



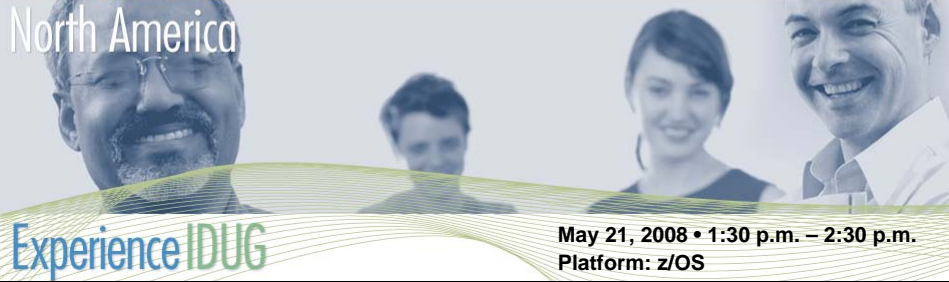
Session: K10

How to Tell if Your Database is Getting Full
and What Are Your Options if it is?

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Session K10



How to Tell if Your Database is
Getting Full and What Are Your
Options if it is?

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Session aims

- How to detect whether you have a problem with database space
- What to do when you determine you have a problem with database space

Database space components

- RBA
- High-used RBA
- High-allocated RBA
- Bitmap
- CI/CA splits
- Allocation parms
- Volume(s)

Database space components

- RBA – relative byte address
 - Has 32 or 33 bit value
 - Permits 4G or 8G of addressing

Database space components

- High-used RBA

How much of the 4G/8G you have used

The distance between the start of the database and logical EOF

When approaching 4G/8G you have a problem

Database space components

- High-allocated RBA

The highest RBA permitted by the sum of the currently-allocated primary and secondary extents

Database space components

- Bitmap

Freespace algorithms work at the DBD-level so if you have one very long segment it can distort the amount of apparent freespace

Database space components

- CI/CA splits

VSAM KSDS (indices) only

Can cause space problems

Database space components

- Allocation parms – primary & secondary extents

OSAM permits up to 16 extents per volume and somewhere between 52 and 60 extents in total

VSAM permits up to 123 extents per volume and 255 extents in total

VSAM guaranteed free space

Database space components

- Volume(s)

Concern if your “end volume” has insufficient space to allow a secondary allocation

An example

Let's imagine an OSAM database

Blocksize of 27,998

Tracksize of 56,664

Defined with SPACE=(TRK,(1000,600))

Allocated on a single volume

Two extents have been taken

400 tracks of the secondary allocation are in use

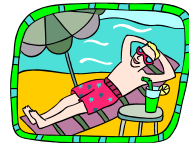
An example

1. High-allocated RBA of
 $(1000+600)*56K = X'00578000'$
2. High-used RBA of
 $(1000+400)*56K = X'004C9000'$



Why should we worry ?

- Are we close to exceeding the maximum RBA?
- Are we close to taking another extent ?
- If we take another extent are we going to exceed the maximum number of extents ?
- Are we close to 64k tracks on a volume ?
- Does the volume contain a free extent large enough to allow us to take another ? Remember, VSAM always takes a primary extent as its first extent on a volume.
- Is another volume available ?



In our example....

- No worry on RBA– X'004C9000' is well below X'FFFFFFFF' maximum
- No worry on existing extent - 200 tracks left
- No worry on the number of extents taken
- Maybe worry as to whether volume has 600 contiguous free tracks ?
- Maybe worry - if the volume doesn't have 600 contiguous free tracks – no alternative volume

How to deal with the general subject

- All of the information is available but it has to be gleaned from many places
- Out-of-the-box IMS provides nothing to help
- Vendors sell pointer checkers that collate the information

Difficulties in dealing with the subject

- Write your own utility – unlikely
- Need a system-wide picture - pointer checkers execute at the database level
- Need a cheap solution - pointer checkers can take a while to execute
- Need current information – due to online systems pointer checkers may not see the current picture

Database Space Analyzer (DSA)

- Batch utility free with CA's Database Analyzer
- Uses RECONS to populate threshold PDS
- Checks the databases in an IMS/DC region
- Collects some of its data from online control blocks to provide an up-to-the-minute picture
- Collects the rest of its data from the catalog or the VTOC

Database Space Analyzer (DSA)

- Thresholds are applied to each database
- Report produced
- Exceptions are highlighted
- Problems are predicted

Database Space Analyzer (DSA)

- ALCUSED – % of used space to allocated space
- PCTMAX - % of used space to theoretical limit
- XTAVAIL - # available extents to hold sec alloc
- XTOSAM - # extents in use by OSAM database
- XTVSAM - # extents in use by VSAM database
- CASPLIT - % of CA splits
- CISPLIT - % of CI splits

Database Space Analyzer (DSA)

```
DSA0400E      150 DATASETS HAD THRESHOLD EXCEPTIONS.  
DSA0401I SUMMARY OF DSN THRESHOLDS EXCEEDED  
      Number of extents, OSAM           :      3  
      Number of extents, VSAM          :      0  
      Number of available extents       :     26  
      Allocation used (percent)         :    140  
      Percent max theoretical size      :      0  
      Percent CI splits                 :      2  
      Percent CA splits                 :      1  
      ** Total number of exceptions     :    172  
  
      ** Total number of DSNs with exceptions :    150
```

Database Space Analyzer (DSA)

DBDname	DDname	DBtype	A M Data Set Name	Ending Volser	Total Cyls	Alloc (Cyl) Ext	Primry	Secry	Threshold	Exception(s)
DVAS8410	VAS08410	INDEX	K TST.HPO.XCF1.DVAS8410.IX	IDI002	50	1	50	0	Avl xtnts= 0, Threshold= 3 CI splits= 31% Threshold= 20 CA splits= 50% Threshold= 35	
DSADB003	DSADB03D	INDEX	K IDI.SYSTEST.DSADB003	IDI127	3	1	3	0	Avl xtnts= 0, Threshold= 3 Alloc Used= 33% Threshold= 20	
D17	MARKH1A	PHIDAM	O IDI.SYSTEST.XCF1.D17.DATABASE.A00001	RJC004	22	22	1	1	Extents= 22, Threshold= 5 Alloc Used= 97% Threshold= 21	
D17	MARKH12A	PHIDAM	O IDI.SYSTEST.XCF1.D17.DATABASE.A00002	RJC005	22	22	1	1	Extents= 22, Threshold= 5 Alloc Used= 97% Threshold= 21	
D17	MARKH13A	PHIDAM	O IDI.SYSTEST.XCF1.D17.DATABASE.A00003	RJC002	22	22	1	1	Extents= 22, Threshold= 5	

Database Space Analyzer (DSA)

- For all datasets whose ALCUSED is exceeded space simulation occurs:

Database Space Analyzer (DSA)

				<-- Threshold -->	<-- Simulation -->		
				C C P E X A	P E V O		
				I A C X T L	C X O V		
				T T A C	T T L E		
				S S E V	E R		
				P P M N A U	M N S 6		
				L L A T I S	A T P 4		
				T T X S L D	X S C K		
DBDname	DDname	DBtype	M			Data set name	
D18	D18P05L	ILDS	K	*	*	IDI.SYSTEST.XCF1.P1EPT05.L00005	
	D18P12X	PHINDX	K	*	*	IDI.SYSTEST.XCF1.P1EPT12.X00012	
	D18P15L	ILDS	K	*	*	IDI.SYSTEST.XCF1.P1EPT15.L00015	

Large Database Alternatives

- Note, even if you're not close to the 4G/8G limit you should still consider these suggestions.
- Reorganize the database (reviewing FSPC or segment lengths)
- Candidate volumes can be dynamically added for VSAM
- LFD ?

Large Database Alternatives

- Per Bill Keene of NESI in his excellent white paper titled “Large Database Alternatives”:
http://www.neonesoft.com/resources_whitepapers.html

Large Database Alternatives

Database purging

- Write a program to purge or archive old data.
- Less DASD, less admin overhead, increased availability, no application or JCL changes, greater database longevity.
- Only cost is in coding the program.

Large Database Alternatives

Convert VSAM databases to OSAM

- Double the capacity
- Better performance, increased availability, no application or JCL changes, greater database longevity.
- Must change DBD, reregister database in DBRC, buffer pool specifications, dataset allocation procedures.

Large Database Alternatives

Multiple Dataset Groups

- Up to 10 DSGs permitted
- Increased addressing, no application changes, performance improvements if done correctly.
- DBD changes, multiple I/O operations needed for record retrieval, dataset allocation procedures, DFSMDA members or JCL changes, backup procedures.

Large Database Alternatives

Segment compression

- DBD-based
- Less space, no application or JCL changes, less admin overhead, possible I/O improvements.
- Extra CPU, possible increase in I/O due to separated prefix & data, possible increase in logging data.

Large Database Alternatives

Convert to DEDB

- Permits 2,048 areas of 4G each
- Increased addressing
- Different philosophy, application changes, no DL/I support, no indexing, no logical relationships.

Large Database Alternatives

Database partitioning

- HALDB or PDF from NESI
- Increased addressing, few (if any) application changes, increased availability, easier admin in terms of manageability, more flexible.
- DBD changes, more admin in terms of setup, DBRC requirements.

Large Database Alternatives

Recommendations

1. Purge or archive old data
2. Implement segment edit/compression where suitable
3. Implement partitioning

CI/CA splits

- Repro index to work file and back again

Too many extents

- Reorganize database changing primary & secondary space allocations
- Consider making primary allocation large enough to hold all data – improves performance

Volume-type issues

- Clear up volume(s)
- Add extra volumes dynamically via utility
- Reorganize database specifying extra volumes or different SMS parms at allocation time
- VSAM guaranteed free space

Any questions ?

