

# z/TPFDF Recoup and CRUISE Statistics Enhancements

Database/TPFDF Subcommittee

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**IBM Z**



# Executive summary



Yumi  
**Chief Technology  
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A z/TPFDF utility update that provides accurate database statistics, even as individual files grow beyond 4 billion physical records and 1 trillion logical records (LRECs).

# Problem Statement

- Most z/TPFDF recoup and CRUISE statistic counters have a maximum value of 4 billion
- Utility messages and statistic displays indicate that a counter has reached the maximum value by showing “GT 4B”
- It is difficult to get accurate counts of various database attributes that exceed the limit of that counter
- As databases grow, such situations occur more frequently

# Pain Points

- While monitoring database growth over time, it is difficult to estimate large database needs, such as more pool records, when statistics counters cannot display values over 4 billion.
- It is difficult to confirm that a large database migration has completed if statistics counters cannot display values over 4 billion.

# As-Is User Story

Calvin is monitoring the growth rates for z/TPFDF databases. He needs to ensure the system has enough pool records for those growing databases.



Calvin  
Capacity Planner

Andres is planning a database migration to expand a large z/TPFDF database. He wants to use z/TPFDF CRUISE statistics to verify a successful migration.



Andres  
Database Administrator

Several statistics show “GT 4B” instead of an exact value, so they do not know exact database sizes and growth rates, or if a migration was successful. They could run CRUISE against subsets of the database and manually add the values, but this approach is awkward and error prone.

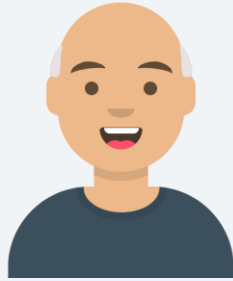
# Value Statement

You can use recoup and CRUISE to view accurate statistics for z/TPFDF files that **contain over 4 billion physical records or over 1 trillion logical records (LRECs).**

- APAR [PJ48035](#)
- Delivered December, 2024

# To-Be User Story

Calvin is monitoring the growth rates for z/TPFDF databases. He needs to ensure the system has enough resources for those growing databases.



Calvin  
Capacity Planner

Andres is planning a database migration to expand a large z/TPFDF database. He wants to use z/TPFDF CRUISE statistics to verify a successful migration.



Andres  
Database Administrator

They know that recoup and CRUISE were recently upgraded so they can report statistics for files with as many as 10 trillion physical records.

They are happy they can easily use either the z/TPFDF recoup or CRUISE utilities to gather the statistics that they need.

# Technical Details

- All z/TPFDF recoup and CRUISE statistic counters displayed with the ZRECP STA, ZRECP LOG, and ZFCRU DISPLAY commands are updated to accommodate larger values
  - 1 quadrillion LRECs per file are counted
  - Values as large as 10 trillion are displayed for all other counters
- Online messages from CRUISE processing are updated to accommodate values as large as 10 trillion as well

# As-Is: Recoup Statistics Display

User==> ZRECP STA BA11

```
RECP9017I          ZRECP STATISTICS DISPLAY          RUN ID 0032
RECOUP  24SEP24   15.09.15   -   ID-BA11   TOTAL COUNT   GT 4B
-----
```

```
BA11 00
BLOCKS P/ GT 4B F/ GT 4B E/0000000000 X/0000000000
CHAINS 1/ GT 4B 2/0000001986 3/0000078995 4/0000007953
        5/0000002926 6/0000002153 7/0000002014 8/0000001970
        9/0000002003 M/0000000000
        MAX/0000000009 A/00000000D0480009
USAGE F 0/0000000000 25/0948193530 50/ GT 4B 75/6396704402
        PCT/064 _
USAGE N 0/0000000848 25/0181519257 50/ GT 4B 75/1840940357
        PCT/066
ITEMS T/ GT 4B F/0000000079 B/0053 MAXL/0232
LLR L/0000000000 D/0000000000
FARF6 H8/ GT 4B F6/ GT 4B
ENCRYPT SE/0000000000 BE/0000000000 BD/0000000000
RSF R/0000000000
ROC O/0000000000
```

- Fields display “GT 4B” when the counters exceed a value of 4 billion.
- Other command entries (such as ZRECP LOG, ZRECP STA VAL and ZFCRU DISPLAY-STATISTIC) also could result in displays with a “GT 4B” indication

# To-Be: Recoup Statistics Display

User==> ZRECP STA BA11

RECP9017I                      ZRECP STATISTICS DISPLAY                      RUN ID 0032  
RECOUP      24SEP24   15.09.15   -   ID-BA11                      TOTAL COUNT 0073172948202

---

BA11 00  
BLOCKS P/0030000000000 F/0073172948202 E/0000000000000 X/0000000000000  
CHAINS 1/0013754600000 2/0014709001986 3/0000000078995 4/000000007953  
         5/0000000002926 6/0000000002153 7/0000000002014 8/000000001970  
         9/0000000002003 M/0000000000000  
         MAX/0000000000009 A/00000000D0480009  
USAGE F 0/0000000000000 25/0000948193530 50/0035828050270 75/0006396704402  
         PCT/064  
USAGE N 0/0000000000000 25/0000181519257 50/0027977540386 75/0001840940357  
         PCT/066  
ITEMS T/002369590154706 LF/0000000000079 B/0053 MAXL/0232  
LLR L/0000000000000 D/0000000000000  
FARF6 H8/0044709248202 F6/0014709248202  
ENCRYPT SE/0000000000000 BE/0000000000000 BD/0000000000000  
RSF R/0000000000000  
ROC O/0000000000000

END OF DISPLAY +

## Key:

- Larger values (as high as 10 trillion) are supported. Displays “GT 10TRILLION” if exceeded.
- Larger values (as high as 1 quadrillion). Displays “GT 1QUADRILLION” if exceeded.
- Added the standard end of display line

Right-align values

Renamed field to “LF”  
to eliminate ambiguity

# To-Be: ZRECP STA VAL and ZRECP LOG

User==> ZRECP STA VAL H8-H-1900

RECP9020I 17.11.40 THESE RECOUP STATISTICS MATCH  
NBR OF 8-BYTE HEADERS HIGHER THAN 1900

| ID               | FVN | H8   | ID   | FVN | H8   | ID   | FVN | H8            |
|------------------|-----|------|------|-----|------|------|-----|---------------|
| ----             | --- | ---- | ---- | --- | ---- | ---- | --- | ----          |
| B214             | 00  | 3770 | B231 | 00  | 2000 | B231 | 01  | 3175          |
| B32E             | 00  | 2591 | B431 | 00  | 2000 | BA11 | 00  | 0044709248202 |
| END OF DISPLAY + |     |      |      |     |      |      |     |               |

## Key:

- Larger values (as high as 10 trillion) are supported. Displays "GT 10TRILLION" if exceeded.
- Added the standard end of display line

User==> ZRECP LOG

CSMP0097I 15.51.13 CPU-A SS-BSS SSU-BSS IS-01 \_  
RECP9009I RECOUP PHASE 1 ACTIVITY LOG  
BSS 02.08.27 \*\* 24SEP24 DATE OF LAST RECOUP RUN  
BSS 02.08.27 \*\* 15.08 PHASE I STARTED  
BSS 16.20.50 BA11 00 F 0073172948202 T 43947 I/O 1665006  
BSS 16.33.21 B311 00 F 0000006141760 T 00000 I/O 0491760  
BSS 16.33.21 \*\* \*\* FIXED ERRORS-CHECK RO-OUTPUT  
BSS 16.33.22 FDEC 00 F 0000000009972 T 00001 I/O 0009973 E 0000000000002  
BSS 16.34.23 B221 00 F 0000005220913 T 00061 I/O 0085228  
...  
BSS 16.43.59 \*\* 0000000000002 TPFDF RECOUP ERRORS DETECTED  
BSS 16.43.59 \*\* 0073860430015 TPFDF RECOUP BLOCKS PROCESSED  
BSS 16.43.59 \*\* 0000000000002 FIXED ERRORS  
END OF DISPLAY+

# To-Be: CRUISE Statistics Display

User==> ZFCRU DIS-STA-BA11

```
CSMP0097I 14.55.04 CPU-B SS-BSS SSU-HPN IS-01
FCRU0186I 14.55.04 CRUISE STATISTICS DISPLAY
CRUISE      14:54:44 09/26/24 - ID-BA11 00          TOTAL COUNT 0073172948202
-----
```

```
BA11 00
BLOCKS P/0030000000000 F/0073172948202 E/0000000000000
CHAINS 1/0013754600000 2/0014709001986 3/0000000078995 4/000000007953
        5/000000002926 6/000000002153 7/000000002014 8/000000001970
        9/000000002003 M/0000000000000
        MAX/000000000009 A/00000000D0480009
USAGE F 0/000000000000 25/0000948193530 50/0035828050270 75/0006396704402
      PCT/064 _
USAGE N 0/000000000000 25/0000181519257 50/0027977540386 75/0001840940357
      PCT/066
ITEMS T/002369590154706 LF/0000000000079 B/0053 MAXL/0232
LLR L/0000000000000 D/0000000000000
FARF6 H8/0044709248202 F6/0014709248202
ENCRYPT SE/000000000000 BE/000000000000 BD/000000000000
RSF R/000000000000
ROC O/000000000000
```

FCRU0000I 14.55.04 END OF DISPLAY+

## Key:

- Larger values (as high as 10 trillion) are supported. Displays “GT 10TRILLION” if exceeded.
- Larger values (as high as 1 quadrillion). Displays “GT 1QUADRILLION” if exceeded.
- Renamed field to eliminate ambiguity

Right-align values

# To-Be: CRUISE processing and log display

User==> ZFCRU START-VERALL

```
CSMP0097I 09.22.40 CPU-A SS-BSS SSU-BSS IS-01
FCRU0100I 09.22.40 CPUA TABLE -VERALL-
                FUNCTION-VER STARTED+
CSMP0097I 09.29.46 CPU-A SS-BSS SSU-BSS IS-01
FCRU0126I 09.29.46 CPUA 0073860430015 RECORDS FOUND+
CSMP0097I 09.29.46 CPU-A SS-BSS SSU-BSS IS-01
FCRU0132I 09.29.46 CPUA TABLE -VERALL-
                FUNCTION-VER COMPLETED
                000000000002 ERRORS DETECTED +
```

User==> ZFCRU DIS-LOG-VERALL

```
CSMP0097I 15.03.24 CPU-B SS-BSS SSU-HPN IS-01
FCRU0000I 15.03.24 MESSAGE LOGGING TABLE -VERALL-
  CPU *B*   SSU HPN   DATE 09/12/24   TERMINAL 010000
  HPN      09:32:10   TABLE -VERALL-
                FUNCTION-VER STARTED
...
  HPN      09:33:41   CHAIN CHASE FINISHED PROCESSING SSU-HPN
  HPN      09:33:41   0073860430015 RECORDS FOUND _
  HPN      09:33:41   TABLE -VERALL-
                FUNCTION-VER COMPLETED
                000000000002 ERRORS DETECTED
```

FCRU0000I 15.03.24 END OF DISPLAY+

## Key:

- Larger values (as high as 10 trillion) are supported. Displays "GT 10TRILLION" if exceeded.

# Migration

1. If you want to save any existing recoup or CRUISE statistics, take one of the following actions before loading the APAR:
  - Display the statistics to be preserved by entering the ZRECP STA command or the ZFCRU DISPLAY command with the STATISTIC parameter specified.
  - Use CRUISE to back up databases FD1F (CRUISE) and FDF6 (recoup).
2. Review the list of changed messages in the APAR migration section and update automation as needed to accommodate larger counts.

# Migration

3. Load APAR PJ48035 to all processors
4. Rebuild the central DBDEF table (ZUDFM DEF INIT)
5. Rebuild the macro label set (MLS) database (ZUDFM MLS)
6. Initialize the CRUISE statistics file:  
Enter ZUDFM INIT FD1F RELEASE INCLUDE-ALL on each SSU
7. Initialize the recoup statistics file:  
Enter ZUDFM INIT FDF6 RELEASE INCLUDE-ALL on each SSU
8. Initialize the recoup log file:  
Enter ZUDFM INIT FDF4

# Fallback

1. Unload APAR PJ48035 from all processors
2. Enter ZUDFM DEF INIT
3. Enter ZUDFM MLS
4. Enter ZUDFM INIT FD1F RELEASE INCLUDE-ALL on each SSU
5. Enter ZUDFM INIT FDF6 RELEASE INCLUDE-ALL on each SSU
6. Enter ZUDFM INIT FDF4
7. If you used CRUISE to back up the statistics databases prior to APAR installation, use CRUISE to restore the databases

# Conclusion

- The z/TPFDF recoup and CRUISE utilities have been updated so statistical counters can hold larger values.
- With this change, you can use recoup and CRUISE to view accurate statistics for z/TPFDF files that **contain up to 10 trillion physical records and up to 1 quadrillion logical records (LRECs).**

# Thank you

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