Getting to Know your Oracle DB

WEEK 03

Some Tools to Work with your New Oracle DB

Tool	OS Platform	Free?
PL/SQL Developer https://www.allroundautomations.com/plsqldev.html	Windows	No ($216 per user)
Oracle Toad https://www.quest.com/products/toad-for-oracle/	Windows	No (€1128 per user)
Oracle SQL Developer http://www.oracle.com/technetwork/developer-tools/sql-developer/overview/index.html	Cross platform	Yes
Sqlplus (is part of any Oracle DB Server setup)	Cross platform	Yes

Oracle DB Viewed from Outside

JUST A BUNCH OF FILES AND SOME "STRANGE" PROCESSES…

The First Challenge of the Week

1

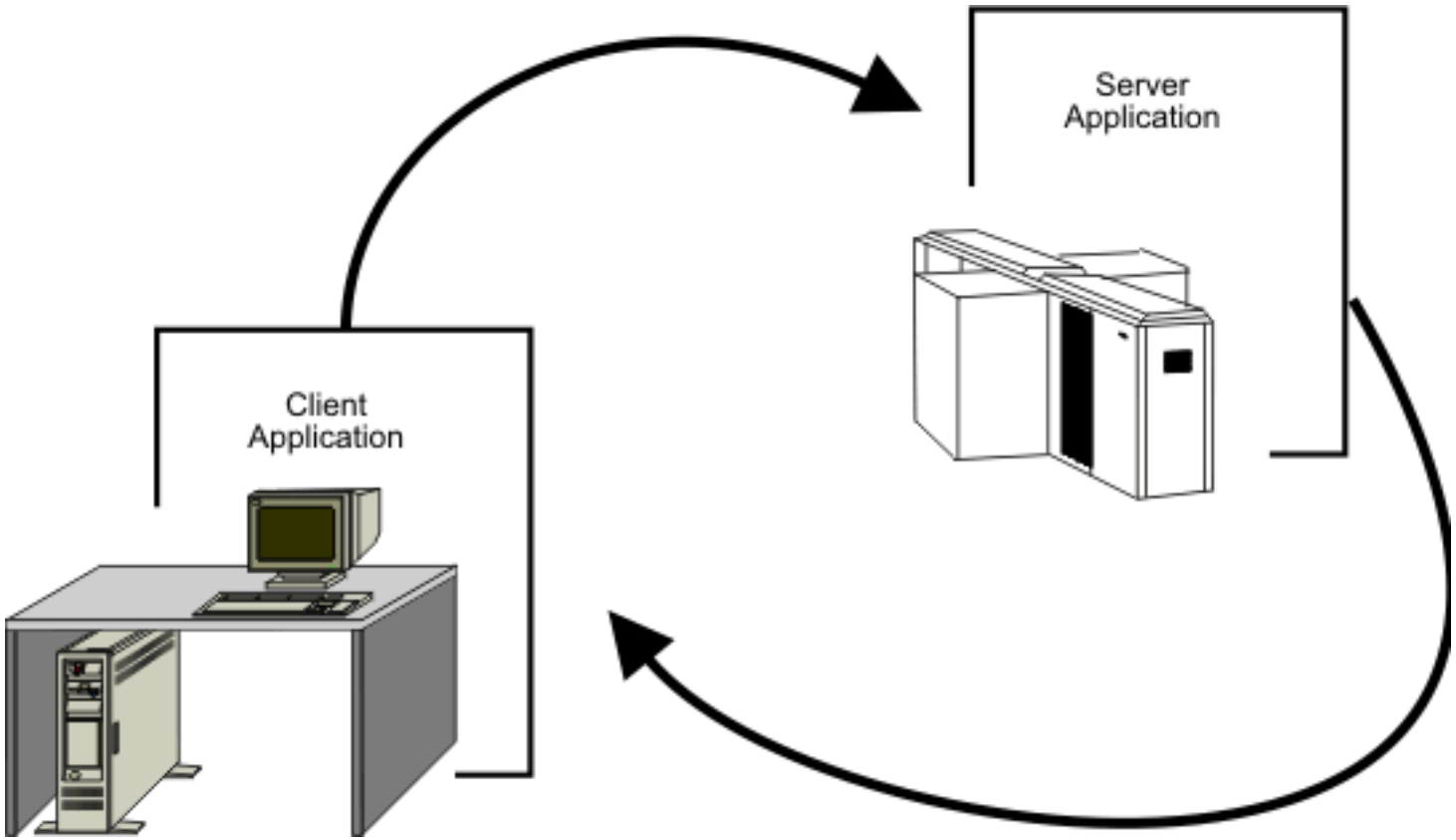
List the database files (hint: `/u01/app/oracle/oradata`). Can you figure out the size of the database?

2

Look at the "oracle" processes which are currently running and guess the ones belonging to Oracle system

Oracle DB Viewed from Inside

WELL, WE HAVE TO CONNECT FIRST…



The Client-server Architecture

Source: https://www.ibm.com/support/knowledgecenter/en/SSLTBW_2.3.0/com.ibm.zos.v2r3.ieak500/ieak5cli.gif

What is Needed to Get to the Database (basic scenario)

1

The client application

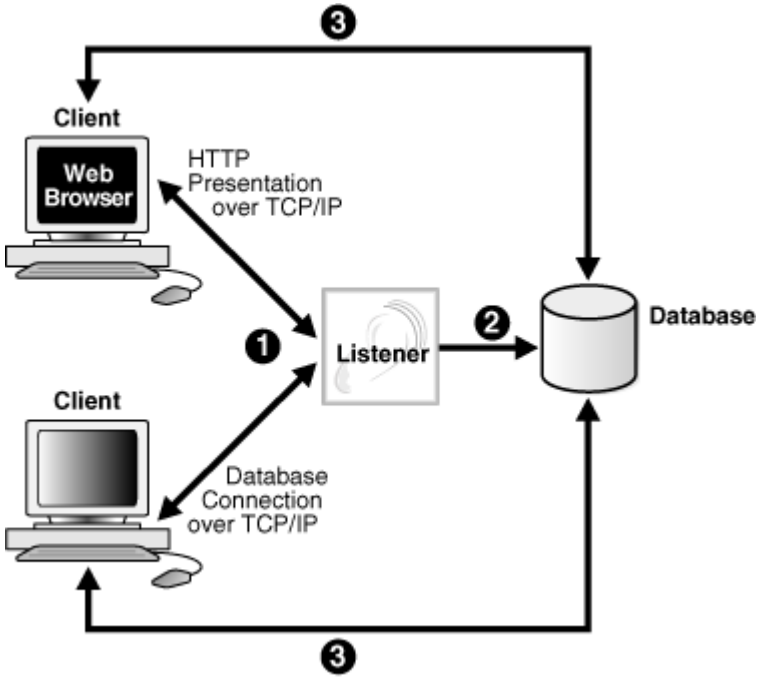
2

Network connectivity

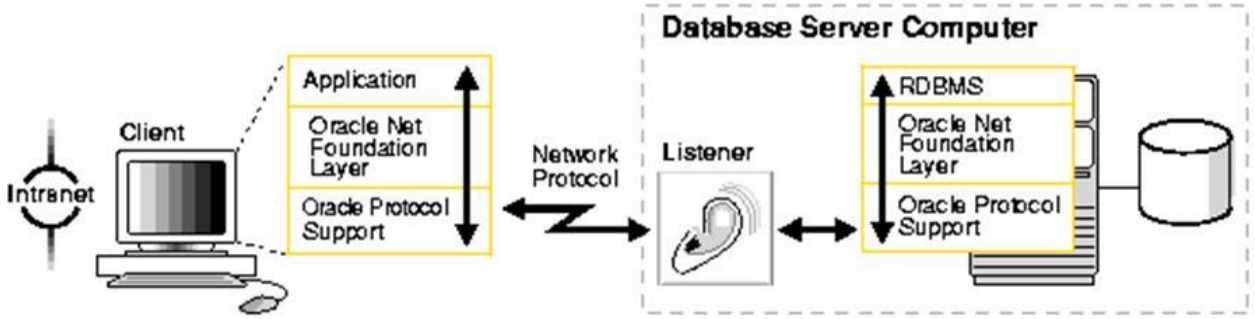
3

A valid username and password

Network Communication



The big picture



Detailed picture

The Oracle Listener

It’s a separate component

It can be configured via a configuration file called “listener.ora”, typically located in $ORACLE_HOME/network/admin

It can be managed using a special tool called “lsnrctl”.

Basic Authentication

A valid username and password are needed.

On the database installation you are asked to provide the password for two admin users:

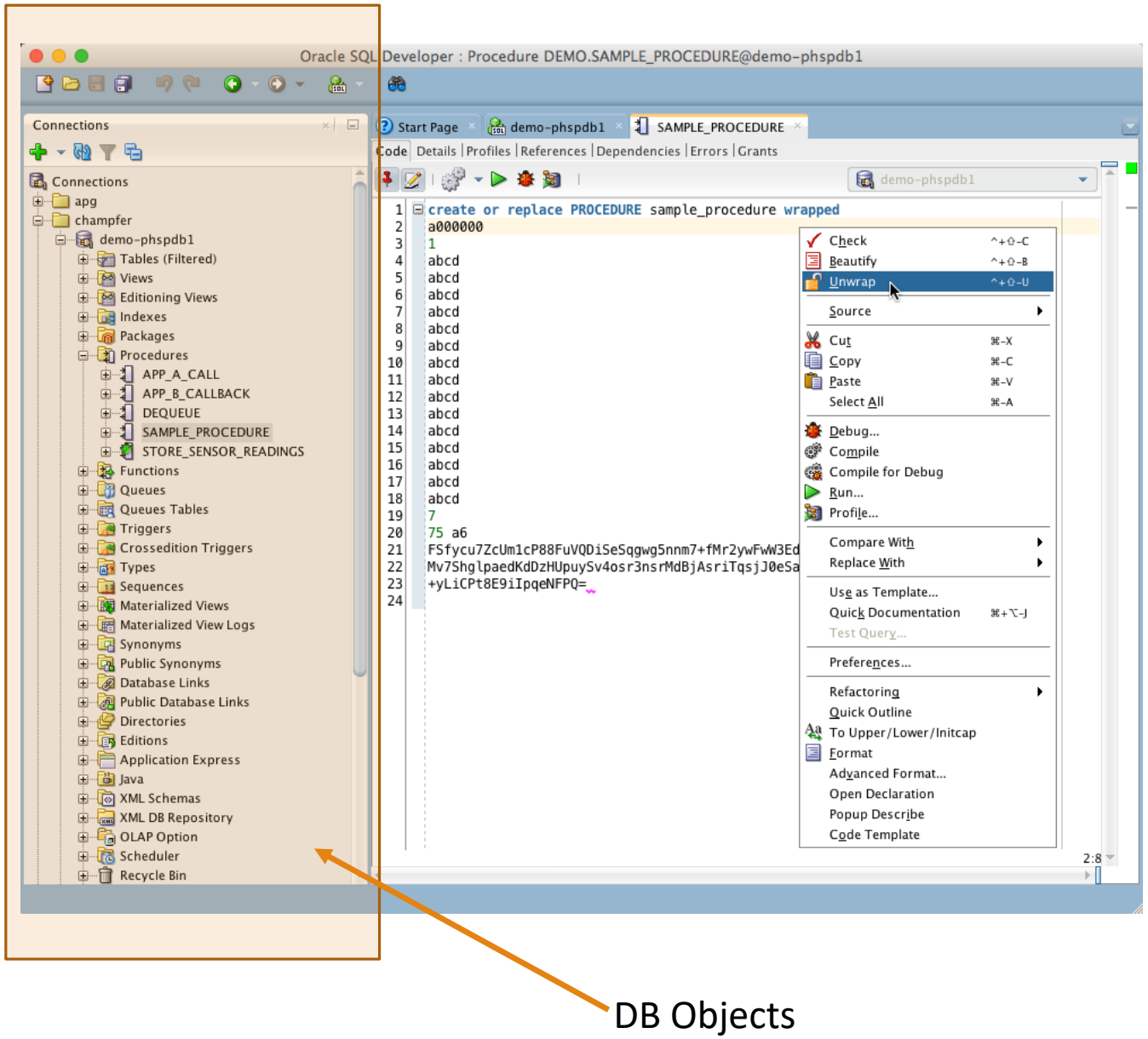
- SYS: the most powerful one (it's like the "root" user in linux)
- SYSTEM: a less powerful user but still having administrative rights and recommended to be used on daily administration tasks

The user's credentials are checked by the database layer, not by the listener.

Basic Info Required to Connect to an Oracle DB

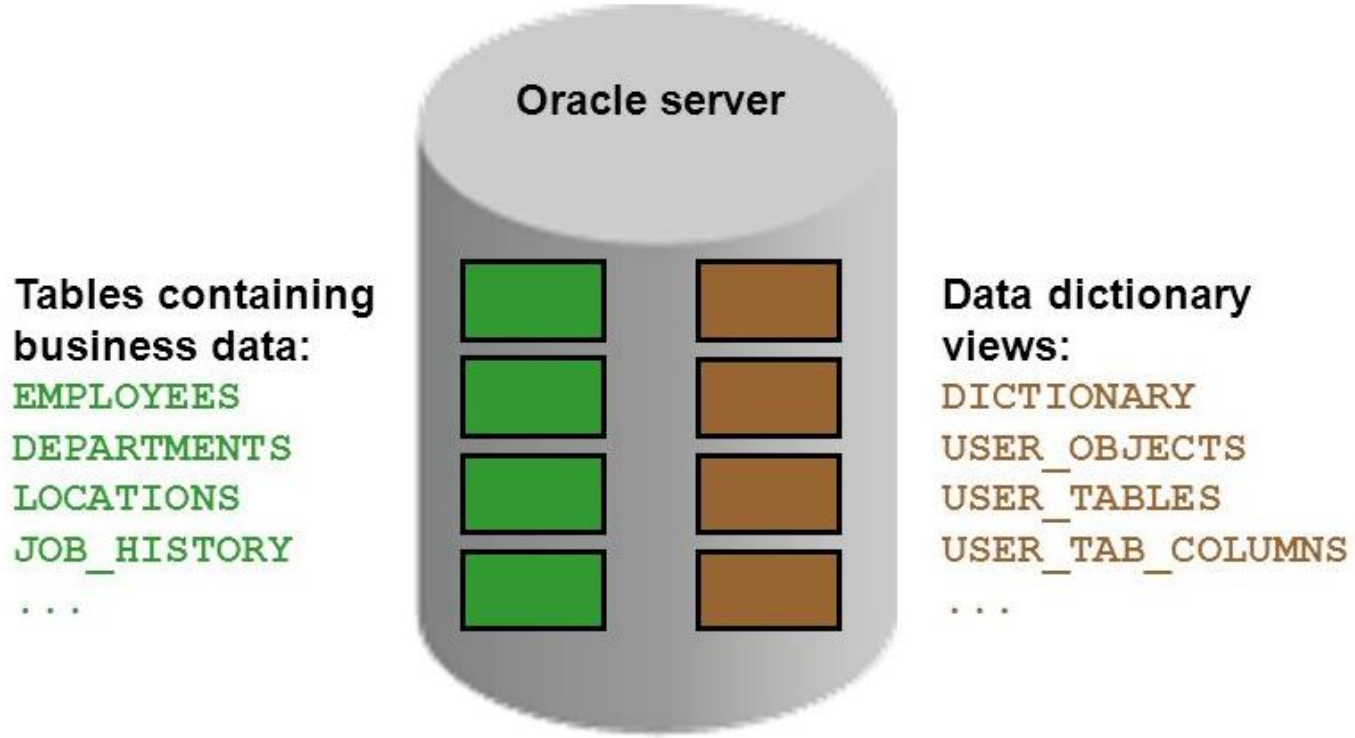
Before trying to connect to an Oracle database, ensure that you have:

- A valid username and password
- The IP address where the listener is running
- The port where the listener is listening
- The database/service name



Oracle DB Viewed from Inside

The Database Dictionary



Did You Know that?

DB Dictionary…

It is owned by SYS user

It’s a metadata repository about the data within the database

You must NEVER alter directly the dictionary data (only if Oracle Support advises so)

It is the most common place DBAs are looking for to accomplish various tasks: adding more space, troubleshooting, tuning etc.

Common Dictionary Queries

What tables are in my own schema?

What columns have a table?

How many indexes are defined?

What Oracle users are created in the database?

How many connections/sessions do currently exit for every user?

In which PL/SQL objects (procedures, triggers, packages etc) a particular table is being referenced?

The Oracle Instance Architecture

Do You Remember the Previous Challenge?

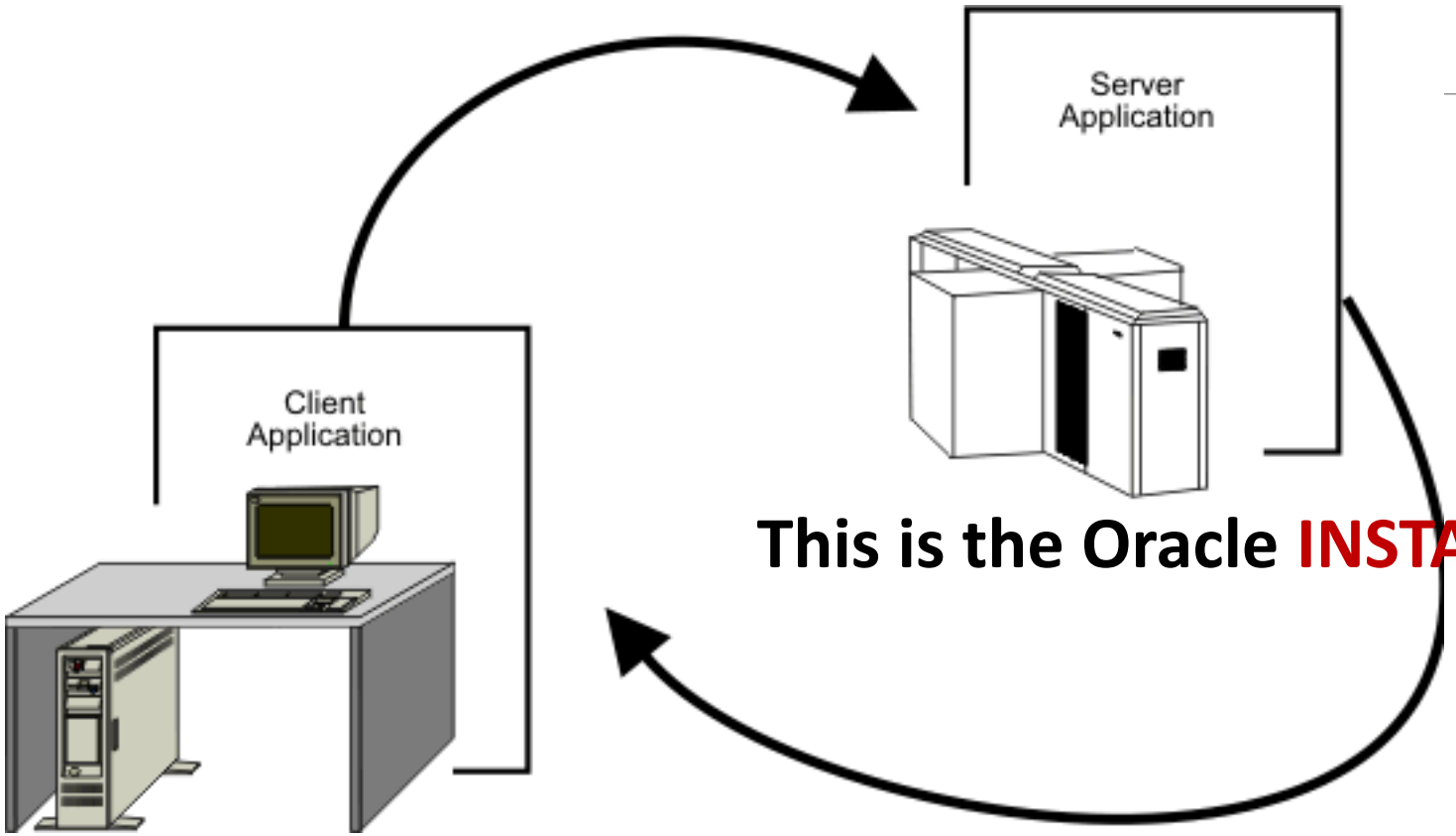
List the database files (hint: `/u01/app/oracle/oradata`). Can you figure out the size of the database?

This is the Oracle DATABASE

Look at the "oracle" processes which are currently running and guess the ones belonging to Oracle system

This is the Oracle INSTANCE

Do You Remember This Slide?

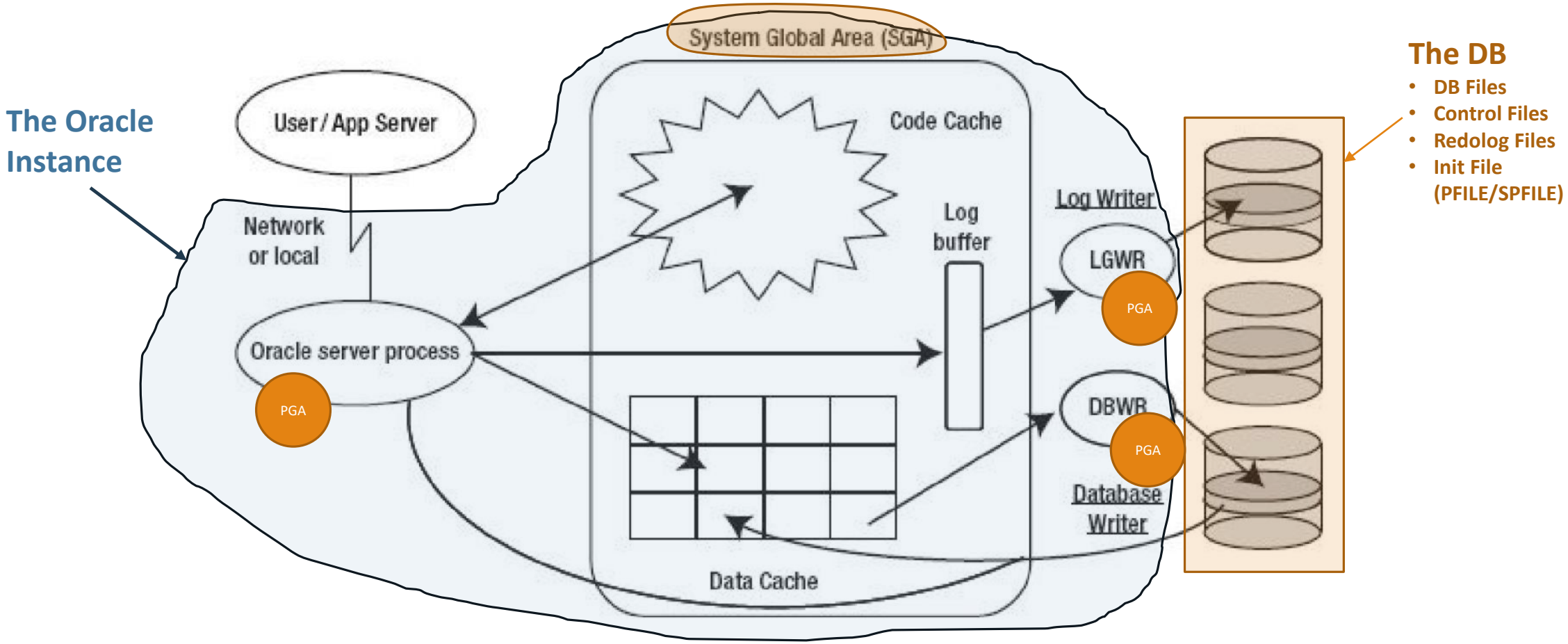


This is the Oracle INSTANCE

What is the Oracle Instance

A COLLECTION OF OS PROCESSES AND MEMORY STRUCTURES.

The Just-enough Diagram



Source: Jonathan Lewis, "Oracle Core - Essential Internals for DBAs and Developers".

Processes Types

Background Processes: takes care of the good health of the database and maintains it in an optimized operational mode: DBWR, LOGWR, SMON, PMON etc.

Process	Description	Mandatory
PMON	Ensure everything is fine after an instance process had died unexpectedly	YES
SMON	Performs instance recovery	YES
DBWn	Writes dirty buffers from buffer cache to the datafiles	YES
LGWR	Writes from log buffer to the online redolog files	YES
ARCn	Copy online redolog files to the archiving location	NO

Foreground Processes: in the Oracle dedicated server architecture, to every user connection a new server process is allocated which does the database work on behalf of the client requests

Memory Structures

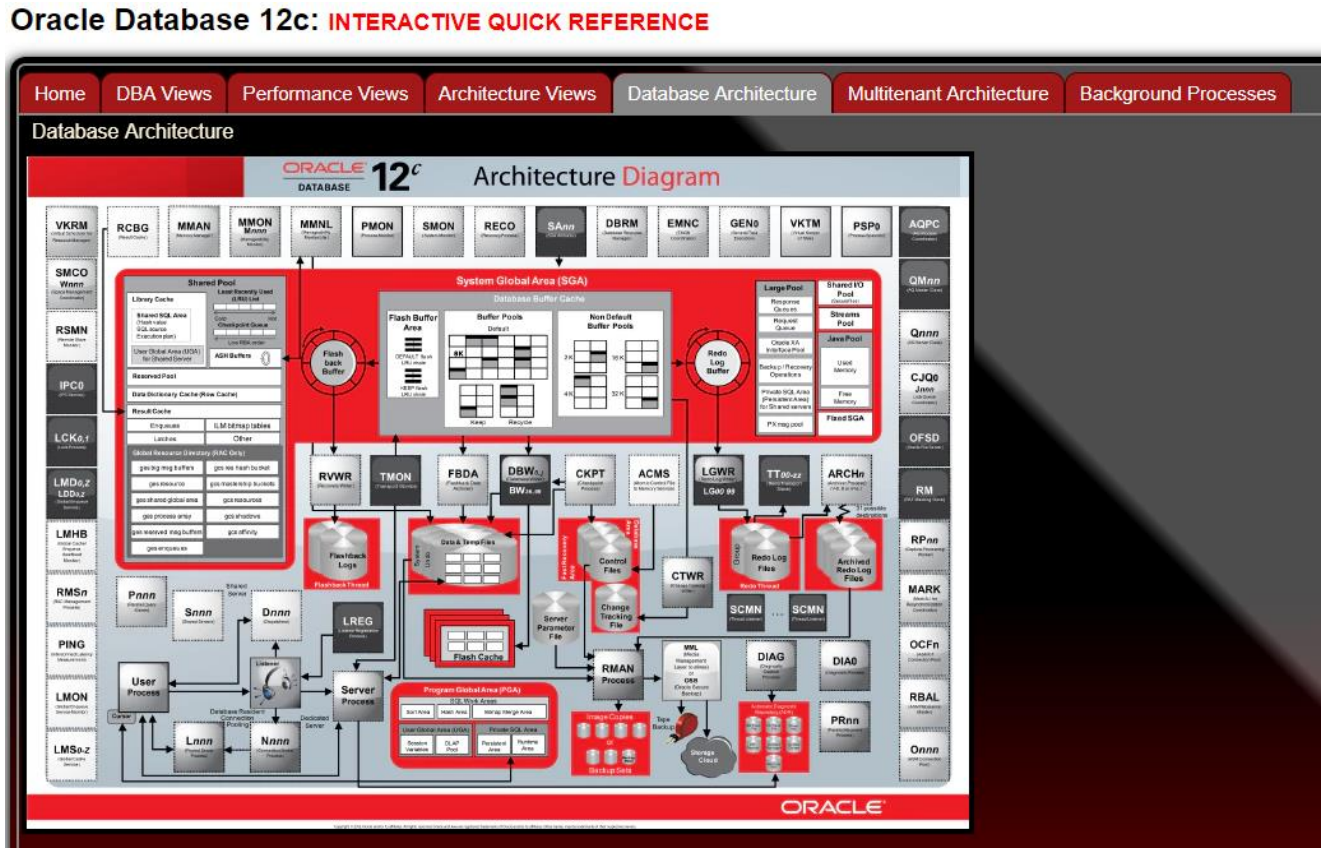
SGA (System Global Area): a big chunk of shared memory. It contains sub-caches:

- Shared pool:
  - Library cache: pl/sql code, shared SQL area
  - Dictionary cache: dictionary metadata
  - Server results cache
- DB Buffer cache
- Log Buffer
- Large Pool: used by parallel processes, RMAN and others
- Java Pool: used by java code
- Streams Pool: used by streams

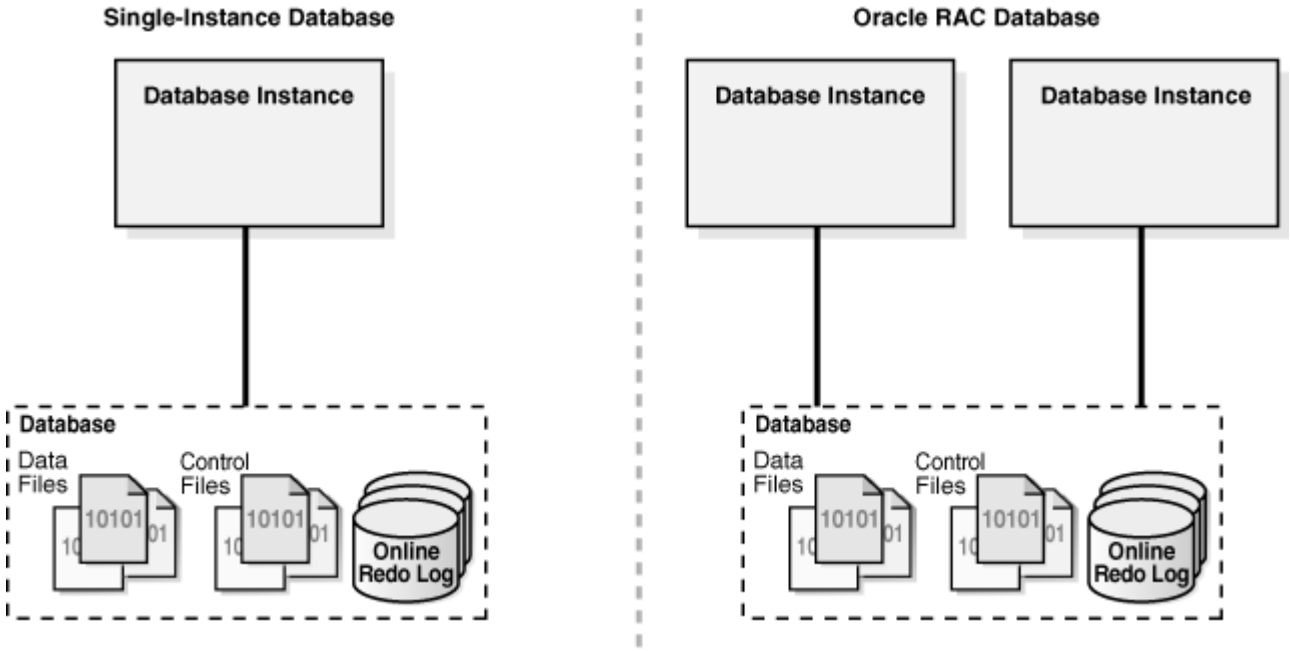
PGA (Program Global Area): private memory allocated to the process only

The Detailed Diagram

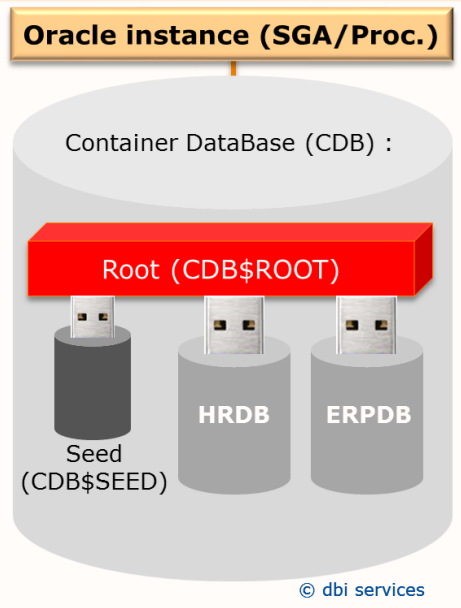
Source: https://goo.gl/RMo6C8



Relationship between an Instance and a Database



New in Oracle 12c



Startup the Instance

1

Only SYS (or a SYSDBA user) can start an Oracle instance.

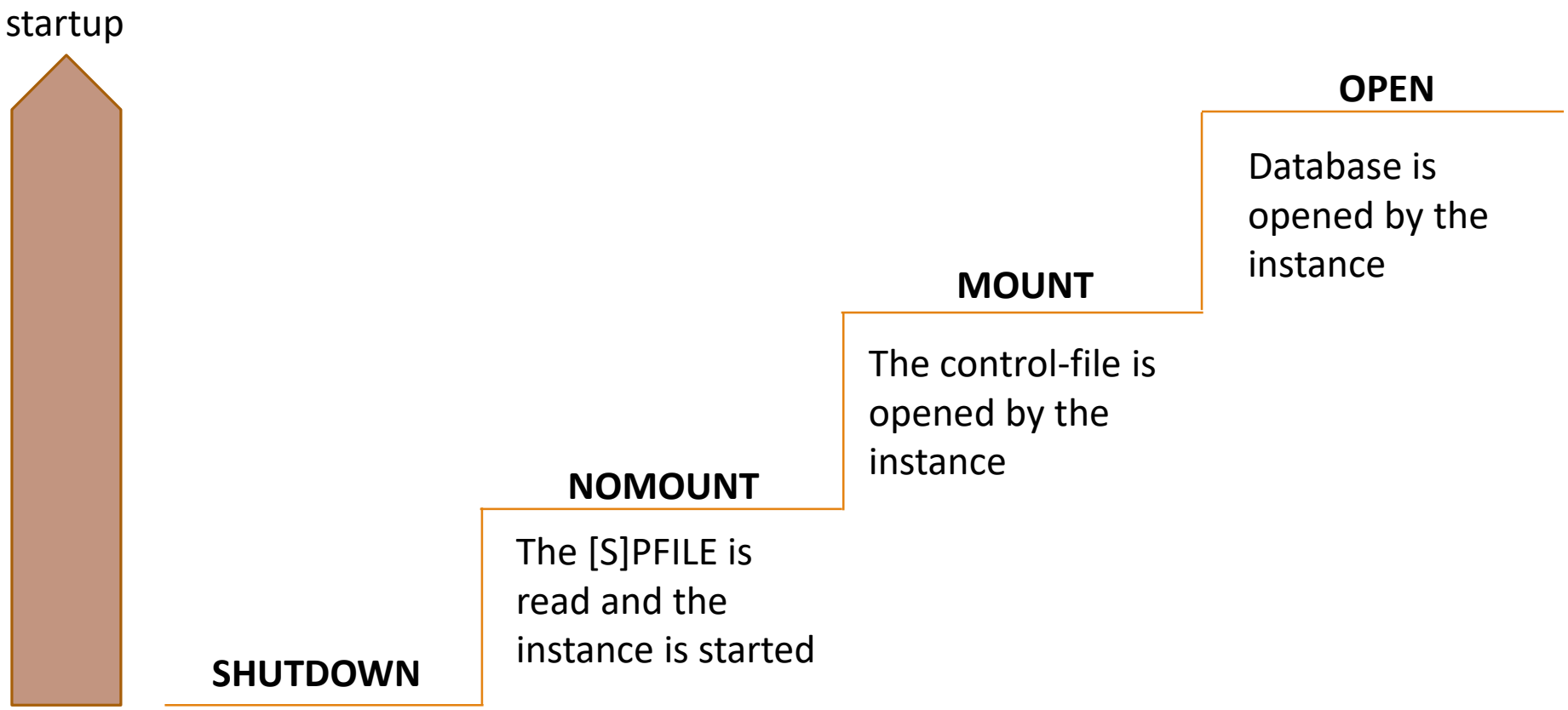
2

In sqlplus, it's just a matter of executing the "startup" command.

3

The startup can be phased (see the next slide).

Phased Instance Startup



OMG! SPFILE, Control file? I feel lost!

DON’T WORRY! WE’LL COVER THESE SHORTLY!

Shutdown the Instance

1

Only SYS user can shutdown the instance

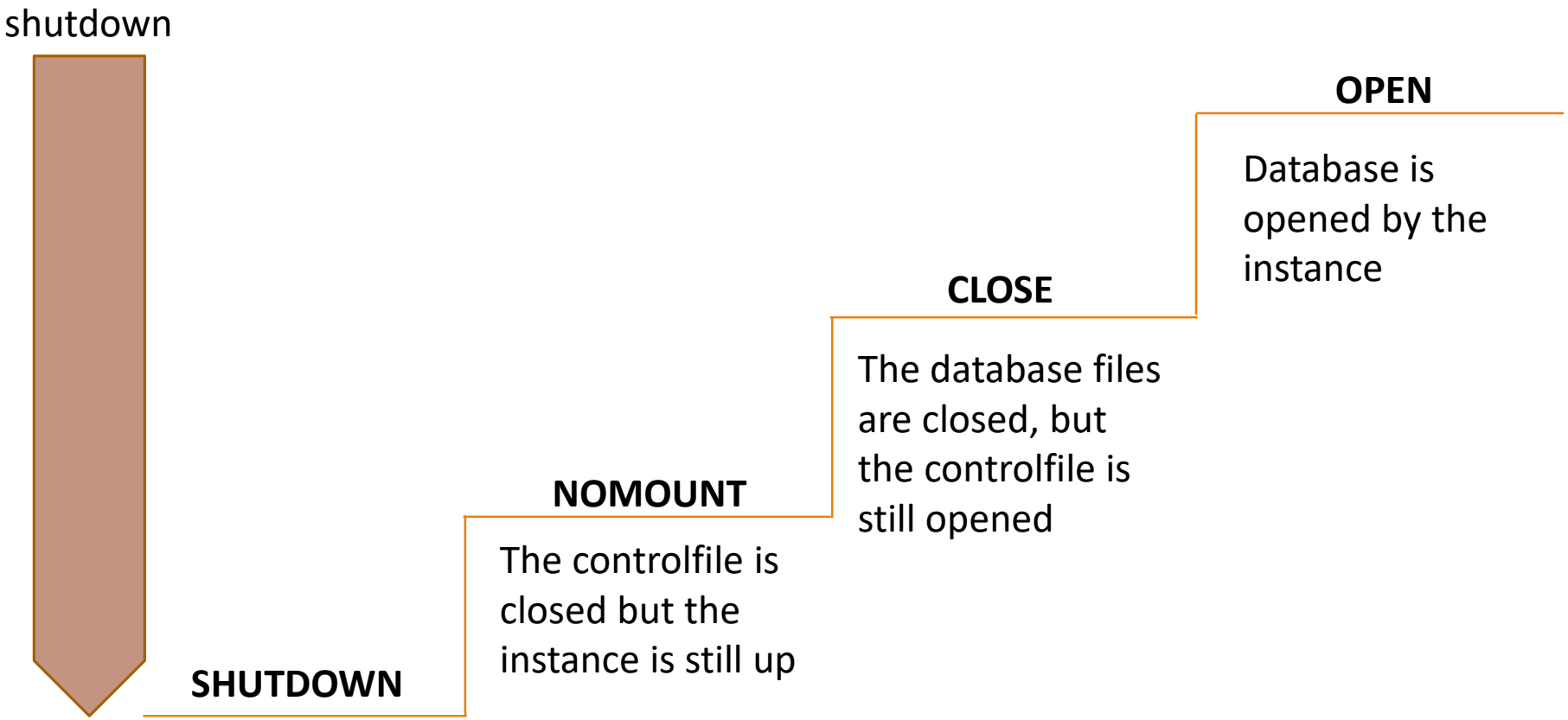
2

In “sqlplus” it’s just a matter of executing the “shutdown” command

3

How gracefully or not the shutdown is intended to be can be controlled with some parameters given to the “shutdown” command

Shutdown Phases



Shutdown Modes

	ABORT	IMMEDIATE	TRANSACTIONAL	NORMAL
New user connections are permitted	NO	NO	NO	NO
Waits until current sessions end	NO	NO	NO	YES
Waits until current transactions end	NO	NO	YES	YES
The data-files are closed cleanly	NO	YES	YES	YES

Play around with Startup & Shutdown

Practical session:

- Login to your dedicated server using the “oracle” user
- Check if there is any oracle instance running
- Assuming that no instance is running, start up the Oracle instance
- Using “sqlplus”, connect using the FB user (password “fb”)
- Insert a new record into the “ACCOUNTS” table (look at the table structure and figure out how to write the INSERT statement). Leave this sqlplus window/terminal opened.
- Open a new terminal, connect as SYS using sqlplus and execute “shutdown transactional”
- Explain what happens

Configure the Oracle Instance

- Initialization parameters
- PFILE vs SPFILE
- SPFILE location
- STATIC parameters vs DYNAMIC parameters
- How to alter initialization parameters
- Parameters documentation reference

What are Initialization Parameters?

Settings which tailor the Oracle instance configuration.

Oracle is a very configurable system therefore there are a lot of initialization parameters.

Some settings can be changed on the fly, others need an instance restart to be taken into consideration.

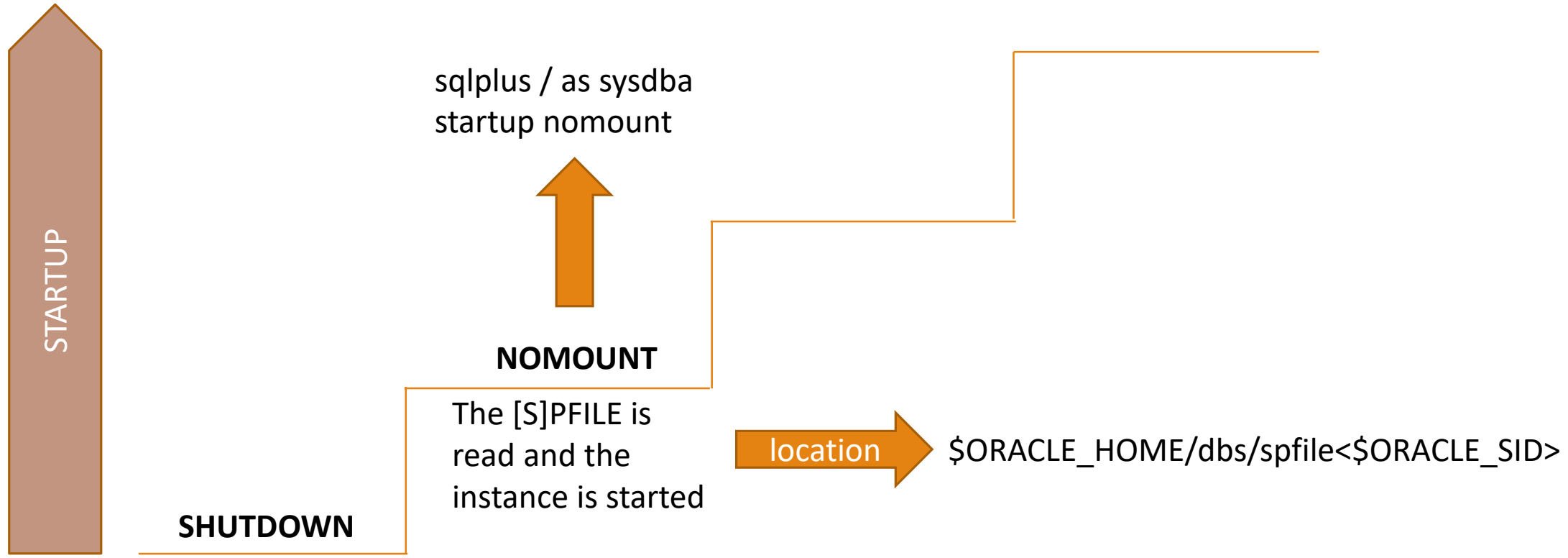
These parameters are stored in a special file called PFILE or SPFILE.

They can be set on the instance level or on the session level.

PFILE vs SPFILE

PFILE	SPFILE
A text based configuration file.	A binary configuration file.
Can be edited with a text editor.	Editing directly this file is not supported.
Obsolete, but needed sometimes.	The recommended format.
It is not automatically updated by the Oracle instance.	It is automatically maintained by the Oracle instance.

When is the [S]PFILE being read?



Static vs Dynamic Parameters

1

A dynamic parameter can be changed on the fly without restarting the database:

2

A change of a static parameter value cannot be effective without restarting the database.

Changing Instance Settings

The "`ALTER SYSTEM SET param_name = param_value`" command is your friend. It changes a setting on the instance level.

Use "`ALTER SESSION SET...`" If you want to change a setting on the session level.

You can use the SCOPE parameter of the "ALTER SYSTEM SET command":

- Change the setting just in the SPFILE: `ALTER SYSTEM SET … SCOPE=SPFILE;`
- Change the setting just in memory: `ALTER SYSTEM SET … SCOPE=MEMORY;`
- Change the settings for both: `ALTER SYSTEM SET … SCOPE=BOTH;`

1.186 MEMORY_TARGET

MEMORY_TARGET specifies the Oracle systemwide usable memory. The database tunes memory to the MEMORY_TARGET value, reducing or enlarging the SGA and PGA as needed.

Property	Description
Parameter type	Big integer
Syntax	MEMORY_TARGET = *integer* [K | M | G]
Default value	0 (SGA autotuning is disabled for DEFERRED mode autotuning requests, but allowed for IMMEDIATE mode autotuning requests)
Modifiable	ALTER SYSTEM
Modifiable in a PDB	No
Range of values	152 MB to MEMORY_MAX_TARGET
Basic	No

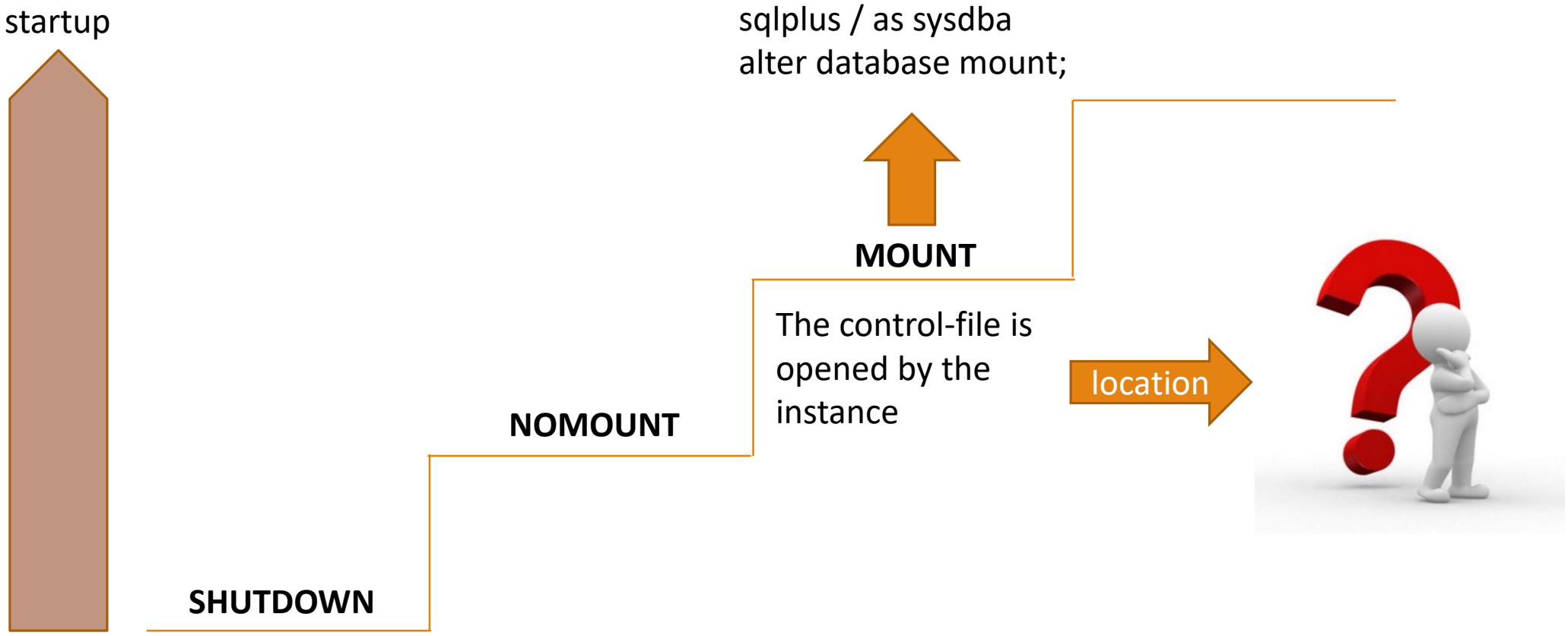
MEMORY_TARGET should be set higher than or equal to the sum of the current sizes of the SGA and PGA.

In a text-based initialization parameter file, if you omit MEMORY_MAX_TARGET and include a value for MEMORY_TARGET, then the database automatically sets MEMORY_MAX_TARGET to the value of MEMORY_TARGET. If you omit the line for MEMORY_TARGET and include a value for MEMORY_MAX_TARGET, the MEMORY_TARGET parameter defaults to zero. After startup, you can then dynamically change MEMORY_TARGET to a nonzero value, provided that it does not exceed the value of MEMORY_MAX_TARGET.

Parameters Doc Reference

https://docs.oracle.com/en/database/oracle/oracle-database/12.2/refrn/index.html

Mounting the Instance

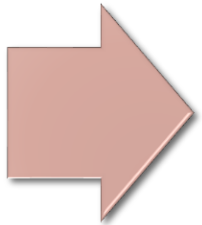


What is the controlfile?

- A critical file: without the controlfile the database can’t be opened
- It is relatively small in size
- It stores data files locations
- It stores checkpoint/synchronization data
- It stores various database properties (e.g. the DB character-set)
- It stores backups metadata
- It can be multiplexed (more than one control files)

Challenge

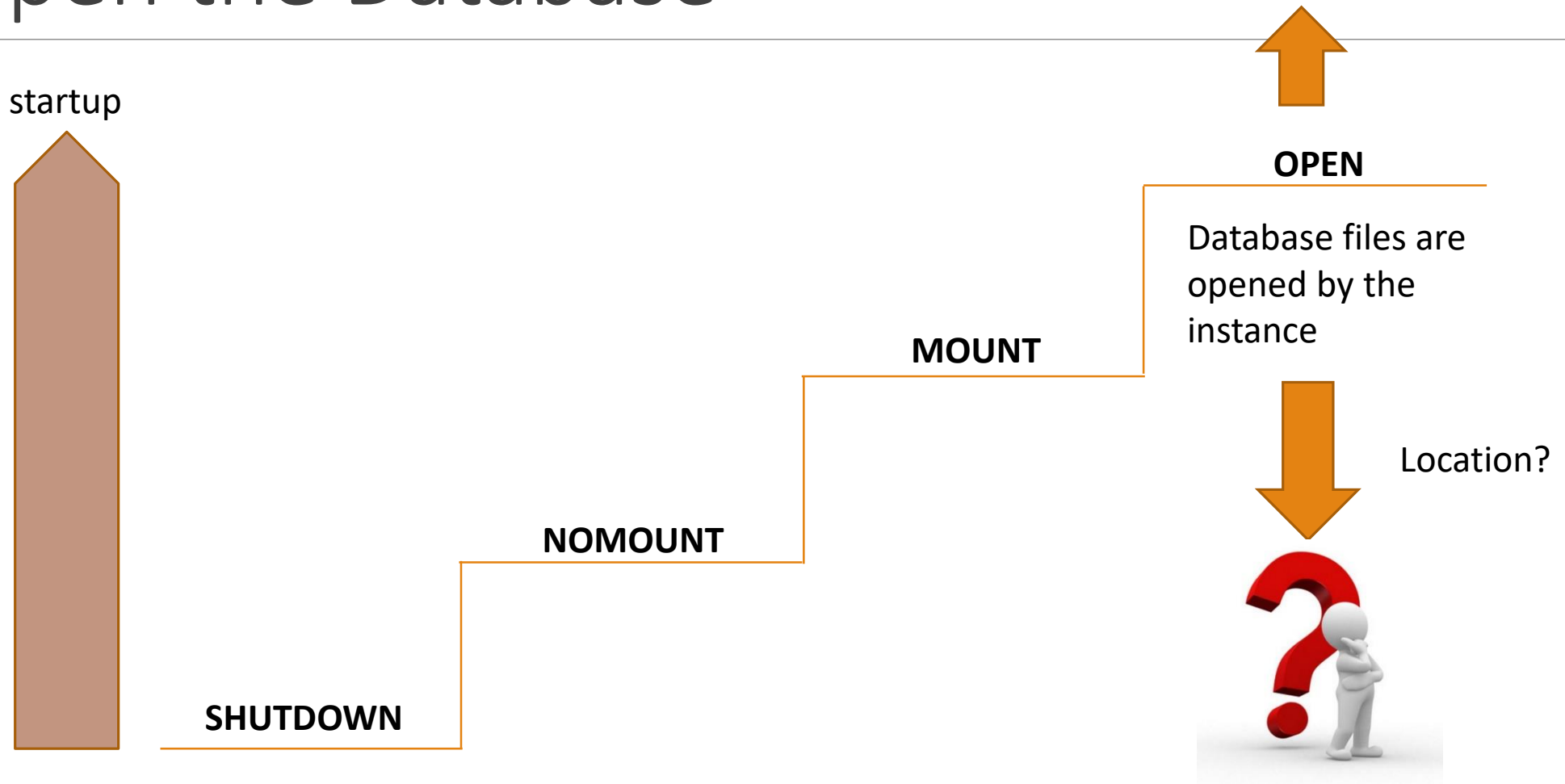
Find out where the controlfile(s) of your database is/are located.



Check the size of your controlfiles.

Open the Database

```
sqlplus / as sysdba
alter database open;
```



That’s all for today!

THANKS AND SEE YOU NEXT WEEK!