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## SIGNIFICANCE OF AUTOMATION SCRIPTS FOR A DATABASE ADMINISTRATOR IN DEVELOPMENT OF DATABASE INFRASTRUCTURE

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### ABSTRACT

Database administrators (DBA) as the name specifies are the people who administer the database activities. The databases maintained for the IT industry or any other firm will always be critical database. Thus a DBA must ensure the high availability of database and also in case of database failure must ensure zero data loss. To achieve these objectives DBA must execute number of commands on the Oracle instance. In this paper, considering an example of building a database infrastructure for a banking application, the numbers of tasks that a DBA undertakes are automated. Five different activities that can be automated to ease the work of DBA are explained. Benefits of automation scripts are described. The database software considered is Oracle 12c in Linux system to show the benefits of UNIX Shell scripts for the automation of database administrative activities.

**Keywords:** *Database Administrator (DBA), automation scripts, container database (CDB).*

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### INTRODUCTION

Basic requirement that any organization or firm must maintain is database. Maintenance of database process is called Database Administration and the person who performs this activity is called a Database Administrator (DBA). There are kinds of DBAs like systems DBA, production DBAs, and application DBAs. Each of these has their own responsibilities. The main focus of this paper is associated with systems DBA. Activities like installations, up-gradations, patching activities, backup and recovery are some tasks that a DBA does on a regular basis. To ensure execution of these activities, DBA must execute 'n' number of commands in Oracle instance. This process is time consuming and is steps oriented. Missing even a single step does not result in success of an activity undertaken by DBA. This there is a scope to overcome this limit by automation scripts. Automation is the buzz word of IT industry. Automation in database administration for DBA has benefits in many ways. Automation leads to complete elimination of manual errors while performing database activities. It reduces the efforts of DBA and helping to perform other critical database activities. This leads to increase in performance by DBA. This paper enlists all such benefits of automation scripts, considering building banking database infrastructure in which DBA's tasks are automated choosing the database software of Oracle 12c in Linux system. Oracle 12c is a multi-tenant featured database that has one database named primary database referred as container and it hosts multiple other database in it called as pluggable database. A feature of Oracle 12c makes the database infrastructure development more efficient.

### LITERATURE SURVEY

In [1] the author describes the features of Oracle 12c. Its advantages over previous releases of Oracle 12c are described. Its multi-tenant features are well described. Author explains, such a database structure bearing architecture where in number of PDBs can be held by a single container. This structure is supplemented with different options like Oracle Real Application Clusters and Oracle Active Data Guard. If the client does not will to have a CDB, then the existing database can be deployed as pluggable database, which does not, requires any changes in the different tires of application.

In [2], the author describes regarding the various roles played by a DBA. Also the responsibilities of DBA are enlisted. Explaining each of roles and responsibilities author describes the career prospects in

the field of database administration. The main focus of the paper is to describe the role of a DBA in IT industry.

In [3], the author describes regarding the company named CA Technologies work of automatic workload automation for databases. According to this, all the SQL related operations are executed on automation without interfering with command line interface. Automatic Event Engine is an extremely powerful event object that allows for the initiation of a job or process flow based on the value of a database query. Thus giving the another perspective to automation for databases.

In [4], the author, in a company named BMC, gives technology to automate database named BladeLogic for database automation. This logic performs previously listed some of the DBA activities like faster configuration, patch, security etc with less time and efforts.

In [5], the author describes regarding the information that is shared in the multitenant application. The methodology used to share information based on privileges are described.

In [6], the author describes the Oracle 12c Multi-tenant architecture. This paper explains all the features, advantages compared to previous versions.

By performing the literature survey, the idea of automation for databases activities can be performed is inferred. To perform these activities, the database chosen is Oracle 12c with Linux system. Following section describes the methodology for the automation scripts.

### METHODOLOGY

This section deals with the methodology for automating the database activities. Following Figure 1 shows the system architecture for automation script processing.

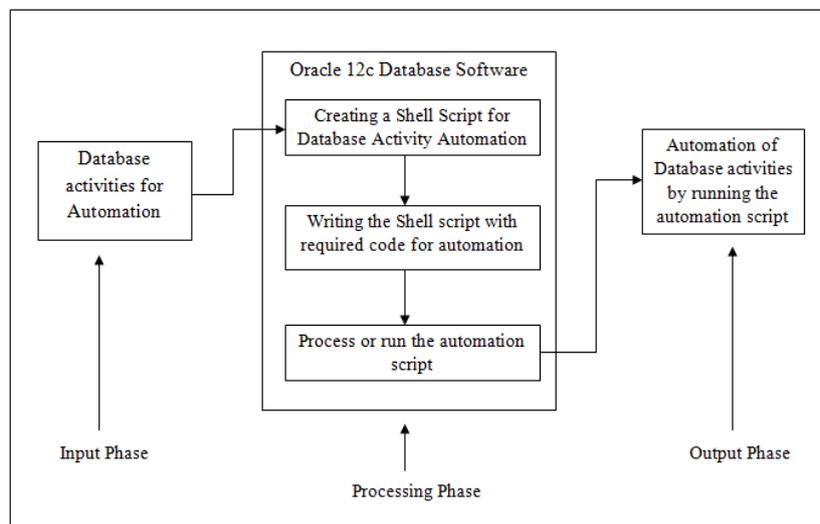


Figure 1: System architecture

Figure 1 describes the system architecture for automating the database activities using automation scripts. In Figure it can be noted that there are three phases for architecture namely input, processing and output phase.

In input phase the requirement for database activity is given for DBA. DBA takes the input of activity name, for example automation of database creation etc.

In processing phase, Oracle 12c in this scenario a banking application database is built<sup>[5]</sup>. The DBA interacts with banking application Oracle instance. Since it is a Linux system, the command-line prompts, the shell scripts are written. At first activity to automate named script is created, then the code that performs database instance interaction is written, once the instance is connected, later the code to achieve that particular activity is written and saved. After that the script is run to automate the process. In output phase, the DBA activity that leads to automation is received as output.

The above section mentioned the term database activities in general for understanding the concept; following are the database activities that are automated:

1. Automation of Database creation.
2. Automation of Net Listener and Net Service Name Configurations.
3. Automation of Tablespace creation.
4. Automation of Database Backup.
5. Automation of Point In Time Recovery of a Table.

### I. BENEFITS OF AUTOMATION SCRIPTS

The following section describes the automation script benefits:

1. Usage of automation script reduces the efforts and time invested by DBA to perform that activity.
2. Command-line prompts are more prone to errors and thus using scripts, error prone can be reduced.
3. DBAs perform plenty of database activities like patching, upgrading, backup, recovery, resource management etc. To perform these activities it requires ‘n’ number of commands to be written step wise compulsorily not missing even a single step, this is difficult for DBA to remember and perform activities. Thus automation script reduces the pressure on memory increasing productivity of a DBA.
4. Tasks that are repetitive can be automated so that DBA can involve in other activities.
5. These tasks are critical and thus automation leads to errorless, effortless and quick, quality oriented output of database activity.

### II. RESULTS AND DISCUSSION

As explained in the previous section of methodology, five DBA activities are implemented by writing the automation scripts and executing them. This section deals with the description of screenshots that show the results of those scripts mentioned in methodology.

#### 1. Automation of Database creation

```
oracle@Oscorp1:~$ vi db_creation.sh
[oracle@Oscorp1 ~]$ sh db_creation.sh
Enter GDB Name:
CDBINV
Enter total Memory:
800
Enter number of pdb's: (less than 252)
2
Enter name for pdb 0 :
PDBSHARES
Enter name for pdb 1 :
PDBFOREX
Copying database files
1% complete
3% complete
37% complete
Creating and starting Oracle instance
40% complete
45% complete
46% complete
47% complete
52% complete
57% complete
58% complete
```

85% complete  
Completing Pluggable Database Creation  
100% complete  
Look at the log file "/u01/app/oracle/cfgtoollogs/dbca/CDBINV/PDBFOREX/CDBINV.log" for further details.

Figure 2: Automation of Database creation

In Figure 2 it can be noted that, a script named db\_creation is created and executed, asked inputs are fed and the database is created automatically.

#### 2. Automation of Net Listener and Net Service Name Configurations.

```
oracle@Oscorp1:~  
[oracle@Oscorp1 ~]$ vi listener_creation.sh  
[oracle@Oscorp1 ~]$ sh listener_creation.sh  
Enter listener name:  
LIST_INV  
Enter Host:  
192.168.4.1  
Enter port:  
1540
```

Figure 3: Automation script for NetListener creation

```
STATUS of the LISTENER  
-----  
Alias                LIST_INV  
Version              TNSLSNR for Linux: Version 12.1.0.2.0 - Production  
Start Date           19-APR-2018 12:20:08  
Uptime               0 days 0 hr. 0 min. 7 sec  
Trace Level          off  
Security             ON: Local OS Authentication  
SNMP                 OFF  
Listener Parameter File /u01/app/oracle/product/12.1.0/db_1/network/admin/listener.ora  
Listener Log File    /u01/app/oracle/diag/tnslsnr/Oscorp1/list_inv/alert/lo  
g.xml  
Listening Endpoints Summary...  
(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.168.4.1)(PORT=1540)))  
The listener supports no services  
The command completed successfully
```

Figure 4: Results of NetListner Creation

```
oracle@Oscorp1:~  
[oracle@Oscorp1 ~]$ sh nsn_creation.sh  
Enter service_name(database name):  
PDBSHARES  
Enter Host:  
192.168.4.1  
Enter port:  
1540  
Enter net service name:  
PDBSHARES
```

Figure 5: Automation of NetService Name

Figure 3, 4 and 5 explains the automation of net listener and service names as names required by DBA, takes the input.

### 3. Automation of Tablespace creation

```
oracle@Oscorp1:~  
[oracle@Oscorp1 ~]$ sh tablespace_creation.sh  
##Creating a New Tablespace##  
Enter Database Name  
CDBINV  
Enter Tablespace Name  
INV_DEVTB  
Enter the Datafile Path  
/u01/app/oracle/oradata/CDBINV/inv_devtb.dbf  
Enter Size of Tablespace  
50  
${datafilepath}  
  
SQL*Plus: Release 12.1.0.2.0 Production on Thu  
Copyright (c) 1982, 2014, Oracle. All rights reserved.  
  
Connected to:  
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0  
With the Partitioning, OLAP, Advanced Analytics and  
XML Expressions  
SQL> SQL> 2  
Tablespace created.
```

Figure 6: Automation of Tablespace creation

Figure 6 explains the automation script named tablespace\_creation.sh is created and run asking the inputs of name. Based on the name, path, size the table space is created.

#### 4. Automation of Database Backup

Figure 7 explains the script to take the full database backup. This is performed the RMAN utility that is used for Oracle database backup.

Also figure 8 explains the successful completion of backup by RMAN.

```
oracle@Oscorp1:~  
[oracle@Oscorp1 ~]$ vi Pitr_Backup.sh  
[oracle@Oscorp1 ~]$ sh Pitr_Backup.sh  
### Performing Backup and Prints Timestamp ###  
Enter the name of Database to be Backedup  
PDBFOREX  
Is the Database a Pluggable database?(Y/N)  
y  
Pitr_Backup.sh: line 9: [: missing `']  
  
Recovery Manager: Release 12.1.0.2.0 - Producti  
Copyright (c) 1982, 2014, Oracle and/or its aff  
connected to target database: CDBINV (DBID=1362  
  
RMAN>  
  
Starting backup at 20-APR-18  
current log archived
```

Figure 7: Automation of Database Backup

```
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01  
Finished backup at 20-APR-18  
  
Starting Control File and SPFILE Autobackup at 20-APR-18  
piece handle=/u01/app/oracle/fast_recovery_area/CDBINV/autobackup/2018_  
Finished Control File and SPFILE Autobackup at 20-APR-18  
  
RMAN>  
  
Recovery Manager complete.
```

Figure 8: Successful completion of Database Backup

#### 5. Automation of Point In Time Recovery of a Table

```
[oracle@Oscorp1 ~]$ sh Pitr_Automation.sh  
##Performing POINT IN TIME RECOVERY of Table##  
Enter Net Service Name  
PDBSHARES  
Enter UserName of Table You want to perform Pitr  
dev  
Enter Table Name  
customer  
Enter TIMESTAMP from when You want Recovery (DD-MON  
20-APR-2018 10:58:39  
  
Recovery Manager: Release 12.1.0.2.0 - Production c  
Copyright (c) 1982, 2014, Oracle and/or its affilia  
connected to target database: CDBINV (DBID=13623738  
  
RMAN> 2> 3> 4>  
Starting recover at 20-APR-18  
using target database control file instead of recov  
allocated channel: ORA_DISK_1  
channel ORA_DISK_1: SID=41 device type=DISK
```

Figure 9: Automation of Point In Time Recovery of a Table

```
oracle@Oscorp1:~  
auxiliary instance file /u01/aux/CDBINV/datafi  
ted  
auxiliary instance file /u01/aux/CDBINV/datafi  
leted  
auxiliary instance file /u01/aux/CDBINV/datafi  
ted  
auxiliary instance file /u01/aux/CDBINV/contr  
auxiliary instance file tspitr_pxaa_47578.dmp  
Finished recover at 20-APR-18  
  
RMAN>  
  
Recovery Manager complete.
```

Figure 10: Successful completion of Recovery.

Figure 9 and 10 shows the automation of point in time recovery of a table. By providing the table name and time stamp, the DBA will get the table recovered till that timestamp.

## CONCLUSION

In this paper the significance of automation in database activities for a database administrator are explained. Some of the activities are automated to check the performance of automation and this leads to reduction of time to execute and efforts of a DBA. This paper also lists the benefits for a DBA by automation. To conclude the topic, automation is the buzz word that will acquire its feet in all areas of engineering. This reduces human efforts and increases efficiency of work

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