Transbase® CD

WHITE PAPER

Delta Management with Transbase® CD (version 6.8 and later)

1. New UPDATE statement

A new UPDATE statement has been introduced which can be used to adjust an existing table in the database with the result of a SELECT statement.

The syntax of this command is:

```
UPDATE <table> FROM <SELECT_Statement>
```

After the UPDATE statement is successfully performed the specified table exactly contains the records retrieved from the <SELECT Statement>. For records that are identical no action is taken. For records that have identical primary keys, non-matching fields are updated. For records not having a primary key equivalent, records are inserted into or deleted from the specified table.

The UPDATE statement is of particular use if remote access features of Transbase® are used, e.g. to reference other Transbase® databases via Transbase® D or to read other data sources via table functions JDBCreader(), OCIreader() or to access files via the flatfile mechanism of Transbase®. The following examples show those cases:

```
UPDATE t FROM t@sourcedb

UPDATE t FROM
SELECT * FROM FUNCTION
OCIreader('//orasrv/oradb', 'scott', 'tiger', 'SELECT * FROM
  t')

CREATE FILE ('t.spl') TABLE tsrc (<Columns_description>);
UPDATE t FROM tsrc
```

2. Terminology

To describe the Delta management with Transbase® CD a few terms must be defined first.

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First we have the initial database generation (which is described by a set of ROM files or rfiles in short). This database generation will be said to have delta counter [0].

Updates of this database generation transfer the database generation into [1], [2] and so on.

In previous versions of Transbase® CD, delta files could have been generated which described the changes between [0] and [g]. These delta files could be stored in the client database directory whereby the database immediately was shifted into generation [g].

The new delta management will allow for "transitional delta files" or "tfiles" for short that describe the transition of database generation [g-1] to [g]. These tfiles are always highly compressed (using an XOR technique before compression). Applying tfiles to a client database, however, requires additional processing at client site. Thereby a new set of delta files for database generation [g] is constructed from the database generation [g-1] and the tfile[g-1, g].

3. Commands at Production Site

3.1. Producing initial ROM files

rfiles are produced identically as in previous versions, i.e. a editorial database must be created and prepared from which initial ROM files can be produced.

The basic command to produce the rfiles is:

```
tbmkrom <dbname> id=<string> [ compress=<numb>mb|kb|pg]
[ extsize=<numb>mb|gb] [ outdir=<dir>]
```

This command produces rfiles in the directory given by `outdir=`. The `compress=` option may be used to specify that the ROM files shall be compressed to a certain size (use `compress=0` to compress them as much as possible).

Additional options can be added, e.g.

`[ mkromfiles=no]` in order to see the compression sizes (without actually producing ROM files).

`[ romfiles=<numb>[ ,<numb>] ...]` in order to produce only ROM files for the given database clusters

`[ extsize=<numb>mb|gb]` in order to specify that rfiles shall be split into extents not larger than the specified extent size

The editorial database can be deleted after the rfiles have been successfully produced.

3.2. (Re)Attaching to initial ROM files

All following steps at production site need to be performed on a "retrieval database" which is established by using the initial ROM files produced in the previous step and performing an "attach" command.

In its simplest form the command to (re)attach is:

```
tbadmin –Cf <dbname> r=<dir>
```

where the directory specified by `r=` option is the same that has been specified by `outdir=` option under 3.1.

3.3. Performing Updates

Updates are simply performed on the attached retrieval database, e.g. by TBI or by a specific application program.

When updates are performed on the attached retrieval database, all modified pages are listed in a data structure called IBB. These modified pages can be seen in a system view called "loadinfo", e.g. by "`SELECT * FROM loadinfo`".

The command tbmkrom can be used to publish all modified pages (listed in IBB), as follows:

```
tbmkrom <dbname>  tfile | delta [ extsize=<numb>mb|gb]
 [ outdir=<dir>]
```

The option delta specifies that delta files are produced. Delta files contain all pages of the database that are different to the rfiles, either in a compressed or non-compressed representation. Delta files are assigned a delta counter [g] to denote the database generation g.

The option `tfile` specifies that tfiles are produced. Tfiles contain all pages that have been modified since the last tfile production in a compressed representation. Tfiles are assigned a pair of delta counters [g-1, g] to denote the transition from database generation g-1 to g.

The `extsize=` option can be used to specify that the files are split into extents not larger than specified.

Note that the IBB is not emptied by this command, i.e. the command can be repeated arbitrarily on the same database generation.

3.4. Establishing a new database generation with tfiles

With the tfiles produced under 3.3 a new database generation can be established. The command to be used is:

```
tbadmin -Uf <dbname> indir=<dir>
```

The result of this command is that the set of tfiles in directory <dir> is processed by this database. If the set of tfiles denotes the transition [g-k, g] a new database generation with delta counter g is produced and the IBB is emptied.

Without the `indir=` option, the command delivers the deltacounter of the specified database.

3.5. Repeating steps 3.3. and 3.4.

These two steps can be repeated arbitrarily on production sites. Thereby a sequence of database generations is established along with sets of tfiles to be used to shift database from generation g-1 to g.

3.6. Merging subsequent tfiles

To allow clients to update from an arbitrarily old database generation with delta counter [g-k] to the newest generation [g] there is a utility command to merge subsequent tfiles, as follows:

```
tbadmin -J indir=<dir> indir=<dir> outdir=<dir>
```

In particular, sets of tfiles residing in the directories specified by the `indir=` options are merged into a single (possibly larger) set of tfiles which is delivered in the directory specified by `outdir=` option. If the first set of tfiles denotes the transition [g-k, g], the second set of tfiles must denote a transition [g, g+l]. The resulting set of tfiles then denotes a transition [g-k, g+l].

The command `tbadmin -J indir=<dir>` can be used to inform about the set of files contained in the given directory. The files can be a set of rfiles or a set of delta files or a set of tfiles. The output of the command is the type of the file set along with the delta counter for delta files or the transitions counters for tfiles.

4. Commands at client site

4.1. Attaching to initial ROM files

In its simplest form the command to attach to a set of ROM files is:

```
Tbadmin -Cf <dbname> r=<dir>
```

Where the directory specified by `r=` option contains the set of rfiles. These rfiles may reside on a CD-ROM or DVD-ROM physically shipped to the client site or may be received by a file transfer.

The database can be used immediately, either for read/only access or even for read/write access. If write access is performed on the database, modified pages are listed in the IBB (as described above, see 3.3).

4.2. Receiving and processing updates

Updates are denoted by tfiles. They can be received either physically on a CD-ROM or DVD-ROM or by a file transfer.

tfiles must be processed at client site. If the database has not been changed locally (i.e. has been a read/only database) the command

```
tbadmin -U <dbname> indir=<dir>
```

should be used. If the database has delta counter [g-k] and the tfiles denote a transition [g-k, g] then the database has delta counter [g] after successfully processing the tfiles in indir. Otherwise an error is generated and the database generation is not changed. The same is true if updates have been committed on the database.

By this command, the set of tfiles will be processed on the database resulting in new "delta files" which are installed in the database configuration in a new subdirectory. After a successful processing, the set of received tfiles may be deleted as well as the set of old "delta files".
The location of delta files for delta counter [g] is in the database directory roms/delta<g>. Older delta files may be deleted. Note that this deletion is not performed automatically.

4.3. Information

```
tbadmin -U <dbname>
```

This command can be used to inform about the delta counter of the specified database.

4.4. Repeating step 4.2

Step 4.2 may be repeated arbitrarily. Thereby the delta files will grow with each repetition.

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