DB2 Bufferpool Tuning with the Buffer Pool Analyzer - a case study

- Objective:
  - Show how the Bufferpool Analyzer can be used to reallocate objects to reduce the synchronous reads with the benefit of improved throughput for the same amount of storage
  - Provide guidance on the tradeoff between allocating additional storage and further reductions in the I/O

DB2 Buffer Pool Analyzer - Functions

- Data collection of virtual buffer pool activity via the DB2 IFI interface
- Comprehensive reporting of the buffer pool activity, including:
  - Ordering by various identifiers (for example, buffer pool, plan, object, primary authorization id)
  - Sorting by, for example, getpage, sequential prefetch, and synchronous read
  - Filtering capability
  - Loading into DB2 tables
- Simulation of buffer pool usage for:
  - Varying buffer pool size
  - Different object placement
- Display of report and simulation results on workstation in form of tables, graphs, and diagrams

Case Study Flow

- Application consisting of 17 tables and 25 stored procedures driven from a rexx procedure
- All application pagesets allocated to BP20, sized at 1000 pages, before tuning
- Run the application for 3 minutes whilst tracing for 2 minutes
- Use Buffer Pool Analyzer to determine re-allocation to 3 pools and re-size within the 1000 page limit
  - BP17 – small objects
  - BP18 – objects whose primary access path is random
  - BP19 – objects whose primary access path is sequential
- Rerun the application to measure the outcome

Application Throughput - Before and After tuning

	BEFORE Tuning		AFTER Tuning	
	SP Calls	Elapsed Secs	SP Calls	Elapsed secs
DPTADD	89	0.022	89	0.021
DPTBAL	119	0.090	143	0.087
DPTDEL	26	0.157	26	0.154
DPTMGR	58	0.053	96	0.030
DPTUPD	86	0.018	98	0.014
DPTUPR	73	0.033	88	0.033
EMPADD	827			
EMPDEL	77			
EMPFND	49			
EMPUPD	83	0.026	90	0.023
PRJADD	80	0.945	71	0.945
PRJUPD	45	0.013	51	0.013
Total	1612		1713	
Tran rate	8.9 calls per second		9.5 calls per second	

The throughput has increased by 7% despite reducing the prefetch quantity for the sequential accessed objects

Buffer Pool Analyzer Reports – Before and After

	BEFORE	AFTER			
BPID	BP20	BP17	BP18	BP19	TOTAL
BP Hit ratio(%)					
System	54.5	100.0	98.5	21.2	55.0
Application	97.1	100.0	98.5	98.9	98.8
Getpage	495860	255			
Sequential	246155	1			
Random	245130	254			
Ridlist	4575				
Hit	479823	25539	182527	269947	478013
Miss random	12935	0	2815	2085	4900
Miss asynch	1290	0	0	1019	1019
Read request	21370	0	2812	16830	19642
Synchronous	**14181**	0	2810	3083	**5893**
Seq prefetch	6482	0	0	13017	13017
List pref	284	0	0	606	606
Dyn prefetch	423	0	2	124	126
Read page	225391	0	2816	215064	217880
Synchronous	**14181**	0	2810	3083	**5893**
Seq prefetch	195324	0	0	201652	201652
List pref	6245	0	0	8536	8536
Dyn prefetch	9641	0	6	1793	1799

The synchronous reads have reduced by 58% though note there has been an increase in the number of prefetch reads

Buffer Pool Analyzer – Step 1 – run trace

Parameter	Value	Description
DB2SSID	(DB21)	DB2 subsystem id
PLANNAME	(FPEPLAN)	DB2 BPA planname
RECORD_FORMAT	(SHORT)	STandard or SHort(default)
DATATYPE	(DETAIL)	DEtail(default), SUmmary, or CAtalog
STARTTIME	(IM)	IMmediately(default) or hh:mm:ss,
DURATION	(2m)	Maximum job duration
MAX_RECORDS	(1M)	Maximum number of records to be collected
BUFSIZE	(1024)	Specifies the op buffer size in the DB2 Start Trace command.
SAMPLING	(15,10)	Indicates that tracing is done in sampling mode.

Buffer Pool Analyzer – Step 2 – object placement

Name	Page	Seq Access	Size	Data	Index	Sort Temp	Comment
BP17	4K	all	-40	YES	NO	NO	Small data pagesets
BP17	4K	all	-10	NO	YES	NO	Small index pagesets
BP18	4K	-50	all	YES	YES	NO	Random Access
BP19	4K	50-	all	YES	YES	YES	Sequential Access

- 50 means less than 50%

50- means greater than or equal to 50%

Buffer Pool Analyzer – Step 3 – ALTER Bufferpools

BP Name	VP Size		PG Steal	VP SEQT	VP PSEQT	PG FIX	DWQT	VDWQT
BEFORE								
BP20	1000		LRU	80	50	YES	30	5
AFTER								
BP17	80		FIFO	20	50	YES	40	5
BP18	644		LRU	20	50	YES	10	5
BP19	276		LRU	80	50	YES	10	5

BP17 is sized to hold all the objects and so can use FIFO as the page steal method

The other BP parameters were also reset according to the recommendation by BPA

Buffer Pool Analyzer – Step 4 – Run Simulation

	Separate Buffer Pools			Combined Buffer Pool		
Total Pages	Misses	Application Hit Ratio	Global Miss Ratio	Misses	Application Hit Ratio	Global Miss Ratio
280	88348	81.7	16.5	51209	89.4	9.5
330	56364	88.9	10.5	46128	90.9	8.6
430	30760	93.9	5.7	26570	94.8	4.9
480	24935	95.1	4.6	24201	95.2	4.5
530	23063	95.5	4.3	23313	95.4	4.3
1680	14774	97.1	2.8	14449	97.1	2.7
1730	13923	97.3	2.6	14165	97.2	2.6
1780	13089	97.4	2.4	13980	97.2	2.6
1980	11697	97.7	2.2	12556	97.5	2.3
2030	11042	97.8	2.1	12234	97.6	2.3
2430	7728	98.5	1.4	9219	98.2	1.7
2630	6432	98.7	1.2	8430	98.3	1.6
2780	5864	98.8	1.1	8123	98.4	1.5
2830	5666	98.9	1.1	8034	98.4	1.5
2880	5619	98.9	1.0	7959	98.4	1.5

DB2 Bufferpool Tuning with Buffer Pool Analyzer

- Summary
  - Correct object placement can improve application throughput by reducing synchronous IO
  - Buffer Pool Analyzer can simulate the usage of pools to show the tradeoff between storage and IO
  - Simple extension to automate object placement through sampling, loading data to DB2 table and using SQL to generate ALTERs