Upgrading to
Oracle 12c

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ABSTRACT:

Oracle 12c offers users improved performance, security, scalability, infrastructure consolidation and management as well as many other benefits sufficiently compelling for Oracle database users to upgrade. Datavail's expert Oracle DBAs have performed numerous upgrades for our clients to Oracle 12c.

In this Datavail white paper, we explore the rationale for upgrading to Oracle 12c, explain the process of upgrading, and provide a script used for an actual upgrade performed in under an hour.

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Oracle touts its latest database update, Oracle 12c, as "the world's first database designed for the cloud"; however, there are any number of more compelling reasons to upgrade to 12c. Namely, upgrading provides users with improved performance, security, scalability, infrastructure consolidation and management as well as many other benefits.

In this white paper, we explore the rationale for the process of upgrading, and we provide a script used for an actual upgrade performed in 43 minutes. Now, we know that not all upgrades go as smoothly or quickly, but this white paper is a real-world example that proves it can be done.

About Oracle 12c

There are more than 500 new features in this latest iteration of the database, according to Oracle. Among those we find particularly welcome are the ease with which a user can execute data-masking, which is used to obscure sensitive data such as social security card or credit card numbers, and other pricing information.

Two other features we are also happy to see upgraded are the Invisible Columns feature and varchar2. The size limit on common data-types for the Invisible Columns feature, which can be use to help introduce changes to an application, has been increased. Also, varchar2 has grown from 4,000 to 32,000. Datafile management can now be executed on-line and the database can be moved in and out of the archive log without needing to shut down operations.

There are two editions of Oracle 12c available. Standard Edition 2 (SE2) is designed for smaller organizations. SE2 is free and has limited support and can be used with servers that have a maximum capacity of two sockets. Enterprise Edition (EE) is available on single or clustered servers with no socket limitations. It is not free but there are numerous options, features, and pricing tiers available to users.

Why You Should Upgrade to Oracle 12c

There are compelling arguments in favor of upgrading, not the least of which is stability. Oracle 12c offers users maximum availability as well as database security through many new features. It also has a host of other new features, such as automatic data optimization and updated memory-based caching features.

These arguments apply across the board to users, regardless of the size of their organization.

Additionally, Oracle 12c can help users reduce their costs while increasing their management with the Flex ASM storage infrastructure. Users can also consolidate many multiple databases using the pluggable databases feature. Data tiering allows users to take advantage of different types of storage based on the data being used. If, for example, data doesn't need to be accessed regularly, it can be compressed and moved to the most appropriate storage location.

If you haven't been swayed yet, it's important to know that end of support is near. Premier Support for Oracle 11gR2 ended January 31, 2015 and the free extended support ends May 31, 2017. Bug fixes, security and other support for Oracle 11gR2 will no longer be provided. Would you want your valuable data to be unprotected and stored in an obsolete database system?

The Process of Upgrading to Oracle 12c

The upgrade process can be relatively painless using the upgrade tool. There is a system of thorough checks added to the pre-upgrade process. It seems 12c wants to be a better database, from the foundation up.

Start by selecting the upgrade path for Oracle Database to 12c. Once you have chosen an upgrade/migration path, confirm that the operating system and database version are on the certification matrix. If you are upgrading from Oracle 11.2.0.2 or higher, you can possibly directly upgrade to 12c.

Finally, you'll want to download and install the Oracle 12c binaries on the target server. You will do this once on each server involved.

The Pre-Upgrade Process

Now, execute the various pre-upgrade tasks. You will need to:

- Check for valid objects.
- Eliminate duplicate objects.
- Check and disable triggers.
- Check database for further issues, including running tools to ensure a smooth upgrade process.

Upgrading the Database

Now, you're ready to upgrade. There are several possible methods you might wish to employ. The one you ultimately select will depend on variables such as the tools you have available, how much downtime you are able to have, and other parameters.

The method you select will also be based on other factors, including the specific version – with patch set level – from which you are upgrading; source and destination characteristics; any substantive changes you have planned for the system (format, partitioning, encryption, et al.), and the size of the database.

We put Oracle 12c through its paces, starting with installation. The entire upgrade process, as executed against an 11.2 database, was completed in 43 minutes.

You can see the entire code we generated from this process in the Appendix.

Here's a summary of the upgrade process illustrated in the Appendix:

- Issue a complete backup of the database (not necessarily LEVEL 0, as some organizations use different technology such as snaps, clones…etc.)
- Check again for any invalid objects.
- Execute any other last-minute tasks (blackouts, notification,..etc) before taking Oracle and all associated applications off-line.
- Bring down the application(s).
- Start the upgrade process.

Three Tools for Upgrading to Oracle 12c

A combination of methods/tools can be used. One of these is upgrading in place, using the Database Upgrade Assistant, which is a GUI-based wizard to handle all tasks. Many DBAs prefer to control every task and choose to execute manual database upgrades. We used the manual process and have detailed that later. You may also use transportable table-spaces with the new full transportable export/import feature, which automates the moving of meta-data via a database link or dump files. This has the benefit of being a simple, speedy means of upgrading in a single operation.

Another possibility is to use Oracle Data Pump. The expdp and impdp utilities can make this method easy. Related to this is using exp and imp, which would be recommended in the event older databases or a different operating system are involved.

Minimal downtime database upgrades are also possible, according to an Oracle white paper on Upgrading to Oracle 12c, using tools including Transient Logical Standby, RMAN Cross-Platform Incremental Backups, or Oracle's GoldenGate application.
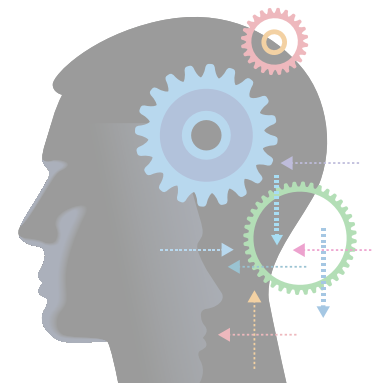
After the Upgrade

Once the upgrade is complete, conduct checks for database integrity with your appropriate tools. You'll also want to create a checklist of tasks required to complete the upgrade.

Once you have finished you should:

- Reboot/Restart the system.
- Make certain the profiles, the environment variables, oratab, any cron or special jobs, and OEM Targets are updated.
- Check and verify that all your targets, statistics, and profiles accurately reflect the update and that these work after the update.
- Identify any invalid objects using the utluiobj script.
- Again, complete a full database backup.

Once the upgrade is complete, you will want to prepare a full analysis and generate a report on the upgrade. These documents can serve as operational baseline as you begin using the new database.

Consult the many resources available from Oracle for more assistance. You may want to look at the following information on the company's blog, where master product manager of database upgrades and migrations, Mike Dietrich, shares his notes on database upgrades for 12c with or without Oracle Multitenant. There are also numerous resources available on Datavail.com for additional assistance.

Finally, don't neglect any ongoing database management tasks. These are mandatory and you will need to maintain and tune your Oracle database regularly to insure its proper ongoing operation and availability.

What's Next?

With more than 500 database administrators and 300-plus clients worldwide, Datavail is the largest database services provider in North America. With 24x7 managed database services, including database design, architecture and staffing, Datavail can support your organization in working with Oracle and any upgrades you need.

Contact Datavail to discuss a custom Oracle solution designed for your enterprise.
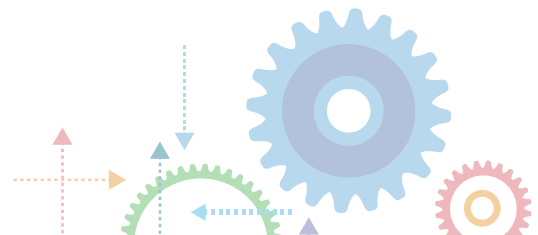
Appendix: Sample Execution of an Upgrade to Oracle 12c

The following code demonstrates the entire upgrade process, as executed against an Oracle 11.2 database. The upgrade was completed within 43 minutes.

I changed the names of the server and database to protect the company. Also, the legal folks made me include some Ts & Cs at the end. Please read those – but the script works.

- login as oracle
  Set your environment appropriately

```
. oraenv
hrdemo

sqlplus / as sysdba

-- Run the new preupgrade check -- generate 3 files
SQL> @/u01/app/oracle/product/12.1.0.2/dbhome_1/rdbms/admin/preupgrd.sql
SQL> EXECUTE dbms_preup.purge_recyclebin_fixup;

-- Remove the OLAP Catalog
SQL> @/u01/app/oracle/product/12.1.0.2/dbhome_1/olap/admin/catnoamd.sql
commit;

-- Move the AUD$ table
SQL> @/u01/app/oracle/product/12.1.0.2/dbhome_1/rdbms/admin/olspreupgrade.sql

-- Prepare your spfile for the 12c
SQL> create pfile from spfile;
SQL> alter system set processes=300 scope=spfile;

-- Raise Comptibile
SQL> alter system set COMPATIBLE='12.1.0' scope=spfile;

-- Gather dictionary stats
SQL> EXECUTE dbms_stats.gather_dictionary_stats;

-- Run the preupgrade_fixups.sql
SQL> @/u01/app/oracle/cfgtoollogs/hrdemo/preupgrade/preupgrade_fixups.sql

-- Shutdown the hrdemo database
SQL> shutdown immediate
SQL> logout

-- Copy your new spfile and your password file into the Oracle 12c home's dbs directory
hrstage01> cp /u01/app/oracle/product/11.2.0.4/dbhome_1/dbs/spfilehrdemo.ora /u01/app/oracle/product/12.1.0.2/dbhome_1/dbs/
hrstage01> cp /u01/app/oracle/product/11.2.0.4/dbhome_1/dbs/orapwhrdemo /u01/app/oracle/product/12.1.0.2/dbhome_1/dbs/
hrstage01> vi /etc/oratab
```

-- Modify hrdemo home to 12c home
From:
hrdemo:/u01/app/oracle/product/11.2.0.4/dbhome_1:Y
To:
hrdemo:/u01/app/oracle/product/12.1.0.2/dbhome_1:Y

-- Run . oraenv again for hrdemo1
. oraenv
hrdemo
echo $ORACLE_HOME

-- Bring the hrdemo database into UPGRADE mode
SQL> sqlplus / as sysdba
SQL> startup upgrade
SQL> exit

hrstage01> cd $ORACLE_HOME/rdbms/admin
hrstage01> $ORACLE_HOME/perl/bin/perl catctl.pl catupgrd.sql
-- Above will take a while to finish all 73 phases

-- Finalize the upgrade with all required post upgrade steps
. oraenv
hrdemo
sqlplus / as sysdba
SQL> startup
SQL> @?/rdbms/admin/utlrp.sql
SQL> @/u01/app/oracle/cfgtoollogs/hrdemo/preupgrade/postupgrade_fixups.sql
SQL> exit

-- Adjust Time Zone settings
-- Scripts to automatically update the RDBMS DST (timezone) version in an 11gR2 or 12cR1 database.
(Doc ID 1585343.1)

cd /orcl_sw/software/database/linux/12.1.0.2/AdjustTimeZone/DBMS_DST_scriptsV1.9

sqlplus / as sysdba

SQL> spool countstatsTSTZ_hrdemo.log
SQL> @countstatsTSTZ.sql
SQL> spool off
--
SQL> exec dbms_scheduler.purge_log;
--
SQL> spool upg_tzv_check_hrdemo.log
SQL> @upg_tzv_check.sql
SQL> spool off

SQL> spool upg_tzv_apply_hrdemo.log
SQL> @upg_tzv_apply.sql
SQL> spool off

```
-- The count should go down
SELECT count(*) FROM ALL_TSTZ_TABLES where UPGRADE_IN_PROGRESS='YES';

--To see what's happening during upg_tzv_check.sql or upg_tzv_apply.sql one can use:
sqlplus / as sysdba

set PAGES 1000
SELECT TARGET
, TO_CHAR(START_TIME,'HH24:MI:SS - DD-MM-YY')
, TIME_REMAINING
, SOFAR
, TOTALWORK
, SID
, SERIAL#
, OPNAME
FROM V$SESSION_LONGOPS
WHERE sid IN
  (
    SELECT SID
    FROM V$SESSION
    WHERE CLIENT_INFO = 'upg_tzv'
  )
AND SOFAR < TOTALWORK
ORDER BY START_TIME;

SELECT S.SID
, S.SERIAL#
, S.SQL_ID
, S.PREV_SQL_ID
, S.EVENT#
, S.EVENT
, S.P1TEXT
, S.P1
, S.P2TEXT
, S.P2
, S.P3TEXT
, S.P3
, S.TIME_REMAINING_MICRO
, S.SEQ#
, S.BLOCKING_SESSION
, BS.PROGRAM "Blocking Program"
, Q1.SQL_TEXT "Current SQL"
, Q2.SQL_TEXT "Previous SQL"
FROM V$SESSION S
, V$SQLAREA Q1
, V$SQLAREA Q2
, V$SESSION BS
WHERE S.SQL_ID         = Q1.SQL_ID(+)
AND S.PREV_SQL_ID      = Q2.SQL_ID(+)
AND S.BLOCKING_SESSION = BS.SID(+)
AND S.CLIENT_INFO      = 'upg_tzv';
```

```
-- Check version
SQL> col property_name format a30
SQL> col value format a30

SQL>SELECT PROPERTY_NAME, SUBSTR(property_value, 1, 30) value
FROM DATABASE_PROPERTIES
WHERE PROPERTY_NAME LIKE 'DST_%'
ORDER BY PROPERTY_NAME;


PROPERTY_NAME                                    VALUE
--------------------------------------------     -----------------
DST_PRIMARY_TT_VERSION                           18
DST_SECONDARY_TT_VERSION                         0
DST_UPGRADE_STATE                                NONE


-- Data patch
cd $ORACLE_HOME/OPatch
./datapatch -verbose
```

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Biography

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Chad Cleveland is an exciting and energetic individual with 15 years of experience in IT, including 9 years as an Oracle Database Administrator. He enjoys working with his customers to streamline and remediate Database Infrastructure in areas such as hardware migrations, Cluster (RAC) and database upgrades, and extensive monitoring solutions with Oracle Enterprise Manager.

About Datavail

Datavail Corporation is the largest provider of remote database administration (DBA) services in North America, offering database design and architecture, administration and 24x7 support. The company specializes in Oracle, Oracle E-Business Suite, Microsoft SQL Server, MySQL, MongoDB, DB2 and SharePoint, and provides flexible on-site/off-site, onshore/offshore service delivery options to meet each customer's unique business needs.

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