Workshop Multitenant, Multimodel, In-Memory para la base de Datos Oracle

Parte 3 de 3

Contenidos

In-Memory (1 hora)

Configuración del área de memoria (5 min)

Lo primero es comprobar la configuración de In-Memory que hay en la base de datos.

```
************************************************************
A. In-Memory Column Store (IM column store) dynamic resizing:
************************************************************

sqlplus / as sysdba

SQL> show parameter inmemo

NAME                                 TYPE        VALUE
------------------------------------ ----------- ------------------------------
inmemory_adg_enabled                       boolean  TRUE
inmemory_automatic_level             string   OFF
inmemory_clause_default              string
inmemory_expressions_usage           string   ENABLE
inmemory_force                             string   DEFAULT
inmemory_max_populate_servers              integer  0
inmemory_optimized_arithmetic              string   DISABLE
inmemory_prefer_xmem_memcompress           string
inmemory_prefer_xmem_priority              string
inmemory_query                             string   ENABLE
inmemory_size                        big integer 0
inmemory_trickle_repopulate_servers_ integer   1
percent
inmemory_virtual_columns             string   MANUAL
inmemory_xmem_size                   big integer 0
optimizer_inmemory_aware             boolean  TRUE



SQL> select version from v$instance;

VERSION
-----------------
19.0.0.0.0
```

Para activar IMC, hay que poner inmemory_size > 0 y reiniciar la instancia

```
sqlplus / as sysdba

SQL> show parameter sga

NAME                                 TYPE        VALUE
------------------------------------ ----------- ------------------------------
allow_group_access_to_sga            boolean  FALSE
lock_sga                             boolean  FALSE
pre_page_sga                         boolean  TRUE
sga_max_size                         big integer 15G
```

```
sga_min_size                    big integer 0
sga_target                      big integer 15G
unified_audit_sga_queue_size          integer  1048576
SQL>


SQL> alter system set inmemory_size = 6G scope=spfile;

[oracle@myoracledb ~]$ srvctl stop database -d $ORACLE_UNQNAME
[oracle@myoracledb ~]$ srvctl start database -d $ORACLE_UNQNAME

sqlplus / as sysdba

show parameter inmemo

NAME                            TYPE     VALUE
----------------------------------- ----------- ------------------------------
inmemory_adg_enabled                  boolean  TRUE
inmemory_automatic_level        string   OFF
inmemory_clause_default         string
inmemory_expressions_usage      string   ENABLE
inmemory_force                        string   DEFAULT
inmemory_max_populate_servers         integer  2
inmemory_optimized_arithmetic         string   DISABLE
inmemory_prefer_xmem_memcompress     string
inmemory_prefer_xmem_priority         string
inmemory_query                        string   ENABLE
inmemory_size                   big integer 6G
inmemory_trickle_repopulate_servers_ integer   1
percent
inmemory_virtual_columns        string   MANUAL
inmemory_xmem_size              big integer 0
optimizer_inmemory_aware        boolean  TRUE
```

Luego el resize es dinámico

```
SQL> alter system set inmemory_size = 8G scope=both;

System altered.

SQL>

SQL> show parameter inmemory

NAME                            TYPE     VALUE
----------------------------------- ----------- ------------------------------
inmemory_adg_enabled                  boolean  TRUE
inmemory_automatic_level        string   OFF
inmemory_clause_default         string
inmemory_expressions_usage      string   ENABLE
inmemory_force                        string   DEFAULT
inmemory_max_populate_servers         integer  2
```

```
inmemory_optimized_arithmetic         string   DISABLE
inmemory_prefer_xmem_memcompress     string
inmemory_prefer_xmem_priority         string
inmemory_query                        string   ENABLE
inmemory_size                    big integer 8G
inmemory_trickle_repopulate_servers_ integer   1
percent
inmemory_virtual_columns        string   MANUAL
inmemory_xmem_size              big integer 0
optimizer_inmemory_aware        boolean  TRUE
```

El proceso de resize dinámico se puede hacer solo al alza porque es un proceso online.

```
SQL> alter system set inmemory_size = 6G scope=both;
alter system set inmemory_size = 2G scope=both
*
ERROR at line 1:
ORA-02097: parameter cannot be modified because specified value is invalid
ORA-02095: specified initialization parameter cannot be modified


SQL>
```

Configurar FastStart (5 min)

El área FastStart es un espacio de tablas designado donde IM FastStart almacena y gestiona los datos de los objetos INMEMORY. Oracle Database gestiona los Espacios de tablas FastStart automáticamente.
En una base de datos Oracle RAC, todos los nodos comparten los datos de FastStart.

```
conn / as sysdba

col tablespace_name format a30

select con_id, TABLESPACE_NAME, STATUS FROM V$INMEMORY_FASTSTART_AREA;

    CON_ID TABLESPACE_NAME         STATUS
---------- ------------------------------ ----------
         1 INVALID_TABLESPACE              DISABLE
         2 INVALID_TABLESPACE              DISABLE
         4 INVALID_TABLESPACE              DISABLE

conn system/WddFsdf_12_we2@SOE

SQL> create tablespace TBS_IMC_FASTSTART datafile size 8G;

Tablespace created.

SQL> EXEC DBMS_INMEMORY_ADMIN.FASTSTART_ENABLE('TBS_IMC_FASTSTART')

PL/SQL procedure successfully completed.
```

```
conn / as sysdba

col tablespace_name format a30

select con_id, TABLESPACE_NAME, STATUS FROM V$INMEMORY_FASTSTART_AREA;

    CON_ID TABLESPACE_NAME         STATUS
---------- ------------------------------ ----------
         1 INVALID_TABLESPACE             DISABLE
         2 INVALID_TABLESPACE             DISABLE
         4 TBS_IMC_FASTSTART              ENABLE

conn system/WddFsdf_12_we2@SOE

COL TABLESPACE_NAME FORMAT a20

SELECT TABLESPACE_NAME, STATUS,
( (ALLOCATED_SIZE/1024) / 1024 ) AS ALLOC_MB,
( (USED_SIZE/1024) / 1024 ) AS USED_MB
FROM V$INMEMORY_FASTSTART_AREA;

TABLESPACE_NAME      STATUS        ALLOC_MB    USED_MB
-------------------- ---------- ---------- ----------
TBS_IMC_FASTSTART    ENABLE            8192       1
```

Algunas notas sobre Fast Start:

- No se puede forzar de forma manual una escritura al FS !!!
- Se puede migrar el contenido del FS a otro TBS:

```
EXEC DBMS_INMEMORY_ADMIN.FASTSTART_MIGRATE_STORAGE('new_fs_tbs')
```

- Se puede deshabilitar el FS fastStart:

```
EXEC DBMS_INMEMORY_ADMIN.FASTSTART_DISABLE
```

Para desactivar el FAST START

```
conn system/WddFsdf_12_we2@SOE

SQL> EXEC DBMS_INMEMORY_ADMIN.FASTSTART_DISABLE

SQL> drop tablespace TBS_IMC_FASTSTART including contents and datafiles;

Tablespace dropped.
```

Publicar las tablas SSB en in-memory (5 min)

```
conn ssb/ssb@SOE
col table_name format a30
```

```
set lines 120
--display current status

select table_name,
       inmemory,
       inmemory_priority,
       inmemory_compression
from user_tables;

TABLE_NAME                     INMEMORY INMEMORY INMEMORY_COMPRESS
------------------------------ -------- -------- -----------------
LINEORDER                      DISABLED
RESULTS                        DISABLED
TMP                            DISABLED
DATE_DIM                       DISABLED
YEARLY_PROFIT_REP_MV                 DISABLED
CUSTOMER                       DISABLED
ETL_DD                         DISABLED
LINEORDER_ACO                  DISABLED
PART                           DISABLED
SUPPLIER                       DISABLED
ETL_LO                         DISABLED

11 rows selected.



--alter tables in memory
alter table lineorder inmemory;
alter table part inmemory;
alter table customer inmemory;
alter table supplier inmemory;
alter table date_dim inmemory;

select table_name,
       inmemory,
       inmemory_priority,
       inmemory_compression
from user_tables;

TABLE_NAME                     INMEMORY INMEMORY INMEMORY_COMPRESS
------------------------------ -------- -------- -----------------
LINEORDER                      ENABLED  NONE     FOR QUERY LOW
RESULTS                        DISABLED
TMP                            DISABLED
DATE_DIM                       ENABLED  NONE     FOR QUERY LOW
YEARLY_PROFIT_REP_MV                 DISABLED
CUSTOMER                       ENABLED  NONE     FOR QUERY LOW
LINEORDER_ACO                  DISABLED
ETL_DD                         DISABLED
SUPPLIER                       ENABLED  NONE     FOR QUERY LOW
PART                           ENABLED  NONE     FOR QUERY LOW
ETL_LO                         DISABLED
```

```
11 rows selected.



--fetch all rows to start population
select count(*) from lineorder;
select count(*) from part;
select count(*) from customer;
select count(*) from supplier;
select count(*) from date_dim;
```

Monitorizar la publicación de SSB en In Memory

```
conn system/WddFsdf_12_we2@SOE

--new view v$im_segments
desc v$im_segments

 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
-
 OWNER                                              VARCHAR2(128)
 SEGMENT_NAME                                       VARCHAR2(128)
 PARTITION_NAME                                     VARCHAR2(128)
 SEGMENT_TYPE                                       VARCHAR2(18)
 TABLESPACE_NAME                                    VARCHAR2(128)
 INMEMORY_SIZE                                             NUMBER
 BYTES                                              NUMBER
 BYTES_NOT_POPULATED                                       NUMBER
 POPULATE_STATUS                                    VARCHAR2(13)
 INMEMORY_PRIORITY                                  VARCHAR2(8)
 INMEMORY_DISTRIBUTE                                       VARCHAR2(15)
 INMEMORY_DUPLICATE                                 VARCHAR2(13)
 INMEMORY_COMPRESSION                                      VARCHAR2(17)
 INMEMORY_SERVICE                                   VARCHAR2(12)
 INMEMORY_SERVICE_NAME                                     VARCHAR2(129)
 IS_EXTERNAL                                        VARCHAR2(5)
 CON_ID                                             NUMBER


col owner format a12
col name format a30
col partition_name format a30
set lines 120

--population status
select v.owner,v.segment_name name,v.partition_name,
v.populate_status status, v.bytes_not_populated
from v$im_segments v
Order by 1;
```

```
OWNER       NAME                         PARTITION_NAME           STATUS
BYTES_NOT_POPULATED
------------ ------------------------------ ------------------------------ ----
--------- -------------------
SSB         LINEORDER                                                    STARTED
          401473536
SSB         PART                                                         COMPLETED
          0
SSB         CUSTOMER                                                     COMPLETED
          0
SSB         SUPPLIER                                                     COMPLETED
          0
SSB         DATE_DIM                                                     COMPLETED
          0

6 rows selected.
```

(La anterior query se puede ejecutar varias veces para ver como van quedando menos bytes por subir a memoria)

```
--size
select v.owner,v.segment_name name,
round(v.bytes/1024/1024,3) orig_size,
round(v.inmemory_size/1024/1024,3) in_mem_size,
ROUND(v.bytes/v.inmemory_size,2) comp_ratio
from v$im_segments v
order by 1;

OWNER       NAME                         ORIG_SIZE IN_MEM_SIZE COMP_RATIO
------------ ------------------------------ ---------- ----------- ----------
SSB         SUPPLIER                           .836       1.25      .67
SSB         DATE_DIM                           .117       1.25      .09
SSB         LINEORDER                              1745.32        1494.375    1.17
SSB         CUSTOMER                         11.852      11.25     1.05
SSB         PART                             40.563     13.438     3.02

6 rows selected.
```

Queries Sencillas

Comprobar la diferencia de acceso entre las distintas queries.

Single Table Scan

Query 1:

```
conn ssb/ssb@SOE

/********************Query 1************************/
/************Single Column Aggregation***************/
/************************************************/

/***************Parallel Disk Access*****************/
/************************************************/
```

```
clear scr
--flush the buffer_cache
alter system flush buffer_cache;
alter session force parallel query parallel 4;

set lines 120
set autotrace traceonly explain statistics
set timing on

select /*+ NO_INMEMORY */ /* DISK ACCESS */
max(lo_ordtotalprice) most_expensive_order From LINEORDER;
```

```
/**************In-Memory Serial Access***************/
/****************************************************/

clear scr
--column store enabled via INMEMORY_QUERY parameter--
alter session disable parallel query;


Select /*+ INMEMORY */ /*IN-MEMORY Serial*/
max(lo_ordtotalprice) most_expensive_order From LINEORDER;
```

```
/**************In-Memory Parallel Access*************/
/****************************************************/

clear scr
alter session force parallel query parallel 4;

select /*+ INMEMORY */ /*IN-MEMORY Parallel*/
max(lo_ordtotalprice) most_expensive_order From LINEORDER;
```

Query 2

```
/******Single Column Aggregation with Filter*********/
/****************************************************/

/***************Parallel Disk Access*****************/
/****************************************************/

clear scr
--flush the buffer_cache
alter system flush buffer_cache;
alter session force parallel query parallel 4;
```

```
select /*+ NO_INMEMORY */ /* DISK ACCESS */
max(lo_ordtotalprice) most_expensive_order From LINEORDER
where LO_PARTKEY=300023;
```

```
/**************In-Memory Serial Access***************/
/****************************************************/

clear scr
alter session disable parallel query;

Select /*+ INMEMORY */ /*IN-MEMORY Serial*/
max(lo_ordtotalprice) most_expensive_order From LINEORDER
where LO_PARTKEY=300023;
```

```
/**************In-Memory Parallel Access*************/
/****************************************************/

clear scr
alter session force parallel query parallel 4;

select /*+ INMEMORY */ /*IN-MEMORY Parallel*/
max(lo_ordtotalprice) most_expensive_order From LINEORDER
where LO_PARTKEY=300023;
```

Queries de grado medio

Two table scan

Query 1

```
conn ssb/ssb@SOE

/**********Group Aggregate with two table join*******/
/****************************************************/

/***************Parallel Disk Access*****************/
/****************************************************/

clear scr
--flush the buffer_cache
alter system flush buffer_cache;
```

```
alter session force parallel query parallel 4;
alter session set inmemory_query='DISABLE';
set autotrace traceonly explain statistics
set timing on

select /*+ NO_INMEMORY */ /* DISK ACCESS */
d_date,sum(l.lo_revenue) "Total Revenue"
From   LINEORDER l, DATE_DIM d
Where  l.lo_orderdate = d.d_datekey
and      D_DAYNUMINMONTH = 25
and    d.d_month = 'December'
group by d_date
order by d_date;
```

```
/**************In-Memory Serial Access***************/

clear scr
alter session disable parallel query;
alter session set inmemory_query='ENABLE';

Select /*+ INMEMORY */ /*IN-MEMORY Serial*/
d_date,sum(l.lo_revenue) "Total Revenue"
From   LINEORDER l, DATE_DIM d
Where  l.lo_orderdate = d.d_datekey
and      D_DAYNUMINMONTH = 25
and    d.d_month = 'December'
group by d_date
order by d_date;
```

```
/**************In-Memory Parallel Access*************/
/*****************************************************/

clear scr
alter session force parallel query parallel 4;

select /*+ INMEMORY */ /*IN-MEMORY Parallel*/
d_date,sum(l.lo_revenue) "Total Revenue"
From   LINEORDER l, DATE_DIM d
Where  l.lo_orderdate = d.d_datekey
and      D_DAYNUMINMONTH = 25
and    d.d_month = 'December'
```

```
group by d_date
order by d_date;
```

Queries complejas

Three table scan

Query 1

```
conn ssb/ssb@SOE


/*********Group Aggregate with three table join******/
/***************************************************/
/***************Parallel Disk Access*****************/

clear scr
--flush the buffer_cache
alter system flush buffer_cache;
set autotrace traceonly explain statistics
alter session force parallel query parallel 4;
alter session set inmemory_query='DISABLE';
set timing on

select /*+ NO_INMEMORY */ /* DISK ACCESS */
p.p_name, sum(l.lo_revenue)
From     LINEORDER l, DATE_DIM d, PART p
Where    l.lo_orderdate = d.d_datekey
And      l.lo_partkey   = p.p_partkey
And      p.p_name       = 'misty gainsboro'
And      d.d_year = 1992
And      d.d_month = 'December'
Group by p.p_name;
```

```


/**************In-Memory Serial Access***************/
/***************************************************/

clear scr
alter session disable parallel query;
alter session set inmemory_query='DISABLE';
```

```
Select /*+ INMEMORY */ /*IN-MEMORY Serial*/
p.p_name, sum(l.lo_revenue)
From     LINEORDER l, DATE_DIM d, PART p
Where    l.lo_orderdate = d.d_datekey
And      l.lo_partkey   = p.p_partkey
And      p.p_name       = 'misty gainsboro'
And      d.d_year = 1992
And      d.d_month = 'December'
Group by p.p_name;
```

```
/*************In-Memory Parallel Access*************/
/***************************************************/

clear scr
alter session force parallel query parallel 4;

select /*+ INMEMORY */ /*IN-MEMORY Parallel*/
p.p_name, sum(l.lo_revenue)
From     LINEORDER l, DATE_DIM d, PART p
Where    l.lo_orderdate = d.d_datekey
And      l.lo_partkey   = p.p_partkey
And      p.p_name       = 'misty gainsboro'
And      d.d_year = 1992
And      d.d_month = 'December'
Group by p.p_name;
```