CSE 4410
DATABASE MANAGEMENT SYSTEMS II LAB

LAB_02: Tablespace

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Tablespace

Tablespace is a logical storage unit of Oracle that consists of one or more files called datafiles. A datafile physically stores the data objects of the database such as tables and indexes on disk. The usages of tablespace are -

> Controlling the storage size allocated for the database data.

> Providing specific space quotas to different database users.

> Controlling the availability of data by using online or offline mood.

> Performing partial database recovery in case of failures.

1 Default Tablespaces

Oracle comes with 5 default tablespaces -

- **SYSTEM** and **SYSAUX** tablespaces store system-generated objects like data dictionary tables.

- **User** is the default tablespace for any newly created table.

- **UNDOTBS1** stores the undo data.

- **TEMP** is the temporary tablespace that is used for storing intermediate results of sorting, hashing, and large object processing operations.

2 Create Tablespace

Using **CREATE TABLESPACE** statement, a new tablespace can be created. As we have seen a tablespace consisting of one or more datafiles, we need to specify the path of the datafiles as well as their size.

```
CREATE TABLESPACE tbs1
   DATAFILE 'tbs1_data.dbf' SIZE 1m,
            'tbs2_data.dbf' SIZE 1m;
```

To allow extent management to be LOCAL, one can optionally add the statement **EXTENT MANAGEMENT LOCAL AUTOALLOCATE** or **EXTENT MANAGEMENT LOCAL UNIFORM SIZE size**. Locally Managed Tablespaces (LMT) have a bitmap of the blocks or groups of blocks, they contain allowing them to track extent allocation without reference to the data dictionary. If UNIFORM is specified, all extents within the tablespace will be the same size, with 1M being the default extent size. The AUTOALLOCATE clause allows you to size the initial extent leaving Oracle to determine the optimum size for subsequent extents, with 64K being the minimum.

Once the tablespace is created, all the information about it is available in the **dba_data_files** view.

```
SELECT tablespace_name, file_name, bytes/1024/1024 MB
FROM dba_data_files;
```

Now to assign a user, a specific tablespace, one can explicitly mention it at the time of user creation.

```
CREATE USER iutlearner
    IDENTIFIED BY test123
    DEFAULT TABLESPACE tbs1 ;
```

source: https://www.oracletutorial.com/oracle-administration/oracle-tablespace

Usually when we create any new table in Oracle, by default that is placed to the **User** tablespace. However to create a new table in a user-defined tablespace, one must add the name of the tablespace at the end of the **CREATE TABLE** statement.

```sql
CREATE TABLE t1(
    id INT,
    c1 VARCHAR2(32)
) TABLESPACE tbs1;
```

Then if we want to check the free space of a certain tablespace, we can fetch that data from the **dba_free_space** view.

```sql
SELECT tablespace_name, bytes/1024/1024 MB
FROM dba_free_space
WHERE tablespace_name='TBS1';
```

Use sum

3 Extend Tablespace

It is very common that the tablespaces of the database get completely occupied. In that case no further addition of data is possible. We have already learned about locally managed extent by the time on tablespace creation. But even if we forget to do that or not want to automate that we can manually handle it using **ALTER TABLESPACE** statement. There are two ways of extention.

- To extend a tablespace is by adding a new datafile.

```sql
ALTER TABLESPACE tbs1
    ADD DATAFILE 'tbs3_data.dbf' SIZE 1m;
```

  Here if we use the **AUTOEXTEND ON** clause at the end of the code, Oracle will automatically extend the size of the datafile as per need.

- To extend a tablespace by resizing the data file

```sql
ALTER DATABASE
    DATAFILE 'tbs1_data.dbf' RESIZE 15m;
```

4 Drop Tablespace

Finally, to remove a tablespace from the database, we use **DROP TABLESPACE** statement.

```sql
DROP TABLESPACE tbs1
    [INCLUDING CONTENTS [AND | KEEP] DATAFILES]
    [CASCADE CONSTRAINTS];
```

Here **INCLUDING CONTENTS** is necessary when there is any table created in the tablespace. If we don't use **AND DATAFILES**, it will by default keep the datafiles of that tables space stored without any tablespace. And **CASCADE CONSTRAINTS** is necessary in case of referential integrity.

5 Read-Only or Read-Write Tablespace

The read-only tablespaces allow Oracle to avoid performing edit on large, static parts of a database. It allows you to remove objects such as tables and indexes from a read-only tablespace. However, it does not allow you to create or alter objects in a read-only tablespace.

```sql
ALTER TABLESPACE tbs1 READ ONLY ;
```

```sql
ALTER TABLESPACE tbs1 READ WRITE ;
```

By default any newly created tablespace is in read-write mood.

6 Read-Only or Read-Write Tablespace

Lastly, a tablespace can be online or offline. If a tablespace is offline, one cannot access data stored in it. On the other hand, if a tablespace is online, its data is available for reading and writing.

```
ALTER  TABLESPACE  tbs1  OFFLINE ;

ALTER  TABLESPACE  tbs1  ONLINE ;
```

Normally, a tablespace is online so that its data is available to users. However, we can take a tablespace offline to make data inaccessible to users when we update and maintain the applications.

7 Task

Now, your task is to:

1. Create two tablespaces tbs1, tbs2.

2. Set quota for single user on both tablespaces.

3. Create two tables student (name, id, fk[dept]) and department (id, name) in tbs1.

4. Create another table course (code, name, credit, fk[offer_by]) in tbs2.

5. Insert large amount of data in student table and course table.

6. Check free space of the tablespaces.

7. Extend tbs1 by adding extra datafiles.

8. Extend tbs2 by resizing datafiles.

9. Check the size of the tablespaces.

10. Delete table space tbs1 including the datafiles.

11. Delete table space tbs2 excluding the datafiles.