

Problem(Abstract)

Multi-threaded DBPurge operation may fail with deadlock in database systems even though all optimization steps have been followed.

Symptom

The IBM Tivoli Identity Manager DBPurge operation, by default, uses 4 threads for IBM DB2 database. DBPurge operation can be executed with 1 thread by specifying the "-threads 1" argument to DBPurge command.

If DBPurge operation is executed without "-threads 1" option for IBM DB2 database, then the DBPurge operation may fail with errors similar to shown below.

DB2 SQL Error: SQLCODE=-1476, SQLSTATE=40506,SQLERRMC=-911

This indicates that either a database time-out or deadlock has occurred.

Cause

The issue is due to deadlock condition within the multiple threads of DBPurge operation. The tables that have foreign key constraints defined on it and do not have index defined on foreign key column may lead to deadlock or a lock timeout in the database system.

Following infocenter link for IBM DB2 database mentions this scenario.

<http://pic.dhe.ibm.com/infocenter/db2luw/v9r7/index.jsp?topic=%2Fcom.ibm.db2.luw.admin.perf.doc%2Fdoc%2Fc0004121.html>

<Snip>

While evaluating referential constraints, the DB2® server might occasionally upgrade the isolation level used on scans of the foreign table to RR, regardless of the isolation level that was previously set by the user. This results in additional locks being held until commit time, which increases the likelihood of a deadlock or a lock timeout. To avoid these problems, create an index that contains only the foreign key columns, and which the referential integrity scan can use instead.

</Snip>

Example: ACTIVITY_LOCK table has foreign key constraint defined with PROCESS_ID and ACTIVITY_ID fields of the table PROCESS and ACTIVITY respectively. The table ACTIVITY_LOCK does not have an index for foreign key ACTIVITY_ID column.

Resolving the problem

Following are the list of such tables, referenced by the DBPurge utility, which do not have the index defined on foreign key column.

1. ACTIVITY_LOCK table does not have index for foreign key ACTIVITY_ID column.
2. The PENDING and PENDING_REQUESTS tables do not have index explicitly defined on foreign key column but this table has the foreign key and primary key defined on the same column, PROCESS_ID. So database creates the index internally for PROCESS_ID column.
3. PROCESSDATA and RECONCILIATION_INFO tables have indexes defined that includes foreign key column, but these tables do not have index that contains only the foreign key columns. The DB2 infocenter documentation specifies that an index containing only the foreign key columns have to be created to resolve deadlock issue.

The following additional indexes needs to be created in the ITIM database to resolve this issue.

```
CREATE INDEX ENROLE.ACTIVITY_LOCK_AIDX ON ENROLE.ACTIVITY_LOCK (ACTIVITY_ID ASC)  
MINPCTUSED 10 ALLOW REVERSE SCANS;
```

```
CREATE INDEX ENROLE.PROCESSDATA_PIDX ON ENROLE.PROCESSDATA (PROCESS_ID ASC)  
MINPCTUSED 10 ALLOW REVERSE SCANS;
```

```
CREATE INDEX ENROLE.RECONCILIATION_INFO_RIDX ON ENROLE.RECONCILIATION_INFO (RECONID  
ASC) MINPCTUSED 10 ALLOW REVERSE SCANS;
```

This will ensure that DBPurge completes without deadlock on a DB2 database when multiple threads of the DBPurge operation execute simultaneously.