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Le novità dell’annuncio z13 in ambito Analytics
Agenda

• DB2 for z/OS Architecture

• BIG MEMORY

• Beyond big memory – more good z13 stuff for z/OS data and analytics people

• DB2 11 for z/OS and Big data
Reliable Analytics by Using IBM z13
DB2 z/OS Architecture
DB2 and z13

- **DB2 workloads**
  - DB2 workloads showing approx. 10% better normalized throughput compared to zEC12 (LSPR, SAP, zBAPI)
  - Increase of **zIIP** processor capability by **multi-thread exploitation**
    - Cognos BI-day operational/tactical queries with SMT-2 showing up to 16% normalized throughput improvements compared to without SMT-2 when zIIPs are over-utilized (> 80% CPU utilization) Benefit varies based on the workload/configurations

- **Increased DB2 buffer pools**
  - SAP banking workload showing 66% response time reduction and 14% DB2 CPU time reduction by expanding buffer pools from **161 to 638 GB**

- **Analytics – z13 & IDAA**
  - Compared to zEC12 & N2001, 47% response time improvement was observed using z13 & N3001 using Cognos BI-day queries
BIG MEMORY
Memory evolution

16 ExaByte = $2^{64}$

DBM1 address space

2 GigaByte = $2^{31}$

EDMPool

Thread

DSMAX

Cthread + Maxdbat = 2000

Cthread + Maxdbat = 20000

- few hundreds

- few thousands

Log buffer V11
CT/PT
Thread
+ Castout bfrs
Compression
DBD Cache
Global DSC
Ridpool
Sortpool

More Real storage 10 – 30%+

CASTout bfrs
Compression
DBD Cache
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First, why is Big Memory a Big Deal?

- Because NOTHING boosts DB2 performance and CPU efficiency like a large real storage resource in a z/OS LPAR

- The most obvious use of Big Memory is big buffer pools
  - every one of the pools in this configuration is defined with PGFIX(YES)
  - the demand paging rate on the associated z/OS LPAR is ZERO
  - the DB2 for z/OS development team anticipated really big buffer pools when they provided support for pools backed by 2 GB page frames

“Memory is cheap or one time charge, CPUs are expensive”
“For every I/O that you save, you avoid the software charge for the CPU that it took to otherwise do that I/O”
## Buffer Pool enhancements...

<table>
<thead>
<tr>
<th>Frame size</th>
<th>Page fix</th>
<th>Supported DB2</th>
<th>H/W Requirement</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4K</td>
<td>NO</td>
<td>All</td>
<td>N/A</td>
<td>Most flexible configuration</td>
</tr>
<tr>
<td>4K</td>
<td>YES</td>
<td>All</td>
<td>N/A</td>
<td>CPU reduction during I/O</td>
</tr>
<tr>
<td>1M</td>
<td>NO</td>
<td>DB2 10 with APAR, or DB2 11</td>
<td>zEC12/z13 and Flash Express Backed by real or LFAREA</td>
<td>CPU reduction from TLB hit Control Blocks only, also applies to 2G Framesize</td>
</tr>
<tr>
<td>1M</td>
<td>YES</td>
<td>DB2 10 or DB2 11</td>
<td>z10 above LFAREA 1M=xx</td>
<td>CPU reduction during I/O, CPU reduction from TLB hit</td>
</tr>
<tr>
<td>2G</td>
<td>YES</td>
<td>DB2 11</td>
<td>zEC12 / z13 LFAREA 2G=xx</td>
<td>CPU reduction during I/O, CPU reduction from TLB hit</td>
</tr>
</tbody>
</table>

* If any HW/SW requirements unmet, 4K frames used
Other good DB2 for z/OS uses of Big Memory – all boost performance

- More in-memory sort work space – specified via two ZP ARMs
  - SRTPOOL (default size is 10 MB – max size is 128 MB – indicates maximum in-memory work area for each concurrent SQL sort)
  - MAXSORT_IN_MEMORY (the portion of the sort pool that can be used for an ORDER BY or a GROUP BY)
- A bigger dynamic statement cache, to get more cache “hits” and fewer full prepares of dynamic SQL statements
- More use of RELEASE(DEALLOCATE) with persistent threads (such as high-performance DBATs and CICS-DB2 protected threads)
- A bigger RID pool, for less spill-over to work files for RID list processing (default is 400 MB, max is 10 GB)

That’s all good, but to USE Big Memory you need to HAVE Big Memory – that’s where the z13 comes in
Z13 memory: you can have (and use) more...

- **z13**: up to 10 TB of memory on one box
  - Max on a zEC12: 3 TB

- **z13**: up to 4 TB of memory for a z/OS LPAR (with z/OS 2.2 – available in September of 2015 – or z/OS 2.1 with PTFs)
  - zEC12: 1 TB

- **Coupling Facility Control Code level 20** will exploit larger memory resources available for an internal coupling facility in a z13
  - Large buffer pools in a DB2 data sharing environment need large group buffer pools
z13 Big Memory: not just good for DB2

- It can also be particularly helpful for Java in a z/OS system
  - A larger memory resource can support a large Java heap size, and that can boost the performance of Java applications
    - Java can use 2 GB page frames for the heap
- This is an important point, as more and more organizations are running Java programs in z/OS systems
  - Typically via WebSphere Application Server for z/OS
    - Gives you a total application system (business logic + data access) in a box
  - Also in the form of DB2 stored procedures
    - DB2 11: enhanced scalability and efficiency for Java stored procedures
  - Also via the IBM JZOS Toolkit (distributed with IBM Java SDKs for z/OS – can be used to launch Java applications as batch jobs or started tasks)
- And of course, Java on z uses specialty engines (good for cost of computing)
Beyond big memory – more good z13 stuff for z/OS data and analytics people
DB2 and zEC12, z13

- **RoCE (RDMA over Converged Ethernet)**
  - Communications protocol based on Infiniband
  - Available with zEC12 GA2
    - Transparent from DB2
  - DDF transaction (DB2z – DB2z) show up to 2x throughput improvement

- **zEDC Compression**
  - Reduction of SMF DB2 trace records and archive logs

- **1MB pageable with FLASH Express**

- **1MB and 2GB fixed pages**
  - Require LFAREA definition and DB2 V11
  - DB2 V11 buffer pools support **FRAMESIZE (4K, 1M, 2G)**

- **CP Assist for Cryptographic Function**
  - In z13 CPACF is physically implemented in the eight-core chip by the compression and cryptography accelerators.
  - Major performance improvement for programs running in WebSphere Application Server and using SSL
The importance of Java on z System

• We want data on z, but we also want applications on z, and lots of modern applications are written in Java

• A lot of people used to think (and some still do) that z Systems – and particularly z/OS – is not a good platform for Java applications
  – In fact, z Systems is a great Java platform: there was a 1200% Java performance improvement from Java 5 on a z9 to Java 7 on a zEC12

• Simultaneous multi-threading (SMT)
  – A hardware multithreading technology that allow more than one thread of execution on a single core (the z13 supports two threads per core; thus the term SMT2)
  – Exploited with zIIP engines, which are used for execution of Java code (and, of course, for a lot of DB2 work such as DDF workload processing)
More interesting z13 information

• Up to 141 cores on one server (versus a max of 101 on the zEC12)
  – Who wants that many engines?
    • Linux on z Systems is a big driver – some organizations already have over 100 z Systems IFLs
• About 10% faster uniprocessor performance versus the zEC12
• Up to 85 LPARs on one server (versus a max of 60 on the zEC12)
• z196 and zEC12 servers can be upgraded to z13
The bottom line

- With the z13, we’re going on offense with respect to z Systems as data and analytics servers
  - For a long time, we’ve focused on preserving z Systems’ role as a data server
  - Now, we have technology that we can use to take on any other platform, by any measure:
    - Cost of computing
    - Capacity per core
    - Memory
    - Numerically intensive – as well as data-intensive – processing
    - And more…

We’ve got a great horse to ride…
DB2 V11 and Big data
Much of the world’s operational data resides on z/OS

Integrate the big data ‘nuggets’

Relational projection of IMS model

Query

Invoke a query against Hadoop data

Unstructured data sources are growing fast

New DB2 11 features integrate big data insights and trusted OLTP data to drive business actions

IBM BigInsights

DB2 11 and big data
InfoSphere BigInsights + InfoSphere System z Connector
DB2 and IDAA and BigData

- Analytics and OLTP in the same data sharing group
- Integrate BigData with operational non-disruptively
- IDAA for query acceleration
- Leverage VUE for OTC option
Thanks for your time!