Sharing IBM i Knowledge

# System Administration **Modernisation**

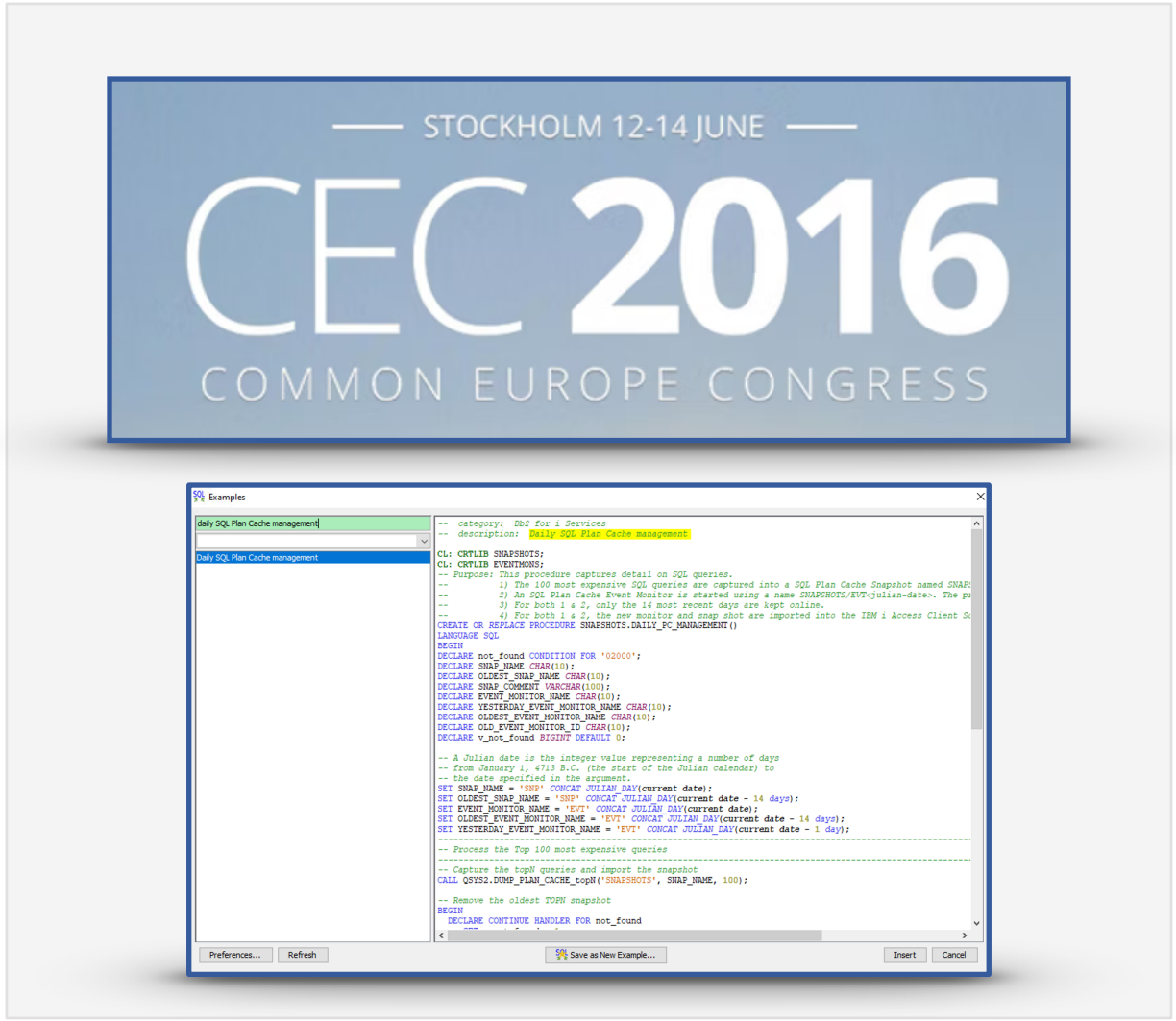
Getting started in the world of SQL performance


DATE
14 June 2026

Host
Rudi van Helvoirt

"You only know what it is, when it is no longer there.."

*The ultimate definition of an invisible foundation.*




Where my journey started

# Entering the world of SQL performance

- **Presentation given by Scott Forstie**

  No need to explain.
  It is what we have been using since the day the AS/400 saw the light, right?

- **IBM i Access Client Solutions**

  Insert from examples

- **IBM i services (SQL)**

  Making the move from CL command & 5250 emulation to Run SQL Scripts

# Daily Plan Cache Management

We did change this:

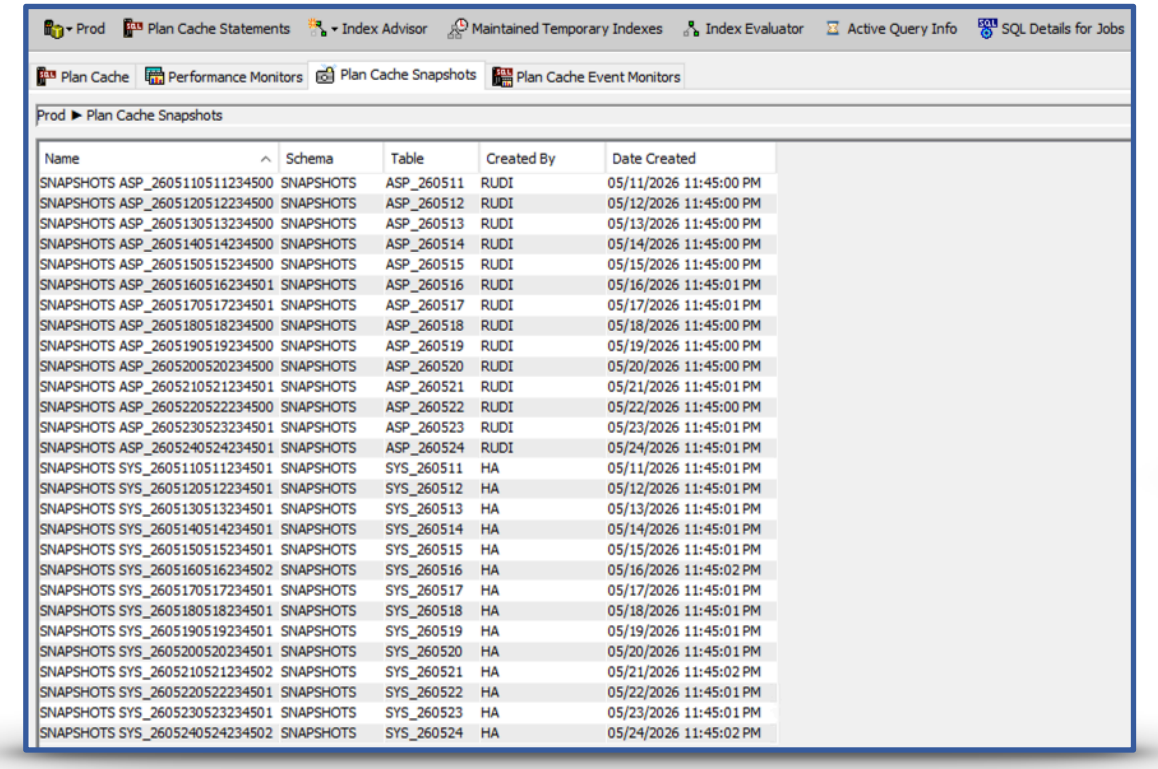
```
-- A Julian date is the integer value representing a number of days
-- from January 1, 4713 B.C. (the start of the Julian calendar) to
-- the date specified in the argument.
SET SNAP_NAME = 'SNP' CONCAT JULIAN_DAY(current date);
SET OLDEST_SNAP_NAME = 'SNP' CONCAT JULIAN_DAY(current date - 14 days);
SET EVENT_MONITOR_NAME = 'EVT' CONCAT JULIAN_DAY(current date);
SET OLDEST_EVENT_MONITOR_NAME = 'EVT' CONCAT JULIAN_DAY(current date - 14 days);
SET YESTERDAY_EVENT_MONITOR_NAME = 'EVT' CONCAT JULIAN_DAY(current date - 1 day);
```

Into this:

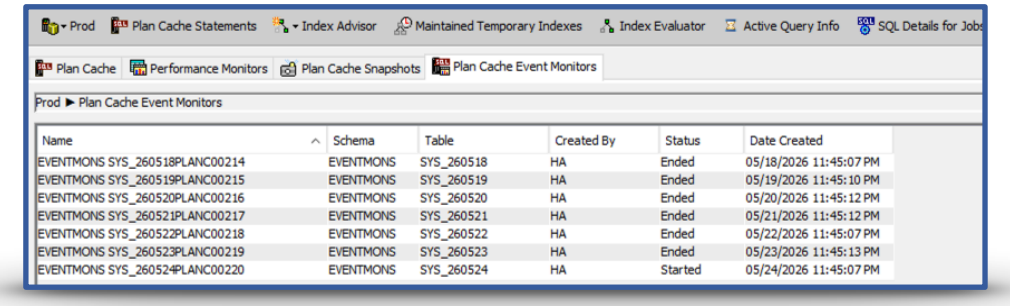
```
SET SNAP_NAME = TRIM ( PREFIX ) || '_' CONCAT SUBSTR ( REPLACE ( CHAR ( CURRENT DATE , ISO ) , '-' , '' ) , 3 , 6 ) ;
SET OLDEST_SNAP_NAME = TRIM ( PREFIX ) || '_' CONCAT SUBSTR ( REPLACE ( CHAR ( CURRENT DATE - 14 DAYS , ISO ) , '-' , '' ) , 3 , 6 ) ;
SET EVENT_MONITOR_NAME = TRIM ( PREFIX ) || '_' CONCAT SUBSTR ( REPLACE ( CHAR ( CURRENT DATE , ISO ) , '-' , '' ) , 3 , 6 ) ;
SET OLDEST_EVENT_MONITOR_NAME = TRIM ( PREFIX ) || '_' CONCAT SUBSTR ( REPLACE ( CHAR ( CURRENT DATE - 7 DAYS , ISO ) , '-' , '' ) , 3 , 6 ) ;
SET YESTERDAY_EVENT_MONITOR_NAME = TRIM ( PREFIX ) || '_' CONCAT SUBSTR ( REPLACE ( CHAR ( CURRENT DATE - 1 DAYS , ISO ) , '-' , '' ) , 3 , 6 ) ;
-----------------------------------------------------------------------------------------
```

# Daily Plan Cache Management

Resulting in:




| Name | Schema | Table | Created By | Date Created |
|---|---|---|---|---|
| SNAPSHOTS ASP_260511051123450 | SNAPSHOTS | ASP_260511 | RUDI | 05/11/2026 11:45:00 PM |
| SNAPSHOTS ASP_260512051223450 | SNAPSHOTS | ASP_260512 | RUDI | 05/12/2026 11:45:00 PM |
| SNAPSHOTS ASP_260513051323450 | SNAPSHOTS | ASP_260513 | RUDI | 05/13/2026 11:45:00 PM |
| SNAPSHOTS ASP_260514051423450 | SNAPSHOTS | ASP_260514 | RUDI | 05/14/2026 11:45:00 PM |
| SNAPSHOTS ASP_260515051523450 | SNAPSHOTS | ASP_260515 | RUDI | 05/15/2026 11:45:00 PM |
| SNAPSHOTS ASP_260516051623450 | SNAPSHOTS | ASP_260516 | RUDI | 05/16/2026 11:45:01 PM |
| SNAPSHOTS ASP_260517051723450 | SNAPSHOTS | ASP_260517 | RUDI | 05/17/2026 11:45:01 PM |
| SNAPSHOTS ASP_260518051823450 | SNAPSHOTS | ASP_260518 | RUDI | 05/18/2026 11:45:00 PM |
| SNAPSHOTS ASP_260519051923450 | SNAPSHOTS | ASP_260519 | RUDI | 05/19/2026 11:45:00 PM |
| SNAPSHOTS ASP_260520052023450 | SNAPSHOTS | ASP_260520 | RUDI | 05/20/2026 11:45:00 PM |
| SNAPSHOTS ASP_260521052123450 | SNAPSHOTS | ASP_260521 | RUDI | 05/21/2026 11:45:01 PM |
| SNAPSHOTS ASP_260522052223450 | SNAPSHOTS | ASP_260522 | RUDI | 05/22/2026 11:45:00 PM |
| SNAPSHOTS ASP_260523052323450 | SNAPSHOTS | ASP_260523 | RUDI | 05/23/2026 11:45:01 PM |
| SNAPSHOTS ASP_260524052423450 | SNAPSHOTS | ASP_260524 | RUDI | 05/24/2026 11:45:01 PM |
| SNAPSHOTS SYS_260511051123450 | SNAPSHOTS | SYS_260511 | HA | 05/11/2026 11:45:01 PM |
| SNAPSHOTS SYS_260512051223450 | SNAPSHOTS | SYS_260512 | HA | 05/12/2026 11:45:01 PM |
| SNAPSHOTS SYS_260513051323450 | SNAPSHOTS | SYS_260513 | HA | 05/13/2026 11:45:01 PM |
| SNAPSHOTS SYS_260514051423450 | SNAPSHOTS | SYS_260514 | HA | 05/14/2026 11:45:01 PM |
| SNAPSHOTS SYS_260515051523450 | SNAPSHOTS | SYS_260515 | HA | 05/15/2026 11:45:01 PM |
| SNAPSHOTS SYS_260516051623450 | SNAPSHOTS | SYS_260516 | HA | 05/16/2026 11:45:02 PM |
| SNAPSHOTS SYS_260517051723450 | SNAPSHOTS | SYS_260517 | HA | 05/17/2026 11:45:01 PM |
| SNAPSHOTS SYS_260518051823450 | SNAPSHOTS | SYS_260518 | HA | 05/18/2026 11:45:01 PM |
| SNAPSHOTS SYS_260519051923450 | SNAPSHOTS | SYS_260519 | HA | 05/19/2026 11:45:01 PM |
| SNAPSHOTS SYS_260520052023450 | SNAPSHOTS | SYS_260520 | HA | 05/20/2026 11:45:01 PM |
| SNAPSHOTS SYS_260521052123450 | SNAPSHOTS | SYS_260521 | HA | 05/21/2026 11:45:02 PM |
| SNAPSHOTS SYS_260522052223450 | SNAPSHOTS | SYS_260522 | HA | 05/22/2026 11:45:01 PM |
| SNAPSHOTS SYS_260523052323450 | SNAPSHOTS | SYS_260523 | HA | 05/23/2026 11:45:01 PM |
| SNAPSHOTS SYS_260524052423450 | SNAPSHOTS | SYS_260524 | HA | 05/24/2026 11:45:02 PM |




| Name | Schema | Table | Created By | Status | Date Created |
|---|---|---|---|---|---|
| EVENTMONS SYS_260518PLANC00214 | EVENTMONS | SYS_260518 | HA | Ended | 05/18/2026 11:45:07 PM |
| EVENTMONS SYS_260519PLANC00215 | EVENTMONS | SYS_260519 | HA | Ended | 05/19/2026 11:45:10 PM |
| EVENTMONS SYS_260520PLANC00216 | EVENTMONS | SYS_260520 | HA | Ended | 05/20/2026 11:45:12 PM |
| EVENTMONS SYS_260521PLANC00217 | EVENTMONS | SYS_260521 | HA | Ended | 05/21/2026 11:45:12 PM |
| EVENTMONS SYS_260522PLANC00218 | EVENTMONS | SYS_260522 | HA | Ended | 05/22/2026 11:45:07 PM |
| EVENTMONS SYS_260523PLANC00219 | EVENTMONS | SYS_260523 | HA | Ended | 05/23/2026 11:45:13 PM |
| EVENTMONS SYS_260524PLANC00220 | EVENTMONS | SYS_260524 | HA | Started | 05/24/2026 11:45:07 PM |

# Daily Plan Cache Management

For iASP handling an extra parameter was added:

For *SYSBAS Plan Cache Dumps

RUNSQL SQL('CALL SNAPSHOTS.DAILY_PC_MANAGEMENT(''SYS'')') COMMIT(*NONE) NAMING(*SQL)

For *iASP Plan Cache Dumps

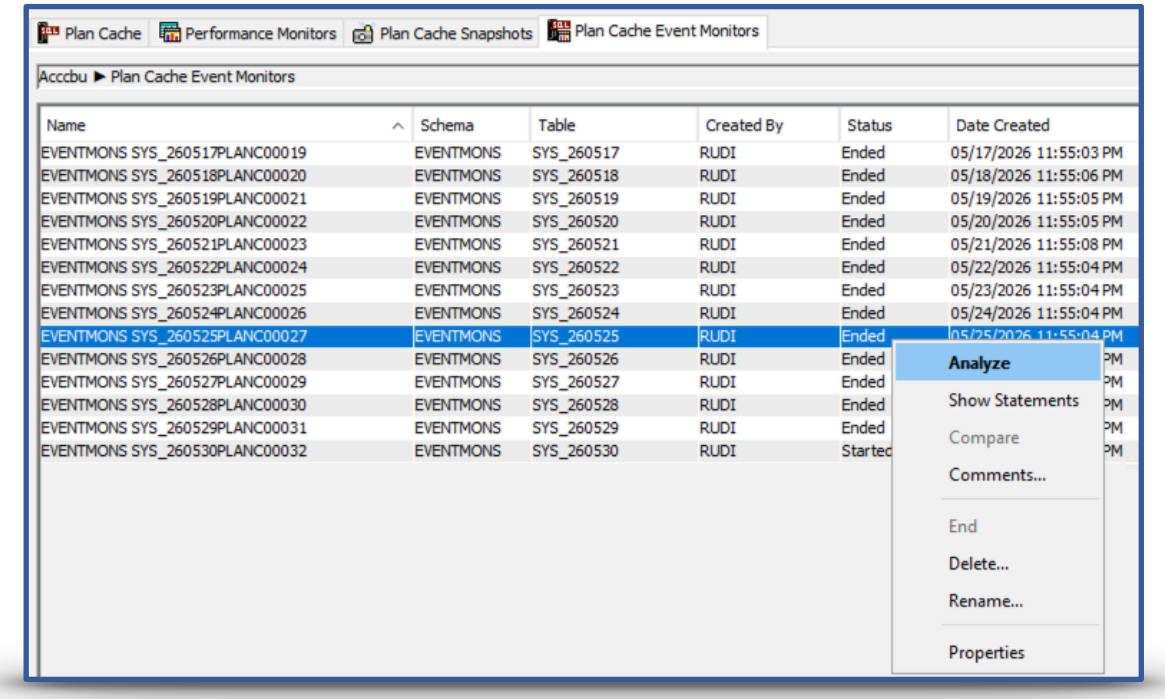
RUNSQL SQL('CALL SNAPSHOTS.DAILY_PC_MANAGEMENT(''ASP'')') COMMIT(*NONE) NAMING(*SQL)

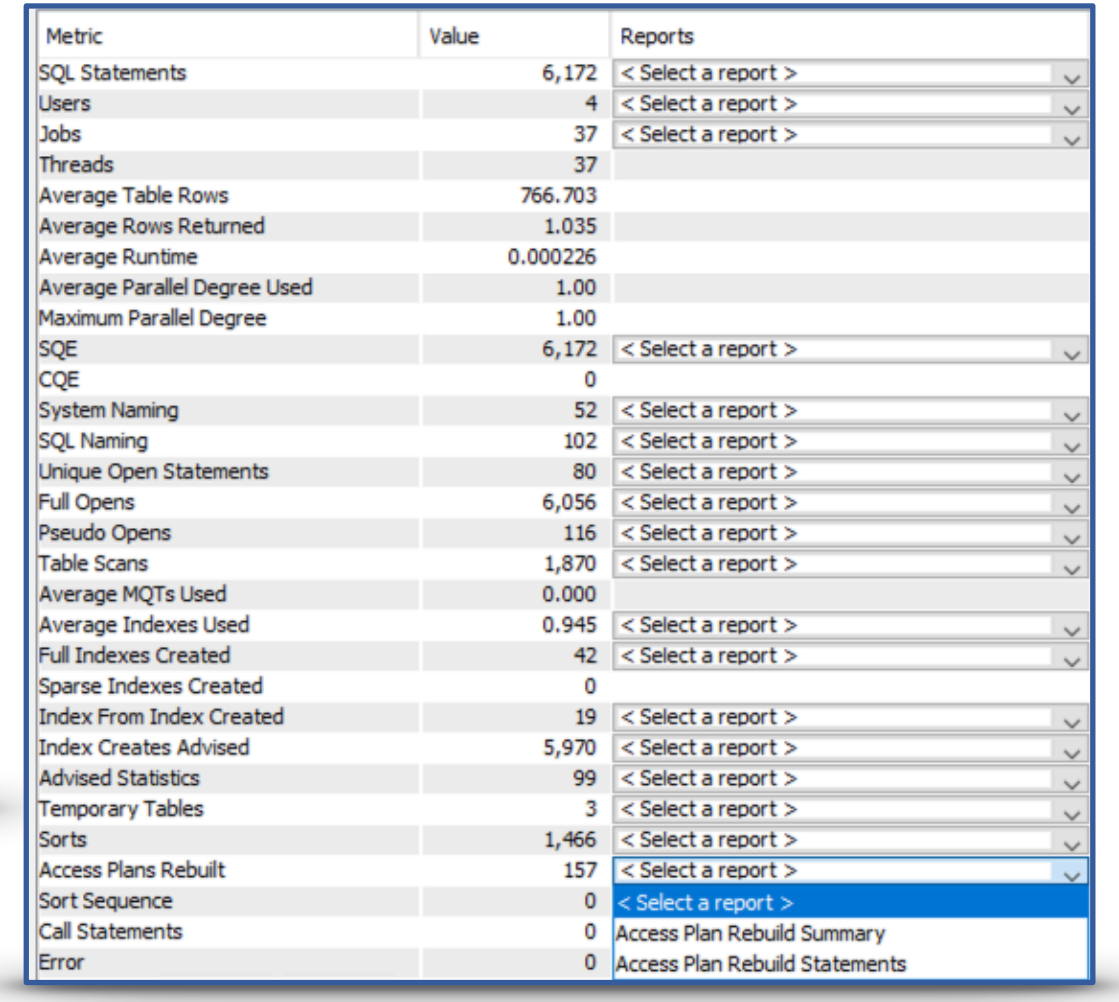
In the code this section was added:

```
52 -- Only do the event monitor once, that is when run in *SYSBAS
53 IF PREFIX = 'SYS'
54 THEN
55 BEGIN
56 -- If we found yesterdays event monitor, end it
57 BEGIN
58 DECLARE CONTINUE HANDLER FOR SQLEXCEPTION
59 SET V_NOT_FOUND = 1 ;
60 CALL QSYS2 . END_PLAN_CACHE_EVENT_MONITOR ( YESTERDAY_EVENT_MONITOR_NAME ) ;
61 END ;
```

# Plan Cache Event Monitor

Access Plan Rebuild Reason:



# Plan Cache Event Monitor

EVENTMONS SYS_260527PLANC00029 - Access Plan Rebuild Statements - [redacted]

File Edit View Actions Help

| Start Time | Last Access Plan Rebuilt | Rebuild Deferred | Access Plan Rebuild Reason | Rebuild Subcode | Original Rebuild Reason | Original Rebuild Subcode | Access Plan Save Reason | Acc Pla Ler |
|---|---|---|---|---|---|---|---|---|
| 2026-04-30 00:04:48.012430 | 2026-04-30 00:04:47.614001 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-02 00:01:50.225397 | 2026-05-02 00:01:50.126463 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-02 00:01:52.385464 | 2026-05-02 00:01:51.795737 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-02 00:03:26.996089 | 2026-05-02 00:03:26.937573 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-03 00:02:00.152706 | 2026-05-03 00:02:00.002883 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-03 00:03:48.703556 | 2026-05-03 00:03:23.733609 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-03 08:00:27.372213 | 2026-04-29 23:12:52.023679 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-03 08:00:44.673759 | 2026-05-03 08:00:44.653600 | No | System programming change | 000A | | 0000 | | |
| 2026-05-03 08:01:29.165326 | 2026-05-03 08:01:29.153531 | No | System programming change | 000A | | 0000 | | |
| 2026-05-05 00:01:52.142694 | 2026-05-05 00:01:52.052709 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-05 00:01:52.543667 | 2026-05-05 00:01:52.503284 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-05 00:01:56.063791 | 2026-05-05 00:01:55.813478 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-05 00:02:00.366530 | 2026-05-05 00:01:56.343255 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-05 00:03:40.024234 | 2026-05-05 00:03:39.968572 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-06 00:04:18.689495 | 2026-05-06 00:04:18.568682 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-06 13:03:26.383766 | 2026-05-06 13:03:26.371021 | No | Significant change in the number of rows | 0004 | | 0000 | | |
| 2026-05-06 13:04:42.936553 | 2026-05-06 13:04:42.796749 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-06 13:04:57.498211 | 2026-05-06 13:04:57.477354 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-06 14:58:29.768475 | 2026-05-06 14:58:29.626569 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-06 14:58:38.020180 | 2026-05-06 13:04:57.138408 | No | Significant change in the number of rows | 0004 | | 0000 | | |
| 2026-05-06 15:07:58.179463 | 2026-05-06 15:07:46.846805 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-07 00:01:51.475986 | 2026-05-07 00:01:51.434417 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-07 00:01:52.323943 | 2026-05-07 00:01:52.275534 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-07 00:01:52.805226 | 2026-05-07 00:01:52.675520 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-08 00:03:22.170658 | 2026-05-08 00:02:36.011108 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-08 00:03:22.290221 | 2026-05-08 00:03:22.231101 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-08 00:03:22.339082 | 2026-05-08 00:03:22.318264 | No | New access plan | 0000 | | 0000 | | |
| 2026-05-09 00:04:22.858166 | 2026-05-09 00:02:56.617015 | No | New access plan | 0000 | | 0000 | | |

100 rows retrieved (more data available).

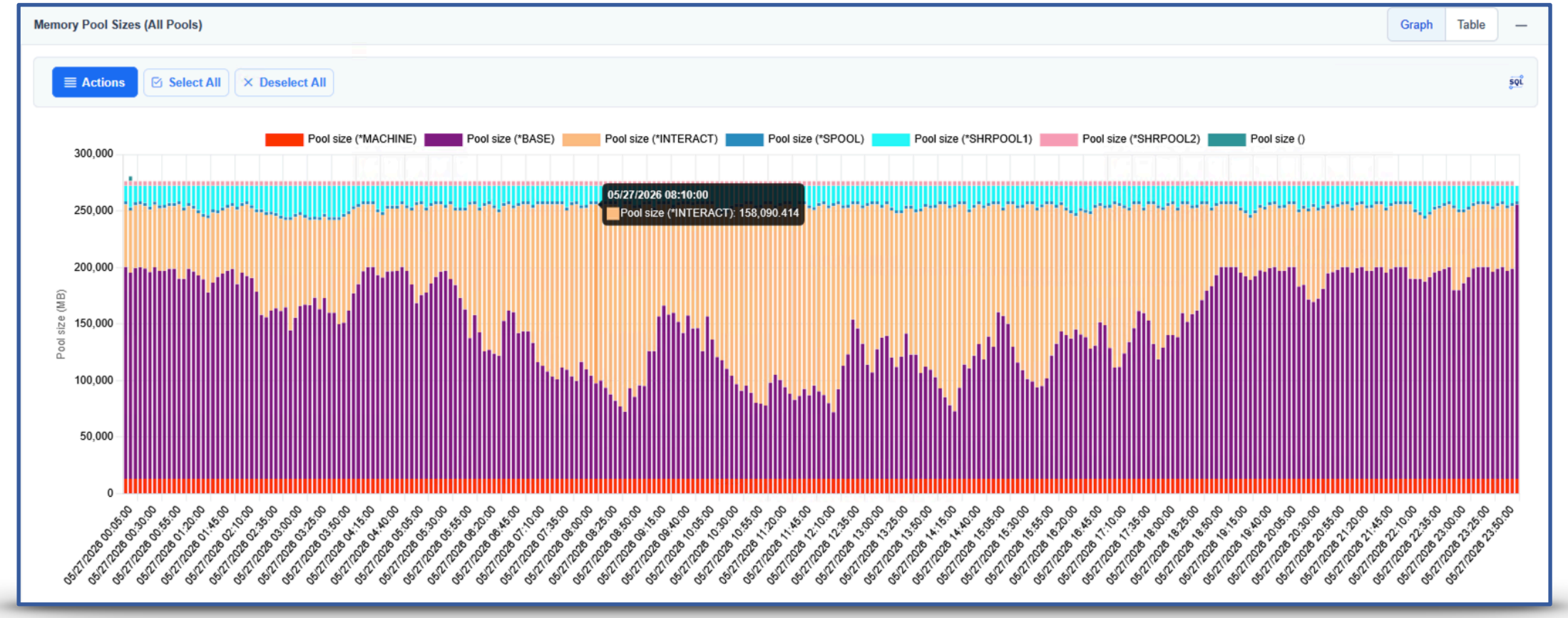
# Plan Cache Event Monitor

[Database monitor view 3006 - Access Plan Rebuild]

| | | |
|---|---|---|
| Reason_Code | QQRCOD | – A3 - Access plan was built to use a non-reusable Open Data Path (ODP) and ODP for this call.<br>– A4 - The number of rows in the table has changed by more than 10% since<br>– A5 - A new index exists over one of the tables in the query<br>– A6 - An index that was used for this access plan no longer exists or is no lor<br>– A7 - IBM i Query requires the access plan to be rebuilt because of system p<br>– A8 - The CCSID of the current job is different than the CCSID of the job that<br>– A9 - The value of one or more of the following is different for the current job this access plan:<br>▪ date format<br>▪ date separator<br>▪ time format<br>▪ time separator. |
| | | – AA - The sort sequence table specified is different than the sort sequence t was created.<br>– AB - Storage pool changed.<br>– AC - The system feature Db2® multisystem has been installed or removed.<br>– AD - The value of the degree query attribute has changed. |

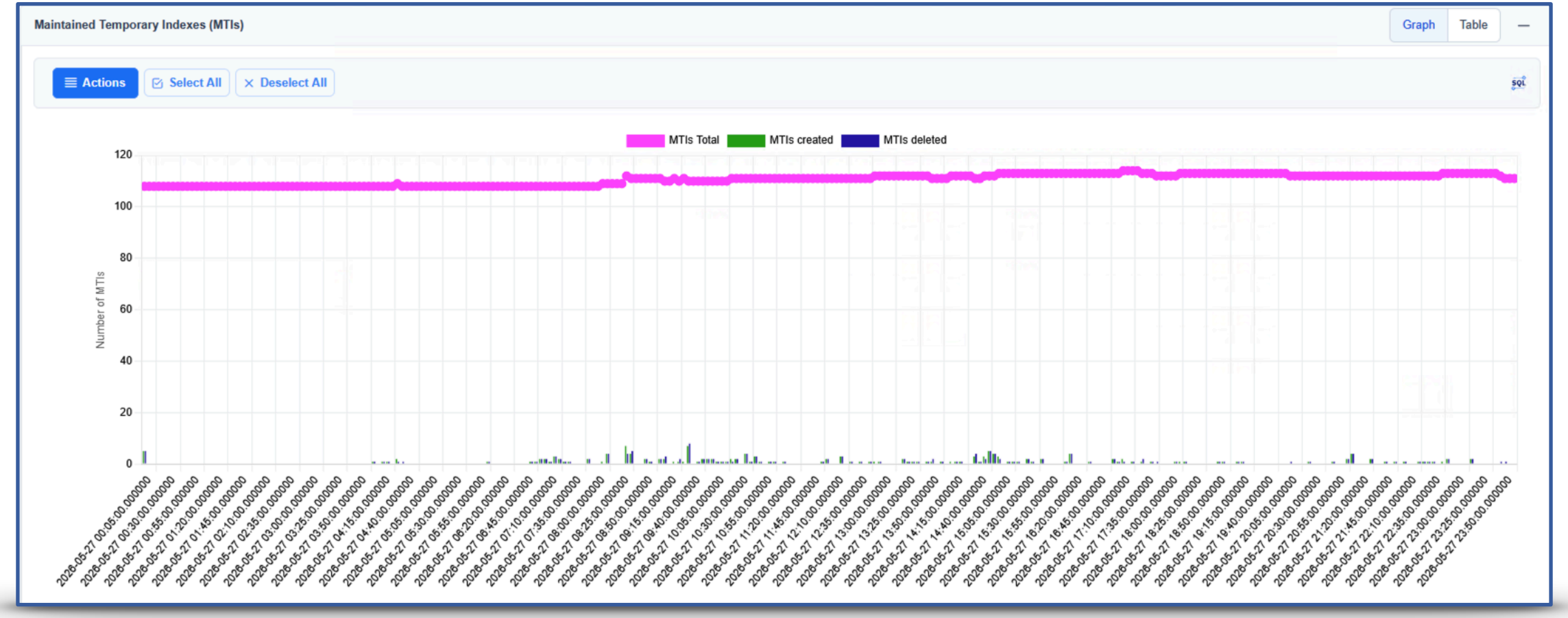
# Plan Cache Event Monitor

## Memory Pool Sizes (All Pools)



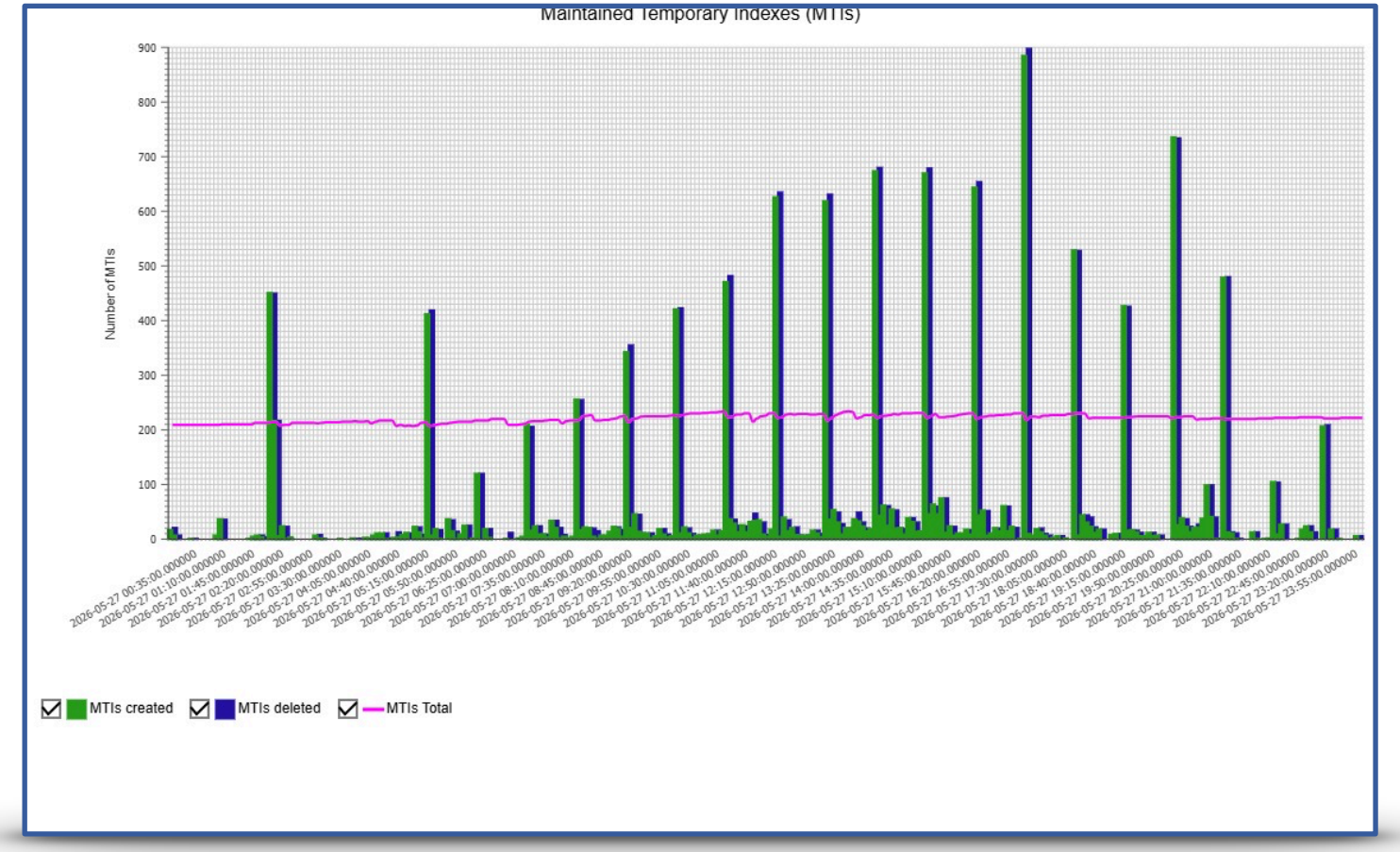
# Plan Cache Event Monitor

## Maintained Temporary Indexes (MTIs)



# Plan Cache Event Monitor

Maintained Temporary Indexes (MTIs) - but what if your graph looks like this?



# Plan Cache Event Monitor

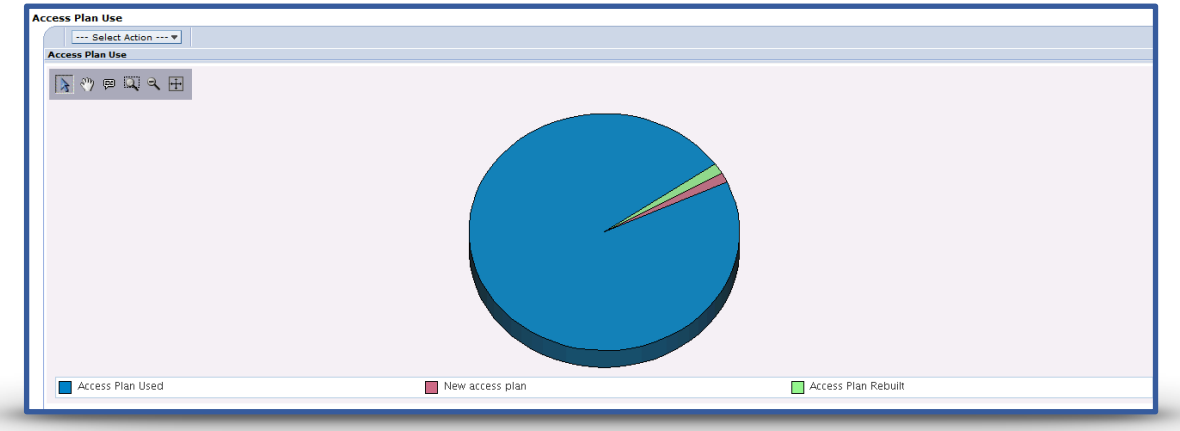
Maintained Temporary Indexes (MTIs) - With the Plan Cache Event Monitor only showing a dozen of Plans being removed during that time window?

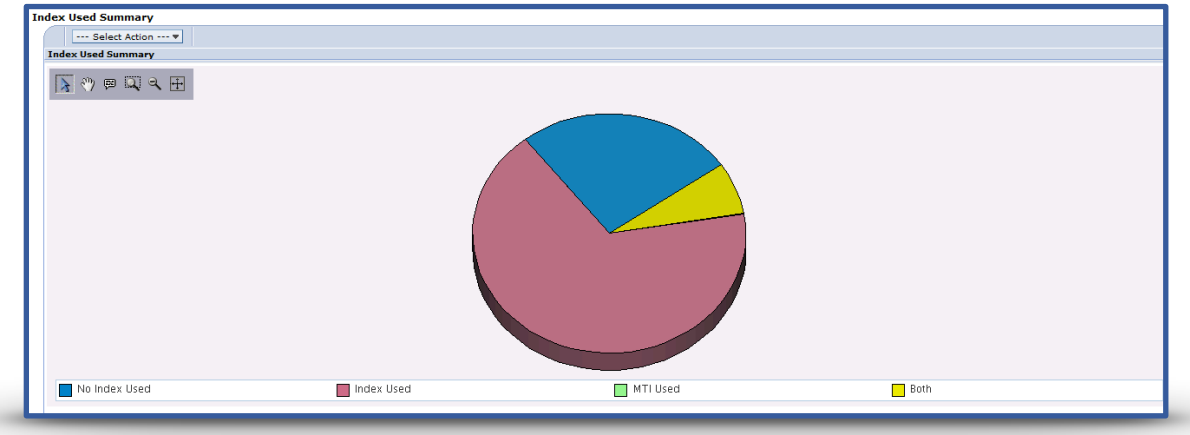
In that case the answer can be found in the Audit Journal DO (Delete Object) entries:

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 748 | 11 | A | Object was deleted (not under commitment control) | AT | O233698 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 749 | 11 | A | Object was deleted (not under commitment control) | AT | O233696 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 750 | 11 | A | Object was deleted (not under commitment control) | AT | O233700 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 751 | 11 | A | Object was deleted (not under commitment control) | AT | O233699 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 752 | 11 | A | Object was deleted (not under commitment control) | AT | O233701 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 753 | 12 | A | Object was deleted (not under commitment control) | AT | O233702 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 754 | 12 | A | Object was deleted (not under commitment control) | AT | D3440806 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 755 | 16 | A | Object was deleted (not under commitment control) | AT | O233703 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 756 | 17 | A | Object was deleted (not under commitment control) | AT | O233704 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 757 | 17 | A | Object was deleted (not under commitment control) | AT | O233705 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 758 | 19 | A | Object was deleted (not under commitment control) | GV | ROI8787 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 759 | 7 | A | Object was deleted (not under commitment control) | AT | O233706 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 760 | 8 | A | Object was deleted (not under commitment control) | AT | O233707 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 761 | 7 | A | Object was deleted (not under commitment control) | AT | Z3440816 | *FILE | PF-DTA | *SYSBAS | 1 | | |
| 762 | 7 | A | Object was deleted (not under commitment control) | AT | Z3440817 | *FILE | PF-DTA | *SYSBAS | 1 | | |

# Plan Cache Snapshots

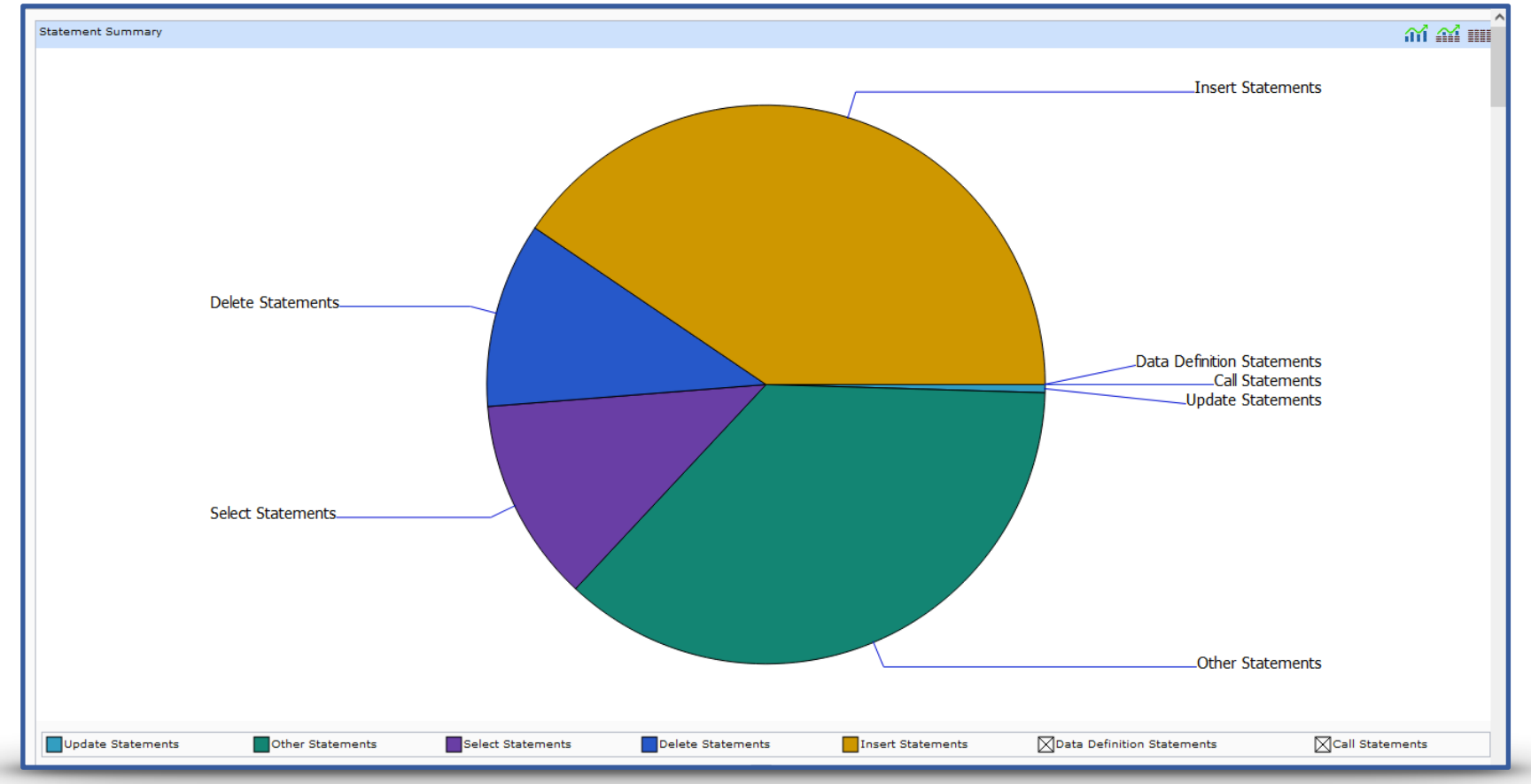
Plan Cache Snapshots Navigator for i - will be back soon 😀



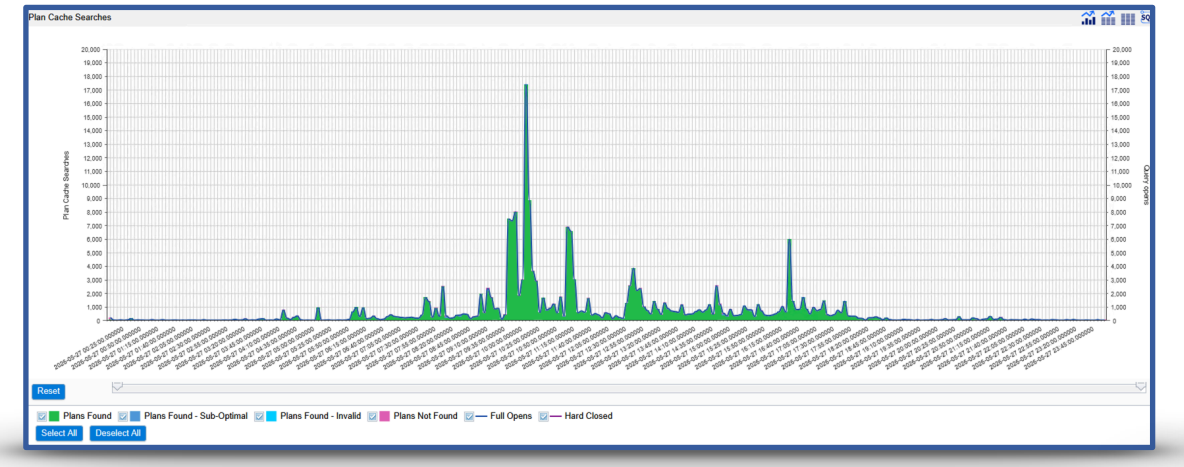
# Plan Cache Snapshots

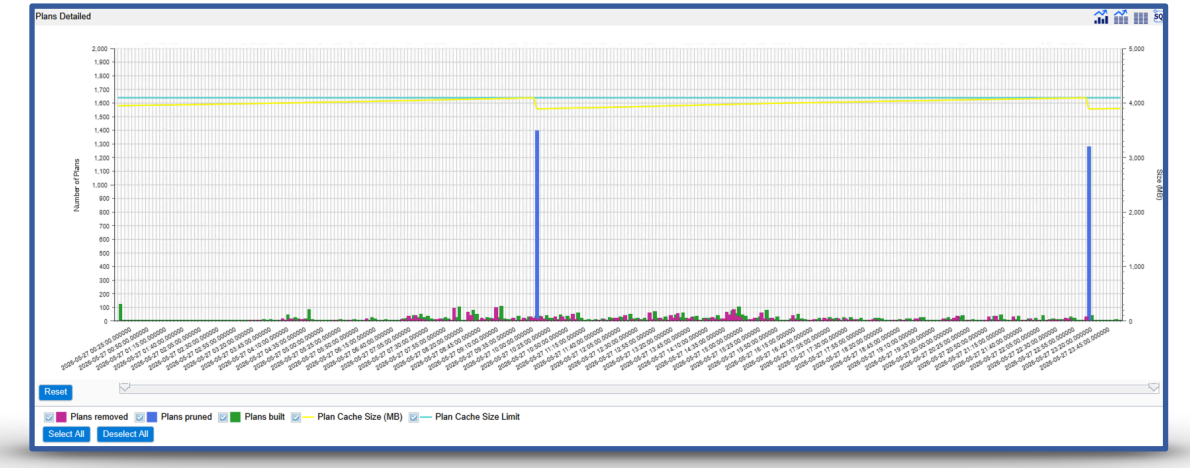
Plan Cache Snapshots Navigator for i - will be back soon 😀



# Plan Cache Perspectives - Currently available

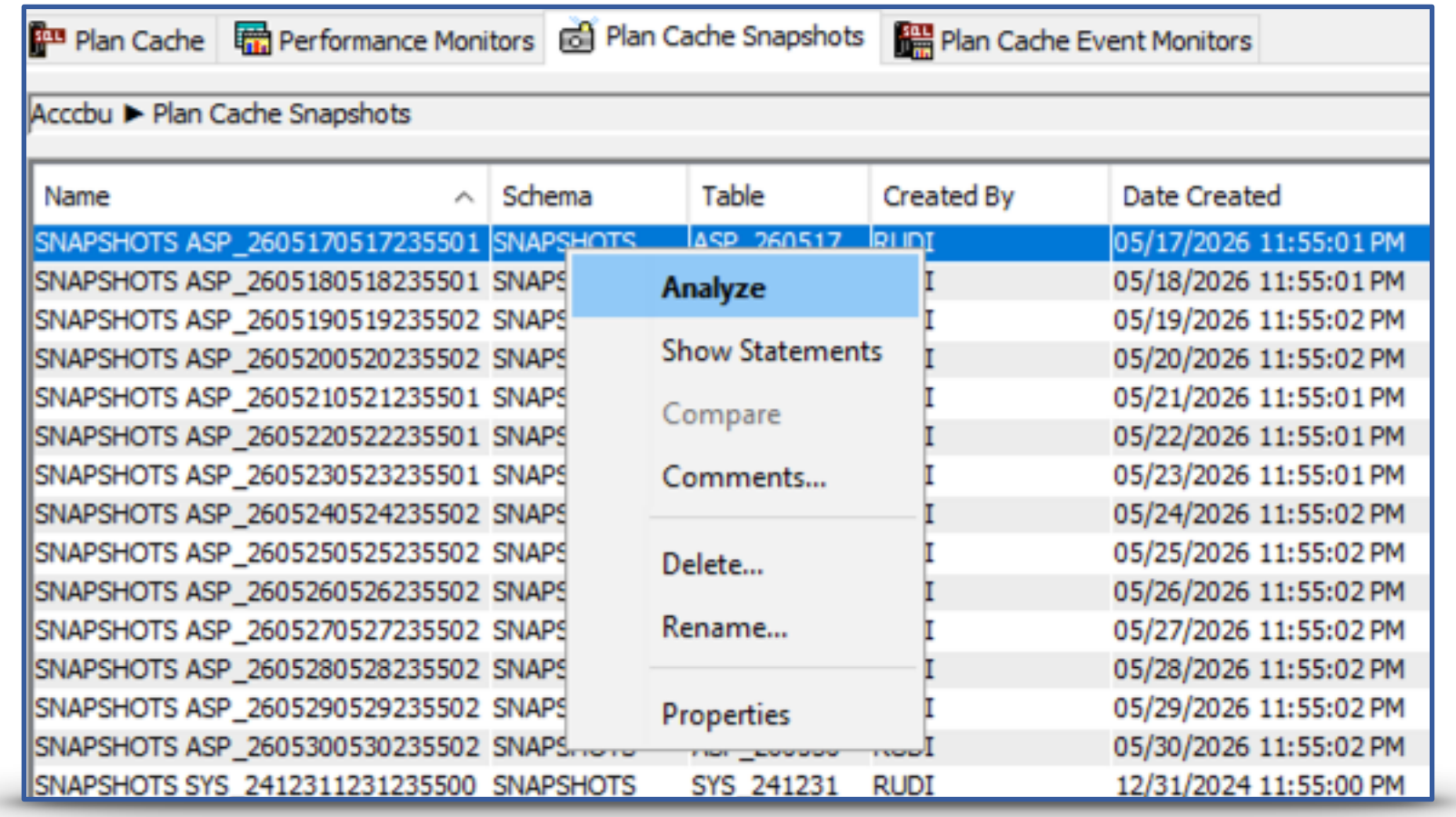
| Package Name | Perspective Path | Perspective | Description |
|---|---|---|---|
| 4 items selected | 32 items selected | plan | Filter |
| Database | SQL Performance Data > Collection Services | Plan Cache Searches | This chart shows the total number of plan cache searches done over time for the selected collection or collections. The total number of plan cache searches is broken down into searches resulting in plans found and plans not found. The number of query full opens and queries hard closed is also shown. |
| Database | SQL Performance Data > Collection Services | Plan Cache Hit Ratio | This chart shows the plan cache hit ratio and total number of plans in the SQL plan cache. |
| Database | SQL Performance Data > Collection Services | Plans Detailed | This chart shows the number of plans stored in the SQL plan cache, plans built, plans pruned due to plan cache size, and plans removed from SQL plan cache over time for the selected collection or collections. This chart also shows the size of the SQL plan cache and threshold value for SQL plan cache. Plan cache size threshold is the maximum size that the SQL plan cache is allowed to be before DB2 automatically manages the SQL plan cache and replaces older plans with new plans. |



# Plan Cache Snapshots

## Full Table Scans



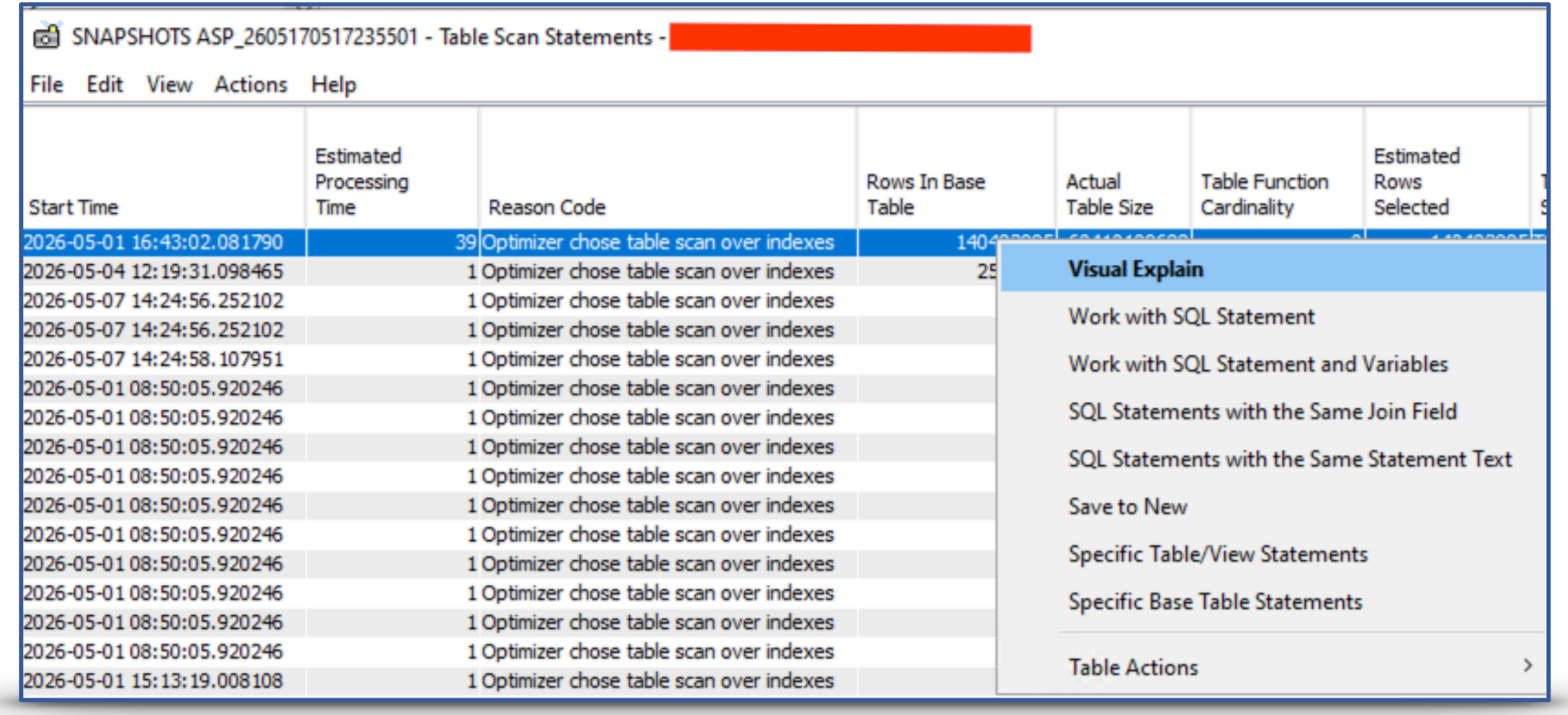
# Plan Cache Snapshots

## Full Table Scans

| Metric | Value | Reports |
|---|---|---|
| SQL Statements | 81,517 | < Select a report > |
| Users | 6 | < Select a report > |
| Jobs | 29 | < Select a report > |
| Threads | 29 | |
| Average Table Rows | 845,812.823 | |
| Average Rows Returned | 521.111 | |
| Average Runtime | 1.281123 | |
| Average Parallel Degree Used | 1.00 | |
| Maximum Parallel Degree | 1.00 | |
| SQE | 81,517 | < Select a report > |
| CQE | 0 | |
| System Naming | 75 | < Select a report > |
| SQL Naming | 8 | < Select a report > |
| Unique Open Statements | 50 | < Select a report > |
| Full Opens | 1,561 | < Select a report > |
| Pseudo Opens | 79,956 | < Select a report > |
| Table Scans | 71,533 | < Select a report > |
| Average MQTs Used | 0.000 | < Select a report > |
| Average Indexes Used | 2.150 | Table Scan Summary |
| Full Indexes Created | 0 | Table Scan Statements |
| Sparse Indexes Created | 0 | |
| Index From Index Created | 0 | |
| Index Creates Advised | 4,152 | < Select a report > |
| Advised Statistics | 1 | < Select a report > |
| Temporary Tables | 68,386 | < Select a report > |
| Sorts | 10,951 | < Select a report > |
| Access Plans Rebuilt | 100 | < Select a report > |
| Sort Sequence | 0 | |
| Call Statements | 0 | |
| Error | 0 | |

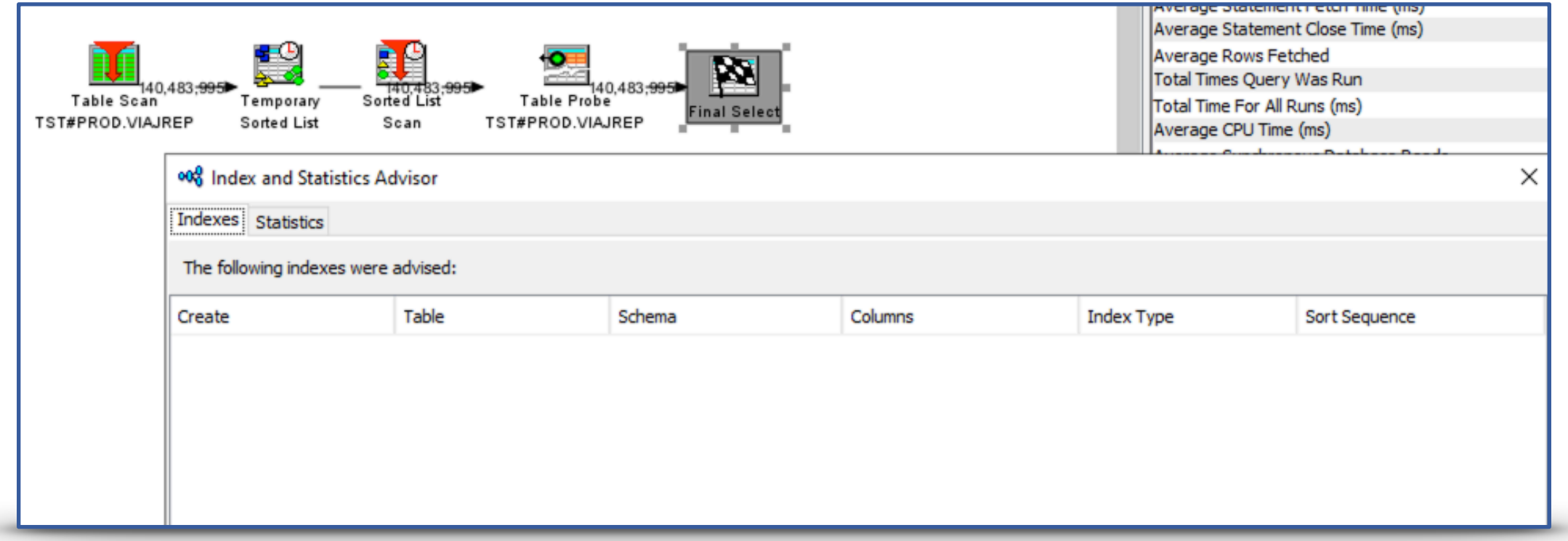
# Plan Cache Snapshots

## Full Table Scans



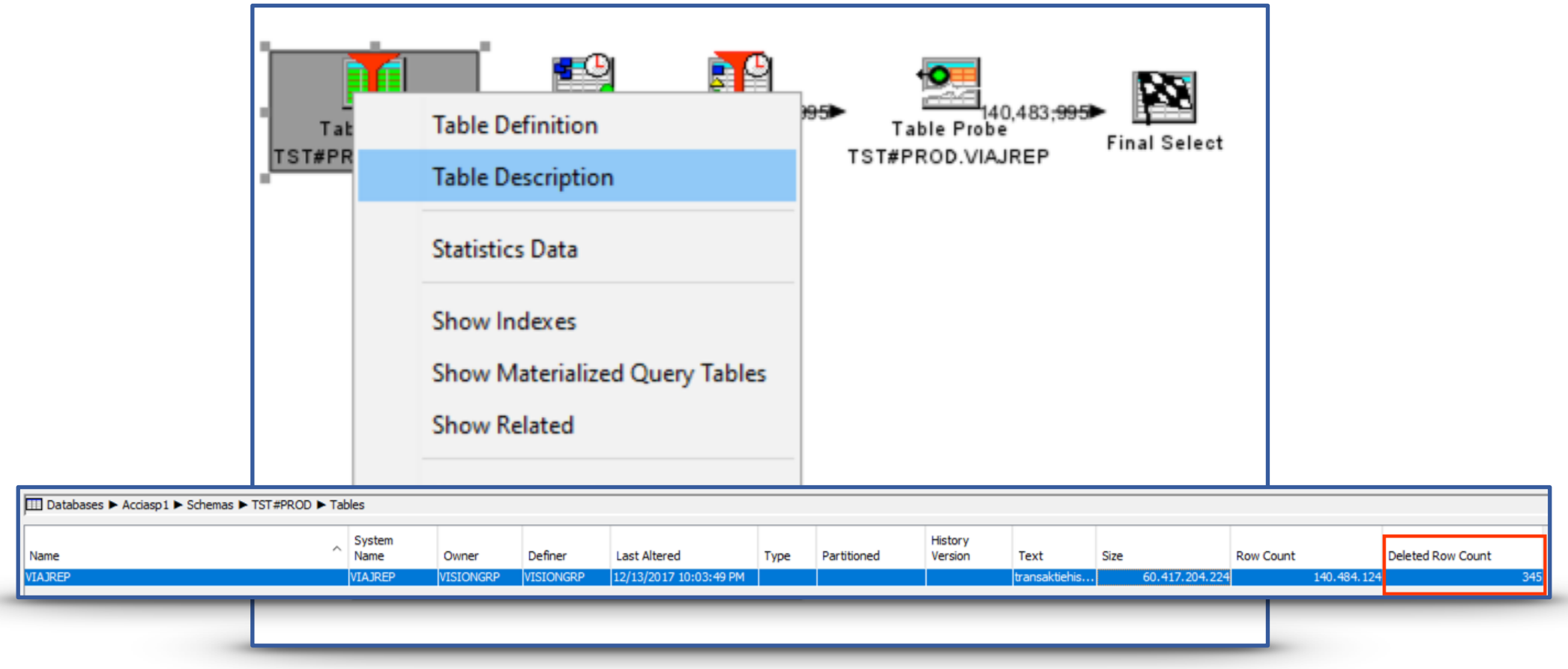
# Plan Cache Snapshots

## Full Table Scans



# Plan Cache Snapshots

## Full Table Scans



# Plan Cache Snapshots

[Database monitor view 3000 - Table Scan]

| | | |
|---|---|---|
| System_Table_Schema | QQTLN | Schema of table queried |
| System_Table_Name | QQTFN | Name of table queried |
| Member_Name | QQTMN | Member name of table queried |
| System_Base_Table_Schema | QQPTLN | Schema name of base table |
| System_Base_Table_Name | QQPTFN | Name of base table for table queried |
| Base_Member_Name | QQPTMN | Member name of base table |
| Table_Total_Rows | QQTOTR | Total rows in table |
| Estimated_Rows_Selected | QQREST | Estimated number of rows selected |
| Estimated_Join_Rows | QQAJN | Estimated number of joined rows |
| Estimated_Processing_Time | QQEPT | Estimated processing time, in seconds |

# Plan Cache Snapshots

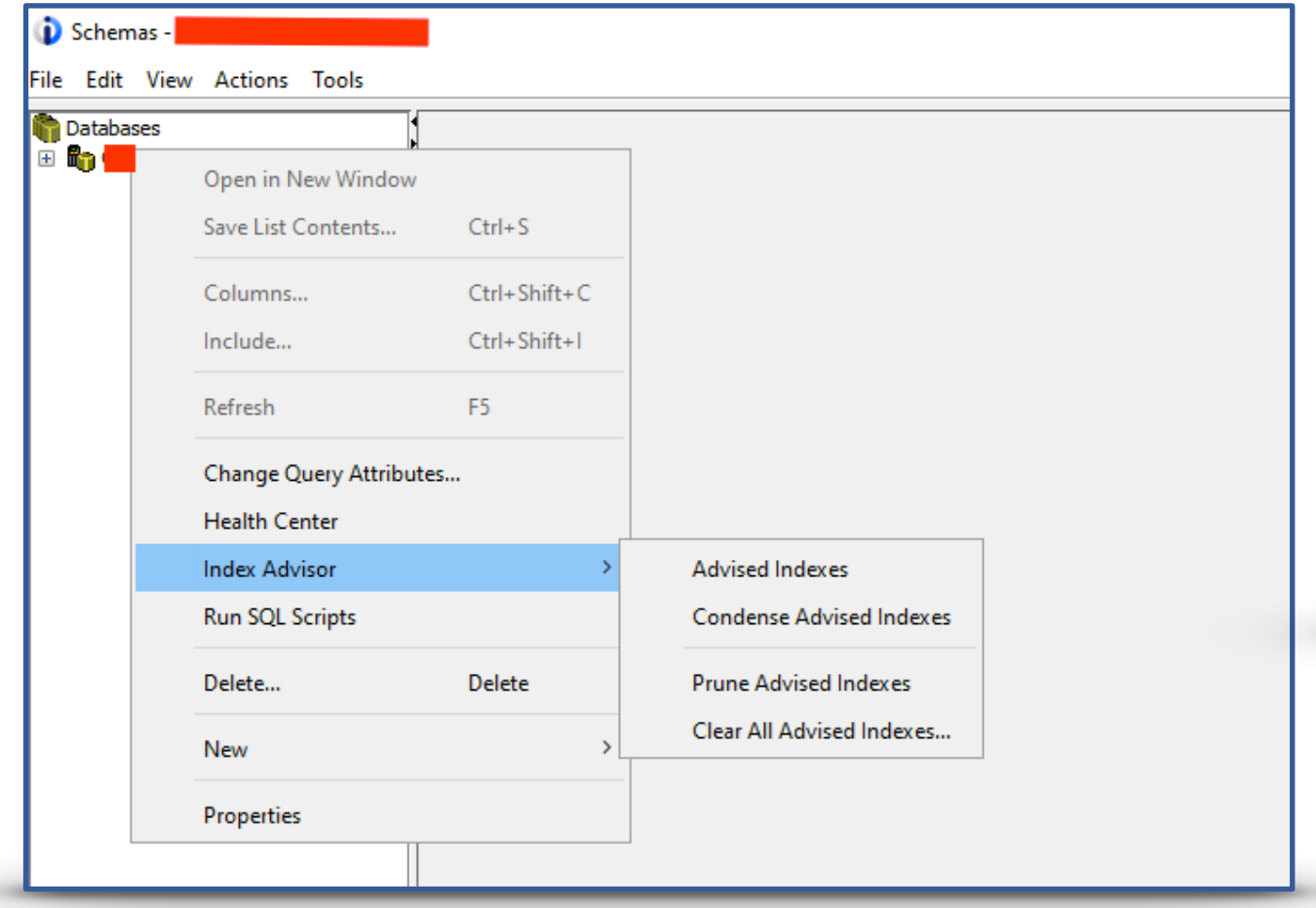
Two options to avoid the impact of Table Scans on Performance:

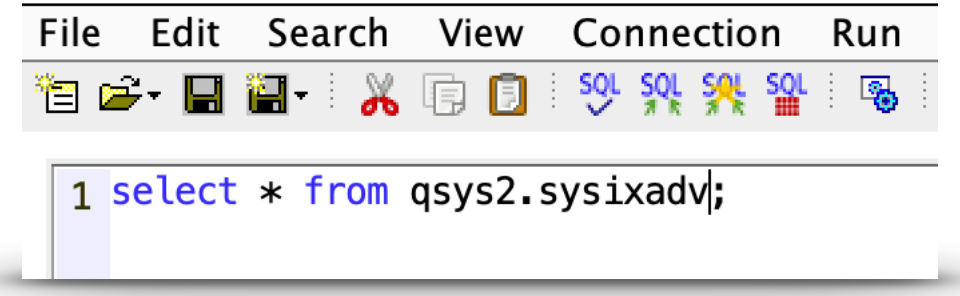
1. Use the Index Advisor with or without Visual Explain
   to avoid Table Scan

2. Reorganize Table
   to mitigate the impact of a Table Scan

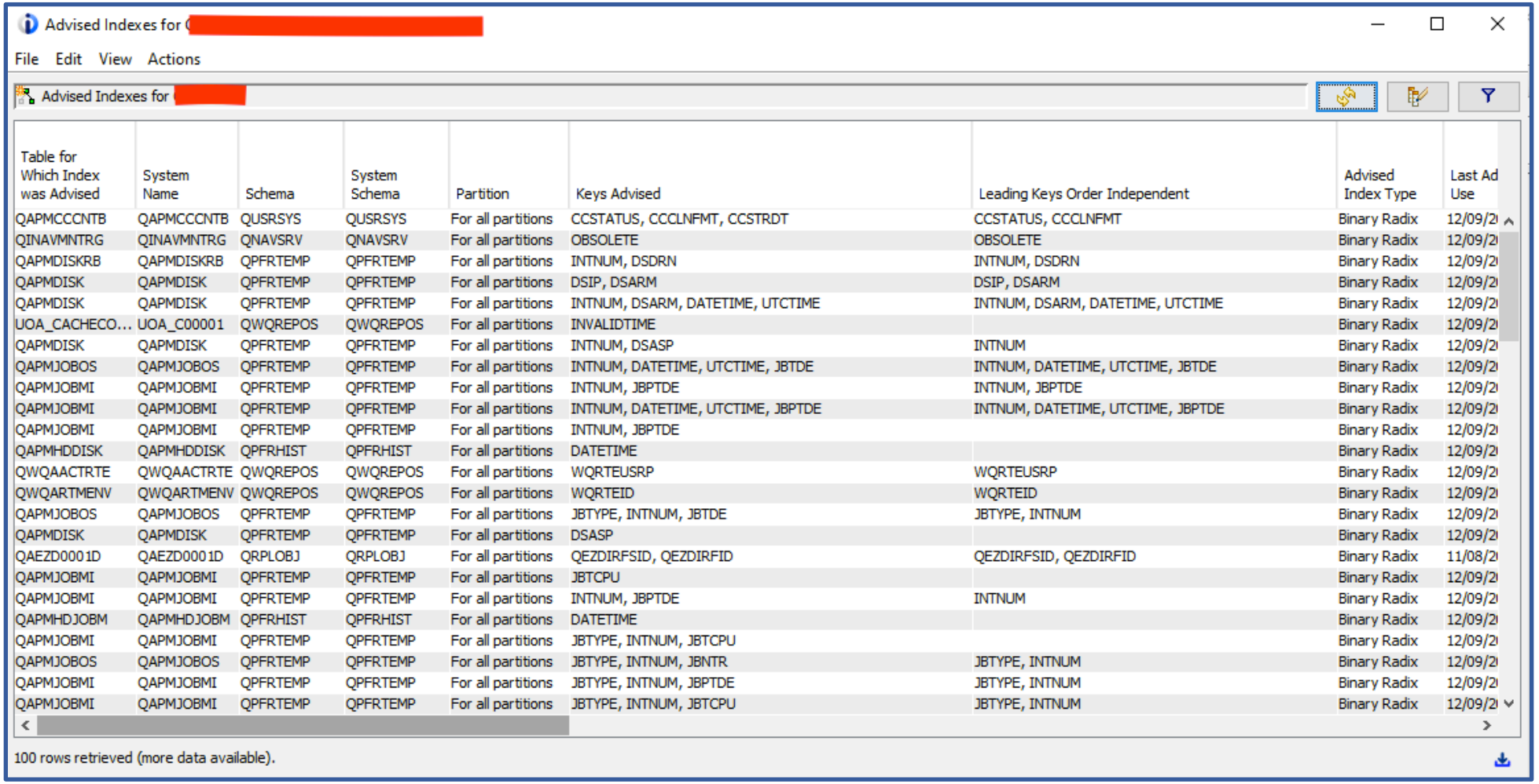
3. Implement Db2 Symmetric Multiprocessing

# Use the Index Advisor with or without Visual Explain



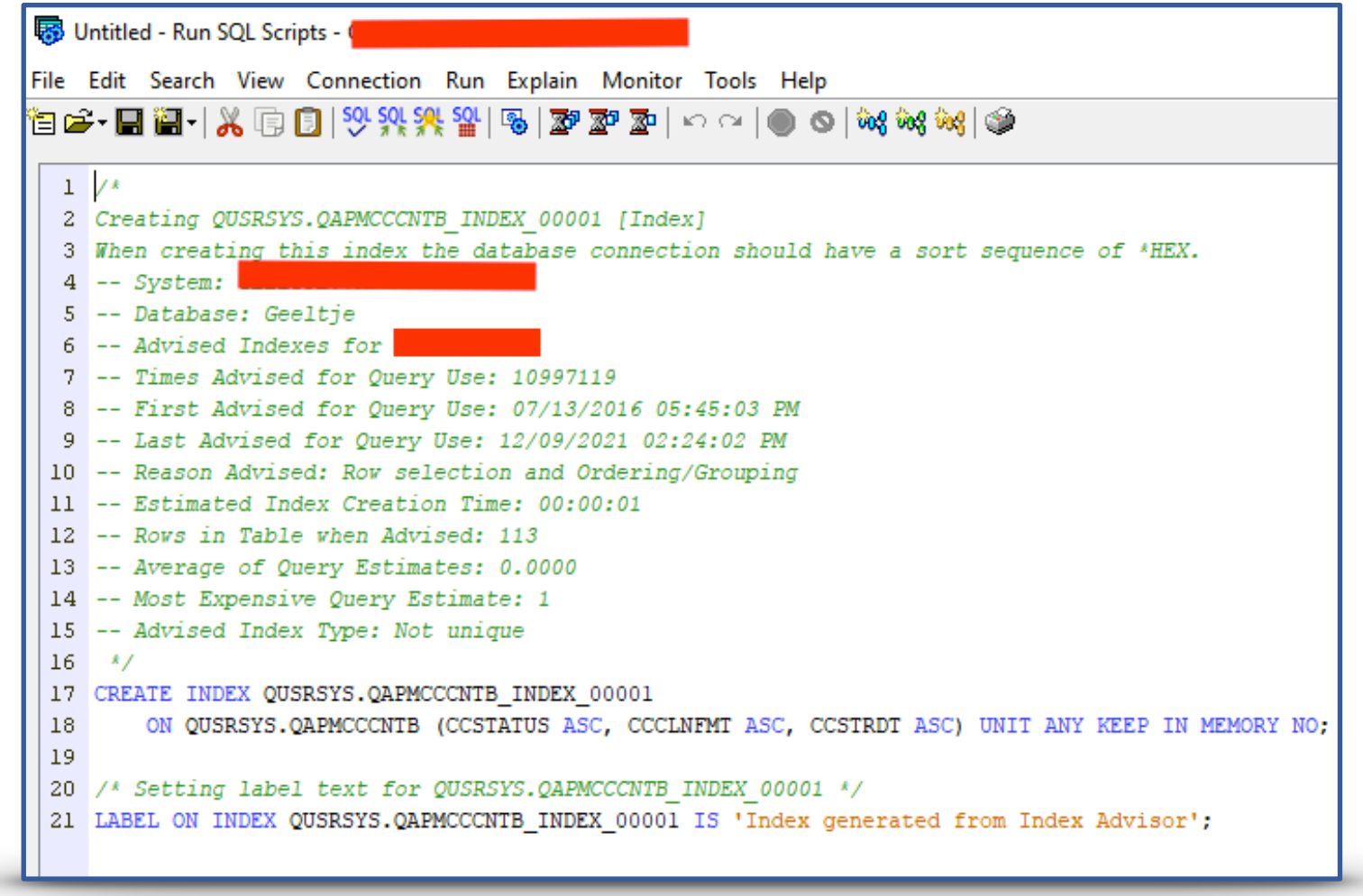
# Use the Index Advisor with or without Visual Explain



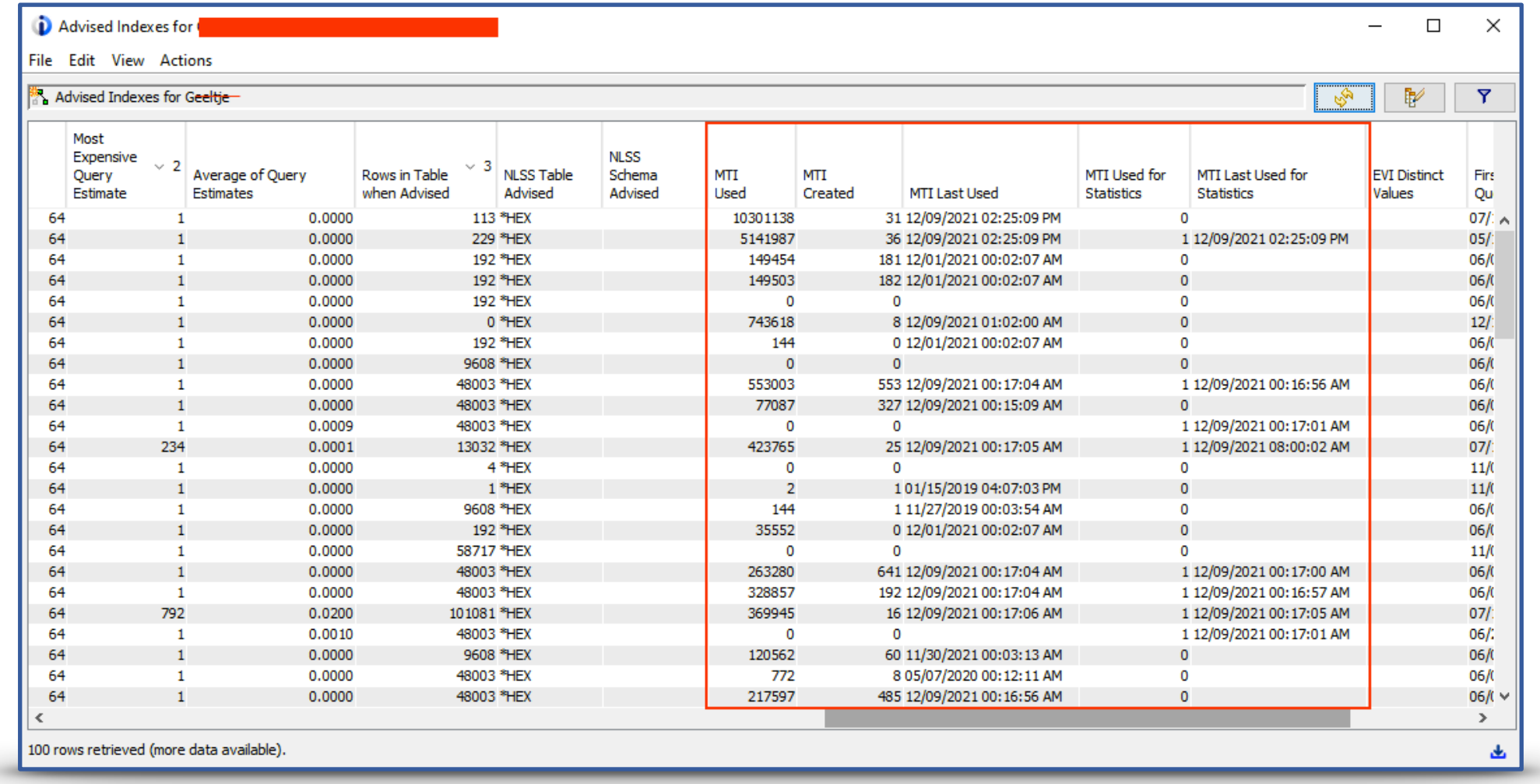

| Table for Which Index was Advised | System Name | Schema | System Schema | Partition | Keys Advised | Leading Keys Order Independent | Advised Index Type | Last Ad Use |
|---|---|---|---|---|---|---|---|---|
| QAPMCCCNTB | QAPMCCCNTB | QUSRSYS | QUSRSYS | For all partitions | CCSTATUS, CCCLNFMT, CCSTRDT | CCSTATUS, CCCLNFMT | Binary Radix | 12/09/2 |
| QINAVMNTRG | QINAVMNTRG | QNAVSRV | QNAVSRV | For all partitions | OBSOLETE | OBSOLETE | Binary Radix | 12/09/2 |
| QAPMDISKRB | QAPMDISKRB | QPFRTEMP | QPFRTEMP | For all partitions | INTNUM, DSDRN | INTNUM, DSDRN | Binary Radix | 12/09/2 |
| QAPMDISK | QAPMDISK | QPFRTEMP | QPFRTEMP | For all partitions | DSIP, DSARM | DSIP, DSARM | Binary Radix | 12/09/2 |
| QAPMDISK | QAPMDISK | QPFRTEMP | QPFRTEMP | For all partitions | INTNUM, DSARM, DATETIME, UTCTIME | INTNUM, DSARM, DATETIME, UTCTIME | Binary Radix | 12/09/2 |
| UOA_CACHECO... | UOA_C00001 | QWQREPOS | QWQREPOS | For all partitions | INVALIDTIME | | Binary Radix | 12/09/2 |
| QAPMDISK | QAPMDISK | QPFRTEMP | QPFRTEMP | For all partitions | INTNUM, DSASP | INTNUM | Binary Radix | 12/09/2 |
| QAPMJOBOS | QAPMJOBOS | QPFRTEMP | QPFRTEMP | For all partitions | INTNUM, DATETIME, UTCTIME, JBTDE | INTNUM, DATETIME, UTCTIME, JBTDE | Binary Radix | 12/09/2 |
| QAPMJOBMI | QAPMJOBMI | QPFRTEMP | QPFRTEMP | For all partitions | INTNUM, JBPTDE | INTNUM, JBPTDE | Binary Radix | 12/09/2 |
| QAPMJOBMI | QAPMJOBMI | QPFRTEMP | QPFRTEMP | For all partitions | INTNUM, DATETIME, UTCTIME, JBPTDE | INTNUM, DATETIME, UTCTIME, JBPTDE | Binary Radix | 12/09/2 |
| QAPMJOBMI | QAPMJOBMI | QPFRTEMP | QPFRTEMP | For all partitions | INTNUM, JBPTDE | | Binary Radix | 12/09/2 |
| QAPMHDDISK | QAPMHDDISK | QPFRHIST | QPFRHIST | For all partitions | DATETIME | | Binary Radix | 12/09/2 |
| QWQAACTRTE | QWQAACTRTE | QWQREPOS | QWQREPOS | For all partitions | WQRTEUSRP | WQRTEUSRP | Binary Radix | 12/09/2 |
| QWQARTMENV | QWQARTMENV | QWQREPOS | QWQREPOS | For all partitions | WQRTEID | WQRTEID | Binary Radix | 12/09/2 |
| QAPMJOBOS | QAPMJOBOS | QPFRTEMP | QPFRTEMP | For all partitions | JBTYPE, INTNUM, JBTDE | JBTYPE, INTNUM | Binary Radix | 12/09/2 |
| QAPMDISK | QAPMDISK | QPFRTEMP | QPFRTEMP | For all partitions | DSASP | | Binary Radix | 12/09/2 |
| QAEZD0001D | QAEZD0001D | QRPLOBJ | QRPLOBJ | For all partitions | QEZDIRFSID, QEZDIRFID | QEZDIRFSID, QEZDIRFID | Binary Radix | 11/08/2 |
| QAPMJOBMI | QAPMJOBMI | QPFRTEMP | QPFRTEMP | For all partitions | JBTCPU | | Binary Radix | 12/09/2 |
| QAPMJOBMI | QAPMJOBMI | QPFRTEMP | QPFRTEMP | For all partitions | INTNUM, JBPTDE | INTNUM | Binary Radix | 12/09/2 |
| QAPMHDJOBM | QAPMHDJOBM | QPFRHIST | QPFRHIST | For all partitions | DATETIME | | Binary Radix | 12/09/2 |
| QAPMJOBMI | QAPMJOBMI | QPFRTEMP | QPFRTEMP | For all partitions | JBTYPE, INTNUM, JBTCPU | | Binary Radix | 12/09/2 |
| QAPMJOBOS | QAPMJOBOS | QPFRTEMP | QPFRTEMP | For all partitions | JBTYPE, INTNUM, JBNTR | JBTYPE, INTNUM | Binary Radix | 12/09/2 |
| QAPMJOBMI | QAPMJOBMI | QPFRTEMP | QPFRTEMP | For all partitions | JBTYPE, INTNUM, JBPTDE | JBTYPE, INTNUM | Binary Radix | 12/09/2 |
| QAPMJOBMI | QAPMJOBMI | QPFRTEMP | QPFRTEMP | For all partitions | JBTYPE, INTNUM, JBTCPU | JBTYPE, INTNUM | Binary Radix | 12/09/2 |

100 rows retrieved (more data available).

# Use the Index Advisor with or without Visual Explain



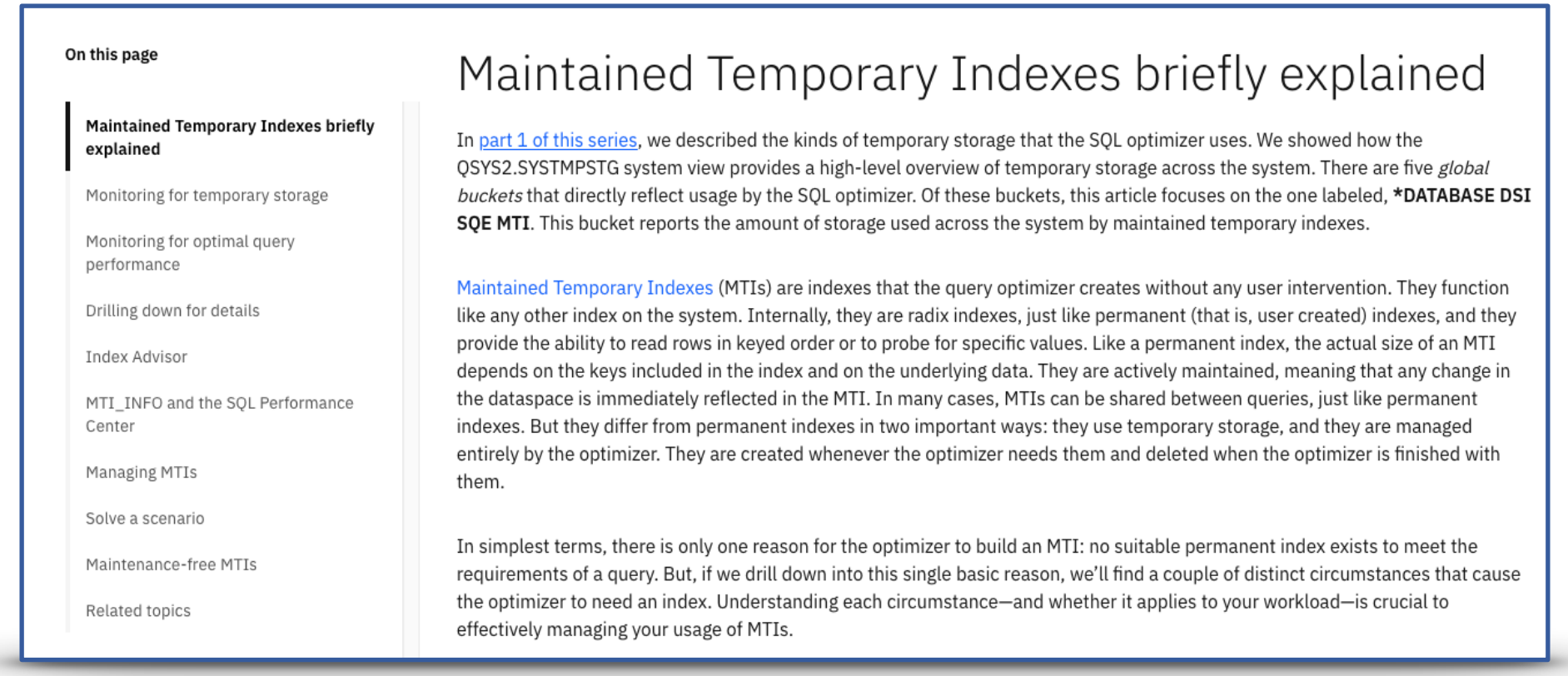
# Use the Index Advisor with or without Visual Explain




| | Most Expensive Query Estimate 2 | Average of Query Estimates | Rows in Table when Advised 3 | NLSS Table Advised | NLSS Schema Advised | MTI Used | MTI Created | MTI Last Used | MTI Used for Statistics | MTI Last Used for Statistics | EVI Distinct Values | Firs Qu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 64 | 1 | 0.0000 | 113 | *HEX | | 10301138 | 31 | 12/09/2021 02:25:09 PM | 0 | | | 07/ |
| 64 | 1 | 0.0000 | 229 | *HEX | | 5141987 | 36 | 12/09/2021 02:25:09 PM | 1 | 12/09/2021 02:25:09 PM | | 05/ |
| 64 | 1 | 0.0000 | 192 | *HEX | | 149454 | 181 | 12/01/2021 00:02:07 AM | 0 | | | 06/ |
| 64 | 1 | 0.0000 | 192 | *HEX | | 149503 | 182 | 12/01/2021 00:02:07 AM | 0 | | | 06/ |
| 64 | 1 | 0.0000 | 192 | *HEX | | 0 | 0 | | 0 | | | 06/ |
| 64 | 1 | 0.0000 | 0 | *HEX | | 743618 | 8 | 12/09/2021 01:02:00 AM | 0 | | | 12/ |
| 64 | 1 | 0.0000 | 192 | *HEX | | 144 | 0 | 12/01/2021 00:02:07 AM | 0 | | | 06/ |
| 64 | 1 | 0.0000 | 9608 | *HEX | | 0 | 0 | | 0 | | | 06/ |
| 64 | 1 | 0.0000 | 48003 | *HEX | | 553003 | 553 | 12/09/2021 00:17:04 AM | 1 | 12/09/2021 00:16:56 AM | | 06/ |
| 64 | 1 | 0.0000 | 48003 | *HEX | | 77087 | 327 | 12/09/2021 00:15:09 AM | 0 | | | 06/ |
| 64 | 1 | 0.0009 | 48003 | *HEX | | 0 | 0 | | 1 | 12/09/2021 00:17:01 AM | | 06/ |
| 64 | 234 | 0.0001 | 13032 | *HEX | | 423765 | 25 | 12/09/2021 00:17:05 AM | 1 | 12/09/2021 08:00:02 AM | | 07/ |
| 64 | 1 | 0.0000 | 4 | *HEX | | 0 | 0 | | 0 | | | 11/ |
| 64 | 1 | 0.0000 | 1 | *HEX | | 2 | 1 | 01/15/2019 04:07:03 PM | 0 | | | 11/ |
| 64 | 1 | 0.0000 | 9608 | *HEX | | 144 | 1 | 11/27/2019 00:03:54 AM | 0 | | | 06/ |
| 64 | 1 | 0.0000 | 192 | *HEX | | 35552 | 0 | 12/01/2021 00:02:07 AM | 0 | | | 06/ |
| 64 | 1 | 0.0000 | 58717 | *HEX | | 0 | 0 | | 0 | | | 11/ |
| 64 | 1 | 0.0000 | 48003 | *HEX | | 263280 | 641 | 12/09/2021 00:17:04 AM | 1 | 12/09/2021 00:17:00 AM | | 06/ |
| 64 | 1 | 0.0000 | 48003 | *HEX | | 328857 | 192 | 12/09/2021 00:17:04 AM | 1 | 12/09/2021 00:16:57 AM | | 06/ |
| 64 | 792 | 0.0200 | 101081 | *HEX | | 369945 | 16 | 12/09/2021 00:17:06 AM | 1 | 12/09/2021 00:17:05 AM | | 07/ |
| 64 | 1 | 0.0010 | 48003 | *HEX | | 0 | 0 | | 1 | 12/09/2021 00:17:01 AM | | 06/ |
| 64 | 1 | 0.0000 | 9608 | *HEX | | 120562 | 60 | 11/30/2021 00:03:13 AM | 0 | | | 06/ |
| 64 | 1 | 0.0000 | 48003 | *HEX | | 772 | 8 | 05/07/2020 00:12:11 AM | 0 | | | 06/ |
| 64 | 1 | 0.0000 | 48003 | *HEX | | 217597 | 485 | 12/09/2021 00:16:56 AM | 0 | | | 06/ |

# Use the Index Advisor with or without Visual Explain

## Maintained Temporary Index (MTI)



On this page



### Maintained Temporary Indexes briefly explained

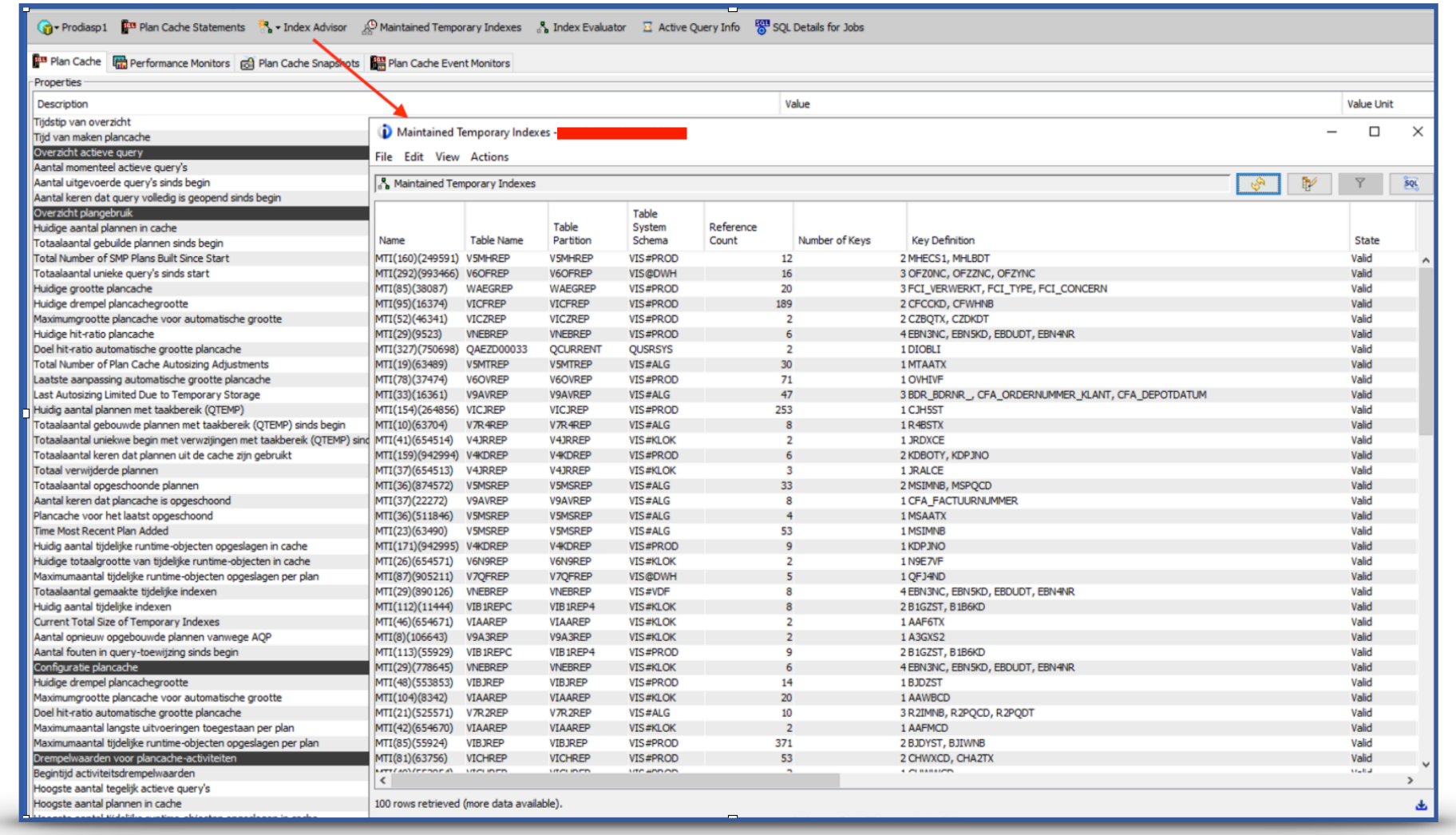
In part 1 of this series, we described the kinds of temporary storage that the SQL optimizer uses. We showed how the QSYS2.SYSTMPSTG system view provides a high-level overview of temporary storage across the system. There are five *global buckets* that directly reflect usage by the SQL optimizer. Of these buckets, this article focuses on the one labeled, ***DATABASE DSI SQE MTI**. This bucket reports the amount of storage used across the system by maintained temporary indexes.

Maintained Temporary Indexes (MTIs) are indexes that the query optimizer creates without any user intervention. They function like any other index on the system. Internally, they are radix indexes, just like permanent (that is, user created) indexes, and they provide the ability to read rows in keyed order or to probe for specific values. Like a permanent index, the actual size of an MTI depends on the keys included in the index and on the underlying data. They are actively maintained, meaning that any change in the dataspace is immediately reflected in the MTI. In many cases, MTIs can be shared between queries, just like permanent indexes. But they differ from permanent indexes in two important ways: they use temporary storage, and they are managed entirely by the optimizer. They are created whenever the optimizer needs them and deleted when the optimizer is finished with them.

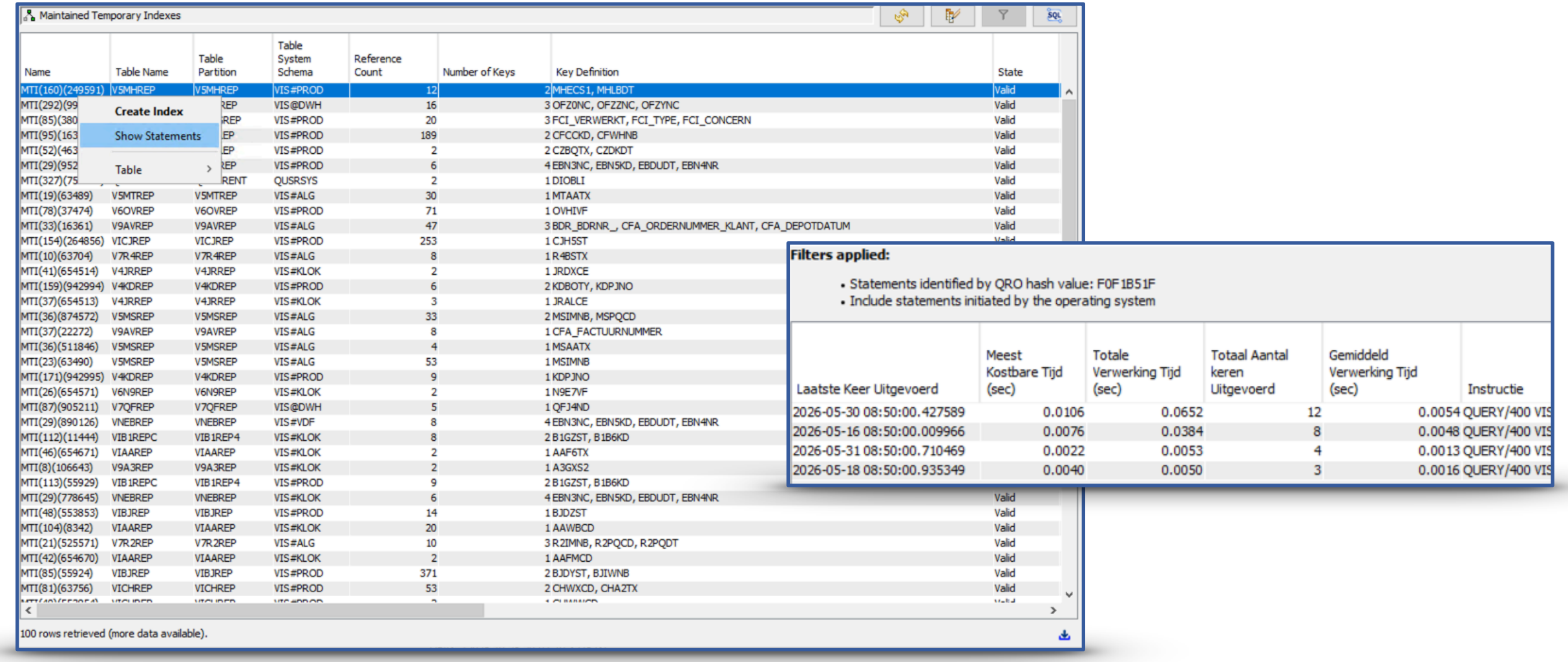
In simplest terms, there is only one reason for the optimizer to build an MTI: no suitable permanent index exists to meet the requirements of a query. But, if we drill down into this single basic reason, we'll find a couple of distinct circumstances that cause the optimizer to need an index. Understanding each circumstance—and whether it applies to your workload—is crucial to effectively managing your usage of MTIs.

Time to read: 17 minutes

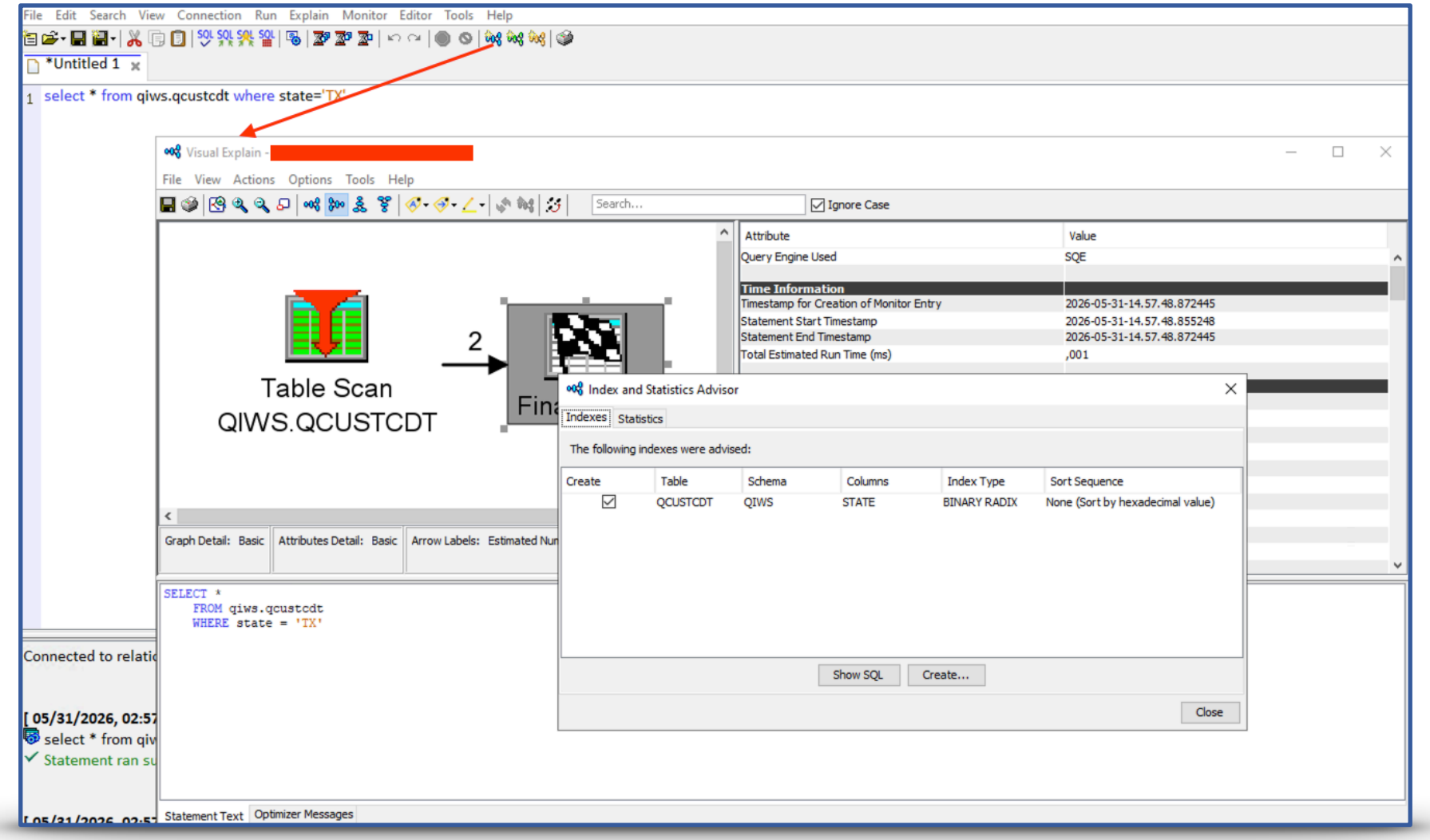
# Use the Index Advisor with or without Visual Explain



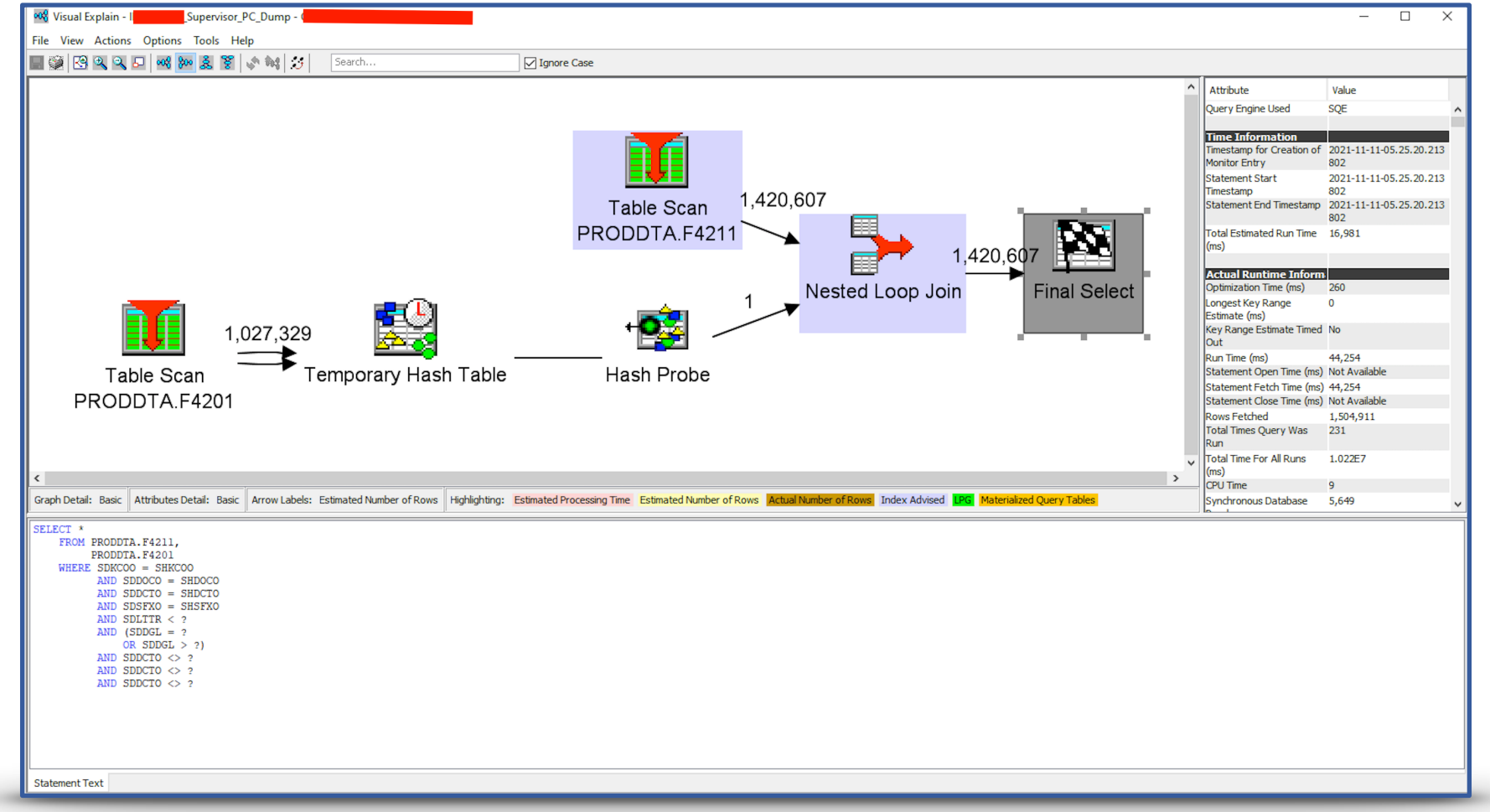
# Use the Index Advisor with or without Visual Explain



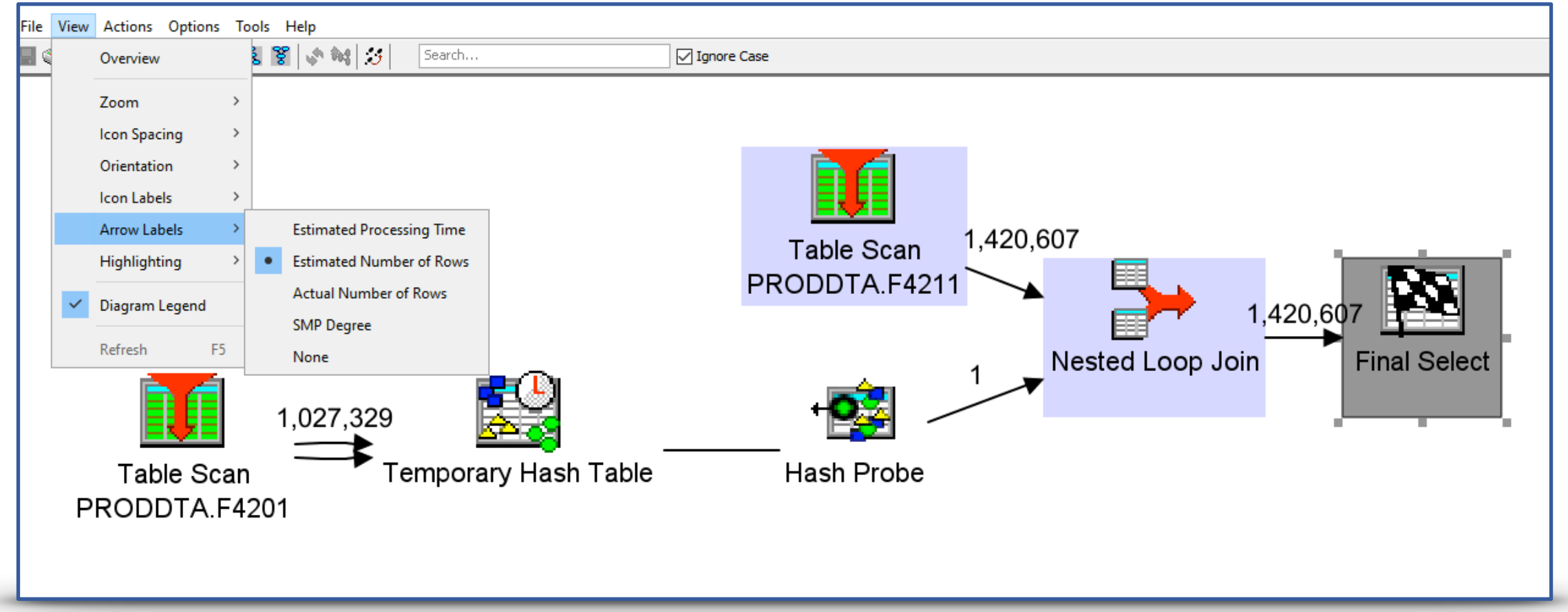
# Use the Index Advisor with or without Visual Explain



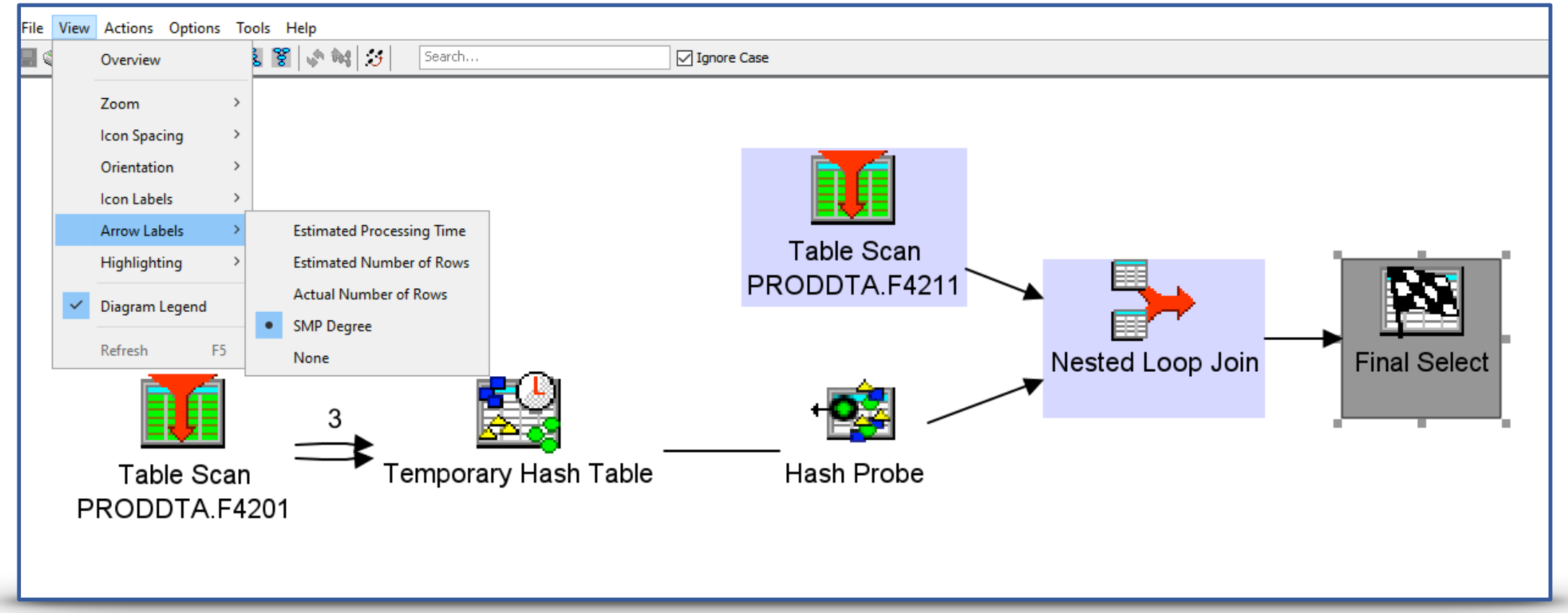
# Use the Index Advisor with or without Visual Explain



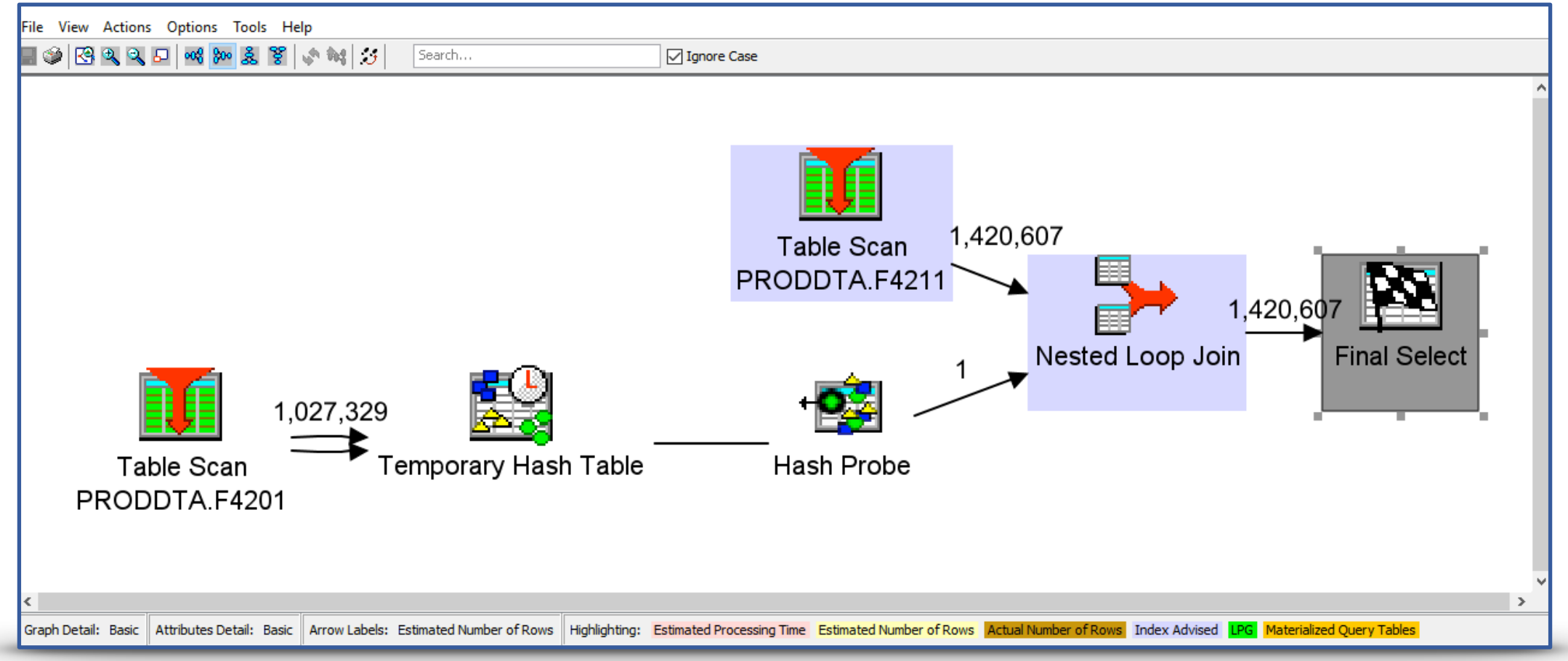
# Use the Index Advisor with or without Visual Explain



# Use the Index Advisor with or without Visual Explain



# Use the Index Advisor with or without Visual Explain



# Use the Index Advisor with or without Visual Explain

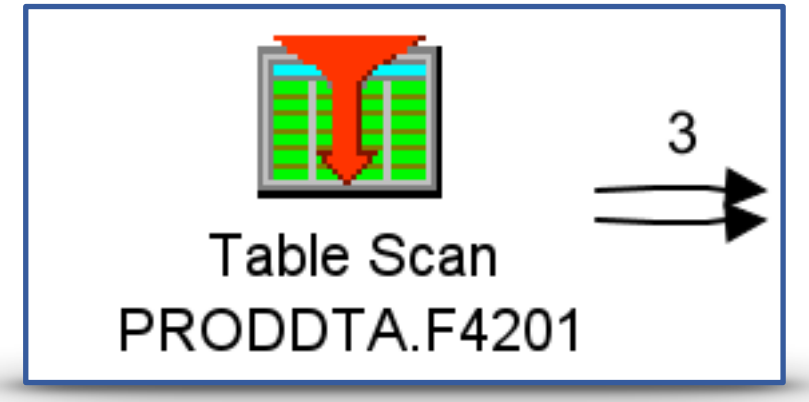
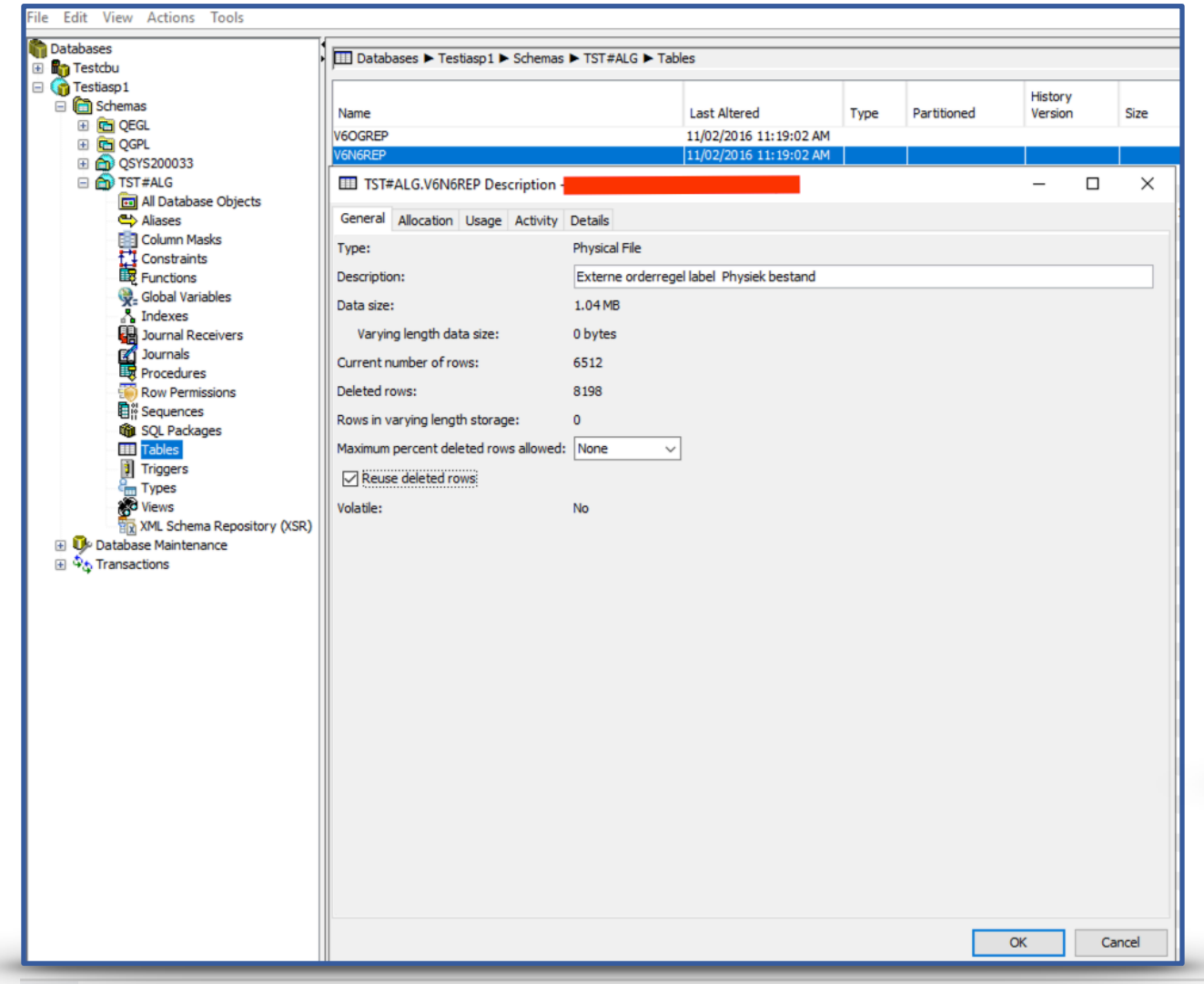


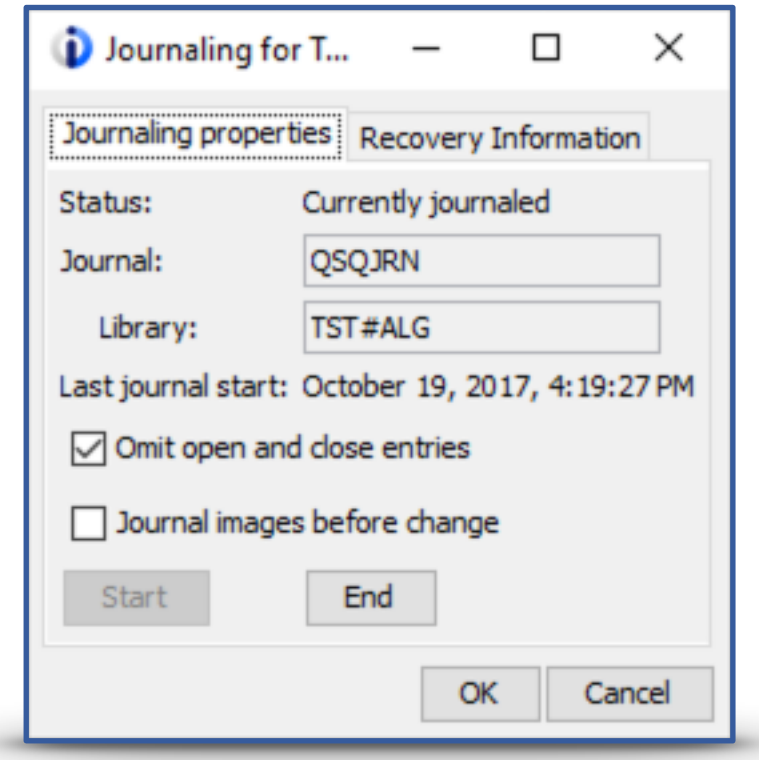

*Table 2. Table scan attributes*

| | |
|---|---|
| **Data access method** | **Table scan** |
| **Description** | Reads all the rows from the table and applies the selection criteria to each of the rows within the table. The rows in the table are processed in no guaranteed order, but typically they are processed sequentially. |
| **Advantages** | • Minimizes page I/O operations through asynchronous pre-fetching of the rows since the pages are scanned sequentially<br>• Requests a larger I/O to fetch the data efficiently |
| **Considerations** | • All rows in the table are examined regardless of the selectivity of the query<br>• Rows marked as deleted are still paged into memory even though none are selected. You can reorganize the table to remove deleted rows. |
| **Likely to be used** | • When expecting many rows returned from the table<br>• When the number of large I/Os needed to scan is fewer than the number of small I/Os required to probe the table |
| **Example SQL statement** | `SELECT * FROM Employee`<br>`WHERE WorkDept BETWEEN 'A01'AND 'E01'`<br>`OPTIMIZE FOR ALL ROWS` |
| **Database Monitor and Plan Cache record indicating use** | QQRID 3000 - Table Scan |
| **SMP parallel enabled** | Yes |
| **Also referred to as** | Table Scan, Preload |
| **Visual Explain icon** |  |

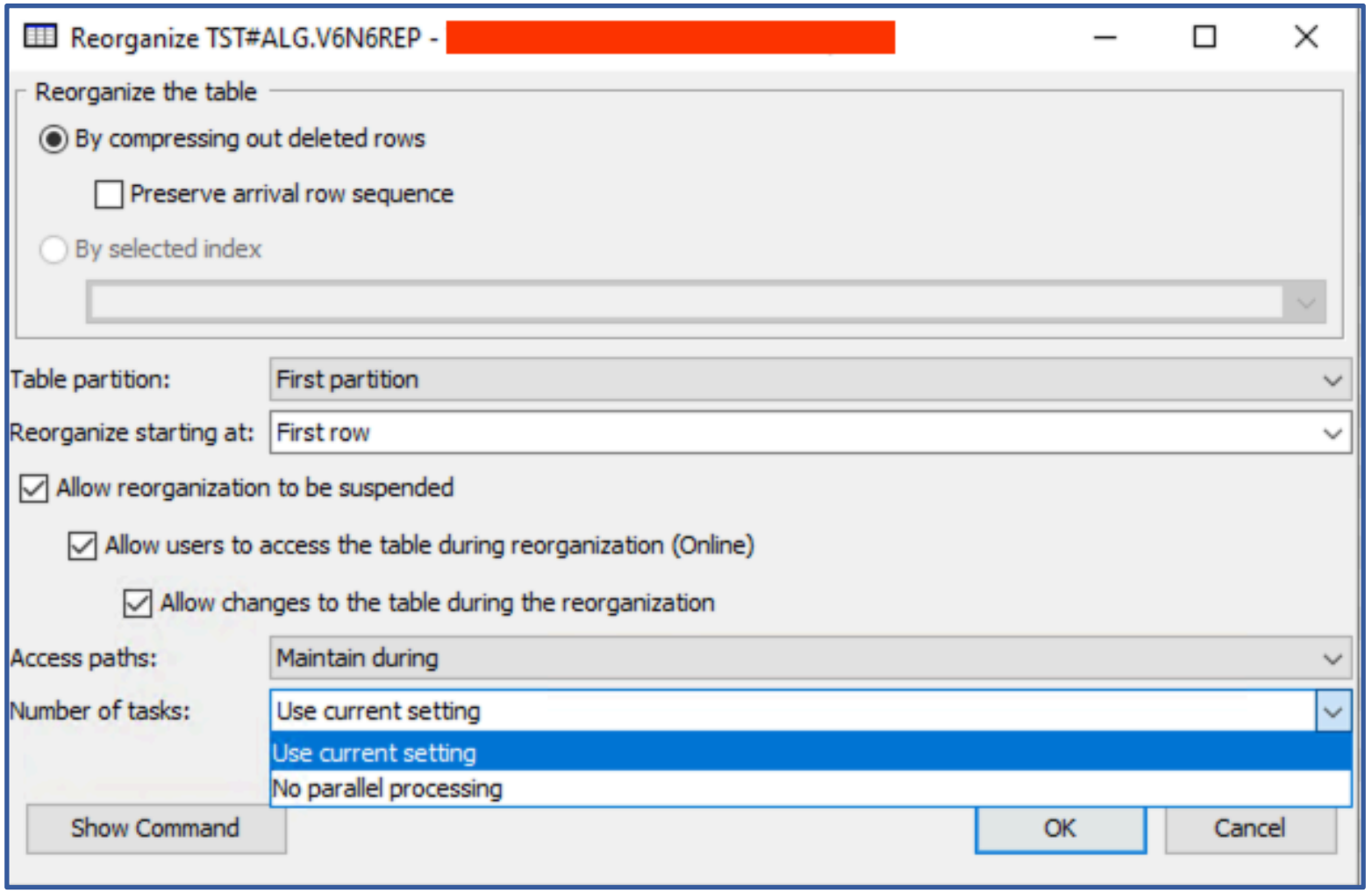
[IBM i 7.6 Databse Performance and Query Optimization]

# Reorganize Table



# Reorganize Table



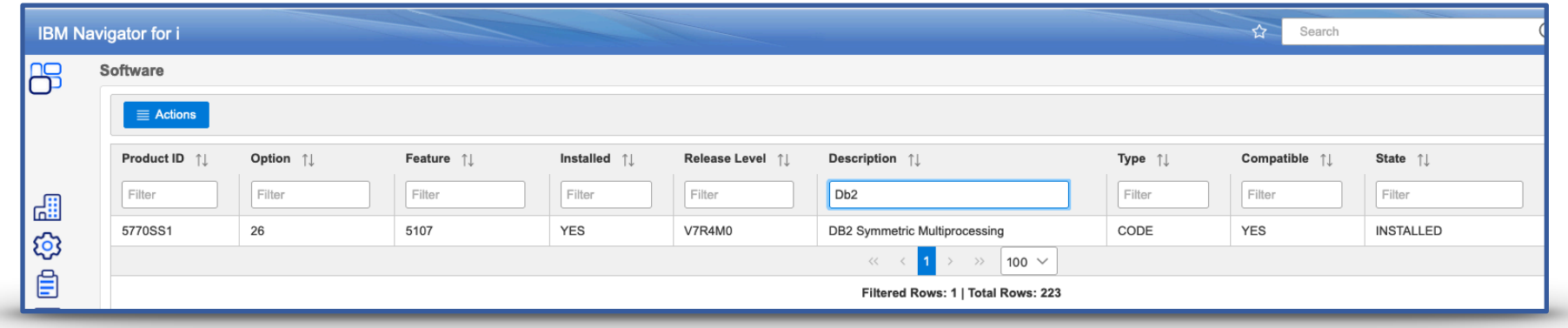
# Reorganize Table

```
1  -- category: System Management
2  -- description: Reorganize on-the-fly per Schema
3  SELECT SYSTEM_TABLE_SCHEMA,
4       SYSTEM_TABLE_NAME,
5       SYSTEM_TABLE_MEMBER,
6       TEXT_DESCRIPTION,
7       TABLE_PARTITION,
8       PARTITION_TYPE,
9       NUMBER_ROWS,
10      NUMBER_PAGES,
11      OVERFLOW,
12      AVGROWSIZE,
13      NUMBER_DELETED_ROWS,
14   --    'CL:RGZPFM FILE(' CONCAT TRIM(SYSTEM_TABLE_SCHEMA) CONCAT '/' CONCAT TRIM(SYSTEM_TABLE_NAME) CONCAT ')
15   MBR(*FIRST) KEYFILE(*RPLDLTRCD) ALWCANCEL(*YES) LOCK(*SHRUPD) RBDACCPTH(*NO) FROMRCD(*START)',
16     QSYS2.QCMDEXC('RGZPFM FILE(' CONCAT TRIM(SYSTEM_TABLE_SCHEMA) CONCAT '/' CONCAT TRIM(SYSTEM_TABLE_NAME) CONCAT ')
17     MBR(*FIRST) KEYFILE(*RPLDLTRCD) ALWCANCEL(*YES) LOCK(*SHRUPD) RBDACCPTH(*NO) FROMRCD(*START)') as true,
18    DATA_SIZE
19    FROM QSYS2.SYSMEMBERSTAT
20    WHERE TABLE_SCHEMA = :TABLE_SCHEMA
21         AND NUMBER_DELETED_ROWS <> 0
22         AND NUMBER_DELETED_ROWS >= 100
23    ORDER BY NUMBER_DELETED_ROWS DESC fetch first 40 rows only;
24
```

# Db2 Symmetric Multiprocessing

## Objects processed in parallel

Database parallelism,
while inherently part of Db2 for i,
is enabled by installing the optional IBM i feature
"Db2 Symmetric Multiprocessing"




## IBM i Portfolio Simplification

# Db2 Symmetric Multiprocessing

## IBM i Simplification, *Stage 2: October 10, 2023 Announcement*

IBM | Let's Create

- Stage 1 - June 1, 2022 announcement: Selected LPPs and IBM i features priced at $0
  - Until Stage 2, LPPs and features still needed to be ordered, keys applied (if applicable), etc.
- Stage 2 - October 10, 2023 announcement: IBM i License Manager changes
  - Install PTF: no ordering, no license checking, software keys not required

**Products/Options $0: keys required prior to 10/24/2023**

- InfoPrint Server (5722-IP1)
- Advanced DBCS Printer Support (5761-AP1)
- Communications Utilities (5761-CM1)
- Advanced Job Scheduler (5770-JS1)
- Performance Tools (5770-PT1)
- Query for i (5770-QU1)
- Db2 Query Mgr & SQL Dev Kit (5770-ST1)
- IBM i Access Family (5770-XW1)

IBM i Optional Features: (5770-SS1)

- Media & Storage Extension – Opt 18
- PSF 1-55 IPM Support – Opt 36
- PSF 1-100 IPM Support – Opt 37
- PSF AnySpeed – Opt 38
- HA Switchable Resource Opt 41
  HA Journal Performance – Opt 42

**Products/Options $0: not keyed**

- Rational Application Management Toolset (5770-AMT)
- AFP Font Collection (5733-B45)
- AFP DBCS Fonts (5769-FN1)
- AFP Fonts (5769-FNT)
- XML Toolkit (5733-XT2)

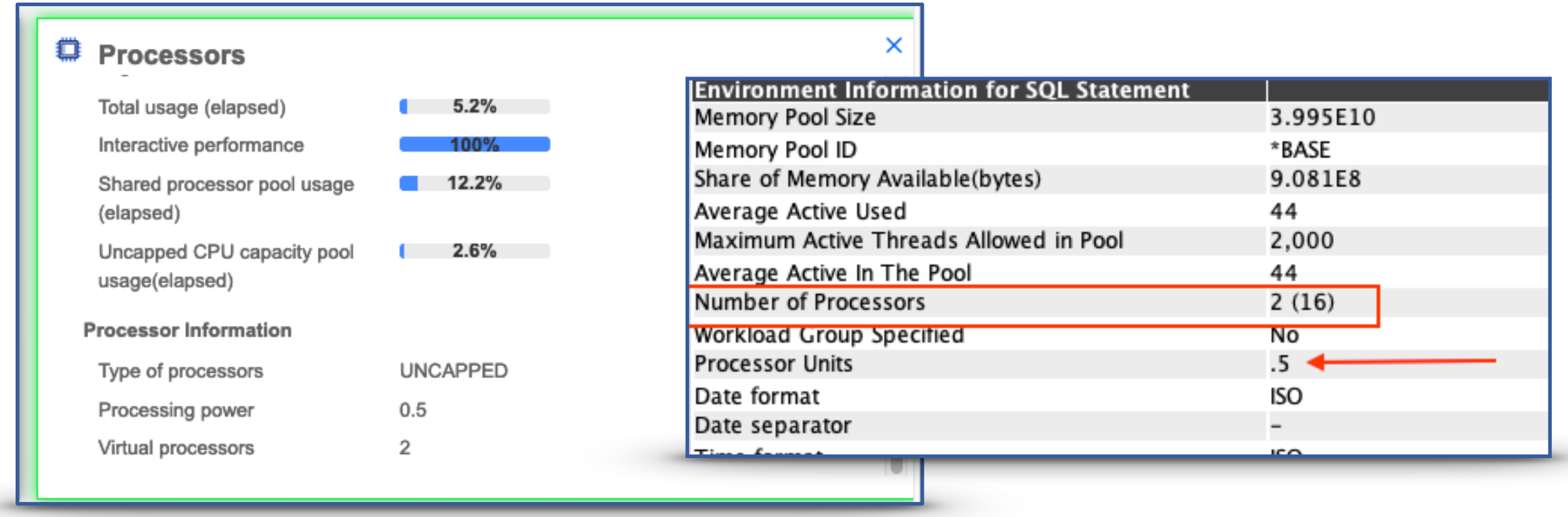
IBM i Optional Features:

- Db2 Symmetric Multiprocessing – Opt 26
- Db2 Multisystem – Opt 27

2

# Db2 Symmetric Multiprocessing

"I have only 1 IBM i core license so SMP will not help"



# Db2 Symmetric Multiprocessing

## Introduction to DB2 Symmetric Multiprocessing for IBM i

## SQE Symmetric Multiprocessing Changes

On IBM® i 7.5, the behavior of the **PARALLEL_DEGREE *OPTIMIZE** setting is changed for database queries.

When Db2 Symmetric Multiprocessing (SMP) is enabled, the PARALLEL_DEGREE value *OPTIMIZE enables the query optimizer to determine the optimal number of parallel tasks with which to run a query.

In most environments, SMP provides the greatest benefit to longer-running queries. With this update, Db2 for i now offers a feature which enables the optimizer to only consider SMP for queries that run for longer than a user-configurable time threshold. This allows the optimizer to apply SMP specifically to those queries that will benefit the most. When running with PARALLEL_DEGREE *OPTIMIZE or *OPTIMIZE%, all queries will initially run without the use of SMP. Only when queries have exceeded the time threshold will they be eligible to use SMP. This feature is delivered with the Db2 for i 7.5 PTF group SF99950 level 3.

**Minimum Runtime for Parallel Queries**

A new QAQQINI option, **PARALLEL_MIN_TIME**, describes the minimum time in seconds that a query must run before the optimizer may consider using SMP. When PARALLEL_DEGREE option *OPTIMIZE is used, queries will initially execute with a non-parallel implementation. If a query completes within the configured PARALLEL_MIN_TIME number of seconds, the optimizer will not run the query with SMP. If the query runs longer than the configured amount of time, the optimizer may choose to replace the plan with a parallel implementation. If a parallel implementation is chosen, all subsequent executions of the query will also use SMP. The optimizer retains information about the choice of SMP for each query (identified by its QRO hash) until the plan cache is cleared or until the next IPL.

By default, **PARALLEL_MIN_TIME** is set to 60 seconds, and may be set to any integer value between 2 and 100,000, inclusive. In order for PARALLEL_MIN_TIME to take effect, PARALLEL_DEGREE must be set to *OPTIMIZE or *OPTIMIZE %.

The new behavior does not apply to native queries, when Adaptive Query Processing is disabled, or when **PARALLEL_MIN_TIME** is set to *NONE. Under these conditions, all queries using **PARALLEL_DEGREE** *OPTIMIZE will consider parallel execution during their initial and all subsequent optimizations, which is the same behavior as prior releases.

# Db2 Symmetric Multiprocessing

## Creating the QAQQINI query options file

### Creating the QAQQINI query options file

Last Updated: 2025-10-07

Each system is shipped with a QAQQINI template file in schema QSYS. The QAQQINI file in QSYS is to be used as a template when creating all user specified QAQQINI files.

To create your own QAQQINI file, use the **Create Duplicate Object (CRTDUPOBJ)** command. Create a copy of the QAQQINI file in the schema specified on the **Change Query Attributes (CHGQRYA)** QRYOPTLIB parameter. The file name must remain QAQQINI. For example:

```
CRTDUPOBJ OBJ(QAQQINI)
          FROMLIB(QSYS)
          OBJTYPE(*FILE)
          TOLIB(MYLIB)
          DATA(*YES)
          TRG(*YES)
```

System-supplied triggers are attached to the QAQQINI file in QSYS therefore it is imperative that the only means of copying the QAQQINI file is through the CRTDUPOBJ CL command. If another means is used, such as **CPYF**, then the triggers could be corrupted. An error is signaled that the options file cannot be retrieved or that the options file cannot be updated.

Because of the trigger programs attached to the QAQQINI file, the following CPI321A informational message is displayed six times in the job log when the **CRTDUPOBJ** CL is used to create the file. These messages are not an error; they are only informational messages.

CPI321A Information Message: Trigger QSYS_TRIG_&1___QAQQINI___00000&N in library &1 was added to file QAQQINI in library &1. The ampersand variables (&1, &N) are replacement variables that contain either the library name or a numeric value.

**Note:** It is highly recommended that the file QAQQINI, in QSYS, not be modified. This file is the original template that is duplicated into QUSRSYS or a user specified library for use.

# Db2 Symmetric Multiprocessing

## OVERRIDE_QAQQINI procedure

### OVERRIDE_QAQQINI procedure

Last Updated: 2025-10-07

The OVERRIDE_QAQQINI procedure creates and modifies a temporary version of the QAQQINI file.

The temporary QAQQINI file will be created in QTEMP. It inherits all query options that are already in place for the job. The OVERRIDE_QAQQINI procedure can be called multiple times to establish job specific QAQQINI settings.

The procedure can also be called to discard the temporary customization settings.

**Authorization:** For most QAQQINI options, none is required. For the following options, the caller must have *JOBCTL special authority or be authorized to the QIBM_DB_SQLADM function usage ID. These options are more restrictive because they can affect the performance of other jobs.

- QUERY_TIME_LIMIT when the *option-value* is not 0.
- STORAGE_LIMIT
- PARALLEL_DEGREE when the *option-value* is not *NONE.
- PARALLEL_MAX_SYSTEM_CPU

# Db2 Symmetric Multiprocessing

***override-option***

An integer value that indicates the function to perform.

**1**

Create the QAQQINI override file. A procedure call with this *override-option* value must be run before option 2 can be used to change QAQQINI options.

**2**

Set a QAQQINI option to the specified value. See QAQQINI query options for the list of options and values.

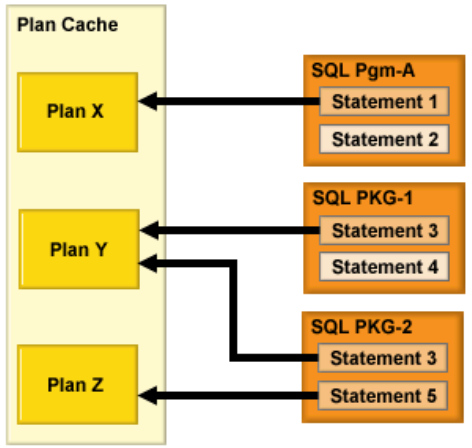
**3**

Discard the temporary QAQQINI file.

```
1 -- Create the QAQQINI override file
2 call qsys2.override_qaqqini(1);
3 -- Set a QAQQINI option to the specified value.
4 call qsys2.override_qaqqini(2, 'PARALLEL_MIN_TIME', '2');
5 -- Discard the temporary QAQQINI file.
6 call qsys2.override_qaqqini(3);
```

# Plan Cache Documentation

The following graphic shows the concept of re-usability of the query access plans stored in the plan cache:




As shown in the previous graphic, statements from packages and programs are stored in unique plans in the plan cache. If Statement 3 exists in both SQL package 1 and SQL package 2, the plan is stored once in the plan cache. The plan cache is interrogated each time a query is executed. If an access plan exists that satisfies the requirements of the query, it is used to implement the query. Otherwise a new access plan is created and stored in the plan cache for future use.

The plan cache is automatically updated with new query access plans as they are created. When new statistics or indexes become available, an existing plan is updated the next time the query is run. The plan cache is also automatically updated by the database with runtime information as the queries are run.

|< Each plan cache entry contains the original query, the optimized query access plan, and cumulative runtime information gathered during the runs of the query. The size of these objects depends largely on the complexity of the SQL statements that are being executed. It is the size of these objects that is counted when calculating the plan cache size. >|

# Plan Cache Documentation

The size of the plan cache may be controlled by either a system-managed auto-sizing algorithm or by an explicitly set value. By default, the system will use automatic sizing, but this can be disabled by setting the SQL Plan Cache Threshold Size. See the SQL plan cache properties topic for more information: SQL plan cache properties

When auto-sizing is enabled, the system will begin after each IPL with a default plan cache size of 512 MB. As queries run, the associated plans are placed into the plan cache. Once the plan cache exceeds the current limit set by auto-sizing, the system will evaluate the current hit ratio for the cache. This is the ratio of the number of times a query could re-use a plan from the cache compared to the number of times a query was run. For example, if ten queries were run and nine of the queries used plans from the plan cache while the other one required a full optimization, the hit ratio is 90%. If the current hit ratio equals or exceeds the SQL Plan Cache Target Ratio ( see the SQL plan cache properties topic for more information: SQL plan cache properties), the system considers the plan cache to be operating at an efficient size and will not adjust the size of the cache.

If the current hit ratio is below the target for the plan cache and no other storage constraints exist, the system will automatically increase (up to the Maximum Plan Cache Size for Auto-sizing) the size of the plan cache. The plan cache will grow incrementally, allowing more plans to be stored, until the current hit ratio meets the target ratio.

Once the target hit ratio has been achieved, the determined size of the cache is maintained by an automatically scheduled background task. The purpose of this task is to go through the plan cache and to remove plans when the cache grows too large. This task will remove access plans based upon age, how frequently it is used, and how much cumulative resources (CPU/IO) were consumed.

Each plan cache entry may also have query runtime objects associated with it. These runtime objects are the real executable objects and temporary storage containers (hash tables, sorts, temporary indexes, and so on) used to run the query. Although these objects are not included the in the plan cache size calculation, they may indirectly affect and be affected by the plan cache size. This is because, in addition to honoring the determined plan cache size, the system also seeks to keep the total temporary storage usage for inactive, cached plans within an internally determined threshold. Unlike the plan cache size calculation, this temporary storage calculation considers both the cached plans and the associated runtime objects. If this temporary storage calculation exceeds a system determined percentage of the system auxiliary storage pool (ASP) or if the system storage lower limit (defined by QSTGLOWLMT) is surpassed, the system considers the plan cache to be using excessive temporary storage.

To reduce the excessive temporary storage, the automatically scheduled background task will begin by removing runtime objects from cached plans. This will continue until the plan cache's temporary storage usage is within the system's constraints, and this will happen even if all the cached plan entries themselves fit within the determined plan cache size. If temporary storage usage remains excessive even after the runtime objects are removed, the system will begin a process of incrementally reducing the plan cache size and will continue this reduction until it reaches the minimum value of 512 MB or until the plan cache temporary storage usage is no longer excessive.

# Plan Cache Documentation

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# Plan Cache Documentation

## IBM i temporary storage percentage

**Question**

What are some options to determine what my temporary storage percentage on the IBM i?

**Answer**

Here are four options to check your temporary storage percentage. There may be others you like better as well.

1) Using SQL (simple calculation, modify / add precision as you'd like)

Use Run SQL Scripts (part of Access Client Solutions)

```
SELECT CURRENT_TEMPORARY_STORAGE,
    SYSTEM_ASP_STORAGE,
    (CURRENT_TEMPORARY_STORAGE * 100)
      / SYSTEM_ASP_STORAGE as Temp_Percent
 FROM QSYS2.SYSTEM_STATUS_INFO
;
```

| CURRENT_TEMPORARY_STORAGE | SYSTEM_ASP_STORAGE | TEMP_PERCENT |
|---|---|---|
| 6790 | 286331 | 2 |

2) Database specific

Use IBM i command line

a. `CALL PGM(QQQOOOCACH) PARM('F:QTEMP/UFILE:U')`
b. `runqry () qtemp/ufile`
c. `Temp %` is on the first screen

```
Temp bytes    - 6763470848  (6 GB)
Temp %        - 2.36
```

d. **bonus**: page down to `SQE ACTIVE CURSOR SUMMARY` to see `Job with largest SQE temp usage`

```
SQE ACTIVE CURSOR SUMMARY
  Total SQE cursors on the system     - 23
  Total SQE ROQ sizes on the system   - 1832120  (1 MB)
  Job with largest SQE temp usage     - QDBSRV04  QSYS      132869 used 838344 bytes.
```

# Plan Cache Documentation

## IBM i temporary storage percentage

3) An IBM i API - (*message can be confusing however*)

Use IBM i command line

a. CALL QWCCTLTS PARM(*DSPLMT *ALL)
b. F1 on the Temporary storage threshold reached message.

```
  Cause . . . . . :   The amount of storage used for temporary objects in the system ASP is 2.3621 percent.
```

4) An IBM i API - Add functionality to WRKSYSSTS

Use IBM i command line

a. CALL QWCCTLTS PARM(*SETLMTPCT *ALL 80)
b. WRKSYSSTS
c. F19=Extended system status

```
 % temporary storage used  . . . . . :       2.3
 % temporary storage limit . . . . . :        80
```

d. note that the 80 is from step 4.a.
e. To remove a warning limit for all temporary storage on the system (and set it back to the default of no warning limit)

```
  CALL QWCCTLTS PARM(*SETLMTPCT *ALL 0)
```

# Plan Cache

## Using Run SQL Scripts

```
1  CL:CALL PGM(QQQOOOCACH) PARM('F:QTEMP/UFILE:U');
2
3  Select * from qtemp.ufile;
```

```
SQE Temp Storage Threshold %       - 7.00
Using new temp threshold calculation (SQE Plancache Temp Usage)
New Temp Threshold Calculation %   - 2.18
Old Temp Threshold Calculation %   - 6.69
Using new autosize storage calculation
Original Autosize Calculation %    - 18.64
New Autosize Calculation %         - 2.18
```

# Plan Cache

Remember this section for link before?

Use IBM i command line

a. `CALL PGM(QQQOOOCACH) PARM('F:QTEMP/UFILE:U')`

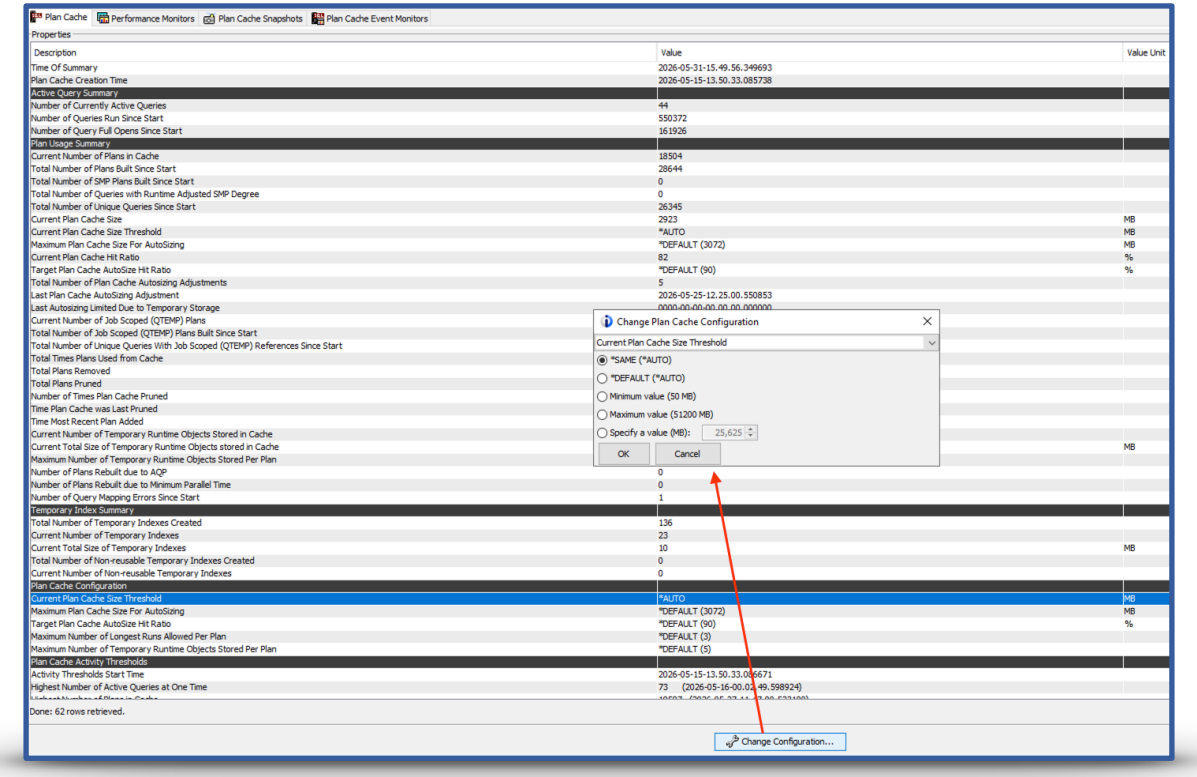
b. `runqry () qtemp/ufile`

c. `Temp %` is on the first screen

# Plan Cache

If Autosizing is limited due to Temporage Storage by the 7 % rule are:

Change the Plan Cache Configuration by switching off Auto Sizing



# Plan Cache

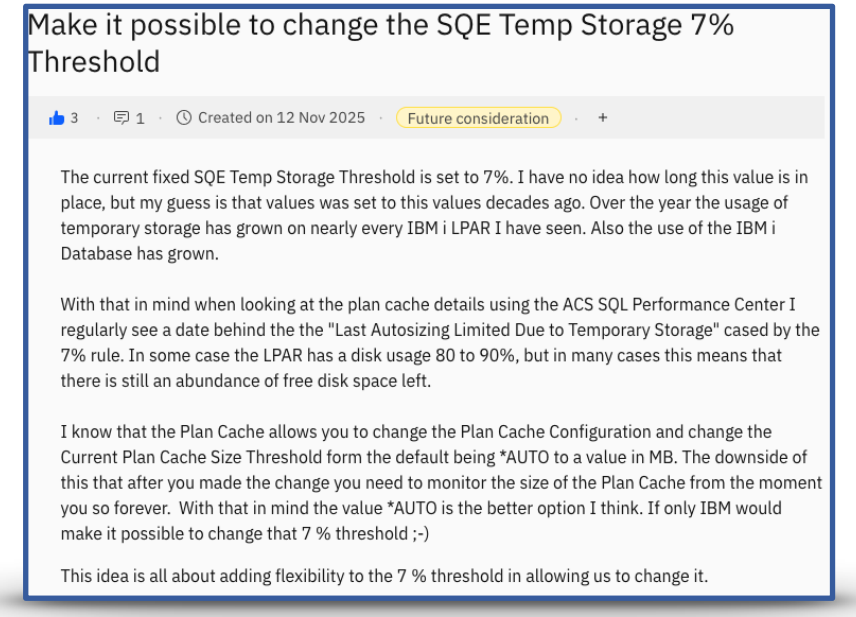
Switching off Auto Sizing means monitoring - What is the alternative?

Ask IBM to make the 7 % rule flexibel?

Well that is what I did by entering an IBM idea

[Make it possible to change the SQE Temp Storage 7% Threshold]

If you think this is a good idea you have the option to vote for it 🤓



Make it possible to change the SQE Temp Storage 7% Threshold

3 · 1 · Created on 12 Nov 2025 · Future consideration · +

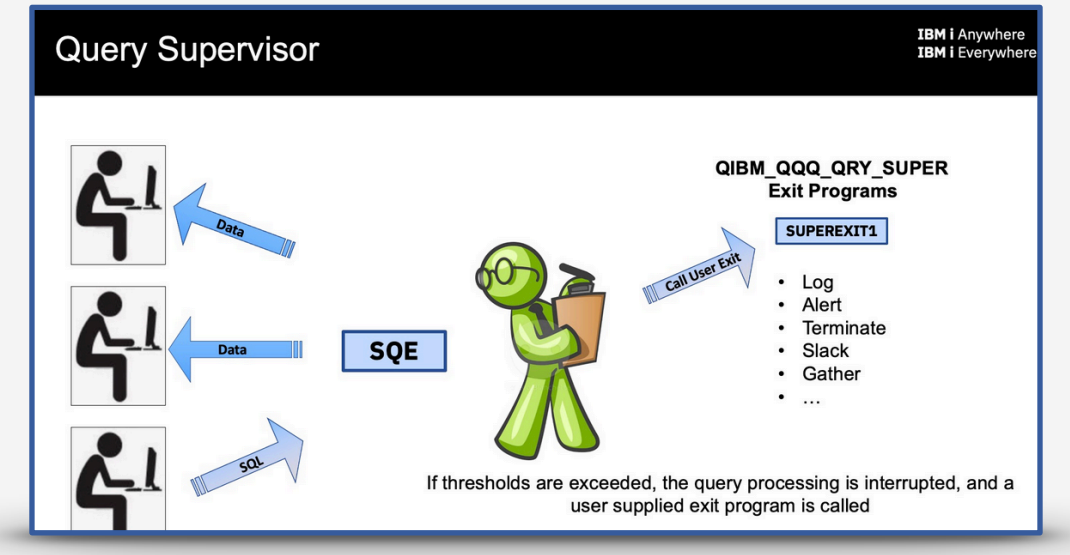
The current fixed SQE Temp Storage Threshold is set to 7%. I have no idea how long this value is in place, but my guess is that values was set to this values decades ago. Over the year the usage of temporary storage has grown on nearly every IBM i LPAR I have seen. Also the use of the IBM i Database has grown.

With that in mind when looking at the plan cache details using the ACS SQL Performance Center I regularly see a date behind the the "Last Autosizing Limited Due to Temporary Storage" cased by the 7% rule. In some case the LPAR has a disk usage 80 to 90%, but in many cases this means that there is still an abundance of free disk space left.

I know that the Plan Cache allows you to change the Plan Cache Configuration and change the Current Plan Cache Size Threshold form the default being *AUTO to a value in MB. The downside of this that after you made the change you need to monitor the size of the Plan Cache from the moment you so forever. With that in mind the value *AUTO is the better option I think. If only IBM would make it possible to change that 7 % threshold ;-)

This idea is all about adding flexibility to the 7 % threshold in allowing us to change it.

IBM i 7.3 TR10 and 7.4 TR4 on April 13 2021




**Db2 for i - Services (new)**

- QSYS2.ADD_QUERY_THRESHOLD
- QSYS2.END_IDLE_SQE_THREADS
- QSYS2.QUERY_SUPERVISOR
- QSYS2.REMOVE_QUERY_THRESHOLD

# Where the journey started

✓ **Abstract**

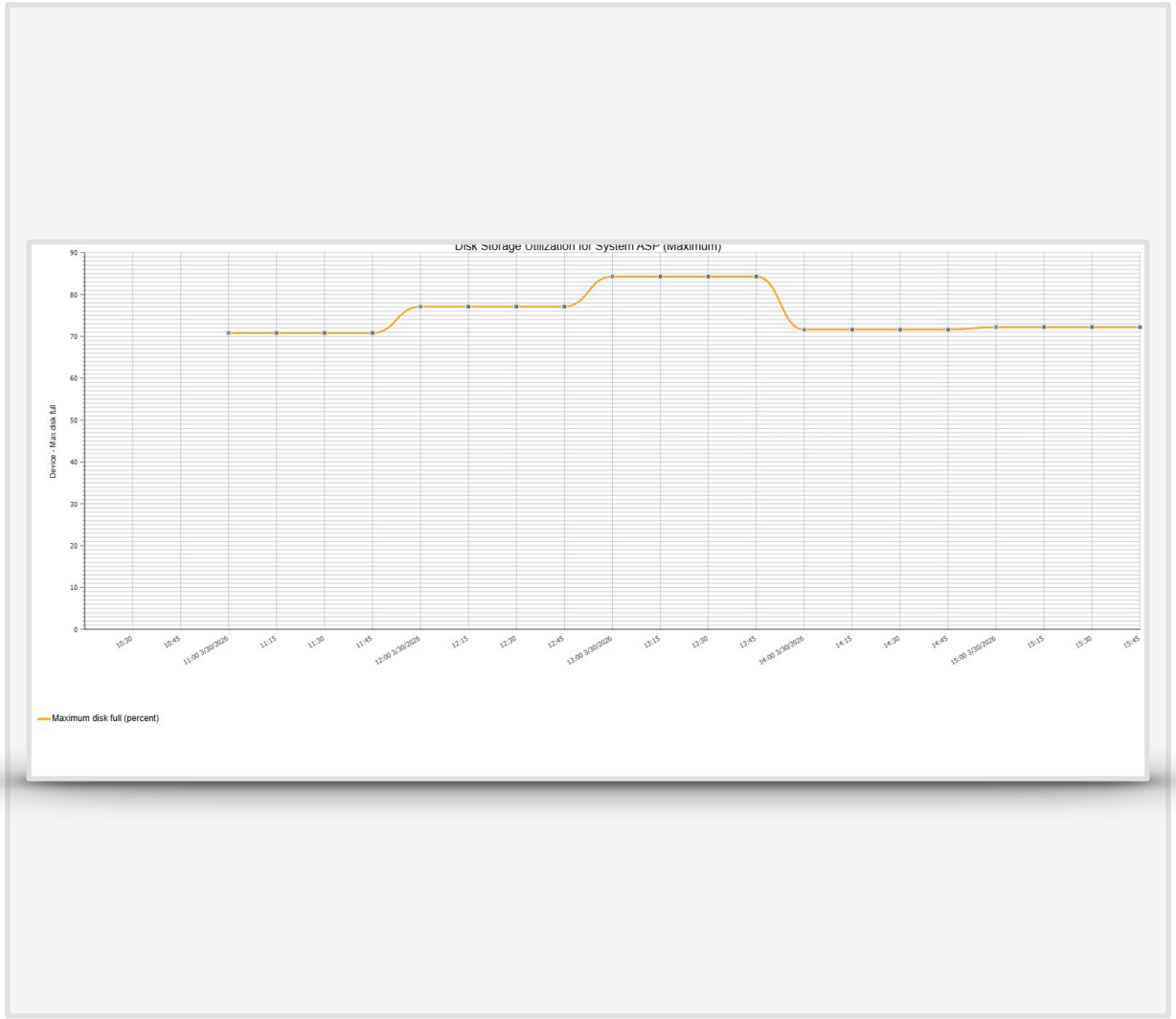
The Db2 for i SQL Query Engine (SQE) provides a Query Supervisor which enables real-time monitoring of resource consumption by SQL and native queries.

✓ **Documentation**

Query Supervisor

✓ **For complete details**

Query Supervisor
ADD_QUERY_THRESHOLD procedure
REMOVE_QUERY_THRESHOLD procedure
QUERY_SUPERVISOR view
Query Supervisor Exit Program
(updated to include CL, to join RPG and C, versions of sample exit programs)




Potential Situation

# This could happen to you or not?

- **Disk space usage 90 %**

  After investigation afterwards!!!

  - An ad hoc SQL query was initiated (in this case from an Excel sheet)
  - The user did “cancel” the query
  - In the background the query continued
  - An automated trigger process “killed” all ODBC tasks QZDASOINIT

- **A rough remedy**

  Nothing in place to detect the real cause.

- **Tailor-made solution**

  The Query Supervisor is part of this solution.

The agenda

# Three Parts

## The Theory 01

What is the Query Supervisor

- The thresholds
- The triggers

## The Explanation 02

How does the Query Supervisor work

- Components
- How to activate?
- How to review?
- How to check?

## The Building 03

How to build and implement the Query Supervisor

- Schemas
- Tables
- Procedures
- Programs
- Bring it all together
- Testing

# The Theory

### The Threshold

When running SQL statements they:

- Have an I/O count
- Use CPU time.
- Run for an amount of time
- Use temporary storage

How to determine the thresholds?

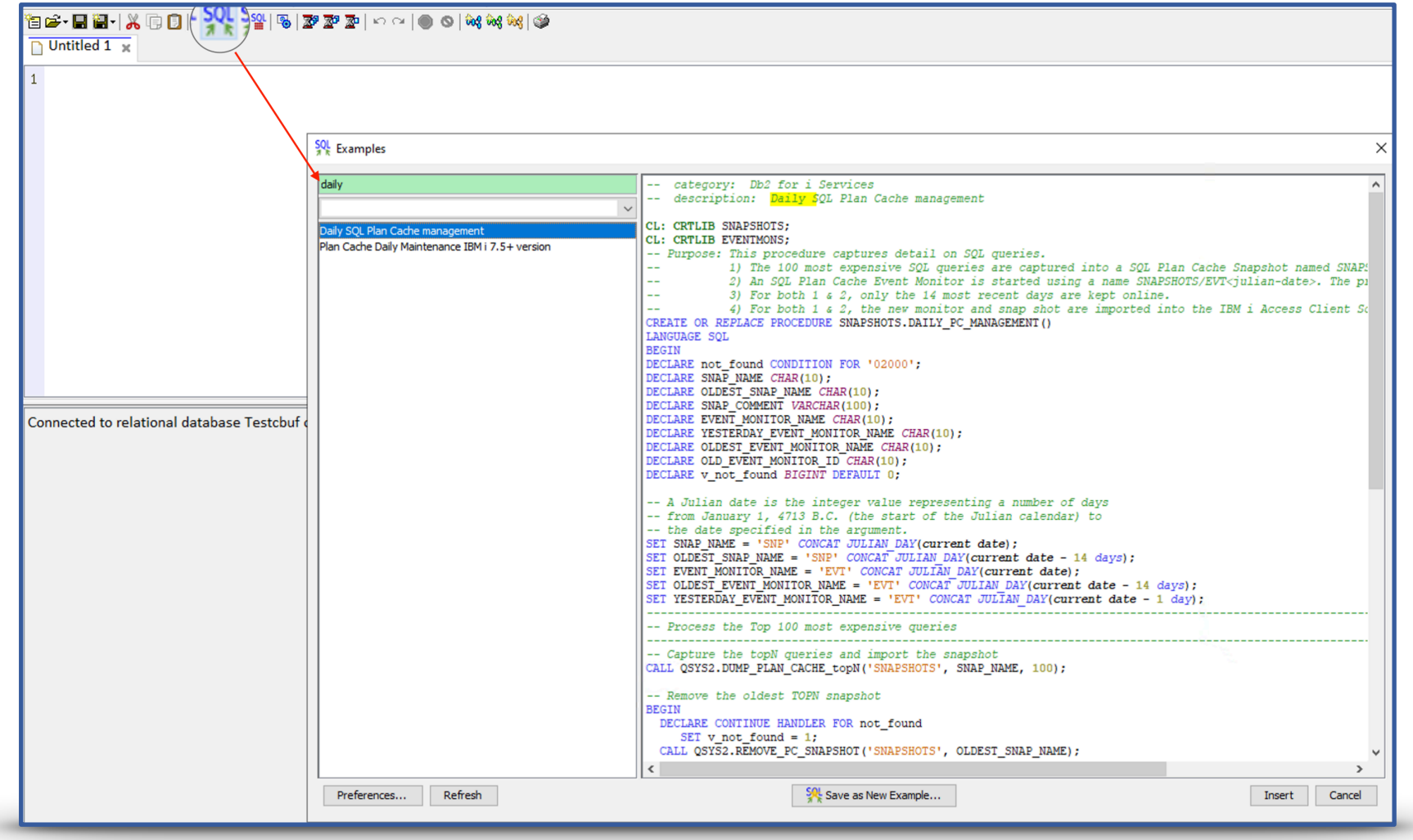
What is “too much”?

The answer as always is “it depends”.

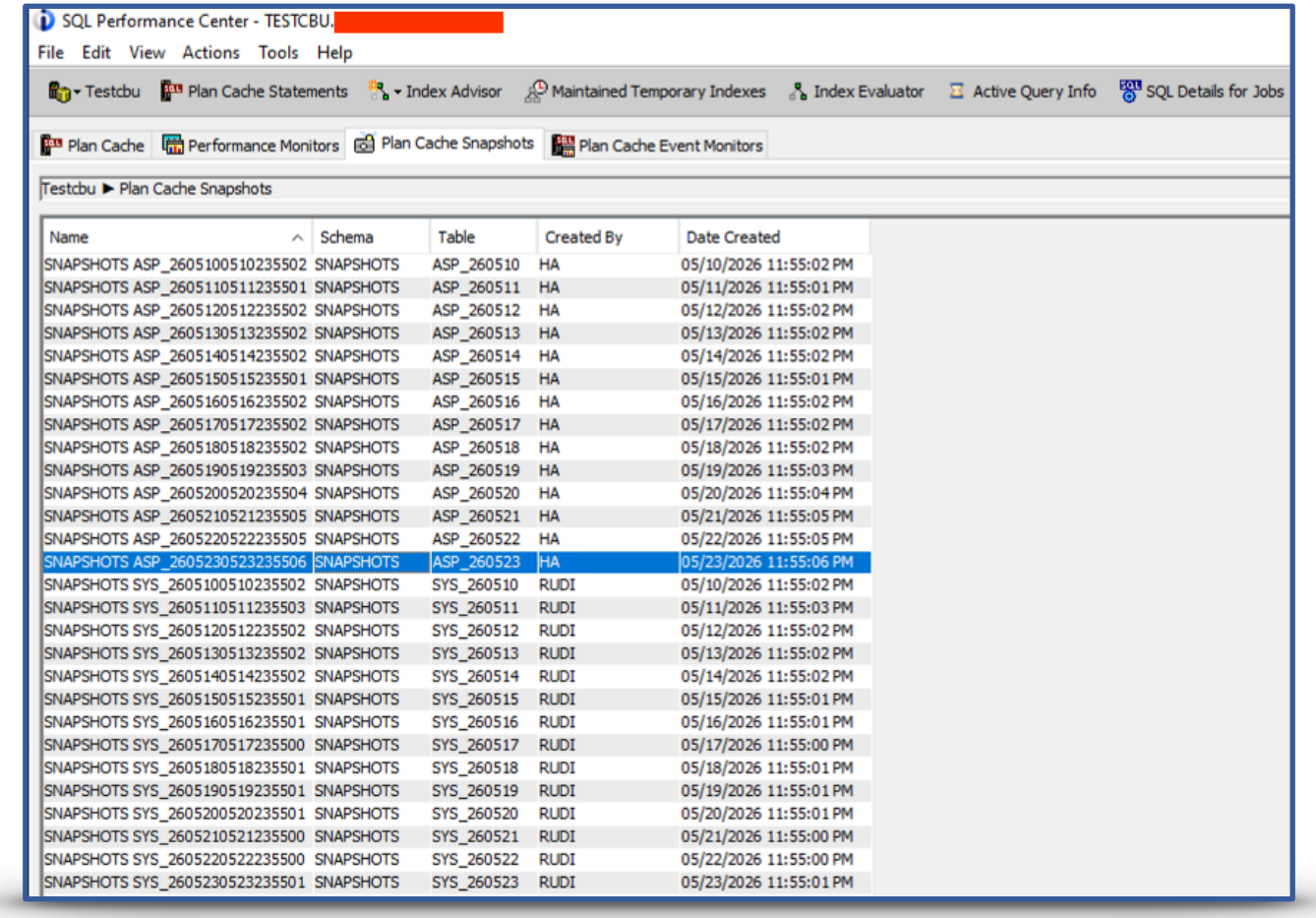
What can we do to get insight?

Daily Plan cache Management.

# Daily Plan Cache Management

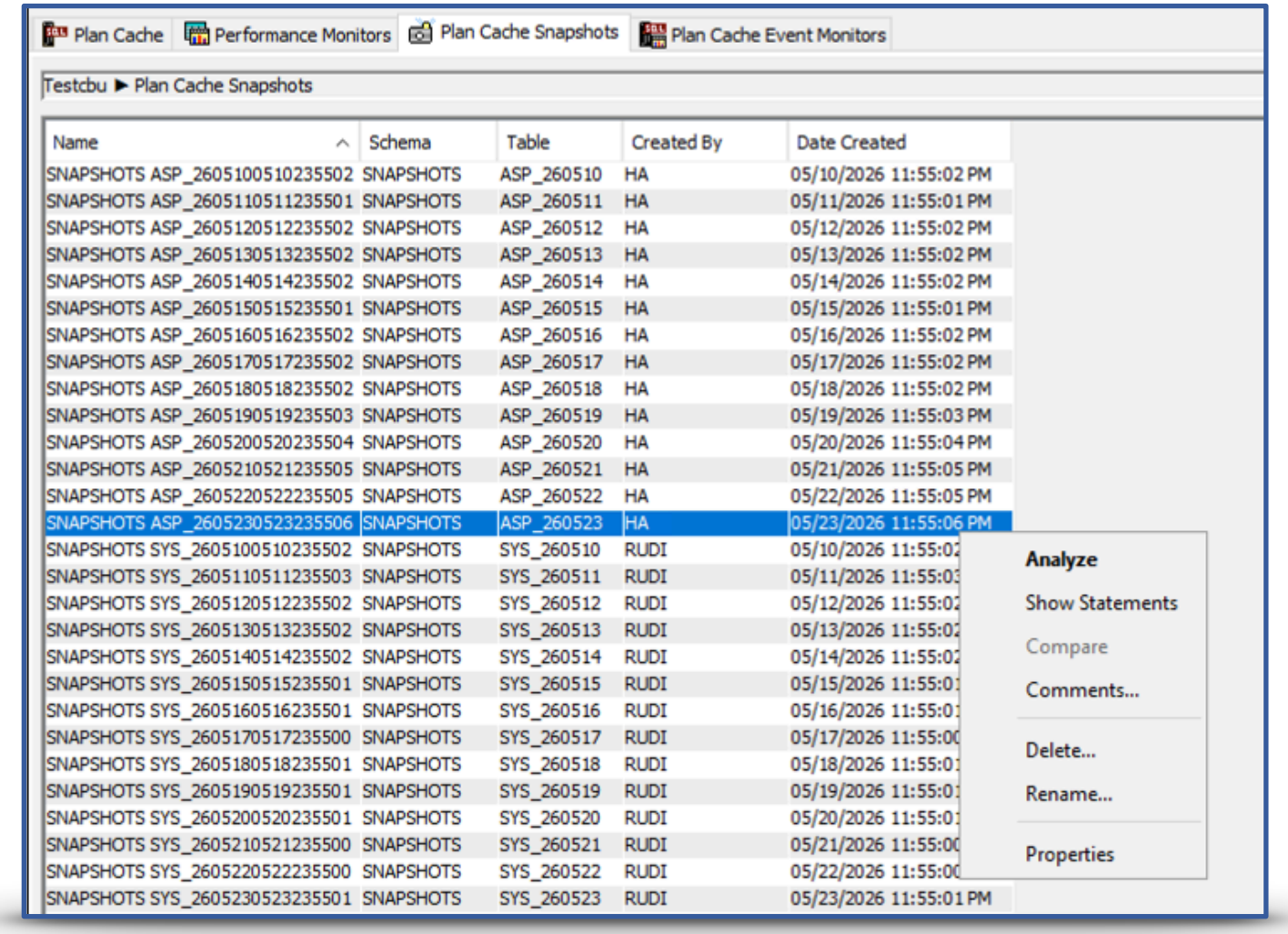


# Daily Plan Cache Management




| Name | Schema | Table | Created By | Date Created |
|---|---|---|---|---|
| SNAPSHOTS ASP_2605100510235502 | SNAPSHOTS | ASP_260510 | HA | 05/10/2026 11:55:02 PM |
| SNAPSHOTS ASP_2605110511235501 | SNAPSHOTS | ASP_260511 | HA | 05/11/2026 11:55:01 PM |
| SNAPSHOTS ASP_2605120512235502 | SNAPSHOTS | ASP_260512 | HA | 05/12/2026 11:55:02 PM |
| SNAPSHOTS ASP_2605130513235502 | SNAPSHOTS | ASP_260513 | HA | 05/13/2026 11:55:02 PM |
| SNAPSHOTS ASP_2605140514235502 | SNAPSHOTS | ASP_260514 | HA | 05/14/2026 11:55:02 PM |
| SNAPSHOTS ASP_2605150515235501 | SNAPSHOTS | ASP_260515 | HA | 05/15/2026 11:55:01 PM |
| SNAPSHOTS ASP_2605160516235502 | SNAPSHOTS | ASP_260516 | HA | 05/16/2026 11:55:02 PM |
| SNAPSHOTS ASP_2605170517235502 | SNAPSHOTS | ASP_260517 | HA | 05/17/2026 11:55:02 PM |
| SNAPSHOTS ASP_2605180518235502 | SNAPSHOTS | ASP_260518 | HA | 05/18/2026 11:55:02 PM |
| SNAPSHOTS ASP_2605190519235503 | SNAPSHOTS | ASP_260519 | HA | 05/19/2026 11:55:03 PM |
| SNAPSHOTS ASP_2605200520235504 | SNAPSHOTS | ASP_260520 | HA | 05/20/2026 11:55:04 PM |
| SNAPSHOTS ASP_2605210521235505 | SNAPSHOTS | ASP_260521 | HA | 05/21/2026 11:55:05 PM |
| SNAPSHOTS ASP_2605220522235505 | SNAPSHOTS | ASP_260522 | HA | 05/22/2026 11:55:05 PM |
| SNAPSHOTS ASP_2605230523235506 | SNAPSHOTS | ASP_260523 | HA | 05/23/2026 11:55:06 PM |
| SNAPSHOTS SYS_2605100510235502 | SNAPSHOTS | SYS_260510 | RUDI | 05/10/2026 11:55:02 PM |
| SNAPSHOTS SYS_2605110511235503 | SNAPSHOTS | SYS_260511 | RUDI | 05/11/2026 11:55:03 PM |
| SNAPSHOTS SYS_2605120512235502 | SNAPSHOTS | SYS_260512 | RUDI | 05/12/2026 11:55:02 PM |
| SNAPSHOTS SYS_2605130513235502 | SNAPSHOTS | SYS_260513 | RUDI | 05/13/2026 11:55:02 PM |
| SNAPSHOTS SYS_2605140514235502 | SNAPSHOTS | SYS_260514 | RUDI | 05/14/2026 11:55:02 PM |
| SNAPSHOTS SYS_2605150515235501 | SNAPSHOTS | SYS_260515 | RUDI | 05/15/2026 11:55:01 PM |
| SNAPSHOTS SYS_2605160516235501 | SNAPSHOTS | SYS_260516 | RUDI | 05/16/2026 11:55:01 PM |
| SNAPSHOTS SYS_2605170517235500 | SNAPSHOTS | SYS_260517 | RUDI | 05/17/2026 11:55:00 PM |
| SNAPSHOTS SYS_2605180518235501 | SNAPSHOTS | SYS_260518 | RUDI | 05/18/2026 11:55:01 PM |
| SNAPSHOTS SYS_2605190519235501 | SNAPSHOTS | SYS_260519 | RUDI | 05/19/2026 11:55:01 PM |
| SNAPSHOTS SYS_2605200520235501 | SNAPSHOTS | SYS_260520 | RUDI | 05/20/2026 11:55:01 PM |
| SNAPSHOTS SYS_2605210521235500 | SNAPSHOTS | SYS_260521 | RUDI | 05/21/2026 11:55:00 PM |
| SNAPSHOTS SYS_2605220522235500 | SNAPSHOTS | SYS_260522 | RUDI | 05/22/2026 11:55:00 PM |
| SNAPSHOTS SYS_2605230523235501 | SNAPSHOTS | SYS_260523 | RUDI | 05/23/2026 11:55:01 PM |

# Daily Plan Cache Management



# Query Supervisor limitations & scope

The Query Supervisor enables monitoring and management of queries that reach pre-determined thresholds of resource consumption. Unlike the Predictive Query Governor, which intervenes on the basis of *estimated* resource usage *before* a query runs, the Query Supervisor reacts to *actual* resource usage *while* the query runs.

The Query Supervisor monitors any SQL queries that are run to implement user SQL statements, including native database queries that are processed by SQE. SQL statements that do not require query processing such as a simple INSERT (for example, INSERT INTO <table> VALUES(123) ) or COMMIT are not monitored by the Query Supervisor. Query supervision does not occur for queries initiated by the IBM® i operating system or for SQL that has been classified as specific to operating system processing.

The Query Supervisor allows a Database Engineer (DBE) to:

- Deploy real-time notification solutions when a query exceeds a specific resource threshold
- Take actions to terminate queries based on real-time query consumption of system resources
- Capture and log performance details for long-running queries

By configuring the Query Supervisor, a DBE can proactively manage excessive resource usage, monitor for unexpected workload variation, and automatically end run-away queries. The Query Supervisor provides the infrastructure for establishing and detecting thresholds. The specific action(s) taken when a threshold is reached is determined by one or more exit programs that the DBE provides.

# The Theory

### The Triggers

Action to be taken when a threshold is exceeded?

- Ability to investigate the SQL statement
- End or Hold the SQL Statement
- Get notified
- Automate the action

Maximum of flexibility:

- Using custom build software
- You determine, but IBM offers example software

# The Explanation

**Components**

Thresholds

- Define Threshold
- Maintain the Thresholds
- Active the Thresholds
- Remove the Threshold

## Query Supervisor configuration and operation

Query Supervisor thresholds are configured using the add and remove procedures:
ADD_QUERY_THRESHOLD procedure
REMOVE_QUERY_THRESHOLD procedure.
The QUERY_SUPERVISOR view shows the defined thresholds.

The four threshold types which can be monitored by the Query Supervisor are:

1. **CPU Time** – The total processing unit time used by the query, in seconds
2. **Elapsed Time** – The total clock time, in seconds
3. **Temporary storage** – The amount of storage, in megabytes (MB), that the query allocates
4. **Total I/O count** – The total number of I/O operations

# The Explanation

**Components**

Exit Point Programs

- Query Supervisor Exit Program
- Add Query Supervisor Exit Program
- Remove Query Supervisor Exit Program
- Review Query Supervisor Exit Program

## Query Supervisor Exit Program

The Query Supervisor exit program is called when a job is running a query and a resource threshold defined by the Query Supervisor is met or exceeded.
This exit is called in the thread that is running the query.

The resource thresholds monitored by the Query Supervisor may be configured by using the ADD_QUERY_THRESHOLD procedure and the REMOVE_QUERY_THRESHOLD procedure.

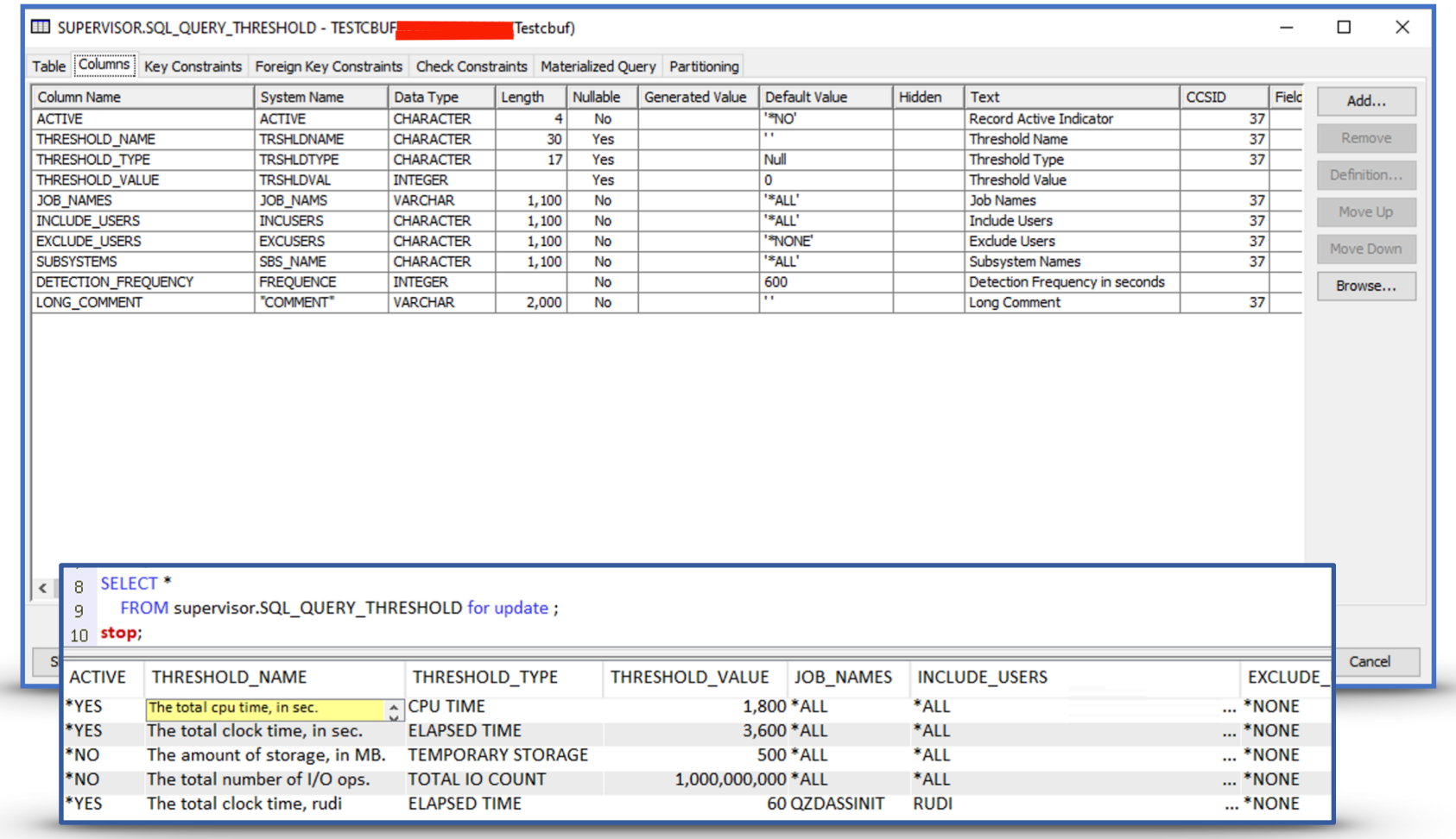
```
SELECT *
   FROM qsys2.EXIT_PROGRAM_INFO
   WHERE exit_point_name LIKE 'QIBM_QQQ_QRY_SUPER';
```

# The Building

## Schemas

Why a SQL Query Threshold table?

- Flexibility
- Transparency
- Security
- Traceability



# SQL_QUERY_THRESHOLD Table

Field definition based on ADD_QUERY_THRESHOLD procedure

***threshold-name***

A character or graphic string that provides a name for the threshold. The name can be up to 30 characters long and can contain any characters including blanks. The name cannot be the same as an existing threshold name.

***threshold-type***

A character or graphic string that specifies the type of the threshold to be enforced.

**CPU TIME**

The total processing unit time used by the query, in seconds.

**ELAPSED TIME**

The total clock time, in seconds.

**TEMPORARY STORAGE**

The amount of storage, in megabytes (MB), that the query allocates.

**TOTAL IO COUNT**

The total number of I/O operations.

***threshold-value***

A big integer value that contains the threshold value, in units defined by the specified *threshold-type*. The value must be greater than 0.

***job-names***

A character or graphic string that specifies up to 100 job names separated by either a blank or a comma. Each job name can end with a wildcard character. For example, 'QPADEV*' indicates that any job name starting with the characters 'QPADEV' is a match.

Only jobs running with a matching job name are eligible to be supervised. Can contain the following special value:

***ALL**

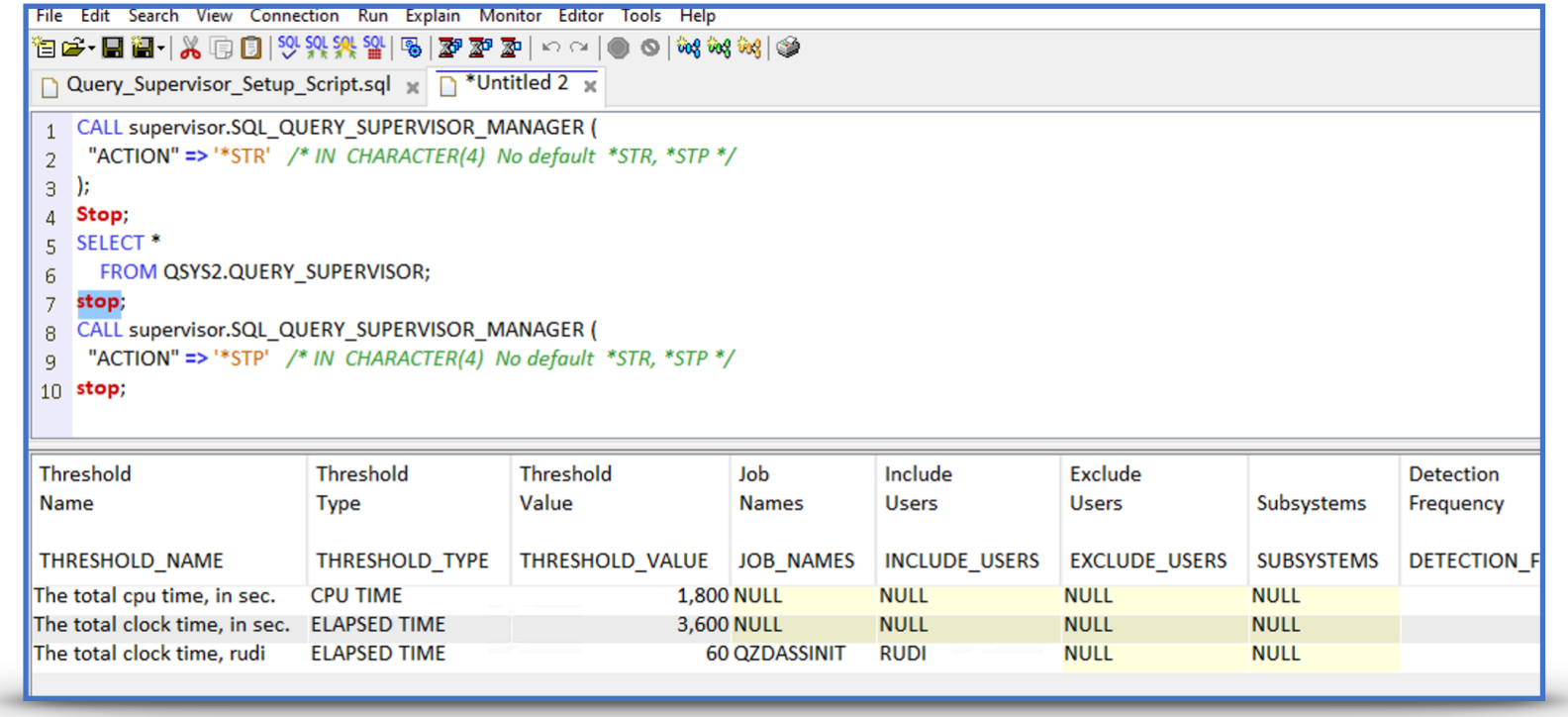
All jobs are supervised. This is the default.

# The Building

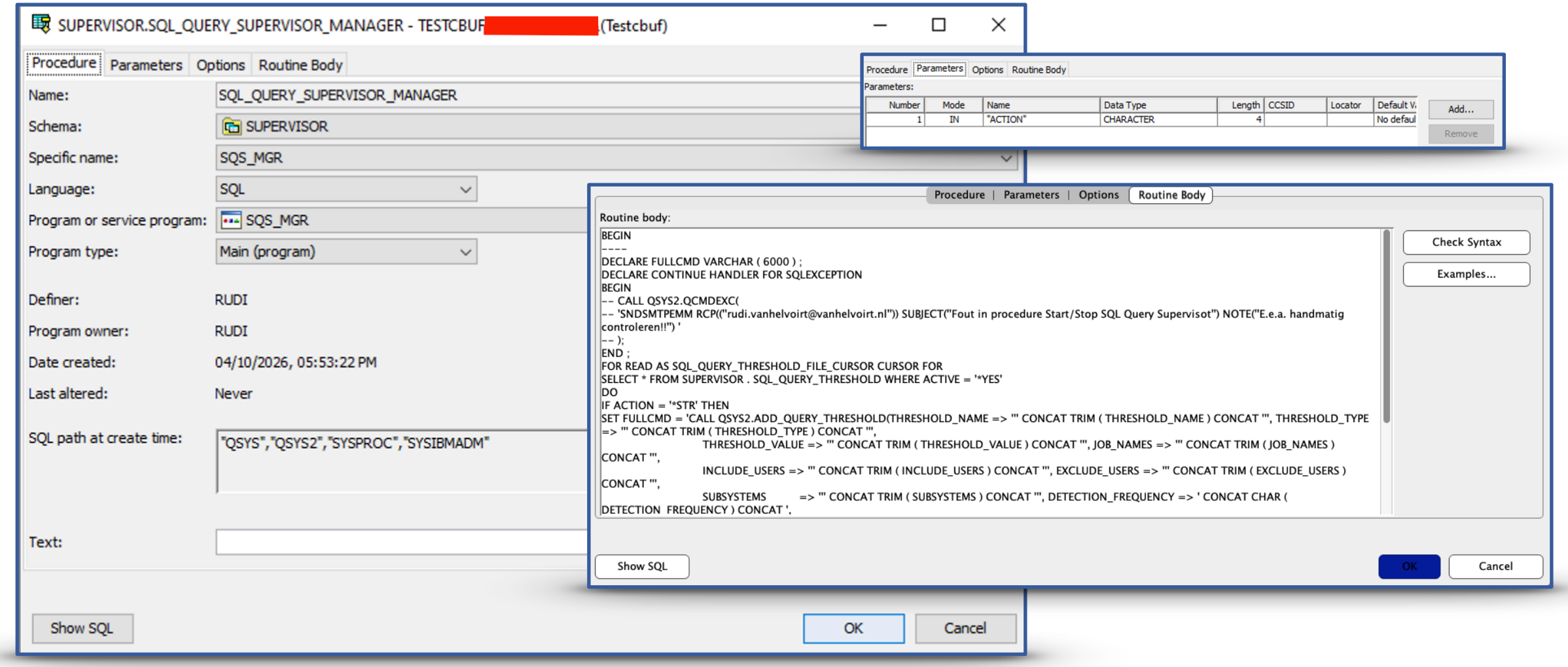
## Schemas

A SQL Procedure using the Query Threshold table

- Flexibility
- Transparency
- Security
- Traceability



# SQL_QUERY_SUPERVISOR_MANAGER Procedure



# The Building

## Exit Programs

Do not reinvent the wheel

- Get started
- Start learning
- Build confidence
- Use the Query Supervisor example exit programs

## Query Supervisor example exit programs

Last Updated: 2025-10-07

The exit programs in this section demonstrate some of the ways an exit program can be used when a Query Supervisor threshold is reached. They are provided to enable quick and easy adoption of Query Supervisor.

The details of the exit program interface can be found here: Query Supervisor Exit Program

- **Exit program to send message to QSYSOPR**
  This Query Supervisor exit program sends an informational message to the QSYSOPR message queue.
- **Exit program to end query**
  This Query Supervisor exit program shows how to request that the query that was running when the threshold was reached is to be stopped.
- **Exit program to dump plan cache information for query**
  This Query Supervisor exit program dumps plan cache information about the query that reached a threshold.
- **Exit program to log information using a data queue**
  This Query Supervisor exit program shows how to use an asynchronous job to log information about the query that reported a threshold.

# Exit program to send message to QSYSOPR

SQS_SNDMSG.CLLE

SUPERVISOR > QCLLESRC > SQS_SNDMSG.CLLE

```
57  /*****************************************************************/
58  /**********                  Execute                    **********/
59  /*****************************************************************/
60
61   /* INIT RETURN CODE TO CONTINUE RUNNING QUERY */
62
63              CHGVAR     VAR(&RC) VALUE(0)
64
65   /* GET VALUES FROM THE INPUT FORMAT */
66              CHGVAR     VAR(&JOBNAME) VALUE(%SST(&QRYS0100 13 10))
67              CHGVAR     VAR(&JOBUSER) VALUE(%SST(&QRYS0100 23 10))
68              CHGVAR     VAR(&JOBNBR)  VALUE(%SST(&QRYS0100 33  6))
69              CHGVAR     VAR(&THRESHTYPE) VALUE(%SST(&QRYS0100 135 30))
70              CHGVAR     VAR(&BINHIGH) VALUE(%BINARY(&QRYS0100 165 4))
71              CHGVAR     VAR(&BINLOW)  VALUE(%BINARY(&QRYS0100 169 4))
72              CHGVAR     VAR(&THRESHVAL) VALUE(%DEC(&BINHIGH 15 0) * +
73                           &MAXINT + %DEC(&BINLOW 15 0))
74
75    /* GENERATE MESSAGE TEXT STRING  */
76              CHGVAR     VAR(&MSGTXT) VALUE('QUERY SUPERVISOR +
77                           THRESHOLD TYPE ' *BCAT &THRESHTYPE *TCAT  +
78                           ', THRESHOLD VALUE ' *BCAT                +
79                           %CHAR(&THRESHVAL) *BCAT 'REACHED IN JOB ' +
80                           *BCAT &JOBNBR *TCAT '/' *TCAT &JOBUSER    +
81                           *TCAT '/' *TCAT &JOBNAME  )
82              CHGVAR     VAR(&MSGLEN) VALUE(%LEN(&MSGTXT))
83              CHGVAR     VAR(%BINARY(&MSGDTA 1 2)) VALUE(&MSGLEN)
84              CHGVAR     VAR(&MSGDTA) VALUE(&MSGDTA *TCAT &MSGTXT)
85              SNDPGMMSG  MSGID(SQL7064) MSGF(QSQLMSG) MSGDTA(&MSGDTA) +
86                           TOMSGQ(*SYSOPR)
87
88  /*****************************************************************/
89  /**********            Normal end of program            **********/
90  /*****************************************************************/
```

# Exit program to end query

SQS_ENDQRY.SQLRPGLE

SUPERVISOR > QRPGLESRC > SQS_ENDQRY.SQLRPGLE > SQS_endqry

```
55
56  dcl-proc SQS_endqry; // Main procedure
57    dcl-pi *n;
58      input likeds(QQQ_QRYSV_QRYS0100_t);
59      rc int(10);
60    end-pi;
61
62  //*************************************************************************
63  // Init the return code to continue running the query
64  //*************************************************************************
65    rc = 0;
66
67  //* Check Threshold type against SQL Query Supervisor Thresholds Table  */
68
69    EXEC SQL
70        SELECT THRESHOLD_VALUE into :sqs_threshold_value FROM SUPERVISOR.SQS_TRSHLD
71        WHERE THRESHOLD_NAME = :input.Threshold_Name and ACTIVE = '*YES';
72
73    If SQLSTATE = '00000';
74      //note 00000 = no errors or warning
75      if input.Threshold_Consumption_Value >= sqs_threshold_value;
76        rc = 1; //* Terminate the query */
77      //     02000 = no data
78      // <do somthing?>
79    endif;
80    endif;
81     return;
82  end-proc;
```

# Exit program to dump plan cache information for query

SQS_DMPQRY.CLLE

SUPERVISOR > QCLLESRC > SQS_DMPQRY.CLLE

```
52  /*****************************************************************/
54  /* INIT RETURN CODE TO CONTINUE RUNNING QUERY */
55
56      CHGVAR     VAR(&RC) VALUE(0)
57
58  /* GET VALUES FROM THE INPUT FORMAT */
59
60      CHGVAR     VAR(&BINHIGHU) VALUE(%BINARY(&QRYS0100 67 4))
61      CHGVAR     VAR(&BINLOW) VALUE(%BINARY(&QRYS0100 71 4))
62      CHGVAR     VAR(&PLANID) VALUE(%DEC(&BINHIGHU 15 0)  * +
63                   &MAXINT + %DEC(&BINLOW 15 0))
64
65  /* SUBMIT JOB TO DUMP THE PLAN CACHE FOR THIS QUERY */
66      SBMJOB     CMD(RUNSQL SQL('CALL QSYS2.DUMP_PLAN_CACHE(' +
67                   *BCAT 'FILESCHEMA => ''SUPERVISOR'', +
68                   FILENAME => ''PLANDUMPS'', +
69                   PLAN_IDENTIFIER=> ''' *TCAT +
70                   %CHAR(&PLANID) *TCAT ''')')) +
71                   JOBQ(QUSRNOMAX)
72
73  /*****************************************************************/
74  /**********            Normal end of program            **********/
75  /*****************************************************************/
```

# SQL procedure used to log information using a data queue

```
DECLARE V_QUERY_IDENTIFIER VARCHAR ( 8 ) CCSID 1208 ;
DECLARE V_QUERY_PLAN_IDENTIFIER DECIMAL ( 20 , 0 ) ;
DECLARE CONTINUE HANDLER FOR SQLEXCEPTION
BEGIN
GET DIAGNOSTICS CONDITION 1
LOCAL_SQLCODE = DB2_RETURNED_SQLCODE , LOCAL_SQLSTATE = RETURNED_SQLSTATE ,
V_MESSAGE_TEXT = MESSAGE_TEXT ;
CALL SYSTOOLS . LPRINTF ( 'process_SQS_data_queue() - failed with SQLCODE:' CONCAT
ERROR_SQLCODE CONCAT ' SQLSTATE:' CONCAT ERROR_SQLSTATE CONCAT ' and MESSAGE:'
CONCAT V_MESSAGE_TEXT ) ;
END ; /* end of continue handler */
WHILE ( 1 = 1 ) DO
SELECT MESSAGE_DATA_BINARY
INTO V_MESSAGE_DATA_BINARY
FROM
TABLE (
QSYS2 . RECEIVE_DATA_QUEUE (
DATA_QUEUE => 'SQS_DQ' , DATA_QUEUE_LIBRARY => 'SUPERVISOR' ,
WAIT_TIME => - 1 )  -- any negative means to wait forever for the next message
) ;

-- Convert the UTF16 data to UTF8
SET V_MESSAGE_DATA_BINARY_LENGTH = LENGTH ( V_MESSAGE_DATA_BINARY ) / 2 ;
SET V_MESSAGE_DATA_UTF8 = (
SELECT
INTERPRET (
VARBINARY_FORMAT ( HEX ( V_MESSAGE_DATA_BINARY_LENGTH ) ) CONCAT V_MESSAGE_DATA_BINARY
AS DBCLOB ( 63 K ) CCSID 1200 )
FROM SYSIBM . SYSDUMMY1 ) ;
```

# SQL procedure used to log information using a data queue

```
CREATE TABLE SUPERVISOR.SUPERVISOR_LOG FOR SYSTEM NAME SUPERLOG (
        THRESHOLD_TIMESTAMP FOR COLUMN WHENHIT    TIMESTAMP DEFAULT NULL ,
        JOB_NAME VARCHAR(10) CCSID 37 DEFAULT NULL ,
        JOB_USER VARCHAR(10) CCSID 37 DEFAULT NULL ,
        JOB_NUMBER FOR COLUMN JOBNUM     VARCHAR(6) CCSID 37 DEFAULT NULL ,
        SUBSYSTEM VARCHAR(10) CCSID 37 DEFAULT NULL ,
        USER_NAME VARCHAR(10) CCSID 37 DEFAULT NULL ,
        THRESHOLD_NAME FOR COLUMN THRESHNAME VARCHAR(30) CCSID 1208 DEFAULT NULL ,
        THRESHOLD_TYPE FOR COLUMN THRESHTYPE VARCHAR(30) CCSID 1208 DEFAULT NULL ,
        THRESHOLD_CONSUMPTION_VALUE FOR COLUMN THRESHVAL  BIGINT DEFAULT NULL ,
        OPERATION_TYPE FOR COLUMN OP        SMALLINT DEFAULT NULL ,
        SQL_STATEMENT_TEXT FOR COLUMN STMTTEXT   VARCHAR(10000) CCSID 1208 DEFAULT NULL ,
        HOST_VARIABLE_LIST FOR COLUMN HVLIST     VARCHAR(10000) CCSID 1208 DEFAULT NULL ,
        CLIENT_ACCTNG FOR COLUMN "ACCTNG" VARCHAR(255) CCSID 1208 DEFAULT NULL ,
        CLIENT_APPLNAME FOR COLUMN "APPLNAME" VARCHAR(255) CCSID 1208 DEFAULT NULL ,
        CLIENT_PROGRAMID FOR COLUMN "PROGRAMID" VARCHAR(255) CCSID 1208 DEFAULT NULL ,
        CLIENT_USERID FOR COLUMN "USERID" VARCHAR(255) CCSID 1208 DEFAULT NULL ,
        CLIENT_WRKSTNNAME FOR COLUMN "WRKSTNNAME" VARCHAR(255) CCSID 1208 DEFAULT NULL ,
        QUERY_IDENTIFIER FOR COLUMN QRO_HASH   VARCHAR(8) CCSID 1208 DEFAULT NULL ,
        QUERY_PLAN_IDENTIFIER FOR COLUMN PLAN_ID    DECIMAL(20, 0) DEFAULT NULL )

        RCDFMT SUPERLOG   ;

LABEL ON TABLE SUPERVISOR.SUPERVISOR_LOG
        IS 'SQL Query Supervisor Log Table' ;

GRANT ALTER , DELETE , INDEX , INSERT , REFERENCES , SELECT , UPDATE
ON SUPERVISOR.SUPERVISOR_LOG TO RUDI WITH GRANT OPTION ;
```

```
-- Run once only
CL:CRTDTAQ DTAQ(SUPERVISOR/SQS_DQ) MAXLEN(45000) FORCE(*YES) SIZE(*MAX2GB 1000)
   AUTORCL(*YES) TEXT('SQL Query Supervisor Threshold Processor');
```

```
-- Make sure this job is submitted after every IPL
CL:SBMJOB CMD(RUNSQL SQL('call supervisor.process_SQS_data_queue()') COMMIT(*NONE)) JOB(SQS_MGR)
JOBQ(QUSRNOMAX) INLASPGRP(*NONE) LOG(4 00 *SECLVL) JOBMSGQFL(*PRTWRAP) CCSID(37);
stop;
```

# Bring it all together

```
SELECT *
   FROM QSYS2.QUERY_SUPERVISOR;
Stop;
SELECT *
   FROM supervisor.SQL_QUERY_THRESHOLD for update ;
stop;
```

```
CALL
supervisor.SQL_QUERY_SUPERVISOR_MANAGER (
  "ACTION" => '*STR');
```

# Bring it all together

```
-- Review Query Supervisor Exit Point Program
SELECT *
   FROM qsys2.EXIT_PROGRAM_INFO
   WHERE exit_point_name LIKE 'QIBM_QQQ_QRY_SUPER';
stop;
-- Unregister Exit Point Programs
CL:RMVEXITPGM EXITPNT(QIBM_QQQ_QRY_SUPER) FORMAT(QRYS0100) PGMNBR(*ALL);
stop;
```

# Bring it all together

```
-- Register Exit Point Programs
CL:ADDEXITPGM EXITPNT(QIBM_QQQ_QRY_SUPER) FORMAT(QRYS0100)
                PGMNBR(*LOW) PGM(supervisor/SQS_SNDDTQ) THDSAFE(*YES)
                TEXT('Query Supervisor send data to *DTAQ');

-- Activation Command => SQL Query Supervisor - Send Message to QSYSOPR
CL:ADDEXITPGM EXITPNT(QIBM_QQQ_QRY_SUPER) FORMAT(QRYS0100)
                PGMNBR(*LOW) PGM(supervisor/SQS_SNDMSG) THDSAFE(*YES)
                TEXT('Query Supervisor send message to QSYSOPR');

-- Activation Command => SQL Query Supervisor - Dump Query
CL:ADDEXITPGM EXITPNT(QIBM_QQQ_QRY_SUPER) FORMAT(QRYS0100)
                PGMNBR(*LOW) PGM(supervisor/SQS_DMPQRY) THDSAFE(*YES)
                TEXT('Query supervisor dump plan cache');

-- Activation Command => SQL Query Supervisor - End Query
CL:ADDEXITPGM EXITPNT(QIBM_QQQ_QRY_SUPER) FORMAT(QRYS0100)
                PGMNBR(*LOW) PGM(supervisor/SQS_ENDQRY) THDSAFE(*YES)
                TEXT('Query Supervisor End Query');
stop;
```

# Bring it all together

```
-- testing SQL statement
SELECT qsys2.qcmdexc('DLYJOB 5'),
       HIST.*
    FROM TABLE (
           QSYS2.HISTORY_LOG_INFO(START_TIME => CURRENT TIMESTAMP - 1 HOUR)
        ) HIST
    FETCH FIRST 150 ROWS ONLY;
```

# Q & A

# Thank you