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BMC Recovery Manager for DB2 UDB

Recoverable Load Made Simple

In the complex world of global business, every database operation needs to be done very quickly to cope with constant data changes. There are many ways to perform database operations quickly, but most are very complex. Is there anybody who makes these complex operations simple, to help DBAs get their work completed quickly and efficiently?

Databases need to be created and populated very quickly so that applications can be tested and deployed on schedule. Two options for loading data into a DB2 Universal Database (UDB) database are the *load* operation and the *import* operation. A load operation moves large quantities of data into newly created tables, or tables that already contain data. When you are moving a large amount of data, a load operation is much faster than an import, because load operations write formatted pages directly into the database.

If load operations are faster, why would you ever choose to perform an import? This is an obvious question for any experienced user of DB2 UDB. Although load operations tend to run faster than imports, loads can add considerable complexity to your recovery scenarios.

There are two types of load operations in the DB2 Universal Database environment:

- > non-recoverable load
- > recoverable load

When you perform a non-recoverable load operation to a table, it will not be possible to restore the table with a subsequent rollforward action. The rollforward will skip the transaction and will mark the target table — the table into which the data was loaded — as invalid. Once the rollforward completes, you can either drop the table or restore it from a prior backup image, if one is available.

When a recoverable load operation is performed, the table can be restored by a subsequent rollforward. However, recoverable loads are rather complex operations. There are two options for performing a recoverable load:

- > COPY NO
- > COPY YES

If you use the COPY NO option, the tablespace that contains the target table is placed in backup-pending mode and is therefore unavailable to users. To make the table available and to ensure that it can be restored in a subsequent rollforward operation, the DBA must perform a tablespace backup immediately after the recoverable load. Unfortunately, the time saved by performing a load operation may be offset by the time required to run the required tablespace backup.

If you use the COPY YES option, the tablespace is available immediately after the load operation completes, the target table can be restored in a subsequent rollforward operation, and no tablespace backup is required. In these respects, the COPY YES option is clearly preferable to COPY NO. However, the COPY YES option introduces a number of complicated extra steps for users of the DB2 UDB utilities.

When the COPY YES option is enabled during a recoverable load operation, DB2 UDB produces a load-copy image. The load-copy image is saved to backup media as specified with the LOAD command for each table. The DBA must maintain the load-copy images for use in subsequent rollforward operations.

The following table summarizes the primary advantages, disadvantages, and limitations of recoverable and non-recoverable load operations.

Non-recoverable Load	Recoverable Load with COPY NO	Recoverable Load with COPY YES
Tablespace backup is strongly recommended	Tablespace backup is mandatory	No tablespace backup is required
Tables can't be restored with a rollforward	Tables can be restored with a rollforward	Tables can be restored with a rollforward
Relatively fast (without tablespace backup)	Relatively slow (due to mandatory tablespace backup)	Fast, but extra steps required if using DB2 UDB utilities
Load-copy image is not created	Load-copy image is not created	Load-copy image is created

Figure 1. Advantages, disadvantages, and limitations of the load operations

Before a rollforward operation can be performed with the DB2 UDB utility, the DBA needs to prepare a location file to specify information about the load copies and where they are stored. This is a time-consuming process, and the DBA

must take care to ensure precision and accuracy of the information in the file. A separate entry must be created in the location file for each table, as shown in Figure 2.

```

TIMESTAMP      20051028182542 [timestamp generated at load time]
SCHEMA        PAYROLL        [schema of table loaded]
TABlename     EMPLOYEES      [table name]
DATAbasename  DBT           [database name]
DB2instance   db2           [instance, as defined by DB2INSTANCE]
BUffernumber  NULL          [number of buffers for recovery]
SESSionnumber NULL          [number of sessions for recovery]
TYPeofmedia   L             [type of media: L = local device, A = TSM, O = other vendors]
LOCationnumber 3             [number of locations]
  ENtry        /u/db2/dbt.payroll.employees.001 [load-copy location]
  ENT          /u/db2/dbt.payroll.employees.002 [load-copy location]
  ENT          /dev/rmt0       [load-copy location]
  
```

Figure 2. Sample Entry in the Load-Copy Location File

DB2 UDB looks for the location file during the rollforward operation. Based on the information in the file, DB2 UDB then reads the required load-copy images and restores table data that was loaded in the prior recoverable load operation.

The diagram in Figure 3 shows the operations associated with a recoverable load operation in DB2 UDB, and the required resources for each operation. Rectangles represent DB2 UDB processes and the arrows indicate data movement between files and processes.

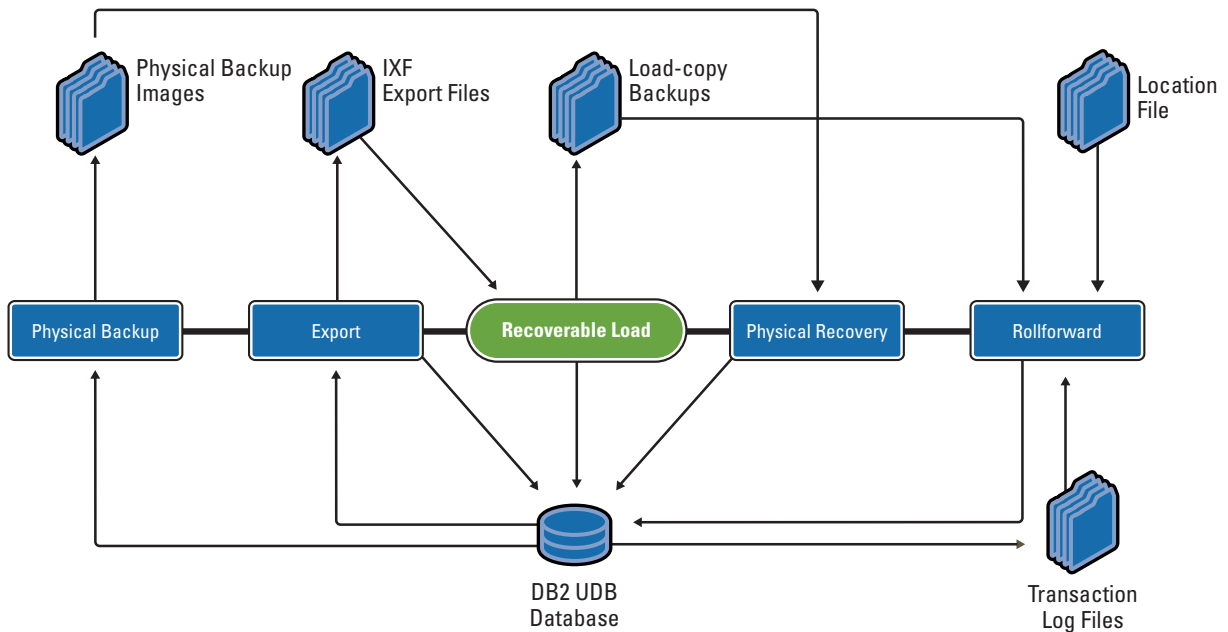


Figure 3. Recoverable Load Workflow in DB2 UDB

BMC Recovery Manager for DB2 UDB automates all the complex steps required for performing recoverable load operations with the COPY YES option, as well as any subsequent rollforward operations. This functionality allows users to take advantage of this complex DB2 UDB functionality through a simple menu or easy-to-use commands and options.

The diagram in Figure 4 shows the processes associated with a recoverable load operation in BMC Recovery Manager. The arrows indicate data movement between DB2 UDB processes, BMC Recovery Manager processes, and backup media. The diagram shows that BMC Recovery Manager is far easier to use for these operations than the DB2 UDB utilities. Unlike the DB2 UDB utilities, BMC Recovery Manager writes physical backup images, export files, and load-copy images directly to backup media.

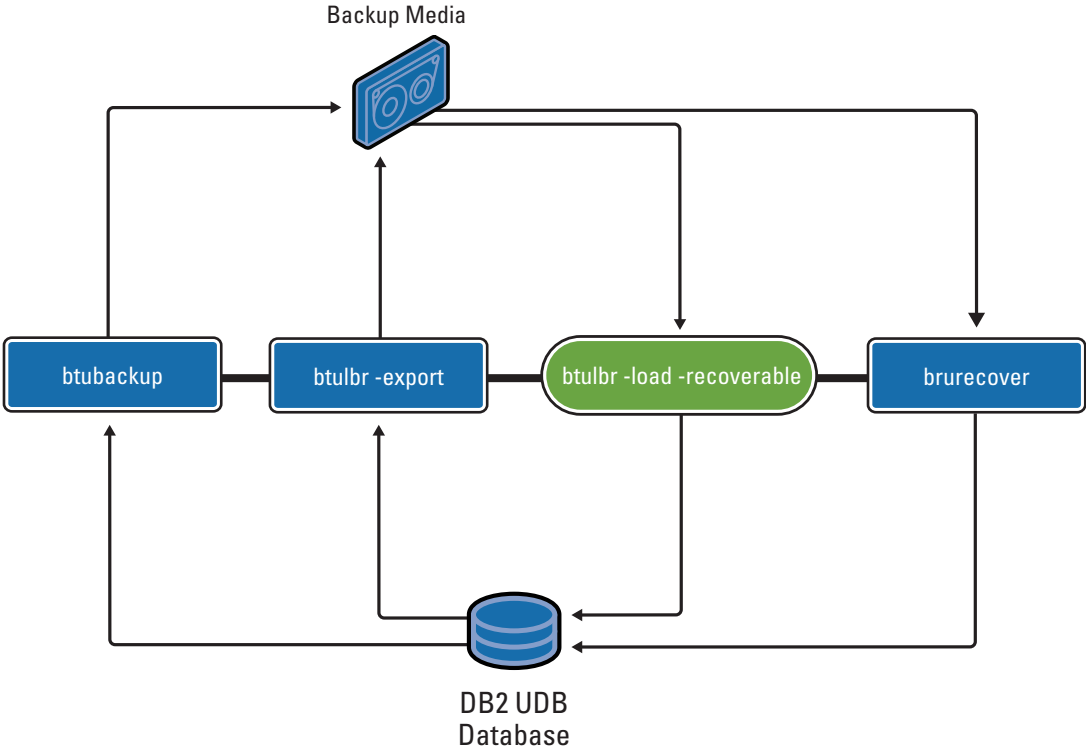


Figure 4. Recoverable Load Workflow Using BMC Recovery Manager

The table below compares the steps required to perform a recoverable load and subsequent rollforward operation with the DB2 UDB utilities and with BMC Recovery Manager for DB2 UDB.

DB2 Universal Database Native Load Utility	BMC Recovery Manager for DB2 Universal Database
Recoverable Load Operation with COPY YES Option	
1. Execute multiple load commands for multiple tables; provide backup media details with LOAD command to back up the load-copy image during the load operation: <pre>% connect to <db_name></pre> <pre>% load from <export_file1> of del insert into <table1> (<col1>, <col2>) copy yes to <dest_dir></pre> <pre>% load from <export_file2> of del insert into <table2> (<col1>, <col2>) copy yes to <dest_dir></pre> <pre>% connect reset</pre>	1. Execute a single command for multiple tables on multiple partitions with the LOAD COPY YES option: <pre>% btulbr -database <db_name> -table <schema1.table1> -table <schema1.table2> -load insert -recoverable</pre>
2. Repeat Step 1 for every partition (if applicable)	Not required
3. Move load-copy images from the destination directory to other backup media; track timestamps and corresponding table names for every load-copy image	Load-copy images are automatically maintained and tracked with respect to table names and timestamps
Rollforward Operation with Multiple Load-Copy Images	
1. Perform the database recovery using the following command: <pre>% restore db <db_name> from <dir> taken at <timestamp></pre>	1. Execute the following single command: <pre>% btrecover -database <db_name></pre> <p>This command automates all steps required by DB2 UDB. BMC Recovery Manager performs a physical restore operation and a rollforward, then restores load-copy images for all tables on all partitions.</p>
2. Just before the rollforward operation, prepare a list of tables that were loaded in the past.	Not required
3. Identify tables that will be restored during the current rollforward operation.	Not required
4. Identify the corresponding load-copy images required for the current load operation, considering the timestamp for each table.	Not required
5. Edit all table entries in the location file.	Not required
6. Set the DB2LOADREC registry variable to the name of the load-copy location file.	Not required
7. Repeat Steps 1 to 6 for every partition (if applicable).	Not required
8. Initiate the rollforward operation using the following command: <pre>% roll forward db <db_name> to end of logs and complete</pre>	Not required

Figure 5. Steps required to perform load operation.

BMC Recovery Manager for DB2 UDB makes this complex recoverable load operation so simple that it can be launched with a single command. This functionality will enable DBAs to load large volumes of data for multiple tables without worrying about load-copy image backups during recoverable load operations. Moreover, subsequent rollforward operations are completely automated, without the burden of extra manual steps.



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