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Best Practices for Upgrading to Oracle Database 11g Release 2

Carol Palmer
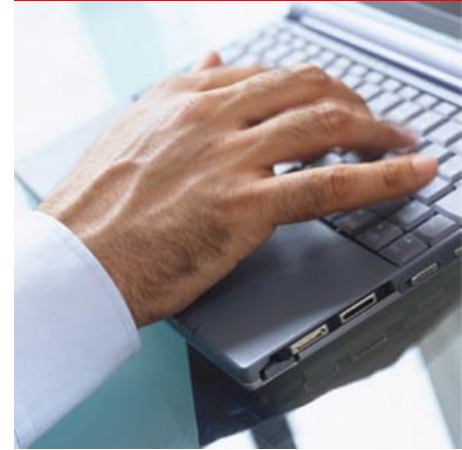
Principal Product Manager, Database Upgrade & Utilities

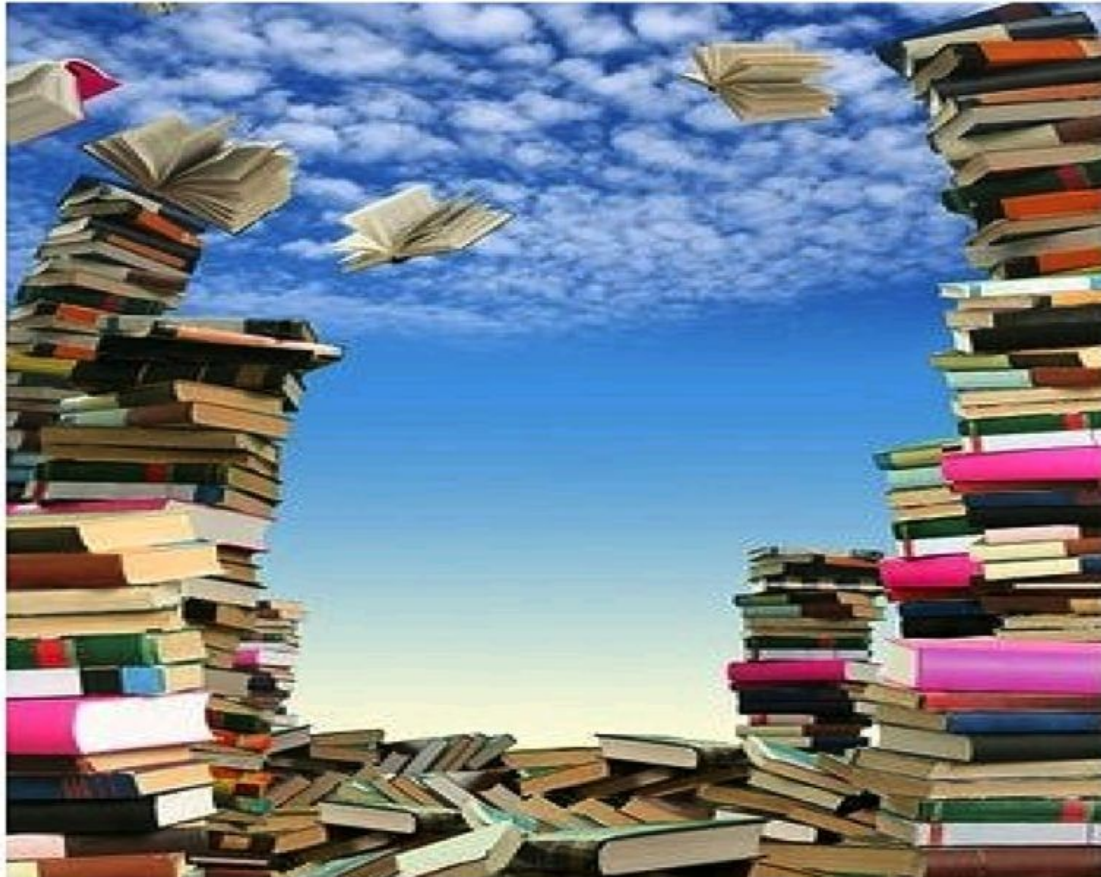23-February-2012

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Agenda

- **Best Practices**

- FAQ

- Summary

Best Practice #1

- Read the FRIENDLY manuals!

Documentation

- Note:250.1 Upgrade Advisors

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.

View All | **Oracle Database** | Fusion Middleware | JD Edwards | E–Business Suite | PeopleSoft | Siebel

Upgrade Advisor	Description	Document
Database Upgrade from 10.2 to 11.2	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].	251.1
Database Upgrade from 9.2 to 11.2	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).	264.1

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Documentation

·Note: 251.1 Database Upgrades from 10.2 to 11.2

Documentation

·Note: 264.1 Database Upgrades from 9.2 to 11.2

Database Upgrade Lifecycle Advisor from 9.2 to 11.2 > Evaluate

1. Evaluate	2. Plan	3. Configure	4. Test	5. Implement	6. Accept

Phase Overview

Step by Step Guide

- ☐ Learn about the value of upgrading
- ☐ Review Product Enhancements
- ☐ Consider Configuration Efficiencies
- ☐ Learn about performance and scalability improvements.
- ☐ Review Product Quality Improvements
- ☐ Review Lifetime Support Policy
- ☐ Review hardware and 3rd party software stack changes.
- ☐ Review Product Certifications

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 improvments
    - ○ 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
- ○ Documented understanding of the impact for the business
    - ○ Expected benefits for the business
    - ○ Expected costs (people, other recources, 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)
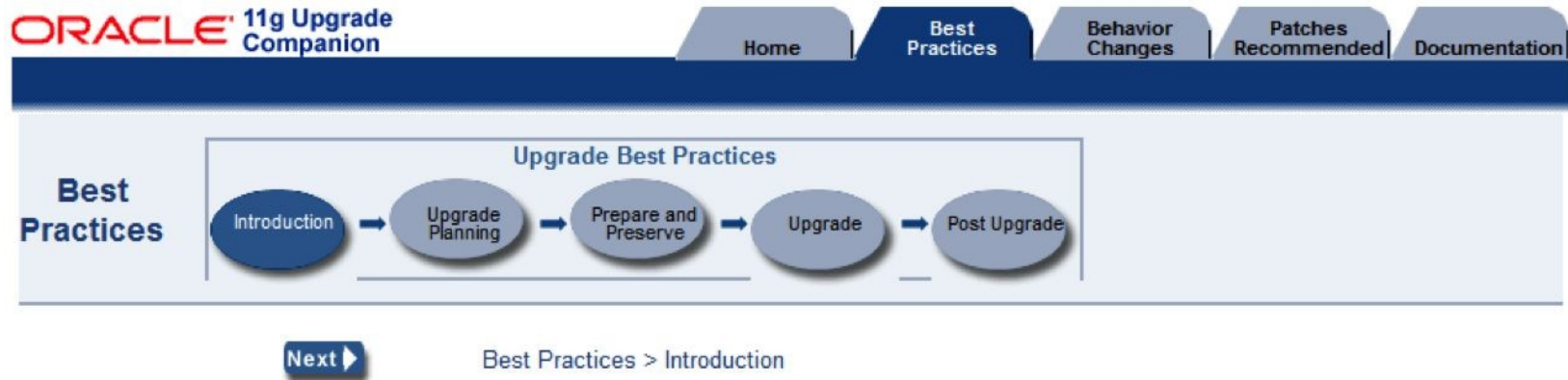
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Documentation

- Note:785351.1 Upgrade Companion 11g Release 2

Documentation

- Note:785351.1 Upgrade Companion 11g Release 2

ORACLE 11g Upgrade Companion

| Home | Best Practices | Behavior Changes | Patches Recommended | Documentation |

Behavior Changes

Behavior Changes

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**

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Documentation

- Upgrade Guides

  Oracle® Database
  Upgrade Guide
  11*g* 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 11*g* Release 2

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Documentation

- Important Database Upgrade Notes

  - Note: 1152016.1
    Master Note For Oracle Database Upgrades and Migrations

  - 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 10g to 11g: What to expect from the Optimizer
    http://www.oracle.com/technetwork/database/focus-areas/bi-datawarehousing/twp-upgradin

OTN Upgrade Page

·http://www.oracle.com/technetwork/database/upgrade/index.html

OTN Upgrade Page

- http://www.oracle.com/technetwork/database/upgrade/index.html

OTN Upgrade Page

- http://www.oracle.com/technetwork/database/upgrade/index.html

OTN Upgrade Forum

Upgrade Blog: `blogs.oracle.com/UPGRADE`

Best Practice #2

- Always upgrade Grid Infrastructure (Clusterware and ASM) First!

Grid Infrastructure Installation

11.1.0.7

⬠ **11.2.0.1**

$ORACLE_BASE
| — *Inventory, ADR etc.*

$ORACLE_BASE
| — *Inventory, ADR etc.*

GRID_HOME

ORA_CRS_HOME   ← same owner → **Grid Infrastructure**

1.   **Oracle Clusterware**   **Oracle Clusterware**

$ORACLE_HOME – for ASM

2.   **Oracle ASM**   **Oracle ASM**

$ORACLE_HOME – for Database $ORACLE_HOME – for Database

3.   **Oracle Database**   **Oracle Database**
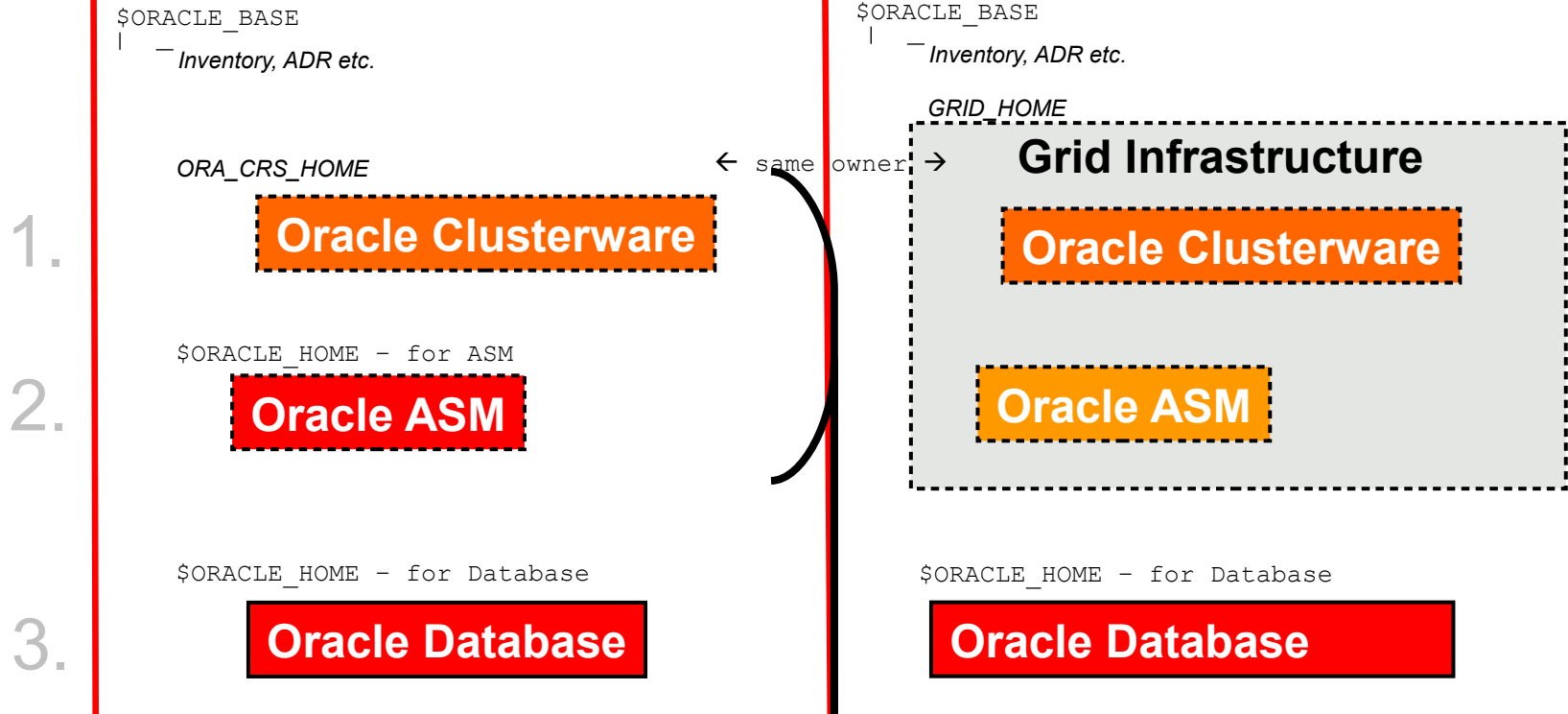
Grid Infrastructure Upgrade 11*g* Release 2

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

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

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Grid Infrastructure Upgrade Paths
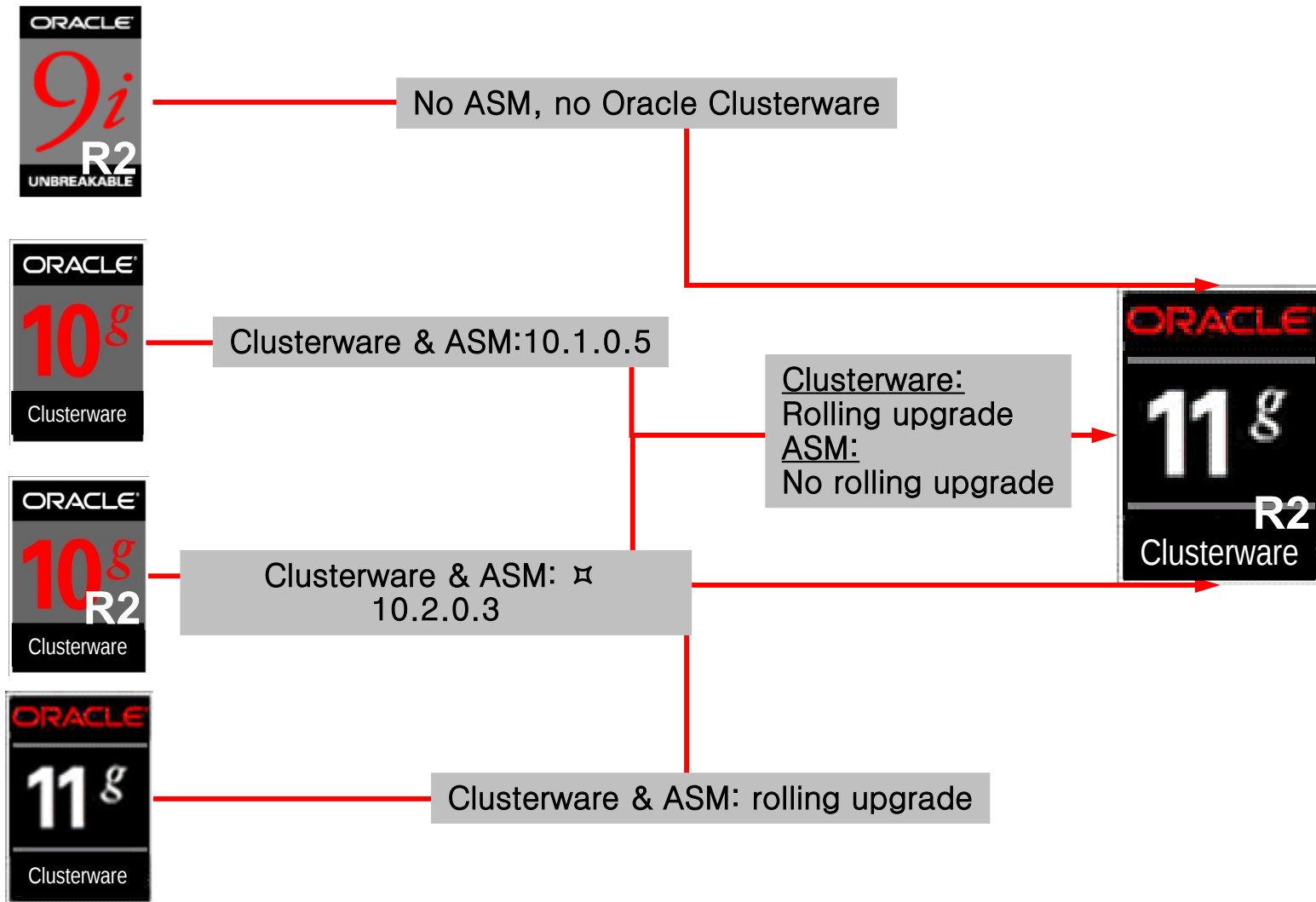
Oracle Grid Infrastructure 11.2.0.3

- 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

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Best Practice #3

- Use the Upgrade Planner in My Oracle Support

Upgrade Planner

Upgrade Planner

Best Practice #4

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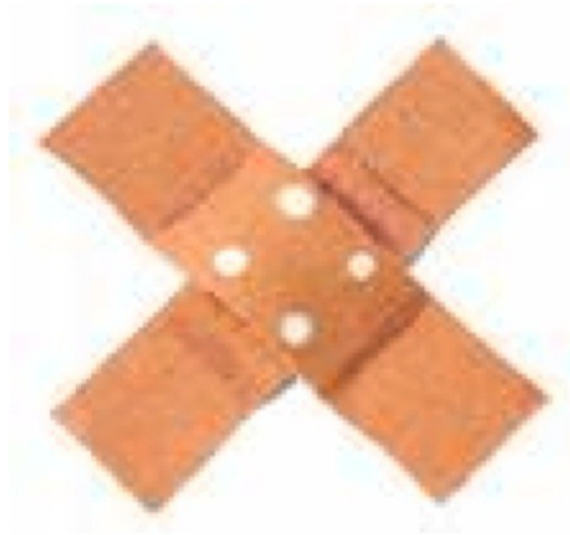
Patch Set Installation 11.2.0.3

- 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`

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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.

Product	My Oracle Support Note
Oracle Database	Note:756671.1
Oracle Enterprise Manager	Note:822485.1
Oracle Fusion Middleware	Note:859115.1
Oracle Solaris Operating System	Note:1272947.1

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]

Modified 18-OCT-2011 *Type* ANNOUNCEMENT *Status* PUBLISHED

Oracle Recommended Patches -- Oracle Database

- 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
    - 10.2.0.5 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:756388.1.

Target Configurations

Recommended Patches are provided for the following target configurations:

- Generic
- Real Application Clusters
- Data Guard
- Exadata
- Ebusiness Suite Certification

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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
    - 17-Jan-2012, 19-Apr-2012, 19-Jul-2012 and 17-Oct-2012
  - PSU check: `opatch lsinventory -bugs_fixed | grep -i 'DATABASE PSU'`

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Important Alerts and One-Off-Patches?

- Check for important alerts: Note:161818.1

Oracle Database Releases Status Summary

Release (Click to see Details)	Current Patch Set	Next Patch Set	Premier Support Ends	Extended Support Ends	Notes
11.2.0.X	11.2.0.3	11.2.0.4	Jan-2015	Jan-2018 Extended Support fees are waived for the first year from Jan-2015 to Jan-2016	Base release is 11.2.0.1. 11.2 Patch Sets are full releases - see Note:1189783.1 Patching for 11.2.0.1 ended on 13/Sep/2011 - See Note:742060.1 .
11.1.0.X	11.1.0.7	None	Aug-2012	Aug-2015	Base release is 11.1.0.6 . 11.1.0.7 is the terminal 11.1 Patch Set
10.2.0.X	10.2.0.5	None	Jul-2010	Jul-2013	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:742060.1 for platform specific end patching dates
10.1.0.X	10.1.0.5	None	Jan-2009	Jan-2012	10.1.0.5 is the terminal 10.1 Patch Set. 10.1 is now in Extended Support - see Note:761713.1

'click'

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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 .

Release	Comments	
	Oracle 11g Release 2 Patch Set 2	
11.2.0.3	Availability and Known issues for 11.2.0.3 **'click'**	te:1348336.1
	List of fixes included in 11.2.0.3	Note:1348303.1
	Oracle 11g Release 2 Patch Set 1	
11.2.0.2	Availability and Known issues for 11.2.0.2	Note:1179474.1
	List of fixes included in 11.2.0.2	Note:1179583.1
	Oracle 11g Release 2 Base Release.	
11.2.0.1	Availability and Known issues for 11.2.0.1	Note:880707.1

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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.

9832338	ORA-600 [15160] / ORA-7445 [kkogfp] from CONNECT BY and OUTER JOIN (+)
Note:1354793.1	Oracle Text Lexer Feature Changes introduced in 11.2.0.3

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

Bug/Doc	Description	Updated
13496250	Unexpected ORA-976 using LEVEL / PRIOR / ROWNUM in an ANSI "ON" filter predicate	20/Dec/2011
13384182	ORA-600 [delrow:iot1] from DELETE or MERGE..DELETE with an IOT	24/Nov/2011
13365021	SDO_NN query fails with ORA-22165 "given index [32767] must be in the range ...."	29/Nov/2011
13117043	ORA-600 [13009] Raised for SELECT FOR UPDATE on Hierarchical Query	23/Nov/2011

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Recommended OS patches

· **OS Installation and Configuration** See Note:169706.1

Oracle Database on Unix AIX,HP-UX,Linux,Mac OS X,Solaris,Tru64 Unix Operating Systems Installation and Configuration Requirements Quick Reference (8.0.5 to 11.2) [ID 169706.1]

Modified 13-DEC-2011   Type BULLETIN   Status PUBLISHED

Jump to:
AIX
HP-UX (PA-RISC and Itanium)
Linux x86
Linux x86-64
Linux Itanium
Linux on Power
Linux on zSeries
Mac OS X (PowerPC and x86-64)
Solaris (SPARC and x86-64)
Tru64
Pre-Installation Scripts
OPatch
Related Documents
OS Specific Commands
Change History
Note 43208.1 Certified Compilers

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Best Practice #5

- Preserve performance statistics
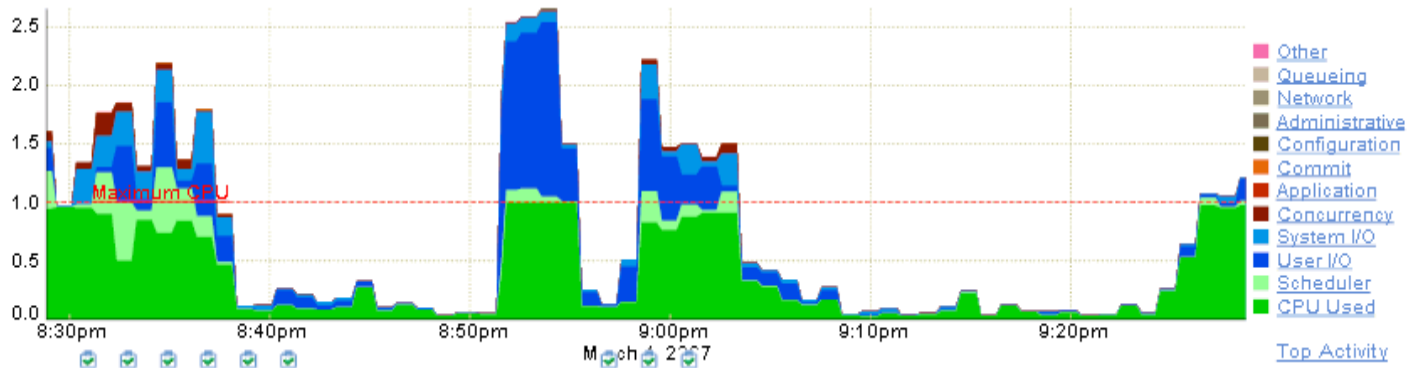
Preparation - Testing
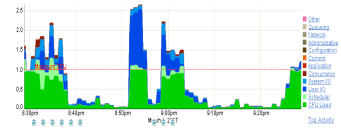
- Test the upgrade itself
  - Functional testing – does the upgrade complete successfully?
  - Performance testing – how long will the upgrade take?

- 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

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Preparation – Performance
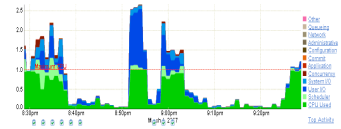
- Collecting sufficient performance data prior to the upgrade is of vital importance
  - Sufficient means: Starting at least 31 days before the upgrade
  - Gather accurate performance statistics from production
  - In Oracle 8i/9i:
    - Use STATSPACK
      - Export the PERFSTAT user right before the 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> `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

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Sanity Operations: Duplicate Objects

- Always check for DUPLICATE objects in SYS/SYSTEM

- 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> 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

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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`

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Pre-Upgrade Check

- Run `utlu112i.sql` in your <u>current</u> 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

[..]
```

Command Line Upgrade

Get the current version of $utlu_{nm}i$**.sql**
Download Note: 884522.1

Coming From Version	Script Build/Date	Upgrade Target Version
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	Build 1 November 2011	11gR2 (11.2.0.3) - utlu112i_3.sql
9.2.0 (9.2.0.8 and above), 10.1.0, 10.2.0, 11.1.0, 11.2.0.1	Build 4 December 2010	11gR2 (11.2.0.2) - utlu112i_2.sql
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.		
9.2.0 (9.2.0.8 and above), 10.1.0, 10.2.0, 11.1.0	Build 4 December 2010	11gR2 (11.2.0.1) - utlu112i_1.sql
9.2.0 (9.2.0.4 and above), 10.1.0,10.2.0	Build 2 December 2010	11gR1- utlu111i.sql
8.1.7, 9.0.1, 9.2.0 (9.2.0.4 and above), 10.1.0	Build 2 December 2010	10gR2 - utlu102i.sql

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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"
<...>
```

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Sanity Operations – Real World

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

```
_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

Unset underscores and events

Upgrade time: 7 minutes!!

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Best Practice #9

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

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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
  - <u>No</u> `ALTER DATABASE RESET COMPATIBILITY` command anymore


```
COMPATIBLE = 10.0/1/2.0
```

```
COMPATIBLE = 11.0.0
```
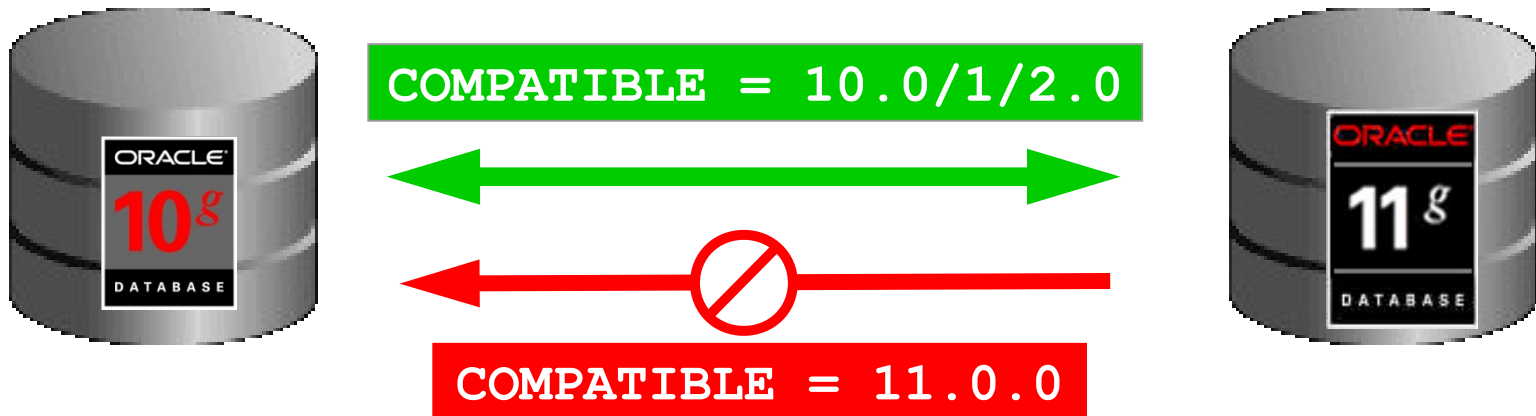
Parameter COMPATIBLE

- DBUA raises `COMPATIBLE` <u>only</u> for 9*i* databases
- To enable new features after the upgrade:

  - 11.2 :

    ```
    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

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Best Practice #10

- Test your fallback strategy!

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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

- If anything unforeseen happens and you 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 10*g*)
  - If NO: export/import, downgrade, Oracle Streams, Oracle Golden Gate

Best Practice #11

- After the upgrade ...

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Post Upgrade

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

```
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$;

NAME                         VALUE INFO
------------------- ---------- ----------------------------
STATUS                             COMPLETED
DSTART                             04-03-2009 12:30
DSTOP                              05-03-2009 12:30
FLAGS                          1
CPUSPEEDNW               1392.39
IOSEEKTIM                  8.405
IOTFRSPEED             255945.605
...
```

Post Upgrade

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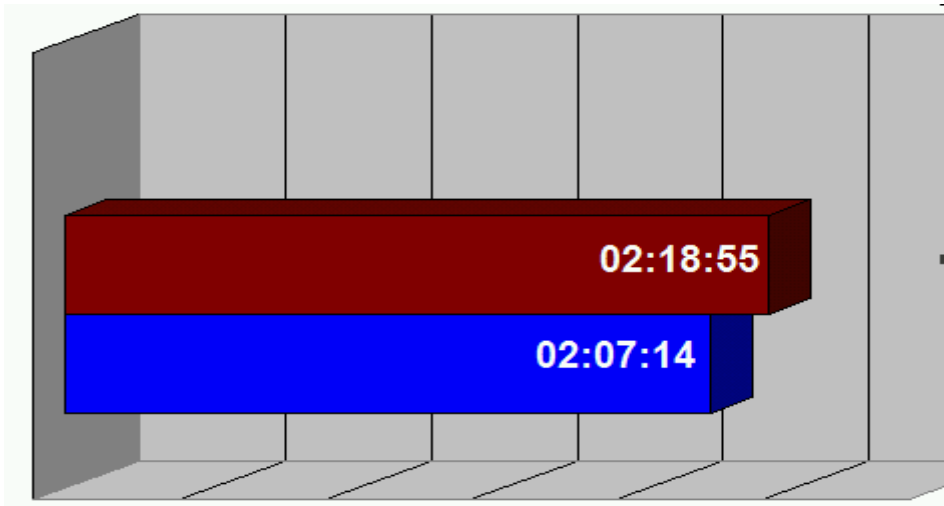
Post Upgrade

- Create fixed table statistics
  - Directly after `catupgrd.sql` has been completed
    - This will speed up processing for recompilation with

      ```
      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> 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;
```

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

Agenda

○ Best Practices

● FAQ

○ Summary

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Lifetime Support Policy

today

January 2015

January 2018

August 2012

August 2015

July 2010   *July 2011*   *July 2013*

January 2009

January 2012

Sustaining Support

Premier Support   **Extended Support**

July 2007   *July 2008*   *July 2010*

2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

t

Upgrade to Oracle Database 11g Release 2

¤ 7.3.4	9.2.0.8
¤ 8.0.6	¤ 9.2.0.4
¤ 8.1.7.4	10.1.0.5
¤ 9.0.1.4	¤ 10.2.0.2

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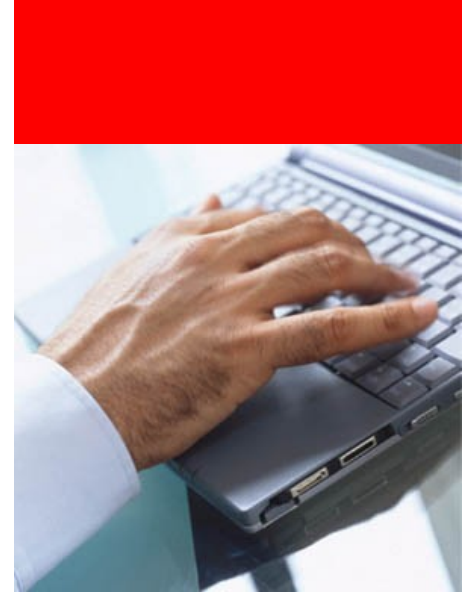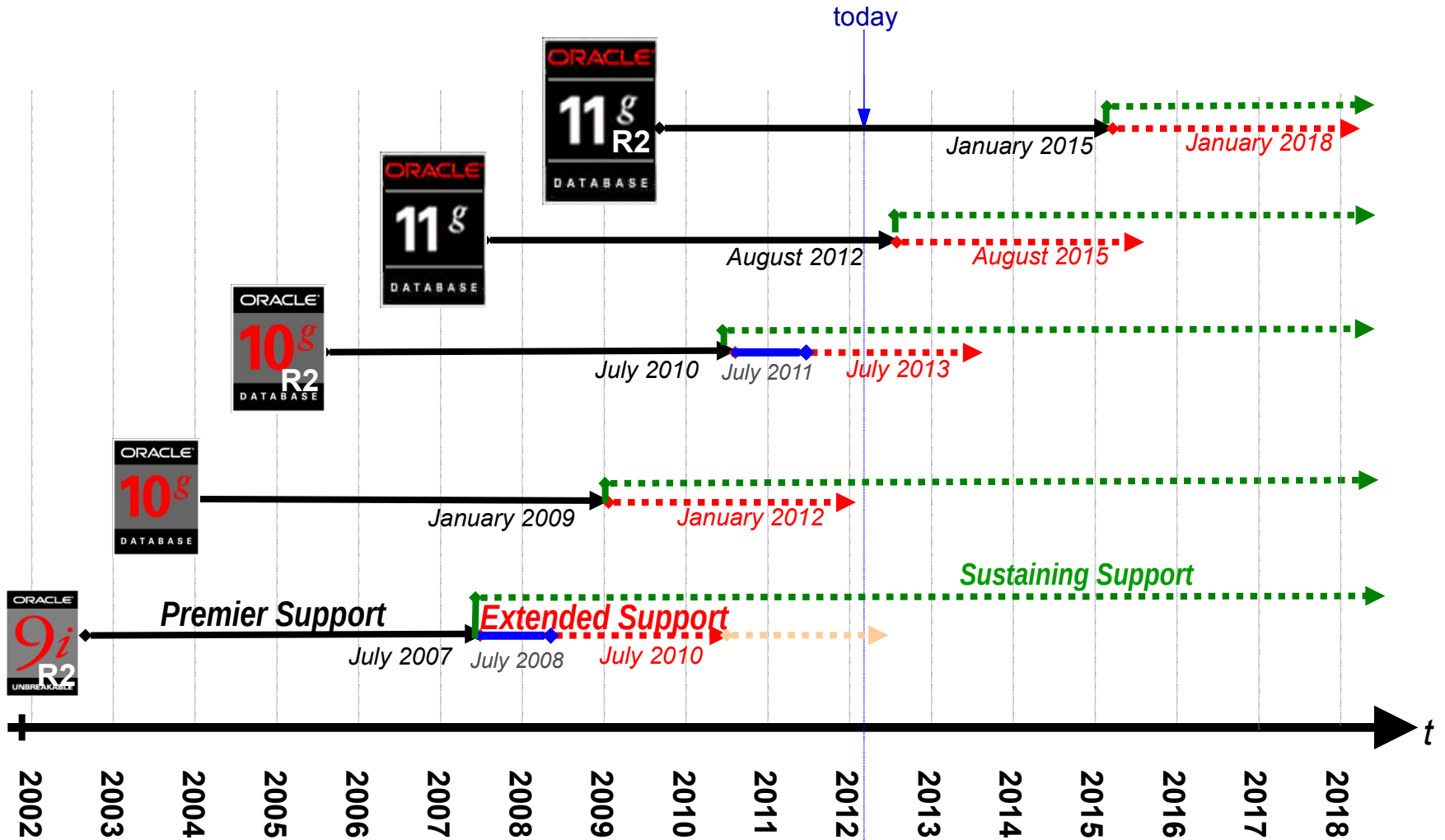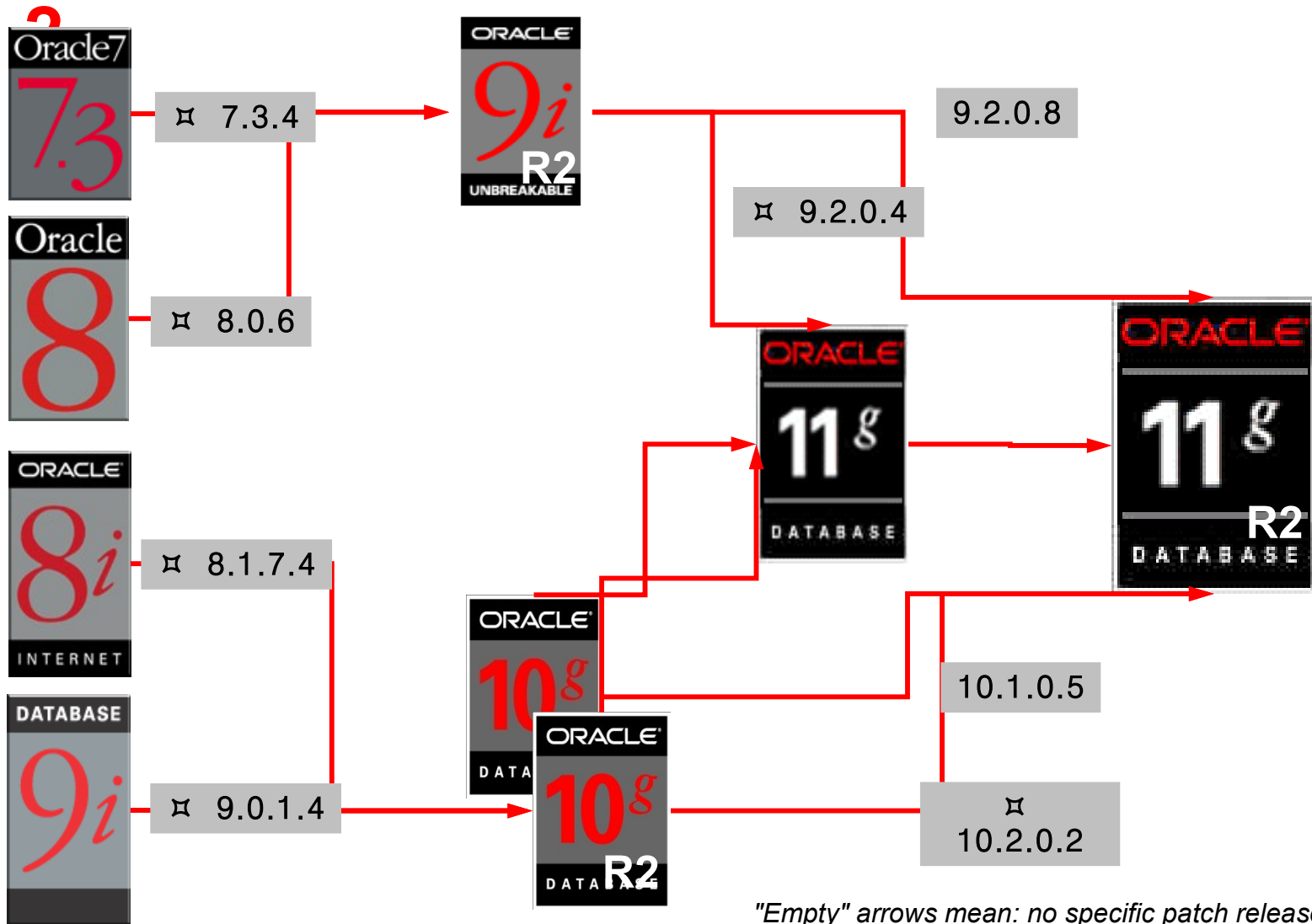
FAQ: How long will the upgrade take?
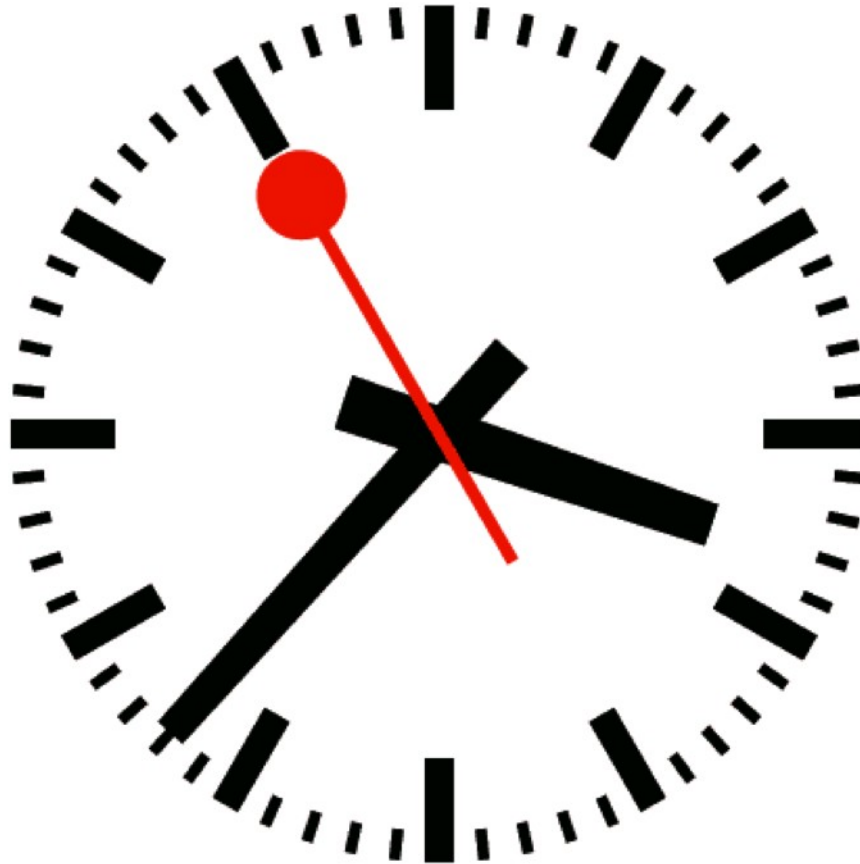
Upgrade Length

- How long will the upgrade take to complete?
  - Independent of:
    - Size of the database
    - Used data types
  - 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
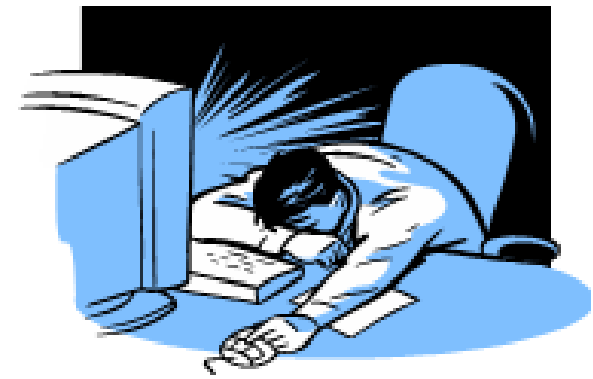
Example: Database Upgrade Time

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

```
Component                         HH:MM:SS

Oracle Server                     00:16:17

JServer JAVA Virtual Machine      00:05:19

Oracle Workspace Manager          00:01:01

Oracle Enterprise Manager         00:10:13

Oracle XDK                        00:00:48

Oracle Text                       00:00:58

Oracle XML Database               00:04:09

Oracle Database Java Packages     00:00:33

Oracle Multimedia                 00:07:43

Oracle Expression Filter          00:00:18

Oracle Rule Manager               00:00:12

Gathering Statistics              00:04:53


Total Upgrade Time: 00:52:31
```

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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!!)

```
SQL> exec DBMS_STATS.GATHER_DICTIONARY_STATS;
```
  - Oracle 10*g*/11*g*:

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FAQ: Which Method Should I Use?

UPGRADE

Export/Import

CTAS, COPY

Stay on same OS? → N / Y

Downtime >30min? → N / Y

SQL Apply

Oracle Streams

Transportable Tablespaces

Transportable Database

Oracle Golden Gate

DBUA

ORACLE recommended

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

```
SQL> spool upgrade.log
SQL> @catupgrd.sql
```

- 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, Tansportable 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
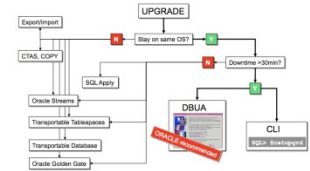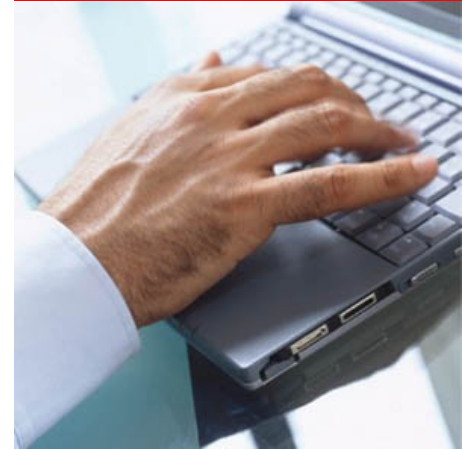
● Summary

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Summary

- Preparation and planning are they 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 11*g* Release 2 is a stable release with lots of great features, so go for it!

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Hardware and Software
Engineered to Work Together

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