Total Solution Event for System z™ 2012

Innovate Transform Grow

IBM DB2 10 Migration Planning and Very Early Migration Experiences – Part 1

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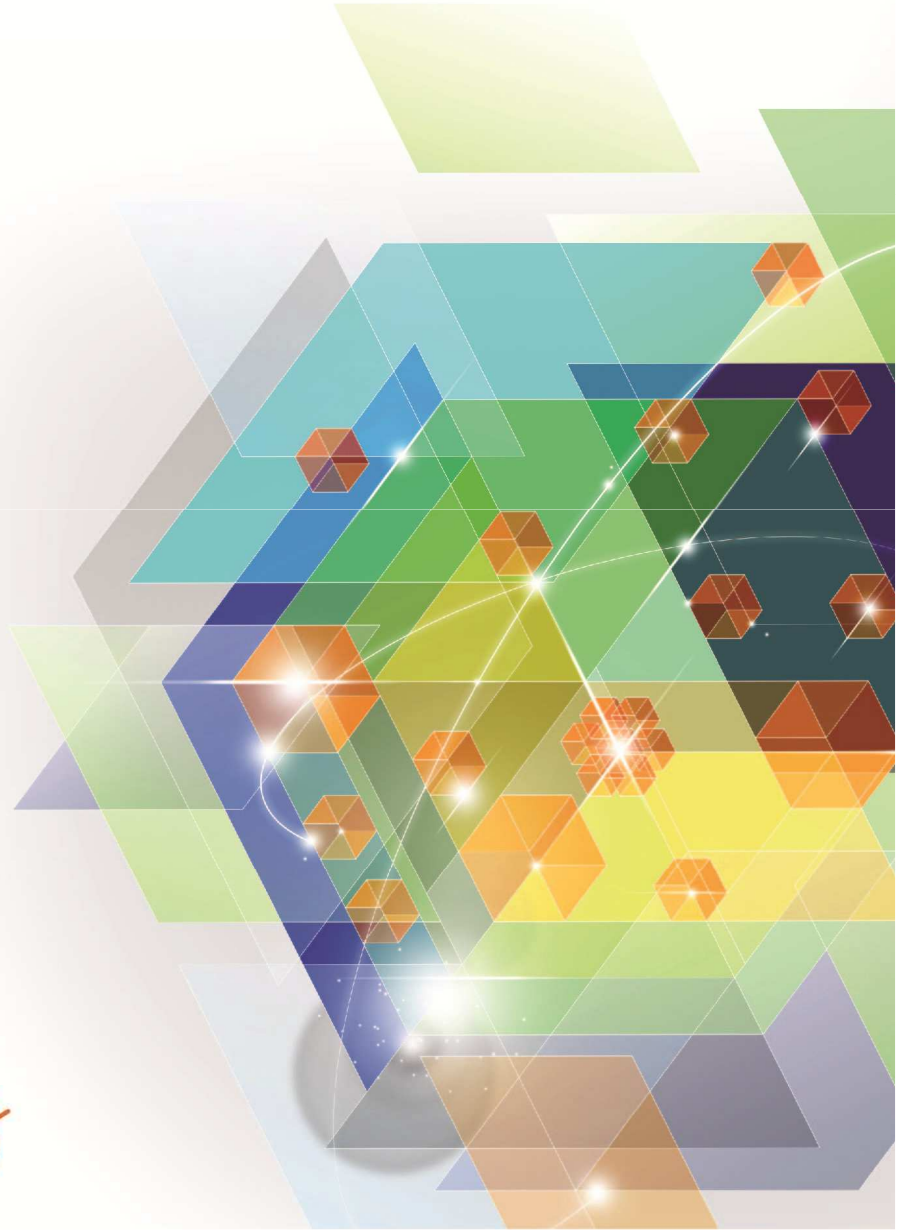
DB2 for z/OS Development



Redbooks

IBM

- **Title:**
- PTF UK76697 (APAR PM51093) is required for DB2 10 for z/OS NFM (New Function Mode) customers executing data recovery in a Data Sharing environment.
- **Abstract:**
- PTF UK76697 (APAR PM51093) is required for DB2 10 for z/OS NFM (New Function Mode) customers executing data recovery in a Data Sharing environment.
- **Description:**
- IBM has become aware of potential data loss when executing data recovery in a DB2 10 Data Sharing environment.
- The problem is related to Fast Log Apply processing when LRSN values are used for log record sequencing and may result in some log records not being processed when duplicate LRSN values are encountered. This situation applies to the RECOVER and RESTORE SYSTEM utilities and LPL and GRECP recovery. The REORG utility and DB2 restart processing are not exposed to this issue.
- Possible symptoms include ABEND04E RC00C90102 DSNIBHRE:0C22 accompanied by MSGDSNI012I PAGE LOGICALLY BROKEN or other consistency errors during log apply. Other abends or errors may be encountered following log apply processing, including errors reported by CHECK INDEX or CHECK DATA.
- **Recommended Action(s):**
- It is recommended that all DB2 10 for z/OS data sharing customers apply PTF UK76697 as soon as possible. Customers planning to migrate to DB2 10 NFM should ensure that UK76697 is applied before they do so. The corrective maintenance can be applied incrementally across members of a data sharing group. A group wide restart is not required.
- Fast Log Apply processing may be disabled to prevent further exposure to this problem before UK76697 can be applied. The process for doing so is as follows, and should be repeated for each subsystem:
  - .Edit macro DSN6SPRC in the SDSNMACS library.
  - .Change &SPRMFLB SETC '10' to &SPRMFLB SETC '0'.
  - .Run job DSNTIJUZ to reassemble and relink the new zparm.
  - .Recycle DB2 to load the new zparm.
- Refer to the cover letter for UK76697 for further details regarding this issue.

PM56535 DB2 10 for z/OS NFM users using UTS that was created in V9 may encounter broken pages during cross partition update cleanup operations in DSNIKDEF.

Correction PTF UK76352 is available

Notes There is no actual data loss, however, the potential exists for corrupted data pages and orphan pointer records.

Customers wishing to proactively check for this condition can use DSN1COPY with the CHECK option, which runs offline and is non-disruptive.

However, the IBM COPY utility would automatically detect corrupted data pages, so a normal backup cycle should be sufficient to validate data.

If DB2 detects a problem, then the page may be marked broken. This can be reset by REPAIR using REPAIR LOCATE db.ts PAGE(nnnn) RESET.

The IBM REORG utility will correct the page corruption.

PM58114 DB2 for z/OS V9 or DB2 10 for z/OS NFM uses concurrent "LOCK table" and "INSERT" on a PBG TABLESPACE may cause page regression.

Correction APAR remains open. Corrective relief, AM58114B, is available from DB2 Technical Support

Notes Latent data corruption may exist as a result of page regression.

CHECK INDEX and CHECK DATA are the best tools for attempting to proactively detect the situation. DSN1LOGP with the CHECK parm may also be used.

If any inconsistencies are encountered then they should be corrected, e.g. by using REORG or REBUILD INDEX

PM45458 DB2 10 for z/OS NFM users using UTS may receive ABEND04E RC00C90105 at DSNIREPR:0C27 when processing an UPDATE on a pointer record.

Correction PTF UK45458 is available (RSU 1110).

Notes Latent data page corruption is possible as a result of this problem.

DSN1COPY CHECK or the IBM COPY utility can be used to identify corrupted pages.

If found to exist, manual REPAIR by IBM Support may be required, and potentially a REORG.

PM55070 DB2 10 for z/OS NFM users of UTS table spaces defined for row level locking that are performing SQL UPDATE may see broken pages during backout processing.

Correction APAR remains open. Corrective relief, AM55070, is available from DB2 Technical Suppor

Notes This is a problem specific to freespace reuse and later rollback. There should be no latent data corruption. i.e. the only way a customer would have data corruption is if they actually encountered an abend during rollback, in which case the page would be marked broken and they should report the problem to IBM Support. There is no need for customers to proactively check for problems. If such is desired, then any utility such as DSN1COPY, REORG, COPY or any application access would report a page marked broken.Then they should be corrected, e.g. by using REORG or REBUILD INDEX

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Objectives

- Share lessons learned, surprises, pitfalls
- Provide hints and tips
- Address some myths
- Provide additional planning information
- Provide usage guidelines and positioning on new enhancements

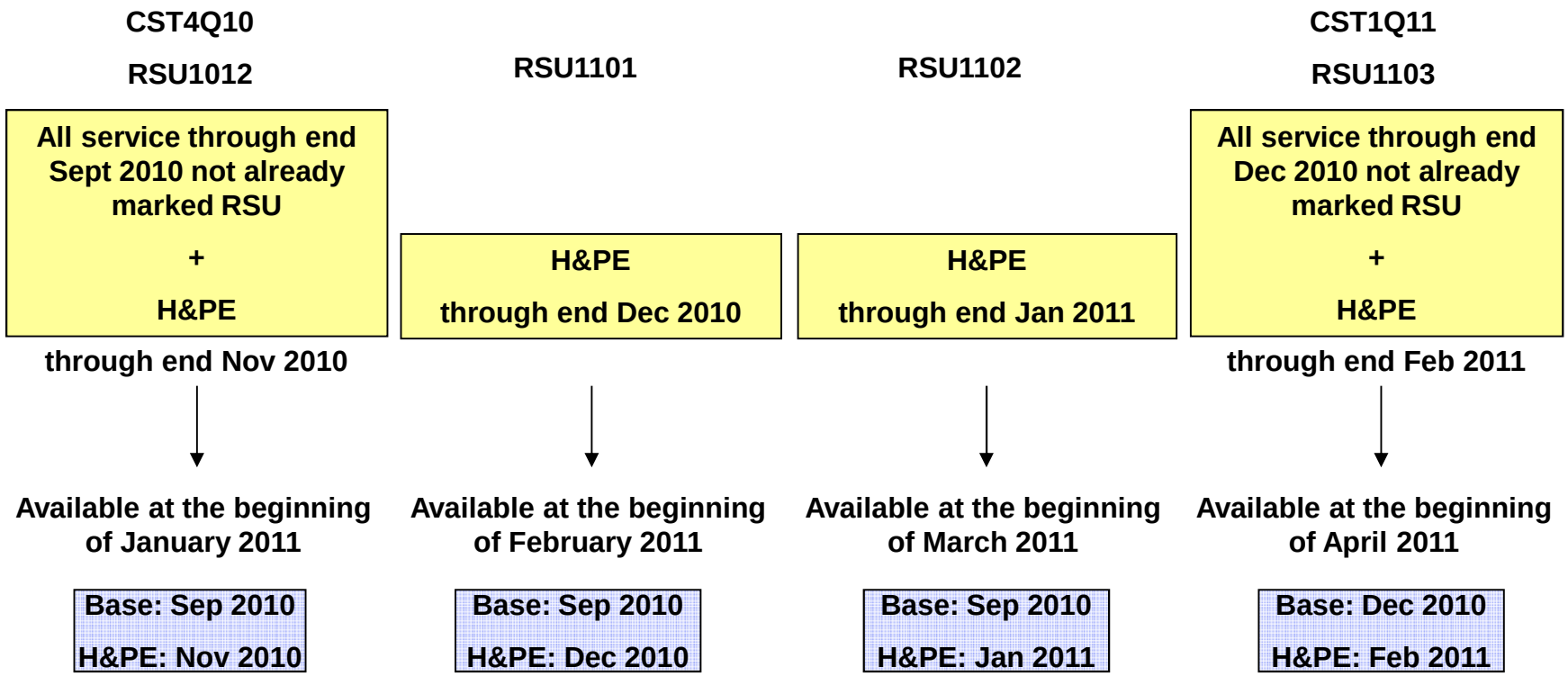
Agenda

- Keys to customer migration success
- Performance and Scalability
- BIND, REBIND and EXPLAIN
- Availability
- Migration Planning
- Removal of DDF Private Protocol
- Security Considerations when removing DDF Private Protocol
- Other
- Summary

Keys to customer migration success

1. Plan for continual application of preventative service
   - Need to stay more current on HIPERs at this stage in the release take up cycle
   - Apply preventative service every 3 months
     - Two “major” and two “minor” releases
     - Refresh of the base every 6 months (“major”)
     - Each base should be based on latest quarterly RSU as opposed use of PUT
     - In addition, two ‘minor’ packages covering HIPERs and PEs in between time
   - Augment by exploiting Enhanced HOLDDATA on a weekly basis before production cutover and continue thereafter
     - Identify and pull all applicable HIPERs and PE fixes
     - Expedite the most critical PTFs into production
2. Perform application regression and stress testing is the best way to keep ‘fires’ away from production
3. Build a realistic project plan
   - Avoid crash project
   - Allow contingency for ‘bumps in the road’
   - Involve applications teams early
     - Investigation of incompatible changes and fix up
     - Testing

CST and RSU example



H&PE = HIPER/Security/Integrity/Pervasive PTFs + PE resolution (and associated requisites and supersedes)

Performance and Scalability

- Many opportunities for price/performance (cost) improvements
  - Major theme of this release
  - Most welcome to our customers
- Customers intimidated by the marketing noise about improved performance
  - Expectation of their CIO
  - For some of their workloads not seeing improvements in CPU and elapsed time
  - Conversely see big improvements for certain workloads
  - Small workloads can skew expectations on savings
  - Some measurements and quotes are insanely positive
    - Should be ignored
  - How to extrapolate and estimate for production mixed workload?
    - Estimation with accuracy and high confidence not practical
    - Benchmarking effort would be required
- Very important to correctly level set customer performance expectations
- Customers should not spend any performance benefits until they see them

Performance and Scalability …

- Assumes no major access path regressions
- On Day 1 in production in CM without any changes (e.g., no rebind, no use of 1MB page size) there may be customers who see zero % improvement and even some will see degradation
  - Why? SPROCs disabled, puffing of run time structures for migrated packages from V8 or V9, etc
- To maximise the performance improvements must:
  - REBIND static SQL packages
  - Use PGFIX=YES bufferpools with sufficient 1MB real storage page frames to 100% fully back the requirement from PGFIX=YES bufferpools
- Seeing 0-10% improvement after REBIND and use of 1MB real storage frames
- Need to look at total CPU resource consumption picture across
  - Acctg Class 2 TCB Time (Accounting Trace)
  - DB2 System Address spaces (Statistics Trace)

Performance and Scalability …

- Customers should expect to see some increase in real storage consumption (10-30%)
  - Must also factor in MAXSPACE requirement for DB2 dumps (approx 16GB)
    - Avoid very long dump capture times and bad system performance
    - Critical for V10 serviceability

Performance and Scalability …

- The 0-10% CPU reduction is based on the DB2 portion of a given application workload
- Customer value driven on how sub-capacity workload licensing works
  - Based on 4-hour rolling average MSU utilisation
  - Highest rolling average figure for each month used to calculate software charges for all MLC products (IBM and non-IBM)
  - Provided DB2 forms a significant component of the total MSU usage during peak period, any MSU savings will translate directly to MLC savings
  - Typically this is the online day - mid morning and mid afternoon
  - So for example - this may be driven by CICS-DB2 workload where the DB2 portion of the workload only represents 40-60% of the total path length
  - So the 0-10% may represent only 0 to 6% (i.e., needs to be discounted)
  - Investigate how much CPU is used in the 4-hour period for DB2 work (SQL)
  - Evaluate V10 price bands under WLC pricing vs. V10 MSU savings
  - Factor in the impact on overall z/OS software stack cost reduction
    - z/OS, CICS, MQ

Performance and Scalability …

- Sub capacity pricing

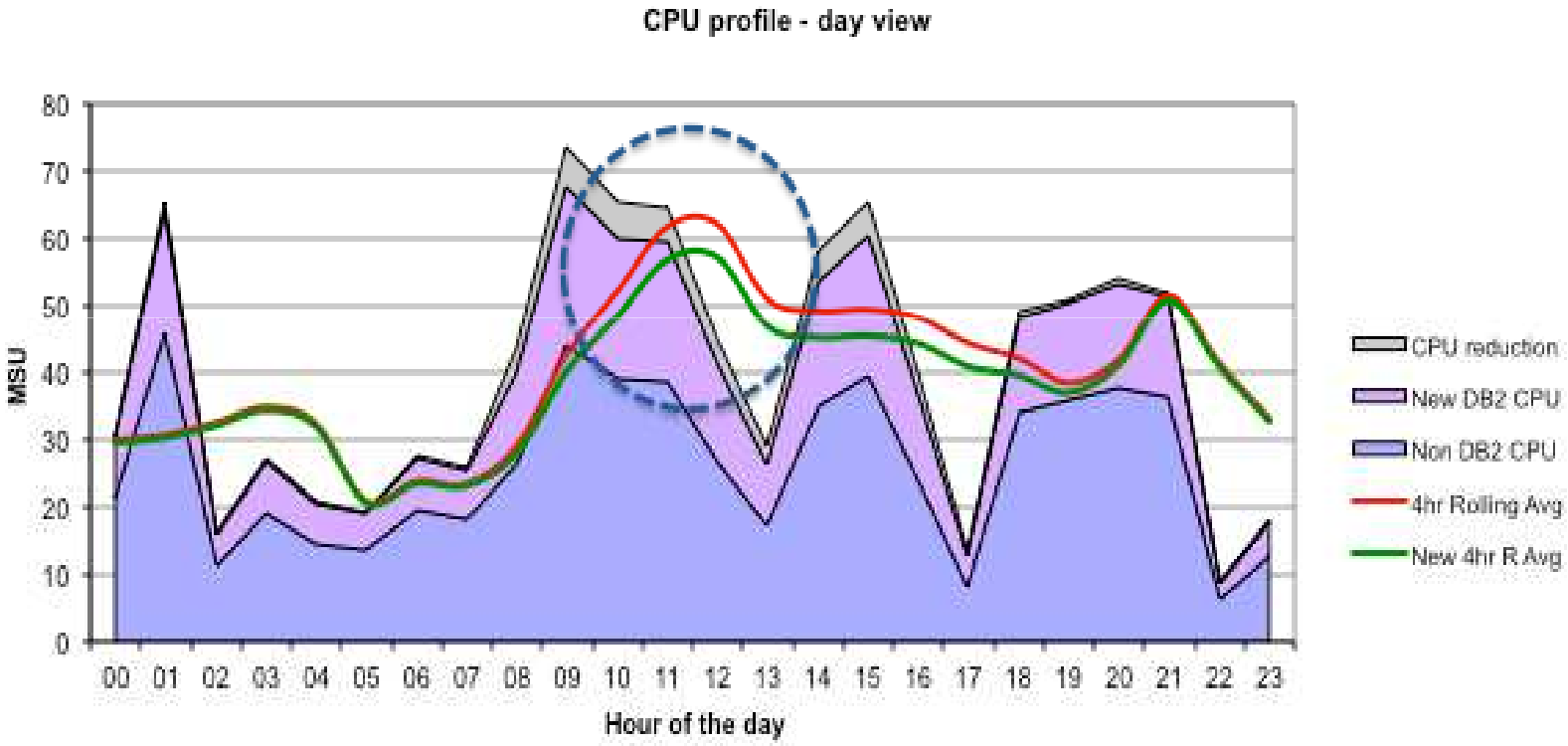


Chart courtesy of Cristian Molaro, taken from White Paper: Getting the financial benefits of DB2 10 for z/OS

Performance and Scalability …

- Opportunities for additional price/performance improvements driven by DBM1 31-bit VSCR supported by additional real storage include
  - More use of persistent threads with selective use of RELEASE(DEALLOCATE)
    - High Performance DBATs
    - CICS Protected ENTRY Threads
    - CICS Unprotected ENTRY Threads with queuing
    - Typical savings 0-10%, may be more
  - Increasing MAXKEEPD to improve Local Dynamic Statement Cache hit ratio and reduce the number of short prepares
  - Sysplex/Data sharing Group consolidation
    - So for example, 8-way to 4-way
    - Reduced cost of data sharing
- Very important to correctly level set customer performance expectations
- Customers should not spend any performance benefits until they see them

Performance and Scalability …

Workload	Customer Results
CICS online transactions	Approx. 7% CPU reduction in DB2 10 CM after REBIND, additional reduction when 1MB page frames are used for selective buffer pools
CICS online transactions	Approx 10% CPU reduction from DB2 9
CICS online transactions	Approx 5% CPU reduction from DB2 V8
CICS online transactions	10+% CPU increase
Distributed Concurrent Insert	50% DB2 elapsed time reduction, 15% chargeable CPU reduction after enabling high performance DBAT
Data sharing heavy concurrent insert	38% CPU reduction
Queries	Average CPU reduction 28% from V8 to DB2 10 NFM
Batch	Overall 20-25% CPU reduction after rebind packages

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Performance and Scalability …

Workload	Customer Results
Multi row insert (data sharing)	33% CPU reduction from V9, 4x improvement from V8 due to LRSN spin reduction
Parallel Index Update	30-40% Elapsed time improvement with class 2 CPU time reduction
Inline LOB	SELECT LOB shows 80% CPU reduction
Include Index	17% CPU reduction in insert after using INCLUDE INDEX
Hash Access	20-30% CPU reduction in random access 16% CPU reduction comparing Hash Access and Index-data access. 5% CPU reduction comparing Hash against Index only access Further improvements delivered late in the beta program.

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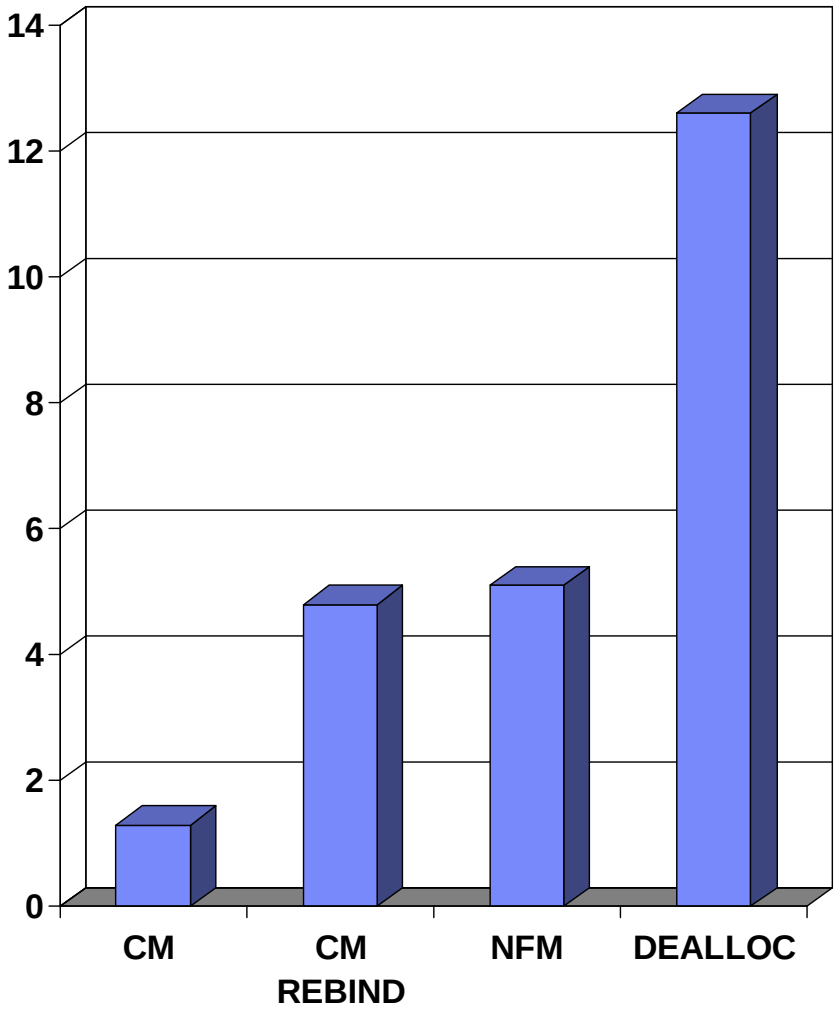
Performance and Scalability …

- Measurements of IBM Relational Warehouse Workload (IRWW) with data sharing
  - Base: DB2 9 NFM REBIND with PLANMGMT EXTENDED
  - DB2 9 NFM → DB2 10 CM without REBIND showed 1.3% CPU reduction
  - DB2 10 CM REBIND with same access path showed 4.8% CPU reduction
  - DB2 10 NFM brought 5.1% CPU reduction
  - DB2 10 CM or NFM with RELEASE DEALLOCATE 12.6% CPU reduction from DB2 9



Performance and Scalability …

- Query performance enhancements
  - No REBIND required for
    - Index list prefetch
    - INSERT index read I/O parallelism
    - Workfile spanned records
    - SQLPL performance
    - High performance DBATs
    - Inline LOBs

Performance and Scalability …

- Query performance enhancements …
  - REBIND required for
    - Use of RELEASE(DEALLOCATE)
    - Early evaluation of residual predicates
    - IN-list improvements (new access method)
    - SQL pagination (new access method)
    - Query parallelism improvements
    - Index include columns
    - More aggressive view/table expression merge
    - Predicate evaluation enhancements
    - RID list overflow improvements
  - Execute RUNSTATS before REBIND
    - When coming from V8, to collect improved index statistics including CLUSTERRATIOF
    - When coming from V9, if do not already include the KEYCARD option of RUNSTATS

Performance and Scalability …

- Potential for access path regression when using OPTIMIZE FOR 1 ROW
  - Used by customers as a hint to discourage use of sort or list prefetch
  - Sometimes applied as an installation SQL coding standard
  - DB2 access path selection has always been cost based
  - V10 ‘hammer’ change
    - Excludes the ‘sort’ access plan candidates
    - Remaining ‘sort avoidance’ access plans compete on cost – lowest cost wins
    - If no ‘sort avoidance’ access plans, then ‘sort’ access plans remain and compete on cost
  - Seeing increasing evidence of access path regression when multiple candidate indexes available e.g.,
    - DB2 using alternate index with lower MATCHCOLS value because there is no sort
  - Solutions
    - Change application to code OPTIMIZE FOR 2 ROWS
    - Alter an existing index or create a new index that would support both sort avoidance and index matching (if predicates allow)
    - APAR PM56845 now open to provide option for OPTIMIZE FOR 1 ROW to allow sort access plans

Performance and Scalability …

- Increase in DB2 system address space CPU resource consumption
  - DBM1 SRB
    - More use of prefetch
      - Row level sequential detection and progressive prefetch
      - INSERT index read I/O parallelism
      - Index list prefetch when disorganised index
      - After BIND, more use of list prefetch
    - zIIP offload for prefetch and deferred write
      - Seeing 50-70% zIIP offload achieved
  - DBM1 TCB
    - Closing of high use CLOSE=YES datasets when hitting DSMAX because of stale list
    - See APAR PM56725 for this issue
  - MSTR TCB
    - Increase related to real storage monitoring which was introduced (APAR PM24723)
    - DB2 is calling a z/OS RSM service for COUNTPAGES function which serialised the frame access with spin loop
    - CPU increase especially when multiple DB2 subsystems running on the same LPAR
    - See z/OS APAR OA37821 and corresponding DB2 APAR PM49816 for this issue

Performance and Scalability …

- Bufferpool Page Classification
  - Sequential, dynamic, and list prefetch are all treated the same
    - Pages are marked *sequential* at the time they are prefetched
  - In V8
    - These pages were reclassified as *random* when subsequently touched via getpage
  - In V9 and V10
    - None of them will be re-classified to *random* on a getpage
- CF utilisation issue
  - Root cause is the way GBP data in the CF is deleted in V10
  - CF DELETE call option being invoked by V10 deletes both data and directory entries in one CF call
    - But the code path used with name class mask requires more internal CFCC serialisation and can take longer
      - Results in significantly more re-drives of the DELETE requests observed with V10
      - Increased volume of re-drives causes the significant increase in CF utilisation
  - See APAR PM51467 for this issue

Performance and Scalability …

- DB2 10 and z196 synergy
  - Taking the general case, performance improvement from V9 to V10 observed on z10 processor should be in same range on z196 processor as long as they are measured on the same number of processors
    - Expectation is still in the 5-10% range
  - Apart from MIPs improvement, z196 provides
    - Higher cache hit ratio thus better scalability as number of processors per LPAR increases (more than 16 processors per LPAR)
  - V10 performance on z196
    - Scales better with more processors per LPAR than z10
    - Can run with higher number of concurrent threads
  - IBM measurement shows 20% ITR improvement from V9 (with a few benchmark specials) compared to V10 on z196 80-way with IRWW-like workload
    - Measurement is extreme case
    - Will only apply to very high end customers
    - Not a general message
  - Why does V10 run better on z196
    - Latch contention reductions, 1MB real storage page frame size, general path length

Performance and Scalability …

- Use of 1MB size real storage page frames on z10 and z196
  - Long term bufferpool page fix was introduced in V8 to reduce CPU
    - Many customers reluctant to use PGFIX=YES
    - Potential for real storage shortage because running too close to the edge of the amount of real storage provisioned
    - Customers do understand the value, but it only applies for a few hours each day
    - But page fix is a long term decision
    - In most cases requires DB2 recycle to change attribute
    - 75% cost reduction on real storage on z196 (USD1.5K vs. USD6K)

Performance and Scalability …

- Use of 1MB size real storage page frames on z10 and z196 …
  - Potential for reduced for CPU through less TLB misses
  - CPU reduction based on customer experience 0 to 6%
  - Buffer pools must be defined as PGFIX=YES to use 1MB size page frames
  - Must have sufficient total real storage to fully back the total DB2 requirement
  - Involves partitioning real storage into 4KB and 1MB size page frames
    - Specified by LFAREA xx% in IEASYSnn parmlib member and only changeable by IPL
    - 1MB size page frames are non-pageable
    - If 1MB size page frames are overcommitted, DB2 will use 4KB size page frames
    - Recommendation to add 5-10% to the size to allow for some growth and tuning
  - Must have both enough 4KB and enough 1MB size page frames
  - Do not use 1MB size real storage frames until running smoothly on V10
  - Make sure any critical z/OS maintenance is applied before using 1MB size real storage page frames

Performance and Scalability …

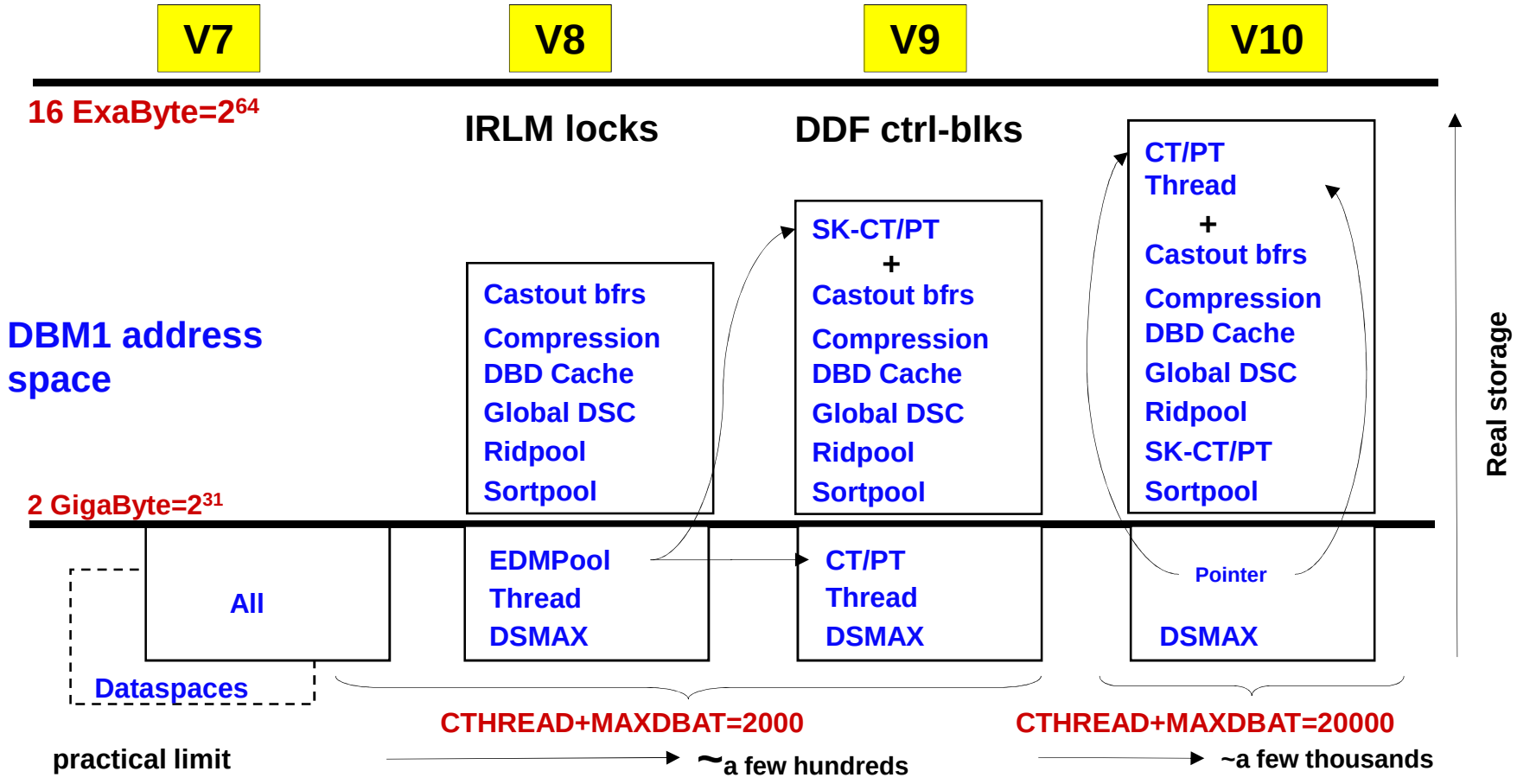
- Use of 1MB size real storage page frames on z10 and z196 …
  - Useful commands
    - DB2 -DISPLAY BUFFERPOOL(BP1) SERVICE=4
      - Useful command to find out how many 1MB size page frames are being used
      - Especially useful when running multiple DB2 subsystems on the same LPAR
      - See DSNB999I message
    - MVS -DISPLAY VIRTSTOR,LFAREA
      - Show total LFAREA, allocation split across 4KB and 1MB size frames, what is available
      - See IAR019I message

Performance and Scalability …

- Exceptions where CPU regression for very light OLTP transactions
  - Skinny packages with few simple SQL
  - Package allocation cost overrides benefit from SQL optimizations in V10
  - APAR PM31614 may solve this by improving package allocation performance
  - Good candidate for the use of persistent threads with RELEASE(DEALLOCATE) and will help compensate

Performance and Scalability …

- DBM1 31-bit Virtual Storage Constraint Relief with 64-bit SQL run time

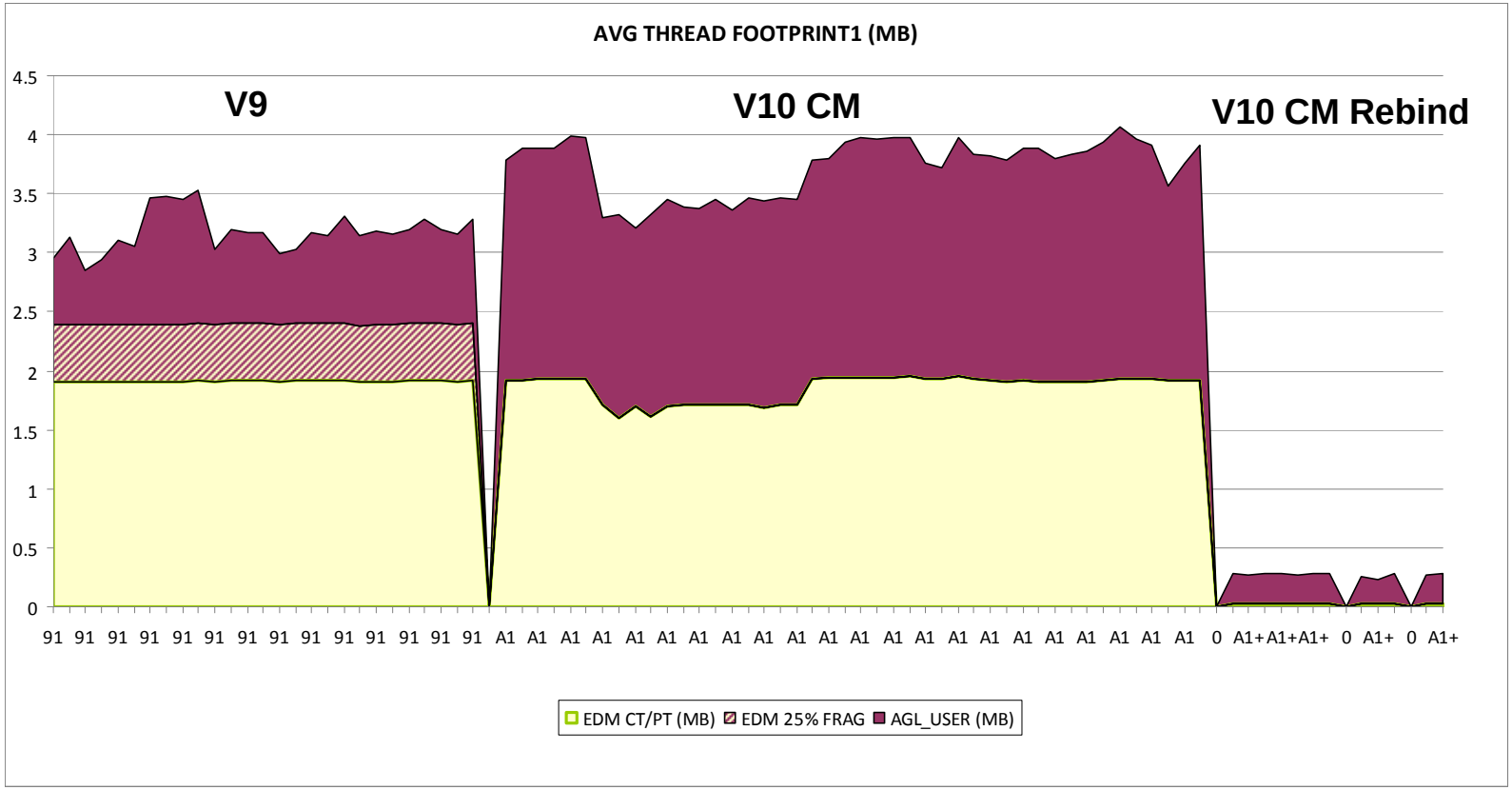


Performance and Scalability …

- DBM1 31-bit Virtual Storage Constraint Relief with 64-bit SQL run time
  - Available in CM
  - Requirement to REBIND static SQL packages to accrue maximum benefit
  - Very good results achieved (up to 90% VSCR)
  - Have high degree of confidence that problem addressed
    - Real world proposition: 500 -> 2500-3000 threads plus
  - Limiting factors now on vertical scalability (# number of threads, thread storage footprint)
    - Amount of real storage provisioned on the LPAR
    - Log latch (LC19) contention
    - ESQA/ECSA (31-bit) storage

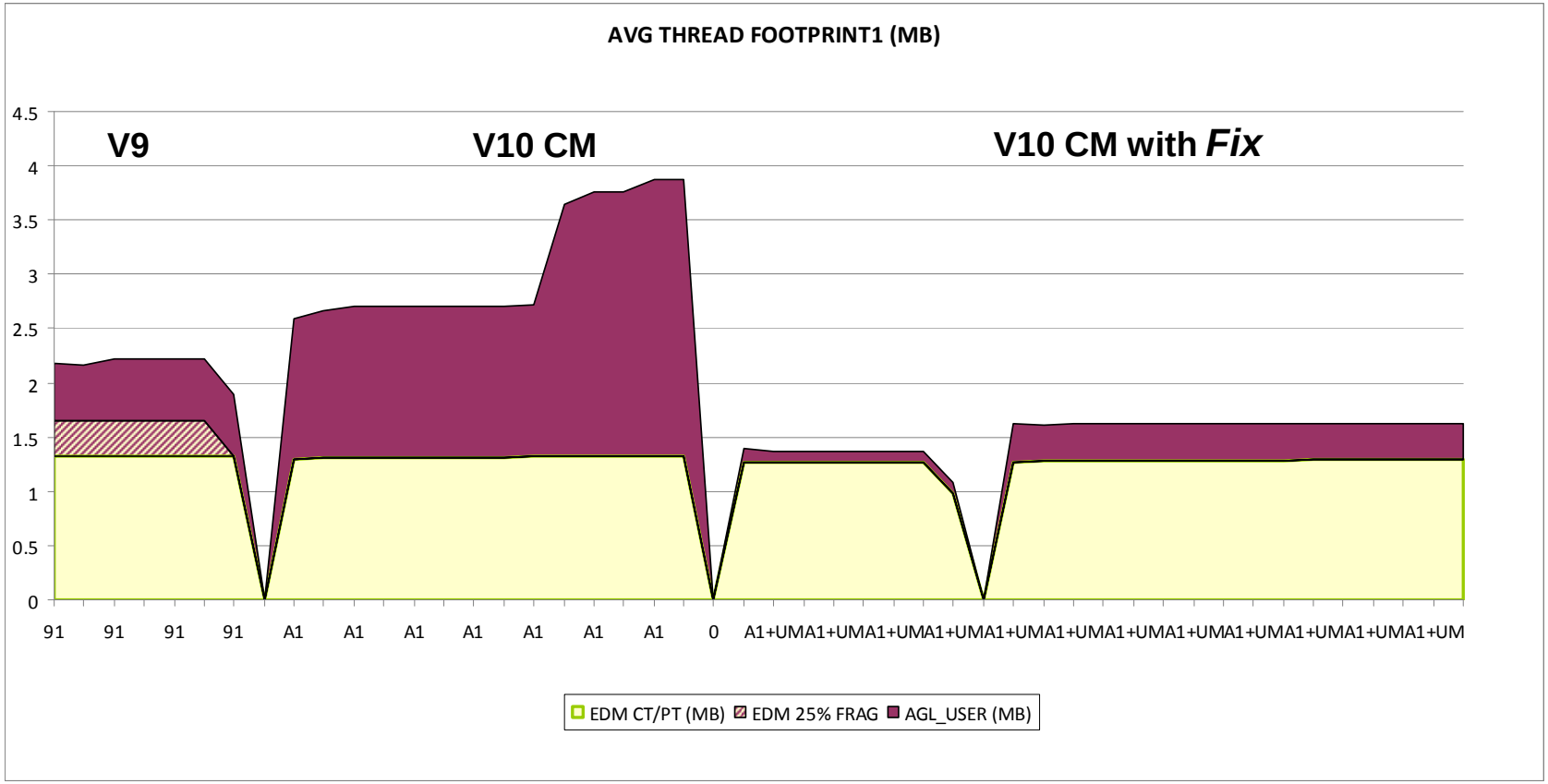
Performance and Scalability …

- DBM1 31-bit Thread Storage V9 vs. V10 – Initially but corrected prior to GA



Performance and Scalability …

- DBM1 31-bit Thread Storage V9 vs. V10 – as at GA after Fix



Performance and Scalability …

- DBM1 31-bit Virtual Storage Constraint Relief with 64-bit SQL run time
  - Major customer opportunities here for 31-bit VSCR and improved price/performance
    - Potential to reduce legacy OLTP transaction CPU cost through use of
      - More CICS protected ENTRY (persistent) threads
      - More use of RELEASE(DEALLOCATE) with next/existing persistent threads
    - Potential to reduce CPU for DRDA transactions by using High Performance DBAT
      - Must be using CMTSTAT=INACTIVE so that threads can be pooled and reused
      - Packages must be bound with RELEASE(DEALLOCATE) to get reuse for same connection
      - MODIFY DDF PKGREL(BNDOPT) must also be in effect
      - Do not to overuse RELEASE(DEALLOCATE) on packages
        - > Will drive up the MAXDBAT requirement
    - Potential to reduce CPU when using KEEPDYNAMIC(YES) e.g., SAP
      - Increase MAXKEEPD to improve Local Dynamic Cache Hit Ratio and reduce the number of short prepares
  - Must provision additional real storage to back the requirement for each opportunity

Performance and Scalability …

- DBM1 31-bit Virtual Storage Constraint Relief with 64-bit SQL run time
  - More persistent threads with RELEASE(DEALLOCATE) is also trade off with BIND/REBIND and DDL concurrency
  - For RELEASE(DEALLOCATE) some locks are held beyond commit until thread termination
    - Mass delete locks (SQL DELETE without WHERE clause)
    - Gross level lock acquired on behalf of a SQL LOCK TABLE
    - Note: no longer a problem for gross level lock acquired by lock escalation
  - CICS-DB2 accounting for cost of thread create and terminate, or avoidance thereof
    - CICS uses the L8 TCB to access DB2 irrespective of whether the application is thread safe or not
    - Thread create and terminate cost will clock against the L8 TCB and will be in the CICS SMF Type 110 record
    - Note: prior to OTE did not capture the thread create in the SMF Type 110

Performance and Scalability …

- DBM1 31-bit Virtual Storage Constraint Relief with 64-bit SQL run time
  - High Performance DBATs (Hi-Perf DBATs) is a new type of distributed thread
    - Must be using CMTSTAT=INACTIVE so that threads can be pooled and reused
    - Packages must be bound with RELEASE(DEALLOCATE) to get reuse for same connection and -MODIFY DDF PKGREL(BNDOPT) must also be in effect
    - When a DBAT can be pooled after end of client's UOW
      - Now DBAT and client connection will remain active together
        - Still cut an accounting record and end the enclave
      - After the Hi-Perf DBAT has been reused 200 times
        - DBAT will be purged and client connection will then go inactive
      - All the interactions with the client will still be the same in that if the client is part of a sysplex workload balancing setup, it will still receive indications that the connection can be multiplexed amongst many client connections
      - IDTHTOIN will not apply if the if the Hi-Perf DBAT is waiting for the next client UOW
      - If Hi-Perf DBAT has not received new work for POOLINAC time
        - DBAT will be purged and the connection will go inactive
      - If # of Hi-Perf DBATs exceed 50% of MAXDBAT threshold
        - DBATs will be pooled at commit and package resources copied/allocated as RELEASE(COMMIT)
      - Hi-Perf DBATs can be purged to allow DDL, BIND, and utilities to break in
        - Via -MODIFY DDF PKGREL(COMMIT)

Performance and Scalability …

- DBM1 31-bit Virtual Storage Constraint Relief with 64-bit SQL run time
  - High Performance DBATs (Hi-Perf DBATs) should be carefully
    - Want to have some high performance applications running on LUW application servers connected to DB2 10 for z/OS running with High Performance DBATs and others not
    - Standard ODBC and JDBC packages supplied with drivers/connect packages should be bound twice into two different package collections e.g.,
      - The CS package in collection1 will be bound with RELEASE(DEALLOCATE) so that the applications using that package will be eligible to use high performance DBATs
      - The CS package in collection2 (e.g., NULLID) would be bound with RELEASE(COMMIT) and would not use high performance DBATs
    - For JDBC applications
      - Set the currentPackageSet property in the respective datasource
    - For .NET and ODBC / CLI applications
      - Set CurrentPackageSet parameter in the db2dsdriver.cfg configuration

Performance and Scalability …

- DBM1 31-bit Virtual Storage Constraint Relief with 64-bit SQL run time
  - Potential to reduce the number of DB2 subsystems in data sharing group
    - First step is to collapse multiple DB2 members running on the same LPAR
    - May then be able to reduce the number of LPARs/DB2 members
    - Consider the increase in logging rate per DB2 member
      - Possible aggravation of LC19 contention despite V10 improvement
    - Consider the increase in SMF data volume per LPAR
      - Can enable DB2 compression of SMF data to reduce SMF data volume
        - > Experience is that Accounting records compress 70-80%
        - > Tiny CPU overhead at ~1%
      - Re-consider use of accounting roll up for DDF and RRSAF workload (default)
        - > Compromises performance PD/PSI as lose information on outlying transactions
        - > Significant enhancements to package level accounting so it is now useful
    - Consider the increased DUMPSRV and MAXSPACE requirement
  - Re-emphasise the continued value of data sharing to differentiate the platform
    - Support avoidance of planned outages
    - Avoid humongous single points of failure
    - Minimum of 4-way for true continuous availability

Performance and Scalability …

- 64-bit virtual storage
  - Three large areas allocated at IPL time
    - Common 6GB (z/OS default)
      - Addressable by all authorized programs on the LPAR
      - IFC for accounting
    - Private 1TB
      - Buffer pools
      - XML and LOB are huge users, RTS blocks, TRACE buffers,
      - some RID blocks, IFC work buffers and few other misc system pools
    - Shared (Private) 128GB
      - Addressable by all authorized products which have registered their interest to z/OS using the unique object token created when the memory object is created
      - V9 introduced 64-bit shared private storage but it was used in limited fashion
      - Almost all the DB2 storage in V10 is now 64-bit shared private
  - DB2 is only "reserving" virtual storage, it does not mean it is being used
    - It costs nothing to reserve virtual storage i.e., addressing range
    - Having a fixed size areas is a lazy design but it makes it easier for serialization
  - Needs to be backed by real storage when it is allocated within the reference area

Performance and Scalability …

- 31-bit and 64-bit virtual storage contraction
  - CONTSTOR=YES and MINSTOR=YES
    - These existing system parameters drive the contraction of 31-bit storage pools and the best fit allocation of 31-bit storage respectively
    - Not applicable to 64-bit storage
    - Not as critical as before V10
    - Assuming generous DBM1 31-bit VSCR in V10, set CONSTOR=MINSTOR=NO
  - 64-bit thread pools are contracted under control of
    - Commit count
    - New Real Storage Management DISCARD function (see follow on slides)

Performance and Scalability …

- Real storage
  - Need to carefully plan, provision and monitor real storage consumption
  - Prior to V10 a hidden zparm SPRMRSMX (‘real storage kill switch’) existed
    - SPRMRSMX prevents a runaway DB2 subsystem from taking the LPAR down
      - Should be used when there is more than one DB2 subsystem running on the same LPAR
      - Aim is to prevent multiple outages being caused by a single DB2 subsystem outage
      - Should to set to 1.5x to 2x normal DB2 subsystem usage
      - Kills the DB2 subsystem when SPRMRSMX value reached
    - With V10, will need to factor in 64-bit shared and common use to establish new footprint
  - Problems with introduction of V10
    - Unable to monitor the REAL and AUX storage frames used for 64-bit shared storage
      - V9 not really an issue, as limited use of 64-bit shared
      - But now V10 makes extensive use of 64-bit shared
    - LPAR level instrumentation buckets for REAL and AUX storage use
      - If more the one DB2 subsystem on the same LPAR then the numbers reported are inaccurate
      - Only able to get reliable numbers if only one subsystem like DB2 on the LPAR uses 64-bit shared
    - Lack of ENF 55 condition monitoring
      - 50% of AUX used

Performance and Scalability …

- Real storage …
  - DB2 APAR PM24723 is very important
    - Monitoring issue is addressed and new extensions to IFCID 225 provided
      - Pre-req is new MVS APAR OA35885 which provides a new callable service to RSM to provide REAL and AUX used for addressing range for shared objects
    - SPRMRSMX hidden zparm now becomes an opaque parameter REALSTORAGE_MAX
    - Introduces DISCARD mode to contract storage usage to protect against excessive paging and use of AUX
      - New zparm REALSTORAGE_MANAGEMENT controls when DB2 frees storage frames back to z/OS
        - ON -> Discard unused frames all the time - discard stack, thread storage, keep footprint small
        - OFF -> Do not discard unused frames unless things are getting out of hand
        - AUTO (default) -> Detect whether paging is imminent and reduce the frame counts to avoid system paging
      - With AUTO, DB2 monitors paging rates, switches between ON/OFF and decides when to discard frames based on
        - 80% of SPRMRSMX reached
        - 50% of AUX (ENF55 condition) used
        - Hitting AVQLOW (available real storage frame)
      - New messages (DSNV516I, 517I) for when paging rate thresholds cause DB2 to free real frames
    - Strong recommendation to apply PTF for APAR PM24723 before going into business production and to run with REALSTORAGE_MANAGEMENT=AUTO

Performance and Scalability …

- Monitoring Virtual and Release Storage
  - SPREADSHEETDD support in OMPE has not been enhanced to support V10
    - OMPE are working on a 'generic' spreadsheet generator
    - Outstanding requirement to also include serviceability fields
  - MEMU2 and MEMUSAGE already enhanced for V10 and available on the DB2 for z/OS Exchange community website on IBM My developerWorks
    1. From IBM My developerWorks My Home (sign in with your IBM login at https://www.ibm.com/developerworks/mydeveloperworks/homepage), search 'memu2' in All My developerWorks.
    2. (From DB2 for z/OS Exchange (http://www.ibm.com/developerworks/software/exchange/db2zos), click on 'View and download examples'. The file is tagged with 'memu2'.
    3. To access MEMU2 directly (but note that if you want to be kept informed of updates and new versions, you need to log on to developerWorks rather than download the file anonymously...)
       - V8/V9

https://www.ibm.com/developerworks/mydeveloperworks/files/app/file/3af12254-4781-43f3-b4a8-3336e09c36df?lang=en

       - V10

https://www.ibm.com/developerworks/mydeveloperworks/files/app/file/e2736ed5-0c73-4c59-b291-9da08255b941?lang=en

More information on zEnterprise

- IBM zEnterprise / System z Redbooks Portal: http://www.redbooks.ibm.com/portals/systemz
- IBM zEnterprise Announcement Landing Page: ibm.com/systems/zenterprise196
- IBM zEnterprise HW Landing Page: ibm.com/systems/zenterprise196
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- IBM System Storage: ibm.com/systems/storage/product/z.html
- IBM Global Financing: ibm.com/financing/us/lifecycle/acquire/zenterprise/
- Global Technology Services: http://www.ibm.com/services/us/index.wss/offerfamily/gts/a1027714

Bedankt!