

# Advanced Database Technologies Project Report

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## 1. DBA REQUIREMENT FOR THE PROJECT

I created 2 different tablespaces according to requirements in course report. First, I created inv\_tsp tablespace which has requirement to store extra inventory information. It needs to store around 10 mb data every day.

I created the table using the code below:

```
SQL> CREATE TABLESPACE inv_tsp DATAFILE'/u01/app/oracle/oradata/I06627A/inv01.dbf' SIZE 10M AUTOEXTEND O
N EXTENT MANAGEMENT LOCAL AUTOALLOCATE SEGMENT SPACE MANAGEMENT AUTO;

Tablespace created.

SQL> █
```

*Figure 1:inv\_tsp tablespace creation*

Before the explanation of the code I tested the tablespace and it basically allowed me to store even more than 50mb in my tests easily and I can test it for more and also it will match the other requirements. Related test for database and results as follows:

---

```
SQL> create table test(id NUMBER) tablespace inv_tsp;
```

```
Table created.
```

```
SQL> insert into test values(1000);
```

```
1 row created.
```

```
SQL> insert into test(select * from test);
```

```
1 row created.
```

```
SQL> /
```

```
2 rows created.
```

```
SQL> /
```

```
4 rows created.
```

```
SQL> /
```

```
8 rows created.
```

```
SQL> /
```

```
16 rows created.
```

```
SQL> /
```

```
32 rows created.
```

```
SQL> /
```

```
64 rows created.
```

```
SQL> /
```

---

*Figure 2:test for inv\_tsp*

16384 rows created.

SQL> /

32768 rows created.

SQL> /

65536 rows created.

SQL> /

131072 rows created.

SQL> /

262144 rows created.

SQL> /

524288 rows created.

SQL> /

1048576 rows created.

SQL> /

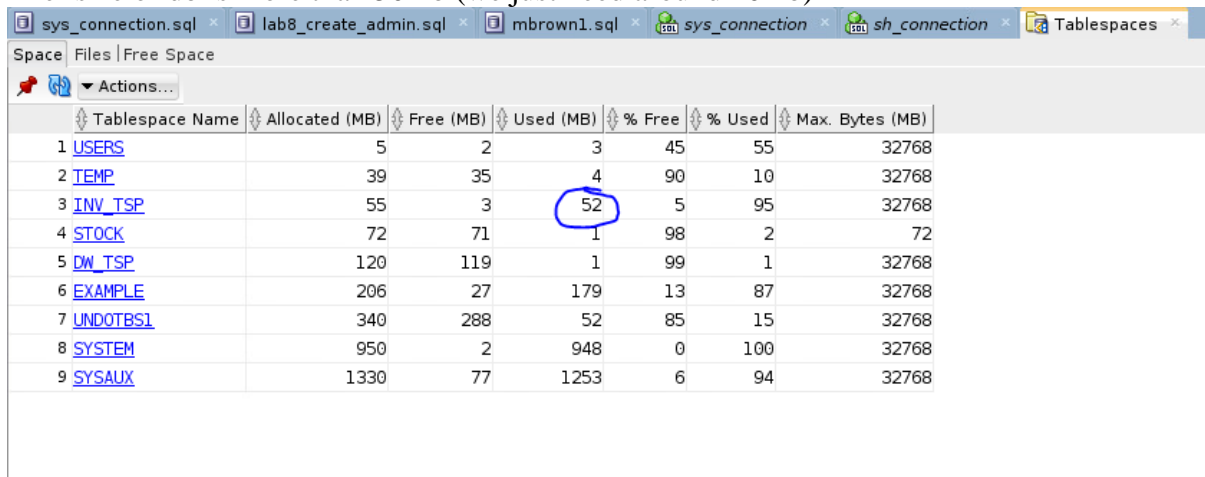
2097152 rows created.

SQL> █

Figure 3:test\_for\_inv\_tsp\_2

I stopped the test at this point because we do not have so big VM capacity in our machines.

The rsize of db is more than 50mb (we just need around 10mb)



Tablespace Name	Allocated (MB)	Free (MB)	Used (MB)	% Free	% Used	Max. Bytes (MB)
1 USERS	5	2	3	45	55	32768
2 TEMP	39	35	4	90	10	32768
3 INV_TSP	55	3	52	5	95	32768
4 STOCK	72	71	1	98	2	72
5 DW_TSP	120	119	1	99	1	32768
6 EXAMPLE	206	27	179	13	87	32768
7 UNDOTBS1	340	288	52	85	15	32768
8 SYSTEM	950	2	948	0	100	32768
9 SYSAUX	1330	77	1253	6	94	32768

Figure 4:test\_reult for inv\_tsp

The second one is dw\_tsp which will be around the 120mb at the beginning, and it will be rarely updated.

The creation code as follows:

```
SQL> CREATE TABLESPACE dw_tsp DATAFILE '/u01/app/oracle/oradata/I06627A/dw01.dbf' SIZE 120M AUTOEXTEND ON  
EXTENT MANAGEMENT LOCAL AUTOALLOCATE SEGMENT SPACE MANAGEMENT AUTO;  
  
Tablespace created.
```

The size test successfully passed, and results are as follows:

```
SQL> create table test1(id NUMBER) tablespace dw_tsp;  
  
Table created.  
  
SQL> insert into test1 values(1000);  
  
1 row created.  
  
SQL> insert into test1(select * from test1);  
  
1 row created.  
  
SQL> /  
  
2 rows created.
```

*Figure 5:test1\_dw*

```
SQL> /  
  
262144 rows created.  
  
SQL> /  
  
524288 rows created.  
  
SQL> /  
  
1048576 rows created.  
  
SQL> /  
  
2097152 rows created.  
  
SQL> /  
  
4194304 rows created.  
  
SQL> drop table test purge;  
Table dropped.  
  
SQL> /  
drop table test purge  
*  
ERROR at line 1:  
ORA-00942: table or view does not exist  
  
SQL> insert into test1(select * from test1);  
8388608 rows created.  
SQL> █
```

Figure 6:dw\_tsp test

I just dropped the previous table for inv\_tsp and continued to add for table1 which I created for dw\_tsp tablespace and it perfectly passed the test. Test result as follows:

	Tablespace Name	Allocated (MB)	Free (MB)	Used (MB)	% Free	% Used	Max. Bytes (MB)
1	USERS	5	2	3	45	55	32768
2	TEMP	39	35	4	90	10	32768
3	INV_TSP	55	54	1	98	2	32768
4	STOCK	72	71	1	98	2	72
5	EXAMPLE	206	27	179	13	87	32768
6	DW_TSP	220	11	209	5	95	32768
7	UNDOTBS1	340	252	88	74	26	32768
8	SYSTEM	950	2	948	0	100	32768
9	SYSAUX	1330	100	1230	8	92	32768

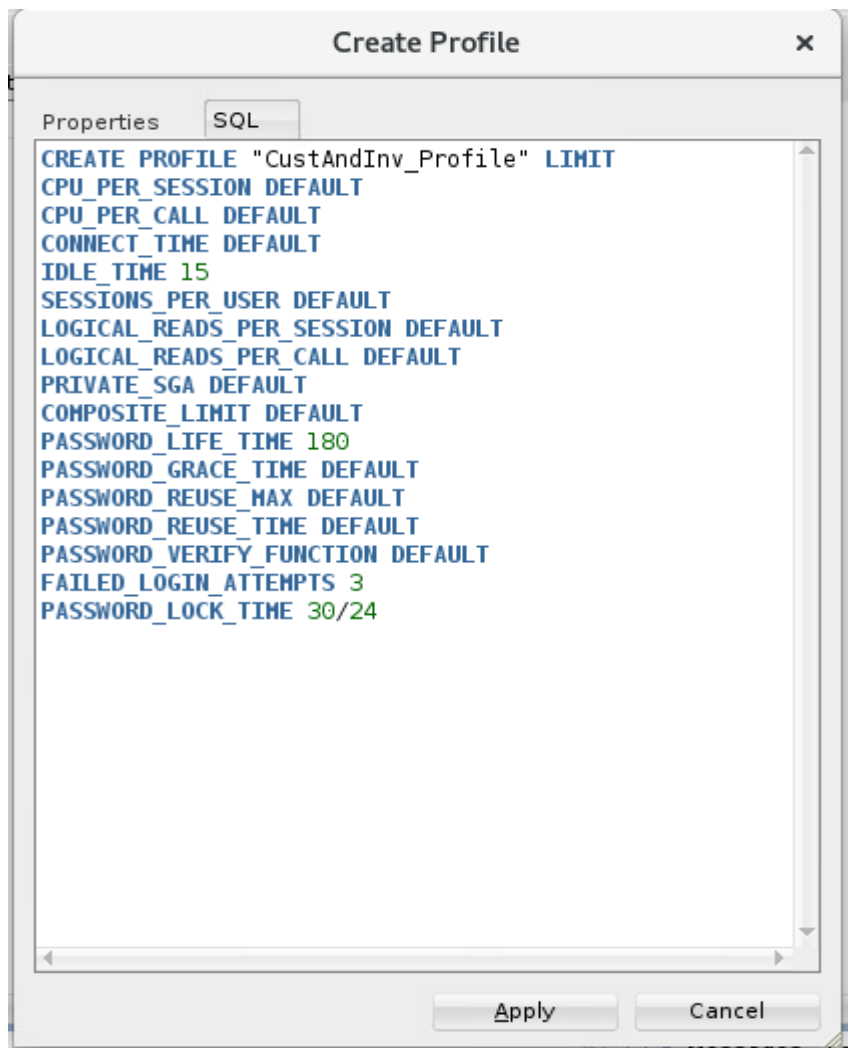
Which is more than 120 mb and it will be rarely updated so it successful passed the test.

In this section, I will explain the properties of the tablespaces I have defined and why it is defined this way. First, there are some decisions I had to make when creating a tablespace. Deciding whether the tablespace will be a bigfile tablespace or a smallfile tablespace. Deciding whether extents will be managed locally or by the dictionary and deciding whether Segment spacing will be controlled automatically or manually. I chose small file(if you do not mention about BIGFILE it automatically creates SMALLFILE) because A bigfile tablespace can consist of only one datafile or tempfile. In the type of smallfile tablespace, there can be more than one data file belonging to a tablespace. Also we have 8KB data block size and it allows us to store up to 32 GB data which takes more than 10 years for a tablespace that generally use around 10mb everyday. I chose the Autoallocate for extent because size of the extents to be allocated or released with the Autoallocate option may change and they will be included in the segments in this way. Autoallocate option is the best option for small or large tables that I understand from my research. Finally, in order to decide the last criteria, freelist is used to manage free spaces in manual segment space management; Bitmap is used in automatic segment space management. Automatic segment space management is more efficient because there is no need for “coalescing” and it is the default setting. I also gave size values that mentioned in requirements section and both tablespaces met all the required criteria.

## 2. DBA REQUIREMENT FOR THE PROJECT

I created two users for the Customer Service department. (cust\_serv1 & cust\_serv2) and one for inventory department(inv\_dept\_user). I assigned inv\_tsp tablespace for all users as default and temporary tablespace as temp. Before creating the users I created a profile named “CustAndInv\_Profile”

The code that I created profile to check the session and passwords check as follow:



I gave 15 to “IDLE\_TIME” variable because all users without interaction 15 mins will be logged out. According to requirements there can be 3 times chance to try right code and if all 3 attempts are wrong so account will be locked for 30 hours so I changed “FAILED\_LOGIN\_ATTEMPTS” to 3 and “PASSWORD\_LOCK\_TIME” to 30/24 because I converted it from day to hour with that value and I changed “PASSWORD\_LIFE\_TIME” to 180(days) because users must change their password every 6 months. I also created my own password verify method because only requirement desired is passwords could be more than 8 length and I changed it in the profile as follows:



```

ALTER PROFILE "CustAndInv_Profile"
LIMIT
  COMPOSITE_LIMIT DEFAULT
  SESSIONS_PER_USER DEFAULT
  CPU_PER_SESSION DEFAULT
  CPU_PER_CALL DEFAULT
  LOGICAL_READS_PER_SESSION DEFAULT
  LOGICAL_READS_PER_CALL DEFAULT
  IDLE_TIME 15
  CONNECT_TIME DEFAULT
  PRIVATE_SGA DEFAULT
  FAILED_LOGIN_ATTEMPTS 3
  PASSWORD_LIFE_TIME 180
  PASSWORD_REUSE_TIME DEFAULT
  PASSWORD_REUSE_MAX DEFAULT
  PASSWORD_VERIFY_FUNCTION MY_VERIFY_FUNCTION_LENGTH8
  PASSWORD_LOCK_TIME 1.25
  PASSWORD_GRACE_TIME DEFAULT

```

After

My custom “MY\_VERIFY\_FUNCTION\_LENGTH” function which only checks the size of the password. The function is as follow:

```

create or replace FUNCTION MY_VERIF_FUNCTION_LENGTH8
(username varchar2,
 password varchar2,
 old_password varchar2)
RETURN boolean IS
  differ integer;
  canon_username dbms_id := username;
BEGIN
  -- Bug 22369990: Dbms_Utility may not be available at this point, so switch
  -- to dynamic SQL to execute canonicalize procedure.
  IF (substr(username,1,1) = '') THEN
    execute immediate 'begin dbms_utility.canonicalize(:p1, :p2, 128); end;'
    using IN username, OUT canon_username;
  END IF;
  -- Check if the password is same as the username
  IF NLS_LOWER(password) = NLS_LOWER(canon_username) THEN
    raise_application_error(-20001, 'Password same as or similar to user');
  END IF;
  IF NOT ora_complexity_check(password, chars => 8) THEN
    RETURN(FALSE);
  END IF;

  RETURN(TRUE);
END;

```

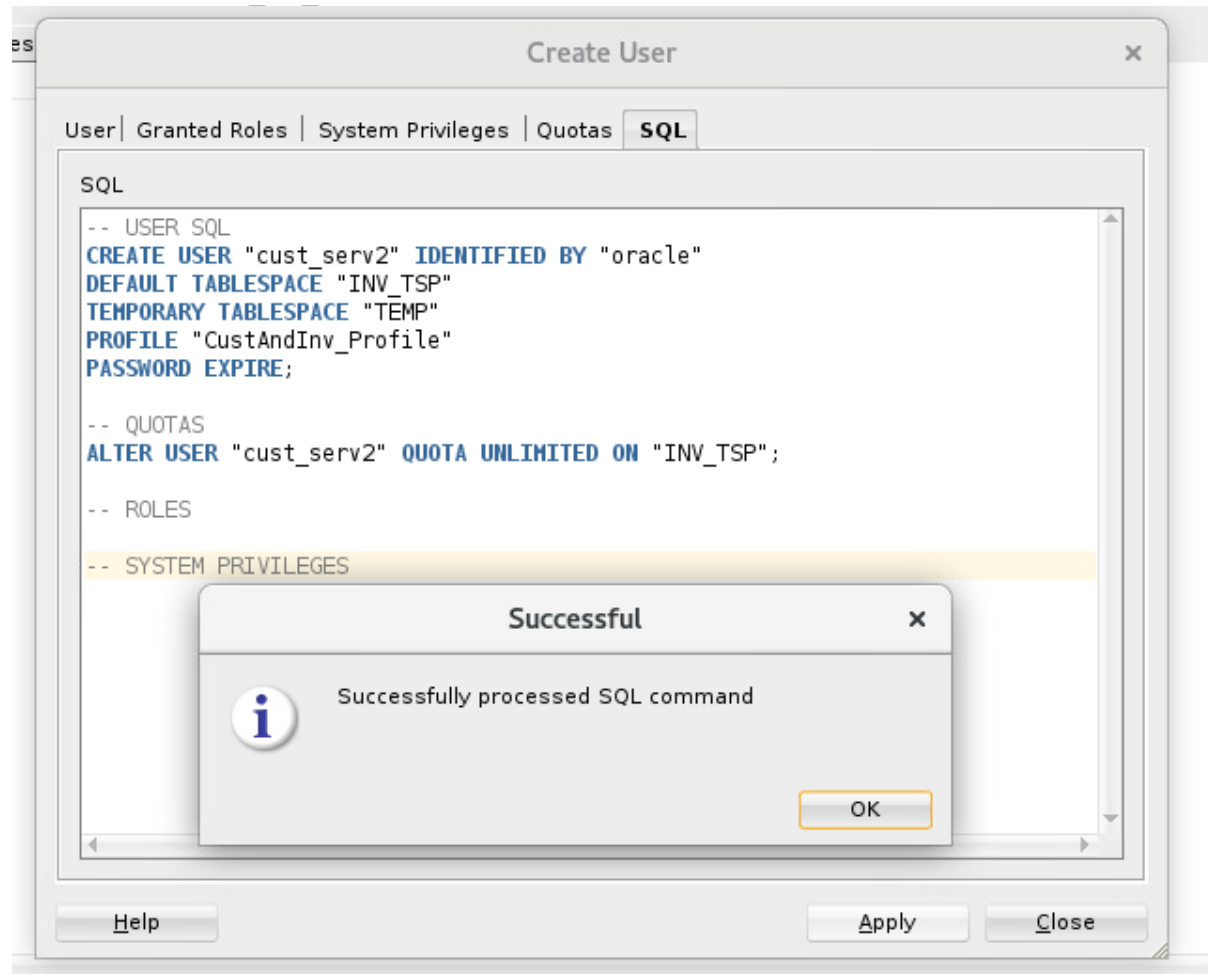
The code part I created users are as follow:

The code for user “cust\_serv1”



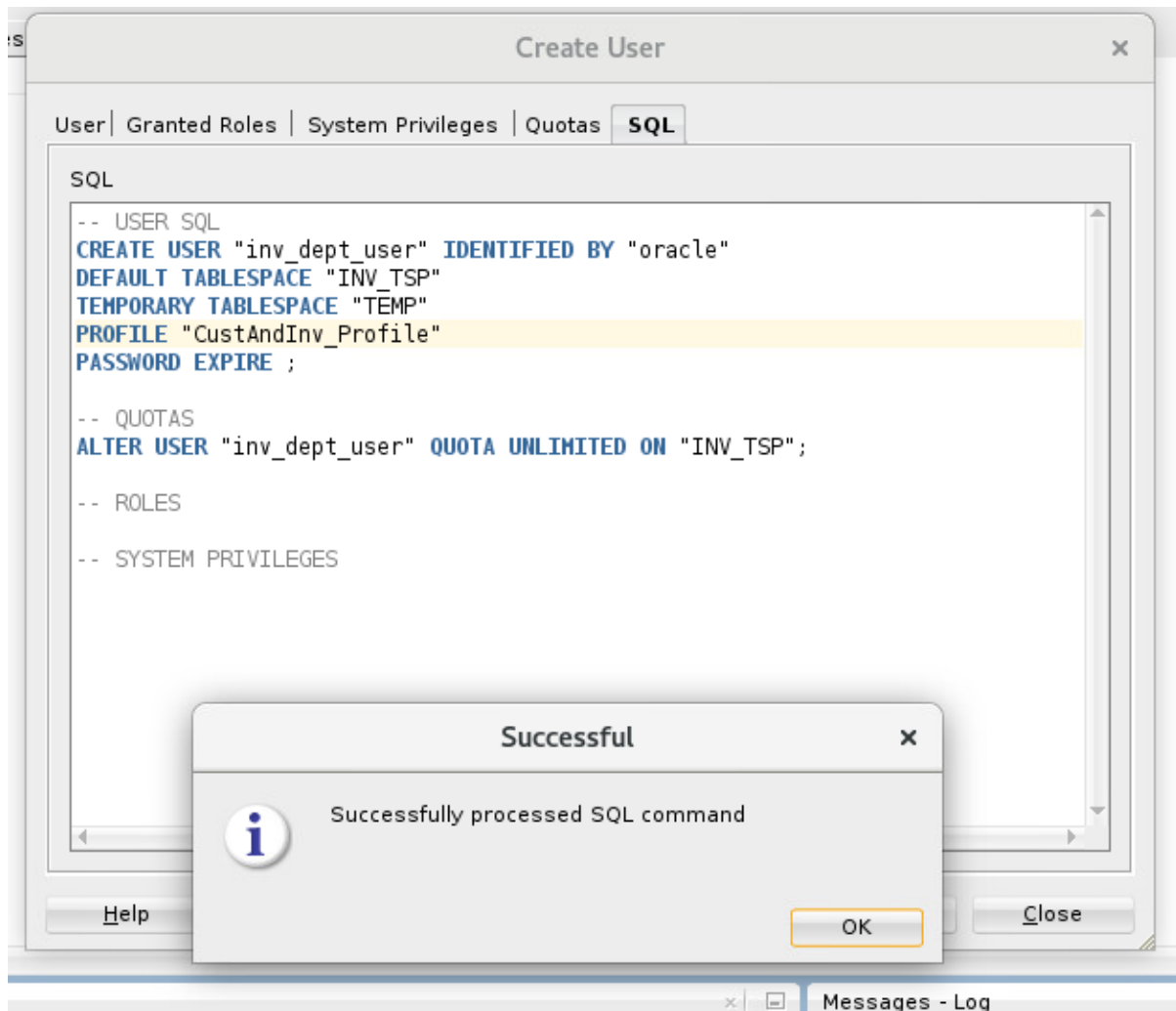
It also forces users to change their password when they first login to database with “PASSWORD EXPIRE” parameter.

The code for “cust\_ser 2”



It also forces users to change their password when they first login to database with “PASSWORD EXPIRE” parameter.

The code for “inv\_dept\_user”



It also forces users to change their password when they first login to database with “PASSWORD EXPIRE” parameter.

I have successfully met all login and password criteria that will be valid for users, now I will talk about the sections where I tested them.

The login test for “cust\_serv\_1” and the new password is: oracleoracle

**IMPORTANT NOTE:** please test the login as “cust\_serv\_1” with quotation marks for user and don’t put any quotation mark for password just type two times oracle : oracleoracle

It asks for the change the password when first login to database

```
Enter user-name: "cust_serv1"/"oracle"  
ERROR:  
ORA-28001: the password has expired
```

```
Changing password for "cust_serv1"  
New password: █
```

I tried to create a password which has length less than 8(oracle) and my\_verify\_function did not allowed to password and passed the test.

```
Changing password for "cust_serv1"  
New password:  
Retype new password:  
ERROR:  
ORA-28003: password verification for the specified password failed  
ORA-20000: password length less than 8 bytes
```

```
Password unchanged  
Enter user-name: █
```

---

Then typed oracleoracle and it changed the password.

```
Changing password for "cust_serv1"  
New password:  
Retype new password:  
Password changed
```

```
Connected to:  
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production  
Version 19.3.0.0.0
```

```
SQL> █
```

The login test for “cust\_serv\_2” and the new password is: oracleoracle

**IMPORTANT NOTE:** please test the login as “cust\_serv\_2” with quotation marks for user and don’t put any quotation mark for password just type just two times oracle : oracleoracle

```
Changing password for "cust_serv2"  
New password:  
Retype new password:  
ERROR:  
ORA-28003: password verification for the specified password failed  
ORA-20000: password length less than 8 bytes  
  
Password unchanged
```

It passed the length test.

```
Changing password for "cust_serv2"  
New password:  
Retype new password:  
Password changed  
Connected.  
SQL>
```

Password is -> oracleoracle

The login test for “cust\_serv\_2” and the new password is: oracleoracle

**IMPORTANT NOTE:** please test the login as “inv\_dept\_user” with quotation marks for user and don’t put any quotation mark for password just type just two times oracle :  
oracleoracle

This user also has totally same rule set with cust\_serv1 & cust\_serv2

```
Changing password for "inv_dept_user"  
New password:  
Retype new password:  
Password changed  
Connected.  
SQL>
```

Password -> oracleoracle

### 3. DBA REQUIREMENT FOR THE PROJECT

All the users that I created should be able to login to database.  
Results screenshots are as follow:

```
Changing password for "cust_serv1"  
New password:  
Retype new password:  
Password changed
```

```
Connected to:  
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production  
Version 19.3.0.0.0
```

```
SQL> █
```

```
Changing password for "cust_serv2"  
New password:  
Retype new password:  
Password changed  
Connected.  
SQL> █
```

```
Changing password for "inv_dept_user"  
New password:  
Retype new password:  
Password changed  
Connected.  
SQL> █
```

I gave Read/Only access to two Customer Service user for the following tables:  
PRODUCT\_INFORMATION, PRODUCT\_DESCRIPTIONS, ORDERS, ORDER\_ITEMS  
and CUSTOMERS tables.

I gave create session permission to “cust\_serv2” ,”cust\_serv1” and “inv\_dept\_user” to login  
and change their password.

```
SQL> grant create session to "cust_serv1";  
  
Grant succeeded.  
  
SQL> █
```

```
SQL> grant create session to "cust_serv2","inv_dept_user";
```

Grant succeeded.

```
SQL>
```

I gave Read/Only user access to Customer Service department user.

Customer\_Rep is created and Read/Only permits granted for product\_information, product\_description, orders, order\_items and customers table.

```
SQL> connect sys/oracle as sysdba
```

Connected.

```
SQL> create role Customer_rep;
```

Role created.

```
SQL>
```



Figure 7:customer\_rep role creation

```
SQL> grant select on oe.product_information to Customer_rep;
```

Grant succeeded.

```
SQL> grant select on oe.product_descriptions to Customer_rep;
```

Grant succeeded.

```
SQL> grant select on oe.orders to Customer_rep;
```

Grant succeeded.

```
SQL> grant select on oe.order_items to Customer_rep;
```

Grant succeeded.

```
SQL> grant select on oe.customers to Customer_rep;
```

Grant succeeded.

```
SQL>
```



Figure 8: Customer representatives granted for reading data



For the third requirement I created a view that returns every detail about the orders with customer\_id, I used inner join to access customers details but in question only requirement was to see the order details but if customers details wanted, we just need to change ORDERS.\* to only \* so we can see both tables, also we can select desired tables according to needs. The reason I created a view is that the user can get the information they want with just the customer id without writing any complex queries. The reason why I write with join here is to ensure that the information of the customer table is displayed when requested, so that other software developer does not need to write a new query again.

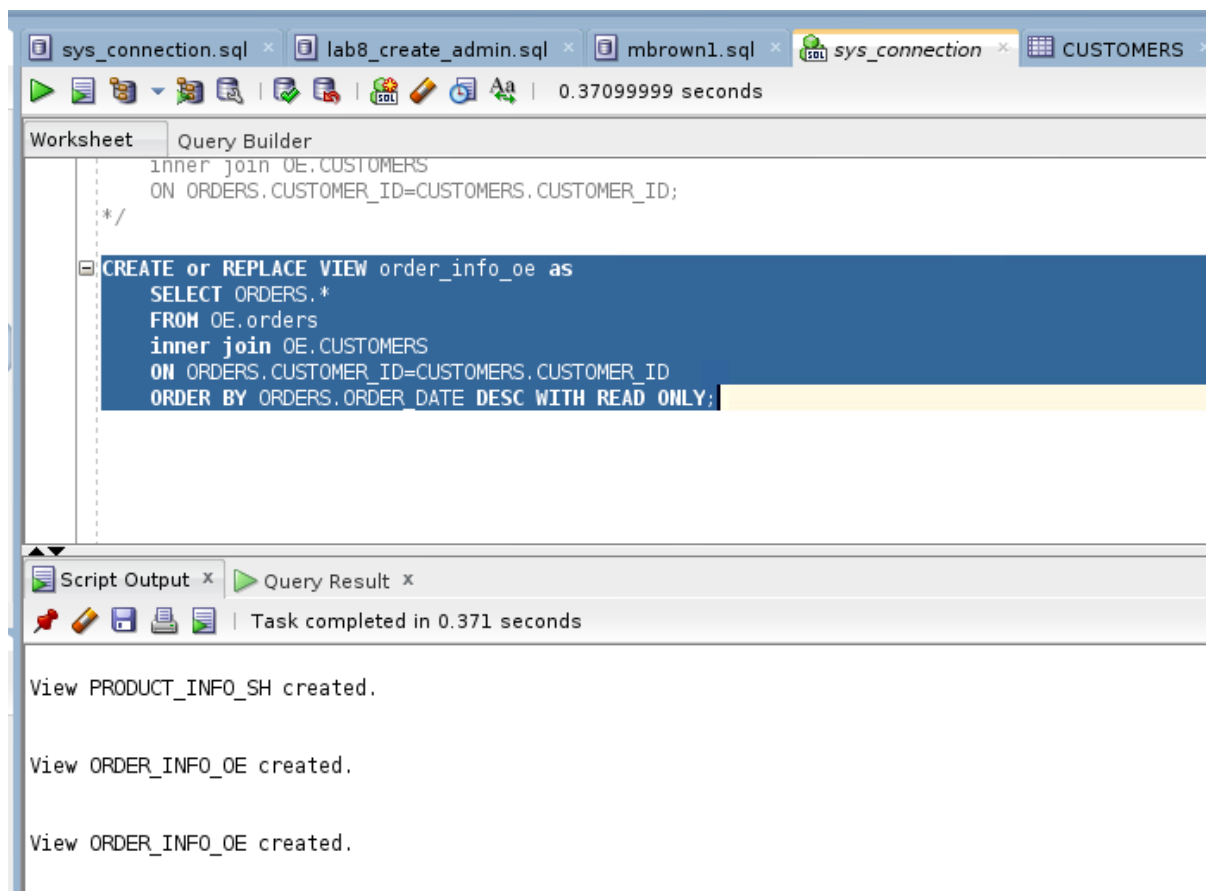


Figure 9: view for order details

I created role to assign roles for inventory department users.

```
SQL> create role inv_user;
```

Role created.

Figure 10: inv\_user role creation for inventory department users

I assigned Read/Write privileges for INVENTORIES, WAREHOUSES and Read/Only privileges to ORDERS, ORDER\_ITEMS and CUSTOMERS to inv\_user.

```
SQL> grant select on oe.inventories to inv_user;
Grant succeeded.

SQL> grant update on oe.inventories to inv_user;
Grant succeeded.

SQL> grant select on oe.warehouses to inv_user;
Grant succeeded.

SQL> grant update on oe.warehouses to inv_user;
Grant succeeded.

SQL> grant select on oe.orders to inv_user;
Grant succeeded.

SQL> grant select on oe.order_items to inv_user;
Grant succeeded.

SQL> grant select on oe.customers to inv_user;
Grant succeeded.

SQL> █
```

---

*Figure 11:grants for inv\_user*

In this code section I allowed all inventory department users to create a new table and view.

I also assigned that inv\_user role to my “inv\_dept\_user” user.

```
SQL> grant create table,create view to inv_user;
Grant succeeded.

SQL> grant inv_user to "inv_dept_user";
Grant succeeded.

SQL> █
```

---

*Figure 12:create view and table privileges assigned to user*

## 4. DBA REQUIREMENT FOR THE PROJECT

In this section, a new table named `inv_categories` have been created. "`cat_id`" and "`sub_cat_id`" are assigned as the composite primary key, so I prevented them from being empty with not null. "`cat_name`", "`sub_cat_name`", "`cat_description`" varchar values are ensured to be a maximum of 25 characters for catname and subcatname and a maximum of 50 characters for cat derscription and these values are prevented from being empty with not null. In the available variable, With the check( ) method, only 'y' and 'n' values are allowed. It is prevented from being empty with not null in this field because it reports the availability status, and this table is saved under the `inv_tsp` tablespace.



The screenshot shows a database query builder interface with two tabs: "Worksheet" and "Query Builder". The "Query Builder" tab is active, displaying the SQL statement for creating the `INV_CATEGORIES` table. The SQL code is as follows:

```
CREATE TABLE INV_CATEGORIES(  
  cat_id number not null,  
  sub_cat_id number not null,  
  cat_name varchar2(25) not null,  
  sub_cat_name varchar2(25) not null,  
  cat_description varchar2(50) not null,  
  available char(1) not null constraint check_available_y_n CHECK(available IN ('Y','N')),  
  primary key(cat_id,sub_cat_id)) tablespace inv_tsp;
```

Below the query editor, there is a "Script Output" window showing the result of the execution: "Task completed in 2.43 seconds".

Table `INV_CATEGORIES` created.

*Figure 13:inv\_categories table created*

## 5. CREATING A REPORT FOR SH USER

In this part, I got the report using a view and I observe that it works fine for the user. Here, it is not necessary for the user to know how to write complex queries, only customer id and user information and information about all the runes he receives are presented to the service of the user in a complete manner.

```

SELECT SALES.prod_id,products.prod_name,CUSTOMERS.CUST_FIRST_NAME,CUSTOMERS.cust_last_name,SALES.cust_id,SALES.quantity_sold,SALES.amount_sold
FROM SH.SALES
inner join SH.CUSTOMERS
ON SALES.CUST_ID=CUSTOMERS.CUST_ID
INNER JOIN SH.products
ON SALES.prod_id=PRODUCTS.prod_id
ORDER BY PRODUCTS.PROD_NAME

SELECT * FROM product_info_sh WHERE CUST_ID=4117;

```

Script Output x Query Result x

SQL | All Rows Fetched: 68 in 0.143 seconds

	PROD_ID	PROD_NAME	CUST_FIRST_NAME	CUST_LAST_NAME	CUST_ID	QUANTITY_SOLD	AMOUNT_SOLD
1	311.44MB	External 3.5" Diskette	Abner	Everett	4117	1	8.88
2	311.44MB	External 3.5" Diskette	Abner	Everett	4117	1	10.24
3	125 3 1/2"	Bulk diskettes, Box of 50	Abner	Everett	4117	1	16.86
4	146	Adventures with Numbers	Abner	Everett	4117	1	12.88
5	139	Bounce	Abner	Everett	4117	1	20.2
6	113	CD-R Mini Discs	Abner	Everett	4117	1	23.89
7	119	CD-R with Jewel Cases, pack OF 12	Abner	Everett	4117	1	8.63
8	117	CD-R, Professional Grade, Pack of 10	Abner	Everett	4117	1	9.33
9	117	CD-R, Professional Grade, Pack of 10	Abner	Everett	4117	1	11.11
10	116	CD-RW, High Speed Pack of 5	Abner	Everett	4117	1	12.73

Figure 14:creating a view

I also created a report called product\_info in the sql developer for customer to find just using filtering it with customer id. I used the query that I used to query that I used in view creation.

	PROD_ID	CUST_ID	PROD_NAME	CUST_FIRST_NAME	CUST_LAST_NAME	QUANTITY_SOLD	AMOUNT_SOLD
1	31	116031.44MB	External 3.5" Diskette Leonora	Jones		1	8.88
2	31	120471.44MB	External 3.5" Diskette Vida	Emmerson		1	8.88
3	31	48421.44MB	External 3.5" Diskette Thayer	Ling		1	8.9
4	31	79391.44MB	External 3.5" Diskette Grady	Finch		1	8.9
5	31	15881.44MB	External 3.5" Diskette Cecil	Packerman		1	8.89
6	31	118501.44MB	External 3.5" Diskette Reuben	Zanth		1	8.89
7	31	58361.44MB	External 3.5" Diskette Tallula	Grinshaw		1	8.88
8	31	73631.44MB	External 3.5" Diskette Psyche	Danato		1	8.88
9	31	88251.44MB	External 3.5" Diskette Cal	Gentle		1	8.88
10	31	2401.44MB	External 3.5" Diskette Meg	Devereaux		1	8.88
11	31	9431.44MB	External 3.5" Diskette Philip	Fromm		1	8.88
12	31	19251.44MB	External 3.5" Diskette Heloise	Fepoi		1	8.88
13	31	25591.44MB	External 3.5" Diskette Leonora	Ready		1	8.88
14	31	25951.44MB	External 3.5" Diskette Ginna	Kirwin		1	8.88
15	31	26751.44MB	External 3.5" Diskette Horatio	Ballenger		1	8.88
16	31	32321.44MB	External 3.5" Diskette Ada	Kitchens		1	8.88
17	31	36131.44MB	External 3.5" Diskette Letty	Thompson		1	8.88
18	31	37471.44MB	External 3.5" Diskette Milburn	Klenn		1	8.88
19	31	39451.44MB	External 3.5" Diskette Tesia	Lessnan		1	8.88
20	31	41651.44MB	External 3.5" Diskette Benedict	Zhao		1	8.88
21	31	44151.44MB	External 3.5" Diskette Harry	Rohrbach		1	8.88
22	31	74431.44MB	External 3.5" Diskette Rosanond	Colven		1	8.88
23	31	84471.44MB	External 3.5" Diskette Blosson	Ellis		1	8.88
24	31	105771.44MB	External 3.5" Diskette Gaston	Greene		1	8.88
25	31	106191.44MB	External 3.5" Diskette Gwendolyn	Baer		1	8.88
26	31	132981.44MB	External 3.5" Diskette Harland	Pettit		1	8.88

Figure 15:custom\_report for customer

I checked it with using the filtering with customer\_id and it returned the correct results.

PROD_ID	CU...	PROD_NAME	CUST_FIRST_NAME	CUST_LAST_NAME	QUANTITY_SOLD	AMOUNT_SOLD
1	31	141.44MB External 3.5" Diskette	Gloria	Saintclair	1	9.85
2	31	141.44MB External 3.5" Diskette	Gloria	Saintclair	1	9.74
3	31	141.44MB External 3.5" Diskette	Gloria	Saintclair	1	9.85
4	31	141.44MB External 3.5" Diskette	Gloria	Saintclair	1	9.85
5	14	1417" LCD w/built-in HDTV Tuner	Gloria	Saintclair	1	1264.4
6	14	1417" LCD w/built-in HDTV Tuner	Gloria	Saintclair	1	1264.4
7	14	1417" LCD w/built-in HDTV Tuner	Gloria	Saintclair	1	1244.33
8	14	1417" LCD w/built-in HDTV Tuner	Gloria	Saintclair	1	1264.4
9	126	143 1/2" Bulk diskettes, Box...	Gloria	Saintclair	1	30.57
10	126	143 1/2" Bulk diskettes, Box...	Gloria	Saintclair	1	30.26
11	125	143 1/2" Bulk diskettes, Box...	Gloria	Saintclair	1	16.86
12	125	143 1/2" Bulk diskettes, Box...	Gloria	Saintclair	1	16.69
13	125	143 1/2" Bulk diskettes, Box...	Gloria	Saintclair	1	16.67
14	125	143 1/2" Bulk diskettes, Box...	Gloria	Saintclair	1	16.69
15	125	143 1/2" Bulk diskettes, Box...	Gloria	Saintclair	1	16.69
16	146	14Adventures with Numbers	Gloria	Saintclair	1	17.03
17	146	14Adventures with Numbers	Gloria	Saintclair	1	17.03
18	119	14CD-R with Jewel Cases, pAC...	Gloria	Saintclair	1	8.42
19	117	14CD-R, Professional Grade, ...	Gloria	Saintclair	1	10.83
20	116	14CD-RW, High Speed Pack of 5	Gloria	Saintclair	1	14.44
21	120	14DVD-R Disc with Jewel Case...	Gloria	Saintclair	1	9.12
22	120	14DVD-R Disc with Jewel Case...	Gloria	Saintclair	1	8.91
23	120	14DVD-R Disc with Jewel Case...	Gloria	Saintclair	1	9.12
24	123	14DVD-R Discs, 4.7GB, Pack of 5	Gloria	Saintclair	1	65.22
25	123	14DVD-R Discs, 4.7GB, Pack of 5	Gloria	Saintclair	1	65.22
26	123	14DVD-R Discs, 4.7GB, Pack of 5	Gloria	Saintclair	1	65.22

Figure 16:report for one customer

Here I am stuck between creating a procedure with pls/sql and creating a view, but since it is a topic we have handled before, I implemented it with view. Here, the positive side of the view is that pl/sql destroys the relational database and cannot be optimized, but we can easily make the optimization in the views that are probably progressing and complicated in the view. On the positive side of the procedure, it seems more logical to use the procedure when we want to reduce the network traffic. A Stored Procedure can execute SQL statements in batches, rather than sending them multiple times into the network environment. This reduces traffic and increases performance. Another positive side of procedure is that it improves the security of data. Allowing users to execute stored procedure statements directly without authorization in the stored procedure ensures security. It will be more logical to decide which choice to make here after the user expectations are taken in more detail, but I chose view here because it will see the needs of the user very quickly, but in companies where issues such as security are important within the company, it would be more logical to use the procedure.

## 6. Solution for how to recover your database if you drop an important schema

The flashback database feature allows you to reduce the restore-recovery process from hours to minutes. You can go back in time and open your database at a specified point in time. It is more appropriate to use the flashback database feature for retrieval of user errors rather than for physical faults. If you dropped a schema in database, you can use flashback database command to a past time or past SCN. Flashback database feature is turned off by default. It is necessary to set FLASHBACK\_ON feature to turn this feature on. There are some steps have to be followed. Before these, you must enable Flashback Recovery Area for your database. First of all , The database must be configured for archiving and FLASHBACK has to be enabled.

```
SQL> ALTER DATABASE ARCHIVELOG;  
SQL> ALTER DATABASE FLASHBACK ON;
```

Also system needs to be started in MOUNT mode.

```
SQL> SHUTDOWN IMMEDIATE;  
SQL> STARTUP MOUNT;
```

We have FLASHBACK DATABASE command to return database to a past time or past SCN. In real life problems, we may not have the SCN number values but we can have TIMESTAMP

```
SQL> FLASHBACK DATABASE TO TIMESTAMP(SYSDATE-1/24);  
SQL> FLASHBACK DATABASE TO SCN your_scnNumber;
```

The database must be opened to READ/WRITE functionality with RESETLOGS.

```
SQL> ALTER DATABASE OPEN RESETLOGS;
```

We can flashback the schema using flashback database command to restore our schema.

Note: some of those sql codes from week 7 lab session.

## 7. “ORA-1555: Snapshot too old” error and how to solve it

Transaction undo information generated in the database is kept in rollback segments until commit or rollback. Sometimes our long running queries in the database encounter the error “ORA-01555:Snapshot Too Old”. Also according to Oracle website (“Managing Undo”) explains it as follows:

“The database attempts to honour the minimum retention term set by UNDO RETENTION for an undo tablespace with the AUTOEXTEND option enabled. The tablespace auto-extends when space is low, instead of overwriting unexpired undo information. When the MAXSIZE clause is specified for an auto-extending undo tablespace, the database may begin to overwrite unexpired undo information when the maximum size is reached. ( “Managing Undo”,2017)

This is because our UNDO parameters are not configured correctly. If you want to change the undo tablespace to a fixed size, you must choose a tablespace size that is large enough. The UNDO RETENTION option and the UNDO Tablespace size must be correctly configured to prevent the "ORA-01555:Snapshot Too Old" issue. The UNDO RETENTION parameter controls how much undo data the database retains after a commit. The default value for this parameter is 900 seconds. It is up to us to raise its value over time. Increasing the 900s(15 min) value will demand additional space in proportion. Instead of having to define and maintain rollback segments, it's much easier to construct an undo tablespace and let Oracle handle the undo management. ORACLE will take care of the rest if you set the UNDO MANAGEMENT parameter to AUTO.

## 8. DIFFERENCE BETWEEN HOT BACK UP AND COLD BACK UP AND THEIR BENEFITS

Cold backups are backups performed when the database is in offline or shutdown mode. Conversely, you can create other types of backups when data is flowing in or out of a database or data warehouse structure while the database is running. The logic behind cold backups is that some files and information forms that can be compromised if a backup attempt fails while streaming those files when the backup is inactive in the database. It makes it so easy to backup. According to (Li & Hu , 2009) “When we do cold backup operation, all objects can keep in consistent. There are the some main steps of cold backup, shutdown database in normal and efficient way which is shutdown immediate command and there is also need to use operation system (OS) command to copy files to other places with cp (files\_location) new\_files\_location command. In most 24\*7 enterprises, database backup is not permitted to implement under this cold condition, enterprises cannot take this kind of backup method because of its huge offline cost.”

The advantage of cold backups is that the backups are not affected by live viruses or hacking attempts which makes it safer. It is also the most reliable way to back up your data because it is not affected by problems like power surges. Negative side of the cold backup is basically users can not access to database during the backup and that is not possible for some business models. It also takes more time to backup from a database disaster and that makes extra delays for the system.

The expression "hot backup" refers to a backup that is taken while the database is still active, and users can continuously work on the live system. Although users can access and process data while a Hot Backup is being taken, the recovery process must always be executed after the backup has been completed. In rare situations, hot backup can cause database discrepancy because it is writing data in real time. Because of the responsibility for responding to queries and ensuring that the file is backed up, it can be slower than Cold Backup. The positive point of Hot Backup is that if any damage occurs to the main server where the data is kept, the server that owns the Hot backup replaces it and the work is considered to have continued almost non-stop.



## 9. DATABASE FAILURES AND THEIR IMPACT TO BUSINESS AND COMPANIES

On the subject of database failures, companies cannot find much data online, as they do not look forward to sharing their own data. The analysis I will make here will be an analysis of how companies' databases are downtime and the size of the company and its brand. The analysis I will make here will mostly be an analysis of how companies' databases are downtime and the size of the company and its brand. The main reasons for database failures are human error, software/hardware error, natural disasters, cyber attacks, misconfiguration of device and bugs that usually appear in version updates. I will look at the damage done to companies by the process of staying in this downtime with simple mathematical calculations on this subject. While I was in Turkey, Akbank, one of the largest banks in the country, could not provide service for exactly 1 week due to a problem in its database. In the statement made by the bank, it was stated that the possible loss was more than 5m\$ for each working hour. The source of the error is the error made during the update to the mainframe. It took exactly 1 week for them to fix the error and bring the system back. Meanwhile, it is estimated that the bank has incurred a loss of approximately 115 million dollars in a week. The method used in this calculation is the bank's weekly profit balance sheet for the previous year + I think that after this process, the customers transfer their money from this bank to another bank due to the lack of trust in the bank. The important thing here is that the trust in the company is deeply injured and the bank customers are afraid of not being able to withdraw my money. This situation has short-term effects as well as long-term negative effects on the companies.

## 10. References

“Managing Undo.” Oracle.Com, 2017, docs.oracle.com/database/121/ADMIN/undo.htm.

Q. Li and H. Xu, "Research on the Backup Mechanism of Oracle Database," 2009 International Conference on Environmental Science and Information Application Technology, 2009, pp. 423-426, doi: 10.1109/ESIAT.2009.294.