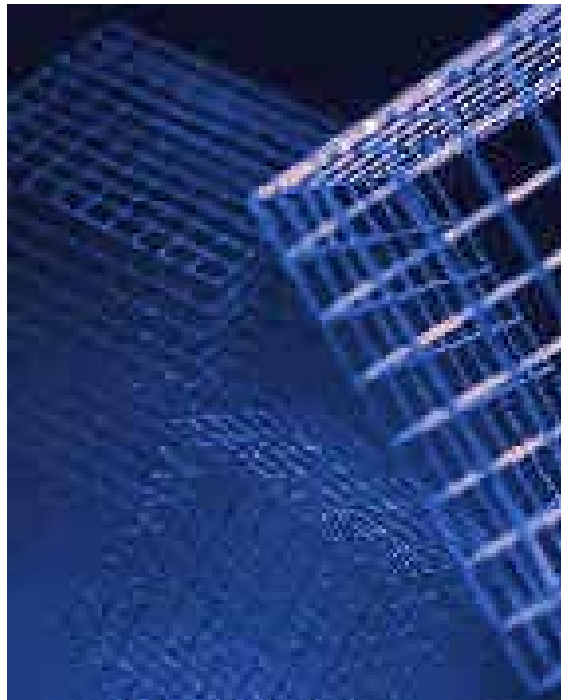


Backup and Restore Interface for SAP DB Systems (Backint for SAP DB)



Version 7.x









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Introduction

Backup of SAP DB Database Systems

A backup of a SAP DB is performed by the SAP DB database software itself. This ensures an easy and complete backup and smooth system operation. SAP DB allows complete and incremental backups to tapes, autoloader, files and named pipes. Backups can be performed online and offline.

Backups and restores are controlled with the help of database management tools supplied with every SAP DB. These management tools are DBMGUI, DBMCLI and WebDBM. The management tools DBMGUI, DBMCLI and WebDBM call the DBM server (DBMSRV) on the database server.

Backup of a SAP DB Database System Using External Backup Tools

Integration of external backup programs (common client/server backup programs) is based on the backup of SAP DB to named pipes, because this is an effective way already supplied by SAP DB to transfer a complete database backup to another program.

There are two possibilities:

- The external backup tool is controlled by SAP DB tool DBMSRV .

SAP DB's management tools are precisely adjusted to the different versions of SAP DB.

If a backup is controlled by a SAP DB tool, this tool initiates the data transfer of the database to one or more pipes and it calls the external backup tool to backup the data supplied in the pipes. If an error occurs from SAP DB or from the external backup tool the SAP DB tool ends the data transfer by informing the other partner of the data transfer.

If a restore is controlled by a SAP DB tool, this tool queries the available backups from the external backup tool, displays the result of this query to the user and initiates and controls the transfer of the desired backups from the external backup tool to the database with the help of one or more pipes.

- The external backup tool uses SAP DB tool DBMCLI to control the database.

Why Backint for SAP DB?

Backint for SAP DB defines an interface program, allowing SAP DB tools to communicate with external backup tools via an open interface. Backint for SAP DB allows to initiate a data transfer with files and/or pipes to/from the external backup tool for backup/restore purposes and it allows queries needed to determine available backups.

As SAP has already created the open interface BACKINT to integrate common client/server backup programs in the database administration program SAPDBA to backup and restore Oracle databases, the Backint for SAP DB interface was defined analogous to BACKINT. Backint for SAP DB was designed to be implementable together with BACKINT in one single program.

Platforms

The following platforms are supported:

HP-UX, IBM AIX, SNI Reliant, SUN Solaris, Compaq TRUE64Unix, Windows NT, Windows 2000, Windows XP, Linux (Intel)

Backint for SAP DB Interface for SAP DB Database Systems

The link between the SAP DB program DBMSRV and the external backup tools is established by an interface program called Backint for SAP DB. This program processes the backup, restores and inquires about requests and executes them using the corresponding backup tool. If the external backup tool is a client/server program, Backint for SAP DB communicates with the client or implements the client running on the database server.

Interface Functions (General Description)

The Backint for SAP DB interface supports four functions:

backup

restore

inquire

delete

In all cases, the mandatory user ID (UID) parameter will be used as an identifier for the SAP DB database. After a function has been executed, the interface program always returns an integer value, which indicates whether or not the call was successful.

Backup Function

The *backup function* defines a backup request including all the files or pipes specified in a list. On return, the Media Management System (MMS) generates a backup ID (BID) for each saved file or pipe that clearly identifies the backup. The interface program informs the user which files or pipes have been backed up successfully and which have not, and which BID was assigned to each file and to each pipe and how many bytes were saved for each pipe.

The sequence in which the files in the list are backed up can be freely determined by the external MMS.

If more than one pipe is specified in the list, the pipes have to be backed up in parallel. The special requirements for parallel pipe backups are described in the section *Formal Definition of the Interface Program for the Backup Utility*. Parallel backups are an optional feature of Backint for SAP DB.

Restore Function

The *restore function* is used to pass on a restore request to the external MMS. This request consists of user ID (UID) and a list of files and pipes to be restored. Files are specified by their backup ID (BID), their name, and a directory where the file should be created. Pipes are specified by their backup ID (BID), their name, and the name of the actual pipe where the contents of the saved pipe should be restored to. The name of the directory where the file should be created and the name of the actual pipe are optional. If the backup ID is not set, the last backup of the related file or pipe is used. The return information indicates which files or pipes have been restored successfully and which backup IDs have been used.

The sequence in which the files in the list are restored can be freely determined by the external MMS.

If more than one pipe is specified in the list, they have to be restored in parallel. The special requirements for parallel pipe restores are described in the section *Formal Definition of the Interface Program for the Backup Utility*. Parallel backups and parallel restores are an optional feature of Backint for SAP DB.

Inquire Function

The *inquire function* provides information about the backups managed by the external MMS. This function is called using UID, BID and the file or pipe name (the last two parameters are optional). If the BID is not set, a list of available backups (BIDs) is provided, which includes the specified file or pipe. If a file or pipe name is not specified, a list of files or pipes belonging to a specific BID is generated.

If neither of the two parameters is set, a list of available backups (BIDs) is generated. If both parameters are specified, the system checks whether this file or pipe was saved with a specific BID. The BID does not necessarily identify one backup run (however this is normally the case). It can also identify the backup of a single file or single pipe or a group of files or a group of pipes or a group of files and pipes.

Delete Function

The *delete function* is used to inform Backint for SAP DB about previously saved files or pipes, which are not needed any longer, e.g. if a backup was only partially successful Backint for SAP DB is informed about that through the delete function. The files or pipes which are not needed any longer are specified by their UID, BID, and name.

Backint for SAP DB is allowed to ignore a delete request.

Formal Definition of the Interface Program for the Backup Utility

Backint for SAP DB has a call interface at command line level using the following syntax:

```
backint -u <user_id> [-f <function>] [-t <type>]
[-p <par_file>] [-i <in_file>] [-o <out_file>] [-c]
```

For description of `-u <user_id>`, `-f <function>`, `-t <type>`, `-c` see *Basic Options*.

For description of `-p <par_file>`, `-i <in_file>`, `-o <out_file>` see *Control Options*.

In addition to the command line options the interface also supports some environment variables set by DBMSRV before Backint for SAP DB is called:

Environment Variable	Value	Description
BI_CALLER	DBMSRV	Backint for SAP DB called by DBMSRV
BI_BACKUP	FULL PARTIAL ARCHIVE	complete database backup incremental database backup log backup
BI_REQUEST	NEW OLD	First following call of Backint for SAP DB within a DBMSRV run

As DBMSRV sets the environment dynamically (`putenv`), Backint for SAP DB as the child process can inherit these variables (`getenv`) and use their values to control further processing.

Basic Options

The following basic options can be set for Backint for SAP DB (`backint`).

Basic Options

Command Line Option	Description	Default
<code>-u <user_id></code>	<code><user_id></code> (UID) Backup utility user, normally database instance name (e.g. SAPDB_SID)	None
<code>-f <function></code>	<code><function></code> : <code>backup restore inquire delete</code> Type of operation	Backup
<code>-t <type></code>	<code><type></code> : <code>file</code> Backup type: backup of individual files or pipes See <i>Command Line Option -t file</i>	File
<code>-c</code>	Unattended mode (no interaction with operator possible)	attended mode

See also *Variable Definition*

Command Line Option -t file

Backup type `file` for functions `backup`, `restore`, `inquire`, `delete` is the only type for handling files or pipes. The backup type `file` is equivalent to the type of the same name defined by BACKINT (for Oracle). They differ in the permissible backup objects.

BACKINT (for Oracle) allows files, directories and raw devices to be specified in the input file (control option `-i <in_file>`).

Backint for SAP DB allows only files and pipes to be specified in the input file (control option `-i <in_file>`).

Backint for SAP DB has to check (for function `backup`) or recognize (for functions `restore`, `inquire` and `delete`) if the backup object is a file or a pipe. The list of objects specified in the input file (control option `-i <in_file>`) can be mixed.

Control Options

The following control options can be set for Backint for SAP DB (`backint`).

Control Options

Command Line Option	Description	Default
<code>-p <par_file></code>	<p><file></p> <p>Parameter file for backup utility containing parameters that determine the backup procedure; specific to the backup utility. The SAP tools specify the location of this utility parameter file in their own parameter file but its contents is not evaluated by them.</p>	None
<code>-i <in_file></code>	<p><file></p> <p>Input file: Name of a text file that defines the objects of the function (<code>backup</code>, <code>restore</code>, <code>inquire</code> or <code>delete</code>). See <i>Contents of the Input File</i></p>	If this option is not set, data is read from the standard input (STDIN) .
<code>-o <out_file></code>	<p><file></p> <p>Output file: Name of a text file that serves as a pool for messages about processing and for the results of the executed function. See <i>Contents of the Output File</i></p>	If this option is not set, the messages are written to the standard output (STDOUT) .

See also *Variable Definition*

Contents of the Input File

The contents of the input file <in_file> depend on the function defined by the Backint for SAP DB (backint) basic option -f <function>.

Input File

<function>	Contents of the Input File <in_file>	Entries have form
backup	Names of the files or pipes to be saved. Pipes are marked by the key word #PIPE. <i>See Command Line Option -f backup</i>	<file> <pipe> #PIPE
restore	Names of files or pipes to be restored with BIDs (see <i>Backup ID</i>) of the backups or #NULL <file>; optional with changed target directories for files <dest_dir> and changed target names for pipes <dest_name> <i>See Command Line Option -f restore</i>	<backup_id> <file> [<dest_dir>] #NULL <file> [<dest_dir>] <backup_id> <pipe> [<dest_name>] #NULL <pipe> [<dest_name>]
inquire	Names of files or pipes and/or BIDs about which information is requested – sorted by creation date (most recent backup first) <i>See Input/Output File Correlation</i>	#NULL <backup_id> #NULL <file> #NULL <pipe> <backup_id> <file> <backup_id> <pipe>
delete	BIDs and names of files or pipes which can be deleted.	<backup_id> <file> <backup_id> <pipe>

See also *Variable Definition*

Backup ID

The Backup ID (<backup_id>), assigned by the external backup tool, is passed on as a return value in connection with the backup function (defined by the Backint for SAP DB (backint) basic option `-f backup`), can only be set in the input file <in_file> with the restore, the inquire and the delete function.

Command Line Option `-f backup`

If pipes mentioned in the list in the input file <in_file> do not exist, Backint for SAP DB can either create them or check periodically for their appearance. The pipes must be opened for reading only. The software or user that called Backint for SAP DB (DBMSRV or user) ensures that every pipe mentioned in the list is opened and closed at least once. Backint for SAP DB must report an error for every pipe it has not opened.

The data transfer through a pipe ends if one side of the pipe is closed after both sides were opened successfully.

If more than one pipe is specified in the input list, they must all be processed in a non blocking manner and in parallel to avoid dead locks. In other words, Backint for SAP DB must process these pipes all concurrently but totally independent of each other.

This can be achieved, if an open or a read operation on one pipe is not blocking the open operations and the data transfers on the other pipes mentioned in the input list. Therefore Backint for SAP DB has to check every pipe periodically, to check that it could be opened or that data could be read from the pipe. This can be achieved for instance by starting one child process or thread for every single pipe and by avoiding any synchronisations between these processes and threads. These processes or threads can then open and read their pipes with normal blocking operations, because the operating system is periodically switching to the other processes or threads of the other pipes.

Command Line Option -f restore

If pipes mentioned in the list in the input file `<in_file>` do not exist, Backint for SAP DB can either create them or check periodically for their appearance. The pipes must be opened for writing only. The software or user that called Backint for SAP DB (DBMSRV or user) ensures that every pipe mentioned in the list is opened and closed at least once. Backint for SAP DB must report an error for every pipe it has not opened. Backint for SAP DB must restore the data to a pipe in the same sequence it read the data from the original, saved pipe.

The data transfer through a pipe ends if one side of the pipe is closed after both sides were opened successfully.

If more than one pipe is specified in the input list, Backint for SAP DB must process these pipes in a non blocking manner and in parallel to avoid dead locks. In other words, Backint for SAP DB must process these pipes concurrently but totally independent of each other.

This can be achieved if an open or a write operation on one pipe is not blocking the open operations and the data transfers on the other pipes mentioned in the input list. Therefore Backint for SAP DB has to check every pipe periodically, to check that it could be opened or that data could be written to the pipe. This can be achieved for instance by starting one child process or thread for every single pipe and by avoiding any synchronisations between this processes and threads. These processes or threads can then open and write to their pipes with normal blocking operations, because the operating system is periodically switching to the other processes or threads of the other pipes.

Contents of the Output File

In addition to the messages with fixed format defined below, the file may contain other messages that are simply passed on to the user. If the output file is not specified by the Backint for SAP DB (backint) control option `-o <out_file>`, the output is sent to the standard output (STDOUT).

The contents of the output file `<out_file>` depend on the function defined by the Backint for SAP DB (backint) basic option `-f <function>`.

Output File

<function>	Successful Completion	No Backup / Error
backup	#SAVED <backup_id> <file> [<backup_vol>] #SAVED <backup_id> <pipe> <size> [<backup_vol>]	#ERROR <file> #ERROR <pipe>
restore	#RESTORED <backup_id> <file> #RESTORED <backup_id> <pipe>	#NOTFOUND <file> #NOTFOUND <pipe> #ERROR <file> #ERROR <pipe>
inquire	#BACKUP <backup_id> #BACKUP <backup_id> <file> #BACKUP <backup_id> <pipe> <i>see Input/Output File Correlation</i>	#NOTFOUND <file> #NOTFOUND <pipe> #ERROR <file> #ERROR <pipe>
Delete	#DELETED <backup_id> <file> #DELETED <backup_id> <pipe>	#NOTFOUND <file> #NOTFOUND <pipe> #ERROR <file> #ERROR <pipe> #NOTDELETED <file> #NOTDELETED <pipe>

See also *Variable Definition*

Input/Output File Correlation

Since the contents of the output file <out_file> for the inquire function (basic option -f inquire) greatly depend on the type of request, it is necessary to distinguish four different cases as described in the following table.

Correlation of Input and Output Values for the inquire Function

Case	Entries in the Input File	Entries in the Output File
A	Neither BID nor file or pipe name specified (#NULL)	List of BIDs for UID sorted by creation date (most recent backup first). One list entry consists of one BID. (#BACKUP <backup_id>)
B	BID specified, file or pipe name not specified (<backup_id>)	List of BIDs and related files or pipes in the specified backup. One list entry consists of the specified BID and one file or pipe name. (#BACKUP <backup_id> <file> #BACKUP <backup_id> <pipe>)
C	BID not specified, file or pipe name specified (#NULL <file> #NULL <pipe>)	List of BIDs related to the specified file or pipe, sorted by creation date (most recent backup first). One list entry consists of one BID and the specified file or pipe name. (#BACKUP <backup_id> <file> #BACKUP <backup_id> <pipe>)
D	BID and file or pipe name specified (<backup_id> <file> <backup_id> <pipe>)	BID and file or pipe name, if available, in the specified backup. One list entry consists of one BID and one file or pipe name (#BACKUP <backup_id> <file> #BACKUP <backup_id> <pipe>)

See also *Variable Definition*

Variable Definition

All entries in the Backint for SAP DB (`backint`) command line options have a variable character format as described in the following table.

Type of Entries

Entry	Description	Type (max. Length)
<file>	File	CHAR(255)
<pipe>	Pipe	CHAR(255)
<dest_dir>	Directory for files	CHAR(255)
<dest_name>	Pipe name	CHAR(255)
<size>	File or pipe size	CHAR(16)
<backup_id>	Backup_ID	CHAR(16)
<user_id>	User ID	CHAR(16)
<backup_vol>	Backup volume (e.g. tape label)	CHAR(10)

Backint for SAP DB Return Code

Backint for SAP DB is called by the user or DBMSRV. The user and the program expect Backint for SAP DB to return with a code according to the following description.

Backint for SAP DB Return Code

Return Code	Description
0	OK – All files and pipes were successfully processed without warnings.
1	WARNING – All files and pipes were successfully processed.
2	ERROR – Some or all files or pipes were not successfully processed.