Rule DB2-181:   RID list processing terminated, exceeded calculated limit

Finding: Processing of the Record Identifier (RID) list was terminated because the number of RID entries was greater than the limit of MAX(25% of table size, number of RIDs that can fit into the guaranteed number of RID blocks).

Impact: This finding can have a LOW IMPACT or MEDIUM IMPACT on the performance of the DB2 subsystem.

Discussion: A RID list pool is an area of main storage that is reserved for sorting record identifiers during list prefetch processing. The RID pool is created at start up time, but no space is allocated until RID storage is needed.

When RID storage is needed, it is allocated in blocks known as RID blocks. Prior to DB2 UDB for zOS Version 8, RID storage is allocated above the 16MB line, in 16KB blocks. The default RID pool size is 4MB, with a maximum RID storage allocation of 1000MB..

With DB2 UDB for z/OS Version 8, the RID pool is split into two parts. The RID Pool below the 2 GB bar stores the RID maps (and is allocated as 25% of the RID pool), and the RID pool above the 2 GB bar contains the RID lists (and is allocated as 75% of the RID pool). The RID lists comprise the bulk of the RID pool storage. Also with Version 8 , RID storage is allocated in 32KB blocks. The default RID pool size is 8MB, with a maximum RID storage allocation of 10,000MB.

With DB2 Version 10, the RID MAPs were moved above the bar. The default size of the RID pool is 400MB, and the maximum RID storage is 10,000MB.

The RID pool is used for all record identifier processing. It is used enforcing unique keys while updating multiple rows, and for sorting RIDs during the following operations:

• List prefetch, including single index list prefetch,

• Access via multiple indexes

• Hybrid joins

SQL statements that use those methods of access can benefit from using the RID pool. RID pool processing can help reduce I/O resource consumption and elapsed time.

Whether SQL statements that use RID processing complete efficiently or not depends on other concurrent work using the RID pool. Processing of the RID list is terminated if the number of RID entries was greater than the limit of MAX(25% of table size, number of RIDs that can fit into the guaranteed number of RID blocks). List prefetch terminates after the 25% threshold is passed because a table space scan is generally faster than list prefetch if more than 25% of the rows need to be retrieved.

When list prefetch is terminated, it affects access paths in different ways:

- If the access path is multiple index ORing or single index access using list prefetch, DB2 falls back to a table space scan.

- If the access path step is the index access portion of multiple index ANDing, that step terminates and processing continues with the next multiple index access step. If there is no remaining step, and no RID list has been accumulated, DB2 falls back to a table space scan.

CPExpert compares the QISTRLLM variable in DB2STATS with the **QISTRLLM** guidance variable in USOURCE(DB2GUIDE). The QISTRLLM value contains a count of the number of times RID list was terminated because the number of RID entries was greater than the limit of MAX(25% of table size, number of RIDs that can fit into the guaranteed number of RID blocks). CPExpert produces Rule DB2-181 when the value of the QISTRLLM variable in DB2STATS exceeds the value specified by the **QISTRLLM** guidance variable.

The default value for the **QISTRLLM** guidance variable is 0, indicating that CPExpert should produce Rule DB2-181 whenever processing of the RID list is terminated because the number of RID entries was greater than the limit of MAX(25% of table size, number of RIDs that can fit into the guaranteed number of RID blocks).

The following example illustrates the output from Rule DB2-181:

```
RULE DB2-181: RID LIST PROCESSING TERMINATED

   RID list processing was terminated because the number of RID entries
   was greater than the limit of MAX(25% of table size, number of RIDs
   that can fit into the guaranteed number of RID blocks).  This finding
   occurred during the intervals shown below:

                                      TIMES RID LIST PROCESSING
   MEASUREMENT INTERVAL                     WAS TERMINATED
    7:51- 8:21, 15SEP1999                        2
    8:21- 8:51, 15SEP1999                       47
    8:51- 9:21, 15SEP1999                       66
    9:21- 9:51, 15SEP1999                       52
    9:51-10:21, 15SEP1999                      242
   10:21-10:51, 15SEP1999                      177
   10:51-11:21, 15SEP1999                      103
```

Suggestion: When the DSNTINST CLIST calculates the value for RID POOL SIZE on panel DSNTIPC, the default is depends on the version of DB2 that is being installed. The default values were described earlier in this document..

You can modify the maximum RID pool size that was specified on installation panel DSNTIPC by using the installation panels in UPDATE mode, as follows:

• To favor the selection and efficient completion of list prefetch, multiple index access, or hybrid join, you can increase the maximum RID pool size.

• To disable list prefetch, multiple index access, and hybrid join, specify a RID pool size of 0.

If you disable list prefetch, plans or packages that were previously bound with a non-zero RID pool size might experience significant performance degradation. Rebind any plans or packages that include SQL statements that use RID processing.

Alternatively, you can curtail the number of activities concurrently using RID pools.

Alternatively, you can alter CPExpert's analysis by modifying the **QISTRLLM** guidance variable in USOURCE(DB2GUIDE).

Reference: DB2 for OS/390 Version 5: Installation Guide
         Section 2.2.4 (Virtual Storage for Storage Pools and Working Storage)
         Section 2.5.32 (Install DB2--CLIST Calculations Panel 1: DSNTIPC)

DB2 for OS/390 Version 5: Administration Guide
  Section 5.10.5.2.3 (Bind Time and Execution Time Thresholds)

DB2 for OS/390 Version 6: Installation Guide
  Section 2.2.3 (Virtual Storage for Storage Pools and Working Storage)
  Section 2.5.32 (Install DB2--CLIST Calculations Panel 1: DSNTIPC)

DB2 for OS/390 Version 6: Administration Guide
  Section 5.10.5.2.3 (Bind Time and Execution Time Thresholds)

DB2 UDB for OS/390 and z/OS, Version 7: Installation Guide
  Section 2.1.3 (Virtual Storage for Storage Pools and Working Storage)
  Section 2.4.32 (Install DB2--CLIST Calculations Panel 1: DSNTIPC)

DB2 UDB for OS/390 and z/OS, Version 7: Administration Guide
  Section 5.10.5.2.3 (Bind Time and Execution Time Thresholds)

DB2 UDB for z/OS Version 8: Installation Guide
  Chapter 6. Installing, migrating, and updating system parameters
    (Install DB2--CLIST Calculations Panel 1: DSNTIPC)

DB2 UDB for z/OS Version 8: Administration Guide
  Chapter 26. Tuning DB2 buffer, EDM, RID, and sort pools
    (RID pool size calculation)

DB2 UDB for z/OS Version 9: Performance Monitoring and Tuning Guide
  Chapter 4. Tuning DB2 buffer, EDM, RID, and sort pools
  (Increasing RID pool size)

DB2 10 for z/OS: Managing Performance
  Chapter 7. Configuring storage for performance
  (Increasing RID pool size)

DB2 10 for z/OS *Installation and Migration Guide* |
                                                                      |
DB2 11 for z/OS: Managing Performance |
  Chapter 6. Configuring storage for performance |
  (Increasing RID pool size) |
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DB2 11 for z/OS *Installation and Migration Guide* |