ORACLE 11G TEMPORARY TABLESPACE ENHANCEMENTS

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INTRODUCTION

Oracle 11g has added lots of new enhancements so as to monitor and Manage Temporary tablespaces and Temporary segments. These features will help database administrator to predict and controlled the growth of the `TEMPORARY` tablespace. One of the new enhancements allows you to specify the specific TEMP tablespace to `GLOBAL TEMPORARY TABLE` and reduce I/O contention among temporary segments and other types of segments.

New DBA_TEMP_FREE_SPACE view

Oracle 11g has introduced new view DBA_TEMP_FREE_SPACE to provide Temporary tablespaces usage report. Prior to 11g, we can't find the temporary Tablespace in DBA_FREE_SPACE and has to use V$TEMP_SPACE_HEADER to get some idea about the space available in temporary Tablespace. I had provided the query used in 11g and this can be used to create same kind of view in Oracle 10g.

Find the name, location and size of existing Temporary tablespaces

```
SQL> select tablespace_name,file_name,bytes/1024/1024 from dba_temp_files;
TABLESPACE FILE_NAME                                          BYTES/1024/1024
---------- -------------------------------------------------- ---------------
TEMP       /home/oracle/app/oradata/11gtest/temp01.dbf                    361
TEMP       /home/oracle/app/oradata/11gtest/temp02.dbf                     20
```

Check the temporary Tablespace using new DBA_TEMP_FREE_SPACE **view**

```
SQL> select tablespace_name,
            tablespace_size/1024/1024 "Total Space",
            allocated_space/1024/1024 "Alloc Space",
            free_space/1024/1024 "Free Space"
       from dba_temp_free_space;
TABLESPACE Total Space Alloc Space Free Space
---------- ----------- ----------- ----------
TEMP               381         362        379
```

You can use the following script provided by Oracle 11g to create the same kind of view in Oracle 10g

```
create or replace view DBA_TEMP_FREE_SPACE
    (TABLESPACE_NAME, TABLESPACE_SIZE, ALLOCATED_SPACE, FREE_SPACE) as
  SELECT tsh.tablespace_name,
         tsh.total_bytes,
         tsh.bytes_used,
         tsh.bytes_free + (nvl(ss.free_blocks, 0) * ts$.blocksize)
    FROM (SELECT tablespace_name, sum(bytes_used + bytes_free) total_bytes,
                 sum(bytes_used) bytes_used, sum(bytes_free) bytes_free
            FROM gv$temp_space_header
            GROUP BY tablespace_name) tsh,
         (SELECT tablespace_name, sum(free_blocks) free_blocks
            FROM gv$sort_segment
            GROUP BY tablespace_name) ss,
         ts$
    WHERE ts$.name = tsh.tablespace_name and
          tsh.tablespace_name = ss.tablespace_name (+);
/
```

SHRINK TEMPORARY TABLESPACES

Prior to Oracle 11g, if we are doing big sorting or creating big indexes and if you have enabled `AUTOEXTEND ON` on temporary Tablespace, it will grow to a very big size. If we have to reduce the size, we have two option

1. `ALTER DATABASE TEMPFILE … RESIZE`

   This may not work and fail with ORA-03297 error as Tempfile contains data beyond requested `RESIZE` value
2. Create new `TEMPORARY` Tablespace and make it default temporary Tablespace for the database users. Still we are not able to drop the old big `TEMPORARY` Tablespace as long as some active sort operation is going on in old `TEMPORARY` Tablespace.

With Oracle 11g, we got two following new commands that can shrink the `TEMPORARY` Tablespace to required size `ONLINE`.

1. `ALTER TABLESPACE SHRINK SPACE` command.

```
Check the Temp Tablespace size in Megabytes
SQL> select tablespace_name,file_name,bytes/1024/1024 from dba_temp_files;
TABLESPACE FILE_NAME                                          BYTES/1024/1024
---------- -------------------------------------------------- ---------------
TEMP       /home/oracle/app/oradata/11gtest/temp01.dbf                     20

Create new table so as to increase the size of Temporary Tablespace
SQL> create table temp_test as select * from dba_objects;
Table created.
SQL> create index temp_test_idx on temp_test(object_name);
Index created.

Check the Temp Tablespace size in Megabytes after big Index is created
SQL> select tablespace_name,file_name,bytes/1024/1024 from dba_temp_files;
TABLESPACE FILE_NAME                                          BYTES/1024/1024
---------- -------------------------------------------------- ---------------
TEMP       /home/oracle/app/oradata/11gtest/temp01.dbf                    361

Check the Space Allocation in new view DBA_TEMP_FREE_SPACE
SQL> select tablespace_name,
       tablespace_size/1024/1024 "Total Space",
       allocated_space/1024/1024 "Alloc Space",
       free_space/1024/1024 "Free Space"
     from dba_temp_free_space;
TABLESPACE Total Space Alloc Space Free Space
---------- ----------- ----------- ----------
TEMP               381         362        379

Execute the new ALTER TABLESPACE SHRINK SPACE command
SQL> alter tablespace temp shrink space keep 20M;
Tablespace altered.
```

```
Check the size after Shrink is completed
SQL> select tablespace_name,file_name,bytes/1024/1024 from dba_temp_files;
TABLESPACE FILE_NAME                                          BYTES/1024/1024
---------- -------------------------------------------------- ---------------
TEMP       /home/oracle/app/oradata/11gtest/temp01.dbf                     20

SQL> select tablespace_name,
       tablespace_size/1024/1024 "Total Space",
       allocated_space/1024/1024 "Alloc Space",
       free_space/1024/1024 "Free Space"
     from dba_temp_free_space;
TABLESPACE Total Space Alloc Space Free Space
---------- ----------- ----------- ----------
TEMP                21           1         20
```

2. If TEMPORARY Tablespace contain several TEMPFILES, we can use ALTER TABLESPACE SHRINK TEMPFILE command to shrink any tempfile. These commands along with KEEP clause can reduce the space while the Tablespace is ONLINE. Moreover if you are shrinking the TEMPORARY Tablespace and some extents in-use are above shrink estimation, then system will waits until they are released to complete the command.

```
Check the number of Tempfile in the TEMP tablespace
SQL> select tablespace_name,file_name,bytes/1024/1024 from dba_temp_files;
TABLESPACE FILE_NAME                                          BYTES/1024/1024
---------- -------------------------------------------------- ---------------
TEMP       /home/oracle/app/oradata/11gtest/temp01.dbf                     20

Create new table so as to increase the size of Temporary Tablespace
SQL> create table temp_test as select * from dba_objects;
Table created.
SQL> create index temp_test_idx on temp_test(object_name);
Index created.

Check the Increased TEMP tablespace size
SQL> select tablespace_name,file_name,bytes/1024/1024 from dba_temp_files;
TABLESPACE FILE_NAME                                          BYTES/1024/1024
---------- -------------------------------------------------- ---------------
TEMP       /home/oracle/app/oradata/11gtest/temp01.dbf                    361

Add Another TEMPFILE to the existing TEMP tablespaces
SQL> alter tablespace temp
       add tempfile '/home/oracle/app/oradata/11gtest/temp02.dbf' size 20M;
Tablespace altered.
Check the TEMP tablespace to verify TEMPFILES
SQL> select tablespace_name,file_name,bytes/1024/1024 from dba_temp_files;
TABLESPACE FILE_NAME                                          BYTES/1024/1024
---------- -------------------------------------------------- ---------------
TEMP       /home/oracle/app/oradata/11gtest/temp01.dbf                    361
TEMP       /home/oracle/app/oradata/11gtest/temp02.dbf                     20
```

Check the Space Allocation in new **DBA_TEMP_FREE_SPACE** view

```
SQL> select tablespace_name,
       tablespace_size/1024/1024 "Total Space",
       allocated_space/1024/1024 "Alloc Space",
       free_space/1024/1024 "Free Space"
     from dba_temp_free_space;
TABLESPACE Total Space Alloc Space Free Space
---------- ----------- ----------- ----------
TEMP               381         362        379
```

Now we will SHRINK TEMP Tablespace without specifying TEMPFILE

```
SQL> alter tablespace temp shrink space keep 20M;
Tablespace altered.
```

This will Reduce the First TEMPFILE to minimum Size and reduce the rest from Second TEMPFILE. Total Size will be reduced to 20M

```
SQL> select tablespace_name,file_name,bytes/1024/1024 from dba_temp_files;
TABLESPACE FILE_NAME                                          BYTES/1024/1024
---------- -------------------------------------------------- ---------------
TEMP       /home/oracle/app/oradata/11gtest/temp01.dbf                 1.0625
TEMP       /home/oracle/app/oradata/11gtest/temp02.dbf                19.9375

SQL> select tablespace_name,
       tablespace_size/1024/1024 "Total Space",
       allocated_space/1024/1024 "Alloc Space",
       free_space/1024/1024 "Free Space"
    from dba_temp_free_space;
TABLESPACE Total Space Alloc Space Free Space
---------- ----------- ----------- ----------
TEMP                21           1         20
```

Now we will do more Shrink in TEMP space but with specific TEMPFILE

```
SQL> alter tablespace temp shrink
       tempfile '/home/oracle/app/oradata/11gtest/temp02.dbf' keep 10m;
Tablespace altered.
```

You will see that second TEMPFILE specified above is reduced to 10M

```
SQL> select tablespace_name,file_name,bytes/1024/1024 from dba_temp_files;
TABLESPACE FILE_NAME                                          BYTES/1024/1024
---------- -------------------------------------------------- ---------------
TEMP       /home/oracle/app/oradata/11gtest/temp01.dbf                 1.0625
TEMP       /home/oracle/app/oradata/11gtest/temp02.dbf                10.0625
SQL> select tablespace_name,tablespace_size/1024/1024 "Total
Space",allocated_space/1024/1024 "Alloc Space",free_space/1024/1024 "Free Space" from
dba_temp_free_space;
TABLESPACE Total Space Alloc Space Free Space
---------- ----------- ----------- ----------
TEMP            11.125        .125         11
```

GLOBAL TEMPORARY TABLE TABLESPACES

Prior to Oracle 11g, you are not allowed to specify the `TEMPORARY` tablespace to `GLOBAL TEMPORARY TABLE` and so all Temporary tables and any index created on it use the Default Temporary tablespaces of the User who own these tables.

With Oracle 11g, we can now create `TEMPORARY` tablespaces based on required EXTENT size and then used them based on temporary space usage.

```
SQL> create global temporary table temp_table
  2  (
  3     name     varchar2(10)
  4  ) on commit delete rows;

Table created.

SQL> select table_name,status,tablespace_name from dba_tables where table_name='TEMP_TABLE';

TABLE_NAME                     STATUS   TABLESPACE
------------------------------ -------- ----------
TEMP_TABLE                     VALID

SQL> create global temporary table temp_table
  2  (
  3     object_name     varchar2(50)
  4  ) tablespace users;
create global temporary table temp_table
*
ERROR at line 1:
ORA-02195: Attempt to create TEMPORARY object in a NON-TEMPORARY tablespace


SQL>  create global temporary table temp_table
  2  (
  3     object_name     varchar2(50)
  4   ) tablespace temp;
Table created.

SQL> select table_name,tablespace_name from dba_tables where table_name='TEMP_TABLE';
TABLE_NAME                     TABLESPACE_NAME
------------------------------ ------------------------------
TEMP_TABLE                     TEMP

                      - See How TABLESPACE Clause works in 10g
SQL> create global temporary table temp_test
  2  (
  3     object_name     varchar2(10)
  4* ) tablespace users;
```

```
create global temporary table temp_test
*
ERROR at line 1:
ORA-14451: unsupported feature with temporary table

SQL> create global temporary table temp_test
  2  (
  3     object_name     varchar2(10)
  4* ) tablespace temp;
create global temporary table temp_test
*
ERROR at line 1:
ORA-14451: unsupported feature with temporary table
```