LiteSpeed® for SQL Server® 9.1

Integration with IBM Spectrum Project (TSM) Guide

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Legend

CAUTION: A CAUTION icon indicates potential damage to hardware or loss of data if instructions are not followed.

IMPORTANT, NOTE, TIP, MOBILE, or VIDEO: An information icon indicates supporting information.

LiteSpeed Integration with IBM Spectrum Project (TSM) Guide
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Using IBM Spectrum Protect (TSM) with LiteSpeed

About Using IBM Spectrum Protect™ (TSM) with LiteSpeed

IBM Spectrum Protect™ (Tivoli Storage Manager - TSM) and LiteSpeed integrate to cover a very broad range of enterprise storage solutions, and therefore is a critical part of any major corporation's disaster recovery strategy.

TSM is a data backup and storage solution used in many large enterprises.

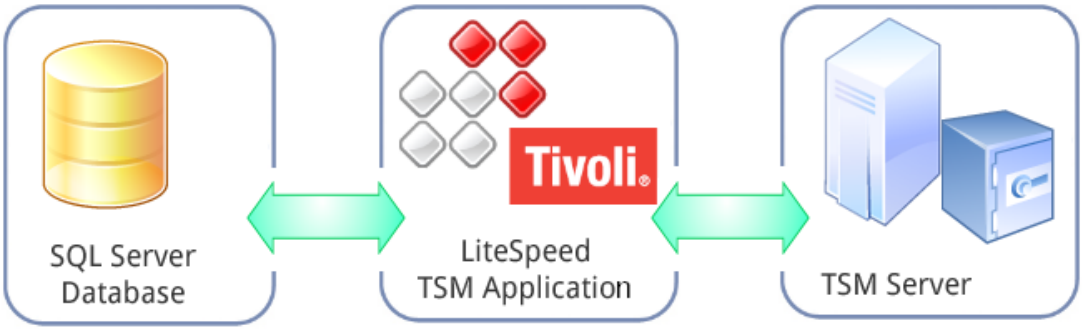
LiteSpeed® for SQL Server®, or LiteSpeed, is a fast and flexible backup and recovery solution that allows database administrators to easily maintain complete control over the backup and recovery process. LiteSpeed's low-impact, high-performance compression and encryption technology helps reduce storage costs and protect data, while maintaining a high level of recoverability.

LiteSpeed interfaces with the TSM through the TSM API, allowing users to conduct backups directly to TSM using LiteSpeed T-SQL commands or the LiteSpeed command-line utility. Any DBA can write a script and effectively start sending their SQL Server backups to TSM directly.

Using LiteSpeed with TSM combines the small, secure, and rapid backups of LiteSpeed with the state-of-the-art storage and retrieval system of TSM.

Overview of IBM Spectrum Protect™ (TSM) Integration

The following diagram shows a very simple, high-level overview of the LiteSpeed/TSM integration:

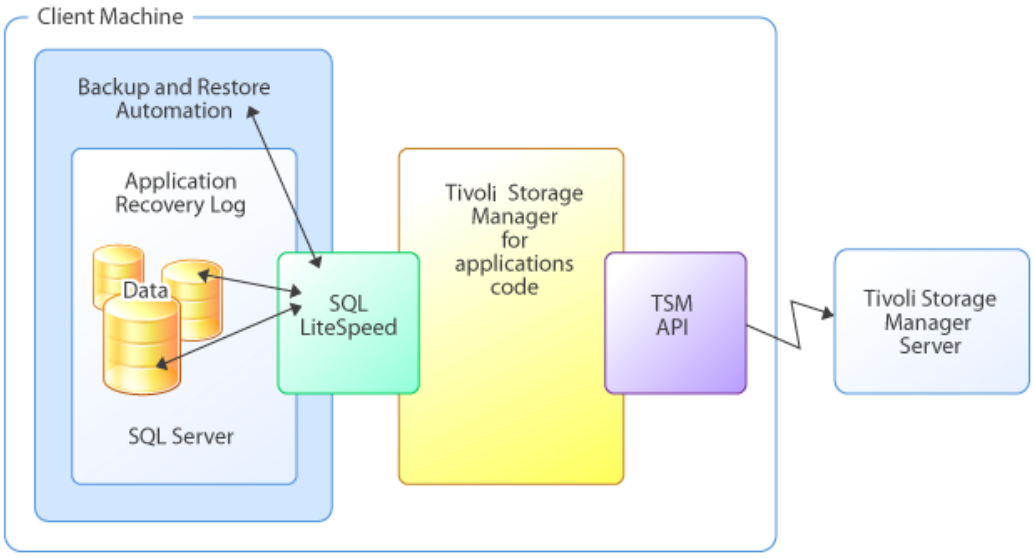


TSM backups conducted through LiteSpeed are transferred to and then stored in and/or managed by the Tivoli Storage Manager. The TSM handles the LiteSpeed backup file from then on, managing expiration date, storage location, etc. The functions of the TSM are not discussed here, please refer to the product documentation for further details.

Because the application is cluster-aware, most users running SQL Server in a clustered environment can take advantage of LiteSpeed to send SQL Server database backups to TSM storage.

In a typical environment:

- Users who want to send LiteSpeed backups to TSM will have the machine from which LiteSpeed is run set up as a TSM client node.
- Because TSM works in a Client-Server implementation, this client node will point to the TSM Server. The client uses a configuration file called client option file to locate the TSM server. Generally, the TCP/IP address of the TSM Server and the port number that it is listening on are stamped in the client option file.
- The user conducts the backup/restores from LiteSpeed, using TSM-specific parameters.
- The TSM client processes the backup and restore requests from SQL server and translates them into TSM backup and restore requests.



(The above graphic is adapted from a similar image at www.redbooks.ibm.com).

Using LiteSpeed Compression

If you use LiteSpeed compression, the database pages will get compressed, and then the compressed data stream is sent to the TSM server. Database backup sizes within a range of 15-30% of the original database size are fairly common. This ensures the footprint of the backup on the network is minimal.

For optimal performance, you can use the Adaptive Compression feature. With Adaptive Compression, LiteSpeed will dynamically change the compression level based on available server resources.

For more information about the LiteSpeed compression options, please refer to the LiteSpeed *User Guide*.

Using Fast Compression

Fast Compression reduces the backup footprint another 70-85% over what you can already get with LiteSpeed compression. When configured, Fast Compression will intelligently back up only database changes rather than the entire database. This form of backup deduplication does not have any performance impact. For more information about the Fast Compression feature, please refer to the LiteSpeed *User Guide*.

Using TSM Client-Side Data Deduplication

You can safely conduct backups through LiteSpeed, when TSM client-side data deduplication is enabled. Client based deduplication processing can reduce the amount of data being transferred over the network to the storage system, but there are often requirements for extra CPU and disk I/O processing on the client side. For more information, refer to the *Implementing IBM Storage Data Deduplication Solutions* guide available at www.redbooks.ibm.com.

Given that LiteSpeed can reduce backup size on average to 20% or less its original size, deduplication may be unnecessary as using LiteSpeed compression alone saves 5X or more disk space.

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LiteSpeed IBM Spectrum Protect (TSM) Configuration

Configure LiteSpeed to Work with IBM Spectrum Protect™ (TSM)

The following instructions show how to set up a combined LiteSpeed/TSM backup solution:

- IBM Spectrum Protect™ (TSM) Requirements
- Configure LiteSpeed to Back Up Directly to IBM Spectrum Protect™ (TSM)
- Back Up and Restore to IBM Spectrum Protect™ (TSM) with LiteSpeed
- Install and Configure the IBM Spectrum Protect™ (TSM) Backup-Archive Client
- IBM Spectrum Project (TSM) Examples

NOTE: The following instructions do not describe how to install or use TSM, refer to the documentation provided with the product for further details. For additional information, refer to the IBM Tivoli Information Center and www.redbooks.ibm.com.

IBM Spectrum Protect™ (TSM) Requirements

Before you set up a combined LiteSpeed/TSM backup solution, please review this section to ensure you meet the software requirements.

Windows

- Windows Server 2008
- Windows 7
- Windows 8
- Windows 8.1
- Windows Server 2012
- Windows Server 2012 R2
- Windows Server 2016
- Windows Server 2019

SQL Server

- SQL Server 2005
- SQL Server 2008
- SQL Server 2012
- SQL Server 2014
- SQL Server 2016
- SQL Server 2017
- SQL Server 2019

IBM Spectrum Protect™ (TSM)

Backup archive client software version 5.3 or later

Configure LiteSpeed to Back Up Directly to IBM Spectrum Protect™ (TSM)

To configure LiteSpeed to back up directly to TSM

1. Set up the machine from where you will run LiteSpeed so that it is a TSM backup-archive client node. This requires that you install the TSM backup-archive client and API files. For more information, see Install and Configure the IBM Spectrum Protect™ (TSM) Backup-Archive Client on page 10.
2. Register the TSM client node with the TSM server. For instructions, refer to *IBM Tivoli Storage Manager Implementation* guide available at www.redbooks.ibm.com.

You should now be able to conduct LiteSpeed backups and restores from the TSM client node.

Install and Configure the IBM Spectrum Protect™ (TSM) Backup-Archive Client

Install the IBM Spectrum Protect™ (TSM) backup-archive client on the server where LiteSpeed will be executing the backup/restore command. For instructions, refer to the *IBM Tivoli Storage Manager Implementation* guide available at www.redbooks.ibm.com.

Ensure that you do a complete install of the backup-archive client. This will install API-specific files on the SQL Server.

Confirm that the installer has installed the API

Check that the following files have been installed in the API directory:

- apienu.dll
- dscenu.txt

Set up the client option file

If the TSM client API is installed with the default options then the options file (dsm.opt) is typically located in the *C:\Program Files\Tivoli\TSM\baclient* directory. At a minimum, the client option file must contain the following:

- `COMMMETHOD`
- `TCPSERVERADDRESS`
- `Tcpport`

The client API needs the communication method and the IP address and TCP port of the TSM server to initiate a session. `TCPSERVERADDRESS` can use either the IP address or the computer name of the TSM server.

For general instructions on the client option file and information on additional options, refer to the *IBM Spectrum Protect™ (TSM) Implementation* guide and the IBM Spectrum Protect™ (TSM) API Documentation available at www.redbooks.ibm.com.

Tip: You can create a new options file for use with LiteSpeed and locate it anywhere you like. Following are the contents of a sample options file for LiteSpeed:

```
commmethod tcpip
tcpport 1500
tcpserveraddress 10.10.26.26
nodename enc2033
passwordaccess generate
deduplication yes
dedupcachepath c:\cases
errorlogname c:\dsierror.log
```

Back Up and Restore to IBM Spectrum Protect™ (TSM) with LiteSpeed

To use LiteSpeed to back up and/or restore to TSM

Conduct a backup from the LiteSpeed UI Console, using the LiteSpeed command line utility or using LiteSpeed T-SQL commands in the normal manner, providing the TSM-required information using TSM specific arguments.

LiteSpeed needs some specific information for every backup data stream sent to the TSM server, including:

- Location of the option file (Usually, *C:\Program Files\Tivoli\TSM\baclient\dsm.opt*.)

  NOTE: Tivoli Server uses the option file to start as a service with a set of default options. Some server options may affect backup/restore processes.

- TSM object name specification, a three-part name used to uniquely identify the object within the TSM server namespace, for example, *FS\HL\LL_xmlData*. The three parts can be generally explained as:

  - File space—The name of the file system or disk drive where related data is located. The file system can hold a group of similar objects. All data sent to the TSM server needs to have a file space associated with it. IBM recommends that an application client should select a unique file space; it is recommended that LiteSpeed users follow this practice with a specific filespace reserved for LiteSpeed backups.
  - High level name—The location of the object within the TSM Server namespace (roughly synonymous to a directory path).
  - Low level name—The actual name given to the object.

  This name identifies the backup in TSM. It is not possible to overwrite or append to an existing object. If backing up to the same tsm objects with init option, they are "versioned" by the TSM server. New backups become active, old ones become inactive and removed as specified by the TSM servers' retention policies.

Depending on your TSM configuration, you may need to provide the following:

- Client node that is accessing the TSM Server
- Node owner password

For more information, see IBM Spectrum Project (TSM) Examples on page 13. on how to perform LiteSpeed functions with the TSM.

NOTE: For information about backing up or restoring using the LiteSpeed UI Console, please see the LiteSpeed User Guide.

Troubleshoot Backing Up and Restoring to IBM Spectrum Protect™ (TSM)

LiteSpeed displays the return codes from the IBM Spectrum Protect™ (Tivoli Storage Manager - TSM) API. If an error occurs, refer to the list of TSM API error codes for a description of the error, the system action occurring in the

event of the error, and the appropriate response. The TSM API error codes are listed in the IBM Spectrum Protect™ (Tivoli Storage Manager - TSM) Information Center.

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IBM Spectrum Project (TSM) Examples

Following are several TSM examples. For more information about the LiteSpeed extended stored procedures and command-line utilities, please refer to the LiteSpeed *User Guide*.

Back up Database to TSM Using SQL

The following command backs up the database:

```
exec master.dbo.xp_backup_database
@database = 'pubs_50gb'
, @tsmclientnode = 'testsystemwas'
, @tsmclientownerpwd = 'password'
, @tsmobject = 'TWAS1_50GB\All_pubs50gb_Backups\pubs50gb_FirstBackup'
, @tsmconfigfile = 'C:\Program Files\Tivoli\tsm\api\SAMPSRC\dsm.opt'
, @init = 1
, @AdaptiveCompression = 'Speed'
```

In this example, LiteSpeed backs up the database pubs_50gb by:

- Connecting to the tsm server as noted by the tsmserveraddress option specified in the dsm.opt file.
- Using the client node name and client owner password to authenticate the user to the TSM server.
- Storing the backup in the TSM name space designated by @tsmobject.
- (If there is a TSM object with the same name) Versioning the backup using the @init = 1 option.
- Using Adaptive Compression to optimize backup for speed.

Back Up to TSM with the Passwordaccess Generate Option Using SQL

If the Passwordaccess Generate option is specified in the dsm.opt file, then the node name and password are not required:

```
exec master.dbo.xp_backup_database
@database = 'Northwind'
, @tsmobject = 'fsMH\nw\Northwind_%z'
, @tsmconfigfile = 'C:\program files\Tivoli\TSM\baclient\dsm.opt'
, @compressionlevel = 1
, @tsmmanagementclass = N'SPS_MGTD'
, @init = 1
```

Use Command-Line to Back Up to TSM

Use the following command to back up the "Northwind" database:

```
sqllitespeed -Bdatabase -DNorthwind -i"fsMH\nw\testcmd" -c"10.0.1.200" -k"password"
-j"c:\program files\Tivoli\TSM\baclient\dsm.opt" --AdaptiveCompression "Speed" -
z"SPS_MGTD" S"MyServer\Instance" -T
```

This will back up the "Northwind" database with the following options:

To the unique location	fsMH\nw\testcmd Where: • fsMH is TSM filespace • nw is TSM high level • testcmd is TSM low level (If backing up to a non-unique location, use -I parameter.)
From the client node	10.0.1.200 (As set up with the TSM server. In this example that node name is the IP address of the client.)
Connecting to the server instance	MyServer\Instance
Using a trusted connection	(Instead of passing the username `-U` and password `-P`.)
Connecting with the client password	"password"

Using the TSM option file	C:\Program Files\Tivoli\TSM\baclient\dsm.opt
Using the Adaptive Compression option	Optimize for speed
Using the specified management class	SPS_MGTD (If not specified, LiteSpeed uses the default management class.)

Use Command-Line to Back Up to TSM with the Passwordaccess Generate Option

If the Passwordaccess Generate option is specified in the dsm.opt file, you can use the following command:

```
sqllitespeed -Bdatabase -D"Northwind" -i"fsMH\nw\Northwind_%z" -j"C:\program
files\Tivoli\TSM\baclient\dsm.opt" -C1 -I -S"MyServer\Instance" -T
```

Restore Database from TSM Using SQL

```
Exec master.dbo.xp_restore_database
@database = 'pubs4'
, @with = 'move ''pubs'' to ''C:\test\pubs4.mdf'''
, @with = 'move ''pubs_log'' to ''C:\test\pubs4_log.ldf'''
, @tsmclientnode = 'nodet1'
, @tsmobject = 'm1\pubs_mb\test1'
, @tsmclientownerpwd = 'password'
, @tsmconfigfile = 'C:\Program Files\Tivoli\tsm\api\SAMPSRC\dsm.opt'
```

Verify TSM Backup Using SQL

```
exec master.dbo.xp_restore_verifyonly
@tsmclientnode = 'nodet1'
, @tsmclientownerpwd = 'nodet1'
, @tsmobject = 'm1\pubs_mb\test1'
, @tsmconfigfile = 'C:\Program Files\Tivoli\tsm\api\SAMPSRC\dsmmt.opt'
```

Restore File List Only from TSM Using SQL

```
Exec master.dbo.xp_restore_filelistonly
@tsmclientnode = 'nodet1'
, @tsmclientownerpwd = 'password'
, @tsmobject = 'm1\pubs_mb\test1'
, @tsmconfigfile = 'C:\Program Files\Tivoli\tsm\api\SAMPSRC\dsmmt.opt'
```

Striped Backup To TSM Using SQL

```
exec master.dbo.xp_backup_database
@database = 'Northwind'
, @tsmobject = 'fsMH\nw\stripetest01'
, @tsmobject = 'fsMH\nw\stripetest02'
, @tsmobject = 'fsMH\nw\stripetest03'
, @tsmobject = 'fsMH\nw\stripetest04'
, @tsmclientnode = '10.0.1.200'
, @tsmclientownerpwd = 'password'
, @tsmconfigfile = 'C:\Program Files\Tivoli\TSM\baclient\dsm.opt'
, @init = 1
```

Striped Restore from TSM Using SQL

Verify Striped Backup

```
exec master.dbo.xp_restore_verifyonly
@tsmobject = 'fsMH\nw\stripetest01'
,@tsmobject = 'fsMH\nw\stripetest02'
,@tsmobject = 'fsMH\nw\stripetest03'
,@tsmobject = 'fsMH\nw\stripetest04'
,@tsmclientnode = '10.0.1.200'
,@tsmclientownerpwd = 'password'
,@tsmconfigfile = 'C:\Program Files\Tivoli\TSM\baclient\dsm.opt'
```

Restore Header Only

```
exec master.dbo.xp_restore_headeronly
@tsmobject = 'fsMH\nw\stripetest01'
,@tsmobject = 'fsMH\nw\stripetest02'
,@tsmobject = 'fsMH\nw\stripetest03'
,@tsmobject = 'fsMH\nw\stripetest04'
,@tsmclientnode = '10.0.1.200'
,@tsmclientownerpwd = 'password'
,@tsmconfigfile = 'C:\Program Files\Tivoli\TSM\baclient\dsm.opt'
```

Restore File List Only

```
exec master.dbo.xp_restore_filelistonly
@tsmobject = 'fsMH\nw\stripetest01'
,@tsmobject = 'fsMH\nw\stripetest02'
,@tsmobject = 'fsMH\nw\stripetest03'
,@tsmobject = 'fsMH\nw\stripetest04'
,@tsmclientnode = '10.0.1.200'
,@tsmclientownerpwd = 'password'
,@tsmconfigfile = 'C:\Program Files\Tivoli\TSM\baclient\dsm.opt'
```

Restore from Striped Backup

```
exec master.dbo.xp_restore_database
@database = 'Northwind'
,@tsmobject = 'fsMH\nw\stripetest01'
,@tsmobject = 'fsMH\nw\stripetest02'
,@tsmobject = 'fsMH\nw\stripetest03'
,@tsmobject = 'fsMH\nw\stripetest04'
,@tsmclientnode = '10.0.1.200'
,@tsmclientownerpwd = 'password'
,@tsmconfigfile = 'C:\Program Files\Tivoli\TSM\baclient\dsm.opt'
```

Striped Backup to TSM Using the Command Prompt

```
sqllitespeed -Bdatabase -DNorthwind -i"fsMH\nw\testcmd1" -i"fsMH\nw\testcmd2" -
i"fsMH\nw\testcmd3" -c"10.0.1.200" -k"password" -j"c:\program
files\Tivoli\TSM\baclient\dsm.opt" -I -S"MyServer\Instance" -T
```

Striped Restore from TSM Using the Command Prompt

```
sqllitespeed -RDatabase -j"c:\program files\Tivoli\TSM\baclient\dsm.opt" -
i"fsMH\nw\testcmd1" --TSMPointInTime "2011-04-12 11:46:48" -i"fsMH\nw\testcmd3" --
TSMPointInTime "2011-04-12 11:46:48" -i"fsMH\nw\testcmd2" --TSMPointInTime "2011-04-
12 11:46:48" -N1 -DNorthwind c"10.0.1.200" -k"password"-S"MyServer\Instance" -T
```

View Filespaces Associated with a Client Node

```
exec master.dbo.xp_view_tsmfilespaces
@tsmclientnode = '10.0.1.200'
,@tsmclientownerpwd = 'password'
,@tsmconfigfile = 'C:\Program Files\Tivoli\TSM\baclient\dsm.opt'
```

View Contents of TSM Filespace

```
exec master.dbo.xp_view_tsmcontents
@tsmclientnode = '10.0.1.200'
,@tsmclientownerpwd = 'password'
,@tsmconfigfile = 'C:\Program Files\Tivoli\TSM\baclient\dsm.opt'
,@tsmfilespace = 'fsMH'
```

View Information on TSM Management Classes

List all the management classes:

```
exec master.dbo. xp_view_tsmmc
@tsmclientnode = '10.0.1.208'
,@tsmclientownerpwd = 'password'
,@tsmconfigfile = 'C:\Program Files\Tivoli\TSM\baclient\dsm.opt'
```

List information about a specific management class:

```
exec master.dbo. xp_view_tsmmc
@tsmmanagementclass = 'SPS_MGTD'
,@tsmclientnode = '10.0.1.208'
,@tsmclientownerpwd = 'password'
,@tsmconfigfile = 'C:\Program Files\Tivoli\TSM\baclient\dsm.opt'
```

Bind an Object to a New Management Class

```
exec master.dbo.xp_rebind_tsmmc
@tsmclientnode = '10.0.1.113'
,@tsmclientownerpwd = 'password'
,@TSMMANAGEMENTCLASS = 'STD_MGT_CLASS_B'
,@tsmobject = 'w2k10\HL1\LL2'
,@tsmconfigfile = 'c:\Program Files\Tivoli\TSM\api\dsm.opt'
```

Delete an Object in TSM Using the Command-Line

SLSMedia.exe -r tsm:file space\high level\low level --TSMConfigFile C:\ProgramFiles\Tivoli\tsm\api\dsm.opt

The above command deletes the TSM object.

usage: SLSMedia {operation} {options}
operation:
-?|--ShowHelp [<help topic>]
-d|--Download <source url> <target filename>
-r|--Remove <object>
-l|--List <object>
-b|--TSMBind <tsm_name>
-q|--TSMQuery <tsm_type>

NOTE: You can only delete an object in this manner if the TSM management policy set for the node allows it. Your TSM administrator will be able to advise you on your TSM policy settings.

Caution: Be careful when deleting objects. LiteSpeed places no restrictions on the objects to be deleted, which means it is possible to delete one object from a striped backup set, rendering the backup set useless.

Delete Old Backups

Delete full, differential and transaction log TSM backups created before 06/15/2012, using the PASSWORDAccess generate option to connect to the TSM Server:

```
exec master.dbo.xp_slsSmartCleanup
@database = N'test_tsm'
, @tsmconfigfile = N'C:\Program Files\Tivoli\TSM\baclient\dsm_gp.opt'
, @BackupExpiration = '2012-06-15'
, @LogExpiration = '2012-06-15'
```

Delete transaction log TSM backups created more than 10 days ago, using the PASSWORDAccess generate option to connect to the TSM Server:

```
SLSSmartCleanup.exe --Database test_tsm --TSMConfigFile "C:\Program
Files\Tivoli\TSM\baclient\dsm_gp.opt" --LogRetainDays 10 --WindowsAuth
```

Convert a TSM Backup to a LiteSpeed Disk Backup

You can use the following command to convert a TSM backup to a LiteSpeed disk backup to be able to restore it on a machine that does not have TSM installed:

```
slsrecast.exe -j "c:\tsmconfig.opt" -E tsmbkp:fs\highlevel\lowlevel -F "c:\new.bkp"
```

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Use IBM Spectrum Protect (TSM) Archive

About Using IBM Spectrum Protect™ (TSM) Archive

You can select to store a backup to IBM Spectrum Project (TSM) as an archive or as the usual backup.

TSM archiving is the method of transferring files off the computer into long-term storage, and it differs from regular TSM backups. Archiving uses different arguments, and allows additional parameters for narrowing the list of items returned in a query.

Store a Backup as a IBM Spectrum Protect™ (TSM) Archive

You can run a TSM archive using xp_backup_database and xp_backup_log. For more information about the LiteSpeed extended stored procedures and command-line utilities, please refer to the LiteSpeed *User Guide*.

To store a backup as a TSM archive

The parameter @tsmarchive = 1 is required.

Example:

```
EXEC master.dbo.xp_backup_database
@database = 'pubs'
, @tsmclientnode = 'ClusterGroup'
, @tsmclientownerpwd = 'test1111'
, @tsmobject = 'SLS_Russel-Mar\pubs\(16)Thursday_14:14'
, @tsmconfigfile = 'C:\Program Files\Tivoli\tsm\baclient\dsm.opt'
, @tsmarchive = 1
, @init = 1
```

Restore an Archived Backup

You can restore a TSM archive backup using xp_restore_database and xp_restore_log. Using xp_restore_ verifyonly you can see if the backup set is complete and valid.

For more information about the LiteSpeed extended stored procedures and command-line utilities, please refer to the LiteSpeed *User Guide*.

To restore an archived backup

1. Run the xp_view_tsmcontents (or the GUI must run it for the TSM Object Selection dialog just as it currently does for backups).
2. From the list, select the desired archive to restore. That selected archive has a tsmpointintime column in the list as seen in xp_view_tsmcontents. That tsmpointintime must be passed in to the restore in the @tsmpointintime parameter. This is the same parameter that backups can currently pass in for selection of an old retained backup to restore.

To restore an archive both the @tsmarchive = 1 and the @tsmpointintime parameters are required. If the @tsmarchive is passed in but the @tsmpointintime is not passed in, an error message is thrown stating that the @tsmpointintime is needed and where to get it (the xp_view_tsmcontents).

The @tsmarchive = 1 must have a supporting check box/radio button in the EC restore wizard. The @tsmpointintime however needs no GUI real estate change since it should work the same way it currently does for backups. Once the user selects an archive to restore the code should pull the tsmpointintime from the xml for that selected archive.

Example:

```
EXEC master.dbo.xp_restore_database
@database = 'pubs'
, @tsmclientnode = 'ClusterGroup'
, @tsmclientownerpwd = 'test1111'
, @tsmobject = 'SLS_Russel-Mar\pubs\(16)Thursday_14:14'
, @tsmconfigfile = 'C:\Program Files\Tivoli\tsm\baclient\dsm.opt'
, @tsmpointintime = '2006-03-16 14:49:35'
, @tsmarchive = 1
```

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