Select Date/Time  Select the date range - **From** and **To** dates - for which you want to view audit events.

Alternatively, you can select the **Current Time** check box instead of selecting the **To** date. Audit events that have occurred from the specified date until the current time are displayed.

Select Audit Categories  Select the audit categories like Certificate, Connection, Host and so on to view the respective events in the report pane.

Alternatively, you can select the **All** check box, select all audit categories at once.

Show Status  Click the link to open the **Status of Selected Audit Categories** pop-up screen. The pop-up screen displays the audit events that are fetched per selected categories.

See “**Viewing audit event status**” on page 250.

Defaults  Click the button to set the default settings for the date and audit categories.

Fetch Audit Events  Click the button to display audit events according to the categories that are selected.

To view additional information about a specific event, select it from the table in the report pane and double-click. The **Details** dialog box opens.

See “**Audit Events Details dialog box**” on page 249.

Initially, the **Audit Events** tab displays audit events for all categories that are recorded so far. You can select the required audit categories and then click the **Fetch Audit Events** button (or refresh the screen) to fetch the recent events for the selected categories.

<table>
<thead>
<tr>
<th>Date</th>
<th>Date and time when the audit event was recorded.</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>User who triggered the event.</td>
</tr>
<tr>
<td>Category</td>
<td>Audit category, for example Certificate (CERT), Login (LOGIN), Security Configuration (SEC_CONFIG), or Token (TOKEN).</td>
</tr>
<tr>
<td>Action</td>
<td>Action that the user has taken, for example CREATE (created a certificate) or MODIFY (modified a security configuration)</td>
</tr>
<tr>
<td>Description</td>
<td>Details about the event and the user action.</td>
</tr>
</tbody>
</table>

**Viewing audit event details**

This section provides the procedure on how to view details of NetBackup audit events.
To view audit event details
1. In the NetBackup Administration Console, expand Security Management > Security Events.
2. In the details pane, click the Audit Events tab.
3. On the report pane, on the table, double-click the audit event for which you want to view the details. The Details dialog box is displayed.

Audit Events Details dialog box

The Details dialog box displays the information specific to the audit event that you have selected on the Audit Events tab.

The dialog box displays the following details:

| Description | Description of the audit event that you have selected. |
| User        | User who triggered the event.                        |
| Date        | Date and time when the audit event was recorded.     |
| Category    | Audit category, for example Certificate (CERT), Login (LOGIN), Security Configuration (SEC_CONFIG), or Token (TOKEN). |
| Action      | Action that the user has taken, for example CREATE (created a certificate) or MODIFY (modified a security configuration) |
| Reason      | Reason for the audit event.                         |

**Note:** If you see audit records in the CONNECTION category, make sure to review the record details. For certain records in this category, the Date field that is displayed on the dialog box indicates when the audit record was posted to the master server. It does not necessarily indicate when an individual event occurred. This type of audit record (for example, a certificate verification failure (CVF) record) represents a group of events that have occurred over a time period. The audit record details provide the Beginning Event Time and Ending Event Time of the time period as well as the Event Count (the total number of events that occurred in that time period).
Following are the audit trail details for the events that are displayed on the dialog box:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Value</td>
<td>Old value of the attribute that is associated with the audit event.</td>
</tr>
<tr>
<td>New Value</td>
<td>New value of the attribute.</td>
</tr>
</tbody>
</table>

**Viewing audit event status**

This section provides the procedure on how to view status of the audit events that you want to fetch and view.

See “Audit Events tab” on page 247.

See “Viewing audit events” on page 247.

**To view status of audit events**

1. In the NetBackup Administration Console, expand Security Management > Security Events.
2. In the details pane, click the Audit Events tab.
3. On the Audit Events tab, click the Show Status link. The Status of Selected Audit Categories pop-up screen is displayed with the following information:

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Status of the events that are fetched and displayed per audit category. For example: 10 audit events are fetched.</td>
</tr>
</tbody>
</table>

**Note:** The Audit Events tab displays maximum of 10000 events per audit category. If the number of records exceeds the maximum allowed limit for a given date and time, the Status of Selected Audit Categories pop-up screen shows the data truncated message. To view the previous records, change the Show Date/Time filter on the Audit Events tab or use the nbauditreport command.

For information about the nbauditreport command, see the NetBackup Commands Reference Guide.

http://www.veritas.com/docs/DOC5332
Troubleshooting auditing issues related to the Access History tab

The **NetBackup Administration Console > Security Management > Security Events > Access History** tab displays details about the login activities that the current user has performed.

The **Accessed from** field on the **Access History** tab displays the component that the user has used to login: **NetBackup Administration Console** or **NetBackup API**.

NetBackup requires the **bprd** service to be running to display the audit details of the users who are logged in using the **NetBackup Administration Console**.

If you observe that the required audit records are not being displayed on the **Access History** tab, ensure that the **bprd** service is running on the master server.

About host management

The **Security Management > Host Management** node lets you map host names to their respective host IDs. Appropriate mapping between host ID-to-host names is important for secure host communication.

See “About secure communication in NetBackup” on page 242.

See “Adding host ID to host name mappings” on page 252.

See “Resetting NetBackup host attributes” on page 262.

Hosts tab

The **Hosts** tab provides the following information:

<table>
<thead>
<tr>
<th>Details</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host</td>
<td>The name of the host. <strong>Note:</strong> The <strong>Host Management</strong> node shows only those hosts that have a host ID.</td>
</tr>
<tr>
<td>Mapped Host Names / IP Addresses</td>
<td>Host names or IP addresses that are mapped to the host ID of the selected client. See “Add or Remove Host Mappings dialog box” on page 254.</td>
</tr>
<tr>
<td>Version</td>
<td>The NetBackup version that is installed on the host.</td>
</tr>
<tr>
<td>Operating System</td>
<td>The operating system version that is installed on the host.</td>
</tr>
<tr>
<td>OS Type</td>
<td>The type of operating system (Windows or UNIX) that is installed on the host.</td>
</tr>
</tbody>
</table>
Adding host ID to host name mappings

Hosts may have multiple host names or IP addresses associated with them. For successful communication between hosts, all relevant host names and IP addresses need to be mapped to the respective host IDs.

During communication, NetBackup may detect new host names or IP addresses with respect to a host ID. These host names or IP addresses can be automatically or manually mapped to the respective host ID for successful communication.

Host names or IP addresses that are detected by the system are automatically mapped to the respective host ID, if the **Automatically map host ID to host names** option on the **Security Management > Global Security Settings > Secure Communication** tab is selected.

See “Automatically mapping host ID to host names and IP addresses” on page 268.

**Important notes**

Review the following notes specific to host ID to host name mappings:

- In the case of DHCP (Dynamic Host Configuration Protocol) hosts, dynamic IP addresses may be detected by the system during communication and added as host ID to host name mappings. You should delete such mappings.
In the case of a cluster setup, host name, and FQDN (Fully Qualified Domain Name) of virtual name are discovered during host communication.

If you redeploy a certificate on a host using a host name that is not mapped with the existing host ID, a new certificate is deployed and a new host ID is issued to the host. This is because, NetBackup considers it as a different host. To avoid this situation, you should map all available host names with the existing host ID.

Use the following procedure to manually map a specific host ID to the corresponding host names or IP addresses.

See “Add or Remove Host Mappings dialog box” on page 254.

See “Removing host ID to host name mappings” on page 255.

To add host ID to host name mappings

1. In the NetBackup Administration Console, expand Security Management > Host Management.

2. On the Hosts tab, in the details pane, right-click the host that you want to modify.

3. Click the Add or Remove Host Mappings option.

4. On the Add or Remove Host Mappings screen, host ID of the selected client host is displayed along with the existing mappings.

   Click Add.

5. On the Add Mapping dialog box, provide the following details:

   Mapping Name Specify host ID-to-host name mapping.

   Note: Host ID-to-host name mappings are not case-sensitive.

   Audit Reason Specify the reason or additional information for adding this mapping for auditing purpose.

   Save Click to save the mapping that you have added and to continue to add more mappings for the same host ID.

   Cancel Click to close the dialog box without saving any changes.
To add host ID to host name mapping using the command-line interface

1. Run the following command to authenticate your web services login:
   ```
   bpnbat -login -loginType WEB
   ```

2. Run the following command to add a host ID to host name mapping:
   ```
   nbhostmgmt -add -hostid host_ID -mappingname mapping_name
   ```

Add or Remove Host Mappings dialog box

Hosts may have multiple host names or IP addresses associated with them. For successful communication between hosts, all relevant host names and IP addresses need to be mapped to the respective host IDs.

On the Security Management > Host Management > Hosts tab, right-click the host that you want to modify, and click the Add or Remove Host Mappings option to open the dialog box.

Only System Administrator can access the Add or Remove Host Mappings properties for a NetBackup host.

See “Adding host ID to host name mappings” on page 252.

See “Removing host ID to host name mappings” on page 255.

The Add or Remove Host Mappings dialog box contains the following properties.

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetBackup Host ID</td>
<td>Displays the host ID of the selected host.</td>
</tr>
<tr>
<td>Mapped Host Names / IP Addresses</td>
<td>Lists host names and IP addresses that are mapped to the host ID of the client host.</td>
</tr>
<tr>
<td>Auto-discovered</td>
<td>States whether the mapped host name or IP address was automatically discovered by the system or not.</td>
</tr>
<tr>
<td>Created On</td>
<td>Date and time when the mapping was created.</td>
</tr>
<tr>
<td>Last Updated On</td>
<td>Date and time when the mapping was last updated.</td>
</tr>
<tr>
<td>Add</td>
<td>Click to add new host ID to host name mappings for the client host.</td>
</tr>
</tbody>
</table>

The Add Mapping dialog box is displayed.

See “Adding host ID to host name mappings” on page 252.
Remove host ID to host name mappings

Use the following procedure to remove host ID to host name mappings.

See “Add or Remove Host Mappings dialog box” on page 254.
See “Adding host ID to host name mappings” on page 252.

To remove host ID to host name mappings

1. In the NetBackup Administration Console, expand Security Management > Host Management.
2. In the details pane, on the Hosts tab, right-click the client host that you want to modify.
3. Click the Add or Remove Host Mappings option.
4. On the Add or Remove Host Mappings screen, host ID of the selected client host is displayed along with the existing mappings.
5. Select the mapping that you want to remove.
6. Click Remove.
7. On the Remove Mapping dialog box, specify the audit reason for removing the selected mapping for auditing purpose.
8. Click Yes.

To remove host ID to host name mapping using the command-line interface

1. Run the following command to authenticate your web services login:
   
   bpnbat -login -loginType WEB

2. Run the following command to remove a host ID to host name mapping:
   
   nbhostmgmt -delete -hostid host_ID-mappingname mapping_name
Mappings for Approval tab

Use the Security Management > Host Management > Mappings for Approval tab to view host ID-to-host name mappings that are pending for approval.

The following options are available on the Mappings for Approval tab:

<table>
<thead>
<tr>
<th>Host</th>
<th>Name of the selected host.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto-discovered Mapping</td>
<td>Host ID-to-host name mapping that was discovered with respect to the host during communication.</td>
</tr>
<tr>
<td>Conflict</td>
<td>States if there is any conflict in the mappings. For example, in a cluster setup, a mapping can be shared across host IDs.</td>
</tr>
<tr>
<td>Discovered On</td>
<td>Date and time when the mapping was discovered by the system.</td>
</tr>
<tr>
<td>NetBackup Host ID</td>
<td>Host ID of the host.</td>
</tr>
</tbody>
</table>

See “Viewing auto-discovered mappings” on page 256.

See “Add or Remove Host Mappings dialog box” on page 254.

Note: If the Automatically map host ID to host names option on the Security Management > Global Security Settings > Secure Communication tab is selected, the Mappings for Approval tab shows only conflicting mappings.

See “Automatically mapping host ID to host names and IP addresses” on page 268.

Viewing auto-discovered mappings

During communication, NetBackup may detect new host names or IP addresses with respect to a host ID. You can view the host ID-to-host name mappings that are automatically discovered.

See “Add or Remove Host Mappings dialog box” on page 254.
To view auto-discovered host ID-to-host name mappings

1 In the NetBackup Administration Console, expand Security Management > Host Management.

2 In the details pane, click the Mappings for Approval tab.

See “Mappings for Approval tab” on page 256.

Note: If the Automatically map host ID to host names option on the Security Management > Global Security Settings > Secure Communication tab is selected, the Mappings for Approval tab shows only conflicting mappings.

See “Automatically mapping host ID to host names and IP addresses” on page 268.

Mapping Details dialog box

Use the Mapping Details dialog box to approve or reject the pending host ID-to-host name mappings.

On the Security Management > Host Management > Mappings for Approval tab, right-click the host ID-to-host name mapping that you want to approve or reject, and click Mapping Details to open the dialog box.

See “Add or Remove Host Mappings dialog box” on page 254.

See “Approving host ID to host name mappings” on page 258.

See “Rejecting host ID to host name mappings” on page 259.

See “Mappings for Approval tab” on page 256.

The following options are available on the dialog box:

- **Host**
  - Displays name of the host for which you want to approve or reject the mapping.

- **Mapped Host Names / IP Addresses**
  - Lists the existing mappings that are associated with the host.

- **NetBackup Host ID**
  - Displays the host ID of the host.
Conflict in mapping -
Shared with hosts

Note: This information is displayed if the selected mapping is already associated with other hosts.

This table lists information of all hosts across which the selected mapping is shared.

For example, in a cluster set up, multiple host IDs share the same virtual name.

If a mapping is added for a host ID and if the same mapping is discovered against a different host ID, it is listed on the Mappings for Approval tab. You can either approve this mapping or reject it using the Mapping Details dialog box.

- Host - Displays the name of the host with which the selected mapping is already associated.
- NetBackup Host ID - Displays host ID of the host with which the selected mapping is already associated.

See “About shared or cluster mapping scenarios” on page 260.

Reason

Provide the reason for approving or rejecting the mapping.

Approve

Click to approve the pending mapping.

Reject

Click to reject the pending mapping.

Close

Click to close the dialog box without saving the changes.

Help

Click to see help.

Approving host ID to host name mappings

This section provides a procedure for approving host ID to host name mappings that are pending for approval.

See “Add or Remove Host Mappings dialog box” on page 254.

See “Rejecting host ID to host name mappings” on page 259.

To approve host ID to host name mapping

1. In the NetBackup Administration Console, expand Security Management > Host Management.

2. In the details pane, click the Mappings for Approval tab.
3. Select the mapping that you want to approve and right-click.

4. On the right-click options, click Approve. The selected mappings are approved.
   Alternatively, click Mapping Details on the right-click options. Use the Mapping Details dialog box to approve the selected mapping.
   See “Mapping Details dialog box” on page 257.

Rejecting host ID to host name mappings

This section provides a procedure for rejecting host ID to host name mappings that are pending for approval.

See “Add or Remove Host Mappings dialog box” on page 254.
See “Approving host ID to host name mappings” on page 258.

To reject host ID to host name mapping

1. In the NetBackup Administration Console, expand Security Management > Host Management.
2. In the details pane, click the Mappings for Approval tab.
3. Select the mapping that you want to reject and right-click.
4. On the right-click options, click Reject. The selected mappings are rejected.
   Alternatively, click Mapping Details on the right-click options. Use the Mapping Details dialog box to reject the selected mapping.

Adding shared or cluster mappings

In certain scenarios, host ID to host name mappings are shared across host IDs. For example, in a cluster setup, virtual name is shared across all nodes. You need to add these shared mappings using the NetBackup Administration Console so that the master server can successfully communicate with the nodes.

See “Add or Remove Host Mappings dialog box” on page 254.

To add shared mappings

1. In the NetBackup Administration Console, expand Security Management > Host Management.
2. On the Hosts tab, in the details pane, right-click to view the options.
3. On the right-click options, select Add Shared or Cluster Mappings.
4. On the Add Shared or Cluster Mappings dialog box, specify the shared mapping name.
   See “Add Shared or Cluster Mappings dialog box” on page 261.
Select host IDs to be mapped with the specified shared mapping name.

Click Save.

About shared or cluster mapping scenarios

Host ID to host name mappings can be shared across multiple hosts in the following scenarios:

- If multiple hosts from different domains use the same host name
- In a cluster setup where the same virtual name is used by multiple cluster nodes

However, in a scenario where the associated hosts do not have the same communication status (some are 8.0 or earlier and can communicate insecurely and some are 8.1 or later and communicate securely), communication may fail.

See “Add or Remove Host Mappings dialog box” on page 254.

Scenario 1 - If multiple hosts from different domains use the same host name

Consider the following example:

- Host1 – abc.secure.domain1.com, version – 8.1, policy – P1
- Host2 – abc.insecure.domain2.com, version – 7.7.3, policy – P2
- Host1 and Host 2 use the same name – abc – as their host name. Security Administrator adds abc as a shared mapping for Host2. See “Adding shared or cluster mappings” on page 259.

- Insecure communication with 8.0 and earlier hosts is enabled.
  See “About insecure communication with 8.0 and earlier hosts” on page 267.
- When Host2 initiates communication with another host, the master server validates the communication status of host2 (which is insecure), which is different than Host1 (which is secure). Because both hosts use the same host name, but their communication status do not match, the communication with Host2 fails.

- Recommendation – Host2 should be upgraded to 8.1 or later.

Scenario 2 - In a cluster setup where the same virtual name is used by multiple cluster nodes

Consider the following example:

- Host1 – abc.secure.domain1.com, active cluster node, version – 8.1
- Host2 – abc.secure.domain1.com, inactive cluster node, version – 8.0
- Host1 and Host2 use the same virtual name that is abc. Security Administrator adds abc as a shared or cluster mapping for Host2.
See “Adding shared or cluster mappings” on page 259.

- Insecure communication with 8.0 and earlier hosts is enabled. See “About insecure communication with 8.0 and earlier hosts” on page 267.

- Host1 fails over to Host2. The master server validates the communication status of host2 (that is insecure), which is different than Host1 (that is secure). Because communication status for both hosts do not match, the communication with Host2 fails.

- Recommendation – Host2 should be upgraded to 8.1.

- Workaround – Delete the host ID-to-host name mapping abc for Host1. In case of shared mapping, if the associated hosts do not have the same communication status (secure), communication fails for the host that has insecure communication status.

### Add Shared or Cluster Mappings dialog box

Use this option to add shared or cluster mappings. On the Security Management > Host Management > Hosts tab, on the right-click options, click Add Shared or Cluster Mappings to open the dialog box.

The following options are available on the Add Shared or Cluster Mappings dialog box:

- **Shared mapping name or virtual name of cluster**: Enter the mapping name that needs to be shared by multiple host IDs.

- **Select Hosts**: Click the button to list all hosts and select the ones that you want to map with the specified mapping name.

  The Select Hosts pop-up screen lists all available hosts. Select the required hosts and click Add to list.

  The selected hosts appear in the list on the Add Shared or Cluster Mappings dialog box.

- **Host**: Name of the host that you want to map with the specified shared name.

- **NetBackup Host ID**: Host ID of the host that you want to map with the specified shared name.

- **Save**: Click to save the mapping.

- **Cancel**: Click to close the dialog box without saving the changes.

- **Help**: Click to see help.
See “Adding shared or cluster mappings” on page 259.

See “About shared or cluster mapping scenarios” on page 260.

Resetting NetBackup host attributes

In certain scenarios, you may need to clean up or reset host attributes: For example, you have downgraded the host.

In such cases, you need to reset host ID to host name mapping information, communication status and so on for successful communication.

Review the following notes before resetting host attributes

■ You must reset the host attributes of the downgraded host if you want the master server to communicate with the host in an insecure mode.

■ Resetting host attributes resets host ID to host name mapping information, communication status and so on. It does not reset the host ID, host name, or security certificates of the host.

■ After you reset the host attributes, the connection status (is secure flag) is set to insecure state. At the time of the next host communication, the connection status is updated appropriately.

■ If you have inadvertently used the Reset Host Attributes option, you can undo the changes by restarting the bpcd service. Else the host attributes are automatically updated with the appropriate values after 24 hours.

See “Add or Remove Host Mappings dialog box” on page 254.

About resetting host attributes

NetBackup 8.1 master server can communicate securely with all 8.1 hosts. However, it communicates insecurely with 8.0 and earlier hosts.

In certain scenarios, you may need to downgrade a NetBackup client from 8.1 version to 8.0 or earlier. After the downgrade, the master server cannot communicate with the client, because the communication status for the client is still set to secure mode. The communication status is not automatically updated to insecure mode after the downgrade.

Use one of the following options to reset a host:
To reset a host using the NetBackup Administration Console

1. Expand **Security Management > Host Management**.
2. On the **Hosts** tab, in the details pane, right-click the host that you have downgraded and which you want to reset, and click **Reset Host Attributes**.

---

**Note:** To resume insecure communication with downgraded hosts, ensure that the **Enable insecure communication with 8.0 and earlier hosts** option on the **Security Management > Global Security Settings > Secure Communication** tab is selected.

To reset host attributes using the command-line interface

1. Run the following command to authenticate your web services login:
   
   ```bash
   bpnbat -login -loginType WEB
   ```
2. Run the following command to reset the host:
   
   ```bash
   nbemcmd -resethost
   ```

Adding or deleting comment for a host

You can provide additional information about a NetBackup host using the **Add or Edit Comment** dialog box. For example, if a host is decommissioned, you can add a comment to explain why and when it was decommissioned.

**To add or edit a comment for a host**

1. Expand **Security Management > Host Management**.
2. On the **Hosts** tab, in the details pane, right-click the host for which you want to provide additional information, and click **Add or Edit Comment**.
3. On the **Add or Edit Comment** dialog box, in the **Comment** pane, enter the required information or comments.
   
   Click **Save**.

**To delete a comment for a host**

1. Expand **NetBackup Management > Security Management > Host Management**.
2. On the **Hosts** tab, in the details pane, right-click the host for which you want to delete comment, and click **Delete Comment**.
About global security settings

The Security Management > Global Security Settings node lets you configure the settings that are crucial for secure communication in NetBackup.

See “About secure communication in NetBackup” on page 242.

See “About disaster recovery settings” on page 269.

See “About secure communication settings” on page 264.

About secure communication settings

NetBackup provides settings that you can configure for secure communication between hosts.
### Table 7-2 Secure communication settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable insecure communication with NetBackup 8.0 and earlier hosts</td>
<td>NetBackup communicates insecurely with 8.0 and earlier hosts.&lt;br&gt;For increased security, upgrade all your hosts to the current version and disable this setting. This ensures that only secure communication is possible between NetBackup hosts.&lt;br&gt;By default, the option is selected, which allows NetBackup to communicate with hosts including 8.0 and earlier hosts that may be present in the existing NetBackup environment.&lt;br&gt;This option also allows communication between NetBackup 8.1 or later master server and OpsCenter server.&lt;br&gt;See “Disabling insecure communication” on page 266.&lt;br&gt;See “About insecure communication with 8.0 and earlier hosts” on page 267.&lt;br&gt;If you have configured Auto Image Replication, ensure the following before you clear the option:&lt;br&gt;The trusted master server that you have specified for image replication is of the version that is later than NetBackup 8.0.&lt;br&gt;For more information, refer to the NetBackup Administrator's Guide, Volume I.&lt;br&gt;<a href="http://www.veritas.com/docs/DOC5332">http://www.veritas.com/docs/DOC5332</a></td>
</tr>
</tbody>
</table>
Table 7-2  Secure communication settings (continued)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatically map NetBackup host ID to host names</td>
<td>Hosts may have multiple host names or IP addresses associated with them. For successful communication between hosts, all relevant host names and IP addresses need to be mapped to the respective host IDs. During communication, NetBackup may detect new host names or IP addresses with respect to a host ID. Select this option to automatically map the host ID to host names or IP addresses that are detected by the system. By default, the option is selected. For increased security, clear this option so that the NetBackup Administrator can manually verify the mappings and approve them. See “Automatically mapping host ID to host names and IP addresses” on page 268.</td>
</tr>
<tr>
<td>Security level for certificate deployment</td>
<td>Based on the security level that is configured on the NetBackup master server, the certificate deployment approach is determined. For example, if the security level is set to <strong>Very High</strong>, an authorization token is a must for certificate deployment. See &quot;About certificate deployment security levels&quot; on page 279. See “Configuring the certificate deployment security levels” on page 281.</td>
</tr>
</tbody>
</table>

Disabling insecure communication

By default, NetBackup can communicate with 8.0 and earlier hosts. For increased security, you should upgrade all hosts to the current version and disable communication with 8.0 and earlier hosts.

See “About secure communication settings” on page 264.

To disable insecure communication

1. In the **NetBackup Administration Console**, expand **Security Management > Global Security Settings**.
2. In the details pane, click the **Secure Communication** tab.
3 Clear the Enable insecure communication with 8.0 and earlier hosts option.
4 Click Save.

**Note:** If you are disabling insecure communications, it is recommended that you restart services to ensure that already established insecure connections are terminated.

### About insecure communication with 8.0 and earlier hosts

NetBackup communicates insecurely with 8.0 or earlier hosts.

If you have NetBackup 8.0 or earlier hosts in your environment, you can allow insecure communication with them using the Enable insecure communication with 8.0 and earlier hosts option in the NetBackup Administration Console.

The option is available on the Security Management > Global Security Settings > Secure Communication tab.

This option also allows communication between NetBackup 8.1 or later master server and OpsCenter server.

By default, insecure communication is enabled. However, for increased security, you should upgrade all hosts to the current version and disable communication with 8.0 and earlier hosts.

See “Disabling insecure communication” on page 266.

See “About communication with 8.0 or earlier host in multiple NetBackup domains” on page 267.

**Note:** If you have configured Auto Image Replication, ensure the following before you disable insecure communication: The trusted master server that you have specified for image replication is of the version that is later than NetBackup 8.0.

See “About secure communication in NetBackup” on page 242.

### About communication with 8.0 or earlier host in multiple NetBackup domains

This section provides information on what is the impact of the Enable insecure communication with 8.0 and earlier hosts option on the host communication when one of the NetBackup hosts is in multiple domains.

Consider the following scenario:
Host A is of version 8.1, which is present in multiple NetBackup domains called M1 and M2.

Host B is of version 8.0, which is present in a NetBackup domain called M3.

The Enable insecure communication with 8.0 and earlier hosts option is cleared on master server M1, which means hosts that are associated with M1 cannot communicate with hosts that are 8.0 or earlier.

The Enable insecure communication with 8.0 and earlier hosts option is selected on master server M2, which means hosts that are associated with M2 can communicate with hosts that are 8.0 or earlier.

The configuration file (bp.conf file on UNIX or registry keys on Windows) for Host A contains 'M2' as the first entry in the master server list.

When Host A initiates communication with Host B, the status of the Enable insecure communication with 8.0 and earlier hosts option is verified for the first master server that appears in the configuration file of Host A, which is M2. As per the option set for M2, communication with 8.0 or earlier hosts is allowed. Therefore, communication between Host A and Host B is successful.

Automatically mapping host ID to host names and IP addresses

For successful communication between NetBackup hosts, all relevant host names and IP addresses need to be mapped to the respective host IDs. You can choose to automatically map the host ID to the respective host names (and IP addresses) or allow the NetBackup Administrator to verify the mappings before approving them.

See “Add or Remove Host Mappings dialog box” on page 254.

Note: For increased security, clear this option so that the NetBackup Administrator can manually verify the mappings and approve them.

To automatically map host ID to host names or IP addresses

1 In the NetBackup Administration Console, expand Security Management > Global Security Settings.
2 In the details pane, click the Secure Communication tab.
3 Select the Automatically map host ID to host names option.
4 Click Save.

See “About secure communication settings” on page 264.
About disaster recovery settings

For increased security, a disaster recovery package is created during each catalog backup.

See "Disaster recovery packages" on page 272.

During each catalog backup, a disaster recovery package is created and encrypted with the passphrase that you set. You need to provide this encryption passphrase while you install NetBackup on the master server in a disaster recovery mode after a disaster.

The following options are displayed on the Disaster Recovery tab:

**Table 7-3**  Disaster recovery settings

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
</table>
| Passphrase      | Enter the passphrase to encrypt disaster recovery packages.  
|                 | ■ The passphrase must contain minimum of 8 and maximum of 20 characters.  
|                 | ■ The existing passphrase and the new passphrase must be different.  
|                 | ■ Only the following characters are supported for the passphrase: White spaces, uppercase characters (A to Z), lowercase characters (a to z), numbers (0 to 9), and special characters. Special characters include: `~ ! @ # $ % ^ & * ( ) _ + - = ` { } [ ] | : ; ' , . / ? < > " |
|                 | See “Setting a passphrase to encrypt disaster recovery packages” on page 270.                                                             |

| Confirm Passphrase | Re-enter the passphrase for confirmation.                                                                                               |

**Caution:** Ensure that the passphrase contains only the supported characters. If you enter a character that is not supported, you may face problems during disaster recovery package restore. The passphrase may not be validated and you may not be able to restore the disaster recovery package.

**Note the following before you modify the passphrase for the disaster recovery packages:**

- Subsequent disaster recovery packages are encrypted with the new passphrase that you set.

- If you change the passphrase anytime, it is not changed for the previous disaster recovery packages. Only new disaster recovery packages are associated with the new passphrase.
Passphrase that you provide while you install NetBackup on the master server in a disaster recovery mode after a disaster must correspond to the disaster recovery package from which you want to recover the master server host identity.

Setting a passphrase to encrypt disaster recovery packages

During each catalog backup, a disaster recovery package is created and encrypted with the passphrase that you set.

See “Disaster recovery packages” on page 272.

Workflow to set a passphrase to encrypt disaster recovery packages and use it after a disaster:

Review the following workflow to learn about disaster recovery package restore:
1. Set an encryption passphrase for disaster recovery packages.
2. Create a catalog policy.
   Consider the following scenarios:
   - If you have not set the passphrase earlier, NetBackup prevents you from configuring a new catalog backup policy.
   - If the catalog backup policy is upgraded from a previous version, catalog backups continue to fail until the passphrase is set.

   **Note:** Catalog backups may fail with status code 144 even though the passphrase is set. This is because the passphrase may be corrupted. To resolve this issue, you must reset the passphrase.

3. After a disaster, when you install NetBackup on the master server in a disaster recovery mode, provide the passphrase that you have set earlier. NetBackup decrypts the disaster recovery package using this passphrase and gets the identity of the master server back during installation.

   **Caution:** If you fail to provide the appropriate passphrase while you install NetBackup on the master server after a disaster, you may need to redeploy the security certificates on all NetBackup hosts. For more details, refer to the following article:

   http://www.veritas.com/docs/000125933
4. Once the master server identity is back in place, the secure communication between the master server and the media server is established and you can perform catalog recovery.

5. After successful catalog recovery, you must set the disaster recovery package passphrase again, because the passphrase is not recovered during the catalog recovery. Catalog backups that you configure in a new NetBackup instance continue to fail until you set the passphrase.

**To set or modify a passphrase**

1. In the NetBackup Administration Console, expand Security Management > Global Security Settings.

2. In the details pane, click the **Disaster Recovery** tab.

   See “About disaster recovery settings” on page 269.

3. Provide **Passphrase** and **Confirm Passphrase**.

   Review the following password rule:

   - The existing passphrase and the new passphrase must be different.
   - The passphrase must contain minimum of 8 and maximum of 20 characters.
   - Only the following characters are supported for the passphrase: White spaces, uppercase characters (A to Z), lowercase characters (a to z), numbers (0 to 9), and special characters. Special characters include: ~ ! @ # $ % ^ & * ( ) _ + - = ` { } [ ] | : ; ' , . / ? < > "

   **Caution:** If you enter a character that is not supported, you may face problems during disaster recovery package restore. The passphrase may not be validated and you may not be able to restore the disaster recovery package.

4. Click **Save**. If the passphrase already exists, it is overwritten.
To set or modify a passphrase using the command-line interface

1. The NetBackup administrator must be logged on to the NetBackup Web Management Service to perform this task. Use the following command to log on:

   bpnbat -login -loginType WEB

2. Run the following command to set a passphrase to encrypt disaster recovery packages:

   nbseccmd -drpkgpassphrase

3. Enter the passphrase.
   If a passphrase already exists, it is overwritten.

Disaster recovery packages

For increased security, a disaster recovery package is created during each catalog backup. The disaster recovery package stores the identity of the master server host. NetBackup requires this package to get the identity of the master server back after a disaster. Once you have recovered the host identity, you can perform the catalog recovery.

The disaster recovery package contains the following information:

- Security certificates and private keys of the master server and the NetBackup CA (Certificate Authority)
- Information about the hosts in the domain
- Security settings

**Note:** You must set a passphrase for the disaster recovery package for the catalog backups to be successful.

See “About disaster recovery settings” on page 269.

See “Setting a passphrase to encrypt disaster recovery packages” on page 270.

About host name-based certificates

By default, individual NetBackup master servers are provisioned with a host name-based certificate during installation. To provision a host name-based certificate on a media server or client, the NetBackup administrator runs the bpnbaz command on the master server to push the certificate to other hosts.

See “Overview of security certificates in NetBackup” on page 242.
Deploying host name-based certificates

Choose one of the following procedures to deploy a host name-based security certificate on NetBackup hosts. Only a NetBackup administrator can deploy certificates.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description and link to procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deploying a host name-based security certificate for a master server in a cluster</td>
<td>Use this procedure to deploy the host name-based security certificates on all of the nodes in a NetBackup master server cluster.</td>
</tr>
<tr>
<td>Deploying a host name-based security certificate for media servers or clients</td>
<td>This procedure uses IP address verification to identify the target NetBackup host and then deploy the certificate. With this procedure, you can deploy a host name-based certificate for an individual host, for all media servers, or for all clients.</td>
</tr>
</tbody>
</table>

**Note:** Deploying a host name-based certificate is a one-time activity for a host. If a host name-based certificate was deployed for an earlier release or for a hotfix, it does not need to be done again.

**Deploying a host name-based certificate for a master server in a cluster**

Use this procedure to deploy host name-based certificates on all cluster nodes. Ensure the following before you deploy a host-name based certificate:

- All nodes of the cluster have a host ID-based certificate.
- All Fully Qualified Domain Names (FQHN) and short names for the cluster nodes are mapped to their respective host IDs.

See “Adding host ID to host name mappings” on page 252.
To deploy a host name-based security certificate for a NetBackup master
server in a cluster

1 Run the following command on the active node of the master server cluster:
   On Windows: \Install_path\NetBackup\bin\admincmd\bpnbaz -setupat
   On UNIX: /usr/openv/netbackup/bin/admincmd/bpnbaz -setupat

2 Restart the NetBackup Service Layer (nbsl) service and the NetBackup Vault
   Manager (nbvault) service on the active node of the master server.

Deploying a host name-based certificate on media servers
or clients

This procedure works well when you deploy host name-based security certificates
to many hosts at one time. As with NetBackup deployment in general, this method
assumes that the network is secure.

To deploy a host name-based security certificate for media servers or clients

1 Run the following command on the master server, depending on your
   environment. Either specify a host name, or deploy to all media servers or
   clients.
   On Windows: \Install_path\NetBackup\bin\admincmd\bpnbaz
      -ProvisionCert host_name|-AllMediaServers|-AllClients
   On UNIX: /usr/openv/netbackup/bin/admincmd/bpnbaz -ProvisionCert
      host_name|-AllMediaServers|-AllClients

2 Restart the NetBackup Service Layer (nbsl) service on the media server.
   No services need to be restarted if the target host is a NetBackup client.

   Note: In you use dynamic IPs on the hosts (DHCP), ensure that the host name and
   the IP address are correctly listed on the master server. To do so, run the following
   NetBackup bpclient command on the master server:
   On Windows: \Install_path\NetBackup\bin\admincmd\bpclient -L -All
   On UNIX: /usr/openv/netbackup/bin/admincmd/bpclient -L -All

About host ID-based certificates

Each host in a NetBackup domain has a unique identity, which is referred to as a
host ID or a Universally Unique Identifier (UUID). The master server is the Certificate
Authority (CA). It assigns host ID-based certificates to hosts and stores the host
information in the nbdb database. The CA maintains a list of all of the host IDs that
have certificates (or revoked certificates). The host ID is used in many certificate management operations to identify the host.

Host IDs are randomly generated by the system and are not tied to any property of the hardware.

NetBackup provides a list of host ID-based certificates that you have revoked.

See “About the host ID-based certificate revocation list” on page 303.

See “Overview of security certificates in NetBackup” on page 242.

Only a NetBackup administrator can control the settings that are related to certificate deployment and revocation.

The host ID remains the same even when the host name changes.

If a host obtains certificates from multiple NetBackup domains, it has multiple host IDs that correspond to each NetBackup domain.

When the master server is configured as part of a cluster, each node in the cluster receives a unique host ID. An additional host ID is assigned for the virtual name. For example, if the master server cluster is comprised of \( N \) nodes, the number of host IDs that are allocated for the master server cluster is \( N + 1 \).

### Web login requirements for nbcertcmd command options

The `nbcertcmd` command can be used to perform all of the operations that are associated with host-ID based certificates. However, some of the `nbcertcmd` options require that the user first logs in to the NetBackup Web Management Service (nbwmc).

- To log in to the NetBackup Web Management Service, run the following command:

  ```bash
  bpnbat -login -logintype WEB
  ```

  The account must have NetBackup administrator privileges.

  The following shows an example WEB login:

  ```bash
  bpnbat -login -LoginType WEB
  Authentication Broker: server.domain.com
  Authentication port [0 is default]: 0
  Authentication type (NIS, NISPLUS, WINDOWS, vx, unixpwd, ldap): unixpwd
  Domain: server.domain.com
  Login Name: root
  Password: ********
  Operation completed successfully.
  ```
The `bnpbat -login -logintype AT` command creates a session with the NetBackup Authentication Broker (`nbatd`). (The NetBackup Authentication Broker may not always be the master server.)

**Note:** An `nbatd` session is not necessary to run the `nbcertcmd` commands.

If neither WEB nor AT is indicated, `bnpbat -login` creates a login session for both `nbatd` and `nbwmc`. (This is true if the Authentication Broker is located on the master server.)

**Note:** The authentication broker for a WEB login is the master server as the `nbwmc` service runs only on the master server.

The procedures in the following topics note whether or not a web login is required.

The [NetBackup Commands Reference Guide](#) lists the privilege details that each `nbcertcmd` option requires. This guide also contains detailed information about running the `bnpbat` command.

### Using the Certificate Management utility to issue and deploy host ID-based certificates

The process for host ID-based certificate deployment varies based on the certificate deployment security level configured on the master server. The levels are **Medium**, **High**, and **Very High**. By default, the security level is **High**.

A host ID-based certificate is automatically deployed on the master server during upgrade or installation.

Host ID-based certificates are deployed on hosts after confirming the fingerprint. Whether an authorization token is required or not depends on the security level.

These levels determine the nature of the Certificate Authority (CA) checks that are performed when the CA receives a certificate request from a NetBackup host. Select the certificate deployment level according to the security requirements of your NetBackup environment.

See “About certificate deployment security levels” on page 279.

In some scenarios, certificate deployment requires the use of authorization tokens that are managed by a NetBackup administrator. The NetBackup administrator creates and shares these tokens with the administrators of individual hosts for certificate deployment on their local hosts. Certificate deployment can happen
easily, allowing for scalable deployment across multiple NetBackup hosts without requiring NetBackup administrator intervention.

Table 7-5  Deployment requirements at each certificate deployment level or scenario

<table>
<thead>
<tr>
<th>Certificate deployment level or scenario</th>
<th>Is an authorization token required?</th>
<th>Deploy host ID-based certificate?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate deployment level setting at Very High</td>
<td>Yes. All certificate requests require an authorization token. The master server administrator creates a token to be used on the non-master host: See &quot;Creating authorization tokens&quot; on page 299.</td>
<td>The host administrator of the non-master server host must obtain an authorization token from the master server administrator and use it to deploy the host ID-based certificate. See &quot;Deploying host ID-based certificates&quot; on page 282.</td>
</tr>
<tr>
<td>Certificate deployment level setting at High (default)</td>
<td>Maybe. Certificates are deployed without tokens on hosts that are known to the master server. The following topic explains what it means to be known to the master server: See &quot;About certificate deployment security levels&quot; on page 279. If the host is not known to the master server, the certificate must be deployed using an authorization token. The master server administrator creates a token to be used on the non-master server host. See &quot;Creating authorization tokens&quot; on page 299.</td>
<td>If a host ID-based certificate is deployed, no further action is required. If a token is required, the host administrator of the non-master server host must obtain one from the master server administrator and use it to deploy the host ID-based certificate. See &quot;Deploying host ID-based certificates&quot; on page 282.</td>
</tr>
<tr>
<td>Certificate deployment level setting at Medium</td>
<td>No. Certificates may be deployed on all hosts that request one. See &quot;Automatic host ID-based certificate deployment&quot; on page 282. Note: A certificate may not be deployed if the master server cannot verify that the requested host name matches the IP from which the certificate request originated.</td>
<td>If a host ID-based certificate is deployed, no further action is required. If the master server cannot verify the host name, a host ID-based certificate must be deployed using a token. See &quot;Deploying host ID-based certificates&quot; on page 282.</td>
</tr>
<tr>
<td>Certificate reissue</td>
<td>Yes. A certificate reissue always requires a token.</td>
<td>See &quot;Creating a reissue token&quot; on page 295.</td>
</tr>
</tbody>
</table>
Table 7-5 Deployment requirements at each certificate deployment level or scenario (continued)

<table>
<thead>
<tr>
<th>Certificate deployment level or scenario</th>
<th>Is an authorization token required?</th>
<th>Deploy host ID-based certificate?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hosts that cannot communicate with the master server directly (an example of this is NetBackup hosts in a demilitarized zone (DMZ)).</td>
<td>Yes. NetBackup can automatically detect whether a host has connectivity with the master server or not. If there is no connectivity, NetBackup attempts to use the built-in HTTP tunnel on a media server to route the certificate request to the master server. See “About the communication between a NetBackup client located in a demilitarized zone and a master server through an HTTP tunnel” on page 320.</td>
<td>See “Deploying certificates on a client that has no connectivity with the master server” on page 291.</td>
</tr>
</tbody>
</table>

Viewing host ID-based certificate details

Details for each host ID-based certificate can be viewed in the NetBackup Administration Console or by using the nbcertcmd command.

To view certificate details in the NetBackup Administration Console

1. In the NetBackup Administration Console, expand Security Management > Certificate Management.

   The certificate details are displayed in the right pane.

2. By default, the host IDs are not displayed. (See Table 7-6.)

   To display or hide columns, right-click on the pane and select Columns > Layout. Select the columns to show or hide in the Column Layout dialog box.

Table 7-6 Hidden and displayed certificate details

<table>
<thead>
<tr>
<th>Column head</th>
<th>Description</th>
<th>Displayed by default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate State</td>
<td>The certificate state (Active, Revoked, or Expired).</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Table 7-6 Hidden and displayed certificate details (continued)

<table>
<thead>
<tr>
<th>Column head</th>
<th>Description</th>
<th>Displayed by default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host</td>
<td>The name of the host to which the certificate is issued.</td>
<td>Yes</td>
</tr>
<tr>
<td>Host Type</td>
<td>The type of host (server or client).</td>
<td>Yes</td>
</tr>
<tr>
<td>Issued On</td>
<td>The date and time on which the certificate was issued.</td>
<td>Yes</td>
</tr>
<tr>
<td>Valid From</td>
<td>The date upon which the certificate becomes valid.</td>
<td>Yes</td>
</tr>
<tr>
<td>Valid Until</td>
<td>The date until after which the certificate is invalid.</td>
<td>Yes</td>
</tr>
<tr>
<td>Days Remaining Until Expiry</td>
<td>The number of days until the certificate expires.</td>
<td>Yes</td>
</tr>
<tr>
<td>Certificate Version</td>
<td>Version of the host ID-based certificate that is deployed on the host.</td>
<td>No</td>
</tr>
<tr>
<td>NetBackup Host ID</td>
<td>The unique ID assigned to the host.</td>
<td>No</td>
</tr>
<tr>
<td>Serial Number</td>
<td>The serial number of the certificate.</td>
<td>No</td>
</tr>
<tr>
<td>Reason For Revocation</td>
<td>The reason for a certification revocation, if the administrator entered a reason at the time of revocation.</td>
<td>No</td>
</tr>
<tr>
<td>Last Updated On</td>
<td>The date when the certificate details were last updated.</td>
<td>No</td>
</tr>
</tbody>
</table>

**To view certificate details using the nbcertcmd command**

- To view all of the host IDs that are assigned to a host from different master servers, run the following command on a NetBackup host:

  nbcertcmd -listCertDetails

**About certificate deployment security levels**

NetBackup offers several levels that determine the nature of the CA checks that are performed when the CA receives a certificate request. The level determines the checks that are performed before the CA issues a certificate to a NetBackup host. It also determines how frequently the Certificate Revocation List (CRL) is refreshed on the host.

See “About the host ID-based certificate revocation list” on page 303.

Choose a certificate deployment level that corresponds with the security constraints and requirements of your NetBackup environment.

Table 7-7 lists and describes the three deployment levels.
Table 7-7 Description of certificate deployment security levels

<table>
<thead>
<tr>
<th>Security Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>Certificates are deployed on hosts during installation after confirming the master server fingerprint or through the <code>nbcertcmd</code> command. An authorization token is required for every new certificate request. No authorization token is required if the host is known to the master server. A host is considered to be known to the master server if the host can be found in the following entities:</td>
</tr>
<tr>
<td></td>
<td>1. If the host is listed against any of the following options in the NetBackup configuration file (Windows registry or the <code>bp.conf</code> file on UNIX):</td>
</tr>
<tr>
<td></td>
<td>■ APP_PROXY_SERVER</td>
</tr>
<tr>
<td></td>
<td>■ DISK_CLIENT</td>
</tr>
<tr>
<td></td>
<td>■ ENTERPRISE_VAULT_REDIRECT_ALLOWED</td>
</tr>
<tr>
<td></td>
<td>■ MEDIA_SERVER</td>
</tr>
<tr>
<td></td>
<td>■ NDMP_CLIENT</td>
</tr>
<tr>
<td></td>
<td>■ SERVER</td>
</tr>
<tr>
<td></td>
<td>■ SPS_REDIRECT_ALLOWED</td>
</tr>
<tr>
<td></td>
<td>■ TRUSTED_MASTER</td>
</tr>
<tr>
<td></td>
<td>■ VM_PROXY_SERVER</td>
</tr>
<tr>
<td></td>
<td>For more details on the NetBackup configuration options, refer to the <em>NetBackup Administrator's Guide, Volume I</em>.</td>
</tr>
<tr>
<td></td>
<td>2. If the host is listed as a client name in the <code>altnames</code> file (ALTNAMESDB_PATH).</td>
</tr>
<tr>
<td></td>
<td>3. If the host appears in the EMM database of the master server.</td>
</tr>
<tr>
<td></td>
<td>4. If at least one catalog image of the client exists. The image must not be older than 6 months.</td>
</tr>
<tr>
<td></td>
<td>5. If the client is listed in at least one backup policy.</td>
</tr>
<tr>
<td></td>
<td>6. If the client is a legacy client. That is, a client that the master server added by using the <code>Client Attributes</code> host properties.</td>
</tr>
<tr>
<td></td>
<td>See “Creating authorization tokens” on page 299.</td>
</tr>
<tr>
<td></td>
<td>The Certificate Revocation List (CRL) that is present on the host is refreshed after every one hour.</td>
</tr>
<tr>
<td></td>
<td>See “About the host ID-based certificate revocation list” on page 303.</td>
</tr>
<tr>
<td>High (default)</td>
<td>Certificates are deployed on hosts during installation after confirming the master server fingerprint or through the <code>nbcertcmd</code> command. No authorization token is required if the host is known to the master server. A host is considered to be known to the master server if the host can be found in the following entities:</td>
</tr>
<tr>
<td></td>
<td>1. If the host is listed against any of the following options in the NetBackup configuration file (Windows registry or the <code>bp.conf</code> file on UNIX):</td>
</tr>
<tr>
<td></td>
<td>■ APP_PROXY_SERVER</td>
</tr>
<tr>
<td></td>
<td>■ DISK_CLIENT</td>
</tr>
<tr>
<td></td>
<td>■ ENTERPRISE_VAULT_REDIRECT_ALLOWED</td>
</tr>
<tr>
<td></td>
<td>■ MEDIA_SERVER</td>
</tr>
<tr>
<td></td>
<td>■ NDMP_CLIENT</td>
</tr>
<tr>
<td></td>
<td>■ SERVER</td>
</tr>
<tr>
<td></td>
<td>■ SPS_REDIRECT_ALLOWED</td>
</tr>
<tr>
<td></td>
<td>■ TRUSTED_MASTER</td>
</tr>
<tr>
<td></td>
<td>■ VM_PROXY_SERVER</td>
</tr>
<tr>
<td></td>
<td>For more details on the NetBackup configuration options, refer to the <em>NetBackup Administrator's Guide, Volume I</em>.</td>
</tr>
<tr>
<td></td>
<td>2. If the host is listed as a client name in the <code>altnames</code> file (ALTNAMESDB_PATH).</td>
</tr>
<tr>
<td></td>
<td>3. If the host appears in the EMM database of the master server.</td>
</tr>
<tr>
<td></td>
<td>4. If at least one catalog image of the client exists. The image must not be older than 6 months.</td>
</tr>
<tr>
<td></td>
<td>5. If the client is listed in at least one backup policy.</td>
</tr>
<tr>
<td></td>
<td>6. If the client is a legacy client. That is, a client that the master server added by using the <code>Client Attributes</code> host properties.</td>
</tr>
<tr>
<td></td>
<td>See “Creating authorization tokens” on page 299.</td>
</tr>
<tr>
<td></td>
<td>The Certificate Revocation List (CRL) that is present on the host is refreshed after every four hours.</td>
</tr>
<tr>
<td></td>
<td>See “About the host ID-based certificate revocation list” on page 303.</td>
</tr>
</tbody>
</table>
Table 7-7  Description of certificate deployment security levels (continued)

<table>
<thead>
<tr>
<th>Security Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td>Certificates are deployed on hosts during installation after confirming the master server fingerprint or through the nbcertcmd command. The certificates are issued without an authorization token if the master server can resolve the host name to the IP address from which the request was originated. The Certificate Revocation List (CRL) that is present on the host is refreshed after every eight hours. See “About the host ID-based certificate revocation list” on page 303.</td>
</tr>
</tbody>
</table>

Configuring the certificate deployment security levels

Use the NetBackup Administration Console or the nbcertcmd command to configure the certificate deployment security level in the NetBackup domain.

To configure the certificate deployment level using the NetBackup Administration Console

1. In the NetBackup Administration Console, expand Security Management and do one of the following:
   - Go to Certificate Management. From the Actions menu, select Configure Security Settings.
   - Go to Global Security Settings.

2. On the Security level for certificate deployment screen, slide the indicator to one of three levels: Very High, High (default), or Medium.

3. Click OK.
To configure the certificate deployment level using the command line

1 The master server administrator must be logged in to the NetBackup Web Management Service to perform this task. Use the following command to log in:

   `bpnbat -login -logintype WEB`

   See “Web login requirements for nbcertcmd command options” on page 275.

2 Run the following command to view the current security level:

   `nbcertcmd -getSecConfig -certDeployLevel -server master_server_name`

3 Run the following command to change the security level:

   `nbcertcmd -setSecConfig -certDeployLevel 0-2 -server master_server_name`

   Where 0 is Very High, 1 is High (default), and 2 is Medium.

Automatic host ID-based certificate deployment

A host ID-based certificate is automatically deployed on the NetBackup master server as part of NetBackup installation.

These certificates are deployed on other NetBackup hosts (after confirming the fingerprint) depending on the certificate deployment level.

The Certificate Authority (CA) on the NetBackup master server can accept or reject the certificate request depending on the certificate deployment level and the ability of the master server to verify the host information.

You can check the list of the deployed certificates on any NetBackup host by using the following command:

   `nbcertcmd -listCertDetails`

When a certificate request is rejected, the host administrator must request the NetBackup administrator to generate and share an authorization token to deploy the certificate manually.

   See “Creating authorization tokens” on page 299.

   See “About certificate deployment security levels” on page 279.

Deploying host ID-based certificates

Depending on the certificate deployment security level, a non-master host may require an authorization token before it can obtain a host ID-based certificate from
the Certificate Authority (master server). When certificates are not deployed automatically, they must be deployed manually by the administrator on a NetBackup host using the `nbcertcmd` command.

The following topic describes the deployment levels and whether the level requires an authorization token.

See “About certificate deployment security levels” on page 279.

**Deploying when no token is needed**

Use the following procedure when the security level is such that a host administrator can deploy a certificate on a non-master host without requiring an authorization token.

**To generate and deploy a host ID-based certificate when no token is needed**

1. The host administrator runs the following command on the non-master host to establish that the master server can be trusted:

   ```sh
   nbcertcmd -getCACertificate
   ```

   See “Setting up trust with the master server (Certificate Authority)” on page 285.

2. Run the following command on the non-master host:

   ```sh
   nbcertcmd -getCertificate
   ```

   **Note:** To communicate with multiple NetBackup domains, the administrator of the host must request a certificate from each master server using the `-server` option.

   Run the following command to get a certificate from a specific master server:

   ```sh
   nbcertcmd -getCertificate -server master_server_name
   ```

3. To verify that the certificate is deployed on the host, run the following command:

   ```sh
   nbcertcmd -listCertDetails
   ```

**Deploying when a token is needed**

Use the following procedure when the security level is such that a host requires an authorization token before it can deploy a host ID-based certificate from the CA.
To generate and deploy a host ID-based certificate when a token is required

1. The host administrator must have obtained the authorization token value from the CA before proceeding. The token may be conveyed to the administrator by email, by file, or verbally, depending on the various security guidelines of the environment.

2. Run the following command on the non-master host to establish that the master server can be trusted:

   ```
   nbcertcmd -getCACertificate
   ```
   See “Setting up trust with the master server (Certificate Authority)” on page 285.

3. Run the following command on the non-master host and enter the token when prompted:

   ```
   nbcertcmd -getCertificate -token
   ```

   **Note:** To communicate with multiple NetBackup domains, the administrator of the host must request a certificate from each master server using the **-server** option.

   If the administrator obtained the token in a file, enter the following:

   ```
   nbcertcmd -getCertificate -file authorization_token_file
   ```

4. To verify that the certificate is deployed on the host, run the following command:

   ```
   nbcertcmd -listCertDetails
   ```

   Use the **-cluster** option to display cluster certificates.

Implication of clock skew on certificate validity

When a master server issues a certificate, it determines for how long the certificate will be valid for the host to use. The master server sets the validity of the certificate based on its own time, recording two timestamps: **Not before** and **Not after**. The certificate is valid only between these two timestamps.

The clock on the master server and the clock on the host that will receive the certificate should be in sync so that the certificate is valid for as long as is expected, given the timestamps.

The hosts can reside in different time zones, as long as the clock on each host is set to the correct time for that host’s timezone. As a general practice, NetBackup recommends using a service such as Network Time Protocol (NTP) to automatically keep all clocks on all hosts in the NetBackup domain synchronized.

If the clocks are not in sync, the difference can result in the following consequences:
If the host clock is ahead of the master server, the validity period of the certificate will be less than expected on that particular host. If the difference is extreme and the clocks vary by more than the certificate's validity period, it is possible that if the master server issued a fresh certificate, it could be treated as expired.

If the host clock is behind the master server, a fresh certificate issued by the master server could be considered as unusable by the host because the host considers the certificate as not yet valid.

To determine whether the master server clock and the host clock are in sync

1. Run the following command on the host to determine whether the host clock is in sync with the master server clock:

   \texttt{nbcertcmd -checkClockSkew -server master\_server\_name}

2. The command returns one of the following results:

   - If both clocks are in sync, the following displays:
     \begin{quote}
     The current host clock is in sync with the master server.
     \end{quote}

   - If the current host is behind the master server, the command reports the difference in seconds:
     \begin{quote}
     The current host clock is behind the master server by 36 seconds(s).
     \end{quote}

   - If the current host is ahead of the master server, the command reports the difference in seconds:
     \begin{quote}
     The current host clock is ahead of the master server by 86363 second(s).
     \end{quote}

   - If the command is run on the master server, the command skips the check and displays the following:
     \begin{quote}
     Specified server is same as the current host. Clock skew check is skipped.
     \end{quote}

     If the clock skew on the host is causing a problem with the certificate validity, take corrective actions as necessary.

Setting up trust with the master server (Certificate Authority)

Each NetBackup host must first trust the NetBackup master server, which acts as the Certificate Authority (CA). Trust is essential so that the host can request a host ID-based certificate. The CA certificate can be used to authenticate other hosts in the domain, and is stored in the trust store of each host. Setting up trust involves requesting a certificate from the master server.

See "Automatic host ID-based certificate deployment" on page 282.
Adding a CA certificate to a host's trust store

Run the `nbcertcmd -listCACertDetails` command to see the list of CA certificates that are in the host's trust store. The output displays all of the master servers that the host already trusts.

To establish trust with the master server (CA)

1. The host administrator must have the Root Certificate Fingerprint that was communicated to them through an authentic source. The source was most likely the master server administrator, who communicated the fingerprint by email, by file, or on an internal website. The following topic describes that process:

   See “Finding and communicating the fingerprint of the certificate authority” on page 287.

2. From the NetBackup host, run the following command:

   ```
   nbcertcmd -getCACertificate -server master_server_name
   ```

3. In the confirmation output, enter `y` to proceed.

   For example:

   ```
   nbcertcmd -getCACertificate -server master1
   Authenticity of root certificate cannot be established.
   ```

   **Note:** The fingerprint that is displayed must match the Root Certificate Fingerprint that the host administrator has received from the master server administrator. Enter `y` to give consent to add the CA certificate to the trust store of the host.

   ```
   Are you sure you want to continue using this certificate? (y/n): y
   The validation of root certificate fingerprint is successful.
   CA certificate stored successfully.
   ```

4. Next, the administrator performs the following task:

   ```
   See "Deploying host ID-based certificates" on page 282.
   ```

Adding a CA certificate via message in the NetBackup Administration Console

The NetBackup Administration Console and the Backup, Archive, and Restore user interfaces communicate with NetBackup hosts (master server, media server, or client) over a secure channel. NetBackup secures this channel using a NetBackup
host ID-based or a host name-based security certificate that the NetBackup Certificate Authority (CA) issues.

Figure 7-1 displays in the NetBackup Administration Console in the following situation: A user is running the NetBackup Administration Console on a NetBackup host. The user tries to connect to another NetBackup host (a target host) using the NetBackup Administration Console. However, the CA that issued the security certificate to the target host is not in the trust store of the host where the user launched the console.

Figure 7-1 Message inquiring whether to add a Certificate Authority (CA) to the trust store

To verify the CA fingerprint that the dialog displays, see the following topic:
See “Finding and communicating the fingerprint of the certificate authority” on page 287.

If the user selects Yes in this message, the CA is added to the trust store of the host where the console is running. This host will then trust all hosts that have a certificate signed by the CA that is listed in the message.

Finding and communicating the fingerprint of the certificate authority

The master server administrator must find the fingerprint of the CA certificate and communicate it to the administrator of the individual host so that the host can add the CA certificate to its trust store.

To find the fingerprint of the CA certificate

1 The master server administrator can find the fingerprint using the NetBackup Administration Console or the command line:

Using the NetBackup Administration Console:

On the Actions menu, select View Certificate Authority. The Certificate Authority Details dialog appears.

The Copy Fingerprint to Clipboard option is available to help the administrator communicate the fingerprint to the host administrator.

Using the command line:

- Run the following command on the master server to view the Root Certificate Fingerprint:

  
  nbcertcmd -listCACertDetails

  Subject Name : /CN=nbatd/OU=root@cayce.rm.com/O=vx
  Start Date : Sep 16 10:37:58 2016 GMT
  Expiry Date : Sep 11 11:52:58 2036 GMT

  If multiple CA certificates are displayed, use the Subject Name to identify the certificate for the desired master.

  2 The master server administrator communicates the fingerprint to the host administrator by email, by file, or on an internal web site.

  The host administrator uses this fingerprint to verify the fingerprint that displays when the host runs nbcertcmd -getCACertificate.

Using the vssat command to view the CA certificate fingerprint

The vssat command can also be used to view the CA certificate fingerprint. Use vssat with the following options:

  vssat showcred -p nbatd

  However, note the following differences between using nbcertcmd -listCACertDetails and vssat:
- vssat displays the fingerprint as a hash and does not include colon separators.
- If the host trusts multiple Certificate Authorities, the `nbcertcmd` command displays all CA certificates. The **Subject Name** displays the identity of the CA.

**Forcing or overwriting certificate deployment**

In some situations it may be necessary to use the `-force` option with the `nbcertcmd -getCertificate` command. For example, to force certificate deployment to a host or to overwrite the existing host ID-based certificate information and fetch a new certificate.

**Forcing certificate deployment**

A host may already have a host ID-based certificate, but needs to overwrite the old certificate with a new one. This is required, for example, when a master server is replaced with a new server. Since the clients have the old certificate to the old server, when the `nbcertcmd -getCertificate` command is run on the clients, it fails with the following error:

*Certificate already exists for the server.*

Use the following procedure to overwrite the existing host ID-based certificate information and fetch a new certificate.

**To force certificate deployment on a host**

- The host administrator runs the following command on the non-master host:
  ```shell
nbcertcmd -getCertificate -server master_server_name -force
  ```
  - Depending on the security setting on the master server, a token may also need to be specified.
    See "Creating authorization tokens" on page 299.
  - Use the `-cluster` option to deploy a cluster certificate.

**Overwrite the existing host ID-based certificate information and fetch a new certificate**

A host may have been issued a certificate, but over time the certificate has become corrupted or the certificate file has been deleted.

The administrator of the non-master host can run the following command to confirm the condition of the certificate:

```
nbcertcmd -listCertDetails
```

- If the certificate is corrupt, the command fails with the following error:
  
  *Certificate could not be read from the local certificate store.*
If no certificate details display, the certificate is not available.

Use the following procedure to overwrite the existing host ID-based certificate information and to fetch a new certificate.

To fetch a new host ID-based certificate

- The host administrator runs the following command on the non-master host:
  
  `nbcertcmd -getCertificate -force`

- Depending on the security setting on the master server, a token may also need to be specified.
  
  See “Creating authorization tokens” on page 299.

- Use the `-cluster` option to deploy a cluster certificate.

Retaining host ID-based certificates when reinstalling NetBackup on non-master hosts

Administrators may want to uninstall NetBackup from a host, and then perform a clean installation on the same host. See the following procedure for instructions on how to retain the identity of a host through the uninstall/reinstall process.

To retain host ID-based certificates when reinstalling NetBackup

1. Stop all NetBackup services on the host.
2. Back up the following directories:
   
   On Windows:
   
   `Install_path\NetBackup\var\VxSS`
   `Install_path\NetBackup\var\webtruststore`

   On UNIX:
   
   `/usr/openv/var/vxss`
   `/usr/openv/var/webtruststore`

3. Where NetBackup Cluster Server is used, also back up the following directories:
   
   `Shared_disk\var\global\vxss`
   `Shared_disk\var\global\webtruststore`

4. Reinstall NetBackup on the host.
5. Restore the data that was backed up in step 2 and step 3.
Deploying certificates on a client that has no connectivity with the master server

NetBackup can detect whether a host has connectivity with the master server or not. If there is no connectivity, NetBackup automatically attempts to use the built-in HTTP tunnel on a media server to route the connection request to the master server.

If NetBackup cannot automatically detect the host connectivity with the master server or find an appropriate media server to route the connection request, you need to manually configure the HTTP tunnel options.

See “About the communication between a NetBackup client located in a demilitarized zone and a master server through an HTTP tunnel” on page 320.

To deploy a certificate on a client that has no connectivity with the master server, refer to the following topic:

See “Deploying host ID-based certificates” on page 282.

Note: As the request is routed via a different host, the master server cannot validate the authenticity of the certificate request, therefore an authorization token is a must.

About host ID-based certificate expiration and renewal

NetBackup host ID-based certificates expire one year after their issue date. They are automatically renewed 180 days before the expiration date. A certificate renewal request is sent periodically until a certificate is successfully renewed. Automatic renewal ensures that the renew process is transparent to the user.

The renewal request is always authenticated using the existing certificate. Hence, the renewal process does not require the use of an authorization token, regardless of the certificate deployment security level.

If the existing certificate has not expired, the host administrator can initiate a manual renewal request, as described in the following procedure.

To renew a host ID-based certificate manually

◆ The host administrator runs the following command on the non-master host:

```
nbcertcmd -renewCertificate
```

■ Certificates corresponding to NetBackup domains other than the primary domain can be manually renewed by specifying the -server option.

■ Use the -cluster option to renew the cluster certificate of NetBackup clustered server.
In a scenario where the certificate has expired, the administrator of the host must manually reissue the certificate.

See “About reissuing host ID-based certificates” on page 294.

Deleting sensitive certificates and keys from media servers and clients

In the cloning process, use the following command to remove certain sensitive certificates and keys from NetBackup media servers and clients in the following scenarios:

- Run the command on the cloned virtual machine, which is cloned from an active NetBackup host.
- Run the command before creating a gold image of a virtual machine for cloning.

nbcertcmd -deleteAllCertificates

**Note:** This command is allowed only on media servers and clients. The command is not allowed on master servers.

This operation deletes or shreds the appropriate sensitive information (certificates and keys) from the following locations:

On Windows:

- C:\Program Files\Veritas\NetBackup\var\VxSS\certmapinfo.json
- C:\Program Files\Veritas\NetBackup\var\VxSS\credentials\<certificate>
  
  For example:
  
  C:\Program Files\Veritas\NetBackup\var\VxSS\credentials\6d92d4dd-ed2d-43de-adb1-bf333aa2cc3c

- C:\Program Files\Veritas\NetBackup\var\VxSS\credentials\keystore\PrivKeyFile.pem (shredded)
- C:\Program Files\Veritas\NetBackup\var\VxSS\at\systemprofile\certstore\<certificate>
  
  For example:
  
  C:\Program Files\Veritas\NetBackup\var\VxSS\at\systemprofile\certstore\9345b05e-lilycl2nb!1556!nbatd!1556.0
Cleaning host ID-based certificate information from a host before cloning a virtual machine

Cloning a virtual machine can present the opportunity for identity theft. Multiple hosts should not have the same key pair. This procedure ensures that each copy of the host gets a unique key pair and identity.

Perform the following procedure before cloning a virtual machine (or before creating a gold image of a machine for cloning) if it is a one-time operation.
To clean the host ID-based certificate information from a host before cloning

1. Stop all NetBackup services on the host.

2. Delete all files and directories from the following locations:
   - On Windows:
     - `Install_path\NetBackup\var\VxSS\at\*`
     - `Install_path\NetBackup\var\VxSS\credentials\*`
     - `Install_path\NetBackup\var\webtruststore\*`
   - On UNIX:
     - `/usr/openv/var/vxss/at/*`
     - `/usr/openv/var/vxss/credentials/*`
     - `/usr/openv/var/webtruststore/*`

3. Delete the following file:
   - On Windows: `Install_path\NetBackup\var\VxSS\certmapinfo.json`
   - On UNIX: `/usr/openv/var/vxss/certmapinfo.json`

4. Where NetBackup Cluster Server is used, perform the following steps in addition:

5. Delete all files and directories from the following locations:
   - `Shared_disk\var\global\vxss\at\*`
   - `Shared_disk\var\global\vxss\credentials\*`
   - `Shared_disk\var\global\webtruststore\*`

6. Delete the following file:
   - `Shared_disk\var\global\vxss\certmapinfo.json`

7. Proceed to clone the virtual machine.

About reissuing host ID-based certificates

A certificate must be reissued in any of the following cases:

- The certificate was revoked, and you later determine that you can trust that host again.
- The certificate expired.
- NetBackup was reinstalled on the host where a certificate was already issued.
- The name of the host was changed.
The key pair for the host was changed.

Reissuing a certificate is one way to prevent malicious users from assuming the identity of an existing NetBackup host that is already registered with the NetBackup master server. A reissue token is always required for certificate reissue, regardless of the security level.

Reissuing a host ID-based certificate for a NetBackup host is different from deploying the certificate for the first time. Use the following procedure to reissue a certificate.

See “Creating a reissue token” on page 295.

Once a reissue token is obtained, the certificate reissue process is similar to manual certificate deployment with an authorization token.

See “Deploying host ID-based certificates” on page 282.

When the master server receives a certificate reissue request, it first revokes all the previously valid certificates for that host and then generates a new certificate when required.

Creating a reissue token

A host ID-based certificate can be reissued if the non-master host is already registered with the master server but its host ID-based certificate is no longer valid. For example, a certificate is not valid when it has expired, is revoked, or is lost.

A reissue token is a type of token that can be used to reissue a certificate. It is a special type of token because it retains the same host ID as the original certificate. Since a reissue token is bound to a specific host, the token cannot be used to request certificates for additional hosts.

To create a reissue a token using the NetBackup Administration Console

1. In the NetBackup Administration Console, expand Security Management > Certificate Management.

2. In the right pane, select the host that requires a reissue token.

3. From the Actions menu, select Generate Reissue Token.

4. In the Create Reissue Token dialog, enter a name for the token.

5. Select a date for token validity from the Valid until option.

Note: The Maximum Uses Allowed setting is not available as it is when a new token is created. A reissue token must be used one time for a specific host.
6 In the **Reason** field, enter a reason for the reissue token. The reason appears in the log as an audit event.

7 Click **Create**.

8 The reissue token appears in a dialog. Select **Copy** to save the token value to the clipboard.

9 Convey the token value to the administrator of the non-master host. How the token is conveyed depends on various security factors in the environment. The token may be transmitted by email, by file, or verbally.

The administrator of the non-master host deploys the token to obtain another host ID-based certificate. See the following topic for instructions:

See "Deploying host ID-based certificates" on page 282.

**To create a reissue a token using the nbcertcmd command**

1 The master server administrator must be logged in to the NetBackup Web Management Service to perform this task. Use the following command to login:

   ```
   bpnbat -login -logintype WEB
   ```

   See “Web login requirements for nbcertcmd command options” on page 275.

2 Run one of the following commands on the master server:

   Use the host name for which the certificate needs to be reissued:

   ```
   nbcertcmd -createToken -name token_name -reissue -host host_name
   ```

   **Note:** You must provide the primary name of the host for which you want to reissue the certificate. If you provide any of the host ID-to-host name mappings that are added for the host, the certificate cannot be reissued.

   Use the host ID for which the certificate needs to be reissued:

   ```
   nbcertcmd -createToken -name token_name -reissue -hostId host_id
   ```

   Additional parameters can be used to indicate validity duration and the reason for creation.

**Additional steps to request a certificate for a renamed NetBackup host**

In addition to reissuing a token, the following steps are required to request a certificate for a renamed NetBackup host.
To request a certificate for a host after a host name change

1. The NetBackup administrator of the master server generates a reissue token for the renamed NetBackup host.

2. Add the new host name as one of the approved host ID-to-host name mappings by using **NetBackup Administration Console**.
   
   See “Adding host ID to host name mappings” on page 252.
   
   Alternatively, you can use the `nbhostmgmt -add` command-line interface option.
   
   For more information about the `nbhostmgmt` command, see the **NetBackup Commands Reference Guide**.

   [link to NetBackup Commands Reference Guide]

3. The NetBackup administrator must revoke the host ID-based certificate for the renamed host.

   See “Revoking a host ID-based certificate” on page 307.

   **Note:** After the certificate is revoked, the host is unable to communicate with the NetBackup Web Management Console service (`nbwmc`). When the host obtains a new certificate using the reissue token, the host can communicate with `nbwmc` again.

4. After the certificate is revoked, the administrator of the non-master host must use the reissue token to get a certificate for the renamed host.

   See “Deploying host ID-based certificates” on page 282.

**Changing the key pair for a host**

Consider changing a key pair only if a key is compromised or leaked. Changing a key pair results in both a new host ID-based certificate and a new host name-based certificate.

The following procedure describes changing a key pair for a host, and then getting a new certificate using the new key pair.

Do not perform the procedure for a master server, only a non-master server host.
To change a key pair for a host

1. The NetBackup host administrator backs up the following directories:
   - On Windows: `Install_path\NetBackup\var\VxSS\at\systemprofile`
   - On UNIX: `/usr/openv/var/vxss/at/root`

2. The NetBackup host administrator removes the directory from the host.

3. Restart the NetBackup services on the host.

4. The master server administrator performs the following steps:
   - Log in to the NetBackup Web Management Service:
     ```bash
     bpnbat -login -logintype WEB
     ```
     See “Web login requirements for `nbcertcmd` command options” on page 275.
   - Revoke the host ID-based certificate:
     ```bash
     nbcertcmd -revokeCertificate -host host_name
     ```
   - Generate a reissue token for the NetBackup host where the key pair is to be changed.
     See “Creating a reissue token” on page 295.
   - Deploy a new host name-based certificate:
     ```bash
     bpnbaz –ProvisionCert host_name
     ```

5. The NetBackup host administrator uses the reissue token to deploy a new host ID-based certificate with an updated key pair.

   Use the following command to enter the token directly:
   ```bash
   nbcertcmd -getCertificate -force -token
   ```
   Use the following command if the token is in a file:
   ```bash
   nbcertcmd -getCertificate -force -file /directory/token_file
   ```

6. If the host has more than one master server, repeat the process beginning at step 4 for each master server.

7. Restart the NetBackup services on the NetBackup host where the key was changed.

### About Token Management for host ID-based certificates

Master server administrators use the Token Management utility to perform the following tasks:
Create new authorization tokens
Depending on the security level, an authorization token may be required for a non-master NetBackup host to obtain a host ID-based certificate. The NetBackup administrator of the master server generates the token and shares it with the administrator of the non-master host. That administrator can then deploy the certificate without the presence of the master server administrator. See “Creating authorization tokens” on page 299.

Delete authorization tokens
See “Deleting authorization tokens” on page 301.

View authorization token details
See “Viewing authorization token details” on page 301.

Clean up invalid or expired authorization tokens
See “About expired authorization tokens and cleanup” on page 302.

Creating authorization tokens
Depending on the certificate deployment security setting, NetBackup hosts may require an authorization token to obtain a host ID-based certificate from the Certificate Authority (master server).

- If the security setting is Very High, all certificate requests require a token. Perform the procedure that is described in this topic.

- If the security setting is High, certificates are automatically deployed to hosts that are known to the master server. If the host is not known to the master server, the certificate must be deployed using an authorization token. In that case, perform the procedure that is described in this topic. To understand what it means to be known to the master server, see the following topic: See “About certificate deployment security levels” on page 279.

- If the security setting is Medium, this procedure may be less likely because certificates are automatically deployed to all hosts that request one. However, the master server must be able to cross verify the IP and host name of the host that is requesting a certificate.

Note: A token is required to request a certificate on behalf of a host that has no connectivity with the master server. See “Deploying certificates on a client that has no connectivity with the master server” on page 291.
Note: Do not use this procedure to create an authorization token for a NetBackup host whose current certificate is not in a valid state because it is lost, corrupt, or expired. In these cases, a reissue token must be used.

See “About reissuing host ID-based certificates” on page 294.

The NetBackup administrator of the master server can use the NetBackup Administration Console or the command line to create the token.

To create a token using the NetBackup Administration Console

1 In the NetBackup Administration Console, expand Security Management > Certificate Management > Token Management.
2 On the Actions menu, select New Token. The Create Token dialog box is displayed.
3 Enter a unique and meaningful name for the token. The field cannot be left blank.
   For example, to create a token to request certificates for multiple hosts that belong to master_server_1, name the token Token1_MS1. A good practice is to write a useful description in the Reason field for the token.
4 Enter a number for the Maximum Uses Allowed option for the number of times the token can be used. The default is 1, which indicates that one host can use the token one time.
   To use the same token for multiple hosts, enter any value between 1 and 99999. For example, to use the token for 8 hosts, enter 8. The ninth host that attempts to use the token will not succeed.
5 Use the Valid for option to indicate how long the token can be used before it is invalid and cannot be used. After the Valid for date, the master server must generate another token.
   Select a period between 1 and 999 hours or days.
6 Optionally, enter the reason for creating the token. The reason appears in the audit logs, along with the other entries in the dialog.
7 Select Create.
8 The new token appears in a dialog. Select Copy to save the token value to the clipboard.
9 Convey the token value to the administrator of the non-master host. How the token is conveyed depends on various security factors in the environment. The token may be transmitted by email, by file, or verbally.

10 The administrator of the non-master host uses the token to obtain a host ID-based certificate from the Certificate Authority. See the following procedure for instructions:

See “Deploying host ID-based certificates” on page 282.

To create a token using the nbcertcmd command
◆ Run the following command on the host:

\[ \text{nbcertcmd -createToken -name token\_name} \]

For example:

\[ \text{nbcertcmd -createToken -name testtoken} \]

Token FCBVYUTDUIELUDOE created successfully.

Additional parameters can be used to indicate maximum uses, validity duration, and the reason for creation.

For information about the nbcertcmd command, see the NetBackup Commands Reference Guide.

Deleting authorization tokens

Use the NetBackup Administration Console or the command line to delete specific authorization tokens. A token can be deleted even though it has not expired and the Maximum Uses Allowed count has not yet been exhausted.

To delete a token using the NetBackup Administration Console

1 In the NetBackup Administration Console, expand Security Management > Certificate Management > Token Management.

2 In the right pane, select the token to be deleted.

3 Select Edit > Delete.

4 Click Yes in the confirmation dialog box to delete the token.

To delete a token using the command line
◆ Run the nbcertcmd -deleteToken command (with additional parameters).

Viewing authorization token details

Details for each authorization token can be viewed in the NetBackup Administration Console or from the command line.
To view token details using the NetBackup Administration Console

1. In the **NetBackup Administration Console**, expand **Security Management > Certificate Management > Token Management**.
2. The token details are displayed in the right pane.

<table>
<thead>
<tr>
<th>Token State</th>
<th>Name</th>
<th>Maximum Uses Allowed</th>
<th>Uses Remaining</th>
<th>Valid From</th>
<th>NetBackup Host ID</th>
<th>Time Remaining Until Expiry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Valid</td>
<td>MasterServerInstallationToken_1473830997937</td>
<td>2</td>
<td>1</td>
<td>1 Sep 14, 2016 10:50:29 AM</td>
<td>abc</td>
<td>17 hour(s) 46 minute(s)</td>
</tr>
<tr>
<td>Valid</td>
<td>aaaaaa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To view token details using the nbcertcmd command

- On the master server, run the `nbcertcmd -listToken` command (with additional parameters) to view the token details.

The token details are displayed.

About expired authorization tokens and cleanup

An authorization token expires in either of the following situations (whichever happens first):

- When the current date-time combination is later than the token’s **Valid for** amount.
- When the token is used for **Maximum Uses Allowed** requests.

An expired authorization token remains in the token database, but cannot be used to authorize certificate deployment requests.

Expired tokens can be deleted one by one, or they can be cleaned up all at once by using the **Cleanup** operation. The **Cleanup** operation deletes all expired tokens from the token database.

**To clean up expired authorization tokens using the NetBackup Administration Console**

1. In the **NetBackup Administration Console**, expand **Security Management > Certificate Management > Token Management**.
2. On the **Actions** menu, select **Cleanup**.
3. Click **Yes** in the confirmation dialog box to clean up all expired tokens and delete them from the token database.

**To clean up tokens using the command line**

- Use the `nbcertcmd -cleanupToken` command to delete all the expired tokens.

See “Deleting authorization tokens” on page 301.
About the host ID-based certificate revocation list

The NetBackup certificate revocation list (CRL) is a list of host ID-based digital security certificates that have been revoked before their expiration date. The hosts that own revoked certificates should no longer be trusted.

The NetBackup certificate revocation list conforms to the Certificate Revocation List profile that the Internet Engineering Task Force publishes in RFC 5280 at https://www.ietf.org. The NetBackup certificate authority signs the CRL. The NetBackup master server is the certificate authority. The CRL is public and does not require secure transmission. The CRL endpoint is open, free for anyone to access.

Every NetBackup host must have a valid security certificate and a valid CRL so that it can communicate with other NetBackup hosts.

How often NetBackup generates a new CRL

The NetBackup master server generates a new CRL as follows:

- On startup.
- Within 5 minutes of when NetBackup revokes a certificate. NetBackup checks every 5 minutes for a newly revoked certificate.
- Sixty minutes since the CRL was last generated.

A CRL expires after 7 days.

How often a NetBackup host gets a CRL

A NetBackup host obtains a CRL when NetBackup is installed on the host. A NetBackup host also obtains a fresh CRL during an upgrade of the NetBackup software.

After installation or upgrade, each host requests a new CRL on a time interval since the host was started. (NetBackup uses a pull method to refresh host CRLs.) The NetBackup master server certificate deployment security level determines the time interval, as shown in the following table.

<table>
<thead>
<tr>
<th>Security level</th>
<th>CRL refresh interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>Hourly</td>
</tr>
<tr>
<td>High</td>
<td>4 hours</td>
</tr>
<tr>
<td>Medium</td>
<td>8 hours</td>
</tr>
</tbody>
</table>
See “About certificate deployment security levels” on page 279.
You can get a new CRL before its scheduled refresh period.
See “Refreshing the CRL on a NetBackup host” on page 304.

For more information
See “Overview of security certificates in NetBackup” on page 242.
See “About host ID-based certificates” on page 274.
See “About revoking host ID-based certificates” on page 304.

Refreshing the CRL on a NetBackup host
Use the following procedure to refresh the CRL on a NetBackup host. The procedure gets the current CRL from the NetBackup certificate authority and copies it to the local host.
See “About the host ID-based certificate revocation list” on page 303.

To refresh the CRL on a NetBackup host
◆ As an administrator on the NetBackup host that requires a fresh CRL, run the following command:

UNIX: /usr/openv/netbackup/bin/nbcertcmd -getCRL [-server master_server_name]

Windows: install_path\NetBackup\bin\nbcertcmd -getCRL [-server master_server_name]
To get a CRL from a NetBackup domain other than the default, specify the -server master_server_name option and argument.

About revoking host ID-based certificates
When you revoke a NetBackup digital security certificate, NetBackup revokes any other certificates for that host. NetBackup ceases to trust the host, and it no longer can communicate with other NetBackup hosts.

If you revoke a certificate by using the NetBackup Administration Console, you must select one of the following reasons:

Affiliation Changed The host changes affiliation to a different NetBackup domain.
CA Compromise The certificate authority is compromised.
The host ceases to be a NetBackup host. For example, you decommission a NetBackup media server or client.

Key Compromise

The certificate key is compromised.

Superseded

A new certificate supersedes the certificate to be revoked.

Unspecified

Other, unspecified reasons. Perhaps you want to suspend privileges temporarily while you investigate a security event.

If you revoke a certificate and later determine that you can trust the host, provision a new certificate on that host. You do so by using a reissue token. See “About reissuing host ID-based certificates” on page 294.

Note: Do not revoke a certificate of the master server. If you do, NetBackup operations may cease.

After you revoke a host’s certificate, you should consider doing the following actions in NetBackup:

- Remove the host from backup policies.
- For a NetBackup media server, deactivate it.

You should also consider any actions that are not related to NetBackup to ensure that someone with malicious intent cannot use the certificate and key. See “About the host ID-based certificate revocation list” on page 303.

Removing trust between a host and a master server

A NetBackup host can trust multiple Certificate Authorities (master servers) at any time. For various reasons, it may be necessary for a NetBackup host to remove trust from a master server that previously had been trusted.

For example, if a NetBackup client is moved from one master server to another, it is advisable to remove trust from the first master server. Security best practices suggest trusting the fewest entities required to function correctly. Also, if a NetBackup host no longer needs to communicate with hosts from a specific NetBackup domain, remove the CA certificate for that master from the trust store of the host.
**Note:** Removing a CA certificate does not remove the host ID-based or host name-based certificates that the host may have obtained from that CA. The `nbcertcmd -listCertDetails` continues to show the host ID-based certificate.

When the CA certificate is removed from a host, the host ID-based certificate issued by that CA will not automatically renew because the host no longer trusts the CA. The host ID-based certificate eventually expires.
Removing trust between a host and a master server

1 The administrator of the non-master host runs the following command on the host to determine the CA certificate fingerprint of the master server:

```
nbcertcmd -listCACertDetails
```

In this example output, the host has certificates from two master servers:

```
nbcertcmd -listCACertDetails
Subject Name: /CN=nbatd/OU=root@master1.abc.com/O=vx
Start Date: Aug 23 14:16:44 2016 GMT
Expiry Date: Aug 18 15:31:44 2036 GMT

Subject Name: /CN=nbatd/OU=root@master2.xyz.com/O=vx
Start Date: Aug 25 12:09:55 2016 GMT
Expiry Date: Aug 20 13:24:55 2036 GMT
```

2 The administrator wants to remove trust to the second master server and runs the following command on the host:

```
```

Include the entire fingerprint, including the colons.

**Warning:** This command removes the CA certificate from the trust store. The trust store is referred to by NetBackup services and by the NetBackup Web Management Console service (`nbwebsvc`).

3 The **NetBackup Administration Console** on the master server displays the certificate state as **Active**. However, that certificate does not automatically renew and eventually expires. The NetBackup administrator should revoke the certificate of the host if the host is no longer going to be part of the NetBackup domain.

Revoking a host ID-based certificate

NetBackup administrators may consider revoking a host ID-based certificate under various conditions. For example, if the administrator detects that client security has been compromised, if a client is decommissioned, or if NetBackup is uninstalled
from the host. A revoked certificate cannot be used to communicate with master server web services.

See “About revoking host ID-based certificates” on page 304.

Security best practices suggest that the administrator explicitly revoke the certificates for any host that is no longer active, regardless of whether the certificate is still deployed on the host, or whether it has been successfully removed from the host.

---

**Note:** Do not revoke a certificate of the master server. If you do, NetBackup operations may cease.

---

**To revoke a host ID-based certificate using the NetBackup Administration Console**

1. In the **NetBackup Administration Console**, expand **Security Management > Certificate Management**.
2. Select the certificate to be revoked.
3. On the **Actions** menu, select **Revoke Certificate**.
4. Select a reason from the drop-down menu and click **Continue**.

The certificate is revoked.

5. After you revoke a host’s certificate, do the following actions in NetBackup:
   - Remove the host from backup policies.
   - For a NetBackup media server, deactivate it.

---

**To revoke a host ID-based certificate using the command line**

1. The master server administrator must be logged in to the NetBackup Web Management Service to perform this task. Use the following command to log in:

   ```bash
   bpnbat -login -logintype WEB
   ```
See “Web login requirements for nbcertcmd command options” on page 275.

2 Run one of the following commands to revoke the certificate using the host name or the host ID.

Revoke using the host name:

```
nbcertcmd -revokeCertificate -host host_name
```

**Note:** You must provide the primary name of the host for which you want to revoke the certificate. If you provide any of the host ID-to-host name mappings that are added for the host, the certificate cannot be revoked.

Revoke using the host ID:

```
nbcertcmd -revokeCertificate -hostID host_id
```

Additional parameters can be used to indicate a revocation reason code and the master server.

3 After you revoke a host’s certificate, do the following actions in NetBackup:
   - Remove the host from backup policies.
   - For a NetBackup media server, deactivate it.

**Note:** Revoking a certificate does not delete the certificate from the local store of the non-master host.

### Determining a NetBackup host's certificate state

You can determine the state of a NetBackup host's ID-based certificate: Active or Revoked. Doing so may help troubleshoot connection and communication problems. Three methods exist to determine a certificate state, as follows:

- **Verify a host certificate from the host itself**
  - The method uses the NetBackup `nbcertcmd` command.
  - See “To verify from the host itself it's certificate state” on page 310.

- **Verify a host certificate from a NetBackup server**
  - The method uses the NetBackup `bptestbpcd` command.
  - See “To verify from a NetBackup server if a different host’s certificate is revoked” on page 310.

- **Verify a host certificate from the NetBackup Administration Console**
  - See “To verify a host's certificate using the NetBackup Administration Console” on page 311.
See “About the host ID-based certificate revocation list” on page 303.

To verify from the host itself it’s certificate state

1 Optionally, on the NetBackup host run the following command as an administrator to get the most recent certificate revocation list:

UNIX: /usr/openv/netbackup/bin/nbcertcmd -getCRL [-server master_server_name]

Windows: install_path\NetBackup\bin\nbcertcmd -getCRL [-server master_server_name]

To get a CRL from a NetBackup domain other than the default, specify the -server master_server_name option and argument.

2 On the NetBackup host, run the following command as an administrator:

UNIX: /usr/openv/netbackup/bin/nbcertcmd-hostSelfCheck [-cluster] [-server master_server_name]

Windows: install_path\NetBackup\bin\nbcertcmd -hostSelfCheck [-cluster] [-server master_server_name]

Use one or both of the following options if necessary:

-cluster Use this option on the active node of a NetBackup master server cluster to verify the certificate of the virtual host.

-server Use this option with the master_server_name argument to verify a certificate from a master server other than the default.

3 Examine the command output. The output indicates that either the certificate is or is not revoked.

To verify from a NetBackup server if a different host’s certificate is revoked

1 As an administrator on the NetBackup master server or a NetBackup media server, run the following command:

UNIX: /usr/openv/netbackup/bin/admincmd/bptestbpcd -host hostname -verbose

Windows: install_path\NetBackup\bin\bptestbpcd -host hostname -verbose

For -host hostname, specify the host for which you want to verify the certificate.

2 Examine the command output. If the certificate on the specified host is revoked, the command output includes the string The Peer Certificate is revoked. If the command output does not include that string, the certificate is valid.
To verify a host’s certificate using the NetBackup Administration Console


2. For the host of interest, examine the Certificate State column for state of the certificate.

Getting a list of NetBackup hosts that have revoked certificates

Use the following procedure to obtain a list of NetBackup hosts that have a revoked certificate.

See “About the host ID-based certificate revocation list” on page 303.

To get a list of NetBackup hosts with revoked certificates

1. In a command window, log on to the NetBackup Web Management Service on the master server, as follows (the logon account must have NetBackup administrator privileges):

   UNIX: /usr/openv/netbackup/bin/bpnbat -login -loginType WEB

   Windows: install_path\NetBackup\bin\bpnbat -login -loginType WEB

2. Run the following command to extract from the CRL a list of certificates that are not expired and then filter the results for the word “Revoked”:

   UNIX: /usr/openv/netbackup/bin/nbcertcmd-listAllDomainCertificates | grep Revoked

   Windows: install_path\NetBackup\bin\nbcertcmd -listAllDomainCertificates | findstr Revoked

Deleting host ID-based certificates

Use this topic to manually delete host ID-based certificate of a NetBackup host. You may need to delete certificates in certain scenarios, for example: A NetBackup host is moved from one NetBackup domain to another NetBackup domain. In this scenario, the current host ID-based certificate needs to be deleted and the host must have a certificate issued by the new Certificate Authority (CA) that is the new master server.

Caution: Manually deleting the host ID-based certificates may adversely impact NetBackup functionality.
Note: During NetBackup software removal, host ID-based certificates are automatically deleted.

To delete a host ID-based certificate from a NetBackup host

1. Run the following command on the NetBackup host to view the details of all associated host ID-based certificates.
   - UNIX: `/usr/openv/netbackup/bin/nbcertcmd -listCertDetails`
   - Windows: `install_path\NetBackup\bin\nbcertcmd -listCertDetails`

2. To delete a certificate, run the following command on the host:
   - UNIX: `/usr/openv/netbackup/bin/nbcertcmd -deleteCertificate -hostid host_ID`
   - Windows: `install_path\NetBackup\bin\nbcertcmd -deleteCertificate -hostid host_ID`

To delete a host ID-based certificate from an active node in a cluster setup

1. Run the following command on the active node to view the details of all associated host ID-based certificates.
   - UNIX: `/usr/openv/netbackup/bin/nbcertcmd -listCertDetails -cluster`
   - Windows: `install_path\NetBackup\bin\nbcertcmd -listCertDetails -cluster`

2. To delete a certificate, run the following command on the active node of the cluster:
   - `nbcertcmd -deleteCertificate -hostid host_ID -cluster`
   - UNIX: `/usr/openv/netbackup/bin/nbcertcmd -hostid host_ID -cluster`
   - Windows: `install_path\NetBackup\bin\nbcertcmd -hostid host_ID -cluster`

Security certificate deployment in a clustered NetBackup setup

This section provides information on deployment of host name-based and host ID-based certificates in a NetBackup clustered setup.

For more information on NetBackup clusters, see the NetBackup Clustered Master Server Administrator’s Guide.

http://www.veritas.com/docs/DOC5332
About host ID-based certificate deployment on a NetBackup cluster

In a clustered NetBackup master server setup, the host ID-based certificates are deployed as follows:

- One certificate for each cluster node: A certificate resides on the local disk of each node.
- One certificate for the virtual name: A certificate resides on the shared disk of the cluster.

Consider the following example:

If a cluster setup consists of 4 nodes, 5 host ID-based certificates are deployed. One certificate is deployed on each of the 4 nodes and one on the shared disk, which is used for the virtual name of the master server.

Note: Only master servers can be clustered in NetBackup.

About host name-based certificate deployment on a NetBackup cluster

In a clustered NetBackup master server setup, the host name-based certificates are deployed as follows:

- One certificate for each cluster node: A certificate resides on the local disk of each node.
- One certificate for the virtual name on each node: A certificate resides on the local disk of each node.

See "Deploying host name-based certificates" on page 273.

About deployment of a host ID-based certificate on a clustered NetBackup host

Review the following scenarios for certificate deployment on cluster nodes:

- In case of fresh NetBackup installation, certificate on an active node is deployed automatically. You must manually deploy certificates on all inactive nodes.

- In case of disaster recovery, certificates for active and inactive nodes are not recovered. After you install NetBackup in a disaster recovery mode after a disaster, you must manually deploy certificates on all nodes.

See “Generating a certificate on a clustered master server after disaster recovery installation” on page 319.
Note: In case of upgrade, active or inactive nodes may already have a certificate. You can verify whether a cluster node has a certificate or not.

See “Viewing certificate details of a clustered NetBackup setup” on page 317.

See “Host ID-based certificate deployment on the active master server node” on page 314.

See “Host ID-based certificate deployment on inactive master server nodes” on page 314.

Host ID-based certificate deployment on the active master server node
During NetBackup installation, host ID-based certificates are deployed on the active master server node and the virtual name. The certificate for the active node is deployed on a local disk. The certificate for the virtual name is deployed on the shared disk.

Host ID-based certificate deployment on inactive master server nodes
Certificates on inactive nodes are not deployed during installation. You must manually deploy certificates on all inactive nodes after the installation.

See “Deploying host ID-based certificates on cluster nodes” on page 314.

Deploying host ID-based certificates on cluster nodes
You must manually deploy certificates on all inactive nodes.

In certain scenarios, you need to manually deploy host ID-based certificates also on active nodes.

To manually deploy a host ID-based certificate on a master server cluster node
◆ Run the following commands on the master server cluster node:
  ■ nbcertcmd -getCACertificate
  ■ nbcertcmd -getCertificate [-file authorization_token_file]

See “About Token Management for host ID-based certificates” on page 298.
Revoking a host ID-based certificate for a clustered NetBackup setup

NetBackup administrators may consider revoking a host ID-based certificate under various conditions. For example, if the administrator detects that client security has been compromised, if a client is decommissioned, or if NetBackup is uninstalled from the host. A host with a revoked certificate cannot communicate with other hosts. Every NetBackup host must have a valid security certificate and a valid Certificate Revocation List (CRL) for successful communication.

See “About the host ID-based certificate revocation list” on page 303.

The NetBackup administrator can revoke certificates for a cluster node or the virtual name from any host in a NetBackup domain.

Ensure that you revoke the appropriate certificate.

After the certificate is revoked, you may need to deploy a new host ID-based certificate. Create a reissue token on the clustered node and deploy a new certificate using the reissue token.

See “Creating a reissue token for a clustered NetBackup setup” on page 316.

See “Deploying a host ID-based certificate on a clustered NetBackup setup using reissue token” on page 316.

To revoke a certificate from a cluster node

1. Log in to the NetBackup Web Management Service:
   
   bpnbat -login -logintype WEB
   
   See “Web login requirements for nbcertcmd command options” on page 275.

2. Run the following command to revoke a certificate for a cluster node:
   
   nbcertcmd -revokeCertificate -host host_name
   
   See “Revoking a host ID-based certificate” on page 307.

To revoke a certificate for the virtual name

1. Log in to the NetBackup Web Management Service:
   
   bpnbat -login -logintype WEB

2. Run the following command to revoke a host ID-based certificate for the virtual name:
   
   nbcertcmd -revokeCertificate -host virtual_name
   
   See “Revoking a host ID-based certificate” on page 307.
Deploying a host ID-based certificate on a clustered NetBackup setup using reissue token

After a host ID-based certificate is revoked, you can deploy new certificates on a clustered NetBackup setup using reissue tokens.

See “Creating a reissue token for a clustered NetBackup setup” on page 316.

To deploy a new host ID-based certificate on a cluster node

Run the following command to deploy a new certificate on the cluster node using the reissue token:

```
nbcertcmd -getCertificate -file reissue_token_file -force
```

To deploy a new host ID-based certificate for the virtual name

Run the following command to deploy a new certificate for the virtual name using the reissue token:

```
nbcertcmd -getCertificate -file reissue_token_file_virtual -force -cluster
```

Creating a reissue token for a clustered NetBackup setup

You need to reissue a certificate to a host in certain scenarios, for example a certificate is revoked for a host and you need to reissue a new certificate to the host.

See “Deploying a host ID-based certificate on a clustered NetBackup setup using reissue token” on page 316.

You need a reissue token to reissue a new certificate to a host.

See “About Token Management for host ID-based certificates” on page 298.

To create a reissue token for a cluster node

1. Log in to the NetBackup Web Management Service with the following command:

   ```
   bpnbat -login -logintype WEB
   ```

   See “Web login requirements for nbcertcmd command options” on page 275.

2. Run the following command to create a reissue token for the required cluster node:

   ```
   nbcertcmd -createToken -name token_name -reissue -host host_name
   ```

   See “Creating a reissue token” on page 295.
To create a reissue token for the virtual name

1. Log in to the NetBackup Web Management Service with the following command:
   
   ```
   bpnbat -login -logintype WEB
   ```
   
   See “Web login requirements for nbcertcmd command options” on page 275.

2. Run the following command to create a reissue token for the virtual name.
   
   ```
   nbcertcmd -createToken -name token_name_virtual -reissue -host virtual_name
   ```
   
   See “Creating a reissue token” on page 295.

Renewing a host ID-based certificate on a clustered NetBackup setup

Host ID-based certificates for the cluster nodes and the virtual name are automatically renewed. The certificates are automatically renewed 180 days before the expiration date.

You can also renew the certificates manually, if required.

See “About host ID-based certificate expiration and renewal” on page 291.

To manually renew certificate for a cluster node

- Run the following command from a cluster node to renew the certificate for the node:
  
  ```
  nbcertcmd -renewCertificate
  ```

To manually renew certificate for the virtual name

- Run the following command on the active node to manually renew the certificate for the virtual name:
  
  ```
  nbcertcmd -renewCertificate -cluster
  ```

Viewing certificate details of a clustered NetBackup setup

Run the following commands to view the certificate details of a cluster node or the virtual name.

To view certificate details of a cluster node

- Run the following command on a cluster node:
  
  ```
  nbcertcmd -listCertDetails
  ```

See “Viewing host ID-based certificate details” on page 278.
To view certificate details for the virtual name

To view certificate details for the virtual name:

- Run the following command on the active node to view certificate details for the virtual name:

  nbcertcmd -listCertDetails -cluster

See “Viewing host ID-based certificate details” on page 278.

Removing CA certificates from a clustered NetBackup setup

Run the following commands to remove the CA (Certificate Authority) certificates from a clustered setup.

**Caution:** Removing the CA certificate from a master server node can adversely impact the NetBackup functionality.

To remove the CA certificates from a cluster node

1. Run the following command on a cluster node to view the fingerprints of the CA certificates:

   nbcertcmd -listCACertDetails

2. Run the following command to remove the CA certificate by providing the appropriate fingerprint:

   nbcertcmd -removeCACertificate -fingerprint fingerprint

To remove the CA certificates for the virtual name

1. Run the following command on the active node to view the fingerprints of the CA certificates for the virtual name:

   nbcertcmd -listCACertDetails -cluster

2. Run the following command on the active node to remove the CA certificate for the virtual name by providing the appropriate fingerprint:

   nbcertcmd -removeCACertificate -fingerprint fingerprint virtual -cluster
Generating a certificate on a clustered master server after disaster recovery installation

After you complete the disaster recovery of a clustered master server, you must generate a certificate on the active node as well as all inactive nodes. This procedure is required for successful backups and restores of the cluster.

Generating the local certificate on each cluster node after disaster recovery installation

1. Add all inactive nodes to the cluster.
   
   If all the nodes of the cluster are not currently part of the cluster, start by adding them to the cluster. Please consult with your operating system cluster instructions for assistance with this process.

   More information about supported cluster technologies is available. Please see the Veritas NetBackup Clustered Master Server Administrator’s Guide.

   http://www.veritas.com/docs/DOC5332

2. Run the `nbcertcmd` command to store the Certificate Authority certificate.

   UNIX: `/usr/openv/netbackup/bin/nbcertcmd -getCACertificate`

   Windows: `install_path\Veritas\NetBackup\bin\nbcertcmd -getCACertificate`

3. Use the `bnpbat` command as shown to authorize the necessary changes. When you are prompted for the authentication broker, enter the virtual server name, not the local node name.

   `bnpbat -login -loginType WEB`

4. Use the `nbcertcmd` command to create a reissue token. The `hostname` is the local node name. When the command runs, it displays the token string value. A unique reissue token is needed for each cluster node.

   `nbcertcmd -createtoken -name token_name -reissue -host hostname`

5. Use the reissue token with the `nbcertcmd` command to store the host certificate. This command prompts you for the token string value. Enter the token string from the `nbcertcmd -createToken` command.

   `nbcertcmd -getCertificate -token`

Additional information is available. Please see the section on deploying certificates on master server nodes in the Veritas NetBackup Security and Encryption Guide.

See “Disaster recovery packages” on page 272.
About the communication between a NetBackup client located in a demilitarized zone and a master server through an HTTP tunnel

In a NetBackup deployment setup, the client computers can be in a demilitarized zone (DMZ) where the communication takes place only through specific web ports.

All NetBackup clients must be able to communicate with the web management service on the master server to deploy security certificates and authorize peers for secure connections. For example, the NetBackup client sends requests to the master server for deploying certificates, which is essential for secure NetBackup communication. In a DMZ setup, the client might not be able to send web service requests directly to the master server. In this scenario, a NetBackup client sends a connection request and a web service request to the HTTP tunnel on the media server by the HTTP CONNECT proxy method. The HTTP tunnel accepts the connection request and forwards the web service request to the master server.

The HTTP tunneling feature allows the NetBackup clients in a DMZ to send web service requests to the master server. The NetBackup media server forms an HTTP tunnel that forwards the web service request from the NetBackup client to the master server. The further web service communication uses Secure Socket Layer (SSL).

Note: The port number 1556 on the media server must be accessible by the NetBackup client for sending web service requests.
In a single domain or multi-domain environment, when the NetBackup client in a DMZ tries to send a web service connection request to the master server, it follows a particular sequence:

Table 7-9  Sequence to send a connection request

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The NetBackup client tries to send the connection request directly to the master server.</td>
<td>In a DMZ, the web service connection request might not succeed.</td>
</tr>
</tbody>
</table>
About the communication between a NetBackup client located in a demilitarized zone and a master server through an HTTP tunnel

Table 7-9  Sequence to send a connection request (continued)

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. If the direct connection fails, then the client checks if a media server is specified to use HTTP tunneling to send the web service connection request to the master server.</td>
<td>You can define a preferred media server that the NetBackup client can use for sending the web service connection. Add the WEB_SERVER_TUNNEL option in the registry on Windows client or in the bp.conf file on a UNIX client. For more information, refer to the WEB_SERVER_TUNNEL option for NetBackup clients section in the NetBackup Administrator’s Guide Volume I. <a href="http://www.veritas.com/docs/DOC5332">http://www.veritas.com/docs/DOC5332</a></td>
</tr>
<tr>
<td>3. If a media server is not specified, then the client refers to a list of media servers that is available in the NetBackup configuration and uses them for sending web service connection requests.</td>
<td>NetBackup client maintains an internal cache file (websvctunnels.cache) that contains a list of media servers that are automatically updated based on previous successful connections. The cache file is available in the same location as the bp.conf file for both Windows and UNIX.</td>
</tr>
</tbody>
</table>

Additional information

- The following additional options are available for configuring the HTTP Tunnel feature:

  - **WEB_SERVER_TUNNEL_USE** - You can use this option on the NetBackup clients to configure the default communication behavior using the HTTP Tunnel.

  - **WEB_SERVER_TUNNEL_ENABLE** - By default, HTTP Tunnel is enabled on the media server. You can use this option on the media servers to disable the HTTP Tunnel feature.

    For more information, refer to the [NetBackup Administrator’s Guide Volume I](http://www.veritas.com/docs/DOC5332).

- If your NetBackup client configuration does not contain information about the media servers in the domain, run the `nbsetconfig` command on the master server. The registry on a Windows client or the `bp.conf` file on a UNIX client includes the master and the media servers that the client selects to send connection and web service requests.

- If you use the `nbcertcmd -getCertificate` command on the NetBackup client in a DMZ, and if you see one of the following errors:
■ EXIT STATUS 5955: The host name is not known to the master server.
■ EXIT STATUS 5954: The host name could not be resolved to the requesting host's IP address.

Use a token to deploy the security certificate because the master server cannot match the IP address of the HTTP tunnel to the identity of the host that requests the certificate.

■ NetBackup audit report lists the media server as the user if an HTTP tunnel is used to send a certificate request to the master server.
Data at rest encryption security

This chapter includes the following topics:

- Data at rest encryption terminology
- Data at rest encryption considerations
- Encryption security questions to consider
- Comparison of encryption options
- About NetBackup client encryption
- Configuring standard encryption on clients
- Configuring legacy encryption on clients
- Media server encryption

Data at rest encryption terminology

The following table describes the data at rest encryption terminology.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Encryption Standard (AES)</td>
<td>Specifies the synchronous encryption algorithm that replaced DES.</td>
</tr>
<tr>
<td>Asynchronous encryption</td>
<td>Includes the encryption algorithms that use both a public key and private key.</td>
</tr>
</tbody>
</table>
## Data at rest encryption terminology (continued)

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Encryption Standard (DES)</td>
<td>Specifies the accepted synchronous data encryption standard from the 1970s until 1998.</td>
</tr>
<tr>
<td>Initialization vector</td>
<td>Specifies a seed value that is used to prime an encryption algorithm. Priming is done to obscure any patterns that would exist when using the same key to encrypt a number of data files. These files begin with the same pattern.</td>
</tr>
<tr>
<td>Public Key Encryption</td>
<td>Uses asynchronous encryption.</td>
</tr>
<tr>
<td>Synchronous encryption</td>
<td>Includes the encryption algorithms that use the same key for both encryption and decryption. For the same key size, synchronous algorithms are faster and more secure than their asynchronous counterparts.</td>
</tr>
</tbody>
</table>

## Data at rest encryption considerations

The following table describes the data at rest encryption limitations.

<table>
<thead>
<tr>
<th>Limitation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer performance effect of data encryption</td>
<td>Encryption algorithms are like data compressions algorithms in that they are very CPU intensive. Compressing data without the addition of computer hardware (either dedicated or shared), can affect computer and NetBackup performance.</td>
</tr>
<tr>
<td>Data compression must be performed before data encryption</td>
<td>Data compression algorithms look for data patterns to compress the data. Encryption algorithms scramble the data and remove any patterns. Therefore if data compression is desired, it must be done before the data encryption step.</td>
</tr>
<tr>
<td>Choice of an encryption algorithm</td>
<td>There are many encryption algorithms and associated key sizes. What should a user choose for data encryption? AES (Advanced Encryption Standard) is the standard for data encryption and supports 128, 192, or 256-bit encryption keys.</td>
</tr>
<tr>
<td>Suggested key size</td>
<td>Generally, the larger key the more secure, and the longer into the future the data will stay secure. AES is one of the best choices because it is deemed secure with all three supported (128, 192, 256 bit) key sizes.</td>
</tr>
</tbody>
</table>
Table 8-2 Data at rest encryption limitations (continued)

<table>
<thead>
<tr>
<th>Limitation</th>
<th>Description</th>
</tr>
</thead>
</table>
| FIPS certification for my encryption solution | While FIPS certification may be required for use by the US government, it should not be the only criteria that is used to evaluate an encryption solution. Other considerations should be part of any decision-making process as follows:  
- FIPS certificates only apply to the named version of a product. And then only when the product is used in conformance with the “FIPS security policy” the document that is submitted when the product was validated. Future product versions and non-standard uses would be subject to questioned validation.  
- The security of algorithms like AES is not in the obscurity of how they work. Rather the security is in the difficulty to deduce an unknown encryption key. The years of scrutiny and peer review for AES, have lead to mature implementations. In fact, tests exist for AES where specific keys and data sets are input, and verified against the expected output.  
- Data encryption is much like automobile security. Most problems are related to lost or misplaced keys and not related to malfunctioning locks.  
- Since misuse is more likely to lead to problems, the usability of an encryption product should be part of the consideration. Usability considerations include the following:  
  - Encryption integration with the product  
  - Encryption integration with business processes.  
  - Appropriate encryption key granularity  
  - Recoverability |

| Appropriate encryption key granularity | The appropriate encryption key granularity is best explained with the example of home security. A single house key is convenient. You can enter the garage, front door, or backdoor all using the same key. This security is good until the key is compromised (for example, if the key is stolen). Then you need to change all the locks that used the key. An extreme example is to have a key for every drawer and cupboard in a house. Then, a lost key would require the changing of on a single lock.  

The correct solution is somewhere in between. You must understand your tolerance for a compromised or lost key from your business process perspective. A lost key implies all the data that is encrypted with that key is destroyed. A compromised key implies all the data that is encrypted with that key must be decrypted and reencrypted to become secure. |

Encryption security questions to consider

Before considering encryption security, the following questions should be asked.
The answers depend upon your particular encryption needs as follows:

- How do I choose the best encryption?
- Why would I use encryption security?
- What protection do I need from possible inside attacks?
- What protection do I need from possible outside attacks?
- What are the specific areas of NetBackup that encryption security protects?
- Do I need to create drawings of NetBackup architecture showing encryption security at work?
- What are my deployment use cases for encryption security?

## Comparison of encryption options

The following NetBackup options exist for data at rest encryption:

- NetBackup client encryption, with standard encryption
- NetBackup client encryption, with legacy encryption
- Media server encryption
- Third-party encryption appliances and hardware devices

The following table shows the available encryption options along with their potential advantages and disadvantages.

<table>
<thead>
<tr>
<th>Encryption option</th>
<th>Potential advantages</th>
<th>Potential disadvantages</th>
</tr>
</thead>
</table>
| Client encryption, standard encryption                 | The encryption key is on the client computer and not controlled by the NetBackup administrator  
|                                                        | Can be deployed without affecting the NetBackup master and media servers          | The encryption key on the client does not scale well to environments where each client must have a unique encryption key and individual encryption key  
|                                                        | Can be deployed on a per client basis                                               | Encryption and compression taking place on the client can affect client performance  |
| Client encryption, legacy encryption                   | Same advantages as client encryption with standard encryption.                      | Same disadvantages as client encryption with standard encryption.                      
|                                                        | See “Configuring legacy encryption on clients” on page 340.                        |                                                                                        |

For detailed configuration and usage instructions, see the NetBackup documentation.
### Table 8-3  Encryption options comparison (continued)

<table>
<thead>
<tr>
<th>Encryption option</th>
<th>Potential advantages</th>
<th>Potential disadvantages</th>
</tr>
</thead>
</table>
| See "Media server encryption" on page 350. | - Does not affect client computer performance  
- Master/Media server centralized keys | - Master / Media server centralized keys  
- Limited options for detailed Key Granularity  
- Not tightly integrated with NetBackup configuration and operation  
- Encryption and compression taking place on the media server can affect media server performance |
| Third-party encryption appliances and hardware devices | - Little or no performance effect due to added hardware.  
- Generally NIST FIPS 140 certified. | - The NetBackup Compatibility lab tests some of these solutions. This testing is neither an endorsement or rejection or a particular solution. This effort verifies that basic functionality was verified when used with a specific version of NetBackup.  
- No integration with NetBackup configuration, operation, or diagnostics.  
- The Disaster recovery scenario is provided by the appliance or device. |

### About NetBackup client encryption

The NetBackup client encryption option is best for the following:

- Clients that can handle the CPU burden for compression / encryption
- Clients that want to retain control of the data encryption keys
- Situations where the tightest integration of NetBackup and encryption is desired
- Situations where encryption is needed in terms of a per client basis

### Installation prerequisites for encryption security

Encrypted backups require the NetBackup encryption software, which is included in NetBackup server and client installations. To use encryption, you must have a valid license. Refer to the NetBackup Administrator's Guide, Volume I for details on how to administer NetBackup licenses.

NetBackup Administrator's Guide, Volume I
For a list of the platforms on which you can configure NetBackup Encryption, see the NetBackup Release Notes.

About running an encryption backup

You can run an encryption backup as follows:

- Choosing encryption for a backup
  See “About choosing encryption for a backup” on page 329.

- Standard encryption backup process
  See “Standard encryption backup process” on page 330.

- Legacy encryption backup process
  See “Legacy encryption backup process” on page 330.

About choosing encryption for a backup

When a backup is started, the server determines from a policy attribute whether the backup should be encrypted. The server then connects to bpcd on the client to initiate the backup and passes the Encryption policy attribute on the backup request.

The client compares the Encryption policy attribute to the CRYPT_OPTION in the configuration on the client as follows:

- If the policy attribute is yes and CRYPT_OPTION is REQUIRED or ALLOWED, the client performs an encrypted backup.
- If the policy attribute is yes and CRYPT_OPTION is DENIED, the client performs no backup.
- If the policy attribute is no and CRYPT_OPTION is ALLOWED or DENIED, the client performs a non-encrypted backup.
- If the policy attribute is no and CRYPT_OPTION is REQUIRED, the client does not perform the backup.

The following table shows the type of backup that is performed for each condition:

<table>
<thead>
<tr>
<th>CRYPT_OPTION</th>
<th>Encryption policy attribute with CRYPT_OPTION</th>
<th>Encryption policy attribute without CRYPT_OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQUIRED</td>
<td>Encrypted</td>
<td>None</td>
</tr>
<tr>
<td>ALLOWED</td>
<td>Encrypted</td>
<td>Non-encrypted</td>
</tr>
<tr>
<td>DENIED</td>
<td>None</td>
<td>Non-encrypted</td>
</tr>
</tbody>
</table>
Standard encryption backup process

The prerequisites for encrypting a standard backup are as follows:

- **Note:** In NetBackup 7.5 and later versions, the encryption software is automatically installed with the NetBackup UNIX server and client installations.

A key file must exist. The key file is created when you run the `bpkeyutil` command from the server or from the client.

- The **Encryption** attribute must be selected on the NetBackup policy that includes the client.

If the prerequisites are met, the backup takes place as follows:

- The client takes the latest key from the key file.
  
  For each file that is backed up, the following occurs:
  
  - The client creates an encryption **tar** header. The **tar** header contains a checksum of the key and the cipher that NetBackup used for encryption.
  
  - To write the file data that was encrypted with the key, the client uses the cipher that the CRYPT_CIPHER configuration entry defines. (The default cipher is AES-128-CFB.)

**Note:** Only file data is encrypted. File names and attributes are not encrypted.

- The backup image on the server includes a flag that indicates whether the backup was encrypted.

Legacy encryption backup process

The prerequisites for encrypting a legacy backup are as follows:

- The encryption software must include the appropriate DES library, as follows:
  
  - For 40-bit DES encryption, `libvdes40.suffix`; the suffix is `so`, `sl`, or `dll`, depending on the client platform.
  
  - For 56-bit DES encryption, `libvdes56.suffix`; the suffix is `so`, `sl`, or `dll`, depending on the client platform.
Note: The encryption software is automatically installed with the NetBackup UNIX server and client installations.

- A key file must exist as specified with the CRYPT_KEYFILE configuration option. You create the key file when you specify a NetBackup pass phrase with the server `bpinst` command or the client `bpkeyfile` command.

- You must select the Encryption attribute on the NetBackup policy that includes the client.

If the prerequisites are met and the backup is to be encrypted, the following occurs:

- The client takes the latest data from its key file and merges it with the current time (the backup time) to generate a DES key. For 40-bit DES, 16 bits of the key are always set to zero.

  For each backed-up file, the following occurs:

  - The client creates an encryption `tar` header. The `tar` header contains a checksum of the DES that NetBackup used for encryption.

  - The client writes the file data that was encrypted with the DES key. Note that only file data is encrypted. File names and attributes are not encrypted.

  - The server reads the file names, attributes, and data from the client and writes them to a backup image on the server. The server DOES NOT perform any encryption or decryption of the data. The backup image on the server includes the backup time and a flag that indicates whether the backup was encrypted.

### NetBackup standard encryption restore process

The prerequisites for restoring a standard encrypted backup are as follows:

- The encryption software must be loaded onto the client.

Note: The encryption software is automatically installed with the NetBackup UNIX server and client installations.

- A key file must exist. The key file is created when you run the `bpkeyutil` command from the server or from the client.

When the restore occurs, the server determines from the backup image whether the backup was encrypted. The server then connects to `bpcd` on the client to initiate the restore. The server sends to the client an encryption flag on the restore request.

When a backup takes place properly, the restore occurs as follows:
The server sends file names, attributes, and encrypted file data to the client to be restored.

If the client reads an encryption tar header, the client compares the checksum in the header with the checksums of the keys in the key file. If the one of the keys' checksum matches the header's checksum, NetBackup uses that key to decrypt the file data. It uses the cipher that is defined in the header.

The file is decrypted and restored if a key and cipher are available. If the key or cipher is not available, the file is not restored and an error message is generated.

NetBackup legacy encryption restore process

The prerequisites for restoring a legacy encrypted backup are as follows:

- The legacy encryption software must be loaded on the client.

**Note:** The encryption software is automatically installed with the NetBackup UNIX server and client installations.

- The encryption software must include the 40-bit DES library. The name of the 40-bit DES library is `libvdes40.suffix`; the suffix is `so`, `sl`, or `dll` depending on the client platform.

- If the CRYPTO_STRENGTH configuration option is set to DES_56, the encryption software must also include the 56-bit DES library. The name of the 56-bit DES library is `libvdes56.suffix`; the suffix is `so`, `sl`, or `dll` depending on the client platform.

- A key file must exist as specified with the CRYPTO_KEYFILE configuration option. You create the key file when you specify a NetBackup pass phrase with the server `bpinst` command or the client `bpkeyfile` command.

The server determines from the backup image whether the backup was encrypted. The server then connects to `bpcd` on the client to initiate the restore. The server sends to the client an encryption flag and backup time from the backup image on the restore request.

If the prerequisites are met, the following occurs:

- The server sends file names, attributes, and encrypted file data to the client to be restored.

- The client takes its key file data and merges it with the backup time to generate one or more 40-bit DES keys. If the 56-bit DES library is available, the client also generates one or more 56-bit DES keys.
If the client reads an encryption `tar` header, the client compares the checksum in the header with the checksums of its DES keys. If the checksum of a DES key matches the checksum in the header, NetBackup uses that DES key to decrypt the file data.

The file is decrypted and restored if a DES key is available. If the DES key is not available, the file is not restored and an error message is generated.

**Configuring standard encryption on clients**

This topic describes how to configure standard NetBackup encryption.

The following configuration options are in the `bp.conf` file on UNIX clients, and in the registry on Windows clients.

The configuration options are as follows:

- **CRYPT_OPTION**
- **CRYPT_KIND**
- **CRYPT_CIPHER**

You can also use the NetBackup Administration Console to configure the options from the server. They are on the Encryption tab in the Client Properties dialog box.

See the NetBackup Administrator's Guide, Volume I for details.

**Managing standard encryption configuration options**

The following table describes the three encryption-related configuration options for the standard encryption that can exist on a NetBackup client.

Ensure that the options are set to the appropriate values for your client.

<table>
<thead>
<tr>
<th>Table 8-5</th>
<th>Three encryption-related configuration options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Option</strong></td>
<td><strong>Value</strong></td>
</tr>
<tr>
<td>CRYPT_OPTION = option</td>
<td></td>
</tr>
<tr>
<td></td>
<td>denied</td>
</tr>
<tr>
<td></td>
<td>allowed</td>
</tr>
</tbody>
</table>
### Table 8-5
Three encryption-related configuration options *(continued)*

<table>
<thead>
<tr>
<th>Option</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>required</td>
<td>REQUIRED</td>
</tr>
<tr>
<td>CRYPT_KIND = kind</td>
<td>NONE</td>
<td>Defines the encryption kind on NetBackup clients. The <em>kind</em> option can be set to any of the following option values.</td>
</tr>
<tr>
<td></td>
<td>STANDARD</td>
<td>Specifies that you want to use the cipher-based 128-bit encryption or 256-bit encryption. This option is the default value if standard encryption is configured on the client.</td>
</tr>
<tr>
<td></td>
<td>LEGACY</td>
<td>Specifies that you want to use the legacy-based encryption, with 40-bit DES or 56-bit DES.</td>
</tr>
<tr>
<td>CRYPT_CIPHER = cipher</td>
<td>AES-128-CFB</td>
<td>Defines the cipher type to use. It can be set to any of the following option values.</td>
</tr>
<tr>
<td></td>
<td>BF-CFB</td>
<td>128-bit Advanced Encryption Standard. This is the default value.</td>
</tr>
<tr>
<td></td>
<td>DES-EDE-CFB</td>
<td>128-bit Blowfish</td>
</tr>
<tr>
<td></td>
<td>AES-256-CFB</td>
<td>Two Key Triple DES</td>
</tr>
</tbody>
</table>

### Managing the NetBackup encryption key file

This topic describes how to manage the NetBackup encryption key file.

**Note:** The key file must be the same on all nodes in a cluster.

Use the *bpkeyutil* command to set up the cipher-based encryption key file and pass phrase on the NetBackup Encryption client.

- For a Windows client, the full command path is as follows

  ```bash
  install_path\NetBackup\bin\bpkeyutil
  ```
For a UNIX client, the full command path is as follows:

/usr/openv/netbackup/bin/bpkeyutil

You are prompted to add a pass phrase for that client.

NetBackup uses the pass phrase you specify to create the key file, as follows:

- NetBackup uses a combination of the following two algorithms to create a key from the pass phrase that is up to 256 bits:
  - Secure hashing algorithm, or SHA1
  - Message digest algorithm, or MD5
- NetBackup uses the NetBackup private key and 128-bit AES algorithm to encrypt the key.
- The key is stored in the key file on the client.
- At run time, NetBackup uses the key and a random initialization vector to encrypt the client data. The initialization vector is stored in the header of the backup image.

Previous pass phrases remain available in the key file to allow restores of the backups that were encrypted by using those phrases.

**Caution:** You must remember the pass phrases, including the old pass phrases. If a client’s key file is damaged or lost, you need all of the previous pass phrases to recreate the key file. Without the key file, you cannot restore the files that were encrypted with the pass phrases.

The key file must be accessible only to the administrator of the client machine.

For a UNIX client, you must ensure the following:

- The owner is root.
- The mode bits are 600.
- The file is not on a file system that can be NFS mounted.

**About configuring standard encryption from the server**

You can configure most NetBackup clients for encryption by using the `bpkeyutil` command from the server.

Prerequisites include the following:

- The NetBackup client software must be running on the platforms that support NetBackup encryption (see the [NetBackup Release Notes](#)).
- The NetBackup clients must be running the required NetBackup version.

**About creating encryption key files on the clients**

Use the following guidelines to create encryption key files on the clients:

- If the server is in a cluster and is also an encryption client, all nodes in the cluster must have the same key file.

- The `bpkeyutil` command sets the cipher-based encryption key file and pass phrase on each NetBackup Encryption client.

  - For a Windows server, the full path to the command is as follows:
    
    `install_path\NetBackup\bin\bpkeyutil`

  - For a UNIX server, the full path to the command is as follows:
    
    `/usr/openv/netbackup/bin/bpkeyutil`

**Creating the key files**

For each encryption client, run the following command:

`bpkeyutil -clients client_name`

You are prompted for a new pass phrase to add to that client’s key file.

To set up several clients to use the same pass phrase, specify a comma-separated list of client names, as follows:

`bpkeyutil -clients client_name1,client_name2,...,client_namen`

To create the key file, NetBackup uses the pass phrase you specify.

NetBackup uses the pass phrase you specify to create the key file, as follows:

- NetBackup uses a combination of the following two algorithms to create a key from the pass phrase that is up to 256 bits.
  - Secure hashing algorithm, or SHA1
  - Message digest algorithm, or MD5

- NetBackup uses the NetBackup private key and 128-bit AES algorithm to encrypt the key.

- The key is stored in the key file on the client.
At run time, NetBackup uses the key and a random initialization vector to encrypt the client data. The initialization vector is stored in the header of the backup image.

Previous pass phrases remain available in the file for restores of the backups that were encrypted with those phrases.

**Caution:** You must ensure that pass phrases, whether they are new or were in use previously, are secure and retrievable. If a client’s key file is damaged or lost, you need all of the previous pass phrases to recreate the key file. Without the key file, you cannot restore the files that were encrypted with the pass phrases.

The key file must only be accessible to the administrator of the client machine. For a UNIX client, you must ensure the following:

- The owner is root.
- The mode bits are 600.
- The file is not on a file system that can be NFS mounted.

**Best practices for key file restoration**

Even when an encrypted backup does not have a key file available, you may be able to restore the files.

**Manual retention to protect key file pass phrases**

Manual retention is the most secure method for protecting your key file pass phrases. When you add a phrase by using the `bpkeyutil` command, complete manual retention as follows:

- Write the phrase on paper.
- Seal the paper in an envelope
- Put the envelope into a safe.

If you subsequently need to restore from encrypted backups and you have lost the key file, do the following:

- Reinstall NetBackup.
- Use `bpkeyutil` to create a new key file by using the pass phrases from the safe.
Automatic backup of the key file

The automatic backup method is less secure, but it ensures that a backup copy of your key file exists.

This method requires that you create a non-encrypted policy to back up the key file. If the key file is lost, you can restore it from the non-encrypted backup.

The problem with this method is that a client's key file can be restored on a different client.

If you want to include the key file in the back up to a client, add the key file's path name to the client's include list.

Redirected restores require special configuration changes to allow a restore.

Restoring an encrypted backup file to another client

Redirected restores are described in the following procedure.

To restore an encrypted backup to another client

1. The server must allow redirected restores, and you (the user) must be authorized to perform such restores.
   
   See the NetBackup Administrator's Guide, Volume I for details on redirected restores.

2. Obtain the pass phrase that was used on the other client when the encrypted backup was made. Without that pass phrase, you cannot restore the files.
   
   Note if the pass phrase is the same on both clients, skip to step 5.

3. To preserve your own (current) key file, move or rename it.

4. Use the `bpkeyutil` command to create a key file that matches the other client's. When the `bpkeyutil` process prompts you for the pass phrase, specify the other client's pass phrase.

5. Restore the files to the other client.
   
   After you restore the encrypted files from the client, rename or delete the key file that you created in step 4.
   
   Next, you move or rename the original key file to its original location or name. If you do not re-establish your key file to its original location and name, you may not be able to restore your own encrypted backups.

About configuring standard encryption directly on clients

You can also configure NetBackup encryption directly on clients as explained in the following topics:
Setting standard encryption attribute in policies
You must set the **Encryption** attribute on your NetBackup policy as follows:

- If the attribute is set, the NetBackup server requests that NetBackup clients in that policy perform encrypted backups.
- If the attribute is not set, the NetBackup server does not request that NetBackup clients in that policy perform encrypted backups.

You can use the **Attributes** tab of the policy in the NetBackup Administration Console to set or clear the **Encryption** attribute for a policy.

Refer to the NetBackup Administrator's Guide, Volume I for more information on how to configure policies.

Changing the client encryption settings from the NetBackup server
You can change the encryption settings for a NetBackup client from the **Client Properties** dialog on the NetBackup server.

**To change the client encryption settings from the NetBackup server**

1. Open the **NetBackup Administration Console** on the server.
2. Expand **Host Properties > Clients**.
3. In the **Clients** list, double click the name of the client that you want to change. The **Client Properties** window displays.
4. Expand **Properties > Encryption** to display the encryption settings for that client.

See the following topic for information about the configuration options that correspond to the settings in the **Encryption** pane:

See "Managing standard encryption configuration options" on page 333.

For additional explanations of the settings, click the **Help** button in the window, or see the NetBackup Administrator's Guide, Volume I.
Configuring legacy encryption on clients

This topic discusses configuring legacy NetBackup encryption.

The configuration options are in the `bp.conf` file on UNIX clients and in the registry on Windows clients.

The options are as follows:

- CRYPT_OPTION
- CRYPT_STRENGTH
- CRYPT_LIBPATH
- CRYPT_KEYFILE

You can also use the **NetBackup Administration Console** to configure the options from the server. They are on the **Encryption** tab in the **Client Properties** dialog box.

Refer to the **NetBackup Administrator’s Guide, Volume I** for details.

You can set the CRYPT_OPTION and CRYPT_STRENGTH options on the `bpinst -LEGACY_CRYPT` command. The equivalent option settings are `-crypt_option`, `-crypt_strength`, respectively.

About configuring legacy encryption from the client

The following table contains the legacy encryption-related configuration options that are on a NetBackup client. Ensure that these options are set to the appropriate values for your client. These are set if you run the `bpinst -LEGACY_CRYPT` command from the server to the client name.

<table>
<thead>
<tr>
<th>Option</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRYPT_OPTION = <strong>option</strong></td>
<td>denied</td>
<td>DENIED</td>
</tr>
<tr>
<td></td>
<td>allowed</td>
<td>ALLOWED</td>
</tr>
<tr>
<td>Option</td>
<td>Value</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>required</td>
<td>REQUIRED</td>
</tr>
<tr>
<td>CRYPT_KIND = kind</td>
<td></td>
<td>Defines the encryption type on NetBackup clients. The possible values for kind follow:</td>
</tr>
<tr>
<td></td>
<td>NONE</td>
<td>Neither standard encryption nor legacy encryption is configured on the client.</td>
</tr>
<tr>
<td></td>
<td>LEGACY</td>
<td>Specifies the legacy encryption type, either 40-bit DES or 56-bit DES. This option is the default if the legacy encryption type is configured on the client, and the standard encryption type is not configured.</td>
</tr>
<tr>
<td></td>
<td>STANDARD</td>
<td>Specifies the cipher encryption type, which can be either 128-bit encryption or 256-bit encryption.</td>
</tr>
<tr>
<td>CRYPT_STRENGTH =</td>
<td></td>
<td>Defines the encryption strength on NetBackup clients. The possible values for strength follow:</td>
</tr>
<tr>
<td>strength</td>
<td>des_40</td>
<td>DES_40</td>
</tr>
<tr>
<td></td>
<td>des_56</td>
<td>DES_56</td>
</tr>
<tr>
<td>CRYPT_LIBPATH =</td>
<td></td>
<td>Defines the directory that contains the encryption libraries on NetBackup clients.</td>
</tr>
<tr>
<td>directory_path</td>
<td></td>
<td>The install_path is the directory where NetBackup is installed and by default is C: \VERITAS.</td>
</tr>
<tr>
<td></td>
<td>/usr/openv/lib/</td>
<td>The default value on UNIX systems.</td>
</tr>
<tr>
<td></td>
<td>install_path\NetBackup\bin\</td>
<td>The default value on Windows systems</td>
</tr>
<tr>
<td>CRYPT_KEYFILE =</td>
<td></td>
<td>Defines the file that contains the encryption keys on NetBackup clients.</td>
</tr>
<tr>
<td>file_path</td>
<td>/usr/openv/netbackup\keyfile</td>
<td>The default value on UNIX systems.</td>
</tr>
<tr>
<td></td>
<td>install_path\NetBackup\bin\keyfile.dat</td>
<td>The default value on Windows systems.</td>
</tr>
</tbody>
</table>
Managing legacy encryption key files

This topic describes managing legacy encryption key files.

**Note:** The key file must be the same on all nodes in a cluster.

Each NetBackup client that does encrypted backups and restores needs a key file. The key file contains the data that the client uses to generate DES keys to encrypt backups.

You can use the `bpkeyfile` command on the client to manage the key file. Check the `bpkeyfile` command description in the NetBackup Commands Reference Guide for a detailed description.

The first thing that you need to do is to create a key file if it does not already exist. The key file exists if you set a pass phrase from the `bpinst -LEGACY_CRYPT` command from the server to this client name.

The file name should be the same as the file name that you specified with the `CRYPT_KEYFILE` configuration option as follows:

- For Windows clients, the default key file name is as follows
  
  `install_path\NetBackup\bin\keyfile.dat`

- For UNIX clients, the default key file name is as follows
  
  `/usr/openv/netbackup/keyfile`

NetBackup uses a key file pass phrase to generate a DES key, and it uses the DES key to encrypt a key file.

Generally, you use the key file pass phrase that is hard-coded into NetBackup applications. However, for added security you may want to use your own key file pass phrase.

See “Additional legacy key file security for UNIX clients” on page 348.

**Note:** If you do not want to use your own key file pass phrase, do not enter a new key file pass phrase. Instead, use the standard key file pass phrase and enter a new NetBackup pass phrase.

You must decide what NetBackup pass phrase to use. The NetBackup pass phrase is used to generate the data that is placed into the key file. That data is used to generate DES keys to encrypt backups.
To create the default key file on a UNIX client that is encrypted with the standard key file pass phrase, enter a command such as the following:

```
bpkeyfile /usr/openv/netbackup/keyfile
Enter new keyfile pass phrase: (standard keyfile pass phrase)
Re-enter new keyfile pass phrase: (standard keyfile pass phrase)
Enter new NetBackup pass phrase: ***********************
Re-enter new NetBackup pass phrase: ***********************
```

You may enter new NetBackup pass phrases fairly often. Information about old pass phrases is kept in the key file. This method lets you restore any data that was encrypted with DES keys generated from old pass phrases. You can use the `-change_netbackup_pass_phrase` (or `-cnpp`) option on the `bpkeyfile` command to enter a new NetBackup pass phrase.

If you want to enter a new NetBackup pass phrase on a Windows client, enter a command similar to the following example:

```
bpkeyfile.exe -cnpp install_path\NetBackup\bin\keyfile.dat
Enter old keyfile pass phrase: (standard keyfile pass phrase)
Enter new NetBackup pass phrase: ********
Re-enter new NetBackup pass phrase: ********
```

**Caution:** You must ensure that pass phrases, whether they are new or were in use previously, are secure and retrievable. If a client's key file is damaged or lost, you need all of the previous pass phrases to recreate the key file. Without the key file, you cannot restore the files that were encrypted with the pass phrases.

The key file must only be accessible to the administrator of the client machine.

For a UNIX client, you must ensure the following:

- The owner is root.
- The mode bits are 600.
- The file is not on a file system that can be NFS mounted.

You must consider whether to back up your key file. For encrypted backups, such a backup has little value, because the key file can only be restored if the key file is already on the client. Instead, you can set up a NetBackup policy that does non-encrypted backups of the key files of the clients. This policy is useful if you require an emergency restore of the key file. However, this method also means that a client's key file can be restored on a different client.

If you want to prevent the key file from being backed up, add the key file’s path name to the client’s exclude list.
About configuring legacy encryption from the server

You can configure most NetBackup clients for encryption by using the `bpinst` command from the server.

Prerequisites for this method include the following:

- The NetBackup client software must be running on a platform that supports NetBackup encryption. Refer to the *NetBackup Release Notes* for details on supported platforms.
- The NetBackup clients must be running the required NetBackup version.
- If a clustered server is a client for NetBackup encryption, ensure that all nodes in the cluster have the same key file.

The `bpinst` command is loaded into the NetBackup bin directory on the server as follows:

- For a Windows server, the bin directory is as follows

  \`install_path\NetBackup\bin\`

- For a UNIX server, the bin directory is as follows

  `/usr/openv/netbackup/bin`

See the `bpinst` command description in the *NetBackup Commands Reference Guide* for details about the options that are available with the `bpinst` command.

For examples about how to use `bpinst`:

See "About pushing the legacy encryption configuration to clients" on page 344.

See "About pushing the legacy encryption pass phrases to clients" on page 345.

Normally, you specify client names in the `bpinst` command. However, if you include the `-policy_names` option, you specify policy names instead. The option affects all clients in the specified policies.

About pushing the legacy encryption configuration to clients

You can use the `-crypt_option` and `-crypt_strength` options on the `bpinst` command to set encryption-related configuration on NetBackup clients as follows:

- The `-crypt_option` option specifies whether the client should deny encrypted backups (denied), allow encrypted backups (allowed), or require encrypted backups (required).
The -crypt_strength option specifies the DES key length (40 or 56) that the client should use for encrypted backups.

To install the encryption client software and require encrypted backups with a 56-bit DES key, use the following command from the server:

```
bpinst -LEGACY_CRYPT -crypt_option required -crypt_strength des_56 \ -policy_names policy1 policy2
```

The example uses a UNIX continuation character (\) because it is long. To allow either encrypted or non-encrypted backups with a 40-bit DES key, use the following command:

```
bpinst -LEGACY_CRYPT -crypt_option allowed -crypt_strength des_40 \ client1 client2
```

In clustered environments you can do the following:

- Push the configuration to the client only from the active node.
- Specify the host names of the individual nodes (not the virtual names) in the list of clients.

---

**Note:** The master server `USE_VXSS` setting in bp.conf should be set to `AUTOMATIC`. Use this setting when pushing from an NBAC enabled master to a host that does not have NetBackup previously installed. Also use this setting when NBAC has not enabled the master server's `USE_VXSS` setting in bp.conf.

---

### About pushing the legacy encryption pass phrases to clients

To send a pass phrase to a NetBackup client, you can use the `bpinst` options `-passphrase_prompt` or `-passphrase_stdin`. The NetBackup client uses the pass phrase to create or update data in its key file.

The key file contains the data that the client uses to generate DES keys to encrypt backups as follows:

- If you use the `-passphrase_prompt` option, you are prompted at your terminal for a zero to 62 character pass phrase. The characters are hidden while you type the pass phrase. You are prompted again to retype the pass phrase to make sure that is the one you intended to enter.

- If you use the `-passphrase_stdin` option, you must enter the zero to 62 character pass phrase twice through standard input. Generally, the `-passphrase_prompt` option is more secure than the `-passphrase_stdin` option, but `-passphrase_stdin` is more convenient if you use `bpinst` in a shell script.
To enter a pass phrase for the client named client1 from a NetBackup server through standard input, you would enter commands like the following:

```
bpinst -LEGACY_CRYPT -passphrase_stdin client1 <<EOF
This pass phrase is not very secure
This pass phase is not very secure
EOF
```

To enter a pass phrase for the client named client2 from a NetBackup server, you would enter commands like the following:

```
bpinst -LEGACY_CRYPT -passphrase_prompt client2
Enter new NetBackup pass phrase: ****************
Re-enter new NetBackup pass phrase: ****************
```

You may enter new pass phrases fairly often. The NetBackup client keeps information about old pass phrases in its key file. It can restore the data that was encrypted with DES keys generated from old pass phrases.

---

**Caution:** You must ensure that pass phrases, whether they are new or were in use previously, are secure and retrievable. If a client’s key file is damaged or lost, you need all of the previous pass phrases to recreate the key file. Without the key file, you cannot restore the files that were encrypted with the pass phrases.

You must decide whether to use the same pass phrase for many clients. Using the same pass phrase is convenient because you can use a single `bpinst` command to specify a pass phrase for each client. You can also do redirected restores between clients when they use the same pass phrase.

**Note:** If you want to prevent redirected restores, you should specify different pass phrases by entering a separate `bpinst` command for each client.

For clustered environments you can do the following:

- Push the configuration to the client only from the active node.
- Specify the host names of the individual nodes (not the virtual names) in the list of clients.

**Note:** The master server `USE_VXSS` setting in `bp.conf` should be set to `AUTOMATIC`. Use this setting when pushing from an NBAC enabled master to a host that does not have NetBackup previously installed. Also use this setting when NBAC has not enabled the master server’s `USE_VXSS` setting in `bp.conf`.  

---
Restoring a legacy encrypted backup created on another client

If a server allows redirected restores, you (the user) must be authorized to perform such restores.

Refer to the NetBackup Administrator’s Guide, Volume I for details on redirected restores.

To restore an encrypted backup that was created on another client:

1. Obtain the pass phrase that was used on the other client when the encrypted backup was made. Without that pass phrase, you cannot restore the files.
   
   Note if the pass phrase is the same on both clients, skip to step 4.

2. To preserve your own (current) key file, move or rename it.

3. Use the `bpkeyfile` command to create a key file that matches the other client’s. When the `bpkeyutil` process prompts you for the pass phrase, specify the other client’s pass phrase.

   ```
   bpkeyfile -change_key_file_pass_phrase key_file_path
   ```

   The `key_file_path` is the path for a new key file on your client. This key file matches the other client’s.

   After you enter the command, `bpkeyfile` prompts you for the client’s pass phrase (obtained in step 1).

   For more information on the `bpkeyfile` command, refer to the NetBackup Commands Reference Guide.

4. Restore the files to the other client.

   After you restore the encrypted files from the client, rename or delete the key file that you created in step 3.

   Next, you move or rename the original key file to its original location or name. If you do not re-establish your key file to its original location and name, you may not be able to restore your own encrypted backups.

About setting legacy encryption attribute in policies

You must set the Encryption attribute in your NetBackup policy according to the following:

- If the attribute is set, the NetBackup server requests that NetBackup clients in that policy perform encrypted backups.

- If the attribute is not set, the NetBackup server does not request that NetBackup clients in that policy perform encrypted backups.
You can use the Attributes tab of the policy in the NetBackup Administration Console to set or clear the Encryption attribute for a policy. Refer to the NetBackup Administrator's Guide, Volume I for more information on how to configure policies.

You can also use the bpinst command to set or clear the Encryption attribute for NetBackup policies. This method is convenient if you want to set or clear the attribute for several policies.

For example, to set the Encryption attribute for policy1 and policy2 from a NetBackup server, enter a command like the following:

```
bpinst -LEGACY_CRYPT -policy_encrypt 1 -policy_names policy1 policy2
```

The 1 parameter sets the encryption attribute (0 would clear it).

### Changing client legacy encryption settings from the server

You can change the encryption settings for a NetBackup client from the Client Properties dialog on the NetBackup server.

To change the client encryption settings from the NetBackup server

1. In the NetBackup Administration Console on the server, expand Host Properties > Clients.
2. In the Clients list, double click the name of the client you want to change. The Client Properties dialog displays.
3. In the Properties pane, click Encryption to display the encryption settings for that client.

   For additional explanation of the settings, click the Help option on the dialog, or refer to the NetBackup Administrator's Guide, Volume I.

### Additional legacy key file security for UNIX clients

This topic applies only to UNIX NetBackup clients. The additional security is not available for Windows clients.

**Note:** Veritas does not recommend using the additional key file security feature in a cluster.

The key file for an encryption client is encrypted using a DES key that is generated from a key file pass phrase. By default, the key file is encrypted using a DES key that is generated from the standard pass phrase that is hard-coded into NetBackup.
Using the standard key file pass phrase lets you perform automated encrypted backups and restores the same way you perform non-encrypted backups and restores.

This method has potential problems, however, if an unauthorized person gains access to your client's key file. That person may be able to figure out what encryption keys you use for backups or use the key file to restore your client's encrypted backups. For this reason, you must ensure that only the administrator of the client has access to the key file.

For extra protection, you can use your own key file pass phrase to generate the DES key to encrypt the key file. An unauthorized person may still gain access to this key file, but the restore is more difficult.

If you use your own key file pass phrase, backup, and restore are no longer as automated as before. Following is a description of what happens on a UNIX NetBackup client if you have used your own key file pass phrase.

To start a backup or restore on a client, the NetBackup server connects to the \texttt{bpcd} daemon on the client and makes a request.

To perform an encrypted backup or restore, \texttt{bpcd} needs to decrypt and read the key file.

If the standard key file pass phrase is used, \texttt{bpcd} can decrypt the key file automatically.

If you use your own key file pass phrase, \texttt{bpcd} can no longer decrypt the key file automatically, and the default \texttt{bpcd} cannot be used. You must initiate \texttt{bpcd} with a special parameter. See “Running the \texttt{bpcd -keyfile} command” on page 349.

\begin{quote}
\textbf{Note:} In a clustered environment, if you change the key file on one node, you must make the same change in the key file on all nodes.
\end{quote}

\section*{Running the \texttt{bpcd -keyfile} command}

This topic describes running the \texttt{bpcd} command as a stand-alone program.
To run `bpcd` as a stand-alone program

1. Use the `-change_key_file_pass_phrase` (or `-ckfpp`) option on the `bpkeyfile` command to change the key file pass phrase, as in the following example:

   ```
bpkeyfile -ckfpp /usr/openv/netbackup/keyfile
Enter old keyfile pass phrase: (standard keyfile pass phrase)
Enter new keyfile pass phrase: (standard keyfile pass phrase)
******
Re-enter new keyfile pass phrase: (standard keyfile pass phrase) ******
```

   If you type a carriage return at the prompt, NetBackup uses the standard key file pass phrase.

2. Stop the existing `bpcd` by issuing the `bpcd -terminate` command.

3. Initiate the `bpcd` command with the `-keyfile` option. Enter the new key file pass phrase when prompted.

   ```
bpcd -keyfile
Please enter keyfile pass phrase: ******
```

   `bpcd` now runs in the background, and waits for requests from the NetBackup server.

   You can change the key file pass phrase at any time with the `bpkeyfile` command and the `-ckfpp` option. The new key file pass phrase does not take effect until the next time you start `bpcd`.

   You can also change the NetBackup pass phrase that is used to generate the DES keys to encrypt backups. Change this phrase at any time with the `bpkeyfile` command and the `-cnpp` option. Note, however, that the new NetBackup pass phrase does not take effect until you kill the current `bpcd` process and restart `bpcd`.

Terminating `bpcd` on UNIX clients

To terminate `bpcd` on UNIX clients, use the `bpcd -terminate` command.

Media server encryption

NetBackup media server encryption is ideally suited for the following:

- Media servers that can handle the burden for compression / encryption
- NetBackup administrators that want centralized and coarse key management granularity
- Situations where tight NetBackup operational integration is not needed

Information about administering the media server encryption option is located in the following documents on the Veritas Support site.

NetBackup Media Server Encryption Option Administrator’s Guide

NetBackup Media Server Encryption Option Release Notes
Data at rest key management

This chapter includes the following topics:

- Federal Information Processing Standards (FIPS)
- About FIPS enabled KMS
- About the Key Management Service (KMS)
- Installing KMS
- Configuring KMS
- About using KMS for encryption
- KMS database constituents
- Command line interface (CLI) commands
- Troubleshooting KMS

Federal Information Processing Standards (FIPS)

The Federal Information Processing Standards (FIPS) define U.S. and Canadian Government security and interoperability requirements for computer systems. The FIPS 140-2 standard specifies the security requirements for cryptographic modules. It describes the approved security functions for symmetric and asymmetric key encryption, message authentication, and hashing.

For more information about the FIPS 140-2 standard and its validation program, see the National Institute of Standards and Technology (NIST) and the

The NetBackup Cryptographic Module is now FIPS validated. NetBackup KMS uses the NetBackup Cryptographic Module and can now be operated in FIPS mode.

See “About FIPS enabled KMS” on page 353.

About FIPS enabled KMS

NetBackup KMS can now be operated in the FIPS mode, wherein the encryption keys that you create are always FIPS approved. FIPS configuration is enabled by default.

When you create a new key, a salt is always generated with the new key. Providing the salt value is mandatory when you want to recover a key.

Consider the following example; hrs09to12hrs is a key created using an older version of NetBackup:

- Key Group Name : ENCR_Monday
- Supported Cipher : AES_256
- Number of Keys : 8
- Has Active Key : Yes
- Description : -
- Key Tag :
  5e16a6ea988fc8ec7cc9bdbe230811b65583c0437748db4521278f9c1bbdf9
- Key Name : hrs09to12hrs
- Current State : ACTIVE
- Description : active

The key hrs09to12hrs is moved from key group ENCR_Monday to a new key group ENCR_77.

C:\Program Files\Veritas\NetBackup\bin\admincmd>nbkmsutil -modifykey -keyname hrs09to12hrs -kgname ENCR_Monday -move_to_kgname ENCR_77
Key details are updated successfully

Now list all the keys of the ENCR_77 key group. Note that the new key Fips77 would be FIPS approved, but not hrs09to12hrs that was created using an older version of NetBackup.

C:\Program Files\Veritas\NetBackup\bin\admincmd>nbkmsutil -listkeys -kgname NCR_77

Key Group Name : ENCR_77 Supported
Cipher : AES_256
Number of Keys : 2
Has Active Key : Yes
Creation Time : Thu Feb 26 04:44:12 2015
Last Modification Time: Thu Feb 26 04:44:12 2015
Description : -
Key Tag :
5e16a6ea988fc8ec7cc9bdbc230811b65583c0437748db4521278f9c1bbdf9
Key Name : hrs09to12hrs
Current State : ACTIVE
Last Modification Time: Thu Feb 26 04:48:17 2015
Description : active
FIPS Approved Key : No
Key Tag :
4590e304aa53da036a961cd198de97f24be43b212b2a1091f896e2ce3f4269a6
Key Name : Fips77
Current State : INACTIVE
Creation Time : Thu Feb 26 04:44:58 2015
Last Modification Time: Thu Feb 26 04:48:17 2015
Description : active
FIPS Approved Key : Yes
Salt : 53025d5710ab36ac1099194fb97bad318da596e27fdefe1f2
Number of Keys: 2
The new key Fips77 is FIPS approved and also has a Salt value.

KMS with FIPS compliance is supported on the following platforms:

- MS Windows Server 2012
- Linux.2.6.16 x86-64 Suse-10
- Linux.2.6.18 x86-64 RHEL-5
- HP-UX IA64 11.31
- AIX 5.3 TL12 SP2
- AIX 5.3 TL12 SP2

About the Key Management Service (KMS)

The NetBackup Key Management Service (KMS) feature is included as part of the NetBackup Enterprise Server and NetBackup Server software. An additional license is not required to use this functionality. KMS runs on NetBackup and is a master server-based symmetric Key Management Service. The KMS manages symmetric cryptography keys for the tape drives that conform to the T10 standard. KMS has been designed to use volume pool-based tape encryption. KMS is used with the tape hardware that has a built-in hardware encryption capability. An example of a tape drive that has built-in encryption is the IBM ULTRIUM TD4 cartridge drive. KMS is also used with disk volumes associated with NetBackup AdvancedDisk storage solutions. KMS runs with Cloud storage providers. KMS runs on Windows and UNIX. KMS generates keys from your passcodes or it auto-generates keys. The KMS operations are done through the KMS command line interface (CLI) or the Cloud Storage Server Configuration Wizard (when KMS is used with Cloud storage providers). The CLI options are available for use with both nbms and nbmksutil.

KMS has a minimal effect on existing NetBackup operation system management and yet provides a foundation for future Key Management Service enhancements.

KMS considerations

The following table describes the considerations that relate to the functionality and use of KMS.
<table>
<thead>
<tr>
<th>Consideration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New NBKMS service</strong></td>
<td>The nbkms service is a master-server-based service that provides encryption keys to the media server BPTM processes.</td>
</tr>
<tr>
<td><strong>New nbkmsutil KMS configuration utility</strong></td>
<td>For security reasons, the KMS configuration utility can only be run from the master server as root or administrator.</td>
</tr>
<tr>
<td><strong>NetBackup wide changes</strong></td>
<td>Changes were necessary throughout NetBackup for the following:</td>
</tr>
<tr>
<td></td>
<td>■ To allow for the ENCR_ prefix on the volume pool names.</td>
</tr>
<tr>
<td></td>
<td>■ To communicate with the key Management Service.</td>
</tr>
<tr>
<td></td>
<td>■ To provide support for the T10 / SCSI standard tape drives with embedded encryption.</td>
</tr>
<tr>
<td></td>
<td>■ NetBackup GUI and CLI changes to report the encryption key tag addition to the NetBackup image information</td>
</tr>
<tr>
<td></td>
<td>The bpimmedia and bpimagelist were modified.</td>
</tr>
<tr>
<td></td>
<td>■ An emphasis on recoverability and ease of use for this NetBackup release</td>
</tr>
<tr>
<td></td>
<td>The recommended option is that all encryption keys are generated with pass phrases. You type in a pass phrase and the key management system creates a reproducible encryption key from that pass phrase.</td>
</tr>
<tr>
<td><strong>KMS installation and deployment decisions</strong></td>
<td>Following are decisions you must make for KMS deployment:</td>
</tr>
<tr>
<td></td>
<td>■ Whether to choose KMS random generated keys or pass phrase generated keys</td>
</tr>
<tr>
<td></td>
<td>■ Whether to include NBAC deployment</td>
</tr>
<tr>
<td><strong>KMS security</strong></td>
<td>No burden is placed on existing NetBackup services with additional security concerns.</td>
</tr>
<tr>
<td><strong>Cipher types</strong></td>
<td>The following cipher types are supported in KMS:</td>
</tr>
<tr>
<td></td>
<td>■ AES_128</td>
</tr>
<tr>
<td></td>
<td>■ AES_192</td>
</tr>
<tr>
<td></td>
<td>■ AES_256 (default cipher)</td>
</tr>
<tr>
<td><strong>KMS recoverability</strong></td>
<td>You can use KMS in such a way where all of the encryption keys are generated from pass phrases. You can record these pass phrases and then use them at a later time to recreate the entire KMS for NetBackup.</td>
</tr>
<tr>
<td>Consideration</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>KMS files</td>
<td>KMS files associated with it where information on the keys is kept, as follows:</td>
</tr>
<tr>
<td>■ Key file or key database</td>
<td>Contains the data encryption keys. The key file is located at /opt/openv/kms/db/KMS_DATA.dat.</td>
</tr>
<tr>
<td>■ Host master key</td>
<td>Contains the encryption key that encrypts and protects the KMS_DATA.dat key file using AES 256. The host master key is located at /opt/openv/kms/key/KMS_HMKF.dat.</td>
</tr>
<tr>
<td>■ Key protection key</td>
<td>Encryption key that encrypts and protects individual records in the KMS_DATA.dat key file using AES 256. The key protection key is located at /opt/openv/kms/key/KMS_KPKF.dat. Currently the same key protection key is used to encrypt all of the records.</td>
</tr>
<tr>
<td>■ Back up KMS files</td>
<td>If you want to back up the KMS files, the best practices should be followed. Put the KMS database file on one tape and the HMK files and KPK files on another tape. To gain access to encrypted tapes, someone would then need to obtain both tapes. Another alternative is to back up the KMS data files outside of the normal NetBackup process. You can copy these files to a separate CD, DVD, or USB drive. You can also rely on pass phrase generated encryption keys to manually rebuild KMS. All of the keys can be generated by pass phrases. If you have recorded all of the encryption key pass phrases you can manually recreate KMS from information you have written down. If you only have a few encryption keys you generate this process could be short.</td>
</tr>
</tbody>
</table>
### Table 9-1  Considerations that relate to the functionality and use of KMS (continued)

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key records</td>
<td>Key records contain many fields but the primary records are the encryption key, the encryption key tag, and the record state. Key records also contain some metadata. These key records are defined as follows:</td>
</tr>
<tr>
<td></td>
<td>- Encryption key</td>
</tr>
<tr>
<td></td>
<td>This key is given to the tape drive.</td>
</tr>
<tr>
<td></td>
<td>- Encryption key Tag</td>
</tr>
<tr>
<td></td>
<td>This tag is the identifier for the encryption key.</td>
</tr>
<tr>
<td></td>
<td>- Record state</td>
</tr>
<tr>
<td></td>
<td>Each of the key records has a state. The states are prelive, active, inactive, deprecated, and terminated.</td>
</tr>
<tr>
<td></td>
<td>- Metadata</td>
</tr>
<tr>
<td></td>
<td>Metadata includes logical name, creation date, modification date, and description.</td>
</tr>
<tr>
<td>Key groups</td>
<td>Key groups are a logical name and grouping of key records. All key records that are created must belong to a group. A key group can only have one active state key record at any time. NetBackup supports 100 key groups. Only 10 encryption keys are allowed per key group.</td>
</tr>
<tr>
<td>Tape drives and media capabilities</td>
<td>Drive, tape, and NetBackup capabilities must all match for drive encryption to be successful. A number of drives adhere to the T10 standard. Some well-known tape drives we support (that adhere to the T10 standard) are LT0-4, LT0-5, LT0-6, IBM TS1120/30/40, Oracle T10000B/C, and so on.</td>
</tr>
<tr>
<td></td>
<td>You can still run earlier LTO versions for reading and writing but you cannot encrypt the data. For example, if you use LT02 media, that data can be read in LT04 drives but they cannot be written in either unencrypted or encrypted format.</td>
</tr>
<tr>
<td></td>
<td>You must keep track of these drive issues and media issues as you run setup encryption. Not only do you need the drives that are capable of encryption but the media needs to be grouped and capable of encryption. For later decryption the tape must be placed in a drive that is capable of decryption.</td>
</tr>
<tr>
<td></td>
<td>Refer to Table 9-2 for brief information about interoperability between media and tape drives. Veritas recommends that you refer to vendor-specific user guides for detailed information.</td>
</tr>
<tr>
<td></td>
<td>Refer to the article HOWTO56305 for more details.</td>
</tr>
<tr>
<td>KMS with NBAC</td>
<td>Information on using KMS with NBAC is included where applicable in various sections of this document. For further information, refer to the NetBackup NBAC documentation.</td>
</tr>
</tbody>
</table>
Table 9-1  Considerations that relate to the functionality and use of KMS (continued)

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KMS with HA clustering</td>
<td>Information on using KMS with HA clustering is included where applicable in various sections of this document. For further information, refer to the NetBackup HA documentation</td>
</tr>
<tr>
<td>KMS logging</td>
<td>The service uses the new unified logging and has been assigned OID 286. The nbkmsutil command uses traditional logging and its logs can be found in the file /usr/openv/netbackup/logs/admin/*.log.</td>
</tr>
<tr>
<td>KMS with Cloud</td>
<td>Information on using KMS with Cloud providers is included where applicable in various sections of this document. For further information, refer to the NetBackup Cloud Administrator's Guide.</td>
</tr>
<tr>
<td>KMS with AdvancedDisk</td>
<td>Information on using KMS with AdvancedDisk storage is included where applicable in various sections of this document. For further information, refer to the NetBackup AdvancedDisk Storage Solutions Guide.</td>
</tr>
<tr>
<td>NBAC and KMS permissions</td>
<td>Typically when using NBAC and the Setupmaster command is run, the NetBackup related group permissions (for example, NBU_Admin and KMS_Admin) are created. The default root and administrator users are also added to those groups. In some cases the root and administrator users are not added to the KMS group when NetBackup is upgraded. The solution is to grant the root and administrator users NBU_Admin and KMS_Admin permissions manually.</td>
</tr>
</tbody>
</table>

Table 9-2  Media support for encryption

<table>
<thead>
<tr>
<th>Media</th>
<th>LTO4 tape drives</th>
<th>LTO5 tape drives</th>
<th>LTO6 tape drives</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTO-2  media</td>
<td>Read only no encryption support</td>
<td>Not supported</td>
<td>Not supported</td>
</tr>
<tr>
<td>LTO-3  media</td>
<td>Read and Write no encryption support</td>
<td>Read only no encryption support</td>
<td>Not supported</td>
</tr>
<tr>
<td>LTO-4  media</td>
<td>Read and Write encryption enabled</td>
<td>Read and Write encryption enabled</td>
<td>read-only encryption enabled</td>
</tr>
<tr>
<td>LTO-5  media</td>
<td>Not supported</td>
<td>Read and Write encryption enabled</td>
<td>Read and Write encryption enabled</td>
</tr>
<tr>
<td>LTO-6  media</td>
<td>Not supported</td>
<td>Not supported</td>
<td>Read and Write encryption enabled</td>
</tr>
</tbody>
</table>
KMS principles of operation

KMS works with encryption capable tape drives. KMS is integrated into NetBackup in such a way so as to eliminate difficulties in using NetBackup from a system management perspective. KMS provides encryption key management for tape drives with built-in encryption capabilities. These tape drives adhere to the SCSI standard. A SCSI command enables encryption on the tape drive. NetBackup accesses this capability through the volume pool name.

About writing an encrypted tape

BPTM receives a request to write to a tape and to use a tape from a volume pool with the ENCR_ name prefix. The ENCR_ prefix is a signal to BPTM that the information to be written to tape is to be encrypted.

BPTM contacts KMS and requests an encryption key from the key group with a name that matches the name of the volume pool.

KMS hands back to BPTM an encryption key and a key identifier (known as the encryption key tag).

BPTM places the drive in encryption mode and registers the key tag and identifier tag with the drive. This process is all done with the SCSI security protocol in or out command that has been added to the SCSI specification.

The backup then proceeds as normal.

When the backup is complete, BPTM unregisters the key and tag with the drive and sets the drive back into regular mode.

BPTM then records the tag in the NetBackup image record catalog.

Figure 9-1 shows how the process flows.
Figure 9-1  Process flow for writing an encrypted tape

About reading an encrypted tape

When a tape is read and an area of the tape in encountered where an image is encrypted, BPTM determines: what tag is used and KMS loads that record and key into BPTM. Then BPTM provides the key to the drive and reading the tape proceeds as normal.

KMS terminology

Table 9-3 defines the terms that are associated with KMS.
### Table 9-3  Definitions for common KMS terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command line interface (CLI)</td>
<td>From the CLI, you can operate the KMS feature from the provided command line using the <code>nbkmsutil</code> command. You can use the CLI to: create a new key group, create a new key, modify key group attributes, modify key attributes, and get details of key groups. You can also get details of keys, delete a key group, delete a key, recover a key, modify the host master key, and get host master key ID. Further you can modify key protection key, get key protection key ID, get keystore statistics, quiesce the KMS database, unquiesce the KMS database.</td>
</tr>
<tr>
<td>Host Master Key (HMK)</td>
<td>The host master key contains the encryption key that encrypts and protects the <code>KMS_DATA.dat</code> key file using AES 256. The host master key is located at <code>/opt/openv/kms/key/KMS_HMKF.dat</code>.</td>
</tr>
<tr>
<td>Key</td>
<td>A key is an encryption key that is used to encrypt and decrypt data.</td>
</tr>
<tr>
<td>Key group record (KGR)</td>
<td>A key group record contains the details of a key group.</td>
</tr>
<tr>
<td>Key Management Service (KMS)</td>
<td>The key Management Service is a master server-based symmetric key Management Service that manages symmetric cryptography keys. Keys are managed for the tape drives that conform to the T10 standard (LTO4). The KMS is located in <code>/usr/openv/netbackup/bin/nbkms</code>.</td>
</tr>
<tr>
<td>Key record (KR)</td>
<td>A key record contains the details of an encryption key.</td>
</tr>
<tr>
<td>KMS database</td>
<td>The KMS database contains the data encryption keys.</td>
</tr>
<tr>
<td>Key Protection Key (KPK)</td>
<td>A key protection key is an encryption key that encrypts and protects individual records in the <code>KMS_DATA.dat</code> key file using AES 256. The key protection key is <code>kms/key/KMS_KPKF.dat</code>. Currently the same key protection key is used to encrypt all of the records.</td>
</tr>
<tr>
<td>Key file (key database)</td>
<td>A key file or key database contains the data encryption keys. The key file <code>/opt/openv/kms/db/KMS_DATA.dat</code>.</td>
</tr>
<tr>
<td>Key group</td>
<td>The key group is a logical name and grouping of key records. A key group can only have one active state key record at any time. One hundred key groups are supported.</td>
</tr>
<tr>
<td>Key record</td>
<td>Key records include the encryption key, encryption key tag, and the record state. Other useful metadata such as logical name, creation date, modification date, and description are also included.</td>
</tr>
</tbody>
</table>
Table 9-3  Definitions for common KMS terms (continued)

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key record states</td>
<td>Key record states are as follows:</td>
</tr>
<tr>
<td></td>
<td>■ Prelive, which means that the key record has been created, but has never been used.</td>
</tr>
<tr>
<td></td>
<td>■ Active, which means that the key record can be used for encryption and decryption in both backup and restore.</td>
</tr>
<tr>
<td></td>
<td>■ Inactive, which means that the key record cannot be used for encryption, but can be used for decryption only during restore.</td>
</tr>
<tr>
<td></td>
<td>■ Deprecated, which means that the key record cannot be used for encryption or decryption.</td>
</tr>
<tr>
<td></td>
<td>■ Terminated, which means that the key record is not available for use but it can be deleted.</td>
</tr>
<tr>
<td></td>
<td>■ Keystore, which means that the keystore is the file that keeps the data encryption keys.</td>
</tr>
<tr>
<td></td>
<td>■ Pass phrase, which means that the pass phrase is a user-specified random string. Seed to create encryption keys.</td>
</tr>
<tr>
<td></td>
<td>You have a choice of creating the HMK, the KPK, and the encryption key with or without a pass phrase.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Keep track of all pass phrases by recording them and storing them in a safe place for future use.</td>
</tr>
<tr>
<td></td>
<td>Using a pass phrase has definite benefits. It results in keys with better security strength. And if keys are lost, you can regenerate them by providing the pass phrase that was used to create the original key.</td>
</tr>
<tr>
<td>Quiesce</td>
<td>A quiesce sets the KMS DB to read-only administrator mode. Quiescing is required to make a backup of consistent copy of the KMS DB files.</td>
</tr>
<tr>
<td>Tag</td>
<td>A tag is a unique identifier (UUID) used to identify an individual key or key group in a keystore.</td>
</tr>
</tbody>
</table>

### Installing KMS

The following procedure describes how to install KMS.

**Note:** For more information on configuring KMS in a Cloud storage environment refer to the NetBackup Cloud Administrator's Guide.

The KMS service is called `nbkms`. 
The service does not run until the data file has been set up, which minimizes the effect on environments not using KMS.

To install KMS

1. Run the `nbkms -createemptydb` command.
2. Enter a pass phrase for the host master key (HMK). You can also press Enter to create a randomly generated key.
3. Enter an ID for the HMK. This ID can be anything descriptive that you want to use to identify the HMK.
4. Enter a pass phrase for the key protection key (KPK).
5. Enter an ID for the KPK. The ID can be anything descriptive that you want to use to identify the KPK.

The KMS service starts when after you enter the ID and press Enter.

6. Start the service by running the following command:

   `nbkms`

7. Use the `grep` command to ensure that the service has started, as follows:

   `ps -ef | grep nbkms`

8. Create the key group. The key group name must be an identical match to the volume pool name. All key group names must have a prefix `ENCR_`.

   **Note:** When using key management with Cloud storage, the `ENCR_` prefix is not required for the key group name.

To create a (non-Cloud storage) key group use the following command syntax.

   `nbkmsutil -createkg -kgname ENCR_volumepoolname`

   The `ENCR_` prefix is essential. When BPTM receives a volume pool request that includes the `ENCR_` prefix, it provides that volume pool name to KMS. KMS identifies it as an exact match of the volume pool and then picks the active key record for backups out of that group.

To create a Cloud storage key group use the following command syntax.

   `nbkmsutil -createkg -kgname cloud_provider_URL:volume_name`
Create a key record by using the -createkey option.

```
nbkmsutil -createkey -kgname ENCR_volumepool -keyname keyname -activate -desc "message"
```

The key name and message are optional; they can help you identify this key when you display the key.

The -activate option skips the prelive state and creates this key as active.

Provide the pass phrase again when the script prompts you.

In the following example the key group is called ENCR_pool1 and the key name is Q1_2008_key. The description explains that this key is for the months January, February, and March.

```
nbkmsutil -createkey -kgname ENCR_pool1 -keyname Q1_2008_key -activate -desc "key for Jan, Feb, & Mar"
```
11 You can create another key record using the same command; a different key name and description help you distinguish they key records:

```
nbkmsutil -createkey -kgname ENCR_pool1 -keyname Q2_2008_key -activate -desc "key for Apr, May, & Jun"
```

**Note:** If you create more than one key record by using the command `nbkmsutil -kgname name -activate`, only the last key remains active.

12 To list all of the keys that belong to a key group name, use the following command:

```
nbkmsutil -listkeys -kgname keyname
```

**Note:** Veritas recommends that you keep a record of the output of the `nbkmsutil -listkeys` command. The key tag that is listed in the output is necessary if you need to recover keys.

The following command and output use the examples in this procedure.

```
# nbkmsutil -listkeys -kgname ENCR_pool1
Key Group Name  : ENCR_pool1
Supported Cipher : AES_256
Number of Keys   : 2
Has Active Key   : Yes
Creation Time    : Thu Aug 8 16:23:06 2013
Last Modification Time: Thu Aug 8 16:23:06 2013
Description      :

  Key Tag  : 825784185f87145c368c54e919908905a45f79927cb733337a53e9b174b0046
  Key Name  : Q2_2013_key
  Current State: ACTIVE
  Creation Time: Thu Aug 8 16:25:19 2013
  Last Modification Time: Thu Aug 8 16:25:19 2013
  Description : key for Apr, May, & Jun
  FIPS Approved Key : No

  Key Tag  : f63af53ead99920e98f3e0f4a586afccf32e79e75240e654999d1c0c7bd7c7fdd
  Key Name  : Q1_2013_key
  Current State: INACTIVE
  Creation Time: Thu Aug 8 16:25:03 2013
  Last Modification Time: Thu Aug 8 16:25:19 2013
  Description : key for Jan, Feb, & March
  FIPS Approved Key : No

Number of Keys: 2
```

See "About installing KMS with HA clustering" on page 367.
See “Using KMS with NBAC” on page 367.

Using KMS with NBAC

The following changes have been made to NBAC to support the introduction of KMS:

- Addition of the new authorization object **KMS**
- Addition of the new NetBackup user group **NBU_KMS Admin**

The permissions a user has on the KMS object determines the KMS-related tasks you are allowed to perform. **Table 9-4** shows the default KMS permissions for each of the NetBackup user groups.

**Table 9-4**  Default KMS permissions for NetBackup user groups

<table>
<thead>
<tr>
<th>Set</th>
<th>Activity</th>
<th>NBU_User</th>
<th>NBU_Operator</th>
<th>NBU_Admin</th>
<th>NBU_Security Admin</th>
<th>Vault_Operator</th>
<th>NBU_SAN Admin</th>
<th>NBU_KMS Admin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Browse</td>
<td>Browse</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>Read</td>
<td>Read</td>
<td>---</td>
<td>---</td>
<td>X</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>Configure</td>
<td>New</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>Configure</td>
<td>Delete</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
<tr>
<td>Configure</td>
<td>Modify</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>X</td>
</tr>
</tbody>
</table>

Besides the KMS permissions listed above, the NBU_KMS admin group also has the following permissions on other authorization objects:

- BUAndRest has Browse, Read, Backup, Restore, List
- HostProperties has Browse, Read
- License has Browse, Read

About installing KMS with HA clustering

In a typical NetBackup environment, it is possible that not all the optional packages are installed, licensed or configured. In such scenarios, any services that pertain to these optional products may not be active all the time. These services are hence not monitored by default and do not cause a NetBackup to failover if they fail. If at a future time an optional product is installed, licensed and configured, its services...
You can make the KMS service cluster-enabled by adding it to the list of services that can be monitored.

**To enable cluster use with KMS**

1. Open the command prompt on the active node of the cluster.
2. Change the directory, as follows:
   - On Windows: `<NetBackup_install_path>\NetBackup\bin`
   - On UNIX: `/usr/openv/netbackup/bin`
3. Run the following command:
   - On Windows: `bpclusterutil -addSvc "NetBackup Key Management Service"`
   - On UNIX: `bpclusterutil -addSvc nbkms`
4. Follow the optional product-specific steps to enable the product. For NetBackup Key Management Service run the command to create the database, and start the service.

You can enable the monitoring of the KMS service and failover NetBackup when the service fails.

**To enable monitoring of the KMS service and failover NetBackup if it fails**

1. Open a command prompt on the active node of the cluster.
2. Change the directory, as follows:
   - On Windows: `<NetBackup_install_path>\NetBackup\bin`
   - On UNIX: `/usr/openv/netbackup/bin`
3. Run the following command.
   - On Windows: `bpclusterutil -enableSvc "NetBackup Key Management Service"`
   - On UNIX: `bpclusterutil -enableSvc nbkms`
Disabling the monitoring of the KMS service

You can disable monitoring of the KMS service.

To disable monitoring of the KMS service

1. Open a command prompt on the active node of the cluster.
2. Change the directory, as follows:
   - On Windows: `<NetBackup_install_path>\NetBackup\bin`
   - On UNIX: `/usr/openv/netbackup/bin`
3. Run the following command:
   - On Windows: `bpclusterutil -disableSvc "NetBackup Key Management Service"`
   - On UNIX: `bpclusterutil -disableSvc nbkms`

Removing the KMS service from monitored list

You can remove the KMS service from the list of services that can be monitored.

To remove the KMS service from the list of monitored services

1. Disable monitoring of the optional product service using the previous procedure
2. Follow the optional product-specific steps to remove the product
3. Open the command prompt on the active node of the cluster
4. Change the directory, as follows:
   - On Windows: `<NetBackup_install_path>\NetBackup\bin`
   - On UNIX: `/usr/openv/netbackup/bin`
5. Run the following command:
   - On Windows: `bpclusterutil -deleteSvc "NetBackup Key Management Service"`
   - On UNIX: `bpclusterutil -deleteSvc nbkms`

Configuring KMS

The configuration of KMS is done by creating the key database, key groups, and key records. Then NetBackup is configured to work with KMS.
To configure and initialize KMS

1. Create the key database, the host master key (HMK), and the key protection key (KPK).
2. Create a key group that matches the volume pool.
3. Create an active key record.

Creating the key database

Use the following procedure to create an empty key database. A key database is created by invoking the service name with the **-createemptydb** option. This process checks and ensures that an existing key database does not already exist, and then proceeds with the creation. Two protection keys need to be created when the KMS is initialized. They are the Host Master Key (HMK) and the Key Protection Key (KPK).

As with all KMS key creation activities, the user is presented with the following options for creating these keys:

- Keys are generated by pass phrases
- Randomly generated pass phrases

You are prompted to provide a logical ID to be associated with each key. At the end of this operation, the key database and protection keys are established.

On a Windows system they can be found in the following files:

```
\Program Files\Veritas\kms\db\KMS_DATA.dat
\Program Files\Veritas\kms\key\KMS_HMKF.dat
\Program Files\Veritas\kms\key\KMS_HKPKF.dat
```

On a UNIX system, they can be found in the following files:

```
/opt/openv/kms/db/KMS_DATA.dat
/opt/openv/kms/key/KMS_HMKF.dat
/opt/openv/kms/key/KMS_HKPKF.dat
```

**Note:** On Windows the following `nbkms` command is run from the `C:\Program Files\Veritas\NetBackkup\bin` directory.
To create the key database

1. Run the following command:
   
   ```bash
   nbkms -createemptydb.
   ```

2. Enter a pass phrase for the Host Master Key, or press Enter to use a randomly generated key. Re-enter the pass phrase at the following prompt.

3. Enter an HMK ID. This ID is associated with the HMK; you can use it to find this particular key in the future.

4. Enter a pass phrase for the Key Protection Key, or press Enter to use a randomly generated key. Re-enter the pass phrase at the following prompt.

5. Enter a KPK ID. This ID is associated with the KPK; you can use it to find this particular key in the future.


About key groups and key records

A key group is a logical collection of key records where no more than one record is in the active state.

A key group definition consists of the following:

- **Name**
  Given to a key group. Should be unique within the keystore. Renaming of the key group is supported if the new name is unique within the keystore.

- **Tag**
  Unique key group identifier (not mutable).

- **Cipher**
  Supported cipher. All keys belonging to this key group are created with this cipher in mind (not mutable).

- **Description**
  Any description (mutable).

- **Creation Time**
  Time of creation of this key group (not mutable).

- **Last Modification Time**
  Time of last modification to any of the mutable attributes (not mutable).

About creating key groups

The first step for setting up encryption is to create a key group.
In the following example, the key group `ENCR_mygroup` is created:

```bash
nbkmsutil -createkg -kgname ENCR_mygroup
```

**Note:** For this version of KMS, it is important that the group name you create (i.e., `mygroup`), is prefixed with `ENCR_`.

### About creating key records

The next step is to create an active key record. The key record can either be created in the prelive state and then transferred to the active state. Or the key record can be created directly in the active state.

A key record consists of the following critical pieces of information:

- **Name**
  Name that is given to a Key, should be unique within a KG. The renaming of a Key is supported if the new name is unique within the KG.

- **Key Tag**
  Unique Key identifier (not mutable).

- **Key Group Tag**
  Unique KG identifier, to which this Key belongs (not mutable).

- **State**
  Key's current state (mutable).

- **Encryption key**
  Key, used to encrypt or decrypt the backup or restore data (not mutable).

- **Description**
  Any description (mutable).

- **Creation Time**
  Time of Key creation (not mutable).

- **Last Modification Time**
  Time of last modification to any of the mutable attributes (not mutable).

The following key record states are available:

- **Prelive**, which indicates that the record has been created, but has not been used
- **Active**, which indicates that the record and key are used for encryption and decryption
- **Inactive**, which indicates that the record and key cannot be used for encryption. But they can be used for decryption
Overview of key record states

The key record states include the prelive, active, inactive, deprecated, and terminated. Key record states adhere to a key record life cycle. Once a key has entered the active state (that is set up for encryption), the key must progress in proper order through the lifestyle. The proper order includes passing from one state to its adjacent state. A key cannot bypass any of the states.

Between the active state and terminated state, the record can move one state at a time in either direction. Outside of this state range, the transitions are one directional. Deleted key records cannot be recovered (unless they were created using a pass phrase), and active keys cannot be moved back to prelive state.

---

**Note:** Keys can be created in either the prelive state or the active state. Active key records are available for both backup and restore operations. An inactive key is only available for restore operations. Deprecated keys are not available for use. If your key record is in the deprecated state and you attempt to do a backup or restore with that key record, it can fail. A key record that is in the terminated state can be removed from the system.

The following figure shows the process flow for creating keys in a prelive state or an active state.
Key record state considerations

The following considerations can be followed for key record states.

- Key record state transitions are well-defined and you must go through the whole path of states to delete a key record.

- Setting a key record to active bumps active key record to the inactive state for that group. There can only be one active record in a group.

- The deprecated state is useful for saving a key and restricting its use. If as an administrator you think that a key has been compromised you can manually put a hold on anyone using that key without that key being deleted from the system. You can set the key record to the deprecated state and someone attempting to do a backup or restore with this deprecated key would get an error.

- The key record deletion involves two steps helping to reduce the possibility of accidentally deleting a key. You must first set deprecated keys to terminated and then you can delete the key record. Only terminated key records can be deleted (other than the keys which are in the prelive state).

- You can use the prelive state to create a key record before use.
Prelive key record state
A key record that is created in the prelive state can be made active or deleted.
The prelive state can be used in the following way:
- The KMS administrator wants to test the creation of a key record without affecting the system. If the record is created correctly it can then be activated. If not created correctly the record can be deleted.
- The KMS administrator wants to create a key record, but then only activate it at some time in the future. The reasons for this issue may include delay setting the record active until the KMS keystore has been backed up (or the pass phrase has been recorded). Or delay setting the record active until some future time.
Key records in the prelive state can be made active or deleted from the system.

Active key record state
Active key records can be used to encrypt and decrypt data. If necessary, the active key record could be made inactive. The active state is one of the three most important data management states. The inactive state and deprecated state are the other two important data management states.
Key records can be created directly in the active state bypassing the prelive state.
Key records in the active state can either stay active or be made inactive. Active records cannot go back to the prelive state.

Inactive key record state
Inactive key records can be used to decrypt data. If necessary, the inactive key record could be made active again or moved to the deprecated state. The inactive state is one of the three most important data management states. The active state and deprecated state are the other two important data management states.
Key records in the inactive state can either stay inactive, be made active, or be made deprecated.

Deprecated key record state
Deprecated key records cannot be used to encrypt or decrypt data. If necessary, key records in the deprecated state could be made inactive or terminated. The deprecated state is one of the three most important data management states. The active state and inactive state are the other two important data management states.
The deprecated state can be used in the following ways:
- The use of a key needs to be tracked or regulated. Any attempt to use a deprecated key can fail, until its state is changed to the appropriate state.
A key should not be needed any longer, but to be safe is not set to the terminated state. Key records in the deprecated state can either stay deprecated, be made inactive, or terminated.

**Terminated key record state**

The terminated state adds a second step or safety step for deleting a deprecated state key record. A terminated key record can be moved to the deprecated state and ultimately made active again as needed. A terminated key record can also be deleted from the KMS.

---

**Caution:** Before deleting a key, make sure that no valid image exists which was encrypted with this key.

Key records in the terminated state can either stay terminated, be made deprecated, or physically deleted.

---

**About backing up the KMS database files**

Back up the KMS database involves backing up the KMS files. The KMS utility has an option for quiescing the database files or temporarily preventing anyone from modifying the data files. It is important to run the quiesce option if you plan to copy the `KMS_DATA.dat`, `KMS_HMKF.dat`, and `KMS_KPKF.dat` files to another location for backing up purposes.

During quiesce, NetBackup removes write access from these files; only read access is allowed.

When you run `nbkmsutil -quiescedb`, it returns with a quiesce successful statement and an indication of the number of outstanding calls. The outstanding calls number is more of a count. A count is placed on the file for the number of outstanding requests on this file.

After quiesce, you can then back up the files by copying them to another directory location.

After you have copied the files, you can unquiesce the KMS database files by using `nbkmsutil -unquiescedb`.

After the outstanding quiesce calls count goes to zero, the KMS can run the commands that can modify the `KMS_DATA.dat`, `KMS_HMKF.dat`, and `KMS_KPKF.dat` files. Write access is once again returned to these files.
About recovering KMS by restoring all data files

If you have made backup copies of the `KMS_DATA.dat`, `KMS_HMKF.dat`, and `KMS_KPKF.dat` files, it is just a matter of restoring these three files. Then startup the `nbkms` service and the KMS system will be up and running again.

Recovering KMS by restoring only the KMS data file

You can restore the backed-up copy of the KMS data file `kms/db/KMS_DATA.dat` by regenerating the `KMS_HMKF.dat` and `KMS_KPKF.dat` files with pass phrases. So, if you have written down pass phrases for the host master key and key protection key, you can run a command to regenerate those files. The system prompts you for the pass phrase and if the pass phrase you now enter matches the pass phrase originally entered, you will be able to reset the files.

**To recover KMS by restoring only the KMS data file**

1. Run the `nbkms --resetkpk` command.
2. Run the `nbkms --resethmk` command.
3. Startup the `nbkms` service.

Recovering KMS by regenerating the data encryption key

You can regenerate the complete KMS database by regenerating the data encryption keys. The goal is to create a brand new empty KMS database and then repopulate it with all your individual key records.

**To recover KMS by regenerating the data encryption key**

1. Create an empty KMS database by running the following command

   `nbkms --createemptydb`

   You do not have to use the same host master key and key protection key. You can choose new keys.

2. Run the `nbkmsutil --recoverkey` command and specify the key group, key name, and tag.

   `nbkmsutil --recoverkey -kgname ENCR_pool1 -keyname Q1_2008_key -tag d5a2a3df1a32eb61aff9e269ec777b5b9092839c6a75fa17bc2565f725aafe90`

   If you did not keep an electronic copy of the output of the `nbkmsutil --listkey` command when you created the key, you must enter all 64 characters manually.
3  Enter the pass phrase at the prompt. It must be an exact match with the original
pass phrase you previously provided.

**Note:** If the tag you enter already exists in the KMS database, you cannot
recreate the key.

4  If the recovered key is the key that you want to use for backups, run the
following command to make the key active:

```
nbkmsutil -modifykey -kgname ENCR_pool1 -keyname Q1_2008_key
-state active
```

The `-recoverkey` option places the key record in the inactive state, and it is
brought into the KMS database in the inactive state.

5  If this is a key record that is to be deprecated, run the following command:

```
nbkmsutil -modifykey -kgname ENCR_pool1 -keyname Q1_2008_key
-state deprecated
```

### Problems backing up the KMS data files

There can be problems backing up the KMS data files with the normal NetBackup
tapes or with the catalog backup.

**Caution:** The KMS data files are not included in the NetBackup catalog backups.

If the KPK, HMK, and key files were included in a catalog backup, and the catalog
backup tape is lost, the keystore is compromised because the tape contains
everything needed to gain access to the keys.

Significant problems can exist if both the catalog backup and data tapes are lost
together on the same transport truck, for example. If both tapes are lost together
then that situation is not be any better than not ever encrypting the tape in the first
place.

Encrypting the catalog is not a good solution either. If the KPK, HMK, and key file
were included in a catalog backup, and the catalog backup itself is encrypted, you
have done the equivalent of locking the keys in the car. To protect from this problem
is why KMS has been established as a separate service for NetBackup and why
the KMS files are in a separate directory from the NetBackup directories. However,
there are solutions for backing up the KMS data files.
Solutions for backing up the KMS data files

The best solution for backing up KMS data files is to do so outside of the normal NetBackup process, or rely on pass phrase generated encryption keys to manually rebuild KMS. All of the keys can be generated by pass phrases. So if you have recorded all of the pass phrases, then you can recreate the KMS manually from the information you have written down. One way to back up KMS is to place the KMS information on a separate CD, DVD, or USB drive.

Creating a key record

The following procedure shows how to create a key record using a pass phrase and bypassing the prelive state and creating an active key.

**Note:** If an attempt is made to add a key to a group that already has an active key, the existing key is automatically moved to the inactive state.

**To create a key record and create an active key**

1. To create a key record enter the following command:

   ```
   nbkmsutil -createkey -usepphrase -kgname ENCR_mygroup -keyname my_latest_key -activate -desc "key for Jan, Feb, March data"
   ```

2. Enter a pass phrase.

Listing keys from a key group

Use the following procedure to list all or selected keys that you created in a particular key group.

**To list the keys in a key group**

- To list the keys in a key group enter the following command:

  ```
  nbkmsutil -listkeys -kgname ENCR_mygroup
  ```

  The `nbkmsutil` outputs the list in the verbose format by default. Following is a non-verbose listing output.

  ```
  KGR ENCR_mygroup AES_256 1 Yes 134220503860000000
  134220503860000000 -
  KR my_latest_key Active 134220507320000000 134220507320000000 key for Jan, Feb, March data
  Number of keys: 1
  ```
The following options help to list all keys from a specific key group or a specific key from a particular key group:

```
# nbkmsutil -listkeys -all | -kgname <key_group_name> [ -keyname <key_name> | -activekey ]
  [ -noverbose | -export ]
```

The `-all` option lists down all the keys from all the key groups. The keys are listed in a verbose format.

The `-kgname` option lists the keys from the specified key group.

The `-keyname` option lists a specific key from the specified key group. It must however be used with the option `-kgname`.

The `-activekey` option lists an active key from the specified key group name. It must however be used with the `-kgname` option.

**Note:** The `-activekey` and `-keyname` options are mutually exclusive.

The `-noverbose` option lists the details of the keys and key groups in a formatted form (non-readable). The default is a verbose list.

The `-export` option generates an output that the key_file requires. (The `key_file` is used in `nbkmsutil -export -path <key_container_path> -key_file <key_file>`. You can use the output for another `key_file`.

Run the following command to list all the keys from a specific key group:

```
nbkmsutil -listkeys -kgname <key_group_name>
```

Run the following command to list specific keys from a specific key group:

```
nbkmsutil -listkeys -kgname <key_group_name> -keyname <key_name>
```

Run the following command to list all keys from all groups:

```
nbkmsutil -listkeys -all
```

Run the following command to list all keys from a specific key group:

```
nbkmsutil -listkeys -kgname <key_group_name>
```

Run the following command to list the active keys from a specific key group:

```
nbkmsutil -listkeys -kgname <key_group_name> -activekey
```

**Configuring NetBackup to work with KMS**

Configuring NetBackup to work with KMS involves the following topics:
- NetBackup getting key records from KMS
  See “NetBackup and key records from KMS” on page 381.
- Setting up NetBackup to use encryption
  See “Example of setting up NetBackup to use tape encryption” on page 381.

**NetBackup and key records from KMS**

The first step in configuring NetBackup to work with KMS is to set up a NetBackup-supported, encryption-capable tape drive and the required tape media.

The second step is to configure NetBackup as you would normally, except that the encryption-capable media must be placed in a volume pool with the identical name as the key group you created when you configured KMS.

---

**Note:** The Key Management feature requires the key group name and NetBackup volume pool name match identically and both be prefixed with `ENCR_`. This method of configuration-enabled encryption support to be made available without requiring major changes to the NetBackup system management infrastructure.

---

**Example of setting up NetBackup to use tape encryption**

The following example sets up two NetBackup volume pools created for encryption (with the `ENCR_` prefix).

The following figure shows the **NetBackup Administration Console** with two volume pools with the correct naming convention to use KMS.
Figure 9-3  NetBackup Administration Console with two volume pools set up to use KMS

Figure 9-4 shows a NetBackup Policy that is configured to use the volume pool ENCR_testpool, which is the same name as the key group that you configured earlier.
When a NetBackup image has been encrypted, the key tag is recorded and associated with the image. You can see this information through the **NetBackup Administration Console** reports, or in the output of the `bpimmedia` and `bpimagelist` commands.
About using KMS for encryption

You can use KMS to run an encrypted tape backup, verify an encrypted tape backup, and manage keys. The following topics provide examples for each of these scenarios:

- Example of running an encrypted tape backup
  See “Example of running an encrypted tape backup” on page 384.

- Example of verifying an encryption backup
  See “Example of verifying an encryption backup” on page 385.

- About importing KMS encrypted images
  See “About importing KMS encrypted images” on page 384.

About importing KMS encrypted images

Importing KMS encrypted images is a two-phase operation. In phase one, the media header and each fragment backup header is read. This data is never encrypted. However, the backup headers indicate if the fragments file data is encrypted with KMS or not. In summary, phase one does not require a key.

Phase two rebuilds the catalog .f file, which requires it to read the encrypted data. The key-tag (KAD in SCSI terms) is stored on the tape by the hardware. The NBU/BPTM reads the key-tag from the drive, and sends it to KMS for a key lookup. If KMS has a key, then the phase two processes continues to read the encrypted data. If KMS has no key, the data is not readable until the KMS has the key recreated. This is when the pass phrase is important.

If you do not destroy keys, then KMS contains all the keys ever used and you can import any encrypted tape. Move the keystore to your DR site and you do not need to recreate it.

Example of running an encrypted tape backup

To run an encrypted tape backup, you must have a policy that is configured to draw from a volume pool with the same name as your key group.

Figure 9-5 shows a NetBackup Policy that you have configured to use the volume pool ENCR_pool1.
Example of verifying an encryption backup

When NetBackup runs a tape-encrypted backup, and you view the Images on Media, you see the encryption key tag that is registered with the record. This key tag is your indication that what was written to tape was encrypted. The encryption key tag uniquely identifies which key was used to encrypt the data. You can run a report and read down the policy column to determine whether everything on a particular tape was encrypted.
KMS database constituents

The KMS database consists of three files:

- The keystore file (*KMS_DATA.dat*) contains all the key group and key records along with some metadata.
- The KPK file (*KMS_KPKF.dat*) contains the KPK that is used to encrypt the ciphertext portions of the key records that are stored in the keystore file.
- The HMK file (*KMS_HMKF.dat*) contains the HMK that is used to encrypt the entire contents of the keystore file. The keystore file header is an exception. It contains some metadata like the KPK ID and HMK ID that is not encrypted).

Creating an empty KMS database

An empty KMS database can be created by executing the command `nbkms -createemptydb`.

This command prompts you for the following information:

- HMK pass phrase (leave empty for a random HMK)
- HMK ID
- KPK pass phrase (leave empty for a random KPK)
- KPK ID

The KMS database backup and disaster recovery procedures vary for random and pass phrase-generated KPK and HMK as described below.

**To recover when the HMK and KPK were generated randomly**

1. Restore the keystore file from a backup.
2. Execute the command `nbkms -info` to find out the KPK ID and HMK ID of the KPK and HMK needed to decrypt this keystore file. The output should also inform you that the HMK and KPK for this keystore file were generated randomly.
3. Restore the HMK file corresponding to the HMK ID from a secure backup.
4. Restore the KPK file corresponding to the KPK ID from a secure backup.

Importance of the KPK ID and HMK ID

To decipher the contents of a keystore file, it is essential to identify the right KPK and HMK that will do the job. The KPK ID and HMK ID enable you to make this identification. Since these IDs are stored unencrypted in the keystore file header, they can be determined even if you only have access to the keystore file. It is
important to choose unique IDs and remember the association of IDs to pass phrases and files to be able to perform a disaster recovery.

About periodically updating the HMK and KPK

The HMK and KPK can be updated periodically using the modifyhmk and modifykpk options of the KMS CLI. These operations prompt you for a new pass phrase and ID and then update the KPK/HMK. You can choose either a random or a pass phrase-based KPK/HKM at each such invocation.

Note: It is a best practice to use the -usephrase option when modifying the HMK and KPK so that you are required to use a known pass phrase for future recovery. With the -nopphrase option, KMS generates a random pass phrase that is unknown and eliminates the possibility of future recovery if needed.

Backing up the KMS keystore and administrator keys

The important KMS data files can be backed up by making copies of the key database KMS_DATA.dat, the Host Master Key KMS_HMKF.dat, and the Key Protection Key KMS_KPKF.dat.

On Windows these files are as follows:

\Program Files\Veritas\kms\db\KMS_DATA.dat
\Program Files\Veritas\kms\key\KMS_HMKF.dat
\Program Files\Veritas\kms\key\KMS_KPKF.dat

On UNIX these files are at this location:

/opt/openv/kms/db/KMS_DATA.dat
/opt/openv/kms/key/KMS_HMKF.dat
/opt/openv/kms/key/KMS_KPKF.dat

Command line interface (CLI) commands

The following topics describe the command line interface (CLI), as follows:

- CLI usage help
  See “CLI usage help” on page 388.

- Create a new key group
  See “Create a new key group” on page 389.

- Create a new key
  See “Create a new key” on page 389.
CLI usage help

To get CLI usage help, use the NetBackup Key Management Service (KMS) utility command (the nbkmsutil command) with the included arguments.

Use nbkmsutil -help -option for help on an individual option.
Create a new key group

To create a new key group, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments.

```
# nbkmsutil -help -createkg
nbkmsutil -createkg -kgname <key_group_name>
  [ -cipher <type> ]
  [ -desc <description> ]
```

*Note:* The default Cipher is AES_256.

- `kgname` Specifies the name of the new key group (it has to be unique within the keystore).
- `cipher` Specifies the type of cipher that is supported by this key group.

Create a new key

To create a new key, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments.

```
# nbkmsutil -help -createkey
nbkmsutil -createkey [ -nophrase ]
  -keyname <key_name>
  -kgname <key_group_name>
  [ -activate ]
  [ -desc <description> ]
```

*Note:* The default key state is prelive.
-nopphrase  Creates the key without using a pass phrase. If this option is not
specified, the user is prompted for a pass phrase.

-keyname  Specifies the name of the new key (it should be unique within the key
group to which it belongs).

-kgname  Specifies the name of an existing key group to which the new key should
be added.

-activate  Sets the key state to active (default key state is prelive).

Note: From this release, a salt is generated when you create a new key using a
pass phrase. In the event where you try to recover a key, the system prompts you
for a salt along with the pass phrase and key tag.

Modify key group attributes

To modify the key group attributes, use the NetBackup Key Management Service
(KMS) utility command (the nbkmsutil command) with the included arguments.

# nbkmsutil -help -modifykg
nbkmsutil -modifykg -kgname key_group_name
[ -name <new_name_for_the_key_group> ]
[ -desc <new_description> ]

-kgname  Specifies the name of the key group to be modified.

-name  Specifies the new name of the key group (should be unique within the
keystore).

Modify key attributes

To modify the key attributes use the NetBackup Key Management Service (KMS)
utility command (the nbkmsutil command) with the included arguments.

# nbkmsutil -help -modifykey
nbkmsutil -modifykey -keyname <key_name>
-kgname <key_group_name>
[ -state <new_state> | -activate ]
[ -name <new_name_for_the_key> ]
[ -desc <new_description> ]
[ -move_to_kgname <key_group_name> ]
Note: The -state and -activate options are mutually exclusive.

- **KeyName**
  Specifies the name of the key to be modified.

- **KgName**
  Specifies the name of the key group to which this key belongs.

- **Name**
  Specifies the new name of the key (it should be unique within the key group).

- **State**
  Specifies the new state of the key (see valid key state transition order).

- **Activate**
  Sets the key state to active.

- **Desc**
  Adds the new description to the key.

- **Move To KgName**
  Specifies the name of the key group that the key has to be moved to.

### Get details of key groups

To get details of key groups, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments.

```bash
# nbkmsutil -help -listkgs
nbkmsutil -listkgs [ -kgname <key_group_name> ] [ -cipher <type> ] [ -emptykgs ] [ -noactive ] [ -noverbose ]
```

**Note:** By default all of the key groups are be listed. If no option is specified, the details of all of the key groups are returned.

- **KgName**
  Specifies the name of a key group.

- **Cipher**
  Gets the details of all the key groups which support specific cipher type.

- **EmptyKgs**
  Gets the details of all the key groups with zero keys in it.

- **NoActive**
  Gets the details of all the key groups in which there is no active key.

- **NoVerbose**
  Prints the details in formatted form (non-readable) format. The default is verbose. The output is displayed in a human readable form.
The -export option generates an output that the key_file requires. The key_file is used in the nbkmsutil -export -path <key_container_path> -key_file file. The output can be used for another key_file.

# nbkmsutil -listkeys -all | -kgname <key_group_name>
[ -keyname <key_name> | -activekey ]
[ -noverbose | -export ]

Get details of keys

To get details of the keys, use the NetBackup Key Management Service (KMS) utility command (the nbkmsutil command) with the included arguments.

#nbkmsutil -help -listkeys
nbkmsutil -listkeys -kgname <key_group_name>
[ -keyname <key_name> | -activekey ]
[ -noverbose ]

-kgname Specifies the key group name. The details of all of the keys belonging to a key group are returned.

-keyname Gets the details of the specific key which belongs to a specific key group.

-activekey Gets the details of a specific key group's active key.

-noverbose Prints the details in formatted form (non-readable) format. The default is verbose. The output is displayed in a human readable form.

Delete a key group

To delete a key group, use the NetBackup Key Management Service (KMS) utility command (the nbkmsutil command) with the included arguments.

Note: Only empty key groups can be deleted.

# nbkmsutil -help -deletekg
nbkmsutil -deletekg -kgname <key_group_name>

-kgname Specifies the name of the key group to be deleted. Only empty key groups can be deleted.
Only empty key groups can be deleted with `-deletekg` option. You can however, also force delete a key group even if it is not empty. Run the following command to force delete a key group:

```
# nbkmsutil -deletekg -kgname <key_group_name> -force
```

### Delete a key

To delete a key, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments.

```
# nbkmsutil -help -deletekey
nbkmsutil -deletekey -keyname <key_name> -kgname <key_group_name>
```

**Note:** Keys in either prelive state or terminated state can be deleted.

- `-keyname` Specifies the name of the key to be deleted (to delete, key state has to be in one of prelive, or terminated).
- `-kgname` Specifies the name of the key group to which this key belongs.

### Recover a key

To recover a key, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments.

```
# nbkmsutil -help -recoverkey
nbkmsutil -recoverkey -keyname <key_name> -kgname <key_group_name> -tag <key_tag> [ -desc <description> ]
```

**Note:** The key state would be set to inactive.

The restore could fail if a key that is used in encrypting the backup data is lost (and no copy of it is available). These keys can be recovered (re-created) with the knowledge of the original key’s attributes (tag and pass phrase).

- `-keyname` Specifies the name of the key to be recovered (re-created).
- `-kgname` Specifies the name of the key group to which this key should belong.
-tag  Specifies the tag that identifies the original key (we need to use the same tag).

**Note:** The user is prompted to enter the correct pass phrase to get the right key (the system does not verify the validity of entered pass phrases).

**Note:** From this release, whenever you recover a key, the system prompts you for a salt. A salt is generated for pass phrase derived keys in this version of KMS. To recover the keys that were generated with an older version of KMS, leave the salt field blank.

---

**About exporting and importing keys from the KMS database**

The export and import of keys allows the user to quickly sync multiple NetBackup domains to use the same set of keys or quickly move a set of keys from one domain to another domain. This feature is especially helpful for a disaster recovery-induced restore on a different NetBackup domain.

**Exporting keys**

The `-export` command helps to export keys and key groups across domains. The following list contains important information about exporting keys and key groups:

- Keys are always exported along with their key group.
- Keys and key groups are exported in an encrypted key container (file) on the host where the Key Management Service (KMS) utility (`nbkmsutil`) is executed. The key container is pass phrase protected.

**Note:** The same pass phrase must be provided when you want to import the keys and key groups.

- Multiple ways of specifying the export contents are to select specific key groups or to selectively export keys.

Use the `-export` command as specified:

```
    nbkmsutil -export -path <secure_key_container>
    [ -key_groups <key_group_name_1 ...> | -key_file <key_file_name> ]
```

By default, the entire keystore is exported.
The `-path` command refers to a fully qualified path where the secure key container is stored.

The `-key_groups` command helps to list the key groups names that separated by spaces.

The `-key_file` command is the file path that lists the keys to be exported in a specific format.

The `<key_group_name>/<key_name>` command helps the user to export keys selectively. You can use a `'*'` to export all the keys from a particular group as shown:

```
<key_group_name>/*
```

You can use the `nbkmsutil -listkeys -export` command to generate an output in a format that this option requires. Refer `nbkmsutil -listkeys -export` for more details.

For more details about listing keys:

See “Listing keys from a key group” on page 379.

---

**Note:** The `-key_groups` and `-key_file` commands are mutually exclusive.

Run the following command to export the entire keystore:

```
nbkmsutil -export -path <secure_key_container>
```

Run the following command to export selected key groups:

```
nbkmsutil -export -path
<secure_key_container> -key_groups
<key_group_name_1 key_group_name_2 ...>
```

Run the following command to export selectively export keys:

```
nbkmsutil -export -path
<secure_key_container> -key_file
<key_file_name>
```

**Troubleshooting common errors during an export**

A set of errors that occur when you export the keys and key groups. This section helps you to troubleshoot them.

- The export can fail when the key container that you specify already exists on the host.
  
  Specify a different key container file and rerun the export operation.
Export also fails when you mention incorrect keys or key group names.
You must correct the keys or key group names and export them again.

Importing keys

The -import command helps to import keys and key groups across domains. The following list contains important information about importing keys and key groups:

- When importing keys and key groups, you must have the key container file that is created during the export operation. You also need the same pass phrase that is used during the export.

- Importing keys is an atomic operation. It reverts backs all updates on encounter of any error during operation.

- Partial import is not supported.

- A preview of the import output is available. Run the -preview command to preview the results of the import.

- The import operation can have two modes, one that includes the -preserve_kgname command and another that excludes the -preserve_kgname command.

  By default, the key groups are imported with following name format:
  `<Original_Kgname_<timestamp>`

  You can opt to preserve the key group name by explicitly specifying the <-preserve_kgname> option.

- Duplicate keys such as the keys with the same key tag or the same key are not imported.

- The import does not support key group merging.

  You can however merge the keys, import the key group without using the <-preserve_kgname> command. Run the nbkmsutil -modifykey -keyname <key_name> -kname <key_group_name> command to move key from current group to the required group.

  For more information about moving keys:

  See “Modify key attributes” on page 390.

If the same key(s) or key(s) that have the same key tags exist in a key group, they are ignored during import. Run the following commands to import the keys and key groups:

# nbkmsutil -import -path <secure_key_container>

[-preserve_kgname]
The `-preserve_kgname` command preserves the key group names during import.

The `-desc <description>` command is a description that is associated with the key groups during import.

The `-preview` command display a preview of the import results.

Run the import operation with the `-preserve_kgname` as follows:

```
nbkmsutil –import -path <secure_key_container> [-preserve_kgname]
```

When you run the `-import` command with the `-preserve_kgname` command, the import operation tries to import the original key groups names from the key container. If a key group with the same name exists, the import operation fails.

Run the import operation without the `-preserve_kgname` as follows:

```
nbkmsutil –import -path <secure_key_container>
```

When you run the `-import` command without the `-preserve_kgname` it imports the key groups, but the key group names are renamed using a suffix, for example a timestamp. Each key group that is renamed always has a unique name.

**Troubleshooting common errors during an import**

A set of errors that occur when you import the keys and key groups. This section helps you to troubleshoot them.

- During an import, when you import key groups with the [-preserve_kgname ] option, and if that group already exists in KMS, the entire operation fails. You must either delete or rename the existing key groups or exclude the [-preserve_kgname ] option and rerun the import operation.

- NetBackup KMS has a limit of 100 key groups. Each group has a limit of 30 keys. The operation fails if more than 100 key groups are imported. You must delete existing unwanted key groups and rerun the import operation.

**Modify host master key (HMK)**

To modify the host master key, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments.
The HMK is used to encrypt the keystore. To modify the current HMK, the user should provide an optional seed or pass phrase. An ID (HMK ID) should also be provided that can remind them of the specified pass phrase. Both the pass phrase and HMK ID are read interactively.

```
# nbkmsutil -help -modifyhmk
nbkmsutil -modifyhmk [ -nopphrase ]
```

**Get host master key (HMK) ID**

To get the HMK ID, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments. The HMK ID is then returned.

```
# nbkmsutil -help -gethmkid
nbkmsutil -gethmkid
```

**Get key protection key (KPK) ID**

To get the KPK ID, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments. The command returns the current KPK ID.

```
# nbkmsutil -help -getkpkid
nbkmsutil -getkpkid
```

**Modify key protection key (KPK)**

To modify the key protection key, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments.

The KPK is used to encrypt the KMS keys. Currently, the KPK is per keystore. To modify the current KPK, the user should provide an optional seed or pass phrase. Also, provide an ID (KPK ID) that can remind us of the specified pass phrase. Both the pass phrase and KPK ID are read interactively.

```
# nbkmsutil -help -modifykpk
nbkmsutil -modifykpk [ -nopphrase ]
```

**Get keystore statistics**

To get the keystore statistics, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments.

This command returns the following keystore statistics:
- Total number of key groups
- Total number of keys
- Outstanding quiesce calls

```bash
# nbkmsutil -help -ksstats
nbkmsutil -ksstats [-noverbose]
```

**Quiesce KMS database**

To quiesce the KMS database, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments.

This command sends the quiesce request to KMS. If the command succeeds, the current outstanding quiesce count is returned as multiple backup jobs might quiesce the KMS database.

```bash
# nbkmsutil -help -quiescedb
nbkmsutil -quiescedb
```

**Unquiesce KMS database**

To unquiesce the KMS database, use the NetBackup Key Management Service (KMS) utility command (the `nbkmsutil` command) with the included arguments.

This command sends an unquiesce request to KMS. If the command succeeds, the current outstanding quiesce count is returned. A count of zero (0) means that the KMS database is completely unquiesced.

```bash
# nbkmsutil -help -unquiescedb
nbkmsutil -unquiescedb
```

**Key creation options**

Any use of the NetBackup KMS feature should include creating a backup of the `kms/db` and `kms/key` directories. The protection keys and the key database exist in two separate subdirectories to facilitate splitting these when creating a backup copy.

**Note:** Due to the small size of these files, that they change infrequently, and that they must not be included on any NetBackup tape that itself is encrypted, the files should be manually copied to backup media.
**Note:** The recommended approach for creating keys with this version of KMS is to always create keys from pass phrases. This includes both the protection keys (Host Master Key and Key Protection Key), and the data encryption keys associated with the key records). It is recommended that the pass phrases used to create the keys are recorded and stored for recovery purposes.

While allowing the KMS system to randomly generate the encryption keys provides a stronger solution, this usage cannot recover from the loss or corruption of all copies of the keystore and protection keys, and therefore is not encouraged.

**Troubleshooting KMS**

Use the following procedure to initiate troubleshooting for KMS.

**To initiate troubleshooting for KMS**

1. Determine what error code and description are encountered.
2. Check to determine if KMS is running and that the following KMS data files exist:
   - `kms/db/KMS_DATA.dat`
   - `kms/key/KMS_HMKF.dat`
   - `kms/key/KMS_KPKF.dat`

   If the files do not exist, then KMS has not been configured, or the configuration has been removed. Find out what happened to the files if they do not exist. If KMS has not been configured, the `nbkms` service is not running. If KMS is not running or is not configured, it does not affect NetBackup operation. If you have previously used the `ENCR_` prefix for a volume pool name, this name must be changed as `ENCR_` now has special meaning to NetBackup.
3. Get the KMS configuration information:
   - Get a key group listing by running the command `nbkmsutil listkgs`. Get a listing of all the keys for a key group by running the command `nbkmsutil listkeys -kgname key_group_name`.
4. Get operational log information such as KMS logs by way of VxUL OID 286 and BPTM logs.
5. Evaluate the log information. The KMS errors are handed back to BPTM.
6. Evaluate the KMS errors that are recorded in the KMS log.
Solution for backups not encrypting

If tape backups are not encrypted, consider the following solutions:

- Verify that a backup is not encrypted by checking that the encryption key tag field is not set in the image record.
- Verify that the key group and volume pool names are an exact match.
- Verify that there is a key record in the key group with an active state.

Other non-KMS configuration options to look at include:

- Verify that everything that is related to traditional media management is configured properly.
- Is the NetBackup policy drawing a tape from the correct volume pool.
- Does the encryption-capable tape drive have encryption capable media available. For example is LTO4 media installed in the LTO4 tape drive?

Solution for restores that do not decrypt

If the encrypted tape restores are not decrypting, consider the following solutions:

- Verify that the original backup image was encrypted to begin with by viewing the encryption key tag field in the image record.
- Verify that the key record with the same encryption key tag field is in a record state that supports restores. Those states include active or inactive states.
- If the key record is not in the correct state change the key back to the inactive state.

Other non-KMS configuration solution options to consider:

- Verify that the drive and media support encryption.
- Is the encrypted media being read in an encryption-capable tape drive?

Troubleshooting example - backup with no active key record

The following example shows what happens when you attempt a backup when there is no active key record.

Figure 9-6 shows a listing of key records. Three of them have the key group ENCR_mygroup and the same volume pool name. One key group named Q2_2008_key was active. At the end of the command sequence, the state of the Q2_2008_key key group is set to inactive.
Figure 9-6  Listing of key records

```
fig (root) [385]: nbkmsutil -listkeys -kname ENCR_mygroup
Key Group Name : ENCR_mygroup
Supported Cipher : AES_256
Number of Keys : 3
Has Active Key : Yes
Creation Time : Sat Mar 15 10:45:55 2008
Last Modification Time: Sat Mar 15 10:45:55 2008
Description : -
  Key Tag : cf7ac430d8795a9b39e703821371ed10be6ec80eab72d89aef6f8a791fc2460d
  Key Name : Q2_2008_key
  Current State : Active
  Creation Time : Sat Mar 15 11:02:46 2008
  Last Modification Time: Sat Mar 15 11:02:46 2008
  Description : key for Apr, May, & Jun
  Key Tag : d5a2a3df1a32eb61aff9e269ec777b5b9092839c6a75fa17bc2565f725a9fe90
  Key Name : Q1_2008_key
  Current State : Inactive
  Last Modification Time: Sat Mar 15 10:46:51 2008
  Description : Key for Jan, Feb, & March
  Key Tag : d5a2a3df1a32eb61aff9e269ec777b5b9092839c6a75fa17bc2565f725a9fe91
  Key Name : test
  Current State : Inactive
  Description : -
Number of Keys: 3
fig (root) [383]: nbkmsutil -modifykey -keyname Q2_2008_key -kname ENCR_mygroup -state Inactive
Key details are updated successfully
```

Figure 9-7 shows the listing of key records that are produced again, and you can see that the Q2_2008_key state is now listed as inactive.
With no active key, what happens to the backup?

**Figure 9-8** shows the BPTM log output. It logs the message within the 1227 error code in the BPTM log.

**Figure 9-8** Output from `bptm` command
The Job Details dialog box shows the detailed status. You can see a message stating what failed and the detailed status. With the information in the previous diagnostics, you can determine the particular problem or to identify what a given problem is related to.

Troubleshooting example - restore with an improper key record state

The following example shows a restore with a key record in an improper state.

**Figure 9-9** shows that a record you need is set to deprecated. This following shows the listing. The same command is used to change the state from inactive to deprecated.

**Figure 9-9** Listing of key records with key group deprecated

```
- fel (root) [426]: 1385
  nbkmsutil -listkeys -kname ENCR_mygroup

  Key Group Name : ENCR_mygroup
  Supported Cipher : AES_256
  Number of Keys : 3
  Has Active Key : No
  Creation Time : Sat Mar 15 10:45:55 2008
  Last Modification Time: Sat Mar 15 10:45:55 2008
  Description : -

  Key Tag : d5a2a3df1a32eb61aff9e269ec777b5b9092839c6a75fa17bc2565f725aafe90
  Key Name : Q1_2008_key
  Current State : Inactive
  Last Modification Time: Sat Mar 15 10:46:51 2008
  Description : Key for Jan, Feb, & March

  Key Tag : d5a2a3df1a32eb61aff9e269ec777b5b9092839c6a75fa17bc2565f725aafe91
  Key Name : test
  Current State : Inactive
  Creation Time : Sat Mar 15 10:12:25 2008
  Last Modification Time: Sat Mar 15 10:12:25 2008
  Description : -

  Key Tag : cf7ac430d8795a9b39e703821371ed10be6e808eab72d89a6f6a791fc2460d
  Key Name : Q2_2008_key
  Current State : **Deprecated**
  Creation Time : Sat Mar 15 11:02:46 2008
  Last Modification Time: Mon Mar 17 14:52:59 2008
  Description : key for Apr, May, & Jun

Number of Keys: 3
```

**Figure 9-10** shows the ```bptm``` log output with the 1242 error returned.
Figure 9-10   bptm log output with error 1242

14:53:48.782 [21109] <2> io_read_back_header: drive index 0, reading backup header
14:53:48.791 [21109] <2> io_position_for_read: successfully positioned UB011 to file number 3
14:53:48.796 [21109] <2> io_position_for_read: next block encryption status: LGN 0x0000000000000000, algorithm index 1, encryption status 0x6
14:53:48.796 [21109] <2> io_position_for_read: Kad type 0x0, kad length 32 Kad
[cf7ae430de879a39e30e703821771ed10be66c80eb72b89ae6f6a791f0c2460d]
14:53:48.796 [21109] <2> KMSSLIB::kmSetKeyAndKadByKeyIdTag: Entering function... (KMSSlib.cpp:655)
14:53:48.796 [21109] <2> KMSSLIB::GetQueryTableFromInstance: Entering function... (KMSSlib.cpp:207)
14:53:48.796 [21109] <2> KMSSLIB::Init2: Entering function... (KMSSlib.cpp:158)
14:53:48.797 [21109] <2> Orb::init: Created non service name: NB_21109_1537488328610200 (Orb.cpp:600)
Regenerating keys and certificates

This chapter includes the following topics:

- About regenerating keys and certificates
- Regenerating NetBackup authentication broker keys and certificates
- Regenerating host identity keys and certificates
- Regenerating web service keys and certificates
- Regenerating nbcertservice keys and certificates
- Regenerating tomcat keys and certificates
- Regenerating JWT keys
- Regenerating NetBackup gateway certificates
- Regenerating web trust store certificates
- Regenerating VMware vCenter plug-in certificates
- Regenerating OpsCenter Administrator Console session certificates
- Regenerating OpsCenter keys and certificates
- Regenerating NetBackup encryption key file

About regenerating keys and certificates

Some of the keys and certificates can be recreated by simply restarting the NetBackup services. If you encounter any error related to keys or certificates, as a
best practice, restart the NetBackup services and verify if the keys or the certificate is recreated. If the key or certificate is not created proceed with the procedures mentioned in the following sections.

**Regenerating NetBackup authentication broker keys and certificates**

Follow the steps to regenerate NetBackup Authentication Broker’s:

- Public and private keys on master server and media server.
- Certificates on the media server and clients.

To regenerate NetBackup authentication broker keys and certificates

1. Restart the NetBackup Authentication service. Ensure that the service is up and running.
2. Run the following command:
   ```bash
   bpnbaz -ConfigureAuth
   ```
   Answer `y` when prompted.
   For information on the command, see *Veritas NetBackup Commands Reference Guide*.
3. Restart all the NetBackup services. Before you restart the services, ensure that no jobs are running.
   For information on how to restart the services, see *Veritas NetBackup Administrator’s Guide, Volume I*.

**Regenerating host identity keys and certificates**

To regenerate host identity public keys, private keys, and certificates on the master server, media server, and clients:

- Change the key pair for a host.
  Changing a key pair results in both a new host ID-based certificate and a new host name-based certificate.
  See “Changing the key pair for a host” on page 297.

**Regenerating web service keys and certificates**

Follow the steps to regenerate web service public key and certificate on the master server.
To regenerate web service keys and certificates

1. Generate the security certificate. Run the following command:
   - Windows
     ```
     set WEBSVC_PASSWORD=<Password of User>
     nbcertconfig -t -user <User Name>
     ```
   - UNIX
     ```
     export WEBSVC_PASSWORD=<Password of User>
     nbcertconfig -t -user <User Name>
     ```

2. Configure NetBackupAuthentication service for the web service user and web service. Run the following command:
   ```
   nbcertconfig -u -user <username>
   nbcertconfig -m -user <username>
   ```

3. Restart the NetBackup Authentication service.

Regenerating nbcertservice keys and certificates

Follow the steps to regenerate nbcertservice keys and certificates on the master server.

To regenerate nbcertservice keys and certificates

1. Remove the old folder with user name.

2. Generate the security certificate. Run the following command:
   - Windows
     ```
     set WEBSVC_PASSWORD=<Password of User>
     nbcertconfig -u -user <User Name>
     ```
   - UNIX
     ```
     export WEBSVC_PASSWORD=<Password of User>
     nbcertconfig -u -user <User Name>
     ```

Regenerating tomcat keys and certificates

Follow the steps to regenerate tomcat public key, private key, and certificates on the master server.

Note: The jkskey is a key to decrypt the keystore used by tomcat and is backed up as part of the catalog backup. There is no need to regenerate it.
To regenerate tomcat keys and certificates

1. Generate the security certificate. Run the following command:
   - Windows
     ```
     set WEBSVC_PASSWORD=<Password of User>
     nbcertconfig -t -user <User Name>
     ```
   - UNIX
     ```
     export WEBSVC_PASSWORD=<Password of User>
     nbcertconfig -t -user <User Name>
     ```

2. Regenerate other files in `tomcatcreds` folder apart from the `keystore` and the `credentials` file. Run the following command:
   - Windows
     ```
     c:\ProgramFiles\Veritas\NetBackup\wmc\bin\install>configurecerts.bat
     ```
   - UNIX
     ```
     /usr/openv/wmc/bin/install/configurecerts
     ```

Regenerating JWT keys

To regenerate JWT public and private keys on the master server:
- Close the NetBackup Administrator Console and restart all the NetBackup services.
  For information on how to restart the services, see *Veritas NetBackup Administrator's Guide, Volume I*.

Regenerating NetBackup gateway certificates

To regenerate nbgateway certificates on the master server:
- Restart all the NetBackup service.
  For information on how to restart the services, see *Veritas NetBackup Administrator's Guide, Volume I*.

Regenerating web trust store certificates

To regenerate web trust store certificates on the master and media server, run the following command:
```
nbcertcmd -getCACertificate
```
Answer `y` when prompted.
Regenerating VMware vCenter plug-in certificates

Follow the steps to regenerate vCenter plug-in certificates on the master server.

To regenerate VMware vCenter plug-in certificates

1 List the existing certificates and identify the existing entry for invalid certificates. Run the following command:

- Windows
  C:\Program Files\Veritas\NetBackup\wmc\bin\install\manageClientCerts.bat -list

- UNIX
  /usr/openv/wmc/bin/install/manageClientCerts -list

2 Delete the invalid certificate. Run the following command:

- Windows
  C:\Program Files\Veritas\NetBackup\wmc\bin\install\manageClientCerts.bat -delete

- UNIX
  /usr/openv/wmc/bin/install/manageClientCerts -delete

3 Generate a new certificate. Run the following command:

- Windows
  C:\Program Files\Veritas\NetBackup\wmc\bin\install\manageClientCerts.bat -create <master_server_name>

- UNIX
  /usr/openv/wmc/bin/install/manageClientCerts -create <master_server_name>

4 Register the newly created certificate with the vCenter plug-in.

For more information, see Veritas NetBackup Plugin-in for VMware vCenter Guide.
Regenerating OpsCenter Administrator Console session certificates

To regenerate session certificates on the master server:
- Close the NetBackup Administrator Console and restart all the NetBackup services.
  For information on how to restart the services, see Veritas NetBackup Administrator’s Guide, Volume I.

Regenerating OpsCenter keys and certificates

Follow the steps to regenerate OpsCenter keys and certificates:

To regenerate OpsCenter keys and certificates
1 Reconfigure Authentication. Run the following commands on the OpsCenter server:
   OpsCenter_Install_path\server\bin\stopAt
   OpsCenter_Install_path\server\bin\configureAt
   OpsCenter_Install_path\server\bin\startAt

2 Restart the OpsCenter services. Run the following commands on the OpsCenter server:
   OpsCenter_Install_path\server\bin>opsadmin.bat stop
   OpsCenter_Install_path\server\bin>opsadmin.bat start

For more information in the OpsCenter commands, see Veritas NetBackup for OpsCenter Administrator’s Guide

Regenerating NetBackup encryption key file

To regenerate NetBackup encryption key file, run the following command:
bpkeyutil -clients client_name1,client_name2,...,client_namen

When you are prompted to enter the passphrase, enter the passphrase you had saved originally.

For more information about key files, see See “About creating encryption key files on the clients” on page 336.

To perform this task using the bpkeyutil, see the NetBackup Commands Reference Guide.
This chapter includes the following topics:

■ About the NetBackup web services account
■ Changing the web service user account

About the NetBackup web services account

Beginning with NetBackup 8.0, the NetBackup master server includes a configured web server to support critical backup operations. This web server operates under user account elements with limited privileges. These user account elements must be available on each master server (or each node of a clustered master server).

NetBackup requires account information for web services as part of the NetBackup master server installation.

More information is available on configuring this account prior to installation and on how to change the account after installation.

See the NetBackup Installation Guide for information on how to create the web server user and group.

See “Changing the web service user account” on page 413.

Note: For security purposes, do not allow the web server users or groups to have administrator or superuser privileges.
Changing the web service user account

To support changing web service user accounts, use the utility script `wmcUtils`. This utility script does not validate if a web service user and group exist. Before you use this utility, you must ensure that the web service user and the group exist and the user is part of the group. Consider the following when changing the web service user account:

- If your environment uses Windows domain users, use the `DOMAIN\USER` format.
- If you use a clustered environment on a Windows platform, the NetBackup web services user account must be a `DOMAIN` user. (Example: AD user)
- If you use non-clustered environments, the NetBackup web service user can be a local or a domain user.
- If you use a clustered environment on Linux or UNIX platforms, the NetBackup web service user can be a local user. Additionally, the group can be a local group. The NetBackup web service user must have the same name and UID on all nodes of the cluster. Also, the group must have the same name and GID on all nodes of the cluster. It is recommended to use domain users (Example: NIS) for clustered environments.

**Note:** Do not use the logged on user to run the `wmcUtils` utility script. If you are logged into an environment as `my_domain\my_user`, you cannot use this account to run the NetBackup Web Management Console service. NetBackup does not support this scenario.

To change the web service user account on Windows

1. Open command prompt.
2. Change the directory to: `install_path\wmc\bin\install`
3. Run `wmcUtils.bat -changeUser` to change the web service user.
   
   **Example:** (nbwebsvc1 is the web service user and nbwebgrp1 is the user group that nbwebsvc1 is a member of)
   
   `wmcUtils.bat -changeUser nbwebsvc1 nbwebgrp1`

   For more information about the `wmcUtils.bat` utility script, use the `wmcUtils.bat -help` option.

4. (Conditional) If using a clustered environment, run `wmcUtils.bat -changeUser` on the active and the inactive nodes.
5 Enter the web service user password (example: nbwebsvc1) when prompted by the script.

The NetBackup Web Management Console service is restarted when the correct password is entered. If you enter an incorrect password, a Logon failure error is displayed before the NetBackup Web Management Console service starts.

6 To verify that the web service user is changed, ensure that

install_path\bin\nbcertcmd.exe –ping works.

**Note:** The output of wmcUtils.bat utility script is captured in the nbwmc_support.log. The log is located here:

install_path\wmc\webserver\logs\nbwmc_support.log

---

**To change the web service user account on Linux or UNIX**

1 Open a shell.

2 Change the directory to: /usr/openv/wmc/bin/install

3 Run wmcUtils -changeUser to change the web service user.

   Example: (nbwebsvc1 is the web service user and nbwebgrp1 is the user group that nbwebsvc1 is a member of)

   usr/openv/wmc/bin/install/wmcUtils –changeUser nbwebsvc1 nbwebgrp1

   For more information about the wmcUtils utility script, use the wmcUtils -help option.

4 (Conditional) If using a clustered environment, run wmcUtils.bat –changeUser on the active and the inactive nodes.

5 Enter the web service user password (example: nbwebsvc1) when prompted by the script.

The NetBackup Web Management Console service is restarted when the correct password is entered. If you enter an incorrect password, a Logon failure error is displayed before the NetBackup Web Management Console service starts.

6 To verify that the web service user is changed, ensure that

/usr/openv/netbackup/bin/nbcertcmd –ping works.

**Note:** The output of wmcUtils utility script is captured in the nbwmc_support.log. The log is located here: /usr/openv/wmc/webserver/logs/nbwmc_support.log
Symbols
40-bit DES key
  library 330, 332
56-bit DES key
  library 332

A
Access Control. See NetBackup Access Control (NBAC)
  host properties 162
access management
  troubleshooting 169
Access Management utility 209, 245
add
  host ID to host name mapping 253
adding a new user to the user group 216
adding cluster mappings 261
adding host comment 263
adding shared mappings 261
adding shared or cluster mappings 261
administration
  NetBackup access management 148
Administration Console
  outgoing ports 102
Administrator Access Control user group 213
Alert Notification 126, 132–133
all NetBackup security
  multi-datacenter 88
all security implemented
  single datacenter 58
ALLOWED (encryption option) 333, 340
alternate client restore (see redirected restore) 338, 347
approving
  host ID to host name mappings 257
assigning a user to a user group 217
attribute for encryption 339, 347
audit event details 248–249
audit event status 250
audit events 247
Audit Manager 113, 126

audit service (nbaudit) 113–114, 126
auditing
  Alert Notification 126, 132–133
  configuration after upgrade 116
  enabling 117
  overview 113
  report 127, 129
  viewing current settings 115
auth.conf 124, 135, 143, 171
Authentication and Authorization troubleshooting 171
Authentication Domain tab 163, 167
authentication port 174
authorization objects 222
authorization objects and permissions 219
authorization port 174
Authorization Service tab 165
automatic backup
  key file 338

B
backing up KMS database files 376
backups
  choosing encryption for 329
  KMS keystore and administrator keys 387
  not encrypting, solution for 401
best practices
  for key file restoration 337
bp.conf file
  auditing changes in 115, 125
  port usage settings 108
bpcd 331–332
  terminating 350
bpclient command
  specifying 109
bpinst command 331–332
  for setting encryption attribute (legacy) 348
  pushing configuration to clients (legacy) 344
bpkeyfile command
  change_netbackup_pass_phrase option 343
  changing key file pass phrase 350
bpkeyfile command (continued)
  introduction (standard) 331–332
  managing the key file (legacy) 342

bpkeyutil command
  adding pass phrases 334
  creating the key file 336
  introduction 330
  managing the key file 334
  redirected restore 338, 347
  standard restore introduction 331

BUAndRest authorization object
  permissions 227

C

CA certificate 285

case sensitivity
  in command syntax 116–117, 127

catalog
  backups, retaining audit records 126
  role in deploying host ID-based certificates 280

catalog backups
  disaster recovery packages 272

Certificate Authority (CA) 242, 275–276, 283, 285, 287

certificate deployment security levels 276, 279, 281

certificate revocation list
  about 303
  determining if a certificate is revoked 309
  getting CRL manually from CA 304
  getting list of revoked hosts 311

certificates
  about revoking 304
  deploying 273
  importance of clock sync 284
  regenerating 406
  reissue 277
  revocation list 303
  viewing details 278

Change Server 124

changing
  client encryption settings from the server 339
  client legacy encryption settings 348

checksum of DES key
  explanation
    legacy encryption 331
    legacy restore 333
    standard encryption 330
    standard restore 332

class
  see policy 339, 347

client
  outgoing ports 101

Client Attributes host properties 280

client encryption settings
  changing 339

client legacy encryption settings
  changing 348

client side encryption
  multi-datacenter 71
  security 30
  single datacenter 49

clients
  configuring legacy encryption 340
  configuring standard encryption 333
  taking offline 125

clock sync for certificates 284

clustered environments
  additional key file security (legacy) 349
  managing the key file (legacy) 342
  managing the key file (standard) 334
  pushing configuration (legacy) 345
  pushing software (standard) 346

  cnpp option 343

  Combined world, enterprise, and data center levels 24

command line interface (CLI)
  usage help 388
  using 387

comparison
  encryption options 327

configuration
  and clustering (legacy) 344
  and clustering (standard) 336
  options (legacy) 340
  pushing to clients (legacy) 344

configuring
  clients for encryption
    from client (standard) 338
    from server (legacy) 344
    from server (standard) 335

  legacy encryption from the server 344
  ports 107
  standard encryption from the server 335

configuring NetBackup
  to work with KMS 380

configuring port usage client attribute settings
  bpclient command 109
considerations
  data at rest encryption 325
Copy Fingerprint to Clipboard option 288
creating
  a new key 389
  a new key group 389
  an empty KMS database 386
  key database 370
  key file 336
  key groups 371
  key records 372, 379
  new user group 214–215
creating reissue token for a cluster 316
CRL. See certificate revocation list
CRYPT option 348
CRYPT_CIPHER option 334
CRYPT_KEYFILE option 331–332, 341–342
CRYPT_KIND option 334, 341
CRYPT_LIBPATH option 341
CRYPT_OPTION 329, 333, 340, 344
CRYPT_STRENGTH option 332, 341, 344
D
data at rest encryption
  considerations 325
  terminology 324
database constituents
  KMS 386
datacenter
  multi 39
  single 39
datacenter-level
  security 19
decryption
  of key file (legacy) 349
  overview (legacy) 332
  overview (standard) 331
deduplication hosts
  and firewalls 102
deduplication port usage
  about 102
default
  port numbers
    NetBackup 97
Default User Access Control user group 214
default user groups 213
delete
  host ID-based certificates 311
deleting
  a key 393
  a key group 392
deleting host comment 263
DENIED (encryption option) 333, 340
deploying a host ID-based certificate on a cluster 316
deploying host ID-based certificate on cluster node 314
DES
  key checksum 331–333
  key checksum for standard encryption 330
DevHost authorization object
  permissions 231
disable
  random port assignments 107
disabling insecure communication 266
disaster recovery package 272
DiskPool authorization object
  permissions 226
documentation
  HTTPS ports 106
drive authorization object
  permissions 224
Dynamic Host Configuration Protocol (DHCP) 274
Eediting host comment 263
EMM database
  containing audit records 118, 126
  role in deploying host ID-based certificates 280
EMM server
  outgoing ports 100
  enabling cluster use
    KMS service 368
encrypted backup
  restoring (legacy) 347
  restoring (standard) 338
encrypted backup file
  restoring to another client 338
encrypted tapes
  reading 361
  writing 360
encryption
  allow
    deny. See require
    attribute 331
    setting 339
  configuration options (legacy) 340
  configuring from client (standard) 338
encryption  (continued)
  confirming the license for 328
  file containing keys for (legacy) 341
  installation prerequisites 328
  kind
    defining (legacy) 341
    defining (standard) 334
  legacy
    prerequisites 330
    prerequisites for restoring 332
    tar header 333
  libraries
    defining (legacy) 341
    managing from client (standard) 333
  of key file (legacy) 349
  overview (legacy) 332
  overview (standard) 331
  policy attribute 329
  policy attribute for
    how to set 339, 347
  security questions 326
  standard
    tar header 332
  strength
    defining (legacy) 341
    tar header
      legacy 331
      standard 330
  using KMS 384
  what is and isn’t encrypted (standard) 330

Encryption attribute
  in policies 347
  encryption backup
    running 329
  encryption key files
    creating on clients 336
  encryption options
    comparison 327
  encryption, legacy
    configuring 340
  encryption, standard
    on clients 333

Enhanced Auditing 135, 242
  about 119
  configuring 121
  configuring to use Change Server 124
  connecting to a media server 121
  disabling 125
  enabling 120

Enhanced Auditing  (continued)
  setting up trust between servers 122
  switching to NBAC 171
  user authentication 143
  user management 142

enterprise level
  security 17

Enterprise Media Manager (EMM)
  database 113
example
  running an encrypted tape backup 384
  setting up NetBackup to use tape encryption 381
  verifying an encryption backup 385
  exporting keys from KMS 394

F
  fat client authorization object
    permissions 233
  fat server authorization object
    permissions 232
  Federal Information Processing Standards
    (FIPS) 352–353
  fingerprint, finding 287
  firewall connection options
    on Media Manager 109
  firewall considerations 103
  firewall environment
    NDMP 110
  firewall problems
    when using NetBackup with other products 111
  firewalls and deduplication hosts 102

H
  host
    reset 262
  host ID to host name mapping
    add 253
    remove 255
  host ID to host name mappings 254
    approving 257
    Mappings for Approval tab 256
    rejecting 257
  host ID-based certificates
    automatic deployment 282
    cleaning from host before cloning 293
    delete 311
    deploying 275
host ID-based certificates  (continued)
deploying when client can’t connect to master server 278
deploying with a token 283
deploying without a token 283
expiration and renewal 291
forcing or overwriting 289
reissuing 294
retaining when reinstalling NetBackup 290
host management 251
Host Management node 251
Host Master Key (HMK) 364, 370, 386–387, 398
host master key (HMK) modify 397
host name-based certificate requirements 242
host name-based certificates
deploying 273–274
host properties
Access Control 162, 166
Authentication Domain tab 163
Authorization Service tab 165
Network Attributes tab 166
HostProperties authorization object permissions 230
Hosts tab 251
hotfix 273

K
key creating 389
key attributes modify 390
key creation options 399
key database, creating 370
key file 330–332
  automatic backup 338
  backing up (legacy) 343
  bpkeyutil command 334
  creating (legacy) 342
  creating (standard) 336
  defining (legacy) 341
  encrypting (legacy) 342
  encrypting with admin’s pass phrase (legacy) 349
  encrypting with admin’s pass phrase (standard) 335
  explanation (legacy) 345
  for redirected restore (standard) 338, 347
  in a cluster (legacy) 342, 348–349
  in a cluster (standard) 334
  legacy 331
  managing (standard) 334
  pass phrase (legacy) 350
key file pass phrase protection
  manual retention 337
key file restoration
  best practices 337
key group attributes modify 390
key groups
  creating 371, 389
  definition 371
  deleting 392
details 391
Key Management Service (KMS)
  about 355
  configuring 369, 380
  considerations 355
  database constituents 386
  installing 363, 367
  NetBackup and key records 381
  principles of operation 360
  recovering 377
terminology 361
troubleshooting 400
using for encryption 384

I
ICMP
  pinging NDMP 110
importing
  KMS encrypted images 384
importing keys from KMS 394
insecure communication with 8.0 and earlier hosts 267
installation
  pushing configuration to clients (legacy) 344
  pushing pass phrases to clients (legacy) 345
installation prerequisites
  for encryption 328
installing
  KMS 363, 367

J
Java server
  outgoing ports 101
job authorization object permissions 228
Key Management Service (KMS) *(continued)*
with NBAC 367
key pair, changing 297
Key Protection Key (KPK) 362, 364, 370, 386–387, 398
key record states
active 375
considerations 374
deprecated 375
inactive 375
overview 373
prelive 375
terminated 376
key records
creating 372, 379
keys
deleting 393
details 392
listing for a key group 379
recovering 393
regenerating 406
keystore statistics 398
KMS Administrator Access Control user group 214
KMS data files
problems backing up 378
solutions for backing up 379
KMS database
creating an empty one 386
quiesce 399
unquiesce 399
KMS database files
backing up 376
KMS encrypted images
importing 384
Kms group authorization object
permissions 234
KMS keystore and administrator keys
backups 387
KMS service
enabling cluster use 368
monitored list 369
monitoring 368–369

L
legacy encrypted backup created on another client
restoring 347
legacy encryption
backup process 330
configuring from the client 340

legacy encryption *(continued)*
managing 342
legacy encryption attribute
setting in policies 347
legacy encryption configuration
pushing to clients 344
legacy encryption configuration options
managing 340
legacy encryption from the server
configuring 344
legacy encryption pass phrases
pushing to clients 345
legacy key file security
for UNIX clients 348
libraries
defining for encryption (legacy) 341
license authorization object
permissions 230
logging on as new user 217

M
managing
clients for encryption
from client (standard) 333
key file (standard) 334
legacy encryption key files 342
NetBackup encryption key file 334
standard encryption configuration options 333
managing key file (legacy) 342
mapping details 257
master server
outgoing ports 98
master server settings
verifying 172
master, media server, and graphical user interface
security
NBAC 33
Maximum Uses Allowed option 295, 300–302
media authorization object
permissions 223
Media Manager
firewall connection options 109
media manager configuration
random port assignments 107
media server
outgoing ports 99
media server encryption 350
Media Server Encryption Option (MSEO)
security 29
Media Server Encryption Option (MSEO)  
- single datacenter 46
- with multi-datacenter 66
- monitoring the KMS service 368–369
multi-datacenter 39
- with all NetBackup security 88
- with client side encryption 71
- with Media Server Encryption Option (MSEO) 66
- with NBAC complete 82
- with NBAC on master and media servers 76
- with standard NetBackup 62

NetBackup  
- (continued)
  - security
    - all 35
    - implementation levels 15
    - security implementation types 25
    - security vulnerabilities 27
- (continued)
  - security
    - all 35

NetBackup Access Control (NBAC) 115, 125, 135
- and security certificates 242
- components 19
- configuration 149–153, 155, 235
- configuring to use Change Server 124
- default user groups 213
- individual users 211
- nbac_cron utility 176
- nbac_cron.exe 176
- user groups 211
- using 145
- using the Access Management utility 245

NetBackup access management
- administration 148

NetBackup and key records
- KMS 381

NetBackup API 244

NetBackup and key records
- KMS 381
- NetBackup API 244
- NetBackup Audit Manager 113, 126
- NetBackup client encryption 328
- NetBackup CloudStore Service Container 242
- NetBackup legacy encryption
- restore process 332
- NetBackup Request Daemon (BPRD) 245, 251

NetBackup security
- standard 28

NetBackup Service Layer (NBSL) 106, 274

NetBackup standard encryption
- restore process 331

NetBackup Vault Manager (nbvault) 274

NetBackup Vault Manager (nbvault) 274
- NetBackup Web Management Console service (nbwmsvc) 307
- NetBackup Web Management Console Service (nbwmc) 275
- NetBackup web services account 412
Network Attributes tab 166, 168
Network Time Protocol (NTP) 284

O
offline
taking clients 125
operating system
security 27
Operator Access Control user group 213
OpsCenter 113, 115–116, 118, 126
outgoing ports
administration console 102
client 101
EMM server 100
Java server 101
master server 98
media server 99
overriding or modifying
port numbers 95
overview
of legacy restore 332
of standard encryption backup 330

P
pass phrase
for encrypting key file (legacy) 342, 349
for redirected restore (legacy) 347
for redirected restore (standard) 338
pushing to clients (legacy) 345
passphrase_prompt option 345
passphrase_stdin option 345
permissions
BUAndRest authorization object 227
DevHost authorization object 231
DiskPool authorization object 226
Drive authorization object 224
fat client authorization object 233
fat server authorization object 232
granting 221
HostProperties authorization object 230
job authorization object 228
Kms group authorization object 234
license authorization object 230
media authorization object 223
NBU_Catalog authorization object 225
policy authorization object 223
report authorization object 225
robot authorization object 226
permissions (continued)
security authorization object 232
server group authorization object 234
service authorization object 228
StorageUnit authorization object 226
vault authorization object 233
volume group authorization object 230
VolumePool authorization object 231
pinging NDMP
ICMP 110
policy authorization object
permissions 223
port numbers
about overriding or modifying 95
backup and archive products 104
default for NetBackup 97
HTTPS 105
key OpsCenter components 103
port usage
and deduplication 102
port usage settings
bp.conf 108
port usage-related Media Manager configuration settings
vm.conf 109
ports
about 95
authentication 174
authorization 174
configuring 107
NetBackup 95
Public Key Infrastructure (PKI) standard 242
pushing
configuration to clients (legacy) 344
legacy encryption pass phrases to clients 345
pass phrases to clients (legacy) 345
pushing the legacy encryption configuration to clients 344

R
random port assignments
disable 107
in media manager configuration 107
reading encrypted tape 361
recovering
a key 393
KMS 377
recovering KMS 377
redirected restore
  of other client’s backup (legacy) 347
  of other client’s backup (standard) 338
  preventing (legacy) 346
redirected restores
  for an encrypted backup file 338
  of legacy encrypted files 347
regenerate
  certificates 406
  keys 406
registry
  auditing changes in 125
reissue token 298
reissuing host ID-based certificates 294
rejecting
  host ID to host name mappings 257
remove
  host ID to host name mappings 255
removing CA certificate from cluster 318
renewing host ID-based certificate on cluster 317
renewing host ID-based certificates 291
report authorization object
  permissions 225
reports
  for audit events 126
  nbauditreport 126
REQUIRED (encryption option) 333, 340
resetting host 262
  See also cleaning up host information
restore
  overview (legacy) 332
restore process
  NetBackup legacy encryption 332
  NetBackup standard encryption 331
restores not decrypting, solution for 401
restoring
  legacy encrypted backup created on another
  client 347
revoking a host ID-based certificate from a cluster 315
robot authorization object
  permissions 226
Root Certificate Fingerprint 286, 288
running
  bpkeyfile command 349
  encryption backup 329

S

Sarbanes–Oxley Act (SOX) 113
Security 243
standard encryption from the server
  configuring 335
standard NetBackup
  with multi-datacenter 62
StorageUnit authorization object
  permissions 226

T
tape encryption, setting up NetBackup to use 381
tar header for legacy encryption 331, 333
tar header for standard encryption 330, 332
terminology
  data at rest encryption 324
Token Management 245
tokens
  creating 299
  deleting 301
  Maximum Uses Allowed option 295, 300–302
  reissuing 295
  Valid for option 300, 302
  viewing details 301
troubleshooting
  access management 169
  Authentication and Authorization 171
  backup with no active key record 401
  KMS 400
  restore with an improper key record state 404

U
UNIX clients
  legacy key file security 348
upgrading
  HMK and KPK 387
upgrading
  NetBackup Access Control (NBAC) 235
upgrading and the auditing configuration 116
USE_AUTH_CONF_NBAC 171
user groups 211
  adding a new user 216
  Administrator 213
  assigning a user 217
  creating 214
  by copying an existing user group 215
  Default User 214
  defining 216
  KMS Administrator 214
  Operator 213
  renaming 216

user groups (continued)
  SAN Administrator 213
  Security Administrator 214
  Vault Operator 214
  viewing specific user permissions 220
user identity in the audit report 119

V
Valid for option 300, 302
vault authorization object
  permissions 233
Vault Operator User Access Control user group 214
Vault_Operator Access Control user group 214
verification procedures
  UNIX 187–188, 191, 193–194, 196
  Windows 178–179, 183, 185, 200, 203, 205
verifying an encryption backup 385
viewing
  audit event details 248–249
  audit event status 250
  audit events 247
viewing certificate details of a cluster 317
vm.conf
  port usage-related Media Manager configuration settings 109
volume group authorization object
  permissions 230
VolumePool authorization object
  permissions 231
VxSS authentication port 174
VxSS authorization port 174

W
Windows
  client verification points 185
  master server verification points 179
  media server verification points 183
  verification points 178
workgroup
  NBU security 39
  with NetBackup 40
world-level
  security 16
writing encrypted tape 360
Symbols
40-bit DES key
   library 330, 332
56-bit DES key
   library 332

A
Access Control. See NetBackup Access Control (NBAC)
   host properties 162
   access management
     troubleshooting 169
Access Management utility 209, 245
add
   host ID to host name mapping 253
   adding a new user to the user group 216
   adding cluster mappings 261
   adding host comment 263
   adding shared mappings 261
   adding shared or cluster mappings 261
   administration
     NetBackup access management 148
Administration Console
   outgoing ports 102
Administrator Access Control user group 213
Alert Notification 126, 132–133
all NetBackup security
   multi-datacenter 88
   all security implemented
     single datacenter 58
ALLOWED (encryption option) 333, 340
alternate client restore (see redirected restore) 338, 347
approving
   host ID to host name mappings 257
   assigning a user to a user group 217
attribute for encryption 339, 347
audit event details 248–249
audit event status 250
audit events 247
Audit Manager 113, 126
audit service (nbaudit) 113–114, 126
auditing
   Alert Notification 126, 132–133
   configuration after upgrade 116
   enabling 117
   overview 113
   report 127, 129
   viewing current settings 115
auth.conf 124, 135, 143, 171
Authentication and Authorization
   troubleshooting 171
Authentication Domain tab 163, 167
authentication port 174
authorization objects 222
authorization objects and permissions 219
authorization port 174
Authorization Service tab 165
automatic backup
   key file 338

B
backing up KMS database files 376
backups
   choosing encryption for 329
   KMS keystore and administrator keys 387
   not encrypting, solution for 401
best practices
   for key file restoration 337
bp.conf file
   auditing changes in 115, 125
   port usage settings 108
bpcd 331–332
   terminating 350
bpclient command
   specifying 109
bpinst command 331–332
   for setting encryption attribute (legacy) 348
   pushing configuration to clients (legacy) 344
bpkeyfile command
   change_netbackup_pass_phrase option 343
   changing key file pass phrase 350
bpkeyfile command (continued)
  introduction (standard) 331–332
  managing the key file (legacy) 342
bpkeyutil command
  adding pass phrases 334
  creating the key file 336
  introduction 330
  managing the key file 334
  redirected restore 338, 347
  standard restore introduction 331
BUAndRest authorization object
  permissions 227

C
CA certificate 285
  case sensitivity
    in command syntax 116–117, 127
  catalog
    backups, retaining audit records 126
    role in deploying host ID-based certificates 280
  catalog backups
    disaster recovery packages 272
  Certificate Authority (CA) 242, 275–276, 283, 285, 287
  certificate deployment security levels 276, 279, 281
  certificate revocation list
    about 303
    determining if a certificate is revoked 309
    getting CRL manually from CA 304
    getting list of revoked hosts 311
  certificates
    about revoking 304
    deploying 273
    importance of clock sync 284
    regenerating 406
    reissue 277
    revocation list 303
    viewing details 278
Change Server 124
changing
  client encryption settings from the server 339
  client legacy encryption settings 348
checksum of DES key
  explanation
    legacy encryption 331
    legacy restore 333
    standard encryption 330
    standard restore 332
cipher types 356
class
  see policy 339, 347
client
  outgoing ports 101
  Client Attributes host properties 280
  client encryption settings
    changing 339
  client legacy encryption settings
    changing 348
  client side encryption
    multi-datacenter 71
    security 30
    single datacenter 49
clients
  configuring legacy encryption 340
  configuring standard encryption 333
  taking offline 125
  clock sync for certificates 284
  clustered environments
    additional key file security (legacy) 349
    managing the key file (legacy) 342
    managing the key file (standard) 334
    pushing configuration (legacy) 345
    pushing software (standard) 346
  cnpp option 343
  Combined world, enterprise, and data center levels 24
command line interface (CLI)
  usage help 388
  using 387
comparison
  encryption options 327
configuration
  and clustering (legacy) 344
  and clustering (standard) 336
  options (legacy) 340
  pushing to clients (legacy) 344
configuring
  clients for encryption
    from client (standard) 338
    from server (legacy) 344
    from server (standard) 335
  legacy encryption from the server 344
  ports 107
  standard encryption from the server 335
configuring NetBackup
  to work with KMS 380
configuring port usage client attribute settings
bpclient command 109
considerations
  data at rest encryption 325
Copy Fingerprint to Clipboard option 288
creating
  a new key 389
  a new key group 389
  an empty KMS database 386
  key database 370
  key file 336
  key groups 371
  key records 372, 379
  new user group 214–215
creating reissue token for a cluster 316
CRL. See certificate revocation list
CRYPT option 348
CRYPT_CIPHER option 334
CRYPT_KEYFILE option 331–332, 341–342
CRYPT_KIND option 334, 341
CRYPT_LIBPATH option 341
CRYPT_OPTION 329, 333, 340, 344
CRYPT_STRENGTH option 332, 341, 344

D
data at rest encryption
  considerations 325
  terminology 324
database constituents
  KMS 386
datacenter
  multi 39
  single 39
datacenter-level
  security 19
decryption
  of key file (legacy) 349
  overview (legacy) 332
  overview (standard) 331
deduplication hosts
  and firewalls 102
deduplication port usage
  about 102
default
  port numbers
    NetBackup 97
Default User Access Control user group 214
default user groups 213
delete
  host ID-based certificates 311
deleting
  a key 393
  a key group 392
deleting host comment 263
DENIED (encryption option) 333, 340
deploying a host ID-based certificate on a cluster 316
deploying host ID-based certificate on cluster node 314
DES
  key checksum 331–333
  key checksum for standard encryption 330
DevHost authorization object
  permissions 231
disable
  random port assignments 107
disabling insecure communication 266
disaster recovery package 272
DiskPool authorization object
  permissions 226
documentation
  HTTPS ports 106
drive authorization object
  permissions 224
Dynamic Host Configuration Protocol (DHCP) 274
Eediting host comment 263
EMM database
  containing audit records 118, 126
  role in deploying host ID-based certificates 280
EMM server
  outgoing ports 100
  enabling cluster use
    KMS service 368
encrypted backup
  restoring (legacy) 347
  restoring (standard) 338
encrypted backup file
  restoring to another client 338
encrypted tapes
  reading 361
  writing 360
encryption
  allow
deny. See require
attribute 331
  setting 339
configuration options (legacy) 340
configuring from client (standard) 338
encryption (continued)
confirming the license for 328
file containing keys for (legacy) 341
installation prerequisites 328
kind
defining (legacy) 341
defining (standard) 334
legacy
prerequisites 330
prerequisites for restoring 332
tar header 333
libraries
defining (legacy) 341
managing from client (standard) 333
of key file (legacy) 349
overview (legacy) 332
overview (standard) 331
policy attribute 329
policy attribute for
how to set 339, 347
security questions 326
standard
tar header 332
strength
defining (legacy) 341
tar header
legacy 331
standard 330
using KMS 384
what is and isn’t encrypted (standard) 330
Enhanced Auditing (continued)
setting up trust between servers 122
switching to NBAC 171
user authentication 143
user management 142
enterprise level
security 17
Enterprise Media Manager (EMM)
database 113
example
running an encrypted tape backup 384
setting up NetBackup to use tape encryption 381
verifying an encryption backup 385
exporting keys from KMS 394
F
fat client authorization object
permissions 233
fat server authorization object
permissions 232
Federal Information Processing Standards (FIPS) 352–353
fingerprint, finding 287
firewall connection options
on Media Manager 109
firewall considerations 103
firewall environment
NDMP 110
firewall problems
when using NetBackup with other products 111
firewalls and deduplication hosts 102
H
host
reset 262
host ID to host name mapping
add 253
remove 255
host ID to host name mappings 254
approving 257
Mappings for Approval tab 256
rejecting 257
host ID-based certificates
automatic deployment 282
cleaning from host before cloning 293
delete 311
deploying 275
host ID-based certificates  (continued)
  deploying when client can't connect to master server 278
  deploying with a token 283
  deploying without a token 283
  expiration and renewal 291
  forcing or overwriting 289
  reissuing 294
  retaining when reinstalling NetBackup 290
host management 251
Host Management node 251
Host Master Key (HMK) 364, 370, 386–387, 398
host master key (HMK)
  modify 397
host name-based certificate requirements 242
host name-based certificates
  deploying 273–274
host properties
  Access Control 162, 166
  Authentication Domain tab 163
  Authorization Service tab 165
  Network Attributes tab 166
HostProperties authorization object
  permissions 230
Hosts tab 251
hotfix 273

I
ICMP
  pinging NDMP 110
importing
  KMS encrypted images 384
importing keys from KMS 394
insecure communication with 8.0 and earlier hosts 267
installation
  pushing configuration to clients (legacy) 344
  pushing pass phrases to clients (legacy) 345
installation prerequisites
  for encryption 328
installing
  KMS 363, 367

J
Java server
  outgoing ports 101
job authorization object
  permissions 228

K
key
  creating 389
key attributes
  modify 390
key creation
  options 399
key database, creating 370
key file 330–332
  automatic backup 338
  backing up (legacy) 343
  bpkeyutil command 334
  creating (legacy) 342
  creating (standard) 336
  defining (legacy) 341
  encrypting (legacy) 342
  encrypting with admin's pass phrase (legacy) 349
  encrypting with admin's pass phrase (standard) 335
  explanation (legacy) 345
  for redirected restore (standard) 338, 347
  in a cluster (legacy) 342, 348–349
  in a cluster (standard) 334
  legacy 331
  managing (standard) 334
  pass phrase (legacy) 350
key file pass phrase protection
  manual retention 337
key file restoration
  best practices 337
key group attributes
  modify 390
key groups
  creating 371, 389
  definition 371
  deleting 392
details 391
Key Management Service (KMS)
  about 355
  configuring 369, 380
  considerations 355
  database constituents 386
  installing 363, 367
  NetBackup and key records 381
  principles of operation 360
  recovering 377
terminology 361
troubleshooting 400
using for encryption 384
Key Management Service (KMS) (continued)
with NBAC 367
key pair, changing 297
Key Protection Key (KPK) 362, 364, 370, 386–387, 398
key record states
  active 375
  considerations 374
  deprecated 375
  inactive 375
  overview 373
  prelive 375
  terminated 376
key records
  creating 372, 379
keys
  deleting 393
  details 392
  listing for a key group 379
  recovering 393
  regenerating 406
keystore statistics 398
KMS Administrator Access Control user group 214
KMS data files
  problems backing up 378
  solutions for backing up 379
KMS database
  creating an empty one 386
  quiesce 399
  unquiesce 399
KMS database files
  backing up 376
KMS encrypted images
  importing 384
Kms group authorization object
  permissions 234
KMS keystore and administrator keys
  backups 387
KMS service
  enabling cluster use 368
  monitored list 369
  monitoring 368–369
L
legacy encrypted backup created on another client
  restoring 347
legacy encryption
  backup process 330
  configuring from the client 340
  (continued)
  managing 342
  legacy encryption attribute
    setting in policies 347
  legacy encryption configuration
    pushing to clients 344
  legacy encryption configuration options
    managing 340
  legacy encryption from the server
    configuring 344
  legacy encryption pass phrases
    pushing to clients 345
  legacy key file security
    for UNIX clients 348
libraries
  defining for encryption (legacy) 341
license authorization object
  permissions 230
logging on as new user 217
M
managing
  clients for encryption
    from client (standard) 333
  key file (standard) 334
  legacy encryption key files 342
  NetBackup encryption key file 334
  standard encryption configuration options 333
managing key file (legacy) 342
mapping details 257
master server
  outgoing ports 98
master server settings
  verifying 172
master, media server, and graphical user interface
  security
    NBAC 33
Maximum Uses Allowed option 295, 300–302
media authorization object
  permissions 223
Media Manager
  firewall connection options 109
media manager configuration
  random port assignments 107
media server
  outgoing ports 99
media server encryption 350
Media Server Encryption Option (MSEO)
  security 29
Media Server Encryption Option (MSEO) (continued)
  single datacenter 46
  with multi-datacenter 66
monitoring the KMS service 368–369
multi-datacenter 39
  with all NetBackup security 88
  with client side encryption 71
  with Media Server Encryption Option (MSEO) 66
  with NBAC complete 82
  with NBAC on master and media servers 76
  with standard NetBackup 62

N
NBAC
  master, media server, and graphical user interface security 33
  switching from Enhanced Auditing 171
NBAC (NetBackup Access Control). See NetBackup Access Control (NBAC)
NBAC complete
  multi-datacenter 82
  security 34
  single datacenter 55
NBAC on master and media servers
  multi-datacenter 76
  single datacenter 51
nbac_cron utility 176
nbac_cron.exe 176
nbaudit (NetBackup Audit Service) 113–114, 126, 128
nbaudit log 132
nbauditreport 118, 127
NBU security
  workgroup 39
NBU_Admin Access Control user group 213
NBU_Catalog authorization object permissions 225
NBU_KMS Admin Access Control user group 214
NBU_Operator Access Control user group 213
NBU_Security Admin Access Control user group 214
NBU_User Access Control user group 214
NDMP
  in firewall environment 110
NetBackup
  components
    used in security 19
  determining access 210
  hotfix 273
  ports 95
  (continued)
  security
    all 35
    implementation levels 15
    security implementation types 25
    security vulnerabilities 27
NetBackup Access Control (NBAC) 115, 125, 135
  and security certificates 242
  components 19
  configuration 149–153, 155, 235
  configuring to use Change Server 124
  default user groups 213
  individual users 211
  nbac_cron utility 176
  nbac_cron.exe 176
  user groups 211
    Administrator 213
    configuring 214
    Default User 214
    KMS Administrator 214
    Operator 213
    renaming user groups 216
    SAN Administrator 213
    Security Administrator 214
    Vault Operator 214
  using 145
    using the Access Management utility 245
NetBackup access management administration 148
NetBackup and key records
  KMS 381
NetBackup API 244
NetBackup Audit Manager 113, 126
NetBackup client encryption 328
NetBackup CloudStore Service Container 242
NetBackup legacy encryption
  restore process 332
NetBackup Request Daemon (BPRD) 245, 251
NetBackup security
  standard 28
NetBackup Service Layer (NBSL) 106, 274
NetBackup standard encryption
  restore process 331
NetBackup Vault Manager (nbvault) 274
NetBackup Web Management Console service (nbwebsvc) 307
NetBackup Web Management Console Service (nbwmc) 275
NetBackup web services account 412
Network Attributes tab 166, 168
Network Time Protocol (NTP) 284

O
offline
taking clients 125
operating system
security 27
Operator Access Control user group 213
OpsCenter 113, 115–116, 118, 126
outgoing ports
  administration console 102
  client 101
  EMM server 100
  Java server 101
  master server 98
  media server 99
overriding or modifying
  port numbers 95
overview
  of legacy restore 332
  of standard encryption backup 330

permissions (continued)
  security authorization object 232
  server group authorization object 234
  service authorization object 228
  StorageUnit authorization object 226
  vault authorization object 233
  volume group authorization object 230
  VolumePool authorization object 231
pinging NDMP
  ICMP 110
policy authorization object
  permissions 223
port numbers
  about overriding or modifying 95
  backup and archive products 104
  default for NetBackup 97
  HTTPS 105
  key OpsCenter components 103
port usage
  and deduplication 102
port usage settings
  bp.conf 108
port usage-related Media Manager configuration
  settings
    vm.conf 109
ports
  about 95
  authentication 174
  authorization 174
  configuring 107
  NetBackup 95
Public Key Infrastructure (PKI) standard 242
pushing
  configuration to clients (legacy) 344
  legacy encryption pass phrases to clients 345
pass phrases
  to clients (legacy) 345
pushing the legacy encryption configuration
  to clients 344

R
random port assignments
  disable 107
  in media manager configuration 107
reading encrypted tape 361
recovering
  a key 393
  KMS 377
recoverying KMS 377
redirected restore
  of other client’s backup (legacy) 347
  of other client’s backup (standard) 338
  preventing (legacy) 346
redirected restores
  for an encrypted backup file 338
  of legacy encrypted files 347
regenerate
  certificates 406
  keys 406
registry
  auditing changes in 125
reissue token 298
reissuing host ID-based certificates 294
rejecting
  host ID to host name mappings 257
remove
  host ID to host name mappings 255
removing CA certificate from cluster 318
renewing host ID-based certificate on cluster 317
renewing host ID-based certificates 291
report authorization object
  permissions 225
reports
  for audit events 126
  nbauditreport 126
REQUIRED (encryption option) 333, 340
resetting host 262
  See also cleaning up host information
restore
  overview (legacy) 332
restore process
  NetBackup legacy encryption 332
  NetBackup standard encryption 331
restores not decrypting, solution for 401
restoring
  legacy encrypted backup created on another client 347
revoking a host ID-based certificate from a cluster 315
robot authorization object
  permissions 226
Root Certificate Fingerprint 286, 288
running
  bpkeyfile command 349
  encryption backup 329
security
  client side encryption 30
  datacenter-level 19
  enterprise level 17
  implementation levels 15
  Media Server Encryption Option (MSEO) 29
  NBAC complete 34
  NetBackup
    all 35
    operating system 27
    world-level 16
  Security Administrator Access Control user group 214
  security authorization object
    permissions 232
  security certificate 121, 124
  security certificate deployment in cluster 312
  security certificates
    about revoking 304
    revocation list 303
    verifying the Certificate Authority 287
  Security Events utility
    Access History tab 244
  security implementation types
    NetBackup 25
  Security Management utilities 243
  security vulnerabilities
    NetBackup 27
  server group authorization object
    permissions 234
  service authorization object
    permissions 228
  setting encryption attribute
    in policies 339
  setuptrust command 160–161
single datacenter
  with all security implemented 58
  with client side encryption 49
  with Media Server Encryption Option (MSEO) 46
  with NBAC complete 55
  with NBAC on master and media servers 51
  with standard NetBackup 43
SNMP port 106
specifying
  bpcclient command 109
standard
  NetBackup security 28
  standard encryption
    backup process 330
standard encryption from the server 335
standard NetBackup 62
StorageUnit authorization object permissions 226

T
tape encryption, setting up NetBackup to use 381
tar header for legacy encryption 331, 333
tar header for standard encryption 330, 332
terminology data at rest encryption 324
Token Management 245
tokens creating 299
deleting 301
Maximum Uses Allowed option 295, 300–302
reissuing 295
Valid for option 300, 302
viewing details 301
troubleshooting access management 169
Authentication and Authorization 171
backup with no active key record 401
KMS 400
restore with an improper key record state 404

U
UNIX clients legacy key file security 348
updating HMK and KPK 387
upgrading NetBackup Access Control (NBAC) 235
upgrading and the auditing configuration 116
USE_AUTH_CONF_NBAC 171
user groups 211
adding a new user 216
Administrator 213
assigning a user 217
creating 214
by copying an existing user group 215
Default User 214
defining 216
KMS Administrator 214
Operator 213
renaming 216

V
valid for option 300, 302
vault authorization object permissions 233
Vault Operator User Access Control user group 214
Vault_Operator Access Control user group 214
verification procedures UNIX 187–188, 191, 193–194, 196
Windows 178–179, 183, 185, 200, 203, 205
verifying an encryption backup 385
viewing audit event details 248–249
audit event status 250
audit events 247
viewing certificate details of a cluster 317
vm.conf port usage-related Media Manager configuration settings 109
volume group authorization object permissions 230
VolumePool authorization object permissions 231
VxSS authentication port 174
VxSS authorization port 174

W
Windows client verification points 185
master server verification points 179
media server verification points 183
verification points 178
workgroup NBU security 39
with NetBackup 40
world-level security 16
writing encrypted tape 360