Best Practices for Upgrading to Oracle Database 11g Release 2

Carol Palmer
Principal Product Manager, Database Upgrade & Utilities
24-January-2012
Agenda

Best Practices

FAQ

Summary
Best Practice #1

• Read the FRIENDLY manuals!
### Upgrade Advisors

The following upgrade advisors are currently available. Please note that for each advisor there is a specific scope defined. If your environment does not match the listed conditions, please let us know so we can work on expanding our content.

<table>
<thead>
<tr>
<th>Upgrade Advisor</th>
<th>Description</th>
<th>Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database Upgrade from 10.2 to 11.2</td>
<td>This document is intended to guide customers on the path to plan for and execute an upgrade of their Oracle Database from Oracle Database 10g release 2 (10.2) to Oracle Database 11g release 2 (11.2). Customers wishing to upgrade from 9.2 Database version (up to 11.2) may consult the Database 9i release 2 (9.2) to Oracle Database 11g release 2 (11.2) Upgrade Advisor [264.1].</td>
<td>251.1</td>
</tr>
<tr>
<td>Database Upgrade from 9.2 to 11.2</td>
<td>This document is intended to guide customers on the path to plan for and execute an upgrade of their Oracle Database from Oracle Database 9i release 2 (9.2) to Oracle Database 11g release 2 (11.2).</td>
<td>264.1</td>
</tr>
</tbody>
</table>
**Note: 251.1** Database Upgrades from 10.2 to 11.2

**Database Upgrade from 10.2 to 11.2 > Evaluate**

### Overview:

The goal of the UPGRADE - EVALUATE phase is to evaluate future and core business requirements and explore new possibilities for the enterprise to improve efficiency, effectiveness or competitive advantage. Emphasis on improving business through upgrading existing hardware/software in the current system.

### Areas of Focus:
- Potential business improvements which can be achieved by upgrade. Examples:
  - Performance and scalability improvements
  - Process improvements
  - Resource optimization
  - Risk reduction
- Upgrade strategies
- Upgrade impact

### Expected Outcome / Deliverables:
- Documented GO/NO-GO decision for upgrading to a new and specified version

### News and Announcements
- Why Upgrade to Oracle Database 11g? (.pdf)
- Lowering Your IT Costs with Oracle Database 11g Release 2 (.pdf)

### Multimedia Training
- Why Upgrade to Oracle Database 11g?
- Oracle Customers Talk About DB 11.2

### Related Resources
- Oracle Database Upgrade (OTN)
- DB 11.2 New Features Guide
**Note: 264.1** Database Upgrades from 9.2 to 11.2

Database Upgrade Lifecycle Advisor from 9.2 to 11.2 > Evaluate

### Overview:

The goal of the UPGRADE - EVALUATE phase is to evaluate future and core business requirements and explore new possibilities for the enterprise to improve efficiency, effectiveness or competitive advantage. Emphasis on improving business through upgrading existing hardware/software in the current system.

### Areas of Focus:

- Potential business improvements which can be achieved by upgrade. Examples:
  - Performance and scalability improvements
  - Process improvements
  - Resource optimization
  - Risk reduction
  - Upgrade strategies
  - Upgrade impact

### Expected Outcome / Deliverables:

- Documented GONOGO decision for upgrading to a new and specified version
- Documented understanding of the impact for the business
  - Expected benefits for the business
  - Expected costs (people, other resources, time, impact on other systems)
- Documented Risk Assessment

### News and Announcements

- Why Upgrade to Oracle Database 11g? (.pdf)
- Lowering Your IT Costs with Oracle Database 11g Release 2 (.pdf)

### Multimedia Training

- Why Upgrade to Oracle Database 11g?
- Oracle Customers Talk About DB 11.2

### Related Resources

- Oracle Database Upgrade (OTN)
- DB 11.2 New Features Guide
- Database 11.2 Value Propositions (.ppt)
Documentation

- **Note:785351.1** Upgrade Companion 11g Release 2

---

**Introduction**

The Best Practices section is not a replacement for the Oracle Database Upgrade Guide but rather a companion document that emphasizes and elaborates on database upgrade recommendations and requirements. The Best Practices are derived by Oracle technical staff and offer an accumulation of real-world knowledge and experience obtained while working with our customers.

**Usage**

The Best Practices tab is organized by the following major steps in the Upgrade Methodology:

- **Upgrade Planning**: Important information related to planning the DB configuration, and testing
- **Prepare and Preserve**: Information related to preserving and preparing the source environment for the Oracle Database 11g Upgrade
- **Upgrade**: Final reminders and information required for the actual upgrade
- **Post Upgrade**: Testing and analysis which should be performed after upgrading your test and production databases to Oracle Database 11g
Documentation

- Note:785351.1 Upgrade Companion 11g Release 2

This section documents important changes in behavior between Oracle9i Release 2 (9.2)/Oracle Database 10g and Oracle Database 11g. This section focuses on behavior changes that require a DBA to make an informed decision to minimize the risks that may be introduced by the changes. This section does not describe all changed behavior or new features in Oracle Database 11g. For a complete list of all new features introduced in Oracle Database 11g, see the Oracle Database New Features Guide 11g.

This page is an accumulation of real-world knowledge and experience obtained from Support and Development engineers and working with Oracle customers on different upgrade scenarios. Pay careful attention to these Behavior Changes to avoid the most common issues when upgrading from Oracle9i Release 2/Oracle Database 10g to Oracle Database 11g.

- Architecture
- Optimizer
- Initialization Parameters
- Performance and Monitoring
- Administration
- Streams
- Security
Documentation

• Upgrade Guides
  • Oracle® Database
    Upgrade Guide
    11g Release 2 (11.2)
    E10819-02
    http://download.oracle.com/docs/cd/E11882_01/server.112/e10819/toc.htm

• Note: 837570.1
  Complete Checklist for Manual Upgrades to 11g Release 2
• Note: 421191.1
  Complete checklist for manual upgrades from X to Y
• Important Database Upgrade Notes
  • **Note: 1152016.1**
    Master Note For Oracle Database Upgrades and Migrations
  • **Note:837570.1**
    Complete Checklist for Manual Upgrades to 11g Release 2
  • **Note: 1320966.1**
    Things to Consider Before Upgrade to 11.2.0.2/11.2.0.3 Database Performance
  • **Note:785351.1**
    Upgrade Companion 11.2
  
  • Upgrading from 9i to 10g: What to expect from the Optimizer
  • Upgrading from 10g to 11g: What to expect from the Optimizer
OTN Upgrade Page

• http://www.oracle.com/technetwork/database/upgrade/index.html
OTN Upgrade Page

OTN Upgrade Page

### OTN Database Upgrade Page

**Posted By:** Brian_McCarthy  -- Aug 4, 2008 2:44 PM

<table>
<thead>
<tr>
<th>Thread</th>
<th>Author</th>
<th>Replies</th>
<th>Last Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTN Database Upgrade Page</td>
<td>Y. Ramlet</td>
<td>3</td>
<td>Dec 30, 2011 7:59 AM Last Post By: Srin Chavali</td>
</tr>
<tr>
<td>11.2.0.2 to 11.2.0.3</td>
<td>Y. Ramlet</td>
<td>3</td>
<td>Dec 30, 2011 5:47 AM Last Post By: Srin Chavali</td>
</tr>
<tr>
<td>ORA-29553: class in use: SYS.6381387c_AOInsEventListener</td>
<td>Mohammed Abdul</td>
<td>3</td>
<td>Dec 29, 2011 4:17 PM Last Post By: Srin Chavali</td>
</tr>
<tr>
<td>How to 10gR2 from db 9.2.0.5 - 11i upgrade purpose</td>
<td>Suresh</td>
<td>2</td>
<td>Dec 29, 2011 5:42 AM Last Post By: GarryB</td>
</tr>
<tr>
<td>Patch set and PSU</td>
<td>GarryB</td>
<td>4</td>
<td>Dec 29, 2011 5:42 AM Last Post By: GarryB</td>
</tr>
<tr>
<td>11gR2 Infrastructure Upgrade Question(s) from 10gR2</td>
<td>user10387007</td>
<td>2</td>
<td>Dec 28, 2011 11:27 PM Last Post By: Helios-GunesE</td>
</tr>
<tr>
<td>how to migrate the Database of Oracle 8i DB</td>
<td>904032</td>
<td>6</td>
<td>Dec 27, 2011 5:56 PM Last Post By: Srin Chavali</td>
</tr>
</tbody>
</table>
Some impressions ...

By Mike Dietrich on Dec 22, 2011

Thanks again to our colleagues of Oracle Japan for the (as always) excellent organization of our journey to Japan in December 2011. And thanks to all the customers and colleagues we’ve met and which did visit the workshops 😊 We’ll hope to meet you next time again!

And here are some impressions:
(you might click on the pictures to get a larger view)
Best Practice #2

• Always upgrade Grid Infrastructure (Clusterware and ASM) First!
Grid Infrastructure Installation

≤ 11.1.0.7

1. $ORACLE_BASE
   - Inventory, ADR etc.

2. $ORACLE_HOME – for ASM
   - ORA_CRS_HOME
   - same owner
   - Grid Infrastructure

3. $ORACLE_HOME – for Database
   - Oracle Database

≥ 11.2.0.1

1. $ORACLE_BASE
   - Inventory, ADR etc.

2. $ORACLE_HOME – for Database
   - Oracle Database

3. $ORACLE_HOME – for Database
   - Grid Infrastructure
Grid Infrastructure Upgrade 11g Release 2

- Always upgrade Oracle Clusterware first!!!
- Upgrading to Oracle Clusterware 11g Release 2:
  - Install new software into new Grid Infrastructure home
  - Out-of-place software upgrade
  - Grid Infrastructure home is owned by 'root'
  - **Make sure** to check [Note:948456.1](Note:948456.1) for known issues

- On 32-bit Windows there'll be no 32-bit Grid Infrastructure and ASM available!
Grid Infrastructure Upgrade Paths

No ASM, no Oracle Clusterware

Clusterware & ASM: 10.1.0.5

Clusterware: Rolling upgrade
ASM: No rolling upgrade

Clusterware & ASM: ≥ 10.2.0.3

Clusterware & ASM: rolling upgrade
Oracle Grid Infrastructure 11.2.0.3

- Oracle Grid Infrastructure Patch Set 11.2.0.3:
  - Patch set is not the correct wording: it’s a full release
  - Installation is out-of-place only into a separate home
  - To upgrade from GI 11.2.0.2 to GI 11.2.0.3:
    - Apply PSU 11.2.0.2.1 (or newer) in-place
  - RAC/Grid Infrastructure Upgrade Note:
    - Note:810394.1: RAC Assurance Support Team: RAC and Oracle Clusterware Starter Kit and Best Practices (Generic)
    - Also see platform-specific notes linked from the generic starter kit

- VERY IMPORTANT:
  - Follow all instructions in Note:1212703.1
    - Make sure MULTICAST is setup correctly Note:1054902.1 – section D
    - Make sure to check Oracle Database Readme 11g Release 2 Section 2.39 - "Open Bugs"
  - Then upgrade GI within OUI
Best Practice #3

- Use the Upgrade Planner in My Oracle Support
Upgrade Planner

Oracle 11.2.0.3.0 (New patch creation available [CPUs, PSUs, one-offs])
Oracle 11.2.0.2.0 (New patch creation to end within the year)
Oracle 11.1.0.7.0 (Terminal, New patch creation available [CPUs, PSUs, one-offs])
Oracle 10.2.0.5 (Certified, Terminal, New patch creation available [CPUs, PSUs, one-offs])

Expecting another choice? Learn More...
Best Practice #4

• Patch your new $ORACLE_HOME before you upgrade
Patch Set Installation 11.2.0.3

- Download patch set 11.2.0.3 from support.oracle.com:
Patch Set Installation 11.2.0.3

• Default: out-of-place patch upgrade!!! It’s a full release!!!
  • If you specify an in-place patch upgrade:
Patch Set Installation 11.2.0.3

- Patch set 11.2.0.3 is a full release
  - Therefore no need anymore to install 11.2.0.1 first!!!
- Only way to do an in-place patch set installation
  - Backup your /dbs and /network/admin files
  - `.runInstaller -detachHome ORACLE_HOME=<11.2.0.1-home>`

```
$ ./runInstaller -detachHome ORACLE_HOME=/u01/orahomes/11.2.0
Starting Oracle Universal Installer...

Checking swap space: must be greater than 500 MB. Actual 10047 MB Passed
The inventory pointer is located at /etc/oraInst.loc
The inventory is located at /u01/orabase
'DetachHome' was successful.
```

- Remove your 11.2.0.1 home contents
- Install 11.2.0.3 into the previous 11.2.0.1 home
- Restore /dbs and /network/admin files
- Upgrade your database with DBUA or `catupgrd.sql`
Recommended Patches

- Recommended Patches: Note:756388.1

Introduction to Oracle Recommended Patches

- What are Recommended Patches?
- Benefits of Recommended Patches
- Common Questions

What are Recommended Patches?

Oracle has introduced a set of Recommended Patches which make it easier for customers to obtain and deploy fixes for known critical issues encountered in targeted environments and configurations. As part of Oracle's overall maintenance strategy, these provide proactive patch recommendations to customers seeking to upgrade or to improve the stability of their current environments. Customers are advised to install Recommended Patches that apply to their environment.

Recommended Patches are available for products listed below. For details, please review the My Oracle Support notes.

<table>
<thead>
<tr>
<th>Product</th>
<th>My Oracle Support Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Database</td>
<td>Note:755571.1</td>
</tr>
<tr>
<td>Oracle Enterprise Manager</td>
<td>Note:822485.1</td>
</tr>
<tr>
<td>Oracle Fusion Middleware</td>
<td>Note:859115.1</td>
</tr>
<tr>
<td>Oracle Solaris Operating System</td>
<td>Note:1272947.1</td>
</tr>
</tbody>
</table>

This note will be updated as Oracle announces Recommended Patches for other Oracle products.

Benefits of Recommended Patches

Oracle Recommended Patches provide the following benefits:

- They fix a set of critical issues commonly encountered in targeted environments and configurations.
- They stabilize production environments because the patches address known critical issues.
- They help save time and cost by eliminating rediscovery of known issues.
- They are tested as a single combined unit, resulting in increased quality and eliminating the risk of combining patches that are only independently tested.
- They make it easier to identify patches applicable for a targeted environment/configuration.
Recommended Patches

- Recommended Database Patches: Note:756671.1

Oracle Recommended Patches -- Oracle Database [ID 756671.1]

- Target Configurations
- Patch Availability
- Current Recommended Patches
  - 11.2.0.3 Current Recommended Patches
  - 11.2.0.2 Current Recommended Patches
  - 11.2.0.1 Current Recommended Patches
  - 11.1.0.7 Current Recommended Patches
  - 11.1.0.6 Current Recommended Patches
  - 10.2.0.8 Current Recommended Patches
  - 10.2.0.4 Current Recommended Patches
  - 10.2.0.3 Current Recommended Patches
- Conflict Resolution
- On Request
- Known Issues
- References

Beginning with release 10.2.0.3, Oracle releases Recommended Patches for Oracle Database. For an introduction to Recommended Patches, see Note:756380.1

Target Configurations

Recommended Patches are provided for the following target configurations:

- Generic
- Real Application Clusters
- Data Guard
- Exadata
- E-Business Suite Certification
Patch Set Update (PSU) Installation

• Install PSUs
  • Note:854428.1: Introduction to Database Patch Set Updates
  • Note:1227443.1: Patch Set Updates Known Issues

• Database PSUs include:
  • Fixes for critical issues that may affect a large number of customers and that are already proven in the field
  • Critical Patch Update (CPU) fixes

• Database PSUs do not include:
  • Changes that require re-certification
  • Fixes that require configuration changes

• Typically 25-100 new bug fixes per PSU – usually cumulative

• Guaranteed to be RAC rolling installable

• Will be released 4x per year on the same schedule as CPUs

• PSU check: opatch lsinventory -bugs_fixed | grep -i 'DATABASE PSU'
### Important Alerts and One-Off-Patches?

- Check for important alerts: **Note:161818.1**

#### Oracle Database Releases Status Summary

<table>
<thead>
<tr>
<th>Release (Click to see Details)</th>
<th>Current Patch Set</th>
<th>Next Patch Set</th>
<th>Premier Support Ends</th>
<th>Extended Support Ends</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2.0.X</td>
<td>11.2.0.3</td>
<td>11.2.0.4</td>
<td>Jan-2015</td>
<td>Jan-2018</td>
<td>Base release is 11.2.0.1. Extended Support fees are waived for the first year from Jan-2015 to Jan-2016. 11.2 Patch Sets are full releases - see Note 1186763.1. Patching for 11.2.0.1 ended on 13/Sep/2011 - See Note 742050.1.</td>
</tr>
<tr>
<td>11.1.0.X</td>
<td>11.1.0.7</td>
<td>None</td>
<td>Aug-2012</td>
<td>Aug-2015</td>
<td>Base release is 11.1.0.6. 11.1.0.7 is the terminal 11.1 Patch Set.</td>
</tr>
<tr>
<td>10.2.0.X</td>
<td>10.2.0.5</td>
<td>None</td>
<td>Jul-2010</td>
<td>Jul-2013</td>
<td>10.2.0.5 is the terminal 10.2 Patch Set. The Free Extended Support period ended on 31-Jul-2011. Patches will only be created for 10.2.0.5 on most platforms. - See Note 742050.1 for platform specific end patching dates.</td>
</tr>
<tr>
<td>10.1.0.X</td>
<td>10.1.0.5</td>
<td>None</td>
<td>Jan-2009</td>
<td>Jan-2012</td>
<td>10.1.0.5 is the terminal 10.1 Patch Set. 10.1 is now in Extended Support - see Note 761713.1.</td>
</tr>
</tbody>
</table>
Upgrade Information / Alerts

- Known issues in 11.2.0.x? See Note:880782.1

### Patch Sets

This section gives a summary of the patch sets available for Oracle 11g Release 2.
Note that the BASE release of Oracle 11g Release 2 is 11.2.0.1.

<table>
<thead>
<tr>
<th>Release</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2.0.3</td>
<td>Availability and Known issues for 11.2.0.3</td>
</tr>
<tr>
<td></td>
<td>List of fixes included in 11.2.0.3</td>
</tr>
<tr>
<td>11.2.0.2</td>
<td>Availability and Known issues for 11.2.0.2</td>
</tr>
<tr>
<td></td>
<td>List of fixes included in 11.2.0.2</td>
</tr>
<tr>
<td>11.2.0.1</td>
<td>Availability and Known issues for 11.2.0.1</td>
</tr>
</tbody>
</table>
Upgrade Information / Alerts

• Known issues in 11.2.0.3? See Note:1348336.1

**11.2.0.3 Alerts / Issues**

This section lists alerts and important issues relevant to 11.2.0.3.

**Notable fixes included in 11.2.0.3**

This section lists fixes / enhancements in 11.2.0.3 which may cause a notable change in behaviour.

<table>
<thead>
<tr>
<th>BugDoc</th>
<th>Description</th>
<th>Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>9832338</td>
<td>ORA-800 [15160] / ORA-7445 [kkqftp] from CONNECT BY and OUTER JOIN (+)</td>
<td></td>
</tr>
<tr>
<td>1354793_1</td>
<td>Oracle Text Lexer Feature Changes introduced in 11.2.0.3</td>
<td></td>
</tr>
</tbody>
</table>

**Issues introduced in 11.2.0.3**

This section lists bugs introduced in 11.2.0.3 (if any). Such issues may be either serious or trivial but the aim is to list them all to help customers assess the risk of applying the Patch Set on top of 11.2.0.2.

<table>
<thead>
<tr>
<th>BugDoc</th>
<th>Description</th>
<th>Updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>13496250</td>
<td>Unexpected ORA-976 using LEVEL / PRIOR / ROWNUM in an ANSI &quot;ON&quot; filter predicate</td>
<td>20/Dec/2011</td>
</tr>
<tr>
<td>13384182</td>
<td>ORA-600 [delrow:iot1] from DELETE or MERGE. DELETE with an IOT</td>
<td>24/Nov/2011</td>
</tr>
<tr>
<td>13365021</td>
<td>SDO_NN query fails with ORA-22165 &quot;given index [32767] must be in the range ....&quot;</td>
<td>29/Nov/2011</td>
</tr>
<tr>
<td>13117043</td>
<td>ORA-600 [13009] Raised for SELECT FOR UPDATE on Hierarchical Query</td>
<td>23/Nov/2011</td>
</tr>
</tbody>
</table>
Recommended OS patches

• OS Installation and Configuration See Note:169706.1
Best Practice #5

- Preserve performance statistics
Preparation - Testing

• Test the upgrade itself
  • Functional testing – does the upgrade complete successfully?
  • Performance testing – how long will the upgrade take?

• Test Post-Upgrade Performance
  • Functional testing
    • Will your applications run correctly?
  • Performance testing
    • Gather performance data before you upgrade
    • Time important queries, reports, and batch jobs
    • Tune your init.ora parameters, OS parameters
  • Use real life loads!
    • Real Application Testing
    • SQL Performance Analyzer
    • Database Replay
Preparation – Performance

• Collecting sufficient performance data prior to the upgrade is of vital importance
  • Sufficient means: Starting at least 31 days before the upgrade
  • Gather accurate performance statistics from production
  • In Oracle 8i/9i:
    • Use STATSPACK
      • Export the PERFSTAT user right before the upgrade
      • Note:466350.1 STATSPACK before/after upgrade
  • In Oracle 10g/11g:
    • Use AWR
      • Take snapshots every 30-60 minutes – retention: >30 days
      • Extract the AWR with: SQL> @/rdbms/admin/awrext.sql
      • => For 10.1 only use: DBMS_SWRF_INTERNAL.EXTRACT_AWR
      • Use AWR DIFF reports to compare before & after upgrade performance:
        DBMS_WORKLOAD_REPOSITORY.AWR_DIFF_REPORT_HTML
    • Managing Optimizer/CBO stats during upgrade: Note:465787.1
Best Practice #6

- Pre-upgrade *Sanity* operations
Sanity Operations: Invalid Objects

- Always check for INVALID objects
- SQL:
  ```sql
  SELECT unique OBJECT_NAME, OBJECT_TYPE, OWNER FROM DBA_OBJECTS WHERE STATUS='INVALID';
  ```
- Fix all INVALID objects BEFORE the upgrade/migration
- There should be no invalid objects in SYS and SYSTEM user schema
  - Recompile invalid objects with `utlrp.sql` before the upgrade
Sanity Operations: Duplicate Objects

- Always check for **DUPLICATE objects** in SYS/SYSTEM
- SQL>
  
  ```sql
  select OBJECT_NAME, OBJECT_TYPE from DBA_OBJECTS where OBJECT_NAME||OBJECT_TYPE in (select OBJECT_NAME||OBJECT_TYPE from DBA_OBJECTS where OWNER='SYS') and OWNER='SYSTEM' and OBJECT_NAME not in ('AQ$_SCHEDULES_PRIMARY', 'AQ$_SCHEDULES', 'DBMS_REPCAT_AUTH');
  ```

- Fix DUPLICATE objects in SYS/SYSTEM **BEFORE** upgrade

- **Note:**1030426.6 How to Clean Up Duplicate Objects Owned by SYS and SYSTEM Schema
Sanity Operations: Invalid Components

• Always check for **NON VALID components**:
  • SQL>
    ```sql
    select substr(COMP_ID, 1,10) compid,
    substr(COMP_NAME,1,24) compname, STATUS, VERSION from DBA_REGISTRY where STATUS<>'VALID';
    ```

• Try to fix all **NON VALID components BEFORE** the upgrade
• If recompilation with utlrp.sql does not correct component status further diagnosis might be required:
  • Note:472937.1 Information On Installed Database Components
  • Note:753041.1 How to diagnose Components with NON VALID status
Sanity Operations

• If upgrading from 10g or 11g, purge the recyclebin

    SQL> purge DBA_RECYCLEBIN;
Best Practice #7

• **Always** run the pre-upgrade script:
  • Upgrade to Oracle Database 11.2: `utlu112i.sql`
Pre-Upgrade Check

- Run `utlu112i.sql` in your current environment

---

Oracle Database 11.2 Pre-Upgrade Information Tool 09-21-2009 22:33:20

**********************************************************************
Database:
**********************************************************************
--> name: ORCL
--> version: 10.2.0.3.0
--> compatible: 10.2.0.3.0
--> blocksize: 8192
--> platform: Linux IA (32-bit)
--> timezone file: V4

[..]

**********************************************************************
Update Parameters: [Update Oracle Database 11.2 init.ora or spfile]
**********************************************************************
WARNING: --> "java_pool_size" needs to be increased to at least 64 MB
[..]

**********************************************************************
Miscellaneous Warnings
**********************************************************************
WARNING: --> Database is using a timezone file older than version 11.
.... After the release migration, it is recommended that DBMS_DST package
.... be used to upgrade the 10.2.0.3.0 database timezone version
.... to the latest version which comes with the new release.
**Command Line Upgrade**

Get the current version of **utlu\_nm\_i.sql**

**Download Note:** 884522.1

<table>
<thead>
<tr>
<th>Coming From Version</th>
<th>Script Build/Date</th>
<th>Upgrade Target Version</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Build 1</strong> November 2011</td>
<td>11gR2 (11.2.0.3) - utlu112i_3.sql</td>
</tr>
<tr>
<td>9.2.0 (9.2.0.8 and above), 10.1.0, 10.2.0, 11.1.0, 11.2.0.1 11.2.0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.2.0 (9.2.0.8 and above), 10.1.0, 10.2.0, 11.1.0, 11.2.0.1</td>
<td><strong>Build 4</strong> December 2010</td>
<td>11gR2 (11.2.0.2) - utlu112i_2.sql</td>
</tr>
<tr>
<td>Use the above script when your target upgrade is 11.2.0.2. If you are planning to upgrade to 11.2.0.1, use the utlu112_1.sql script below.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.2.0 (9.2.0.8 and above), 10.1.0, 10.2.0, 11.1.0</td>
<td><strong>Build 4</strong> December 2010</td>
<td>11gR2 (11.2.0.1) - utlu112i_1.sql</td>
</tr>
<tr>
<td>9.2.0 (9.2.0.4 and above), 10.1.0, 10.2.0</td>
<td><strong>Build 2</strong> December 2010</td>
<td>11gR1 - utlu111i.sql</td>
</tr>
<tr>
<td>8.1.7, 9.0.1, 9.2.0 (9.2.0.4 and above), 10.1.0</td>
<td><strong>Build 2</strong> December 2010</td>
<td>10gR2 - utlu102i.sql</td>
</tr>
</tbody>
</table>
Best Practice #8

• Remove "old" parameters, underscores and events from your init.ora/spfile
  • Examples:

```
init.ora:
<...>
_always_semi_join=off
_unnest_subquery=false
<...>
optimizer_features_enable=9.0.1
<...>
event = "10061 trace name context forever, level 10"
<...>
```
Sanity Operations – Real World

- Upgrade of ORDIM component only from 9.2.0.8 to 11.2.
  - These underscore parameters and events were set:

```plaintext
_complex_view_merging = FALSE
_multi_join_key_table_lookup = FALSE
_library_cache_advice = FALSE
_index_join_enabled = FALSE
_push_join_union_view = FALSE
_push_join_predicate = FALSE
_always_semi_join = OFF
_pred_move_around = FALSE
_ unnest_subquery = FALSE
_predicate_elimination_enabled = FALSE
_eliminate_common_subexpr = FALSE
_no_or_expansion = FALSE

event = '600 trace name systemstate level 10'
event = '600 trace name errorstack level 10'
event = '942 trace name errorstack level 10'
event = '54 trace name systemstate level 10'
event = '54 trace name errorstack level 10'
event = '7445 trace name systemstate level 10'
event = '7445 trace name errorstack level 10'
event = '10195 trace name context forever, level 1'
event = '10778 trace name context forever, level 1'
```

Upgrade time: 49 minutes

Upgrade time: 7 minutes!!

Unset underscores and events
Best Practice #9

• Leave COMPATIBLE at the original value for a week before changing to 11.2.
Parameter COMPATIBLE

- COMPATIBLE has to be at least 10.1.0 for an 11g database
- No way back once ≥11.1.0 has been enabled
  - Supported release downgrade to 10.1.0.5, ≥10.2.0.2, ≥11.1.0.6
  - Flashback database to ≥10.2.0.2
  - No `ALTER DATABASE RESET COMPATIBILITY` command anymore
Parameter COMPATIBLE

- DBUA raises `COMPATIBLE` only for 9i databases
- To enable new features after the upgrade:
  - 11.1:  
    ```sql
    SQL> alter system
    set compatible='11.1.0' scope=spfile;
    ```
  - 11.2:  
    ```sql
    SQL> alter system
    set compatible='11.2.0' scope=spfile;
    ```
- Afterwards: `restart` the database
  - New features will be enabled
  - Datafile headers will be adjusted
  - Redologfiles will be adjusted during first access
Best Practice #10

- Test your fallback strategy!
Fallback Strategy

- In any case: Take a backup!!!
- Make sure your fallback strategy covers both cases:
  - Problems encountered during the upgrade
  - Problems found days, weeks after the upgrade
- Then make clear:
  - If anything unforeseen happens and you'll have to step back, will you be allowed to lose data (i.e. changes done to the data in the system after the upgrade): YES or NO?
    - If YES: restore a backup, flashback (since 10g)
    - If NO: export/import, downgrade, Oracle Streams, Oracle Golden Gate
Best Practice #11

• After the upgrade ...
Post Upgrade

- Create **system statistics** during a regular workload period - otherwise non-appropriate values for the CBO will be used:

```sql
SQL> exec DBMS_STATS.GATHER_SYSTEM_STATS('start');
...  -- gather statistics while running a typical workload
SQL> exec DBMS_STATS.GATHER_SYSTEM_STATS('stop');

SQL> select pname NAME, pval1 VALUE, pval2 INFO 
from aux_stats$;

<table>
<thead>
<tr>
<th>NAME</th>
<th>VALUE</th>
<th>INFO</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATUS</td>
<td></td>
<td>COMPLETED</td>
</tr>
<tr>
<td>DSTART</td>
<td></td>
<td>04-03-2009 12:30</td>
</tr>
<tr>
<td>DSTOP</td>
<td></td>
<td>05-03-2009 12:30</td>
</tr>
<tr>
<td>FLAGS</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CPUSPEEDNW</td>
<td>1392.39</td>
<td></td>
</tr>
<tr>
<td>IOSEEKTIM</td>
<td>8.405</td>
<td></td>
</tr>
<tr>
<td>IOTFRSPEED</td>
<td>255945.605</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
Post Upgrade

• Example: customer OLTP workload
  • Runtime without system statistics: 2:19h
  • Runtime with system statistics: 2:07h
    • => 9% faster
Post Upgrade

- **Create fixed table statistics**
  - Directly after `catupgrd.sql` has been completed
    - This will speed up processing for recompilation with `utlrp.sql`
      
      ```sql
      SQL> exec DBMS_STATS.GATHER_FIXED_OBJECTS_STATS;
      ```
  - Create fixed table statistics again after a week with regular production workload
  - This task should be done only a few times per year
Post Upgrade - SPFILE

• Always create an editable init.ora from the current SPFILE after the upgrade has been finished
• Prevents rewrite in case of setting wrong parameters or forced edit
• Keep in mind:
  • The SPFILE is binary file!!! Don't edit it!! Default since Oracle 9.0
  • It simply will exist after using DBUA or DBCA

```sql
SQL> create pfile='/tmp/initDB.ora' from spfile;
<< Now edit init.ora with any editor >>
SQL> startup force pfile=/tmp/initDB.ora
SQL> create spfile from pfile;
```

• Parameter can be changed by:

```sql
SQL> alter system set PARAMETER=VALUE scope=both;
```
Agenda

Best Practices

FAQ

Summary
Lifetime Support Policy
Upgrade to Oracle Database 11g Release 2

- Oracle 7.3 → ≥ 7.3.4 → R2
- Oracle 8 → ≥ 8.0.6 → 9i R2
- Oracle 8i → ≥ 8.1.7.4 → 10g R2
- Oracle 9i → ≥ 9.0.1.4 → 10g R2
- 9i R2 → ≥ 9.2.0.4 → 11g R2
- 10g R2 → ≥ 10.2.0.2 → 11g R2
- 10g R2 → 10.1.0.5

"Empty" arrows mean: no specific patch release required
FAQ: How long will the upgrade take?
Upgrade Length

• How long will the upgrade take to complete?
  • **Independent** of:
    • Size of the database
    • Used datatypes
  • **Dependent** mainly on:
    • The number of installed components and options
    • Valid and non-stale data dictionary statistics
    • Number of synonyms – they'll get recompiled (upgrade from 9i)
    • Number of objects in XDB
    • At a very low rate, if COMPATIBLE is increased:
      • Number of datafiles
      • Size of redo logs
Example: Database Upgrade Time

- Usually between ~30 and ~90 minutes
  - Dependent mainly on installed options and components
  - *Actual times may vary…

<table>
<thead>
<tr>
<th>Component</th>
<th>HH:MM:SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Server</td>
<td>00:16:17</td>
</tr>
<tr>
<td>JServer JAVA Virtual Machine</td>
<td>00:05:19</td>
</tr>
<tr>
<td>Oracle Workspace Manager</td>
<td>00:01:01</td>
</tr>
<tr>
<td>Oracle Enterprise Manager</td>
<td>00:10:13</td>
</tr>
<tr>
<td>Oracle XDK</td>
<td>00:00:48</td>
</tr>
<tr>
<td>Oracle Text</td>
<td>00:00:58</td>
</tr>
<tr>
<td>Oracle XML Database</td>
<td>00:04:09</td>
</tr>
<tr>
<td>Oracle Database Java Packages</td>
<td>00:00:33</td>
</tr>
<tr>
<td>Oracle Multimedia</td>
<td>00:07:43</td>
</tr>
<tr>
<td>Oracle Expression Filter</td>
<td>00:00:18</td>
</tr>
<tr>
<td>Oracle Rule Manager</td>
<td>00:00:12</td>
</tr>
<tr>
<td>Gathering Statistics</td>
<td>00:04:53</td>
</tr>
</tbody>
</table>

**Total Upgrade Time:** 00:52:31
Upgrade Length

• Speed up your upgrade performance by:
  • Possibly switch off archiving
    • Make sure this will comply with your business rules
    • Do NOT do this if you are using Standby Database or Golden Gate!

• Creating dictionary statistics the night before the upgrade
  • Oracle 9i:

    SQL> exec DBMS_STATS.GATHER_SCHEMA_STATS('SYS,',
                      options => 'GATHER',estimate_percent =>
                      DBMS_STATS.AUTO_SAMPLE_SIZE, method_opt => 'FOR
                      ALL COLUMNS SIZE AUTO', cascade => TRUE);
    (Be aware: EXECUTE command does not allow line breaks!)

  • Oracle 10g/11g:

    SQL> exec DBMS_STATS.GATHER_DICTIONARY_STATS;
FAQ: Which Method Should I Use?

- Export/Import
- CTAS, COPY
- UPGRADE
- Stay on same OS?
  - Y
  - N: Downtime >30min?
    - N: SQL Apply
    - Y: DBUA
      - ORACLE recommended
  - Y: CLI
    - SQL> @catupgrd
When to Choose the DBUA

- Can afford 30 – 90 minutes average downtime
- Operating system remains the same
- GUI is preferred over manual command line interface
  - Automatically performs useful pre-upgrade checks
  - Less error-prone / less manual effort
- Existing database is at least 9.2.0.8
- Note: especially useful for RAC databases
- Consideration:
  - Source and target Oracle Homes must be on the same system
  - Cannot be re-run if an error is encountered mid-upgrade
When to Choose Command-Line

• Can afford 30-90 minutes average downtime
• Manual command-line interface is preferred over GUI
• Existing database is at least 9.2.0.8
• Migrating to a new hardware platform with same OS

• Consideration
  • Cannot upgrade to a system with a different operating system architecture
  • More manual steps required
  • Potential for errors due to typos, missed details
When to Choose an Alternative Method

- Alternative methods include
  - Original exp/imp or Data Pump expdp/impdp
  - Oracle Streams or Oracle Golden Gate
  - Data Guard (SQL Apply)
  - Transportable Tablespaces, Transportable Database
  - Moving data via CREATE TABLE AS SELECT or other techniques
- Alternative methods **must** be used when
  - Moving to a different operating system platform (32- and 64-bit versions of an OS are considered “the same platform” in this case
  - Upgrading from a release older than 9.2.0.8
- Alternative methods **may** be a good option when
  - Minimal downtime (<30 minutes) required or desired
  - Re-organizing database storage or schemas
Agenda

- Best Practices
- FAQ
- Summary
Summary

- Preparation and planning are the keys to a successful upgrade
- The DBUA is the recommended method for simplicity and ease-of-use
- Take advantage of the Oracle Database Upgrade Advisor and Database Upgrade Planner
- Have a fallback strategy and test it
- Oracle Database 11g Release 2 is a stable release with lots of great features, so go for it!
Hardware and Software
Engineered to Work Together