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SAP Adaptive Server Enterprise 16.0 SP03

Document Version: 1.0 – 2019-06-06

Using Backup Server with IBM Tivoli Storage Manager

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1 Create Backups Using the IBM Tivoli Storage Manager

SAP ASE support for the Tivoli Storage Manager is a licensed option.

The Tivoli Storage Manager (TSM) is a third-party client/server program that provides storage management services to the licensed user. The SAP ASE Backup Server supports tape drives and disk files as backup media. TSM works with Backup Server to enable a greater variety of backup media. You can store SAP ASE backups on any backup media supported by TSM.

SAP ASE handles the dump and load of databases and transactions to and from TSM; TSM handles storage and retrieval from the storage media.

TSM provides storage management services, but you can administer all your SAP ASE backup and restore operations, including queries for backup objects and deletion of backup objects, from Backup Server.

i Note

TSM does not support remote Backup Servers.

The SAP ASE and TSM integrated architecture includes SAP ASE, Backup Server, the TSM client, the TSM server, and the TSM client API. The TSM client API enables the client application to call TSM functions.

The SAP® interface with the TSM API provides I/O routines that allow Backup Server to communicate with TSM. When dump or load commands are executed, Backup Server dynamically loads this API module, which in turn loads a shared library supplied by the TSM client API component.

2 Install and Set Up the Backup System

You must install and configure Backup Server and TSM so they can work together to back up databases and transactions.

2.1 Installing the Backup System

Install the TSM client, TSM client API, and the TSM server according to instructions in the TSM documentation.

Prerequisites

Install and configure the TSM client API on the same machine as SAP ASE and Backup Server. Install and configure the TSM server on the same or different machine. See the TSM documentation for instructions.

Procedure

1. Set these TSM-specific environment variables on the Backup Server machine:

- DSMI_DIR–TSM installation directory location
- DSMI_LOG–TSM error log location
- DSMI_CONFIG–TSM configuration file
- DSMI_LIB–TSM shared library fully qualified path name

For example, assuming that SAP ASE, Backup Server, and the TSM client API are installed on a Linux AMD 64-bit machine

- DSMI_DIR–/opt/tivoli/tsm/client/api/bin64
- DSMI_LOG–/opt/tivoli/tsm/client/error_log
- DSMI_CONFIG–/opt/tivoli/tsm/client/api/bin64/dsm.opt
- DSMI_LIB–/opt/tivoli/tsm/client/api/bin64/libAPITSM64.so

2. Update the TSM system file (<dsm.sys>) and the TSM configuration file (<dsm_opt>). At a minimum, set these parameters:

- SERVERNAME–TSM server name.
- COMMETHOD–TSM server communication type.
- TCPPOINT–TSM server port number.
- TCPSEVERADDRESS–fully qualified name of TSM server.
- NODENAME–registered name of TSM client.
- PASSWORDACCESS–access method type of TSM password. Set to “generate”.

- PASSWORDDIR—directory location of TSM password.

i Note

To improve performance, set the appropriate TSM Client configuration parameters. See the TSM documentation for instructions.

3. Create the TSM client node at the TSM server. See the TSM documentation for instructions.
4. Use the `sybtsmpasswd` utility to:
 - Register the TSM client node with TSM server.
 - Generate the TSM-encrypted password file on the TSM client node.

`sybtsmpasswd` generates the TSM password file (<TSM.PWD>) in the directory specified by the `PASSWORDDIR` parameter in the TSM configuration file. (See step 2.)

Execute `sybtsmpasswd` while logged in as the operating system user "root." `sybtsmpasswd` prompts for the existing password and the new password for the registered TSM client node.

i Note

Execute `sybtsmpasswd` only when you set up TSM or change the TSM client node name, user name, or password.

5. Start Backup Server.
6. From the TSM server, grant the TSM client node name permission to delete backup copies at the TSM server. See the TSM documentation for instructions.

This enables these SAP operations at the TSM client node:

- `sp_deletesmobj`
- `dump database <database_name> to "syb_tsm::<object_name"> with init`

Results

After completing these steps, you can execute these commands and stored procedures:

- `dump database`
- `dump transaction`
- `load database`
- `load transaction`
- `sp_querysmobj`
- `sp_deletesmobj`

2.1.1 Configuring TSM to Allow Different Source and Target Machines

TSM does not automatically allow cross-client or cross-owner backup and restore operations.

Context

For example, if you want to dump from machine “node1” and load to machine “node2”. The source client NODENAME is “node1”; the target client NODENAME is “node2”.

Procedure

1. On the TSM client node, set the ASNODENAME parameter to the same value for both source and target client node machines.

For example:

```
ASNODENAME MyCluster
```

2. On the TSM server node:
 1. Add the client node name. For example: “MyCluster”.
 2. Register the common client node name “MyCluster” association with the source “node1” and target “node2” client nodes. See the TSM documentation for instructions on how to grant proxy authority to a client node.
 3. Grant permission to delete backup copies from the “MyCluster” client node. See the TSM documentation for instruction on how to update TSM client node properties.

2.1.2 Configuring TSM Data Compression

TSM provides a configuration parameter that enables backup data compression. If compression is enabled, the TSM client compresses the backup data before sending it to the TSM server. This decreases the amount of backup data sent to TSM server and the storage space it occupies at the TSM server.

Context

To enable TSM compression for SAP database backups, set the “COMPRESSION” parameter to “YES” in the TSM client configuration file (`dsm.sys`). The default value is “NO,” indicating no compression.

See the IBM Tivoli Storage Manager documentation.

3 Logical Structures on TSM

TSM abstracts the details of storage devices into a logical construct that requires few API calls. It allows client applications like Backup Server to use TSM API calls.

TSM uses these hierarchical constructs to structure backup data. Typically, you can use the default values supplied by TSM. Default values can be changed only by the TSM administrator at the TSM server; they cannot be changed from Backup Server.

In descending order, the constructs are:

- Policy domain—the base element of the logical structure, the policy domain associates a TSM client (a node) with a policy set.
- Policy set—each policy domain has one active policy set that determines how TSM server handles data from the TSM clients belonging to the policy domain. Each policy set contains a default management class and one or more additional management classes.
- Management class—backup copy groups that contain information about expiration or retention policies for backup objects.
- Copy group—defines the expiration or retention policies, such as event-based retention, for backup objects.

i Note

If SAP ASE backups require special expiration policies, or do not use the default copy groups, the TSM administrator can create custom classes or groups on the TSM server. You cannot create these special management classes and copy groups from Backup Server.

4 Object Naming and Data Organization

The TSM database schema is optimized for efficient storage and retrieval of data objects. SAP ASE database or transaction data is backed up as named objects on the TSM server. Backup Server assigns the object names.

Data is organized hierarchically on the TSM server at these levels:

- Filespace
- High-level name
- Low-level name

Backup Server prints the dump's backup object names when you successfully execute `dump database` or `dump transaction`.

5 Back Up Databases and Transactions

When you execute the `dump` or `load` command, Backup Server invokes the SAP interface with TSM API, which provides communication with TSM. When you use the `dump` command, you specify an object name that is uniquely associated with the backup object.

This object name is the same as the TSM object name, and should later be used to specify the same database or transaction dump when you execute the `load` command. In general, you can use the same options with the `dump` and `load` commands with TSM as you use with Backup Server when TSM is not configured.

The `dump` and `load` syntax specific to TSM is:

```
dump {database | transaction} <database_name> to "syb_tsm::<object_name">
```

```
load {database | transaction} <database_name> from  
"syb_tsm::[[-S <source_server_name>]  
>[[-D <source_database_name>]::]<object_name">
```

See the *Reference Manual: Commands* for complete syntax and usage information.

The keyword "syb_tsm" invokes the SAP interface with the TSM API (libsyb_tsm). When loading a database or transaction, specify a server or database name only when the current server or database is not the same as the server or database associated with the backup object.

5.1 Dump and Load with the Same and Different Databases

To dump and then load a database and transaction to a different database, when both databases are on the same SAP ASE, use the `-D` option with the `load` command.

For example, to dump a database "testdb" to a TSM backup object named "obj1.1", first dump "obj1.1" to the same database, then load "obj1.1" to a different database,

```
dump database testdb to "syb_tsm::obj1.1"
```

Backup Server prints the following, which provides the backup object identifiers:

```
Backup Server session id is: 5. Use this value when executing the  
'sp_volchanged' system stored procedure after fulfilling any volume change  
request from the Backup Server.Backup Server: 4.132.1.1: Attempting to open byte  
stream device:'syb_tsm::obj1.1::00'Backup Server: 6.28.1.1: Dumpfile name  
'testdb091840CA13 ' section number 1 mounted on byte stream  
'syb_tsm::obj1.1::00'Backup Server: 4.188.1.1: Database testdb: 854 kilobytes  
(84%) DUMPED.  
Backup Server: 3.43.1.1: Dump phase number 1 completed.  
Backup Server: 3.43.1.1: Dump phase number 2 completed.Backup Server: 3.43.1.1:  
Dump phase number 3 completed.  
Backup Server: 4.188.1.1: Database testdb: 870 kilobytes (100%) DUMPED.  
Backup Server: 3.42.1.1: DUMP is complete (database testdb).Additional message  
in Backup Server error log indicating corresponding TSM backup object name and  
ids. Please check the complete Backup Server error log attached as well.
```

Check the Backup Server error log to see the TSM backup object name and id:

```
Jul  3 14:30:19 2009: A00: Database 'testdb' dumped. Tivoli Storage Manager
backup object name: fs = /demo_srv1, high = /testdb.DB, low = /obj1.1.0,
Copyids: (0, 36913).
```

Backup Server also prints the backup object identifiers to the error log. In this example, they are:

- Filespace (fs)–demo_srv1.
- High-level name (high)–testdb.DB.
- Low-level name (low)–obj1.1.0.
- TSM copyid (copyids)–0, 36913. This is a unique identifier assigned by the TSM server. It has two parts: a high copyid and a low copyid.

To load the backup object “obj1.1.0” to the same database, “testdb,” enter:

```
load database testdb from "syb_tsm::obj1.1"
```

Alternatively, to load the backup object “obj1.1” to another database, “anotherdb,” enter:

```
load database anotherdb from
"syb_tsm::-D testdb::obj1.1"
```

5.2 Dump and Load When the Source and Target Adaptive Servers are Different

To dump and then load the database or transaction to a different database on a different SAP ASE, use both the `-s` and `-D` options with the `load` command.

Make sure that you:

- Configure the TSM server and TSM client to enable the `load` command for different source and target machines.
- Start Backup Server using the same login on both the source and target machines.
- Use the `-s` and `-D` options with the `load database` or `load transaction` command, where `-s` specifies the source server and `-D` specifies the source database.

```
load database <database_name> from "syb_tsm::
-S <server_name> -D <database_name>::<object_name">
```

For example, to load the backup object “obj1.3” to “anotherdb” where the source server is “myserver” and the database is “testdb,” enter:

```
load database anotherdb from
"syb_tsm::-S myserver -D testdb::obj1.3"
```

5.3 Dump and Load with Multiple Stripes

When multiple stripes are used with `dump database` or `dump transaction`, each stripe creates a separate backup object at the TSM.

You can use the same or different backup object names for multiple stripes when TSM handles the backup media. In this example, each stripe has the same name. TSM uses a low-level identifier to distinguish between each backup object, for example, `obj.2`. See the error log later in this section.

Note

If TSM is supported at your site, you can use the same or different names for each stripe. If TSM is not supported at your site, you must use different names for each stripe.

Using the same object name for each stripe

For example, to dump “testdb” using multiple stripes with the same stripe object name “obj”, enter:

```
dump database testdb to "syb_tsm::obj"  
stripe on "syb_tsm::obj"  
stripe on "syb_tsm::obj"  
stripe on "syb_tsm::obj"  
stripe on "syb_tsm::obj"
```

In this example, Backup Server provides uniqueness for TSM backup objects by appending the stripe identifier to the supplied backup object name “obj”. Check the Backup Server error log to verify that the TSM low-level backup object name is unique for each stripe.

Backup Server prints:

```
Backup Server session id is: 5. Use this value when executing the  
'sp_volchanged' system stored procedure after fulfilling any volume change  
request from the Backup Server.  
Backup Server: 4.132.1.1: Attempting to open byte stream device: 'syb_tsm::obj::  
00'  
Backup Server: 4.132.1.1: Attempting to open byte stream device: 'syb_tsm::obj::  
01'  
Backup Server: 4.132.1.1: Attempting to open byte stream device: 'syb_tsm::obj::  
02'  
Backup Server: 4.132.1.1: Attempting to open byte stream device: 'syb_tsm::obj::  
03'  
Backup Server: 4.132.1.1: Attempting to open byte stream device: 'syb_tsm::obj::  
04'  
Backup Server: 6.28.1.1: Dumpfile name 'testdb092740CDAD ' section number 1  
mounted on byte stream 'syb_tsm::obj::03'  
Backup Server: 6.28.1.1: Dumpfile name 'testdb092740CDAD ' section number 1  
mounted on byte stream 'syb_tsm::obj::00'  
Backup Server: 6.28.1.1: Dumpfile name 'testdb092740CDAD ' section number 1  
mounted on byte stream 'syb_tsm::obj::01'  
Backup Server: 6.28.1.1: Dumpfile name 'testdb092740CDAD ' section number 1  
mounted on byte stream 'syb_tsm::obj::02'  
Backup Server: 6.28.1.1: Dumpfile name 'testdb092740CDAD ' section number 1  
mounted on byte stream 'syb_tsm::obj::04'  
Backup Server: 4.188.1.1: Database testdb: 24 kilobytes (87%) DUMPED.  
Backup Server: 4.188.1.1: Database testdb: 106 kilobytes (88%) DUMPED.
```

```

Backup Server: 4.188.1.1: Database testdb: 646 kilobytes (97%) DUMPED.
Backup Server: 4.188.1.1: Database testdb: 760 kilobytes (99%) DUMPED.
Backup Server: 4.188.1.1: Database testdb: 874 kilobytes (100%) DUMPED.
Backup Server: 3.43.1.1: Dump phase number 1 completed.
Backup Server: 3.43.1.1: Dump phase number 2 completed.
Backup Server: 3.43.1.1: Dump phase number 3 completed.
Backup Server: 4.188.1.1: Database testdb: 898 kilobytes (100%) DUMPED.
Backup Server: 3.42.1.1: DUMP is complete (database testdb).

```

Check the Backup Server error log to see the TSM backup object names and IDs. Check the complete Backup Server error log attached as well. The Backup Server displays this information:

```

Oct 1 14:37:43 2009: A00: Database 'testdb' dumped. Tivoli Storage Manager
backup object name: fs = /demo_srv1, high = /testdb.DB, low = /obj.0, Copyids:
(0, 80898).
Oct 1 14:37:43 2009: A03: Database 'testdb' dumped. Tivoli Storage Manager
backup object name: fs = /demo_srv1, high = /testdb.DB, low = /obj.3, Copyids:
(0, 80897).
Oct 1 14:37:43 2009: A02: Database 'testdb' dumped. Tivoli Storage Manager
backup object name: fs = /demo_srv1, high = /testdb.DB, low = /obj.2, Copyids:
(0, 80899).
Oct 1 14:37:43 2009: A01: Database 'testdb' dumped. Tivoli Storage Manager
backup object name: fs = /demo_srv1, high = /testdb.DB, low = /obj.1, Copyids:
(0, 80900).

```

To load “obj” to the same database, enter:

```

load database testdb from "syb_tsm::obj"
stripe on "syb_tsm::obj"
stripe on "syb_tsm::obj"
stripe on "syb_tsm::obj"
stripe on "syb_tsm::obj"

```

Using different object names for each stripe

To dump “testdb” using multiple stripes with different strip object names, enter:

```

dump database testdb to "syb_tsm::obj0"
stripe on "syb_tsm_obj1"
stripe on "syb_tsm_obj2"
stripe on "syb_tsm_obj3"
stripe on "syb_tsm_obj4"

```

In this example, each stripe has a unique backup object name; Backup Server appends a stripe identifier to each one.

Backup Server prints:

```

Backup Server session id is: 13. Use this value when executing the
'sp_volchanged' system stored procedure after fulfilling any volume change
request from the Backup Server.
Backup Server: 4.132.1.1: Attempting to open byte stream device:
'syb_tsm::obj0::00'
Backup Server: 4.132.1.1: Attempting to open byte stream device:
'syb_tsm::obj1::01'
Backup Server: 4.132.1.1: Attempting to open byte stream device:
'syb_tsm::obj2::02'
Backup Server: 4.132.1.1: Attempting to open byte stream device:
'syb_tsm::obj3::03'

```

```

Backup Server: 4.132.1.1: Attempting to open byte stream device:
'syb_tsm::obj4::04'
Backup Server: 6.28.1.1: Dumpfile name 'testdb092740D1A6 ' section number 1
mounted on byte stream 'syb_tsm::obj1::01'
Backup Server: 6.28.1.1: Dumpfile name 'testdb092740D1A6 ' section number 1
mounted on byte stream 'syb_tsm::obj0::00'
Backup Server: 6.28.1.1: Dumpfile name 'testdb092740D1A6 ' section number 1
mounted on byte stream 'syb_tsm::obj3::03'
Backup Server: 6.28.1.1: Dumpfile name 'testdb092740D1A6 ' section number 1
mounted on byte stream 'syb_tsm::obj4::04'
Backup Server: 6.28.1.1: Dumpfile name 'testdb092740D1A6 ' section number 1
mounted on byte stream 'syb_tsm::obj2::02'
Backup Server: 4.188.1.1: Database testdb: 24 kilobytes (87%) DUMPED.
Backup Server: 4.188.1.1: Database testdb: 106 kilobytes (88%) DUMPED.
Backup Server: 4.188.1.1: Database testdb: 220 kilobytes (90%) DUMPED.
Backup Server: 4.188.1.1: Database testdb: 334 kilobytes (92%) DUMPED.
Backup Server: 4.188.1.1: Database testdb: 874 kilobytes (100%) DUMPED.
Backup Server: 3.43.1.1: Dump phase number 1 completed.
Backup Server: 3.43.1.1: Dump phase number 2 completed.
Backup Server: 3.43.1.1: Dump phase number 3 completed.
Backup Server: 4.188.1.1: Database testdb: 898 kilobytes (100%) DUMPED.
Backup Server: 3.42.1.1: DUMP is complete (database testdb).

```

The Backup Server error log displays the TSM backup object name and its IDs.

```

Oct 1 14:54:33 2009: A00: Database 'testdb' dumped. Tivoli Storage Manager
backup object name: fs = /demo_srv1, high = /testdb.DB, low = /obj0.0, Copyids:
(0, 80904).
Oct 1 14:54:33 2009: A03: Database 'testdb' dumped. Tivoli Storage Manager
backup object name: fs = /demo_srv1, high = /testdb.DB, low = /obj3.3, Copyids:
(0, 80903).
Oct 1 14:54:33 2009: A02: Database 'testdb' dumped. Tivoli Storage Manager
backup object name: fs = /demo_srv1, high = /testdb.DB, low = /obj2.2, Copyids:
(0, 80905).
Oct 1 14:54:33 2009: A01: Database 'testdb' dumped. Tivoli Storage Manager
backup object name: fs = /demo_srv1, high = /testdb.DB, low = /obj1.1, Copyids:
(0, 80902).
Oct 1 14:54:33 2009: A04: Database 'testdb' dumped. Tivoli Storage Manager
backup object name: fs = /demo_srv1, high = /testdb.DB, low = /obj4.4, Copyids:
(0, 80906).
Oct 1 14:54:34 2009: Backup Server: 3.42.1.1: DUMP is complete (database
testdb).

```

To load this dump to the same database, enter:

```

load database testdb from "syb_tsm::obj0"
stripe on "syb_tsm::obj1"
stripe on "syb_tsm::obj2"
stripe on "syb_tsm::obj3"
stripe on "syb_tsm::obj4"

```

5.4 Use mountwait -M to Specify Server Wait Time

Backup Server supports the Tivoli Storage Manager `mountwait -M` parameter for the `dump database`, `dump transaction`, `load database`, and `load transaction` commands.

The syntax is:

```
[dump database | dump tran] to "syb_tsm::-M::<object_name>"
```

and:

```
[load database | load tran] from "syb_tsm::-M::<object_name>"
```

The `mountwait -M` parameter is disabled by default.

5.5 Restore Databases in Tivoli Storage Manager to Different Target Databases

You can load Tivoli Storage Manager-based backups into a different database on a different server when using the dump history file.

Earlier versions of SAP ASE supported the use of `dump database` with TSM:

```
dump database <source_dbname> to "syb_tsm::-<object_name>"
```

where:

- `<source_dbname>` – is the name of the source database.
- `<syb_tsm>` – is the fully qualified TSM name that specifies the name of the server and database from which you made the backup, using:

```
-S <source_server> -D <source_dbname>
```

- `<object_name>` – is a name of the target database.

In SAP ASE 15.7 SP100 and later, the fully qualified TSM name is stored in the dump history file. Using the `load database...` as syntax allows you to restore a differently named database on a different server.

Performing this `dump database` command changes the information in the dump history file to correctly identify the fully qualified path of your object in TSM.

After you perform this command, the `sp_dump_history` system procedure displays the fully qualified TSM object name.

After you back up your database stored in TSM, you can restore it using:

```
load database <source_dbname> AS  
<target_dbname> with listonly=create_sql
```

The general form of the output generated is:

```
load database <target_dbname>  
  from syb_tsm::[[ -S <source_server> ] [-D <source_dbname> ]  
  ::<object_name>  
  [stripe on syb_tsm::[[ -S <source_server> ]  
  [-D <source_dbname> ]]::<object_name>  
  [[stripe on syb_tsm::[[ -S <source_server> ]  
  [-D <source_dbname> ]]::<object_name>  
load tran <target_dbname>  
  from syb_tsm::[[ -S <source_server> ]  
  [-D <source_dbname> ]]::<object_name>  
  [stripe on syb_tsm::[[ -S <source_server> ]  
  [-D <source_dbname> ]]::<object_name>  
  [[stripe on syb_tsm::[[ -S <source_server> ]
```

```
[-D <source_dbname>]::]<object_name>
```

6 List a Server's Backup Objects

Use the `sp_querysmobj` stored procedure to retrieve a list of a server's backup objects.

See the *Reference Manual: Procedures* for complete syntax and usage information.

7 Delete Backup Objects from TSM

Use the `sp_deletesmobj` stored procedure to delete some or all of the current server's backup objects from TSM.



See the *Reference Manual: Procedures* for complete syntax and usage information.

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