Prime-Duplicate Comparison Utility
Database Subcommittee

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IBM Z

IBM

Problem Statement

- There have been instances where hardware or software issues have caused prime and duplicate DASD modules to get out of sync.

Users

Derrick
Operator

Carol
Coverage
Programmer

Derrick starts to see application dumps on the console. He contacts Carol to investigate the dumps. Carol determines there is a data integrity problem; she believes prime and duplicate copies of the data do not match.

Pain Points

Identifying a mismatch between prime and duplicate modules is difficult. When it is determined a single prime and duplicate copy of data do not match, it is a tedious task to determine how extensive the problem is.

As-Is User Story

- Carol must issue a ZDFIL command to the prime and the duplicate modules for an individual record and compare the results to determine whether the data matches.
- The only way to determine if the prime and duplicate copies of other records do not match is to take one of the following actions:
  - Issue an unreasonably large number of ZDFIL commands.
  - Wait for application errors

To-Be User Story

- Carol can run the prime-duplicate comparison utility to identify if there is a prime-duplicate mismatch and what records are not synchronized between prime and duplicate modules.

Technical Details

- Prime-duplicate module comparisons can be executed from any processor using the z/TPF ZMCMP command.
- The ZMCMP command normally runs as a low-priority utility so that it doesn’t impact transactional workload but can also be run with normal priority.
- Multiple prime-duplicate comparisons can be run at one time across the loosely coupled complex. The number of simultaneous comparisons that can run is configurable. The maximum value is 100.
- Comparisons can be paused, restarted and stopped.
- A comparison is automatically stopped if a certain number of differences are found. You can configure the number of differences. The maximum value is 100.
- Differences are written to a comma-separated variable (csv) file in the file system. If no differences are found, no file is written.

Technical Details (continued)

```
➔ zmcmp start 047 file-'/tmp/compare047.csv'

CSMP0097I 13.34.49 CPU-B SS-BSS  SSU-HPN  IS-01
MCMP0011I 13.34.49 A COMPARISON BETWEEN THE 0047 AND 0048 DASD MODULES
IS STARTED.+

CSMP0097I 13.36.20 CPU-B SS-BSS  SSU-HPN  IS-01
MCMP0017I 13.36.20 THE COMPARISON BETWEEN THE 0047 AND 0048
DASD MODULES IS COMPLETE. 150179 TRACKS WERE COMPARED.
 POSSIBLE MISMATCHES - 0 DEFINITE MISMATCHES - 3+
```

MCMP0016I is issued if there are no differences.

Technical Note

- Definite differences are differences between prime and duplicate records where the data in the prime and duplicate record does not change after comparing the records 10 times.

- Possible differences are differences between prime and duplicate records where the data in the prime record, duplicate record, or both changes between each of the 10 comparisons.

- Possible differences can occur for records that are frequently updated and might not indicate the prime and duplicate copies are out of sync.

Technical Details (continued)

```
➔ zmcmp display 047

CSMP0097I 11.39.04 CPU-B SS-BSS  SSU-HPN  IS-01
MCMP0007I 11.39.04 PRIME-DUPLICATE COMPARISON STATUS
PRIME     DUPLICATE           PERCENT  RECORD MISMATCHES
SYM  SDA   SYM  SDA   STATUS     DONE  DEFINITE  POSSIBLE
0047 0EE5  0048 1800  RUNNING     72          3         0
START TIME - 2024-01-23 11:38:01
TOTAL TRACKS DONE - 108507
TOTAL TRACKS TO DO - 150179
RECORD MISMATCHES ARE WRITTEN TO THE FOLLOWING FILE
/tmp/compare047.csv
```

Indicates the status of the comparison of symbolic module 047 and its duplicate.

Technical Details (continued)

```
➔ zfile cat /tmp/compare047.csv

CSMP0097I 13.37.02 CPU-B SS-BSS  SSU-HPN  IS-01
FILE0001I 13.37.02 START OF DISPLAY FROM cat /tmp/compare047.csv
Version,1
Module,0047
Started,2024-01-23 13:34:49
MCHR,FARF,RECORD TYPE,ORDINAL,OFFSET,TYPE
00470001000101,00000000CC000000,#APPOP  ,0000000000000000,0020,D
0047046A000301,00000000CC026800,#CN1ST  ,0000000000000000,0005,D
004704D0000901,00000000CC029800,#DSCRU  ,0000000000000000,000C,D
END OF DISPLAY+
```

This report indicates that 3 records have a definite mismatch

Technical Details (continued)

```
➔ zmcmp disp all

CSMP0097I 13.41.47 CPU-B SS-BSS  SSU-HPN  IS-01
MCMP0007I 13.41.47 PRIME-DUPLICATE COMPARISON STATUS

 PRIME     DUPLICATE
SYM  SDA   SYM  SDA   CPU
0047 0EE5  0048 1800   B
0049 0DE3  004A 1900   C
004B 0262  004C 1803   B

END OF DISPLAY+
```

This display displays all of the prime-duplicate comparisons across all processors

Technical Details (continued)

```
➔ zmcmp set max-50

CSMP0097I 13.46.29 CPU-B SS-BSS  SSU-HPN  IS-01
MCMP0003I 13.46.29 PRIME-DUPLICATE COMPARISON UTILITY SETTINGS
ALTERED FROM
MAXIMUM CONCURRENT COMPARISONS     100
MISMATCH LIMIT                     100
ALTERED TO
MAXIMUM CONCURRENT COMPARISONS      50
MISMATCH LIMIT                     100
END OF DISPLAY+
```

Sets the maximum concurrent comparisons across all processors to 50.

Technical Details (continued)

```
➔ zmcmp set limit-1

CSMP0097I 13.48.57 CPU-B SS-BSS  SSU-HPN  IS-01
MCMP0003I 13.48.57 PRIME-DUPLICATE COMPARISON UTILITY SETTINGS
ALTERED FROM
MAXIMUM CONCURRENT COMPARISONS      50
MISMATCH LIMIT                     100
ALTERED TO
MAXIMUM CONCURRENT COMPARISONS      50
MISMATCH LIMIT                       1
END OF DISPLAY+
```

Sets the maximum differences that can occur before the utility stops to 1.

Value Statement

Carol can use the prime-duplicate comparison utility to quickly determine the extent of prime and duplicate data mismatches. The comparison can be done in a little over 2 minutes for a DASD with 10,000 cylinders and zHPF full-track operations.

- Support for High Performance FICON® for IBM z Systems (zHPF) full-track operations were provided by APAR PJ47087 (Aug 2023)

Value Statement (continued)

Automation can be used to run the prime-duplicate comparison utility on a regular basis to detect problems before they cause dumps.

Conclusion

APAR PJ46999 (August 2023) delivers support for the prime-duplicate comparison utility.

Thank you