Oracle DBA Responsibilities

(1) Creates and maintains all databases required for development, testing, education and production usage.

(2) Performs the capacity planning required to create and maintain the databases. The DBA works closely with system administration staff because computers often have applications or tools on them in addition to the Oracle Databases.

(3) Performs ongoing tuning of the database instances.

(4) Install new versions of the Oracle RDBMS and its tools and any other tools that access the Oracle database.

(5) Plans and implements backup and recovery of the Oracle database.

(6) Controls migrations of programs, database changes, reference data changes and menu changes through the development life cycle.

(7) Implements and enforces security for all of the Oracle Databases.

(8) Performs database re-organisations as required to assist performance and ensure maximum uptime of the database.

(9) Puts standards in place to ensure that all application design and code is produced with proper integrity, security and performance. The DBA will perform reviews on the design and code frequently to ensure the site standards are being adhered to.

(10) Evaluates releases of Oracle and its tools, and third party products to ensure that the site is running the products that are most appropriate. Planning is also performed by the DBA, along with the application developers and System administrators, to ensure that any new product usage or release upgrade takes place with minimal impact.

(11) Provides technical support to application development teams. This is usually in the form of a help desk. The DBA is usually the point of contact for Oracle Corporation.

(12) Enforces and maintains database contraints to ensure integrity of the database.

(13) Administers all database objects, including tables, clusters, indexes, views, sequences, packages and procedures.

(14) Assists with impact analysis of any changes made to the database objects.

(15) Troubleshoots with problems regarding the databases, applications and development tools.
(16) Create new database users as required.

(17) Manage sharing of resources amongst applications.

(18) The DBA has ultimate responsibility for the physical database design.

The DBA should possess the following skills

(1) A good knowledge of the operating system(s)

(2) A good knowledge of physical database design

(3) Ability to perform both Oracle and also operating system performance monitoring and the necessary adjustments.

(4) Be able to provide a strategic database direction for the organisation.

(5) Excellent knowledge of Oracle backup and recovery scenarios.

(6) Good skills in all Oracle tools.

(7) A good knowledge of Oracle security management.

(8) A good knowledge of how Oracle acquires and manages resources.

(9) Sound knowledge of the applications at your site.

(10) Experience and knowledge in migrating code, database changes, data and menus through the various stages of the development life cycle.

(11) A good knowledge of the way Oracle enforces data integrity.

(12) A sound knowledge of both database and program code performance tuning.

(13) A DBA should possess a sound understanding of the business.

(14) A DBA should have sound communication skills with management, development teams, vendors, systems administrators and other related service providers.
Primary Architecture Components

The figure shown above details the Oracle architecture.

**Oracle database server**: An Oracle server includes an **Oracle Instance** and an **Oracle database**.

An Oracle database includes several different types of files: datafiles, control files, redo log files and archive redo log files. The Oracle server also accesses parameter files and password files.

**Oracle instance**: An Oracle Instance consists of **two** different sets of components:

- The first component set is the set of **background processes** (PMON, SMON, RECO, DBW0, LGWR, CKPT, D000 and others).
  - Each background process is a computer program.
  - These processes perform input/output and monitor other Oracle processes to provide good performance and database reliability.

- The second component set includes the **memory structures** that comprise the Oracle instance.
  - When an instance starts up, a memory structure called the System Global Area (SGA) is allocated.
  - At this point the background processes also start.

  An Oracle Instance provides access to one and only one Oracle database.

**Oracle database**: An Oracle database consists of files. Sometimes these are referred to as operating system files, but they are actually **database files** that store the database information that a firm or organization needs in order to operate.

- The **redo log files** are used to recover the database in the event of application program failures, instance failures and other minor failures.
- The **archived redo log files** are used to recover the database if a disk fails.

Other files not shown in the figure include:
The required **parameter file** that is used to specify parameters for configuring an Oracle instance when it starts up.

The optional **password file** authenticates special users of the database – these are termed **privileged users** and include database administrators.

**Alert and Trace Log Files** – these files store information about errors and actions taken that affect the configuration of the database.

User and server processes: The processes shown in the figure are called **user and server processes**. These processes are used to manage the execution of SQL statements.

A **Shared Server Process** can share memory and variable processing for multiple user processes.

A **Dedicated Server Process** manages memory and variables for a single user process.

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Oracle Server Architectural Components

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The second component set includes the memory structures that comprise the Oracle instance. When an instance starts up, a memory structure called the System Global Area (SGA) is allocated.

Oracle database: An Oracle database consists of files. Sometimes these are referred to as operating system files, but they are actually database files that store the database information.

- The redo log files are used to recover the database in the event of application program failures, instance failures and other minor failures.
- The archived redo log files are used to recover the database if a disk fails.

Other files not shown in the figure include:

- The required parameter file that is used to specify parameters for configuring an Oracle instance when it starts up.
- The optional password file authenticates special users of the database – these are termed privileged users and include database administrators.
- Alert and Trace Log Files – these files store information about errors and actions taken that affect the configuration of the database.
This figure from the *Oracle Database Administration Guide* provides another way of viewing the SGA.

**System Global Area**

The SGA is a read/write memory area that stores information shared by all database processes and by all users of the database (sometimes it is called the Shared Global Area).

- This information includes both organizational data and control information used by the Oracle Server.
- The SGA is allocated in memory and virtual memory.
- The size of the SGA can be established by a DBA.
The SGA has the following mandatory memory structures:

**Buffer Cache** – contains buffers, each size of a database block that stores data needed by SQL. The buffers are of equal size. The size of the buffer is indicated in a parameter file.

**Redo Log Buffer** – temporarily stores in memory the redo entry information generated by DML statements (Update, delete, insert) run in user sessions until Oracle writes the information into the disk.

**Shared Pool** – includes two components:
- Library Cache – used for storing SQL statement text and the statements execution plan for reuse.
- Data Dictionary Cache – also called as row cache, used for storing recently accesses information from the Oracle data dictionary like tables, columns, usernames, passwords…

**Program Global Area (PGA)**

A PGA is: a nonshared memory region that contains data and control information exclusively for use by an Oracle process. PGA helps user processes execute by storing information like bind variable values, sort areas and other aspects of cursor handling. A PGA is created by Oracle Database when an Oracle process is started.

The Program Global Area is also termed the Process Global Area (PGA) and is a part of memory allocated that is outside of the Oracle Instance.

**Reading Data from Disk for users: The server process**

The User Process communicates with the Oracle Server through a Server Process. The User Process executes on the client computer. The Server Process executes on the server computer. There are two ways DBA’s can set up Oracle to run server processes:

**Dedicated Server connection (One genie-One Master):** a one-to-one correspondence between the User and Server Processes. Every user connecting to Oracle will have a personal genie handling data retrieval from disk into buffer cache. Each user get his data retrieval requests acted upon immediately.

**Shared Server (One genie- Many Masters):** where more than one User Process shares a pool of Server Process. Oracle manages this by means of a network process called dispatcher, which
puts the user requests for data into one queue and shared server process fulfill all the requests one at a time. This reduces memory and CPU burden.

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### Stages in processing queries, changes and commits

#### 1. Stages in processing queries

There are several ways to process an Oracle `select` statement. The operations involved in both `select` and DML statement is shown in diagram. The `select` statement processing flow is

1. Search shared pool: The RDBMS will determine if a copy of this parsed SQL statement is available in the library cache.
2. Validate Statement: The RDBMS will check the syntax of SQL statement.
3. Validate Data Sources: The RDBMS ensures that all columns and tables referenced in the statement exist.
4. Acquire locks: The RDBMS acquire parse locks to ensure that their definitions don’t change while parsing the statement.
5. Check Privileges: The RDBMS ensure that the user attempt to execute the SQL statement has enough privileges in the database.
6. Parse statement: The RDBMS creates a PARSE tree (execution plan) for the statement and places in the library cache. If parse tree is already available for this statement, this step is omitted.
7. Execute Statement: The RDBMS executes the `select` statement; the server process will retrieve data from disk into the buffer cache.
8. Fetch values from cursor: Once the `select` statement is executed, all data returned from Oracle is stored in the cursor.
2. Stages in Processing DML Statements

The undo segment is a database object in Oracle that stores old versions of data being changed by DML statements issued by the user process. It stores only the old value and not the new values (new values stored in object itself).
1. Parse statement: The RDBMS creates a PARSE tree (execution plan) for the statement and places in the library cache. If parse tree is already available for this statement, this step is omitted.

2. Execute Statement: The RDBMS executes the DML statement; *For update and delete*, the server process will retrieve data from disk into buffer cache, completely acquires a lock on the data to be changed and then make the particular change in the buffer cache. For *insert* statements, the server processes retrieves a block from a disk that has enough storage available to accommodate the new data.

3. Generate Redo information: Redo log buffer stores redo or data change information produced as the result of DML operations running in user sessions. Oracle can recover a data change if damage is later done to the disk files containing Oracle data.

**Moving data changes from memory to disk**

The execution plan for DML statements stick around the library cache for a variable period of time in case another user tries to execute the same statement. The changed blocks in the buffer cache are now considered “dirty” because the versions in the disk and buffer cache are not the same. **Those dirty buffers stick around the buffer cache are to be copied to disk in order to prevent Oracle from losing the data changes made.** It is done by two background processes: *DBW0* and *LGWR*

**The role of DBW0:**

(Also called DBWR in earlier Oracle Versions) The *Database Writer* writes modified blocks from the database buffer cache to the disk.

The writes are done for any of the following reasons

i. When the server process make room in the buffer cache to read more data

ii. When DBW0 is said to write data to disk by LGWR process.

iii. Every three seconds due to a timeout.

iv. When number of dirty buffers reaches a threshold value.

**The role of LGWR :**
LGWR
The Log Writer (LGWR) writes contents from the Redo Log Buffer in memory to online Redo Log File on disk—that is in use.
The writes are done for any of the following reasons

i. When a transaction commits.

ii. When the redo log buffer is 1/3 full

iii. When there is more than a megabyte of changes recorded in the redo log buffer.

iv. Before DBW0 writes modified blocks in the database buffer cache to the data files.

3. Stages in processing commits
Issuing a commit statement ends the current transaction by making any data change the user process may have issued to the Oracle database permanent.
A rollback discards the data changes.
By keeping a copy of old data in the undo segment, oracle discards any changes made by the transaction until the commit statement is issued.

1. Release table/row locks acquired by transaction: The commit statement releases all row locks held by the user transaction issuing the commit statement. Other users then can modify the rows (or tables) previously locked by this user.

2. Release undo segment locks acquired by transaction: One the change is committed, the space to hold both old and new versions of data for that transaction in the undo segment is available for another user’s transaction.

3. Generate redo committed transaction: Once the commit take place, a redo entry is generated by the user process stating that all changes associated with that transaction have now been committed by the user.

The Oracle Universal Installer (OUI)
It is an interactive and wizard driven flexible tool, helping in the installation of Oracle.

OUI features
- The look and feel of OUI is nice and you can obtain help with installing your Oracle software. The new capability includes installing Oracle database software, client software and integration software.
• OUI not only installs the database software, but also provides an option to create different types of databases using configuration assistants.
• It accepts automated software installation.
• It tracks its own activities with a log file, showing the activities of the OUI and packager.

**Installation of Oracle 9i software**

Oracle 9i is a large application that comes on three CD’s and required 1GB space. In unix systems we need mount and unmount your CD-ROM repeatedly.

Example:

```bash
mount -r -v cdrfs /dev/cd0/cdrom
```

The following steps are to be followed in to unmount the CD-ROM

1. Change directory to the root directory of your system and log in as the root user by using the following commands:

```bash
$ cd /
$ su root
```

2. Unmount and remove the CD-ROM from the CD-ROM

3. Insert and mount the next CD-ROM into the CD-ROM drive

4. Enter the mount command

5. Enter the correct mount point in the Installation dialog box (OUI). Click OK to continue.

On starting the OUI, the following occurs.

• You will be prompted whether you want to install the Enterprise or Standard edition of the Software or custom install the software.
• You will then be prompted whether you want to install just the software or have a general installation.
• You will be asked questions related to software installation location, if you choose to create a database, the name of the database and location for the database files.
• If you have chosen custom installation option, you will have to select the components (including OUI).
• The database configuration assistance will be invoked to assist in creating the database.
Installation Log

OUI creates *oraInventory* directory for the first time it is run to keep an inventory of the products installed.

*installationActions.log*→ stores the log of recent installations.

Non-interactive installation

Non interactive installation is possible by supplying OUI with a *response* file. OUI uses information in the response file to provide answers to the installer prompts.

Setting up Password file Authentication

A DBA authenticating approach is the method of verifying the identity of database administrators. Oracle database administrators are authenticated using an account password like other users. The following approaches are available to secure the authentication

- **Operating-System-based Authentication**: if we connect to the machine hosting Oracle database via telnet or a Windows client, in order to administer the database, this Operating-System-based Authentication method is applicable.

- **Password-File-based Authentication**: it enables many DBA’s to manage databases password files work well to support organizations wanting a team of DBA’s to have a range of capabilities on the machine.

SYS, SYSTEMS and the Data Dictionary

SYS, SYSTEMS are two users Oracle creates when installing the database, each having own default password. The default password for SYS = change_on_install; for SYSTEMS=manager. SYS is more important than SYSTEMS.

Using Operating system Authentication

It is very easy and convenient way of authentication. The main advantage of this method is easy login to Oracle via the slash(/) character
Login: bobcat
Password:
User connected. Today is 27/07/2017

Disadvantages:

i. You must have a machine login to use Oracle.

ii. To use this method, a special group called dba must be created on the OS before you install oracle s/w.

**Authentication with a password file**

The DBA creates the password file, and passwords for all others permitted to administer Oracle are stored in the file. The password file is created with **ORAPWD** utility. In both Unix and Windows, we use *orapwd*.

While using ORAPWD, we pass three parameters: FILE, PASSWORD and ENTRIES

FILE→ we usually place the password file in $ORACLE_HOME/dbs

PASSWORD→ you define the password for your password file

ENTRIES→ number of entries allowed for a password file.

Example

D:\Oracle\Bin\>orapwd File=D:\Oracle\dbs\orapwd1.pwd

PASSWORD= srm ENTRIES=5

---

**USING OEM COMPONENTS**

OEM is a suite of applications that enables you to manage your Oracle Database in a GUI. When you install an Oracle database, the Oracle Universal Installer also installs the new Oracle Enterprise Manager. The web-based Database Control serves as the primary tool for managing your Oracle database and sets a new standard in ease-of-use.

The following list explains the applications available for OEM, along with description and use.

- **Database wizards:** Used for backup management, data management, analysis.
- **Change management pack:** This contains tools for change management.
- **Database Application pack:** This pack contains tools to maintain database applications- the most important part is SQL* Plus worksheet- graphical version of SQL* Plus tool.
• **Diagnostic Pack:** This pack contains tools to diagnose problems such as monitor locks, top sessions, top SQL

• **Service Management Pack:** This contains Net Manager, the Oracle networking tool to create network configuration files.

• **Standard Management Pack:** This pack contains the change manager and performance manager tools.

• **Tuning pack:** This pack contains the tools for tuning the database.

**OEM Architecture**

OEM is a three tier model.

- The *first tier contains java based console and integrated applications* that can be installed or run from a web browser.
• **Tier II is Oracle Management Service (OMS)**—provide centralized intelligence and distributed control between clients and managed nodes. OMS uses OEM repository as back end.

• Tier III is composed of targets such as databases, nodes or other managed services.

**Using the OEM console**

Using OEM console, we can add a database into the database tree, which is a tree structure listing multiple databases that can be administered from the OEM console.

**Using SQL* Plus worksheet**

The SQL Worksheet allows you to enter, edit, and execute SQL and PL/SQL code. You can also execute the Server Manager DBA commands. You can also run scripts from the SQL Worksheet. The SQL Worksheet maintains a history of the commands you have issued, so you can easily retrieve and re-execute previous commands.

You can start a SQL Worksheet from the Enterprise Manager Console window by choosing SQL Worksheet from the Tools menu. The new worksheet is connected to the database you have selected in the Navigator tree list or in the Map window.

If you start the SQL Worksheet from the Windows Program Manager, a database Login dialog box appears.

**Using OEM**

We can administer every aspect of Oracle using OEM. In OEM we can see that all database tools or managers are available in a tree fashion.

- The instance manager allows you to administer the instance like starting and shutting the database.
- Schema manager permits you to administer database objects like tables and indexes.
- Security manager allows to administer the users, roles and profiles.
- Storage manager allows you to administer tablespaces, rollback segments and redo logs.
**FIGURE 10-6.** Adding a database to the tree

**FIGURE 10-7.** Instance Manager
Starting an Instance

**Oracle database** is a set of tables, indexes and procedures and other objects used for storing data. It is identified by the database name DB_NAME. A **database instance** is a set of memory structures that manage database files. A database is created by the CREATE DATABASE statement.

**Oracle Instance** is the memory structures, background processes and disk resources. To start the instance, the steps given are carried out. The **instance** manages its associated data and serves the users of the **database**.

1. Start SQL* plus and login as **sysdba**.
2. From SQL* plus, use the start_option [dbname] to start the instance.

A database instance (Server) is a set of memory structure and background processes that access a set of database files. The process can be shared by all users. The memory structure that are used to store most queried data from database.

Normal database operation means that an instance is started and the database is mounted and open. This mode allows any valid user to connect to the database and perform data access operations.

**Options for starting Oracle**
There are several options available for starting Oracle instances: with or without mounting the database.

**startup nomount**
Start the instance without mounting a database. This does not allow access to the database and usually would be done only for database creation or the re-creation of control files. All memory structures and background processes are in place, but no database is attached. This option with or without specifying an init$sid.ora file for the PFILE parameter. This options of starting Oracle without mounting the database includes the following tasks

- reading parameter file **init.ora**
• Allocate SGA
• Starting background process
• opening the ALERT log and trace files

**startup mount**
This option starts the instance, reads the control file and attaches the database, but it does not open it.
Start the instance and mount the database, but leave it closed. This state allows for certain DBA activities, but does not allow general access to the database. You can start an instance and mount a database without opening it, allowing you to perform specific maintenance operations.
This option is used in situations where you have to move physical database files or when database recovery.
Options of starting Oracle with mounting the database includes the following tasks
  • associating database with a previously started instance
  • opening control files
  • reading control files

**startup open**
This option starts your instance, attaches the database and opens it. This is the default option for starting Oracle.
Start the instance, and mount and open the database. This can be done in unrestricted mode, allowing access to all users, or in restricted mode, allowing access for database administrators only.

**startup force**
This option forces the instance to start and the database to open. It is used in situations where other startup options are met with errors from Oracle and no shutdown options seem to work.

**Two other options for database startup are**
1. **startup recover**: for handling database recovery
2. **startup restrict**: for opening the database while simultaneously preventing all users but the DBA from accessing database objects.

**Starting the database automatically**
Most DBAs’ want their database to start automatically whenever the host machine is rebooted. Many sites use procedures to enable automatic startup of one or more Oracle Database instances and databases immediately following a system start. The procedures for performing this task are specific to each operating system.
Shutting down an Instance

Shutting down the Oracle instance is same as starting the Oracle instance. You should have logged with `sysdba` privileges. From SQL* Plus do the following.

**Example:**

```
enter user name: sys as sysdba
password:

SQL> shutdown immediate
```

**Options for stopping Oracle**

There are several modes for shutting down a database: normal, immediate, transactional, and abort.

i. **Shutting Down with the Normal Mode**

ii. **Shutting Down with the Immediate Mode**

iii. **Shutting Down with the Transactional Mode**

iv. **Shutting Down with the Abort Mode**

i. **Shutting Down with the Normal Mode**

This is the lowest priority shutdown. Normal database shutdown proceeds with the following conditions:

- No new connections are allowed after the statement is issued.
- Before the database is shutdown, the database waits for all currently connected users to disconnect from the database.

```
SQL> SHUTDOWN NORMAL
Database closed
Database Dismounted
Oracle instance shut down
```

ii. **Shutting Down with the Immediate Mode**

This is the higher priority shut down the DBA can use. When this mode of shut down is opted, the following things will happen.
• No new users will be able to connect to the database.
• Oracle will not wait for users to log off-
  • it terminates user connections immediately and rolls back uncommitted transactions.

iii. **Shutting Down with the Abort Mode**

This is the highest priority database shut down.

An aborted database shutdown proceeds with the following conditions:

• No new connections are allowed, nor are new transactions allowed to be started, after the statement is issued.
• Current client SQL statements being processed by Oracle Database are immediately terminated.

iv. **Shutting Down with the Transactional Mode**

When you want to perform a planned shutdown of an instance while allowing active transactions to complete first

SQL>SHUTDOWN transactional
Database closed
Database Dismounted
Oracle instance shut down

**Transactional database shutdown proceeds with the following conditions:**

• No new connections are allowed, nor are new transactions allowed to be started, after the statement is issued.
• After all transactions have completed, any client still connected to the instance is disconnected.
• At this point, the instance shuts down just as it would when a SHUTDOWN IMMEDIATE statement is submitted.

--------------------------------------------------------------------
Creating An Oracle Database

The act of creating a database is nothing but the creation of a physical database. Before creating the database, ERD, which shows the relationship between tables and the columns is created, DBA translates this logical design (ERD) into a physical design. The database can be created using

- database configuration assistant
- creating the database manually

Pre-requisites for Database Creation

- **Make sure your machine has the capacity to handle Oracle**: You have to ensure that the host machine has the CPU power, memory and disk space it takes to run an Oracle database in a multiuser environment.

- **Ensure that you have at least three separately controlled disk resources**: Oracle recommends three separately controlled disk resources. A running Oracle database has many moving parts, all these parts are moving at the same time.

- **Configure certain environmental settings**: The following environment variables are to be configured. ORACLE_BASE, ORACLE_HOME, ORACLE_SID.

- **Shut down and back up other Oracle databases running on the host**: If the system already contains other databases, then shut down and save a backup of these and then install

- **Install Oracle recommended operating system patches on the machine**: The exact operating system version and patches differ from one OS to the other.

Preparing the Parameter file

To create an Oracle database, the parameter file (initsid.ora) should contain necessary parameter values. The DBA will alter/modify this parameter file according to the need. The following parameter values are to be changed
1. **DB_NAME**: This is the local name of the database on the machine hosting the Oracle database and one component of database's unique name within the network. If the value of this parameter is the same as another Oracle database running on the host, permanent damage may result in the event that a database is created. Name may be limited to eight characters approximately. Must begin with alphanumeric character. Once set it **cannot** be changed without recreating the database.

2. **DB_DOMAIN**: Identifies the domain location of the database name within a network—this parameter is used in a distributed database system. DB_DOMAIN specifies the logical location of the database within the network structure.

3. **DB_BLOCK_SIZE** – specifies the size of the default Oracle block in the database. This is also called as standard block size. This parameter cannot be changed once the database is created.

4. **CONTROL_FILES** – This is a name or list of names for the control files of the database- it tells Oracle the location of the control files to be read during database startup and operation. The control files are typically multiplexed (multiple copies).

5. **DB_CACHE_SIZE** – specifies the size of the area the SGA allocates to hold blocks of the default size. If the parameter is not specified, then the default is 0. If the parameter is specified, then the user-specified value indicates a minimum value for the memory pool.

6. **LOG_BUFFER**: This is the size of redo log buffer in bytes.

7. **UNDO_MANAGEMENT**: Initialization parameter determines whether the Oracle server automatically or the DBA manually handles undo data.

8. **UNDO_TABLESPACE**: Parameter set to the name of the table space you want to use to house undo segments generated and managed automatically by Oracle.

9. **PROCESSES**: This is the number of processes that can connect to Oracle at any given time.

**Creating database using the Database Configuration Assistant (DBCA)** – This product provides several options for creating different database types, and it also allows you to upgrade an existing database. With DBCA, we can perform the following

1. you can create a database from scratch by specifying all the information needed to create.
2. you can delete an existing database.
3. you can clone an existing database with and without the data

Creating a database Manually
This approach used the `CREATE DATABASE` command. Usually you do this by creating an SQL script and then executing the script. The following steps are executed before creating the database.

1. Create an `init.ora` parameter file (PFILE) and store it to your $HOME directory.
2. Make sure that directories are specified and Set the operating system environment variables
3. start SQL* PLUS and connect to the database as : `sys as sysdba`
4. startup the instance in `nomount` mode
5. Execute `create database` statement to create database
6. if the database creation process is successful we can mount the database we created
7. Create table spaces for undo segments, users, temp
8. create undo segments
9. Finally run the scripts provided by Oracle to create data dictionary and other database objects

*****

Unit-I (Part-A Questions & Answers)

1. What is a Dedicated Server connection?

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2. What is Oracle database server?
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The first component set is the set of background processes (PMON, SMON, RECO, DBW0, LGWR, CKPT, D000 and others).
The second component set includes the memory structures that comprise the Oracle instance.
An Oracle Instance provides access to one and only one Oracle database.

**Oracle database**: An Oracle database consists of files. Sometimes these are referred to as operating system files, but they are actually **database files** that store the database information that a firm or organization needs in order to operate.

3. **What is a System Global Area?**

   The SGA is a read/write memory area that stores information shared by all database processes and by all users of the database (sometimes it is called the Shared Global Area).
   
   - This information includes both organizational data and control information used by the Oracle Server.
   - The SGA is allocated in memory and virtual memory.
   - The size of the SGA can be established by a DBA by assigning a value to the parameter SGA_MAX_SIZE in the parameter file—this is an optional parameter.

4. **Explain the purpose of the following: Buffer Cache, Redo Log Buffer, Shared Pool**

   **Buffer Cache** – contains buffers, each size of a database block that stores data needed by SQL. The buffers are of equal size. The size of the buffer is indicated in a parameter file.

   **Redo Log Buffer**-- temporarily stores in memory the redo entry information generated by DML statements (Update, delete, insert) run in user sessions until Oracle writes the information into the disk.

   **Shared Pool** – includes two components:
   
   - **Library Cache** – used for storing SQL statement text and the statements execution plan for reuse.
   - **Data Dictionary** Cache – also called as row cache, used for storing recently accesses information from the Oracle data dictionary like tables, columns, usernames, passwords…

5. **What is a PGA?**
Program Global Area (PGA)

A PGA is: a non-shared memory region that contains data and control information exclusively for use by an Oracle process. PGA helps user processes execute by storing information like bind variable values, sort areas and other aspects of cursor handling. A PGA is created by Oracle Database when an Oracle process is started.

The Program Global Area is also termed the Process Global Area (PGA) and is a part of memory allocated that is outside of the Oracle Instance.

6. What are the two ways by which DBA’s can set up Oracle to run server processes?

There are two ways DBA’s can set up Oracle to run server processes:

**Dedicated Server** connection (One genie-One Master): a one-to-one correspondence between the User and Server Processes. Every user connecting to Oracle will have a personal genie handling data retrieval from disk into buffer cache. Each user get his data retrieval requests acted upon immediately.

**Shared Server connection**: (One genie- Many Masters): where more than one User Process shares a pool of Server Process. Oracle manages this by means of a network process called dispatcher, which puts the user requests for data into one queue and shared server process fulfill all the requests one at a time. This reduces memory and CPU burden.

7. List the stages in processing queries.

There are several ways to process an Oracle select statement. The operations involved in both select and DML statement is shown in diagram. The select statement processing flow is

1. Search shared pool :
2. Validate Statement:
3. Validate Data Sources:
4. Acquire locks:
5. Check Privileges:
6. Parse statement:
7. Execute Statement:
8. Fetch values from cursor:

8. Name the stages in Processing DML Statements.

The undo segment is a database object in Oracle that stores old versions of data being changed by DML statements issued by the user process. It stores only the old value and not the new values (new values stored in object itself).

1. Parse statement:
2. Execute Statement:
3. Generate Redo information:

9. Explain the roles of DBW0 and LGWR.

The role of DBW0:

(Also called DBWR in earlier Oracle Versions) The Database Writer writes modified blocks from the database buffer cache to the disk.

The writes are done for any of the following reasons

- When the server process make room in the buffer cache to read more data
- When DBW0 is said to write data to disk by LGWR process.
- Every three seconds due to a timeout.
- When number of dirty buffers reaches a threshold value.

The role of LGWR:

The Log Writer (LGWR) writes contents from the Redo Log Buffer in memory to online Redo Log File on disk-that is in use.

The writes are done for any of the following reasons

- When a transaction commits.
- When the redo log buffer is 1/3 full
- When there is more than a megabyte of changes recorded in the redo log buffer.
- Before DBW0 writes modified blocks in the database buffer cache to the data files.
10. What are the stages AVAILABLE IN PROCESSING COMMITS?

Issuing a *commit statement* ends the current transaction by making any data change the user process may have issued to the Oracle database permanent. A *rollback* discards the data changes. By keeping a copy of old data in the undo segment, oracle discards any changes made by the transaction until the *commit* statement is issued.

1. Release table/row locks acquired by transaction:
2. Release undo segment locks acquired by transaction:
3. Generate redo committed transaction:

11. What are the features of OUI?

OUI features
- The look and feel of OUI is nice and you can obtain help with installing your Oracle software. The new capability includes installing Oracle database software, client software and integration software.
- OUI not only installs the database software, but also provides an option to create different types of databases using configuration assistants.
- It accepts automated software installation.
- It tracks its own activities with a log file, showing the activities of the OUI and packager.

12. State the approaches are available for secure the authentication

The following approaches are available to secure the authentication
- **Operating-System-based Authentication:** if we connect to the machine hosting Oracle database via telnet or a Windows client, in order to administer the database, this method is applicable.
- **Password-File-based Authentication:** it enables many DBA’s to manage databases; password files work well to support organizations wanting a team of DBA’s to have a range of capabilities on the machine.
13. Explain the importance of uses: SYS and SYSTEMS

SYS, SYSTEMS are two users Oracle creates when installing the database, each having own default password. The default password for SYS = change_on_install; for SYSTEMS=manager. SYS is more important than SYSTEMS.

14. Explain the concept of authentication with a password file.

Authentication with a password file
The DBA creates the password file, and passwords for all others permitted to administer Oracle are stored in the file. The password file is created with ORAPWD utility. In both Unix and Windows, we use orapwd.

While using ORAPWD, we pass three parameters: FILE, PASSWORD and ENTRIES
FILE→ we usually place the password file in $ORACLE_HOME/dbs
PASSWORD→ you define the password for your password file
ENTRIES→ number of entries allowed for a password file.

Example
D:\Oracle\Bin\>orapwd File=D:\Oracle\dbs\orapwd1.pwd
PASSWORD= srm ENTRIES=5

15. Explains the list of applications available for OEM, along with description and use.

- **Database wizards:** Used for backup management, data management, analysis.
- **Change management pack:** This contains tools for change management.
- **Database Application pack:** This pack contains tools to maintain database applications- the most important part is SQL* Plus worksheet- graphical version of SQL* Plus tool.
- **Diagnostic Pack:** This pack contains tools to diagnose problems such as monitor locks, top sessions, top SQL
- **Service Management Pack:** This contains Net Manager, the Oracle networking tool to create network configuration files.
- **Standard Management Pack:** This pack contains the change manager and performance manager tools.
- **Tuning pack:** This pack contains the tools for tuning the database
16. What are the layers (tiers) available in OEM?

OEM is a three tier model.

- The first tier contains java based console and integrated applications that can be installed or run from a web browser.

- Tier II is Oracle Management Service (OMS)—provide centralized intelligence and distributed control between clients and managed nodes. OMS uses OEM repository as back end.

- Tier III is composed of targets such as databases, nodes or other managed services.

17. Define: Oracle instance, Oracle Database. What is the normal database operation?

Oracle database is a set of tables, indexes and procedures and other objects used for storing data. It is identified by the database name DB_NAME.

Oracle Instance is the memory structures, background processes and disk resources.

To start the instance, the steps given are carried out.

1. Start SQL* plus and login as sysdba.
2. From SQL* plus, use the start_option [dbname] to start the instance.

A database instance is a set of memory structures that manage database files. A database is a set of physical files on disk created by the CREATE DATABASE statement. The instance manages its associated data and serves the users of the database. A database instance (Server) is a set of memory structure and background processes that access a set of database files. The process can be shared by all users. The memory structure that are used to store most queried data from database.

Normal database operation means that an instance is started and the database is mounted and open. This mode allows any valid user to connect to the database and perform data access operations.

18. What are the Options available for starting Oracle?
We can start a database using OEM instance manager. There are several options available for starting Oracle instances: with or without mounting the database.

- startup nomount
- startup mount
- startup open
- startup force
- Starting the database automatically

19. What are the Options available for stopping Oracle?

Options for stopping Oracle

There are several modes for shutting down a database: normal, immediate, transactional, and abort.

- Shutting Down with the Normal Mode
- Shutting Down with the Immediate Mode
- Shutting Down with the Transactional Mode
- Shutting Down with the Abort Mode

Unit-I (Part-B Questions)

1. Explain in detail about Oracle server Architectural Components.
2. List out and explain the various methods of starting an Oracle Instance.
3. Write a note on creating Oracle database.
4. List out and explain the various methods of shutting down an Oracle Instance.
5. Discuss in detail about OUI.
6. Describe the various Stages in processing queries, changes and commits.
7. Discuss the OEM architecture and its components.