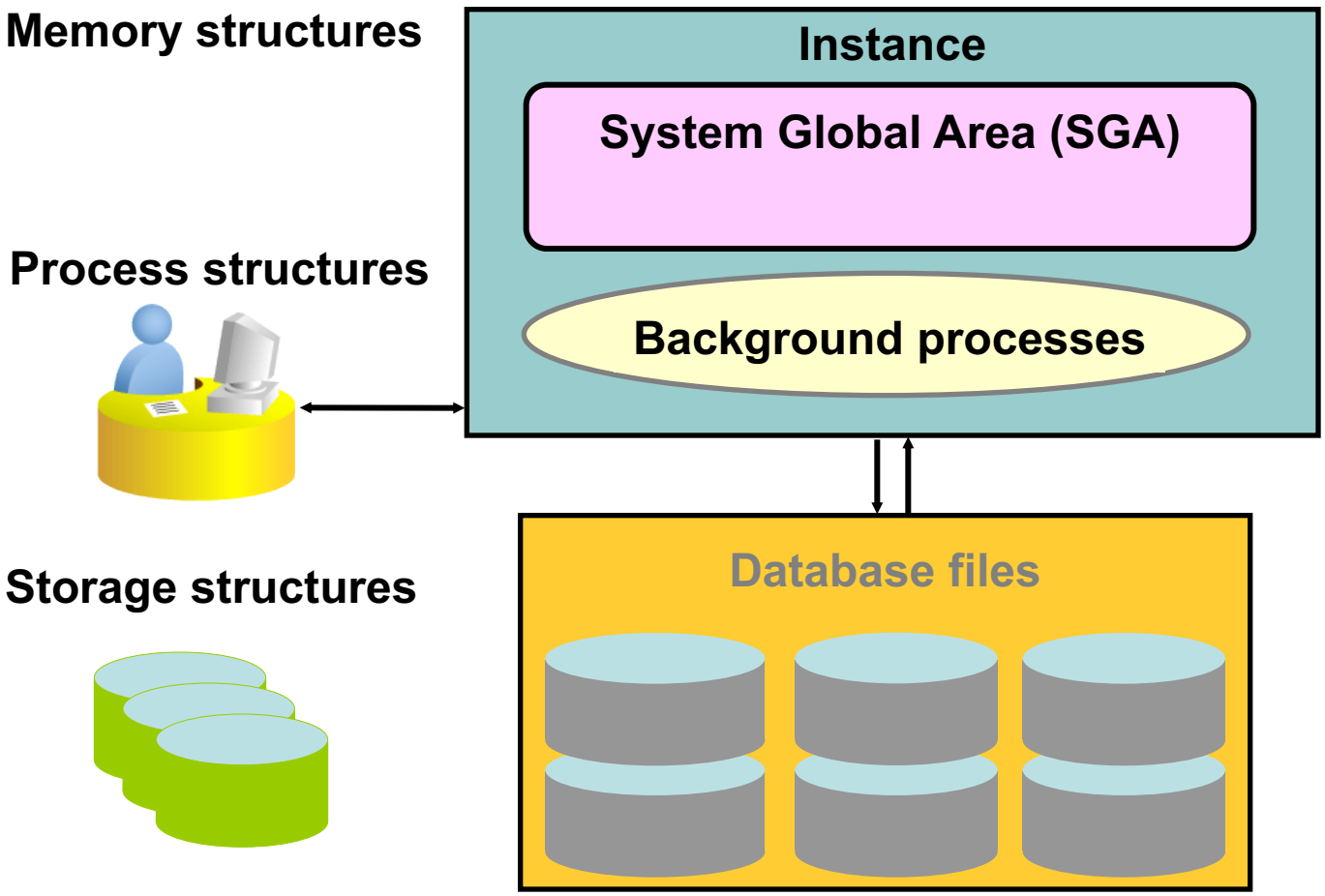
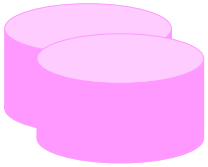
Oracle Database Architecture

- An Oracle server:
  - Is a database management system that provides an open, comprehensive, integrated approach to information management
  - Consists of an Oracle instance and an Oracle database

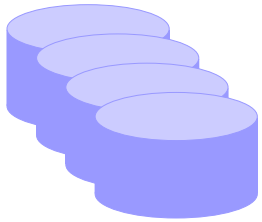
Database Structures



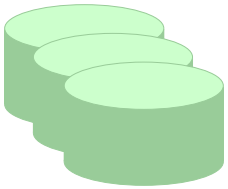
Physical Database Structure



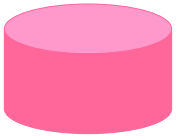
Control files



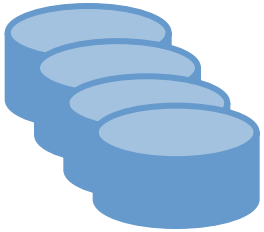
•Data files



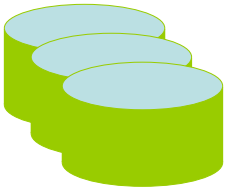
•Online redo log files



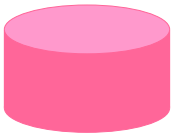
•Parameter file



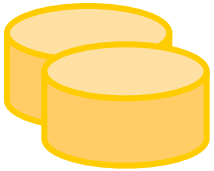
•Backup files



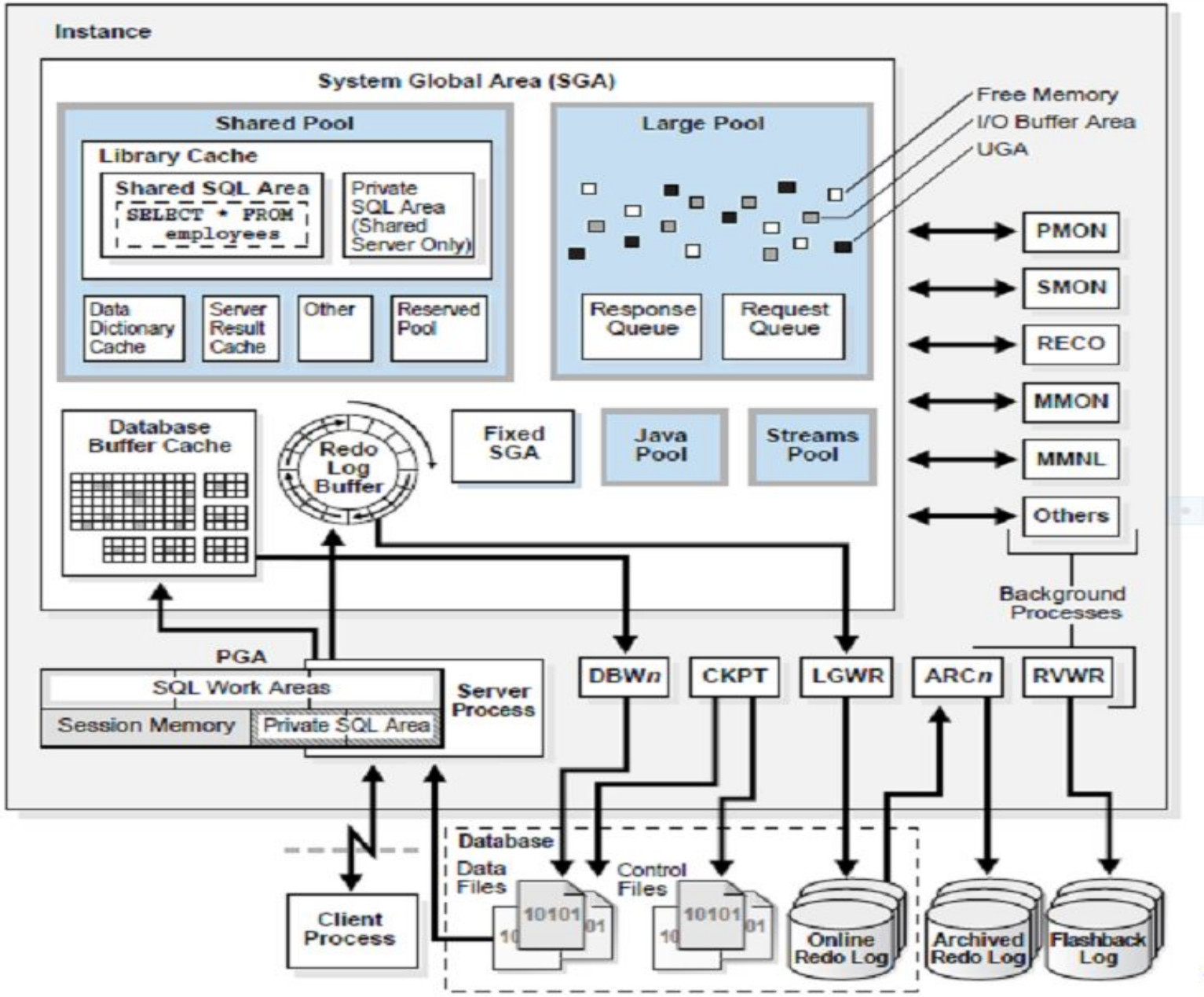
•Archive log files



•Password file



•Alert and trace log files


Instance
System Global Area (SGA)
Shared Pool
Library Cache
Shared SQL Area
SELECT * FROM employees
Private SQL Area (Shared Server Only)
Data Dictionary Cache
Server Result Cache
Other
Reserved Pool
Large Pool
Response Queue
Request Queue
Free Memory
I/O Buffer Area
UGA
Database Buffer Cache
Redo Log Buffer
Fixed SGA
Java Pool
Streams Pool
PMON
SMON
RECO
MMON
MMNL
Others
Background Processes
PGA
SQL Work Areas
Session Memory
Private SQL Area
Server Process
DBWn
CKPT
LGWR
ARCn
RVWR
Client Process
Database
Data Files
Control Files
Online Redo Log
Archived Redo Log
Flashback Log

Data Dictionary Views

	Who Can Query	Contents	Subset of	Notes
`DBA_`	DBA	Everything	N/A	May have additional columns meant for DBA use only
`ALL_`	Everyone	Everything that the user has privileges to see	`DBA_` views	Includes user's own objects
`USER_`	Everyone	Everything that the user owns	`ALL_` views	Is usually the same as `ALL_` except for the missing `OWNER` column. Some views have abbreviated names as `PUBLIC` synonyms.

Data Dictionary: Usage Examples

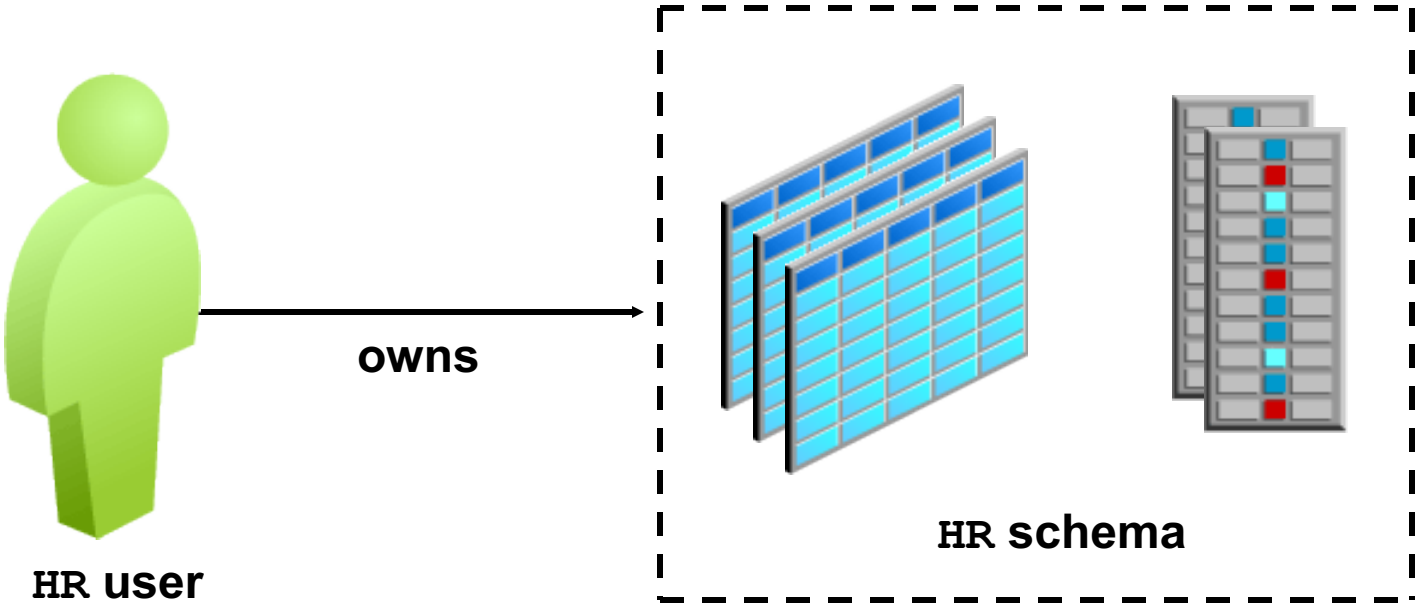
a
```
SELECT table_name, tablespace_name FROM
user_tables;
```

b
```
SELECT sequence_name, min_value, max_value,
increment_by FROM all_sequences WHERE
sequence_owner IN ('MDSYS','XDB');
```

c
```
SELECT USERNAME, ACCOUNT_STATUS FROM
dba_users WHERE ACCOUNT_STATUS = 'OPEN';
```

d
```
DESCRIBE dba_indexes;
```

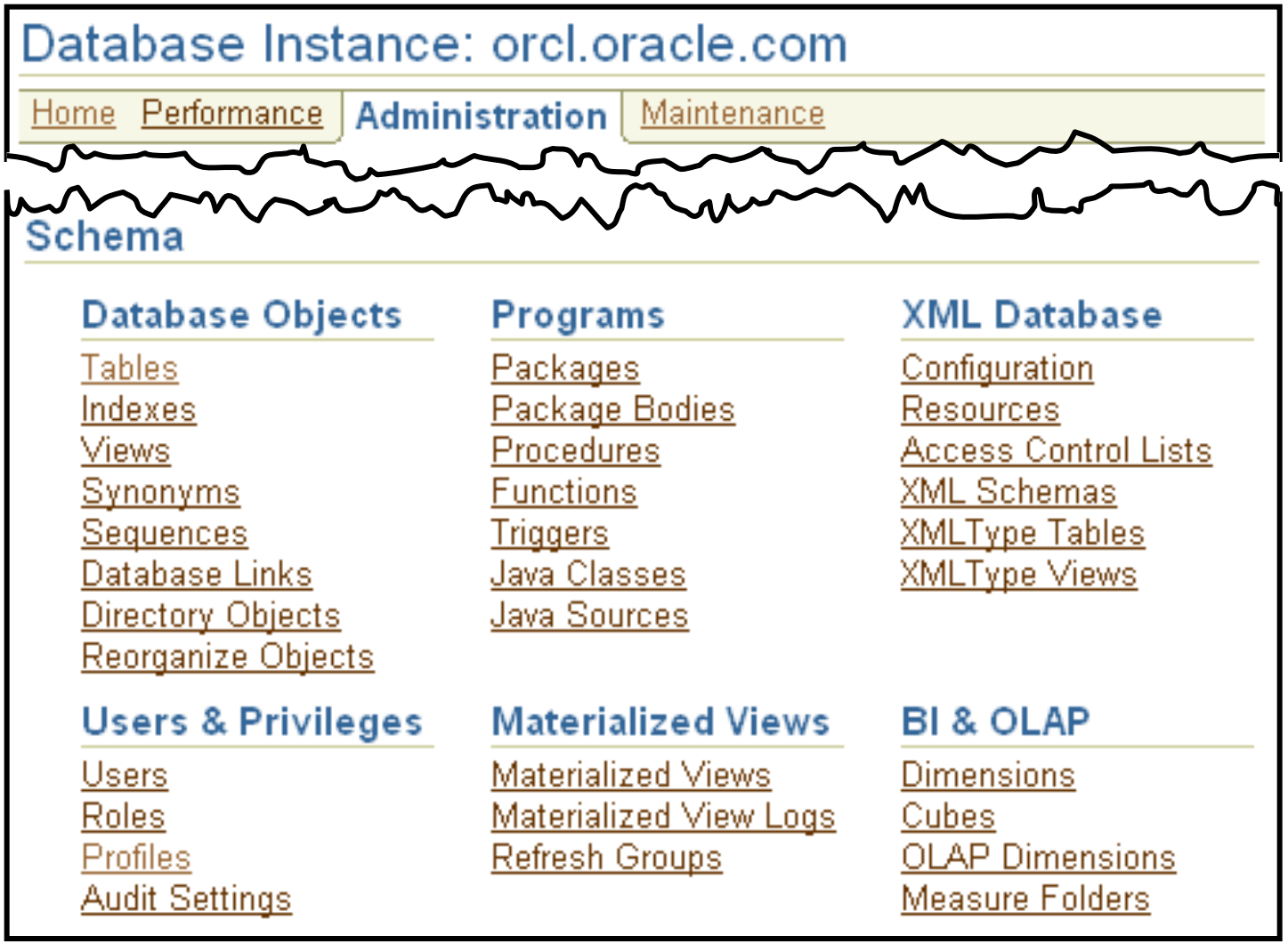
What Is a Schema?



Schema Objects

- In Oracle Database, a database **schema** is a collection of logical data structures, or **schema objects**. A database schema is owned by a database user and has the same name as the **user name**.

Accessing Schema Objects



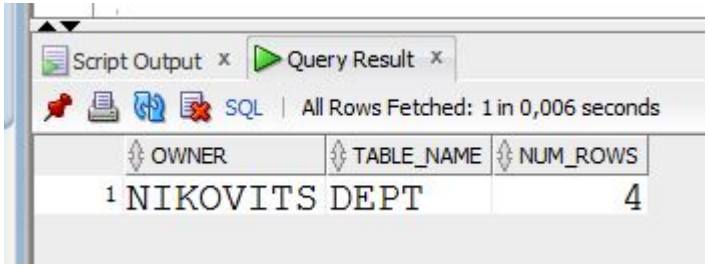
Tables

```
CREATE TABLE dept
  (deptno NUMBER(2), dname VARCHAR2(42), loc VARCHAR2(39));

SELECT owner, table_name, num_rows
FROM DBA_TABLES
WHERE owner='NIKOVITS' AND table_name='DEPT';
```

(!) ANALYZE TABLE DEPT COMPUTE STATISTICS;

(!) ANALYZE TABLE DEPT DELETE STATISTICS;



Tables

```
CREATE TABLE dept
   (deptno NUMBER(2), dname VARCHAR2(42), loc VARCHAR2(39));

SELECT column_id, column_name, data_type, data_length,
            data_precision, data_scale
FROM DBA_TAB_COLUMNS
WHERE owner='NIKOVITS' AND table_name='DEPT';
```

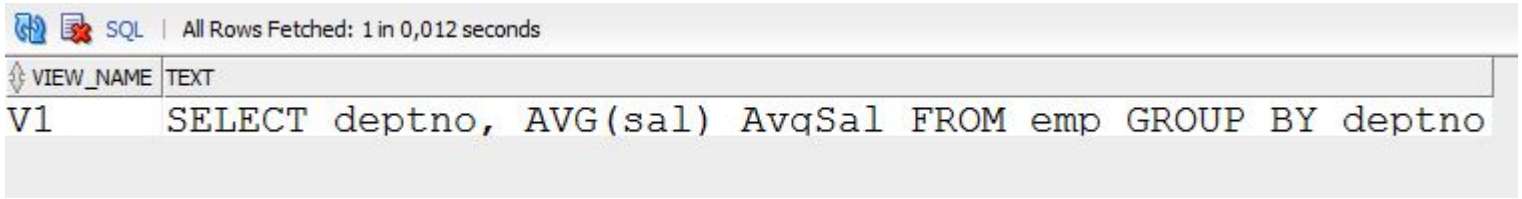
SQL | All Rows Fetched: 3 in 0,003 seconds

COLUMN_ID	COLUMN_NAME	DATA_TYPE	DATA_LENGTH	DATA_PRECISION	DATA_SCALE
1	DEPTNO	NUMBER	22	2	0
2	DNAME	VARCHAR2	42	(null)	(null)
3	LOC	VARCHAR2	39	(null)	(null)

Views

```
CREATE VIEW v1 AS
SELECT deptno, AVG(sal) AvgSal FROM emp GROUP BY deptno;

SELECT view_name, text
FROM DBA_VIEWS
WHERE owner='NIKOVITS' AND view_name='V1';
```



Synonyms

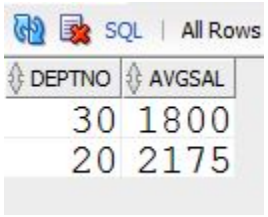
CREATE SYNONYM syn1 FOR v1;

SELECT * FROM DBA_SYNONYMS
WHERE owner='NIKOVITS' AND synonym_name='SYN1';


SQL | All Rows Fetched: 1 in 0,009 seconds

OWNER	SYNONYM_NAME	TABLE_OWNER	TABLE_NAME	DB_LINK
NIKOVITS	SYN1	NIKOVITS	V1	(null)

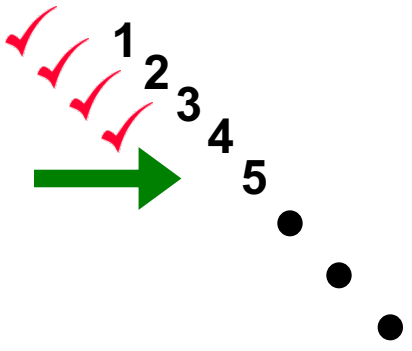
SELECT * FROM syn1 WHERE deptno > 10;


SQL | All Rows

DEPTNO	AVGSAL
30	1800
20	2175

Sequences

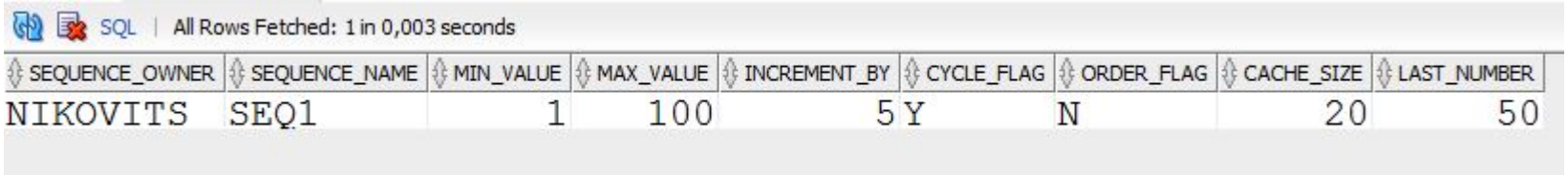
- A sequence is a mechanism for automatically generating integers that follow a pattern.
  - A sequence has a name, which is how it is referenced when the next value is requested.
  - A sequence is not associated with any particular table or column.
  - The progression can be ascending or descending.
  - The interval between numbers can be of any size.
  - A sequence can cycle when a limit is reached.



Sequences

```
CREATE SEQUENCE seq1
MINVALUE 1 MAXVALUE 100 INCREMENT BY 5
START WITH 50 CYCLE;

SELECT * FROM DBA_SEQUENCES
WHERE sequence_name='SEQ1';
```



SQL | All Rows Fetched: 1 in 0,003 seconds

SEQUENCE_OWNER	SEQUENCE_NAME	MIN_VALUE	MAX_VALUE	INCREMENT_BY	CYCLE_FLAG	ORDER_FLAG	CACHE_SIZE	LAST_NUMBER
NIKOVITS	SEQ1	1	100	5	Y	N	20	50

Using a Sequence

Next value from sequence:

```
INSERT INTO dept VALUES(seq1.NEXTVAL, 'IT', 'Budapest');
```

Current value from sequence:

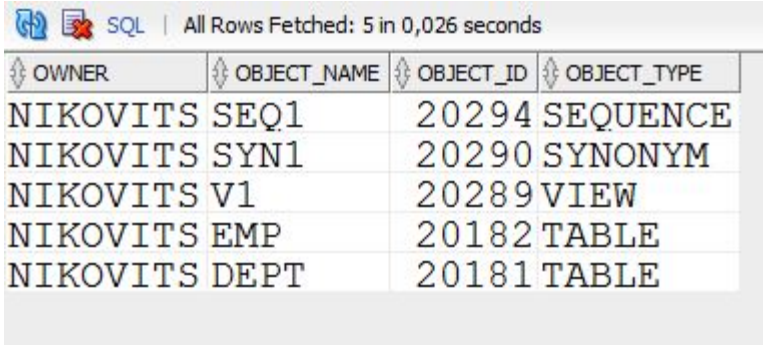
```
INSERT INTO emp(deptno, empno, ename, job, sal)
VALUES(seq1.CURRVAL, 1, 'Tailor', 'SALESMAN', 100);
```

Current value from sequence:

```
INSERT INTO emp(deptno, empno, ename, job, sal)
VALUES(seq1.CURRVAL, 2, 'Sailor', 'SALESMAN', 200);
```

ANY Object

```
SELECT owner, object_name, object_id, object_type
FROM DBA_OBJECTS
WHERE owner='NIKOVITS, and created > sysdate - 1;
```



SQL | All Rows Fetched: 5 in 0,026 seconds

OWNER	OBJECT_NAME	OBJECT_ID	OBJECT_TYPE
NIKOVITS	SEQ1	20294	SEQUENCE
NIKOVITS	SYN1	20290	SYNONYM
NIKOVITS	V1	20289	VIEW
NIKOVITS	EMP	20182	TABLE
NIKOVITS	DEPT	20181	TABLE