



IMS Database Performance – Could have, Should have, Would Have

Rosemary Galvan
Principal IMS Software Consultant

- ▶ Review of various performance statistics which could be monitored to determine database health
 - Do you need to reorg? – Do you need to resize?
 - Focus on Full Function and Fast Path DEDB
 - Focus on statistics/reports obtained from BMC Software utilities or native utilities
- ▶ What to look at and why you should
- ▶ What would simplify database performance monitoring

- ▶ Occurs in VSAM KSDS, not in VSAM DEDB
 - Index databases - Primary or Secondary
- ▶ Occurs with normal insert/delete activity over time
 - Cause performance degradation over time
- ▶ Use IDCAMS, LISTCAT option
 - Displays # of CI/CA Splits
 - High # of CI splits
 - High or any # of CA splits
 - CA splits rare
- ▶ *Means it's time to reorg*

Control Interval = 1 to n+ number of records
Control Area = Block of records

- ▶ Needs of the one over the many?
 - One index may become fragmented over other index databases or the main database
 - Reorg of everything is un-necessary, lengthy outage
 - IDCAMS REPRO option to “reorg” individual Index database
 - Requires an outage
 - MAXM Reorg/Online for IMS
 - Copy function
 - Performs similar function to REPRO but allows index to remain online

- ▶ Max for OSAM is 60, Max for VSAM is 255, Max for DEDB is 0
- ▶ Indicates data is being added to the end of the database because there isn't enough free space in the middle
- ▶ Determining number of extents
 - VSAM - IDCAMS, LISTCAT option
 - OSAM – ISPF option 3.2
 - Fast Path – IDCAMS, LISTCAT option
- ▶ Also monitor volumes as well
 - Ensure space available on candidate volumes to take an extent
 - U844's when not enough space to take extents

ATTRIBUTES

KEYLEN-----19 AVGLRECL-----330... CFSIZE-----2048

RKP-----0 MAXLRECL-----330... CI/CA-----315

SHROPTNS(2,3) RECOVERY SUBALLOC NOERASE EXTRALARGEINDEXED

NOWRITECHK NOIMBED NOREPLICAT UNORDERED NOREUSE NONSPANNED

STATISTICS

REC-TOTAL-----3916753 SPLITS-CI-----7960 EXCPS-----163738140

REC-DELETED-----4155 SPLITS-CA-----1576 EXTENTS-----19

REC-INSERTED-----1622557 FREESPACE-%CI-----0 SYSTEM-TIMESTAMP:

REC-UPDATED-----32262 FREESPACE-%CA-----0 2007.183 02:01:48

REC-RETRIEVED--378842242 FREESPACE-----150570 X'C0D47CA4D42B836A'

ALLOCATION

SPACE-TYPE-----CYLINDER

SPACE-PRI-----800 USECLASS-PRI-----0 HALRBA-OR-CI--2000370500

SPACE-SEC-----500 USECLASS-SEC-----0 HUSRBA-OR-CI--2000219930

Lots of CI/CA splits

0% means low to
Total # records in DB

Data Set Information

More: +

Data Set Name : DBU.QA.HSR.OLRHDO01.OLRHDO01

General Data

Management class . . : **None**
Storage class : **None**
Volume serial : DBU065
Device type : 3390
Data class : **None**
Organization : PS
Record format : FBS
Record length : 4096
Block size : 4096
1st extent cylinders: 25
Secondary cylinders : 15
Data set name type :

Current Allocation

Allocated cylinders : 100
Allocated extents . : 6

Current Utilization

Used cylinders . . . : 88
Used extents : 6

SMS Compressible : NO

Creation date : 2009/12/09

Referenced date . . : 2010/03/12

Expiration date . . : ***None***



DEDB - IDCAMS LISTCAT

Lots of information is misleading

ATTRIBUTES

KEYLEN-----	0	AVGLRECL-----	4089
RKP-----	0	MAXLRECL-----	4089
SHROPTNS(3,3)	RECOVERY	UNIQUE	NOERASE
UNORDERED	REUSE	NONSPANNED	

STATISTICS

REC-TOTAL-----	150	SPLITS-CI-----	0	EXCPS-----	6
REC-DELETED-----	0	SPLITS-CA-----	0		
REC-INSERTED-----	0	FREESPACE-%CI-----	0		
REC-UPDATED-----	0	FREESPACE-%CA-----	0		
REC-RETRIEVED-----	0	FREESPC-----	122880		

ALLOCATION

SPACE-TYPE-----	CYLINDER	HI-A-RBA-----	737280
SPACE-PRI-----	1	HI-U-RBA-----	614400
SPACE-SEC-----	0		

DEDB – EXTEND Area Summary Report

DBD Name: DPOP1 Area DDname: DPOP1A0 Area DSname: PFP.QA.DB.DPOP1A1

	<u>Original</u>	<u>Extended</u>
Randomizing Module Name	DBFHDC40	
UOW=(9,3) CISIZE=4096	ROOT=(14,4)	ROOT=(64,54)
Root Addressable Area (RAA) Portion:		
UOW's in RAA	10	
Total CI's per UOW	9	
RAP CI's per UOW	6	
DOVF CI's per UOW	3	
Total Root Anchor Point CI's	60	
Total Dependent Overflow CI's	30	
Independent Overflow (IOVF) Portion:		
Total Independent Overflow CI's	36	486
IOVF Space Map CI's	1	5 ←
IOVF Data CI's	35	481
Used IOVF CI's	9 (26%)	9 (2%)
Free IOVF Ci's	26 (74%)	472 (98%)
Sequential Dependent (SDEP) Portion:		
Total Sequential Dependent CI's	13	133
SDEP Logical Begin	00000001:00089000	00000001:0024B000
SDEP Logical End	00000001:0009032B	00000001:0025232B
Used SDEP CI's	8 (62%)	8 (62%)
Free SDEP CI's	5 (38%)	125 (94%)

Increased 5 times
w/o taking offline

What to monitor – Space Usage

- ▶ How close to 4 GIG VSAM limit or 8 GIG OSAM limit or DEDB is almost unlimited
- ▶ Schedule purge jobs to delete or archive off data from database to keep within limit.
- ▶ Another option is to compress the database.
- ▶ If databases continue to grow, other alternatives may need to be considered
 - Database Partitioning is an option
- ▶ Monitor
 - VSAM – IDCAMS Listcat option
 - $\text{High Used RBA} / \text{High Allocate RBA} * 100$ is percentage of how full you are & how close to the limit
 - OSAM – get out the calculator
 - DEDB – not much data available

ATTRIBUTES

KEYLEN-----19 AVGLRECL-----330... CFSIZE-----2048

RKP-----0 MAXLRECL-----330... CI/CA-----315

SHROPTNS(2,3) RECOVERY SUBALLOC NOERASE EXTRALARGEINDEXED

NOWRITECHK NOIMBED NOREPLICAT UNORDERED NOREUSE NONSPANNED

STATISTICS

REC-TOTAL-----3916753 SPLITS-CI-----7960 EXCPS-----163738140

REC-DELETED-----4155 SPLITS-CA-----1576 EXTENTS-----19

REC-INSERTED-----1622557 FREESPACE-%CI-----0 SYSTEM-TIMESTAMP:

REC-UPDATED-----32262 FREESPACE-%CA-----0 2007.183 02:01:48

REC-RETRIEVED--378842242 FREESPACE-----150570 X'C0D47CA4D42B836A'

ALLOCATION

SPACE-TYPE-----CYLINDER

SPACE-PRI-----800 USECLASS-PRI-----0 HALRBA-OR-CI--2000370500

SPACE-SEC-----500 USECLASS-SEC-----0 HUSRBA-OR-CI--2000219930

About 2 gig dataset

Within 99% of that limit

*HiUse / HiAlloc * 100 = %*

*2000219930/2000270500*100=99%*

Data Set Information

Data Set Name : DBU.HLD.HI8GIG01.HI8GIG01

So, How close am I
to the 8 gig limit?

General Data

Management class . . : LRGL2
Storage class : DEVSMS
Volume serial : DVL092 +
Device type : 3390
Data class : **None**
Organization : PS
Record format : FBS
Record length : 8192
Block size : 8192
1st extent cylinders: 22
Secondary cylinders : 500
Data set name type :

Current Allocation

Allocated cylinders : 11,200
Allocated extents . : 28

Current Utilization

Used cylinders . . . : 11,200
Used extents : 28

Notice allocated &
Used values the same

SMS Compressible : NO

Creation date : 2009/10/13

Referenced date . . : 2010/03/18

Expiration date . . : ***None***

BMC Software Pointer Checker Plus – Space Usage Analysis Report

SPACE USAGE ANALYSIS

TOTAL NUMBER OF BLOCKS.....	1,007,978
NUMBER OF BLOCKS WITH FREE SPACE.....	1,007,962
NUMBER OF FREE SPACE ELEMENTS.....	1,007,962
NUMBER OF FSE THAT WILL HOLD LARGEST SEG..	555,929
NUMBER OF FSE TOO SMALL FOR SMALLEST SEG.....	0
SEGMENT SIZE RANGE FOR THIS DSG.....	797 TO 1,735
FREE BLOCK FREQUENCY FACTOR (FROM DBD).....	0
FREE SPACE PERCENT FACTOR (FROM DBD).....	13
BYTES OF SPACE REPRESENTED BY FSPF.....	1,065

TOTAL BYTES OF SPACE.....	8,257,355,776
---------------------------	---------------

8 billion bytes means close to 8 Gig

SEGMENT PREFIX.....	44,704,854	0.5%
SEGMENT DATA.....	6,462,221,713	78.3%
SEGMENT PAD.....	5,259,829	0.1%
FREE SPACE -- USEABLE.....	1,736,972,876	21.0%
FREE SPACE -- NOT USEABLE.....	0	0.0%
SLACK.....	0	0.0%

This is all the space left



► IDCAMS LISTCAT not updated by Media Manager

CLUSTER ----- PFP.TEST.FPDEDB.FPDEDB01

STATISTICS

REC-TOTAL-----0	SPLITS-CI-----0	EXCPS-----0
REC-DELETED-----0	SPLITS-CA-----0	EXTENTS-----1
REC-INSERTED-----0	FREESPACE-%CI-----0	SYSTEM-TIMESTAMP:
REC-UPDATED-----0	FREESPACE-%CA-----0	X'0000000000000000'
REC-RETRIEVED-----0	FREESPC-----11796480	

ALLOCATION

SPACE-TYPE-----CYLINDER	HI-A-RBA-----11796480
SPACE-PRI-----16	HI-U-RBA-----11796480
SPACE-SEC-----1	

► IMS Display Area using the IOVF keyword

/DIS AREA FPDEDB01 IOVF

DFS000I	AREANAME	EQECT	TOTAL	UNUSED	TOTAL	UNUSED	DBNAME	EEQECT
DFS000I	DDNAME	REMAIN	SEQ	DEPENDENT	DIR	ADDRESSABLE		
DFS000I	FPDEDB01	N/A	868	631	991	920-CI	FPDEDB	0
DFS000I	FPDEDB01	10	N/A	N/A	N/A	N/A	N/A	
DFS000I	*10139/100645*	TSTA						

- ▶ Normal update activity reduces free space available for new data over time
- ▶ IMS tries to place new data in a convenient location but as free space becomes scarce, data is spread across multiple locations or placed at the end.
- ▶ As databases become unorganized, additional I/O's are required to access data which slows down applications trying to access this data.
- ▶ Regular Reorganization maintains Database Health
 - **Balancing act – REORG enough to keep databases healthy but not too often that impact availability or waste resources**

Analyzing space usage with BMC Software Pointer Checker Plus

- ▶ Several standard reports created which can be used to analyze space usage
 - Bit Map Summary Report
 - Block/CI Summary
 - Distribution of FSE per Block
 - Percent of Blocks without Free Space
 - Space Usage Analysis

- ▶ Other optional reports can be requested as well

What is a Bit Map and why do I care?

- ▶ Bit maps keep track of free space in the database
- ▶ Actual Bit Map Detail is a series of *'s and blanks or 1's and 0's
 - In BMC Bit Map - * means no space and blank means space
- ▶ Indicates if there's enough space in a CI or OSAM block to hold the largest segment defined for the database

Bit Map Detail – beginning of the map

```

      +-----+
      | B I T M A P |
      +-----+

      DDD-BMCHDMDD   DDNAME-BMCHDMDD   (*-NO SPACE, BLANK-SPACE)
      BYTES OF SPACE REQUIRED FOR BITMAP TO REFLECT "SPACE" - 4,006

      BLOCK 1-----10-----20-----30-----40-----50-----60-----70-----80-
      -----90-----100

      00 | ***** |
      ****|
      100 | ***** |
      ** |
      200 | * ***** |
      *****|
      300 | ***** |
      *****|
      400 | ****  |
      *****|
      500 | ***** |
      * * |
      600 | ***** |
      *****|
      700 | ***** |
      *****|
      800 | ***** |
      *****|
      900 | ***** |
      *****|
      1,000 | ***** |
      *****|
      1,100 | ***** |
      *****|
      1,200 | ***** |
      * |
      1,300 | ***** |
      ** |
      1,400 | ***** |
      * |
      1,500 | ***** |
      *****|
      1,600 | ***** |
      *****|

```

Bit Map Detail – end of the database



BITMAP SUMMARY

NUMBER OF BITMAP BLOCKS.....	7
BLOCKS WITH SPACE AS PER BITMAP.....	45,557
BLOCKS WITHOUT SPACE AS PER BITMAP.....	173,592
CONTIGUOUS BYTES REQUIRED FOR BITMAP TO INDICATE SPACE.....	4,006

- ▶ Total # blocks is 219149
- ▶ So approximately 20% of the blocks contain enough contiguous freespace to hold the largest segment
- ▶ So the database is about 80% full
 - If your threshold is 20% you're reached it, but if it's 30%, you've exceed it
 - Padding thresholds is pro-active monitoring

BLOCK/CI SUMMARY

TOTAL NUMBER OF BLOCKS.....	219,150	
COMPLETELY FULL (NO FSE).....	26,792	12.2%
PARTIALLY FULL (1 OR MORE SEGS).....	192,177	87.7%
EMPTY (FORMATTED BUT NO SEGMENTS)....	38	0.0%
UNUSED (NOT FORMATTED).....	142	0.0%
VSAM BLOCK 0.....	1	0.0%
BLOCKS GENERATING WARNING MESSAGES.....	0	
BLOCKS WITH SLACK BYTES.....	25,545	
NUMBER OF SLACK BYTES.....	138,770	
BLOCKS ADDED SINCE LAST LOAD/RELOAD.....	1,001	

- ▶ What bothers me on this report is the low number of empty blocks (0%)
- ▶ This could be okay but I need more information

Segment Counts Report – Tells me how much room I need

```
+-----+
| SEGMENT STATISTICS |
+-----+
```

```
          SEGMENT COUNTS
          -----
```

SEGMENT	SEGMENT LENGTH	TOTAL NUMBER	NBR IN OVERFLOW	NBR PHY DELETED	NBR LOG DELETED
BMCHDR01	412	1,455,260	159,880	0	0
BMCHDR02	36	776	208	0	0
BMCHDR04	61	1,112,365	141,632	0	0
BMCHDR05	61	246,802	33,970	0	0
BMCHDR06	15	356,439	45,876	0	0
BMCHDR07	171	359,987	49,048	0	0
BMCHDR09	32	1,259,405	164,297	0	0
BMCHDR10	173	775	77	0	0
TOTAL SEGMENTS -		4,791,809	594,988		

Notice counts for segments of length 412, 61, and 32
The largest count is for the largest segment length, 412

Analyzing Space Usage

DISTRIBUTION OF FSE PER BLOCK

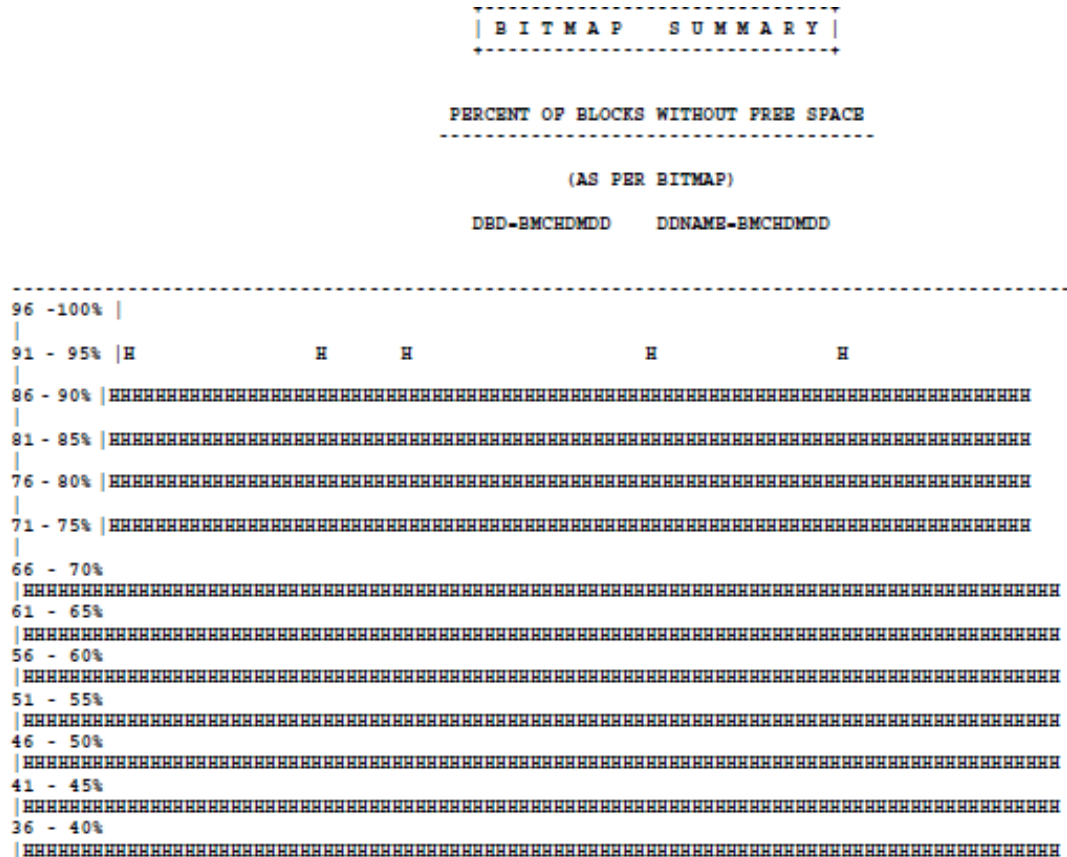
DBD=BMCHDMDD DDNAME=BMCHDMDD

NUMBER OF FSE PER BLK	BLOCK COUNT	AVG FSE SIZE	<---BITMAP INDICATED---> SPACE	NO SPACE
0	26,792	0	0	26,792
1	158,349	334	21,504	136,845
2	21,856	362	14,839	7,017
3	7,639	365	5,858	1,781
4	2,240	434	1,757	483
5	722	414	596	126
6	258	376	232	26
7	140	330	130	10
8	93	268	88	5
9+	1,060	125	553	507
AVERAGE: 1.2	219,149	333	20.8%	79.2%

- ▶ A little room for the 412 length segments but lots for everyone else

Space Usage Analysis – Percentage of Blocks without Free Space

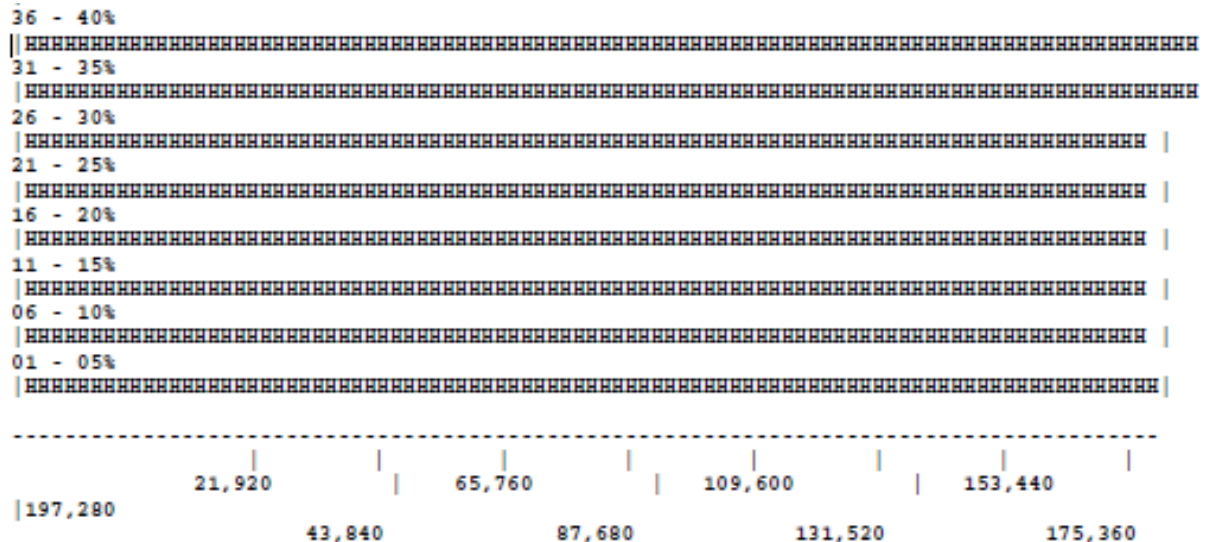
- ▶ This is a graph of the % of FULL blocks



Too data much for slide

Space Usage Analysis – Percentage of Blocks without Free Space

- ▶ Just go to the end of this report



NOTE: TOTAL NUMBER OF BLOCKS IN DSGROUP = 219,150

NUMBER OF BLOCKS REPRESENTED BY EACH VERTICAL BAR = 2,192

HDAM OVERFLOW AREA STARTS IN BLOCK = 175,001

BYTES OF SPACE REQUIRED FOR BITMAP TO REFLECT "SPACE" = 4,006

BLOCKS WITH FREE SPACE = 43 97.7%

BLOCKS WITHOUT FREE SPACE = 1 2.3%

Space Usage Analysis Report – BMC Software Pointer Checker Plus

SPACE USAGE ANALYSIS

TOTAL NUMBER OF BLOCKS.....	219,150	
NUMBER OF BLOCKS WITH FREE SPACE.....	192,357	
NUMBER OF FREE SPACE ELEMENTS.....	257,299	
NUMBER OF FSE THAT WILL HOLD LARGEST SEG	179	
NUMBER OF FSE TOO SMALL FOR SMALLEST SEG	238,988	
SEGMENT SIZE RANGE FOR THIS DSG.....	1,030 TO 4,006	
FREE BLOCK FREQUENCY FACTOR (FROM DBD)..	0	
FREE SPACE PERCENT FACTOR (FROM DBD)....	0	
TOTAL BYTES OF SPACE.....	897,638,400	
SEGMENT PREFIX.....	69,801,308	7.8%
SEGMENT DATA.....	720,020,332	80.2%
SEGMENT PAD.....	16,110,221	1.8%
FREE SPACE -- USEABLE.....	60,243,080	6.7%
FREE SPACE -- NOT USEABLE.....	25,408,170	2.8%
SLACK.....	357,912	0.0%
DL/I OVERHEAD.....	4,405,051	0.5%
VSAM CI OVERHEAD.....	1,538,139	0.2%

A large # of unusable FSEs could indicate the need to Reorganize



This report shows how the space in the database
is being used

Why do you Reorganize?

- Simply to elimination fragmented free space elements (FSEs) and scraps in the root addressable area (RAA)
- Move as many segments as possible from independent overflow (IOVF) into their respective RAA or DOVF control intervals (CIs).
- Also:
 - Reclaims space, Resequences roots, Controls segment placement
- Reporting:
 - Area Summary Report
 - UOW Detailed Analysis Report
 - IOVF Space Analysis Report
 - Free Space Analysis Report

Trade speed for space, Fast Path is a space Hog

Area Summary Report – Shows how the Area is defined

How CI's allocated in the Root, DOVF, IOVF, and SDEP portions 

Area Summary Report

DBD Name: DP\$10 Area DDname: DP\$10A0 Area DSname: PFP.QA.DB.DP\$10A1

Area number: 1

Randomizing Module Name DBFHDC40

UOW=(9,3) ROOT=(14,4) CFSIZE=4096

Root Addressable Area (RAA) Portion:

UOW's in RAA 10

Total CI's per UOW 9

RAP CI's per UOW 6

DOVF CI's per UOW 3

Total Root Anchor Point CI's 60

Total Dependent Overflow CI's 30

Independent Overflow (IOVF) Portion:

Total Independent Overflow CI's 36

IOVF Space Map CI's 1

IOVF Data CI's 35

Sequential Dependent (SDEP) Portion:

Total Sequential Dependent CI's 13

SDEP Logical Begin 00000001:00089000

SDEP Logical End 00000001:0009032B

Significant RBA values:

First Root Anchor Point 00002000

First IOVF CI 0005C000

REORG UOW 00080000

First SDEP CI 00089000

End of AREA 00096000

UOW Detailed Analysis Report

DBD Name: DPOP1 Area DDname: DPOP1A0 Area DSname: PFP.QA.DB.DPOP1A1

Area number: 1

UOW Range: All

UOW	---Number CIs Used---			No. RAPs	--% RAP FS---			% DOVF	No. DB	---Record Length Statistics---		
No.	RAP	DOVF	IOVF	Use Ovfl	Avg	Max	Min	Part FS	Records	Avg	Max	Min
0	6	3	1	4	33	53	1	28	14	2,005	3,011	1,272
1	5	2	0	2	28	52	0	51	10	2,057	3,051	1,281
2	6	2	0	2	34	50	1	61	10	2,091	2,983	937
3	6	3	1	4	26	55	0	9	14	2,253	3,203	1,769
4	6	3	2	4	3	7	0	34	16	2,422	3,336	1,736
5	5	3	0	4	25	53	0	15	11	2,332	2,924	1,635
6	6	3	1	3	25	57	0	33	12	2,333	2,894	1,735
7	5	3	1	3	20	50	1	30	12	2,183	2,916	1,847
8	5	3	2	3	3	3	0	49	14	2,287	2,899	1,856
9	5	3	1	4	12	43	2	25	13	2,157	2,712	1,625
*** UOW Range Total ***									126	2,220		

UOWs using 100% of DOVF = 8 (80.0%)

80% in Dependent overflow, not bad

IOVF Space Analysis Report

DBD Name: DPOP1 Area DDname: DPOP1A0 Area DSname:
PFP.QA.DB.DPOP1A1

Area number: 1

- % IOVF CIs Used												
	1											
	1	2	3	4	5	6	7	8	9	0	No.	
Map RBA	0	0	0	0	0	0	0	0	0	0	Used	Note

0005C000		*	*	*	*	*	*	*	*	*	9	

. VISUAL REPRESENTATION OF CIs USED

. CAN BE USED TO CALCULATE IOVF FREESPACE

Free Space Analysis Report

Area DSname: PFP.QA.DB.DPOD7A1

UOW Range: All

	RAP	DOVF	IOVF	SDEP
Total % FS:	24%	2%	55%	78%
Usable % FS:	23%	1%	55%	78%
Unused:	17%	0%	52%	78%
In Area:	5%	0%	31%	
FS for Root:	29%			

- QUICK GUIDE TO AVAILABLE SPACE FOR A PARTICULAR AREA
- SHOWS LITTLE FREESPACE IN DOVF
- COULD BE HOW RANDOMIZER IS PLACING DATA
- FREESPACE IN RAP WON'T HELP UNLESS RECORDS RANDOMIZE TO THE RAPS WITH FREESPACE
- DATABASE HAS PLENTY OF SPACE JUST NEED TO MONITOR IT

- ▶ Standard reports created which can be used to monitor health
 - HDAM Rap Summary Report
 - Segment Pointer Statistics Report
 - Distribution of Roots per block

- ▶ Other optional reports can be requested as well

Health Check on your IMS Database – BMC Pointer Checker Plus Reports

- ▶ HDAM Rap Summary Report
 - Displays counts of blocks in RAA and overflow
 - Displays RAP usage information

HDAM RAP SUMMARY

BLOCKS IN ROOT ADDRESSABLE AREA.....	175,000
BLOCKS IN OVERFLOW AREA.....	44,149
NUMBER OF RAPS PER BLOCK.....	5
RAPS NOT USED.....	165,797
RAPS USED.....	709,203
RAPS POINTING OUTSIDE THEIR BLOCK.....	434,311

- ▶ Of the RAPS used, 61% point outside their block
- ▶ High # of RAPS pointing outside of their block indicates reorg needed

Health Check on your IMS Database – BMC Pointer Checker Plus Reports

SEGMENT POINTER STATISTICS

SOURCE SEGMENT	PTR TYP	TARGET SEGMENT	NBR-OF-SOURCE-SEGS		I/O PROB	FREQ-THAT-SEGS-ARE-IN	
			W/O PTR	WITH PTR		SAME BLOCK	DIFF BLOCK
HDAM RAP	TO	FIRST ROOT		709,203	.612	274,892	434,311
BMCHDR01	PTF	BMCHDR01	709,203	746,057	.271	544,243	201,814
	PCF	BMCHDR02	1,454,484	776	.189	629	147
	PCF	BMCHDR04	342,895	1,112,365	.026	1,083,475	28,890
	PCF	BMCHDR05	1,208,458	246,802	.036	238,032	8,770
	PCF	BMCHDR06	1,098,821	356,439	.044	340,885	15,554
	PCF	BMCHDR07	1,095,273	359,987	.138	310,280	49,707
	PCF	BMCHDR09	356,143	1,099,117	.068	1,024,553	74,564
	PCF	BMCHDR10	1,454,533	727	.323	492	235
BMCHDR02	PTF	BMCHDR02	776	0	.000	0	0
BMCHDR04	PTF	BMCHDR04	1,112,365	0	.000	0	0
BMCHDR05	PTF	BMCHDR05	246,802	0	.000	0	0
BMCHDR06	PTF	BMCHDR06	356,439	0	.000	0	0
BMCHDR07	PTF	BMCHDR07	359,987	0	.000	0	0
BMCHDR09	PTF	BMCHDR09	1,099,117	160,288	.027	156,003	4,285
BMCHDR10	PTF	BMCHDR10	727	48	.063	45	3

How often a pointer references a different block than the source segment

Health Check on your IMS Database – BMC Pointer Checker Plus Reports

DISTRIBUTION OF ROOTS PER BLOCK

ROOTS PER BLK	NUMBER OF BLOCKS	PCT OF TOTAL	NUMBER OF ROOTS	PCT OF TOTAL
0	11	1.1%	0	0.0%
1	31	3.2%	31	0.7%
2	89	9.2%	178	3.9%
3	160	16.5%	480	10.5%
4	182	18.7%	728	16.0%
5	169	17.4%	845	18.5%
6	157	16.2%	942	20.6%
7	79	8.1%	553	12.1%
8	53	5.5%	424	9.3%
9	25	2.6%	225	4.9%
10	10	1.0%	100	2.2%
11	3	0.3%	33	0.7%
12	1	0.1%	12	0.3%
13	1	0.1%	13	0.3%
14	0	0.0%	0	0.0%
15	0	0.0%	0	0.0%
16	0	0.0%	0	0.0%
data omitted				
35	0	0.0%	0	0.0%
36+	0	0.0%	0	0.0%
TOTALS:	971		4,564	

MAX ROOTS IN ONE BLOCK-13
AVERAGE ROOTS PER BLOCK-4.7

NOTE: ONLY THOSE BLOCKS CONTAINING 1 OR MORE SEGMENTS ARE USED

- ▶ Don't I need to know how many roots will fit into each block?
- ▶ Don't I need the length of the database records, the blocksize, and the bytes parameter to figure this out?

Why reorg?

- Does the UOW extend into IOVF?
- Is UOW fragmentation over a specified threshold?
- Can reorganization of the UOW save a specified amount of IOVF?

Reporting:

- Segment I/O Placement
- Fragmentation on Area Summary Report
- Reorg Report

SEGMENT PLACEMENT ANALYSIS REPORT

FAST PATH ANALYZER/EP

Segment Placement Analysis Report

DBD Name: DPOP1 Area DDname: DPOP1A0 Area DSname: PFP.QA.DB.DPOP1A1
 Area number: 1 UOW Range: All

- SegName	Seg CD	Seg Lvl	Total Segs	---In RAA Base---		-----In DOVF-----		-----In IOVF-----	
				No.	%	No.	%	No.	%
SEGA	1	1	126	91	72.2	29	23.0	6	4.8
SDEP	2	2	239						
SEGB	3	2	389	267	68.6	95	24.4	27	6.9
SEGC	4	3	569	381	67.0	145	25.5	43	7.6
SEGD	5	3	541	354	65.4	149	27.5	38	7.0
SEGE	6	2	325	140	43.1	150	46.2	35	10.8

Direct Segments			1,950	1,233	63.2	568	29.1	149	7.6
All Segments			2,189						

Most segments in RAA & DOVF for good performance

SEGMENT I/O ANALYSIS REPORT

FAST PATH ANALYZER/EP Segment I/O Analysis Report

DBD Name: DPOP1 Area DDname: DPOP1A0 Area DSname: PFP.QA.DB.DPOP1A1
Area number: 1 UOW Range: All

-Segment I/O Analysis - Average DB Record

-----Segment Placement Statistics----- -----Physical I/O-----
--In RAA Base-- ---In DOVF---- ---In IOVF---- -----Statistics-----

SegName	Seg CD	Seg Lvl	Avg Freq	Avg/ SDev	Max/ Min	Avg/ SDev	Max/ Min	Avg/ SDev	Max/ Min	Avg	SDev	Max	Min
SEGA	1	1	1.00	0.72 0.45	1 0	0.23 0.42	1 0	0.05 0.21	1 0	1.52	0.70	3	1
SEGB	3	2	3.09	2.12 1.37	4 0	0.75 1.28	4 0	0.21 0.71	3 0	0.15	0.36	1	0
SEGC	4	3	4.52	3.02 2.17	6 0	1.15 2.04	7 0	0.34 1.14	5 0	0.04	0.20	1	0
SEGD	5	3	4.29	2.81 2.09	7 0	1.18 1.93	6 0	0.30 1.02	5 0	0.06	0.24	1	0
SEGE	6	2	2.58	1.11 1.17	6 0	1.19 1.64	6 0	0.28 0.93	6 0	0.38	0.59	3	0

- ** Record I/O ** Avg: 1.93 SDev: 1.01 Max: 4 Min: 1
*** Root I/O *** Avg: 1.52 SDev: 0.70 Max: 3 Min: 1

FRAGMENTATION ON AREA SUMMARY

FAST PATH ONLINE ANALYZER/EP

Area Summary Report

DBD Name: DPOD7 Area DDname: DPOD7A0 Area DSname: PFP.QA.DB.DPOD7A1

Area number: 1

Randomizing Module Name DBFHDC44

UOW=(40,10) ROOT=(100,60) CISIZE=4096

Root Addressable Area (RAA) Portion:

UOW's in RAA 40

Total CI's per UOW 40

RAP CI's per UOW 30

DOVF CI's per UOW 10

Total Root Anchor Point CI's 1,200

Total Dependent Overflow CI's 400

Independent Overflow (IOVF) Portion:

Total Independent Overflow CI's 2,400

IOVF Space Map CI's 20

IOVF Data CI's 2,380

Sequential Dependent (SDEP) Portion:

Total Sequential Dependent CI's 458

SDEP Logical Begin 00000001:00FCA000

SDEP Logical End 00000001:01030B9D

Significant RBA values:

First Root Anchor Point 00002000

Performance factors:

Fragmentation

2.84

Low % fragmentation is good

Fast Path REORGANIZATION REPORT PARAMETERS

Reorganization Parameters

Selection Criteria:

Only UOW's that use IOVF

Process Criteria:

Selected UOW's where the number of IOVF CI's saved is ≥ 1

Reorganization Statistics

Root Addressable Area Portion:

UOW's Selected	7
UOW's Empty	0
UOW's Rejected due to no IOVF used	3
UOW's Rejected due to no IOVF saved. . . .	0
RAP CI's Read	42
RAP CI's Reused	39
RAP CI's Empty	3

Independent Overflow Portion:

IOVF CI's Used	9
IOVF CI's Reused	1
IOVF CI's Reclaimed	8 ^{***}

REORGANIZE Buffer Statistics:

Space Maps Read	1
Space Maps Written	7

- ▶ Space may be the final frontier but not the only thing to monitor!
- ▶ HDAM and DEDB tuning involves several parameters like:
 - Block Size, RAA size, RAPS parameter, CI's, UOWs
 - Etc..
- ▶ Lots of reports available to indicate something is wrong, but no report tells you what to change

It's time to pull out the calculator

- ▶ By the time you look at a report & notice something is wrong, maybe you've already missed your reorg window
 - End up "padding" values & thresholds to be "pro-active"

Why is database performance monitoring rarely done?

- ▶ Tedious, time consuming, manual process
- ▶ Strain on staff resources
 - Lots of database statistics and performance metrics are obtained when database utilities execute but who has time to review the data?
 - Group of dedicated performance experts, reduced to one, then none
 - Maintaining database performance just another responsibility for the DBA
 - IMS only DBA's rare
 - Typically support both IMS and DB2
 - Some cases, IMS DBA function performed by IMS SysProg

Why is database performance monitoring rarely done?

- ▶ 2 approaches to database performance monitor
 - React response
 - Wait until end users complain about poor response
 - Pro-active response
 - Reorg as often as possible
 - In the past, databases were monitored to avoid un-necessary reorgs and the lengthy associated outage
 - Database utilities have evolved over time & provide capabilities for near online and online reorgs
 - BMC Software MAXM Reorg/Online for IMS
 - Is it really okay to waste cycles for un-necessary reorgs?
- ▶ *A dedicated IMS database expert probably sounds pretty good by now*

- ▶ Encapsulates the knowledge of an experienced DBA into a graphical user interface
 - *Focused* monitoring of your IMS database environment
 - Not worried about DB2
 - No meetings to attend
 - No vacation or sick time
 - No worries about Fantasy Football or March Madness Brackets
 - Space & performance metrics gathered during utility executions and/or through a separate data collector
 - Metrics gathered are automatically analyzed
 - Eliminates need for DBA staff to manually review and interpret various reports

- ▶ Pro-active monitoring of database health
 - Metrics gather stored in a repository for history, trending and *forecasting*
 - DBA's notified of exceptions and provided recommendations for resolution
 - Doesn't just tell you the database needs to be re-sized but provides information on what to change

- ▶ Conditional Reorg
 - No wasted CPU cycles on un-necessary reorgs

- ▶ Fast Path Online
 - Like Cond Reorg - Intelligent Reorg monitors UOW's and only reorgs what needs to be reorged.

**BUSINESS RUNS ON I.T.
I.T. RUNS ON BMC™**