



Last updated: 3-MAR-2011

**ORACLE®**

## **Move to Oracle Database 11g – The whole Story**

Roy Swonger & Mike Dietrich  
Database Upgrade & Utilities  
ORACLE Corporation

# Upgrade Development Group

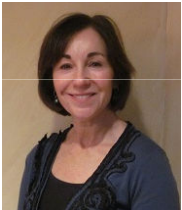


**Roy Swonger**  
Senior Director Software Dev.



**Carol Tagliaferri**  
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**Carol Palmer**  
Principal Product Manager



**Brian McCarthy**  
Principal Member Technical Staff



**Joseph Errede**  
Principal Member Technical Staff

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Principal Member Technical Staff

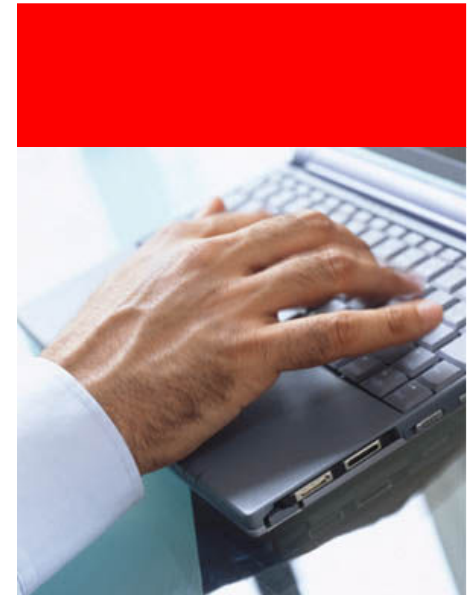


**Mike Dietrich**  
Consulting Member Technical Staff

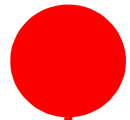


# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

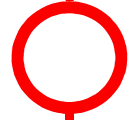


# Agenda

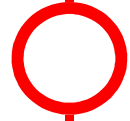


Preparation

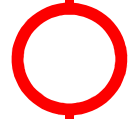
Support Policy  
Certification  
Documentation  
References  
Upgrade paths  
Sanity operations  
Preparation



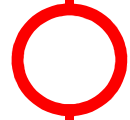
Installation



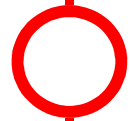
Upgrade



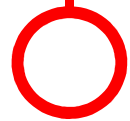
News and Task List



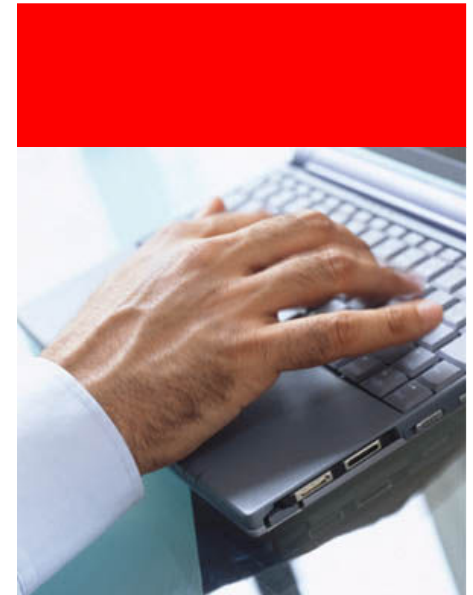
Diagnostics & Tuning



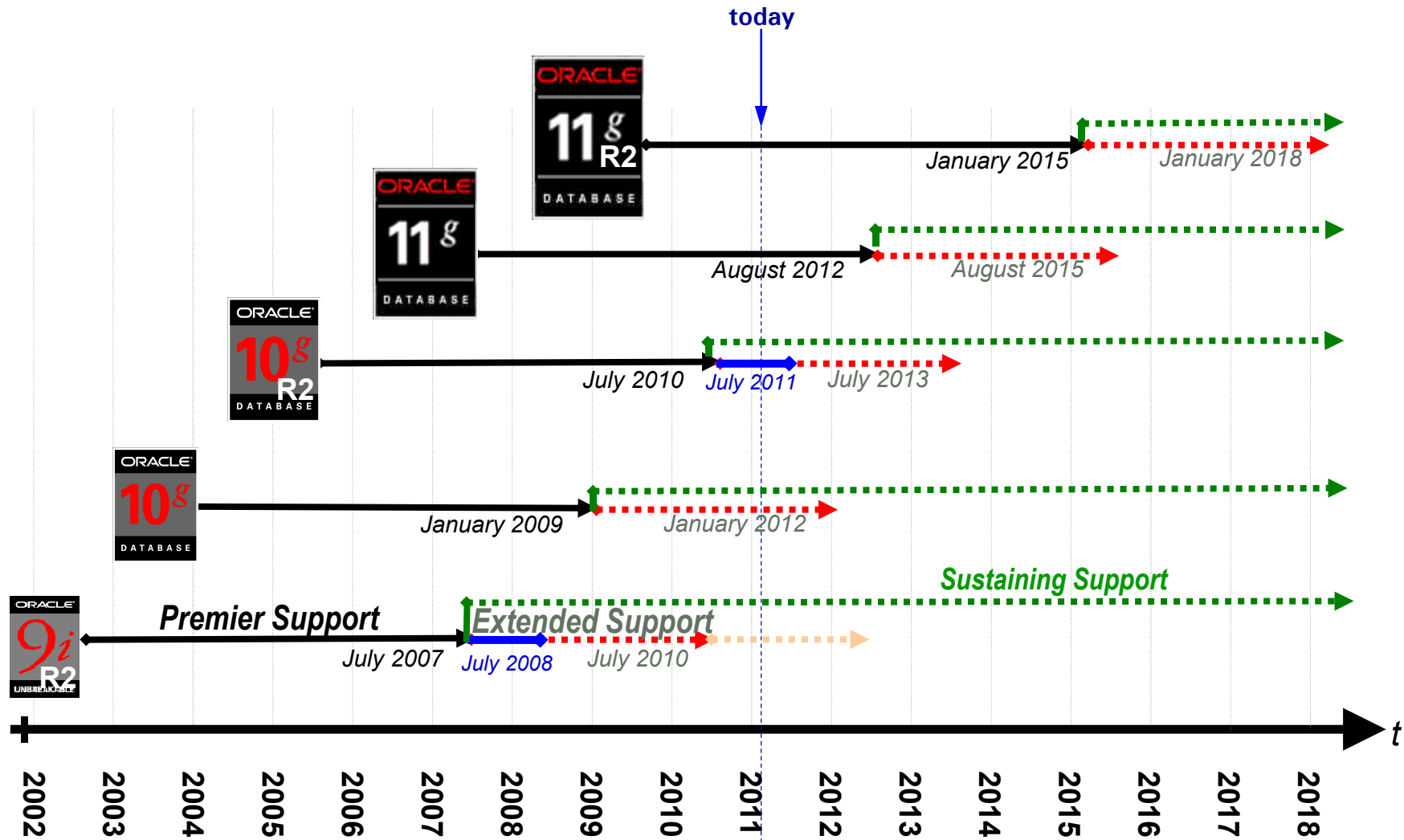
Performance Testing



Best Practices



# Lifetime Support Policy



# Lifetime Support Policy

Feature	Premier Support	Extended Support	Sustaining Support
Major Product and Technology Releases	✓	✓	✓
Technical Support	✓	✓	✓
Access to Knowledge Base (MetaLink/Customer Connection/SupportWeb)	✓	✓	✓
Updates, Fixes, Security Alerts and Critical Patch Updates	✓	✓	Pre-existing Only
Tax, Legal and Regulatory Updates	✓	✓	No
Upgrade Scripts	✓	✓	No
Certification with existing Third Party Products/Versions	✓	✓	No
Certification with New Third Party Products/Versions	✓	No	No
Certification with new Oracle Products	✓	✓	No

# Lifetime Support Policy

- See:

<http://www.oracle.com/support/library/brochure/lifetime-support-technology.pdf>

## Oracle Database Releases

Release	GA Date	Premier Support Ends	Extended Support Ends	Sustaining Support Ends
8.1.7	Sep 2000	Dec 2004	Dec 2006	Indefinite
9.2	Jul 2002	Jul 2007	Jul 2010	Indefinite
10.1	Jan 2004	Jan 2009	Jan 2012	Indefinite
10.2	Jul 2005	Jul 2010	Jul 2013	Indefinite
11.1	Aug 2007	Aug 2012	Aug 2015	Indefinite
11.2	Sep 2009	Jan 2015	Jan 2018	Indefinite

Customers using Oracle Database 9.2 on Fujitsu Siemens BS2000 will receive a fee waiver for Extended Support until December 2009.

For Oracle Database 9.2 a limited bug fix service will be available from Aug 2010 until July 2012. For details please refer to the [Technical Support Policies](#).

For more-detailed information on bug fix and patch release policies, please refer to the "Error Correction Support Policy" on [MyOracle Support](#).

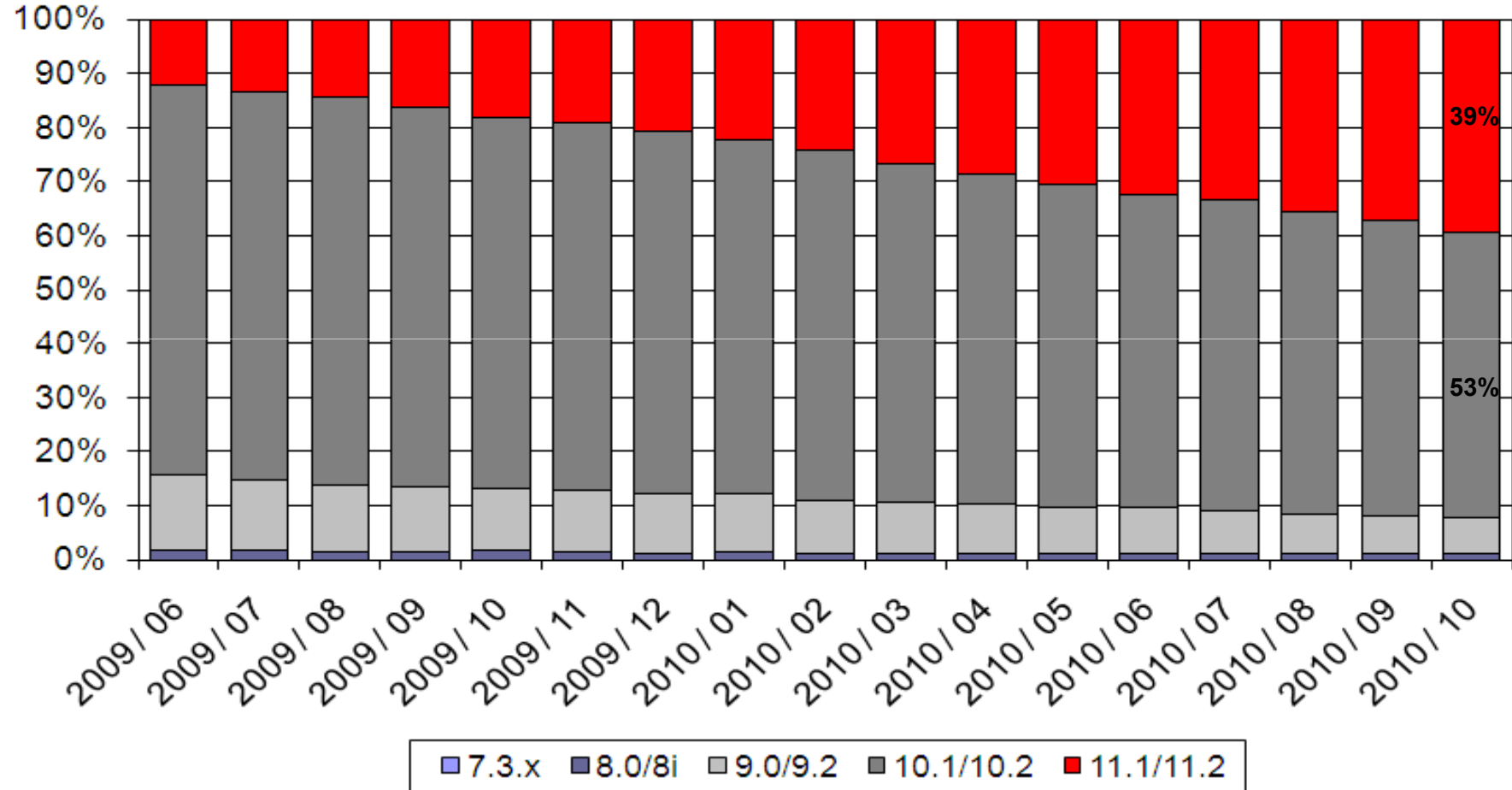
For customers with current support contracts running Oracle Database 10gR2, please refer to the Oracle [Technical Support Policies](#) for Extended Support fee waiver information.

Support does not follow the Lifetime Support Policy.

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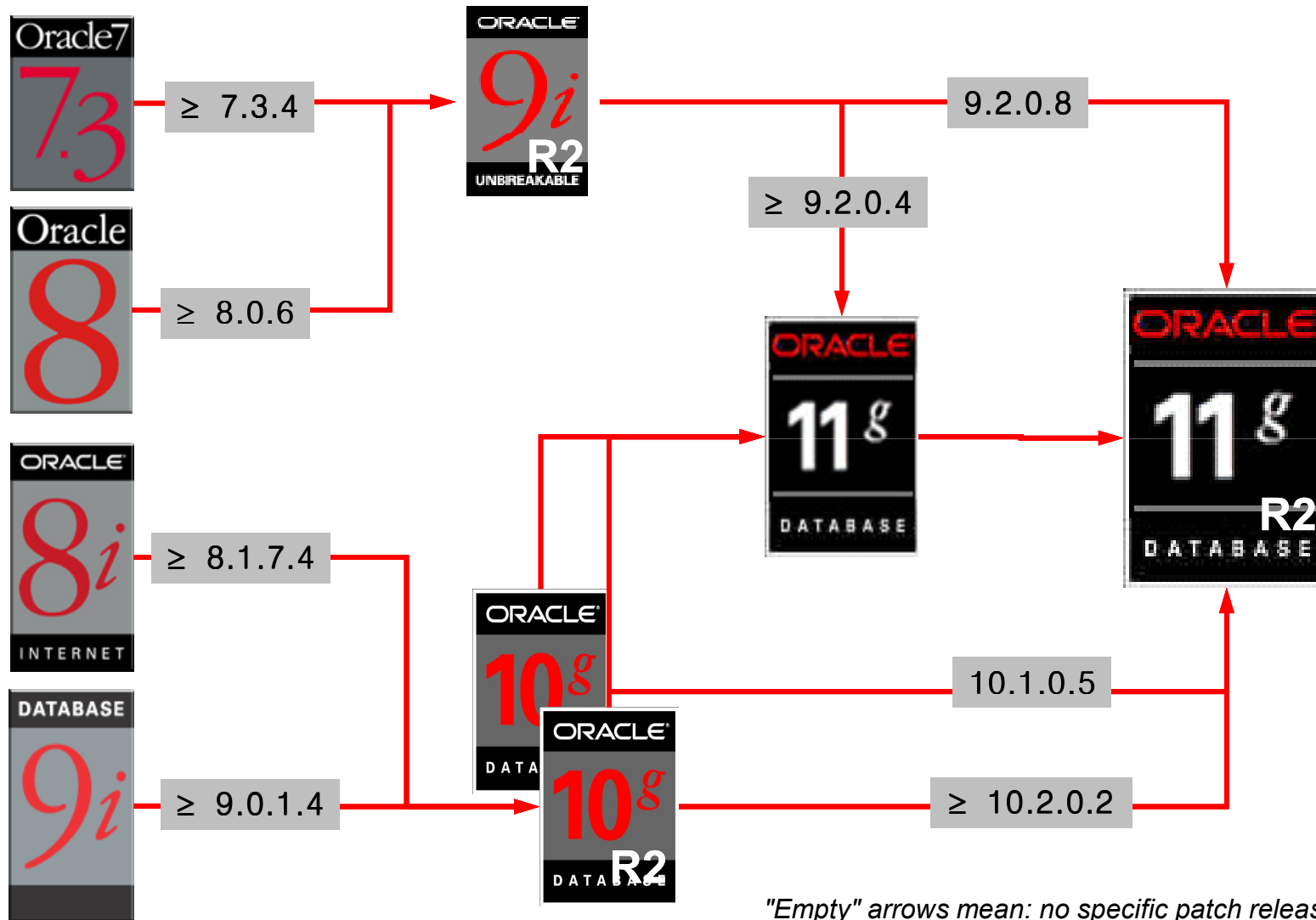
# Releases – Support-SRs

## Mix of Service Requests for RDBMS





# Upgrade to Oracle Database 11g



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# Oracle Certification

- Please see the following MOS notes for explanations on products and product group assignments
  - [Note: 964664.1](#) and [Note:431578.1](#) on Middleware, Application Server

The screenshot displays the Oracle My Oracle Support (MOS) website interface. At the top, the navigation bar includes "ORACLE MY ORACLE SUPPORT", user information "Welcome, Mike", and links for "Contact Us", "Sign Out", and "Help". Below this, a secondary navigation bar contains "Dashboard", "Knowledge", "Service Requests", "Patches & Updates", "Community", "Certifications", and "More...". A search bar for the "Knowledge Base" is also present, along with "Favorites" and "Advanced" options. The main content area is titled "Certifications" and features a "New Certification Search" section. This section is divided into three steps: 1. "Find your product" with a search field containing "Dat" and a dropdown list showing "Database Vault (DB Vault)", "Oracle Database (RDBMS, 10G, 9i, DB, Oracle Server - Ent)", and "Oracle Database (RAC) (RDBMS, Real Application Cluster)"; 2. "Pick a product release" with a search field containing "\*" and a dropdown list showing "11.2.0.1.0", "11.1.0.7.0", and "11.1.0.6.0"; 3. "Click Search!" with a "Search" button. Below the search steps, there are two panels: "Quick Links" with links like "Latest updates on Certifications" and "Tips for Finding Certifications"; and "Certification Search" with a search form containing fields for "Product" (with a dropdown menu), "Release" (with a dropdown menu), and "Platform" (with a dropdown menu), along with a "Search" button and a "Can't find your product? Use the Classic interface." link.



# Oracle Certification

**Certification Search**

Search   Saved   Recent

Product: \* Oracle Database ✖ ▼  
Release: \* 11.2.0.2.0 ✖ ▼  
Platform: Linux x86-64 (Oracle Enterprise Linux 5) ▼

Check certifications with another product ?

Clear   Save   **Search**

\* Required   [Can't find your product? Use the Classic interface.](#)

# Oracle Certification

The screenshot shows the Oracle My Oracle Support interface. The breadcrumb trail is: Certifications > Search Results: Oracle Database 11.2.0.2.0 > Linux x86-64 > Oracle Enterprise Linux 5. The main content area is titled "Certification Search Results" and displays a search result for "Oracle Database 11.2.0.2.0 is certified on Linux x86-64 Oracle Enterprise Linux 5".

**Oracle Database 11.2.0.2.0 is certified on Linux x86-64 Oracle Enterprise Linux 5**

**Notes**

Oracle Database 11.2.0.2.0 with Linux x86-64 Oracle Enterprise Linux 5  
Read all the notes for this Certification to understand any exceptions or additional details necessary  
[More...](#)

**Support Information**

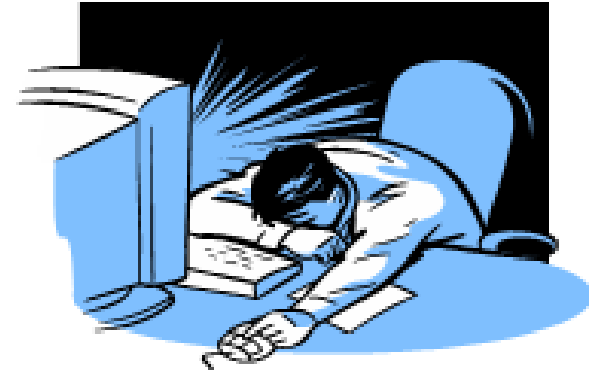
Oracle Database 11.2.0.2.0	End of Premium Support	End of Error Correction	End of Extended Support	End of Sustaining Support
	Jan 30, 2015	Jan 30, 2018	Jan 30, 2018	Indefinite

In approximately 87 months new Oracle Database 11.2.0.2.0 patches will no longer be produced.

Tell us how you like the new Certify Search! [Give Feedback...](#)

# 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 9*i*)
    - Number of user objects in XDB (upgrade from 10.2)
    - At a very low rate, if `COMPATIBLE` is increased:
      - Number of datafiles
      - Size of redo logs



# Upgrade Length

- Speed up your upgrade performance by:

- Truncating the auditing table SYS.AUD\$

```
SQL> truncate table SYS.AUD$ drop storage;
```

- Possibly switch off archiving

- Make sure this will comply with your business rules

- **Creating dictionary statistics** right 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;
```



# Upgrade is easier!

- The upgrade to Oracle Database 11g is much easier than any upgrades to earlier Oracle releases
- Size of Upgrade guides:
  - **8.1.7** - 512 pages
  - **9.0.1** - 484 pages – 111 steps for an RDBMS with 9 components
  - **9.2.0** - 344 pages
  - **10.1.0** - 170 pages
  - **10.2.0** - 140 pages
  - **11.1.0** - 186 pages
  - **11.2.0** - 178 pages

# 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 [ <a href="#">264.1</a> ].	<a href="#">251.1</a>
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).	<a href="#">264.1</a>



# Documentation

- [Note:251.1](#) Database Upgrades from 10.2 to 11.2

**Upgrade Advisor: Database (Doc ID 251.1)**  
Modified 24-JUN-2010 Type REFERENCE Status PUBLISHED(EXTERNAL) Priority 3 [To Bottom](#)

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

<b>1. Evaluate</b>	<b>2. Plan</b>	<b>3. Configure</b>	<b>4. Test</b>	<b>5. Implement</b>	<b>6. Accept</b>
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**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 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
- 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:264.1 Database Upgrades from 9.2 to 11.2](#)

## Database Upgrade from 9.2 to 11.2 (Doc ID 264.1)

Modified 09-AUG-2010 Type REFERENCE Status PUBLISHED(EXTERNAL) Priority 3 [To Bottom](#)

### Database Upgrade Lifecycle Advisor from 9.2 to 11.2 > Evaluate

1. Evaluate	2. Plan	3. Configure	4. Test	5. Implement	6. Accept
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[Phase Overview](#)

[Step by Step Guide](#)

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**Related Resources**

- [Oracle Database Upgrade \(OTN\)](#)
- [DB 11.2 New Features Guide](#)
- [Database 11.2 Value Propositions \(.ppt\)](#)

# Documentation

- [Note:601807.1](#) Upgrade Companion 11g



The screenshot shows the Oracle Database 11gR1 Upgrade Companion page. The header includes the Oracle logo and the text "11g Upgrade Companion". The navigation menu has tabs for "Home", "Best Practices", "Behavior Changes", "Patches Recommended", and "Documentation". The main content area features the title "Oracle Database 11gR1 Upgrade Companion" with "Version 1.40" and the date "April 14, 2009". The introductory text reads: "Welcome to the Oracle Database 11gR1 Upgrade Companion. This Upgrade Companion helps you to upgrade from either Oracle9i Release 2 (9.2) or Oracle Database 10g to Oracle Database 11g Release 1, and includes pre-upgrade, upgrade, and post-upgrade guidance. Oracle continually updates this document as new information becomes available. Please check this document prior to performing any upgrade."

- [Note:785351.1](#) Upgrade Companion 11g Release 2

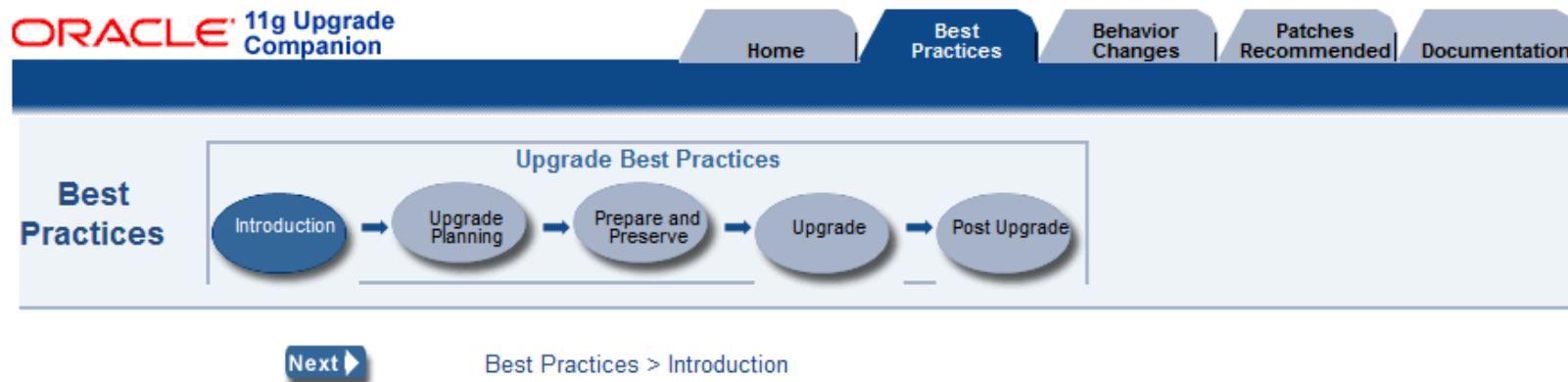


The screenshot shows the Oracle Database 11gR2 Upgrade Companion page. The header includes the Oracle logo and the text "11g Upgrade Companion". The navigation menu has tabs for "Home", "Best Practices", "Behavior Changes", "Patches Recommended", and "Documentation". The main content area features the title "Oracle Database 11gR2 Upgrade Companion" with "Version 2.30" and the date "September 30, 2009". The introductory text reads: "Welcome to the Oracle Database 11gR2 Upgrade Companion. This Upgrade Companion helps you to upgrade from either Oracle9i Release 2 (9.2) or Oracle Database 10g to Oracle Database 11g Release 2, and includes pre-upgrade, upgrade, and post-upgrade guidance. Oracle continually updates this document as new information becomes available. Please check this document prior to performing any upgrade."

**NOTE:** The Upgrade Companion is an instructional document that serves as a companion to the Oracle Database documentation set. The Upgrade Companion:

# Documentation

- [Note:785351.1](#) Upgrade Companion 11g



## 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.

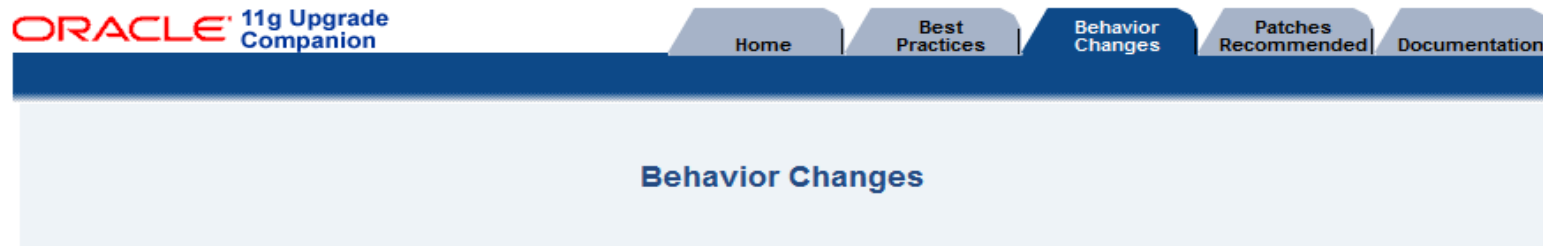
## Usage

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



## 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



# Documentation

- Upgrade Guide

- **Oracle® Database**  
Upgrade Guide  
11g Release 2 (11.2)  
E10819-02

[http://download.oracle.com/docs/cd/E11882\\_01/server.112/e17222/toc.htm](http://download.oracle.com/docs/cd/E11882_01/server.112/e17222/toc.htm)

- Important Notes

- [Note:837570.1](#)

- Complete Checklist for Manual Upgrades to 11g Release 2

- [Note: 421191.1](#)

- Complete checklist for manual upgrades from X to Y

- Upgrading from 9i to 10g: What to expect from the Optimizer

- <http://www.oracle.com/technetwork/database/features/bi-datawarehousing/twp-bidw-optimizer-10gr2-0208-130973.pdf>

- Upgrading from 10g to 11g: What to expect from the Optimizer

- <http://www.oracle.com/technetwork/database/features/bi-datawarehousing/twp-upgrading-10g-to-11g-what-to-ex-133707.pdf>

# Oracle **internal only** Upgrade Page

- <http://database.us.oracle.com>

ORACLE DATABASE 11g

Home | Products, Options, Packs | Sell | Collateral | Competition | Customers | Certification | Partner | **FAQ** | **Upgrades**

Home | Print | Login

### Upgrade Collateral

Rows 50 Go

1 - 37 of 37

Title - click to Download	External	Release	Type of Collateral	Last updated	Feedback
<a href="#">Upgrade to 11g - Internals Course for Support, Consulting and Presales</a>	N	11gR1		06-JAN-09	<a href="#">Feedback</a>
<a href="#">Upgrade to 11g - The whole Story CUSTOMERCOPY - V1.4 (Nov08)</a>	Y	11gR1		27-NOV-08	<a href="#">Feedback</a>
<a href="#">Upgrade to 11g - The whole Story - V1.4 (Nov08)</a>	Y	11gR1		27-NOV-08	<a href="#">Feedback</a>
<a href="#">Upgrade from Oracle 9i to 11g - Real World Customer Experiences</a>	Y	11gR1		14-NOV-08	<a href="#">Feedback</a>
<a href="#">Oracle Consulting Expert Services – Oracle Database Upgrade Services</a>	Y	11gR1		06-NOV-08	<a href="#">Feedback</a>
<a href="#">eSeminar 4: Upgrade to 11g - Real Customer Experiences</a>	N	11gR1		29-OCT-08	<a href="#">Feedback</a>
<a href="#">QOW 2008 - Hitchhiker's Guide to Database Upgrades (PPT)</a>	Y	11gR1		15-OCT-08	<a href="#">Feedback</a>
<a href="#">QOW 2008 - Hitchhiker's Guide to Database Upgrades (CustomerCopy)</a>	Y	11gR1		29-SEP-08	<a href="#">Feedback</a>
<a href="#">Upgrade Strategies</a>	Y	11gR1		25-SEP-08	<a href="#">Feedback</a>
<a href="#">eSeminar 1: Upgrade 10gR2/11g for Partners - Overview</a>	Y	11gR1		19-AUG-08	<a href="#">Feedback</a>
<a href="#">eSeminar 3: Upgrade 11g - Parameters, New Features &amp; Tools</a>	Y	11gR1		19-AUG-08	<a href="#">Feedback</a>
<a href="#">eSeminar 2 - Upgrade 11g: The Best Performance Testing Strategies</a>	Y	11gR1		19-AUG-08	<a href="#">Feedback</a>
<a href="#">Why Upgrade to Oracle Database 11g?</a>	Y	11gR1		22-JUL-08	<a href="#">Feedback</a>
<a href="#">Strategies for a successful upgrade: Database Replay (RAT), DBUA and more</a>	Y	11gR1		06-JUN-08	<a href="#">Feedback</a>

### Quick start guide

**Start here for an Upgrade to 11g:**  
[Note:601807.1 - Upgrade Companion 11g](#)

**Start here for an Upgrade to 10gR2:**  
[Note:466181.1 - Upgrade Companion 10gR2](#)

**Oracle Upgrade Guides:**  
[10gR2 and 11gR1](#)

**OTN: Database Upgrades**  
[Discussion Forum](#)  
[Upgrade Webpage](#)

### Metalink - Most important Upgrade Notes and Patches

**Oracle Database 11g:**  
[Upgrade Companion 11g](#)  
[Complete Checklist for Manual Upgrades to 11g](#)  
[Known Issues and Alerts for 11.1.0.6](#)  
[Recommended Patches for 11.1.0.6](#)

**Oracle Database 10gR2:**  
[Upgrade Companion 10gR2](#)  
[Complete Checklist for Manual Upgrades to 10gR2](#)  
[Known Issues and Alerts for 10.2.0.4](#)  
[Known Issues and Alerts for 10.2.0.3](#)

# OTN Upgrade Page

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

The screenshot displays the Oracle Technology Network (OTN) website interface. At the top, the Oracle logo is on the left, and a navigation bar contains links for 'Welcome Mike (Account | Help | Sign Out)', 'United States', 'Communities', 'I am a...', 'I want to...', and a 'Secure Search' box. Below this is a secondary navigation bar with tabs for 'Products and Services', 'Downloads', 'Store', 'Support', 'Education', 'Partners', and 'About'. The 'Products and Services' tab is active, and its dropdown menu is open, with a red arrow pointing to the 'Products' section. The 'Products' list includes: Oracle Database, Oracle Fusion Middleware, Oracle Applications, Server and Storage Systems, Development Tools, Oracle On Demand, Oracle CRM On Demand, and Product A-Z List. Other sections in the dropdown include 'Acquisitions' (Sun, BEA, Hyperion, JD Edwards EnterpriseOne, PeopleSoft Enterprise, Primavera, See All...), 'Solutions' (Java, Business Intelligence, Enterprise Performance Management, Data Warehousing, Governance, Risk, and Compliance, See All...), and 'Workshops & Events' (TechCast Live). The main content area features a 'Software Downloads' section with 'Top Downloads' (Oracle Database 11g Release 2, Oracle Fusion Middleware 11g, Oracle JDeveloper 11g, Oracle SQL Developer, Oracle Enterprise Pack for Eclipse) and 'New Downloads' (Oracle Application Express 4.0, GlassFish Server 3.0.1, NetBeans IDE 6.9, Enterprise Content Management 11g Release 1, Solaris Studio Express 6/10). There is also a 'Developer Day' banner and a 'Blogs' section with articles like 'Project Coin: ARM API' and 'Deploying ADF applications to a remote server'.



# OTN Upgrade Page

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

Products and Services Downloads Store Support Education Partners About Oracle Technology Network

Products and Services > Oracle Database

Oracle Database

- Enterprise Edition
- Enterprise Options
- Standard Edition
- Standard Edition One
- Express Edition
- Audit Vault
- TimesTen In-Memory Database
- Berkeley DB
- Database Lite
- MySQL
- Secure Backup
- Secure Enterprise Search
- Warehouse Builder
- Database Machine
- Exadata
- Benchmarks
- Customers
- Security

Featured Videos Internet Seminars Demos Podcasts

**Grid Consolidation on Private Clouds**

Register for Live webcast on July 14 Email

**Oracle Database**

**WHY ORACLE?**

The innovation continues with Oracle Database 11g Release 2 to lower IT costs and deliver a higher quality of service by:

- Consolidating business applications onto fast, reliable and scalable [database grids](#)
- Maximizing [availability](#) and eliminating [idle data center redundancy](#)
- [Compressing](#) data onto low cost [storage partitions for faster performance](#)
- [Securely](#) protecting information and enabling compliance
- Doubling [DBA productivity](#) and reducing the [risk of change](#)

**ORACLE IS THE DATABASE LEADER**

- Oracle Exadata V2: [The world's first OLTP database machine](#)
- Gartner: [Oracle is #1 Database](#)
- IDC: Oracle is [#1 in Data Warehousing](#)
- Edison: Oracle is easier to manage than [DB2](#) and [SQL Server](#)
- Gartner: [Oracle RAC Moved to Mainstream Use](#)
- IDC: [Cost-Effective Data Leak Prevention Starts at the Source](#)
- Benchmarks: World record [performance and price/performance](#)

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# OTN Upgrade Page

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

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- Database 10g
- Database Lite
- RDB
- Audit Vault
- Secure Backup
- Real Application Clusters
- Clusterware
- Multimedia
- Windows

## ORACLE 11g Oracle Database Upgrade

Upgrading to Oracle Database 11g Release 2 provides the latest in efficient, reliable, secure data management for mission-critical on-line transaction processing applications, query-intensive data warehouses, and content management and Web2.0 applications. The right planning, preparation, and upgrade steps will make the upgrade process simpler, faster, and more predictable from start to finish.

### Always Relevant Topics

**Database Upgrade Customer Forum**  
Interactive forum containing Database Upgrade relevant information.  
[Oracle Database Upgrade Discussion Forum](#)

**Mike's Upgrade BLOG**  
Database Upgrade Team member Mike Dietrich maintains a BLOG relating to Database Upgrade presentation, events and topics.  
[Mike Dietrich's Upgrade BLOG](#)

**Is your Database Ready for an Upgrade?**  
Find out by visiting My Oracle Support and downloading the latest Pre-Upgrade script.  
[Oracle Database Pre-Upgrade Script](#) (My Oracle Support)

**Upgrade Workshop**  
The Database Upgrade Team is busy traveling and presenting its Upgrade Workshop to customers. The two-day presentation includes over 400 slides.  
[11g Release 2 Upgrade Workshop Presentation](#) (~15M)

**Upgrade Methods**  
Get an overview of various Upgrade Methods that may be used to upgrade to Oracle Database 11.2 Release 2.  
White Paper: [White Paper on Upgrading to Oracle Database 11g Release 2](#)  
Slides: [Slide Show for Upgrading to Oracle Database 11g Release 2](#)

Technical Resources Upgrade Services Oracle OpenWorld Documentation Questions & Prior Releases

### Upcoming Events

**10 November, 2010,**  
[Oracle Webcast: Top 6 Database Security Worst Practices](#)  
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**10 November, 2010, Mumbai**  
[Oracle Database 11g Upgrade Workshop - Mumbai](#)  
[Show Details](#) [Register Now](#)

**10 November, 2010, Troy**  
[Oracle Technology Day](#)  
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**10 November, 2010, Costa Mesa**  
[Oracle Forum: Maximize the Value of Your Applications - Costa Mesa](#)  
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**10 November, 2010, Shirley, Solihull**  
[Oracle Technology Network Developer Day - Database Manageability](#)  
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# OTN Upgrade Forum

- <http://forums.oracle.com/forums/forum.jspa?forumID=583&start=0>

Forum Home Database Database - Upgrade

## Forum: Database - Upgrade

Discuss all aspects of database upgrade from planning and testing through execution and troubleshooting. Also, information about helpful tools and utilities, documentation, and other information to make your database upgrade easier, faster, and less risky.

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	<a href="#">Migration from Oracle 9i 32 bit to Oracle 10G 64 bit on Windows 2003 Server</a>	<a href="#">user6367891</a>	8	Nov 7, 2010 3:14 AM Last Post By: <a href="#">788394</a> »
	<a href="#">Is 11.2.0.2 Patch Set for windows available yet?</a>	<a href="#">david021810</a>	2	Nov 5, 2010 4:44 PM Last Post By: <a href="#">david021810</a> »
	<a href="#">connection from vb.net gives error -ORA-12154: TNS:could not resolve the co</a>	<a href="#">user12158503</a>	1	Nov 5, 2010 12:02 PM Last Post By: <a href="#">schavali</a> »
	<a href="#">Migration - Oracle 9i to Oracle 9.2.0.5</a>	<a href="#">Zombie</a>	3	Nov 4, 2010 12:15 PM Last Post By: <a href="#">Zombie</a> »
	<a href="#">Upgrade from 10.2.0.4 to 10.2.0.5</a>	<a href="#">user611494</a>	0	Nov 4, 2010 11:32 AM Last Post By: <a href="#">user611494</a> »
	<a href="#">oracle upgrde from 10.2.0.1 to 10.2.0.5 and/or with latest patch for 10.2</a>	<a href="#">807486</a>	1	Nov 4, 2010 1:13 AM Last Post By: <a href="#">ora_tech</a> »
	<a href="#">audit public database link by session</a>	<a href="#">susieq</a>	1	Nov 3, 2010 2:46 PM Last Post By: <a href="#">ora_tech</a> »
	<a href="#">upgrade from 10g to 11g</a>	<a href="#">Jimmie_M</a>	7	Nov 3, 2010 1:19 PM Last Post By: <a href="#">mqasperevra</a> »
	<a href="#">upgrde 10.2.0.2 to 10.2.0.5</a>	<a href="#">user11939013</a>	6	Nov 3, 2010 12:18 PM Last Post By: <a href="#">Lynne</a> »
	<a href="#">ORA-06512: at "DBSNMP.BSLN_INTERNAL" -- After 11g Upgrade</a>	<a href="#">user12263759</a>	2	Nov 3, 2010 7:45 AM Last Post By: <a href="#">user12263759</a> »
	<a href="#">upgrde 10.2.0.5 on linux from 10.2.0.1</a>	<a href="#">fmo422299</a>	7	Nov 3, 2010 5:23 AM Last Post By: <a href="#">fmo422299</a> »
	<a href="#">running catcpu.sql after installing patch2 10.2.0.5.0</a>	<a href="#">mtumansery</a>	3	Nov 3, 2010 1:10 AM Last Post By: <a href="#">ora_tech</a> »

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Ease your Oracle Database upgrades - Best Practices, Workshops, Projects ...

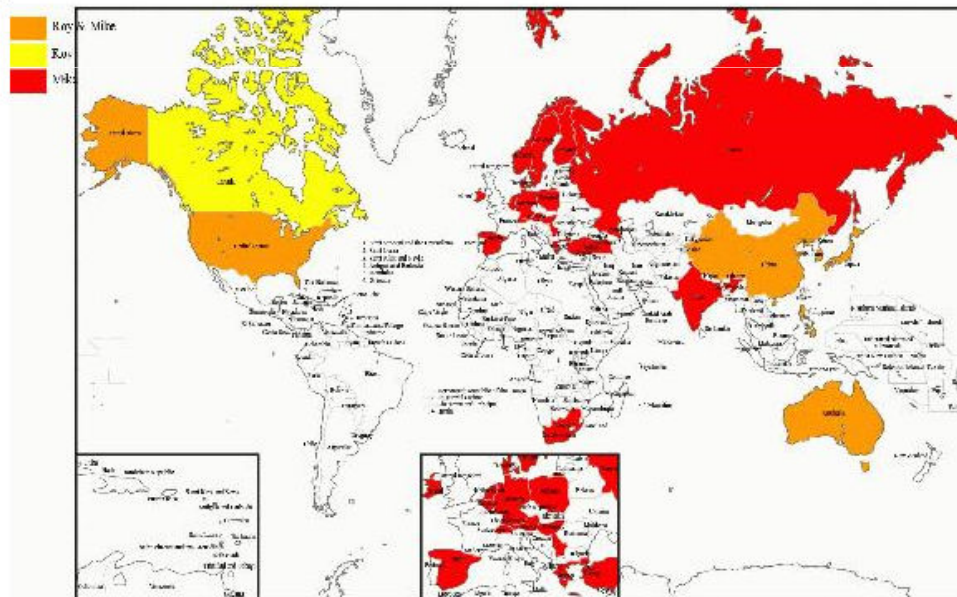
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### Thank you for your support throughout 2010!!!

By [Mike Dietrich](#) on [December 23, 2010 6:40 PM](#)

Now as the calendar year **2010** is close to its end, it's time for a quick wrap-up. The TV stations have shown all their flashbacks already in early December but we'll wait until end of the year ;-) )

I will post some **pictures** done by Roy or me throughout our travel in the next days. We've visited a lot of countries - and did **more than 60 full-day Upgrade Workshops** in **28 different countries**:



About



**Mike Dietrich**  
Consulting Member Technical Staff  
Database Upgrade Development  
ORACLE Corporation

Working out of the [Oracle's Munich office in Germany](#) acting as interlink between customers and Oracle's Upgrade Development. You'd like to connect with me? [LinkedIn](#) or [XING](#) :-)

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[Upgrade to Oracle 11.2](#)  
[Upgrade Workshop +500 Slides](#)  
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# Anybody live on Oracle Database 11g?

- Currently:
  - 62 external Oracle Database 11g Release 2 references
  - 92 external Oracle Database 11g Release 1 references



# 62 External 11.2 References (1/4)

Ref	Name	Country	Industry	System Name	Platform	OS	Release	Nodes	System Status	Application Provider
✓	<a href="#">AUSTRALIAN FINANCE GROUP LTD</a>	Australia	Financial Services	AUSTRALIAN FINANCE GROUP LTD	Sun	Linux	11gR2	2	Production	Oracle,Siebel
✓	<a href="#">AVEA ILETISIM HIZMETLERI AS</a>	Turkey	Telecommunications	AVEA ILETISIM HIZMETLERI A.S - FULL SAS	Sun	Linux	11gR2	8	Production	Custom
✓	<a href="#">Allegro Group</a>	Poland	Consumer/Retail /Distribution	SUN DB MACHINE	Sun	Linux	11gR2	8	Production	-
✓	<a href="#">BANCO AZTECA S.A. INSTITUCION DE BANCA MULTIPLE</a>	Mexico	Financial Services	BANCO AZTECA - SUN DB MACHINE - FULL RACK SAS	Sun	Linux	11gR2	8	Installation	-
✓	<a href="#">BNP PARIBAS</a>	France	Financial Services	BNP PARIBAS - BUSSY ST GEORGE - 1/2 SAS	Sun	Linux	11gR2	4	Production	-
✓	<a href="#">BNP PARIBAS</a>	France	Financial Services	BNP PARIBAS - ST DENIS - 1/2 SAS	Sun	Linux	11gR2	-	Installation	-
✓	<a href="#">BNP PARIBAS</a>	France	Financial Services	BNP PARIBAS - ST DENIS - 2 SATA STORAGE SVRS	Sun	Linux	11gR2	4	Installation	-
✓	<a href="#">Banca Transilvania / Romania</a>	Romania	Financial Services	BANCA TRANSILVANIA S.A. - SUN DB MACHINE - 1/2 SAS RACK	Sun	Linux	11gR2	4	Installation	-
✓	<a href="#">Bank of America</a>	United States	Financial Services	BANK OF AMERICA - 1/2 RACK SAS - KANSAS CITY, MO	Sun	Linux	11gR2	4	Production	-
✓	<a href="#">Bank of America</a>	United States	Financial Services	BANK OF AMERICA - 1/2 RACK SAS - RICHMOND	Sun	Linux	11gR2	4	Installation	-
✓	<a href="#">Bayer (Bayer Health Care -Japan)</a>	Singapore	Pharmaceutical/Biotech	bsgsgps	Sun	Linux	11gR2	2	Test	-
✓	<a href="#">Cardinal Health</a>	United States	Healthcare	CARDINAL HEALTH	Sun	Linux	11gR2	4	Planning	-
✓	<a href="#">Cardinal Health</a>	United States	Healthcare	Exadata	Sun	Linux	11gR2	4	Project Initiation	-
✓	<a href="#">Commonwealth Bank of Australia</a>	Australia	Financial Services	COMMONWEALTH BANK OF AUSTRALIA - FULL SAS	Sun	Linux	11gR2	8	Production	-
✓	<a href="#">Commonwealth Bank of Australia</a>	Australia	Financial Services	COMMONWEALTH BANK OF AUSTRALIA - SUN DB MACHINE - 1/2 RACK SAS	Sun	Linux	11gR2	4	Installation	-

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# 62 External 11.2 References (2/4)

Ref	Name	Country	Industry	System Name	Platform	OS	Release	Nodes	System Status	Application Provider
✓	<a href="#">Commonwealth Bank of Australia</a>	Australia	Financial Services	Peoplesoft / Oracle as a Service	Sun	Linux	11gR2	4	Production	Peoplesoft
✓	<a href="#">E-Plus</a>	Germany	Telecommunications	DWH	Sun	Linux	11gR2	4	Pilot	-
✓	<a href="#">Festo</a>	Germany	Metals Manufacturing	TLIST	HP	HP-UX	11gR2	1	Pilot	-
✓	<a href="#">Genentech</a>	United States	Life Sciences	GENENTECH - REDWOOD CITY - 1/4 RACK SAS	Sun	Linux	11gR2	2	Installation	-
✓	<a href="#">Genentech</a>	United States	Life Sciences	GENENTECH - VACAVILLE - 1/4 RACK SAS	Sun	Linux	11gR2	2	Installation	-
✓	<a href="#">Giant Eagle</a>	United States	Consumer/Retail /Distribution	GIANT EAGLE	Sun	Linux	11gR2	2	Production	-
✓	<a href="#">Giorgio Armani S.p.a.</a>	Italy	General Manufacturing	AFM	IBM	AIX	11gR2	2	Production	Oracle EBS
✓	<a href="#">Interhyp</a>	Germany	Financial Services	TSUN	HP	Linux	11gR2	3	Test Complete	Custom OLTP
✓	<a href="#">Jung von Matt</a>	Germany	Communications and Media	MAIL	Dell	Linux	11gR2	8	Test	Oracle Collaboration Suite
✓	<a href="#">KnowledgeBase Marketing</a>	United States	Services	KNOWLEDGEBASE MARKETING - FULL RACK SAS #1 - ODM2	Sun	Linux	11gR2	8	Installation	-
✓	<a href="#">KnowledgeBase Marketing</a>	United States	Services	KNOWLEDGEBASE MARKETING - FULL RACK SAS #2 - ODM3	Sun	Linux	11gR2	8	Installation	-
✓	<a href="#">LinkShare</a>	United States	Communications and Media	LINKSHARE	Sun	Linux	11gR2	4	Production	-
✓	<a href="#">LinkShare</a>	United States	Communications and Media	LINKSHARE -SUN DB MACHINE- FULL RACK SAS	Sun	Linux	11gR2	8	Installation	Custom
✓	<a href="#">Norwegian Labour and Welfare</a>	Norway	Government	Datawarehouse	Sun	Linux	11gR2	4	Production	Business Objects
✓	<a href="#">OOCL</a>	Hong Kong	Travel and Transportation	MOBILE CARGO TRACKING	HP	Linux	11gR2	2	Production	-

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# 62 External 11.2 References (3/4)

Ref	Name	Country	Industry	System Name	Platform	OS	Release	Nodes	System Status	Application Provider
✓	<a href="#">OSI RESTAURANT PARTNERS, LLC</a>	United States	Consumer/Retail /Distribution	OSI RESTAURANT PARTNERS	Sun	Linux	11gR2	2	-	-
✓	<a href="#">P&amp;G (Procter and Gamble)</a>	United States	Consumer/Retail /Distribution	PROCTER & GAMBLE - 1/2 SATA	Sun	Linux	11gR2	4	Installation	-
✓	<a href="#">P&amp;G (Procter and Gamble)</a>	United States	Consumer/Retail /Distribution	PROCTER & GAMBLE - FULL SAS	Sun	Linux	11gR2	8	Installation	-
✓	<a href="#">PHILIPPINE SAVINGS BANK</a>	Philippines	Financial Services	PHILIPPINE SAVINGS BANK - SUN DB MACHINE - 1/2 SAS RACK	Sun	Linux	11gR2	4	Installation	Custom
✓	<a href="#">Provincia Autonoma di Bolzano – autonomous province of Bozen</a>	Italy	Government	newGIS	Dell	Linux	11gR2	1	Pilot	Custom
✓	<a href="#">RL Polk</a>	United States	Automotive	R.L.POLK & CO.	Sun	Linux	11gR2	4	-	-
✓	<a href="#">SI Mobile</a>	Slovenia	Telecommunications	SI Mobile DBM 1	Sun	Linux	11gR2	2	Project Initiation	-
✓	<a href="#">SOGEI</a>	Italy	Government	GeoPOI	Sun	Solaris	11gR2	1	Production	Custom
✓	<a href="#">SOGETI USA</a>	United States	Services	SOGETI USA - SUN DB MACHINE - 1/2 RACK SAS	Sun	Linux	11gR2	4	Installation	Oracle EBS
✓	<a href="#">SONY MEDIA SOFTWARE AND SERVICES INC</a>	United States	Communications and Media	SONY MEDIA -SUN DB MACHINE- FULL RACK SATA	Sun	Linux	11gR2	8	Installation	-
✓	<a href="#">SONY MEDIA SOFTWARE AND SERVICES INC</a>	United States	Communications and Media	SONY MEDIA SOFTWARE & SERVICES	Sun	Linux	11gR2	4	Development	-
✓	<a href="#">Sharp HealthCare</a>	United States	Healthcare	Data Warehouse - financial data, medical records and clinical research data	IBM	AIX	11gR2	1	Production	-
✓	<a href="#">Sistema informativo agricolo nazionale (SIAN)</a>	Italy	Government	Geo Datawarehouse Condizionalità	IBM	AIX	11gR2	2	Pilot	-
✓	<a href="#">Stadt Borken</a>	Germany	Government	BORKEN	Other Vendor	Linux	11gR2	2	Production	AB-DATA, Aucoteam, IAC, Leipzig, Custom, DataTeam, Wagner, Thierhaupten, Kanis, Somacos, EDV Ermtraud, Prosoz, Verlag für Standesamtswesen, HSH, Berlin, KSL, MBB Dorma
✓	<a href="#">Stadt Emsdetten</a>	Germany	Government	RAC System	HP	Linux	11gR2	2	Production	AB-DATA

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# 62 External 11.2 References (4/4)

Ref	Name	Country	Industry	System Name	Platform	OS	Release	Nodes	System Status	Application Provider
✓	<a href="#">TARGUSinfo</a>	United States	Services	ElementOne	Dell	Linux	11gR2	1	Production	TARGUSinfo
✓	<a href="#">TDS Telecommunications Corp</a>	United States	Telecommunications	Product Applications	HP	Linux	11gR2	4	Production	Custom
✓	<a href="#">TUI Nederland (Travel Unie International)</a>	Netherlands	Travel and Transportation	TUI NEDERLAND N.V. - SUN DB MACHINE - FULL RACK SAS	Sun	Linux	11gR2	8	Production	Custom
✓	<a href="#">Tim w.e.</a>	Portugal	Communications and Media	TIM W.E. - SUN DB MACHINE - 1/4 RACK SAS	Sun	Linux	11gR2	2	Installation	-
✓	<a href="#">Turkcell</a>	Turkey	Telecommunications	Turkcell Database Machine 1	Sun	Linux	11gR2	8	Production	-
✓	<a href="#">Turkcell</a>	Turkey	Telecommunications	XD (DWH Exdata Database)	Sun	Linux	11gR2	8	Production	AB Initio, Microstrategy, Custom
✓	<a href="#">US CUSTOMS AND BORDER PROTECTION</a>	United States	Government	US CUSTOMS & BORDER PROTECTION	Sun	Linux	11gR2	8	Development, Testing	Custom
✓	<a href="#">University of Phoenix</a>	United States	Education	Documentum 6.5	Other Vendor	Linux	11gR2	4	Production	Documentum
✓	<a href="#">University of Phoenix</a>	United States	Education	Osiris	Other Vendor	Linux	11gR2	3	Production	Custom
✓	<a href="#">University of Phoenix</a>	United States	Education	Sabrix	Other Vendor	Linux	11gR2	2	Production	Sabrix
✓	<a href="#">Verizon Wireless</a>	United States	Telecommunications	Verizon Wireless	HP	Linux	11gR2	3	Production	Custom
✓	<a href="#">WETrade Sim s.p.a.</a>	Italy	Financial Services	wbprod	IBM	Linux	11gR2	6	Production	-
✓	<a href="#">Waters</a>	United States	Life Sciences	Empower	Dell	Windows	11gR2	2	Production	Custom
✓	<a href="#">Waters</a>	United States	Life Sciences	NuGenesis SDMS	Dell	Windows	11gR2	2	Production	Custom
✓	<a href="#">Waters</a>	United States	Life Sciences	UNIFI	Dell	Windows	11gR2	1	Production	Custom
✓	<a href="#">Yahoo!</a>	United States	High Technology	Edward2	HP	Linux	11gR2	8	Production	Custom
✓	<a href="#">eDialog</a>	United States	High Technology	EDIALOG - SUN DB MACHINE - FULL RACK SAS	Sun	Linux	11gR2	8	Installation	-

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# 92 External 11.1 References (1/6)

Ref	Name	Country	Industry	System Name	Platform	OS	Release	Nodes	System Status	Application Provider
✓	<a href="#">1-800-Flowers (BloomNet)</a>	United States	Consumer/Retail /Distribution	eBusiness Suite (R12)	Sun	Solaris	11gR1	1	Production	Oracle EBS
✓	<a href="#">ATHENS INTERNATIONAL AIRPORT</a>	Greece	Travel and Transportation	CBIS	Sun	Solaris	11gR1	2	Production	Oracle EBS
✓	<a href="#">Advance America</a>	United States	Financial Services	Advance America	IBM	AIX	11gR1	4	Production	Custom
✓	<a href="#">Allstate</a>	United States	Services	OPODS (Oracle PODS)	Sun	Solaris	11gR1	4	Production	Custom
✓	<a href="#">AmTrust (Ohio Savings Bank)</a>	United States	Financial Services	AmTrust Bank 11g EAP	HP	Linux	11gR1	4	Test	Custom
✓	<a href="#">Amazon</a>	United States	Consumer/Retail /Distribution	Multiple Databases	Other Vendor	Linux	11gR1	1	Production	Custom
✓	<a href="#">Amtrak</a>	United States	Travel and Transportation	AMTRAK - DB MACHINE - 2 X 1/2 SATA RACKS - DLVRD	HP	Linux	11gR1	-	Installation	-
✓	<a href="#">Amtrak</a>	United States	Travel and Transportation	EDW	Other Vendor	Linux	11gR1	4	Project Initiation	Informatica
✓	<a href="#">An Garda Síochána</a>	Ireland	Public Services	PULSE	Dell	Linux	11gR1	3	Production	Accenture
✓	<a href="#">Anritsu</a>	Italy	Telecommunications	MasterClaw	HP	Linux	11gR1	1	Production	Custom
✓	<a href="#">Apple Computer Inc</a>	United States	High Technology	APPLE - DB MACHINE - 1 SAS RACK -DLVRD	HP	Linux	11gR1	8	Production	-
✓	<a href="#">Apple Computer Inc</a>	United States	High Technology	APPLE - DB MACHINE - 1/2 SAS RACK -DLVRD	HP	Linux	11gR1	4	Production	-
✓	<a href="#">Apple Computer Inc</a>	United States	High Technology	iTunes & other Web apps - reader farm	Sun	Solaris	11gR1	1	Production	-
✓	<a href="#">Bielefeld University</a>	Germany	Education	HRZD	Sun	Solaris	11gR1	2	Production	-
✓	<a href="#">City of Albuquerque</a>	United States	Government	PeopleSoft	Sun	Solaris	11gR1	1	Production	Peoplesoft
✓	<a href="#">Comic Relief - RND05</a>	United Kingdom	Not for Profit	Donation Processing	HP	Linux	11gR1	2	Production	Custom
✓	<a href="#">CoreLogic Spatial Solutions (formerly First American Spatial Solutions)</a>	United States	High Technology	Parcel Point	HP	Linux	11gR1	1	Production	-
✓	<a href="#">Credit Suisse (Zuerich)</a>	Switzerland	Financial Services	NZV	Sun	Solaris	11gR1	2	Production	-

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# 92 External 11.1 References (2/6)

Ref	Name	Country	Industry	System Name	Platform	OS	Release	Nodes	System Status	Application Provider
✓	<a href="#">DEUTSCHE TELEKOM AG</a>	Germany	Telecommunications	TPDB	Sun	Solaris	11gR1	2	Installation	Custom
✓	<a href="#">Deutsche Messe AG</a>	Germany	Public Services	amun	Sun	Solaris	11gR1	3	Production	Custom OLTP
✓	<a href="#">ESPRINET</a>	Italy	Consumer/Retail/Distribution	redwood	HP	Linux	11gR1	7	Production	Oracle
✓	<a href="#">Environment Waikato</a>	New Zealand	Government	Pilot	HP	Windows	11gR1	1	Test	Custom,Oracle EBS
✓	<a href="#">Estonia eHealth Foundation</a>	Estonia	Healthcare	single node	Dell	Linux	11gR1	1	Production	-
✓	<a href="#">FIZ Chemie Berlin</a>	Germany	Public Services	scientific information for research	Other Vendor	Linux	11gR1	4	Production	Custom
✓	<a href="#">Festo</a>	Germany	Metals Manufacturing	TLIST	HP	HP-UX	11gR1	1	Pilot	-
✓	<a href="#">First American Spatial Solutions</a>	United States	High Technology	Parcel Point	HP	Linux	11gR1	1	Production	-
✓	<a href="#">Garanti Bank</a>	Turkey	Financial Services	Garanti Bank Database Machine 1	HP	Linux	11gR1	8	Production	-
✓	<a href="#">Giant Eagle</a>	United States	Consumer/Retail/Distribution	GIANT EAGLE - DB MACHINE - 1/2 SATA RACK - DLVRD	HP	Linux	11gR1	4	Installation	-
✓	<a href="#">HP IT</a>	United States	High Technology	PeopleSoftHCM	HP	HP-UX	11gR1	1	Test	Peoplesoft
✓	<a href="#">HealthSouth</a>	United States	Healthcare	Patient Accounts	Dell	Linux	11gR1	5	Production	-
✓	<a href="#">Interactive One (previously known as Community Connect)</a>	United States	Data Center/Hosting	Community Connect site	IBM	Linux	11gR1	3	Production	Custom
✓	<a href="#">Interactive One (previously known as Community Connect)</a>	United States	Data Center/Hosting	RHEL	Other Vendor	Linux	11gR1	1	Test	-
✓	<a href="#">Intermap Technologies</a>	United States	High Technology	NEXTMap	IBM	Linux	11gR1	1	Production	-

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# 92 External 11.1 References (3/6)

Ref	Name	Country	Industry	System Name	Platform	OS	Release	Nodes	System Status	Application Provider
✓	<a href="#">JPMC STAR</a>	United States	Financial Services	STAR	Sun	Solaris	11gR1	2	Production	-
✓	<a href="#">Lotte Home Shopping</a>	Korea, Republic of	Consumer/Retail /Distribution	imall	IBM	AIX	11gR1	2	Production	-
✓	<a href="#">Loyalty Partner Solutions</a>	Germany	Consumer/Retail /Distribution	DWH EXADATA V1 1/2	HP	Linux	11gR1	4	Production	Custom
✓	<a href="#">Lufthansa Systems</a>	Germany	Travel and Transportation	XX	IBM	AIX	11gR1	1	Production	-
✓	<a href="#">Luminex</a>	United States	Life Sciences	eBusiness Suite	Other Vendor	Linux	11gR1	1	Production	Oracle EBS
✓	<a href="#">MOL Magyar Olaj- és Gázipari Nyrt</a>	Hungary	Chemical, Oil and Gas	LOGIR	IBM	AIX	11gR1	1	Production	-
✓	<a href="#">Melbourne Health</a>	Australia	Healthcare	MIM (DICOM Research)	HP	Windows	11gR1	1	Production	Custom
✓	<a href="#">Mercadona</a>	Spain	Consumer/Retail /Distribution	Various [Datawarehouse, Mixed, Consolidation, OLTP] All Systems 11g	HP	HP-UX	11gR1	1	Production	-
✓	<a href="#">Merial</a>	United States	Healthcare	EBS R.12.0.6	HP	Linux	11gR1	4	Production	Oracle EBS
✓	<a href="#">MetService</a>	New Zealand	High Technology	TBC	HP	HP-UX	11gR1	1	Production	Custom
✓	<a href="#">Metcash</a>	Australia	Consumer/Retail /Distribution	-	IBM	AIX	11gR1	1	Production	Business Objects
✓	<a href="#">MobilTel</a>	Bulgaria	Telecommunications	Consolidation Platform	HP	Linux	11gR1	5	Production	Custom
✓	<a href="#">MobilTel Bulgaria</a>	Bulgaria	Telecommunications	HP Oracle Database Machine	HP	Linux	11gR1	4	Production	Custom
✓	<a href="#">MobilTel Bulgaria</a>	Bulgaria	Telecommunications	MOBILTEL BULGARIA - DB MACHINE - 4 SAS SERVERS - DLVRD	HP	Linux	11gR1	-	Installation	-
✓	<a href="#">MorphoTrak (formerly Motorola Printrak)</a>	United States	-	Printrak BIS	Other Vendor	unknown	11gR1	2	Production	Custom

Last updated: 23-OCT-2010

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# 92 External 11.1 References (4/6)

<u>Ref</u>	<u>Name</u>	<u>Country</u>	<u>Industry</u>	<u>System Name</u>	<u>Platform</u>	<u>OS</u>	<u>Release</u>	<u>Nodes</u>	<u>System Status</u>	<u>Application Provider</u>
✓	<a href="#">Morrisons</a>	United Kingdom	Consumer/Retail /Distribution	DWH	HP	HP-UX	11gR1	2	Test	-
✓	<a href="#">NCPA</a>	United States	Public Services	settlement file management	Other Vendor	Windows	11gR1	1	Production	-
✓	<a href="#">NRMA</a>	Australia	Automotive	NRMA Membership EDB	HP	Linux	11gR1	4	Production	Custom
✓	<a href="#">NSW Fire Brigade</a>	Australia	Government	DB Platform	Dell	Linux	11gR1	3	Production	Custom
✓	<a href="#">National Ignition Facility</a>	United States	High Technology	NIF - Content Archive	HP	Linux	11gR1	6	Production	-
✓	<a href="#">National Ignition Facility</a>	United States	High Technology	Panther/Firebird	HP	Linux	11gR1	1	Production	-
✓	<a href="#">Network Rail Infrastructure Limi</a>	United Kingdom	Travel and Transportation	eBusiness Suite	HP	HP-UX	11gR1	1	Production	Oracle EBS
✓	<a href="#">Nokia Siemens Networks</a>	Germany	Telecommunications	NSN - HA	Sun	Solaris	11gR1	2	Pilot	Custom
✓	<a href="#">Nuon - Oracle</a>	Netherlands	Services	Orakel V2	Dell	Linux	11gR1	4	Test	Custom
✓	<a href="#">Posten (Swedish Mail)</a>	Sweden	Public Services	PSS ProductionControlSystem, test	Sun	Solaris	11gR1	1	Pilot	Custom
✓	<a href="#">RTL (Radio Television Luxemburg)</a>	France	Communications and Media	RTL.fr website	Sun	Solaris	11gR1	2	Production	-
✓	<a href="#">Rakuten Travel</a>	Japan	Communications and Media	Online Hotel Reservation System	IBM	AIX	11gR1	10	Production	-
✓	<a href="#">Real Networks</a>	United States	Communications and Media	Content DB	HP	Linux	11gR1	1	Production	Custom
✓	<a href="#">Reliance Mutual Funds</a>	India	Financial Services	RMFDB 11g - Credence system	Dell	Windows	11gR1	2	Production	CGI
✓	<a href="#">SK TELECOM</a>	Korea, Republic of	Telecommunications	SK TELECOM (KOREA) - HP DB MACHINE - 1/2 SATA RACK -DLVRD	HP	Linux	11gR1	4	Installation	-

Last updated: 23-OCT-2010

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# 92 External 11.1 References (5/6)

Ref	Name	Country	Industry	System Name	Platform	OS	Release	Nodes	System Status	Application Provider
✓	<a href="#">SK Telecom</a>	Korea, Republic of	Telecommunications	Billing Data Analysis System	HP	Linux	11gR1	4	Production	Custom
✓	<a href="#">SOGEI</a>	Italy	Government	Red Hat Enterprise Linux 4	Fujitsu	Linux	11gR1	1	Test	-
✓	<a href="#">SOGEI</a>	Italy	Government	Sun 5.10 (Experimental Production)	Sun	Solaris	11gR1	1	Production	-
✓	<a href="#">SPH Search</a>	Singapore	High Technology	Pentaho applications	HP	Linux	11gR1	1	Production	Pentaho
✓	<a href="#">Servicio Electronico de Pago, S.A.</a>	Argentina	Services	RAC	IBM	AIX	11gR1	2	Production	-
✓	<a href="#">Sicredi</a>	Brazil	Financial Services	Sicredi	IBM	AIX	11gR1	3	Production	Custom
✓	<a href="#">Spatial Eye</a>	Netherlands	High Technology	Spatial Workshop	Dell	Windows	11gR1	1	Production	Custom
✓	<a href="#">Stadt Emsdetten</a>	Germany	Government	RAC System	HP	Linux	11gR1	2	Production	AB-DATA
✓	<a href="#">Stadt Greven</a>	Germany	Government	RAC-System	HP	Linux	11gR1	2	Production	AB-DATA
✓	<a href="#">State of Connecticut</a>	United States	Government	CORE-CT (EPM & Portal)	Dell	Linux	11gR1	6	Production	Peoplesoft
✓	<a href="#">Swisscom AG</a>	Switzerland	Telecommunications	Siebel on RAC	HP	Linux	11gR1	4	Test	Siebel
✓	<a href="#">TRUE LEASING CO LTD</a>	Thailand	Telecommunications	TRUE LEASING - DB MACHINE - 1 SAS RACK - DLVRD	HP	Linux	11gR1	8	Installation	-
✓	<a href="#">Taobao</a>	China	High Technology	DW - ODS	Sun	Linux	11gR1	4	Production	Custom
✓	<a href="#">The Hartford</a>	United States	Financial Services	SRS - Specialty Risk Systems	HP	HP-UX	11gR1	1	Pilot	Custom
✓	<a href="#">The Hartford</a>	United States	Financial Services	THE HARTFORD - DB MACHINE - 1 SATA RACK -DLVRD	HP	Linux	11gR1	8	Installation	-

Last updated: 23-OCT-2010

ORACLE

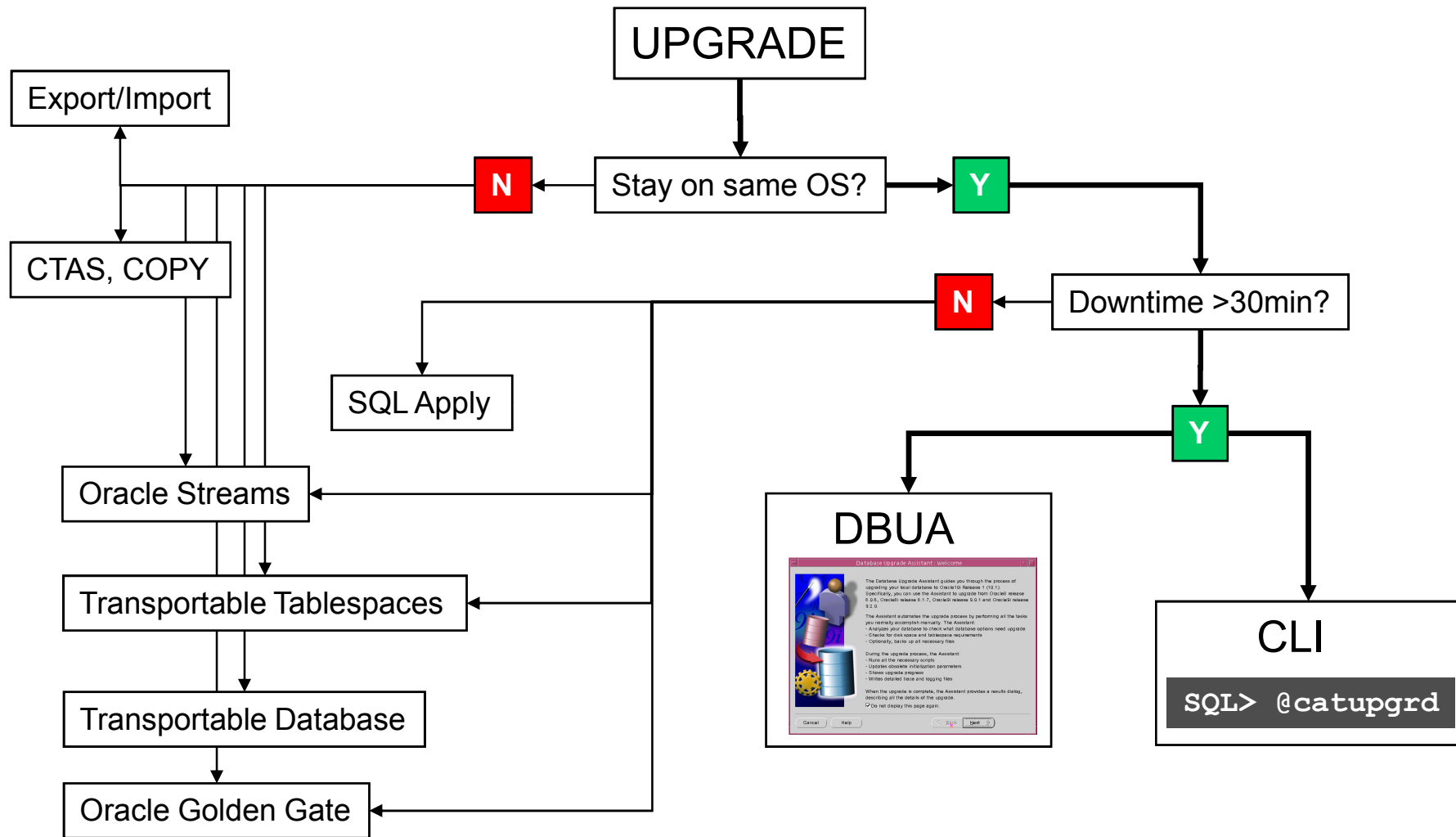
# 92 External 11.1 References (6/6)

Ref	Name	Country	Industry	System Name	Platform	OS	Release	Nodes	System Status	Application Provider
✓	<a href="#">The Hartford</a>	United States	Financial Services	THE HARTFORD - DB MACHINE - 1 SATA RACK -DLVRD	HP	Linux	11gR1	8	Installation	-
✓	<a href="#">Thomson Reuters - Legal</a>	United States	Communications and Media	Publishing Warehouse	Other Vendor	Linux	11gR1	1	Production	Custom
✓	<a href="#">Trivadis</a>	Switzerland	High Technology	RAC	Dell	Windows	11gR1	2	Production	Custom
✓	<a href="#">Turkcell</a>	Turkey	Telecommunications	ODS	HP	HP-UX	11gR1	1	Production	-
✓	<a href="#">Turkcell</a>	Turkey	Telecommunications	VASRES	HP	Linux	11gR1	3	Production	-
✓	<a href="#">Verizon Wireless</a>	United States	Telecommunications	PeopleSoft (Verizon Services Operation)	HP	Linux	11gR1	3	Production	Peoplesoft
✓	<a href="#">Volume Ltd</a>	United Kingdom	Services	don'tknow	Other Vendor	Windows	11gR1	1	Production	-
✓	<a href="#">Vzajemna</a>	Slovenia	Healthcare	linux-64	Dell	Linux	11gR1	1	Production	-
✓	<a href="#">Xactly</a>	United States	Services	Sales Performance Mgmt	Other Vendor	Linux	11gR1	1	Production	Custom
✓	<a href="#">daewoo securities</a>	Korea, Republic of	Financial Services	single system	Sun	Solaris	11gR1	1	Production	-
✓	<a href="#">eDBA</a>	United Kingdom	High Technology	Unknown	Other Vendor	Linux	11gR1	1	Production	-

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ORACLE

# Upgrade Paths





# Sanity Operations

- 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!!!!!!**
- There should be no invalid objects in SYS and SYSTEM user schema
  - Recompile invalid objects with `utlrp.sql` before the upgrade
  - Compare invalid objects from before and after the upgrade
    - Beginning with 11.1.0.7 the comparison has been made easier
    - Run the pre-upgrade check script `utlu112i.sql`
    - Afterwards find invalid objects in `registry$sys_inv_objs` and `registry$nonsys_inv_objs`
    - Compare after the upgrade with: `utluiobj.sql`
    - The view `DBA_INVALID_OBJECTS` contains a list of invalid objects after the upgrade

# Sanity Operations



- If upgrading from 10g or 11g, purge the **recyclebin**

```
SQL> purge DBA_RECYCLEBIN;
```





# Sanity Operations

- 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:

```
_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

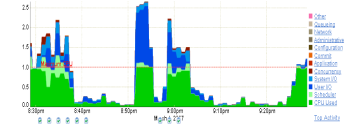
**Upgrade time:  
7 minutes!!**



# Preparation

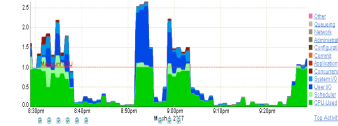
- Switch off DATABASE VAULT (if used/installed)
  - **Oracle® Database Vault Administrator's Guide: Appendix B**
  - Unix: (simplified)
    - Relinking without Database Vault  
`[$ make -f ins_rdbms.mk dv_off ioracle]`
    - `$ chopt disable dv`
  - Windows:
    - Rename `oradv11.dll` in `ORACLE_HOME\bin`
    - Upon restart: `$ chopt disable dv`
- After upgrading relink with `dv_on` or rename the DLL and enable Database Vault again: `$ chopt enable dv`
- *Note: This will just work under the assumption that DVSYS and the DV owning user have identical passwords*

# Preparation



- Preserve performance statistics
  - Get accurate performance statistics
    - Comparison: before ↔ after
    - Time specific queries and batches
  - Test upgrade of the database
    - Functional tests
    - Performance tests with real life loads!!!
      - Real Application Testing
        - SQL Performance Analyzer
        - Database Replay

# Preparation

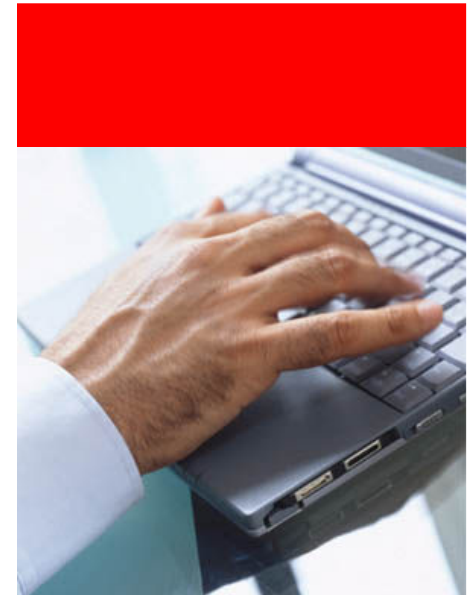


- Collecting sufficient performance data prior to the upgrade is of vital importance
  - Sufficient means: Starting at least 4 weeks before the upgrade
  - Gather accurate performance statistics
  - In Oracle 8i/9i:
    - Use **STATSPACK**
      - Export the PERFSTAT user right before the upgrade
      - [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/awrxt.sql`
      - => For 10.1 only use: `DBMS_SWRP_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](#)

# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

**Installation Overview**  
Oracle Clusterware & ASM  
Installation  
Patches  
Time Zone  
Unattended





# Installation

- How to access the software?

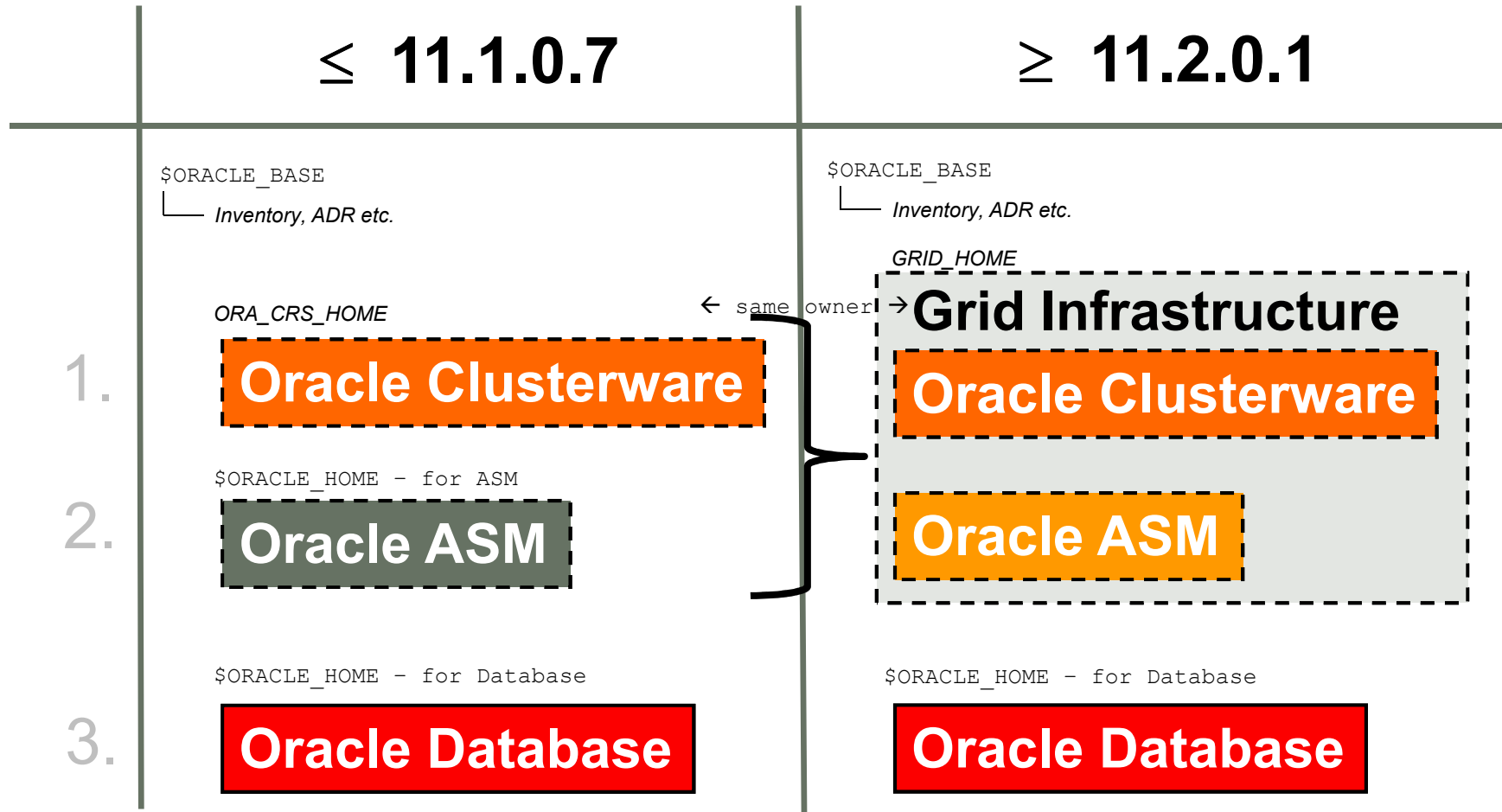
- <http://edelivery.oracle.com/>

The logo for Oracle E-Delivery, featuring the word "ORACLE" in a large, white, sans-serif font, followed by "E-Delivery" in a smaller, white, sans-serif font, all set against a blue rectangular background.

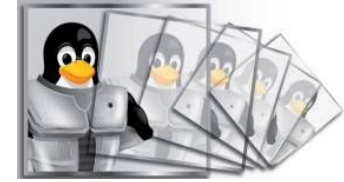
- Download from OTN:

- <http://otn.oracle.com/indexes/downloads/index.html>

# Installation overview



# Installation – VMware



- Does Oracle certify software to run on VMware?
  - Please see the following MOS Notes:
    - [Note:942852.1](#)  
VMWare Certification for Oracle Products
    - [Note:249212.1](#)  
Support Position for Oracle Products Running on VMWare Virtualized Envs.

## Support Status for VMware Virtualized Environments

**Oracle has not certified any of its products on VMware virtualized environments.** Oracle Support will assist customers running Oracle products on VMware in the following manner: Oracle will only provide support for issues that either are known to occur on the native OS, or can be demonstrated not to be as a result of running on VMware. If a problem is a known Oracle issue, Oracle support will recommend the appropriate solution on the native OS. If that solution does not work in the VMware virtualized environment, the customer will be referred to VMware for support. **When the customer can demonstrate that the Oracle solution does not work when running on the native OS**, Oracle will resume support, including logging a bug with Oracle Development for investigation if required. If the problem is determined not to be a known Oracle issue, we will refer the customer to VMware for support. When the customer can demonstrate that the issue occurs when running on the native OS, Oracle will resume support, including logging a bug with Oracle Development for investigation if required.

NOTE: Oracle has not certified any of its products on VMware. For Oracle RAC, Oracle will only accept Service Requests as described in this note on Oracle RAC 11.2.0.2 and later releases.



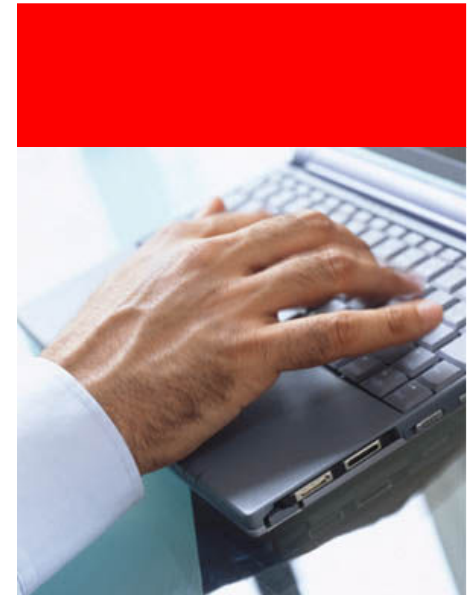
# Installation – Things to Know: Solaris

- Oracle Database 11.2 on SPARC Solaris requires **Oracle Solaris 10 ≥ Update6**
  - See [Note: 971464.1](#) for further information, downtime, Live Update etc.:  
FAQ - 11gR2 requires Solaris 10 update 6 or greater

# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

Installation Overview  
**Oracle Clusterware & ASM**  
Installation  
Patches  
Time Zone  
Unattended

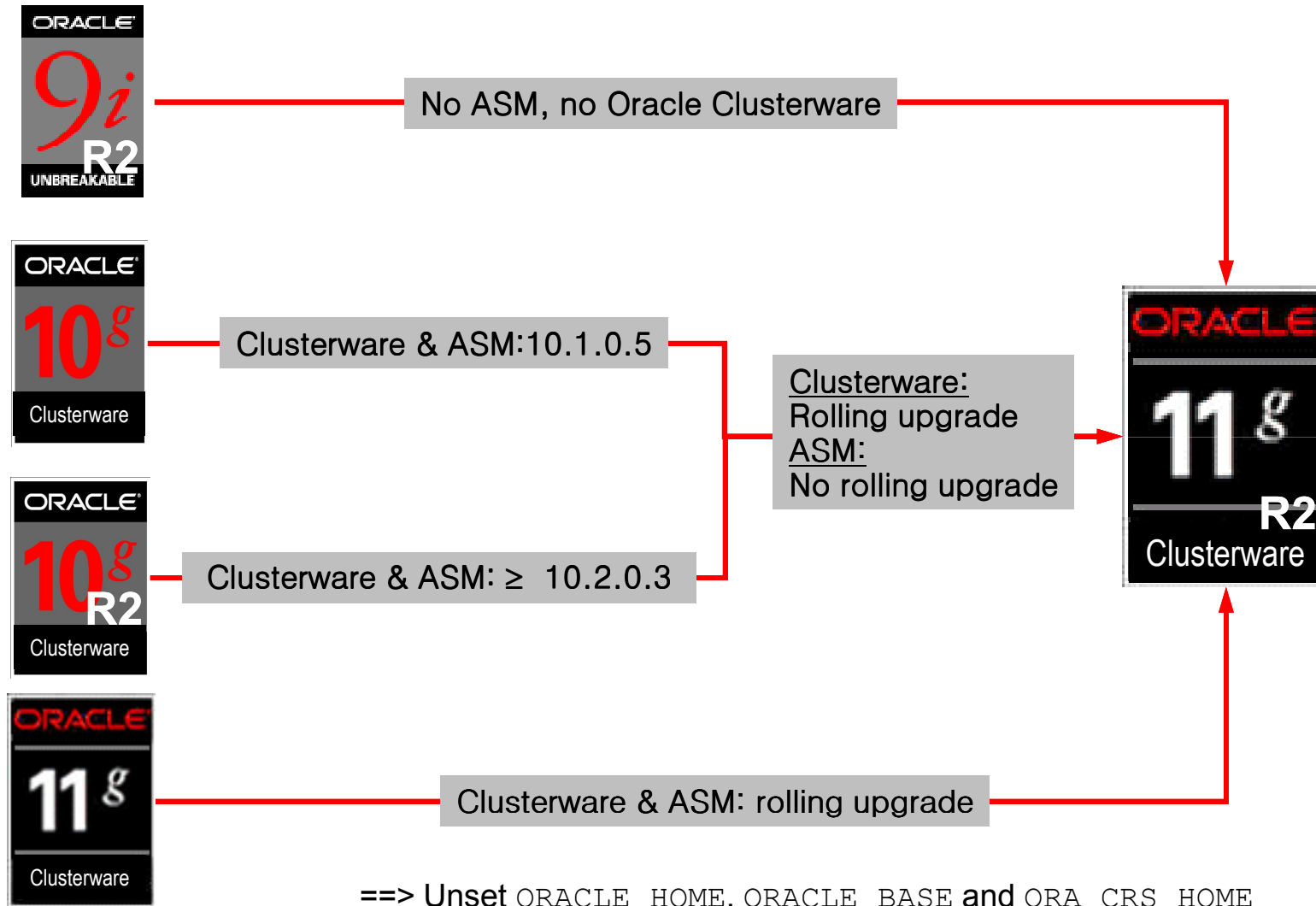




# Oracle Clusterware Upgrade **11g and 11.2**

- Always upgrade Oracle Clusterware first!!!
- Upgrading to Oracle Clusterware 11g:
  - Install new software into the **existing Clusterware home**
  - **In-place** software upgrade
- 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](#) for known issues
- On 32-bit Windows there'll be **no** 32-bit Grid Infrastructure and ASM available!

# Oracle Clusterware Upgrade 11g Release 2





# Oracle Clusterware Upgrade **11g Release 2**

- Don't set environment variables `ORACLE_HOME`, `ORACLE_BASE` and `ORA_CRS_HOME`
- Rolling Oracle Clusterware upgrade possible:
  - From **10.1.0.5** and  $\geq$  **10.2.0.3**:  
Leave Oracle Clusterware running, shutdown nodeapps, ASM, Database Instances
  - From **11.1**:  
Upgrade Oracle Clusterware and Automatic Storage Management to 11.2. at the same time
    - ASM 11.1 only is rolling upgradeable
    - ASM can be upgraded later with `asmca -upgrade`
- Non-rolling upgrade:
  - Shutdown entire Oracle stack
- No rolling upgrade possible if Clusterware is installed in a shared FS





# Oracle Clusterware Upgrade 11g Release 2

- 1.1.1.1 Pinning nodes

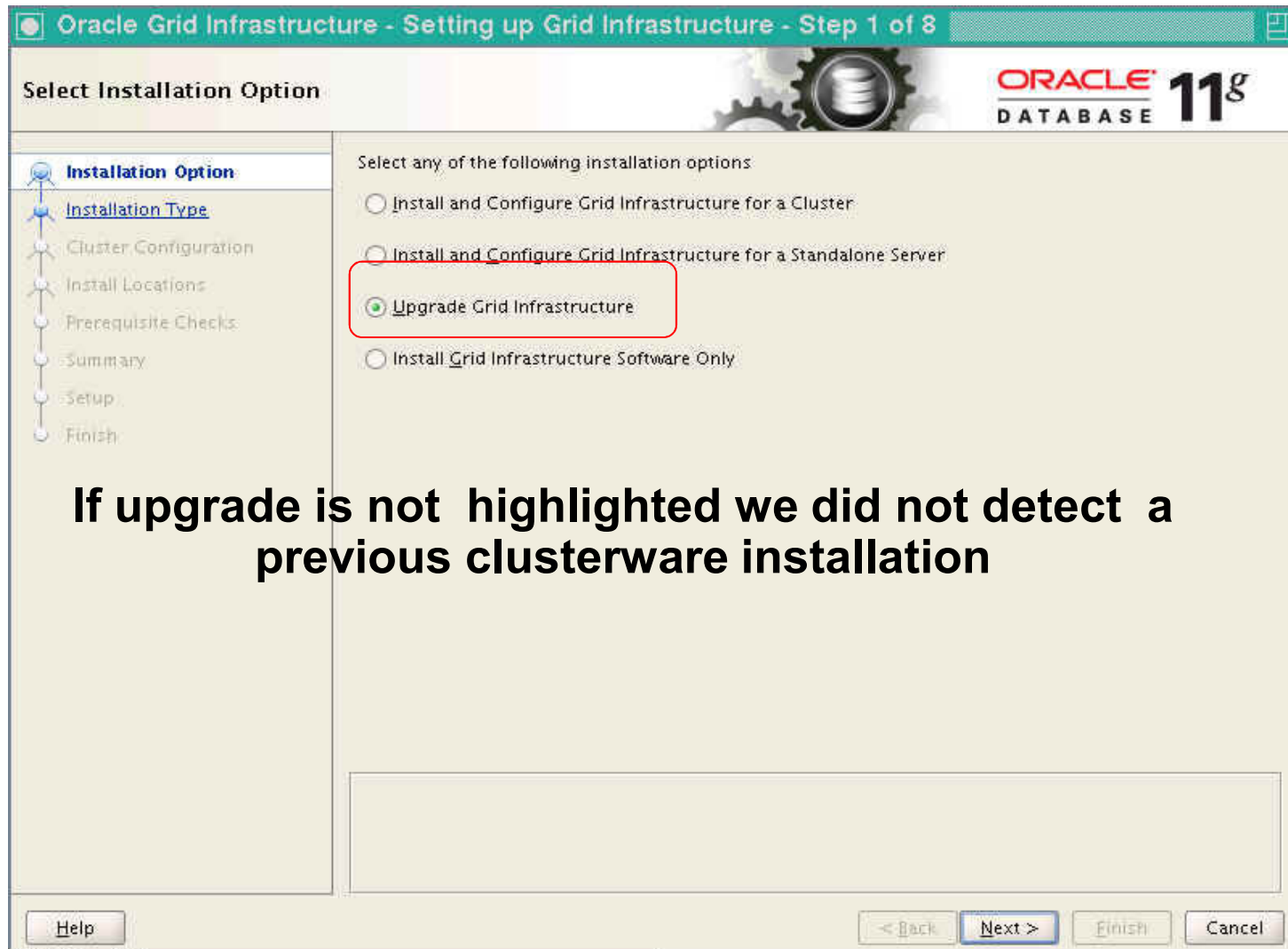
In order to change the node pin behavior the appropriate command is the */crsctl pin/unpin css/* command, to pin or unpin any specific node. Pinning a node means that the association of a node name with a node number is fixed. If a node is not pinned, its node number may change if the lease expires while it is down. The lease of a pinned node never expires. Deleting a node with the */crsctl delete node/* command implicitly unpins the node.

- During upgrade of Oracle Clusterware, all servers are pinned, whereas after a fresh installation of Oracle Clusterware 11/g /release 2 (11.2), all servers you add to the cluster are unpinned.

- You cannot unpin a server that has an instance of Oracle RAC that is older than Oracle Clusterware 11/g/ release 2 (11.2) if you installed Oracle Clusterware 11/g/ release 2 (11.2) on that server.

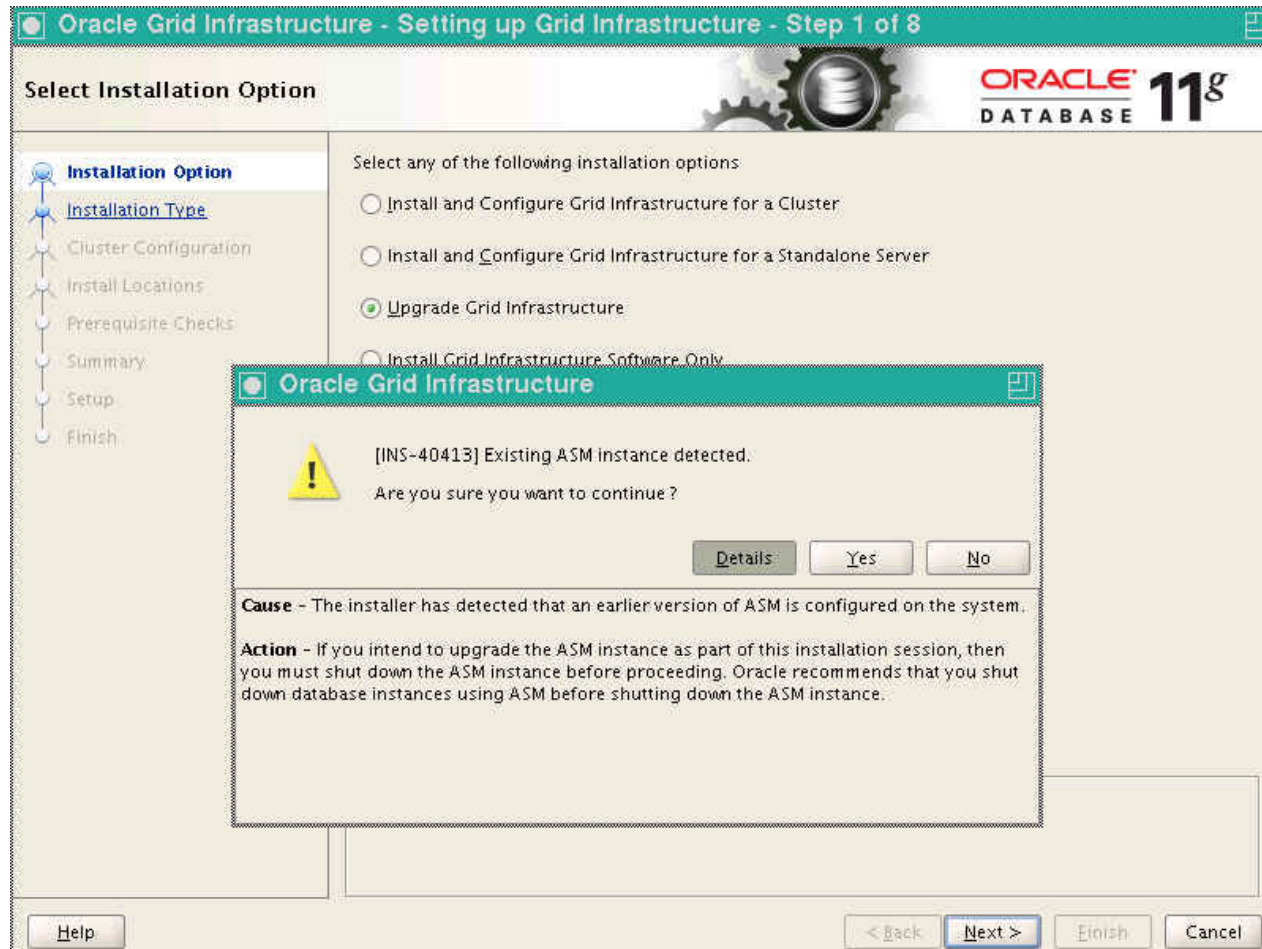
Pinning a node is required for rolling upgrade to Oracle Clusterware 11/g/ release 2 (11.2) and will be done automatically. We have seen cases where customer perform a manual upgrade and this would fail due to unpinned nodes.

# Oracle Clusterware Upgrade 11g Release 2



**If upgrade is not highlighted we did not detect a previous clusterware installation**

# Oracle Clusterware Upgrade 11g Release 2





# Oracle Clusterware Upgrade **11g Release 2**

- OUI detects existing ASM instances and responds:
  - `INS-40413 Existing ASM Instance Detected`
    - Tells you that if you intend to upgrade ASM, you must shut down all ASM instances and therefore all database instances
  - What does this mean to you ?
    - Once you understand there will be a complete outage when `asmca` is running, then hit **YES**
    - ASM and database should remain up
    - `rootupgrade.sh` will shutdown as required (rolling )
    - `asmca` will shutdown instances as required
      - Upgrade from 11.1: In rolling fashion
      - Upgrade from 10g: Non-rolling (complete outage)

# Oracle Clusterware Upgrade 11g Release 2

## GRID\_HOME

Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 5 of 9

### Specify Installation Location

ORACLE 11g DATABASE

Installation Option  
Product Languages  
ASM Monitor Password  
Operating System Groups  
**Installation Location**  
Prerequisite Checks  
Summary  
Setup  
Finish

Specify a base location for storing all Oracle software and configuration-related files. This location is the Oracle base directory. Create one Oracle base for each operating system user. By default, software and configuration files are installed by version and database name in the Oracle base directory.

Oracle Base: /u01/app/grid

This software directory is the Oracle software directory. Specify the software directory either to specify an alternative location for the software or to specify the software directory.

Software Location: /u01/app/grid/product/11.2.0/grid

Make sure that BASE and SW location are different subdirectories – the slide has it the wrong way!!!

Help < Back Next > Finish Cancel

# Oracle Clusterware Upgrade 11g Release 2

## Node Selection and SSH

Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 3 of 10

### Grid Infrastructure Node Selection

Select the Cluster nodes (in addition to the local node) in the hardware cluster where the Installer should upgrade Grid Infrastructure.

Node Name	Oracle Clusterware Home
<input checked="" type="checkbox"/> rat-rm4-ipf...	/u01/app/gridbase
<input checked="" type="checkbox"/> rat-rm4-ipf...	/u01/app/gridbase
<input checked="" type="checkbox"/> rat-rm4-ipf...	/u01/app/gridbase

SSH Connectivity...

OS Username:  OS Password:

User home is shared by the selected nodes

Reuse private and public keys existing in the user home

Test Setup

Help < Back Next > Finish Cancel

# Oracle Clusterware Upgrade 11g Release 2

## Setup ASM Roles

Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 6 of 11

Privileged Operating System Groups

ORACLE DATABASE 11g

Select the name of the operating system group of which you are a member to be used for OS authentication to Automatic Storage Management (ASM).

ASM Database Administrator (OSDBA) Group	asmdba
ASM Instance Administration Operator (OSOPER) Group	oinstall
ASM Instance Administrator (OSASM) Group	asmadmin

Installation Option

Product Languages

Node Selection

SCAN Information

ASM Monitor Password

**Operating System Groups**

Installation Location

Prerequisite Checks

Summary

Setup

Finish

Help

< Back Next > Finish Cancel

# Oracle Clusterware Upgrade 11g Release 2

## Cluster Verification

Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 8 of 11

Perform Prerequisite Checks

ORACLE DATABASE 11g

Some of the minimum requirements for installation are not completed. Review and fix the issues listed in the following table, and recheck the system.

Ignore All

Checks	Status	Fixable
Checks		
Swap Size	Failed	
Hard Limit: maximum open file descriptors	Failed	Yes
OS Kernel Parameters		
OS Kernel Parameter: file-max	Failed	Yes
OS Kernel Parameter: ip_local_port_range	Failed	Yes
OS Kernel Parameter: vmem_max	Failed	Yes
Network Time Protocol (NTP)	Failed	

This is a prerequisite condition to test whether sufficient total swap space is available on the system. [\(more details\)](#)

Check Failed on Nodes: [rat-rm4-ipfix008, rat-rm4-ipfix007, rat-rm4-ipfix006]



# Oracle Clusterware Upgrade 11g Release 2

## Cluster Verification

The screenshot shows the Oracle Grid Infrastructure Setup Wizard at Step 8 of 11, titled "Perform Prerequisite Checks". The main window displays a message: "Some of the minimum requirements for installation are not completed. Review and fix the issues listed in the following table, and recheck the system." Below this message are buttons for "Check Again", "Fix & Check Again", "Show Failed", and "All Nodes", along with an "Ignore All" checkbox.

An "Execute Fixup Scripts" dialog box is open, providing instructions and a list of nodes. The dialog text includes: "Some of the prerequisites have failed on following nodes. Installer has generated a fixup script that can be run outside the installer to fix the issues. The following fixup script needs to be executed as the 'root' user on the given nodes\*." The script path is "/tmp/CVU\_11.2.0.1.0\_grid/runfixup.sh". The nodes listed are "rat-rm4-ipfix006", "rat-rm4-ipfix008", and "rat-rm4-ipfix007".

Below the nodes list, the dialog provides instructions: "To execute the fixup scripts: 1. Open a terminal window 2. Login as 'root' 3. Run the scripts 4. Return to this window and click 'OK' to continue".

At the bottom of the dialog, there are "OK" and "Cancel" buttons. A status bar at the bottom of the main window shows "Check Failed on Nodes: [rat-rm4-ipfix008, rat-rm4-ipfix007, rat-rm4-ipfix006]".

Status	Fixable
Failed	Yes
Failed	Yes
Failed	Yes
Failed	Yes



# Oracle Clusterware Upgrade 11g Release 2

## Cluster Verification

```
root> /tmp/CVU_11.2.0.1.0_grid/runfixup.sh

Response file being used is :/tmp/CVU_11.2.0.1.0_grid/fixup.response
Enable file being used is :/tmp/CVU_11.2.0.1.0_grid/fixup.enable
Log file location: /tmp/CVU_11.2.0.1.0_grid/orarun.log
Setting Kernel Parameters...
fs.file-max = 327679
fs.file-max = 6815744
net.ipv4.ip_local_port_range = 9000 65500
net.core.wmem_max = 262144
net.core.wmem_max = 1048576
uid=501(grid)gid=502(oinstall)groups=502(oinstall),
    503(asmadmin),504(asmdba)
```

# Oracle Clusterware Upgrade 11g Release 2

## Cluster Verification

Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 8 of 11

Perform Prerequisite Checks

ORACLE 11g  
DATABASE

Some of the minimum requirements for installation are not completed. Review and fix the issues listed in the following table, and recheck the system.

Ignore All

Checks	Status	Fixable
Checks		
Swap Size	Failed	
Network Time Protocol (NTP)	Failed	

This is a prerequisite condition to test whether sufficient total swap space is available on the system. [\(more details\)](#)

Check Failed on Nodes: [rat-rm4-ipfix008, rat-rm4-ipfix007, rat-rm4-ipfix006]

# Clusterware - ASM - DB Compatibility

Note:  
337737.1

Clusterware	ASM	DB
11.2	11.2(a)	11.2
11.2	11.2(a)	11.1
11.2	11.2(a)	10.2
11.1	11.1	11.1(b)
11.1	11.1	10.2
11.1	11.1	10.1
11.1	10.2	11.1
11.1	10.2	10.2
11.1	10.2	10.1
11.1	10.1(c)	11.1
11.1	10.1(c)	10.2
11.1	10.1	10.1
10.2	10.2	10.2
10.2	10.2	10.1
10.2	10.1(c)	10.2
10.2	10.1	10.1
10.1	10.1	10.1

- a) The Matrix is valid after the (rolling) upgrade has been completed. During the upgrade you may use an older ASM version.
- b) The ASM version needs to be at least 10.1.0.3



# Oracle Grid Infrastructure Patching

- Oracle Grid Infrastructure Patch Set 11.2.0.2:
  - 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 11.2.0.1 to GI 11.2.0.2:
  - Apply PSU 11.2.0.1.2 (or newer) in-place
  - 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



# Oracle **EXADATA** 11.2.0.2 Patching

- For patching 11.2.0.1 to 11.2.0.2 follow [all instructions](#) in [Note:1279458.1](#)

Exadata Database Machine Reference Guide for Upgrade 11.2.0.1 to 11.2.0.2

- MULTICAST is already setup correctly on a Database Machine V2
- For certification, recommendations, issues, current patches etc. see [Note:888828.1](#)  
Database Machine and Exadata Storage Server 11.2 Supported Versions



# Oracle Clusterware & ASM Upgrade

- Documentation:
  - Oracle Clusterware Administration and Deployment Guide 11g  
[http://download.oracle.com/docs/cd/E11882\\_01/rac.112/e16794/toc.htm](http://download.oracle.com/docs/cd/E11882_01/rac.112/e16794/toc.htm)
- Grid Infrastructure Upgrade Known Issues:
  - [Note: 948456.1](#)  
Pre 11.2 Database Issues in 11gR2 Grid Infrastructure
- Oracle Clusterware rolling upgrade:
  - [Note: 338706.1: Oracle Clusterware Rolling Upgrades](#)
- RAC Best Practices Starter Kit:
  - [Note:810394.1](#)
- Upgrading an ASM instance with OUI within Oracle Clusterware upgrade: OUI or `asmca -upgrade`
  - [http://download.oracle.com/docs/cd/E11882\\_01/server.112/e16102/asmca.htm#sthref586](http://download.oracle.com/docs/cd/E11882_01/server.112/e16102/asmca.htm#sthref586)

# Agenda

○ Preparation

● Installation

○ Upgrade

○ News and Task List

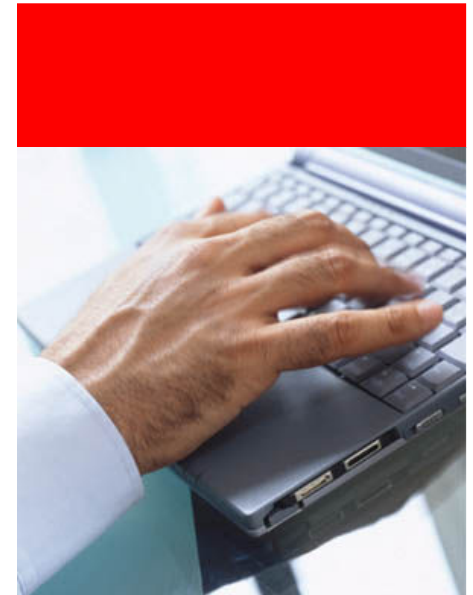
○ Diagnostics & Tuning

○ Performance Testing

○ Best Practices

Installation Overview  
Oracle Clusterware & ASM

Installation  
Patches  
Time Zone  
Unattended





# Installation Database Home 11.2

Install newest **PATCH SET** (full install release since 11.2) into a new Oracle home

Apply newest available patch set update (**PSU**)

Apply recommended (bundled) patches (**BP**)

Apply **one-off** patches for known issues

**Now: Start the database upgrade!!!**

# Installation - Loopback Adapter for DBcontrol

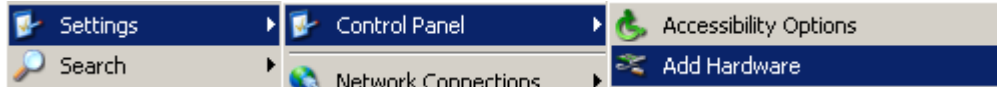


- Microsoft Loopback Adapter is recommended if IP address is distributed via **DHCP**
  - Install the **MS Loopback Adapter**
    - Launch the *Add Hardware* wizard and install a new network adapter - manufacturer is *Microsoft*
  - Adjust this adapter to be the primary network adapter
    - *My Network Places* => *Properties* => *TCP/IP*
      - IP address: 10.10.10.10
      - Subnet mask: 255.255.255.0
  - Edit:
    - `\windows\system32\drivers\etc\hosts`
      - 10.10.10.10 mycomputer.mydomain.com mycomputer
- [http://download.oracle.com/docs/cd/B28359\\_01/install.111/b32006/reqs.htm#sthref291](http://download.oracle.com/docs/cd/B28359_01/install.111/b32006/reqs.htm#sthref291)

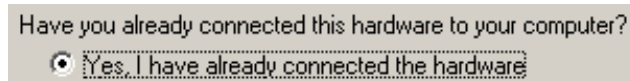
# Installation - Loopback Adapter for DBcontrol



- Launch the Windows *Add Hardware Wizard*



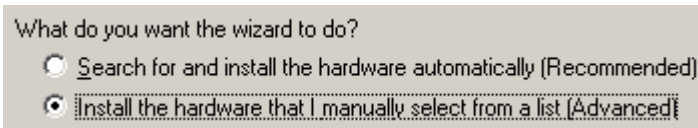
- Choose *Yes, I've already connected the hardware ...*



- Scroll down to *Add a new hardware device*



- Choose *Install the hardware that I manually select ...*



- Select *Network Adapters*:
- Click on Manufacturer *Microsoft*
- Install the *Loopback Adapter*
- Make the Loopback Adapter the **FIRST** network card in TCP/IP properties!!





# Installation

- Space / resource requirements
  - RAM:  $\geq$  1GB
  - Software installation:
    - 1GB in /tmp or \TEMP necessary
    - Between 3 GB (Windows), 3.9 GB (Linux32) and 7 GB (HP-UX)
  - Seed database:  $\geq$  1.7 GB
    - Seed databases (ORCL) are always prebuilt EE databases with all options!!!
  - Swap space
    - Between 1 GB and 2 GB: 1.5 times the size of RAM
    - Between 2 GB and 16 GB: Equal to the size of RAM
    - More than 16 GB: 16 GB

# Installation **11g Release 2**

- [Note.884232.1](#) 11.2 Changes with all new 11.2 OUI



# Installation 11g Release 2

Oracle Database 11g Release 2 Installer - Installing database - Step 1 of 11

**Configure Security Updates**

Provide your email address to be informed of security issues, install the product and initiate configuration manager. [View details.](#)

Email:

Easier for you if you use your My Oracle Support email address/username.

I wish to receive security updates via My Oracle Support.

Oracle Support Password:

This will configure OCM (Oracle Configuration Manager)

Help < Back Next > Install Cancel

# Installation 11g Release 2

The screenshot shows the Oracle Database 11g Release 2 Installer window. The title bar reads "Oracle Database 11g Release 2 Installer - Installing database - Step 2 of 11". The main window has a header with the Oracle logo and "11g DATABASE". The left sidebar contains a navigation tree with the following items: "Configure Security Updates", "Download Software Updates" (highlighted), "Apply Software Updates", "Installation Option", "Grid Installation Options", "Install Type", "Typical Installation", "Prerequisite Checks", "Summary", "Install Product", and "Finish".

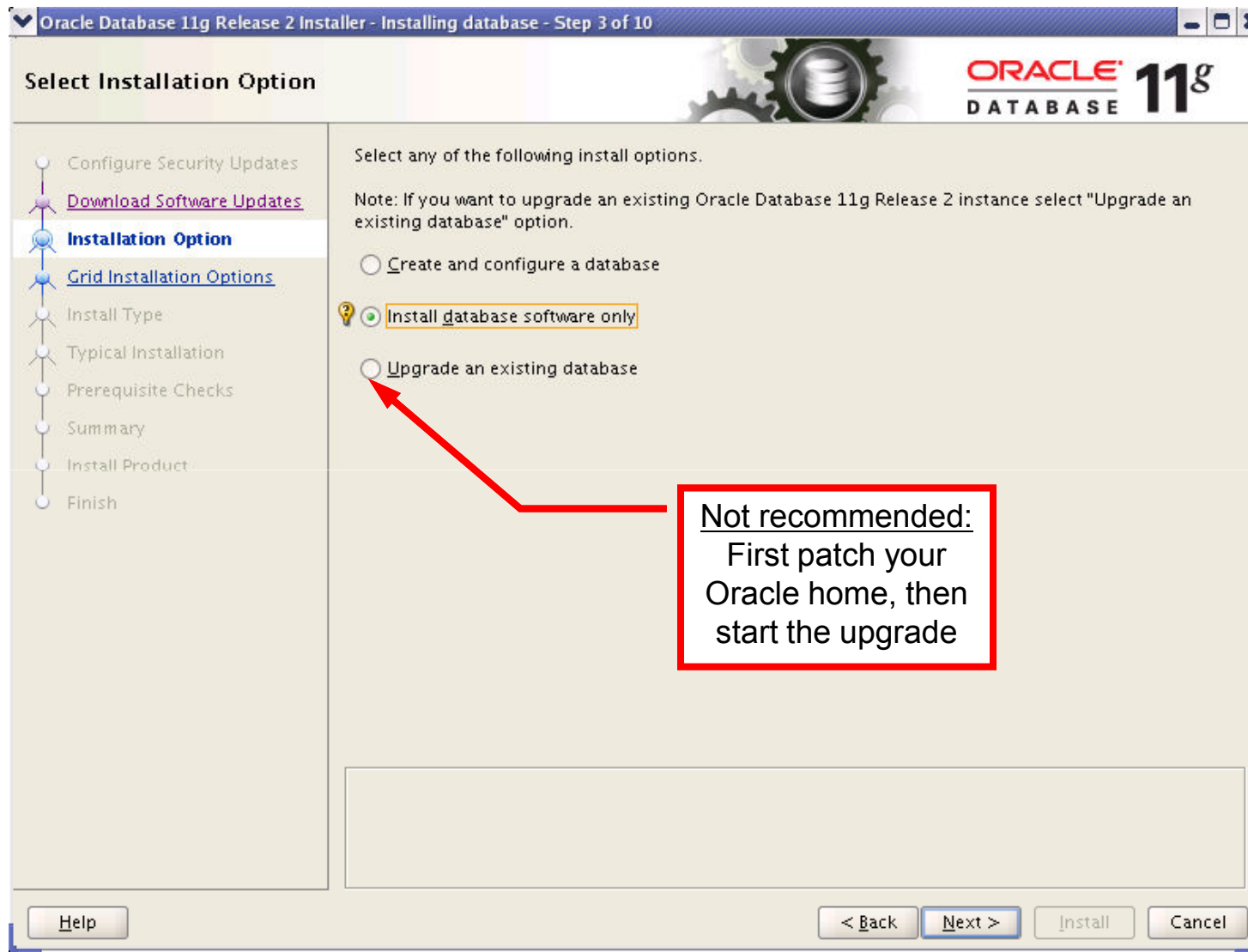
The main content area is titled "Download Software Updates" and contains the following text: "Download software updates for this installation. Software updates include patch updates available after initial release that are important for completing a successful installation. They may consist of updates to the installer system requirement checks, patchset updates (PSUs), and other patches. Be aware that they may not include all patch updates to the software."

Below this text, it says "Select one of the following options:"

- Use My Oracle Support credentials for download
  - My Oracle Support user name:
  - My Oracle Support password:
  -
- Use pre-downloaded software updates
  - Location:
- Skip software updates

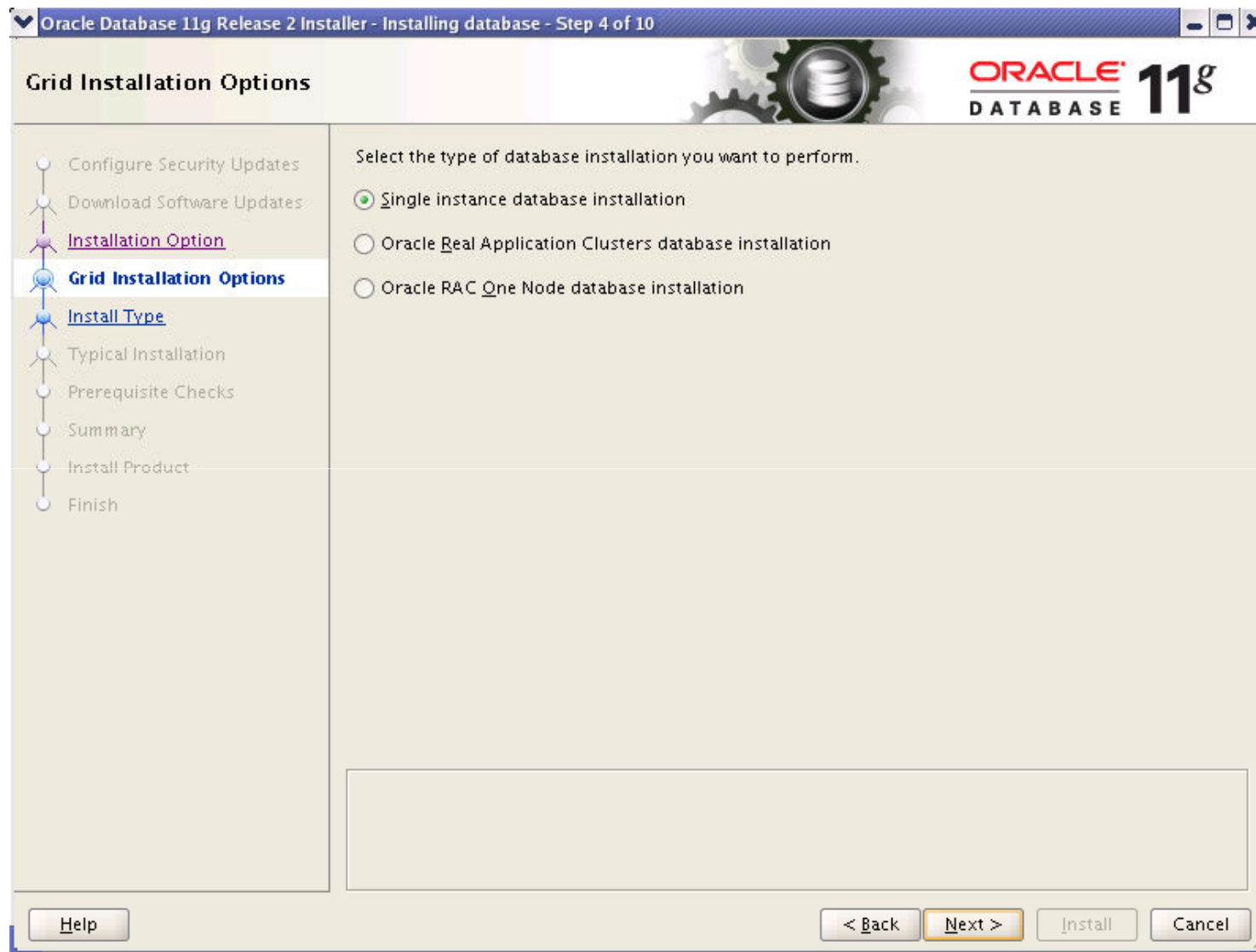
At the bottom of the window, there are four buttons: "Help", "< Back", "Next >" (highlighted), "Install", and "Cancel".

# Installation 11g Release 2

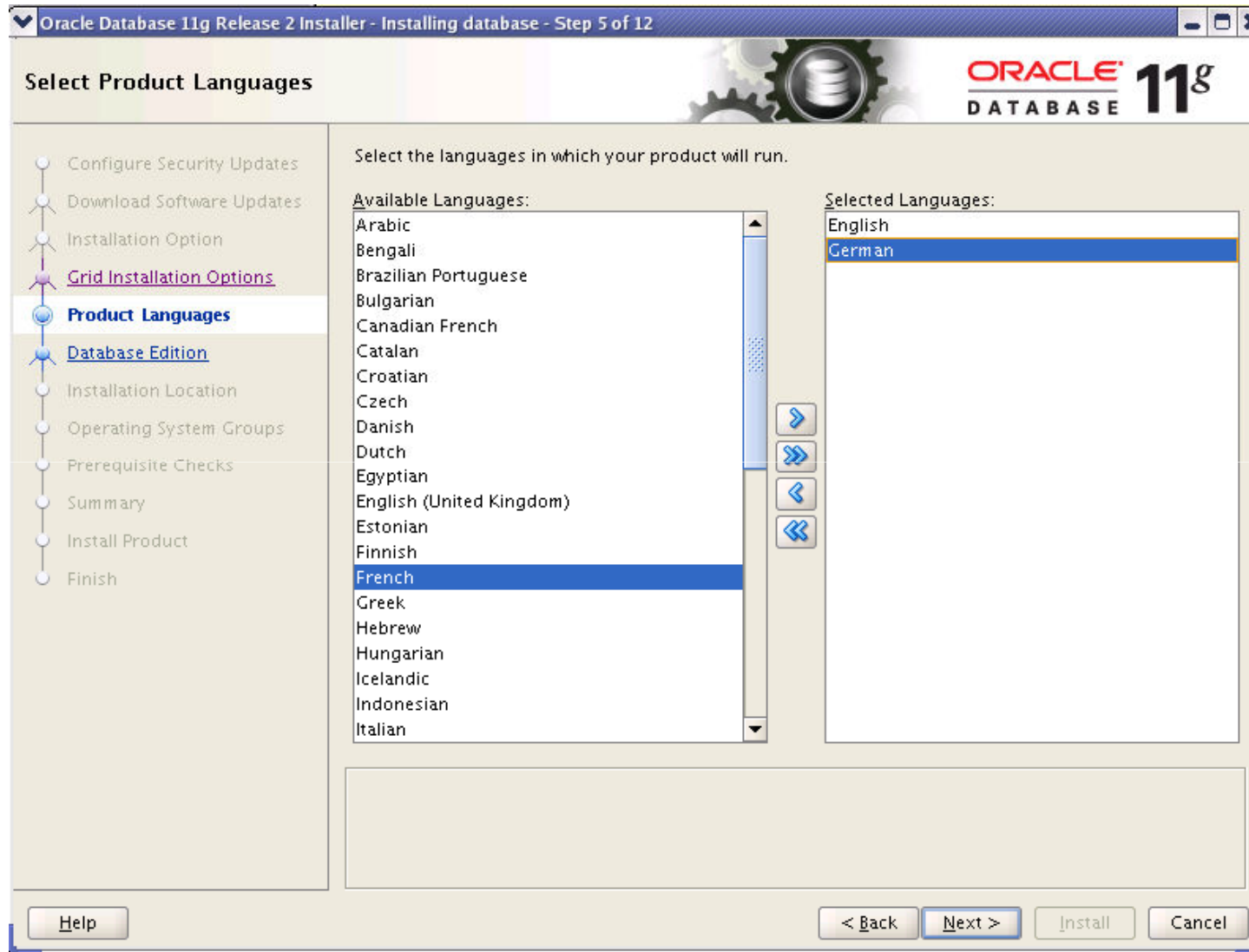




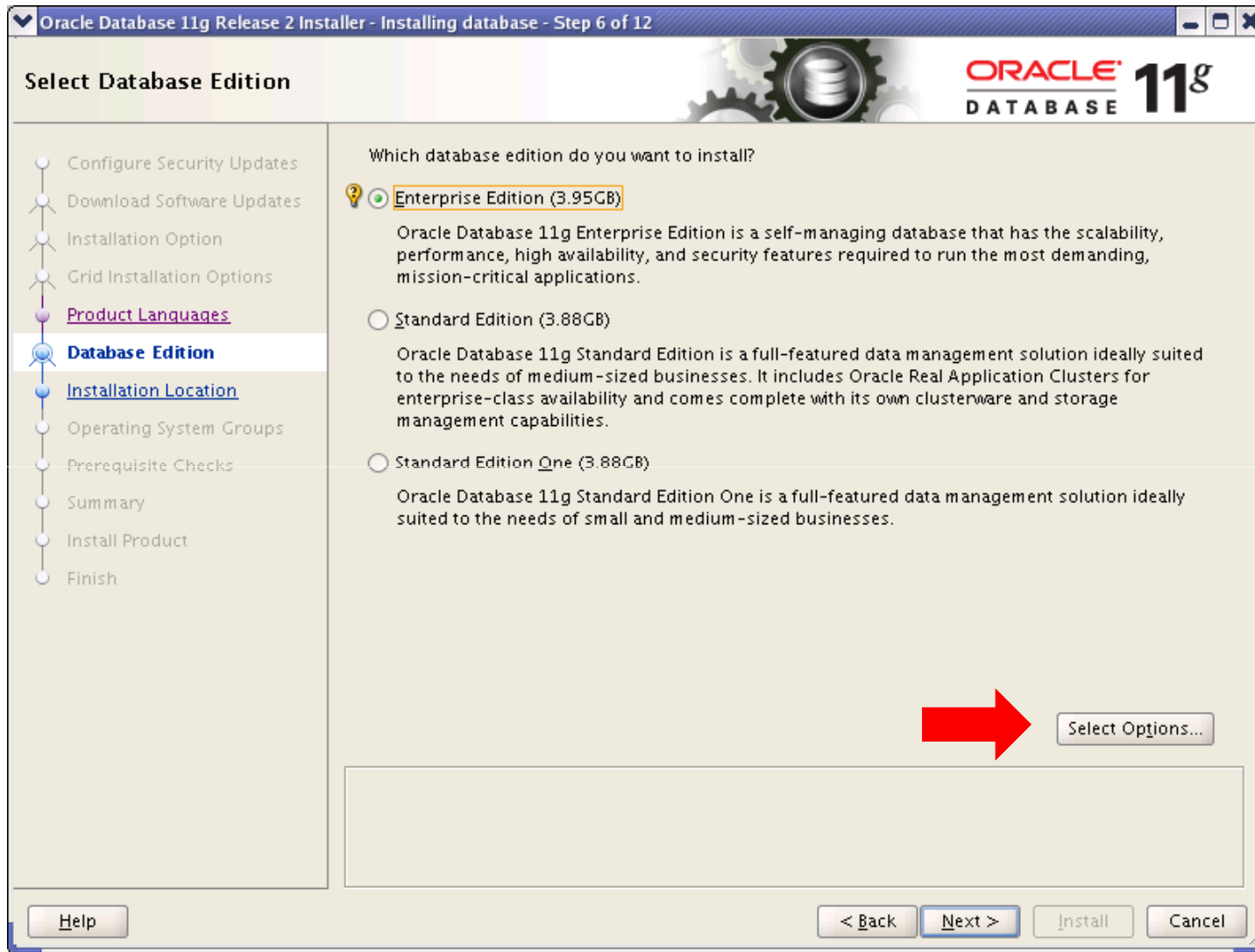
# Installation 11g Release 2



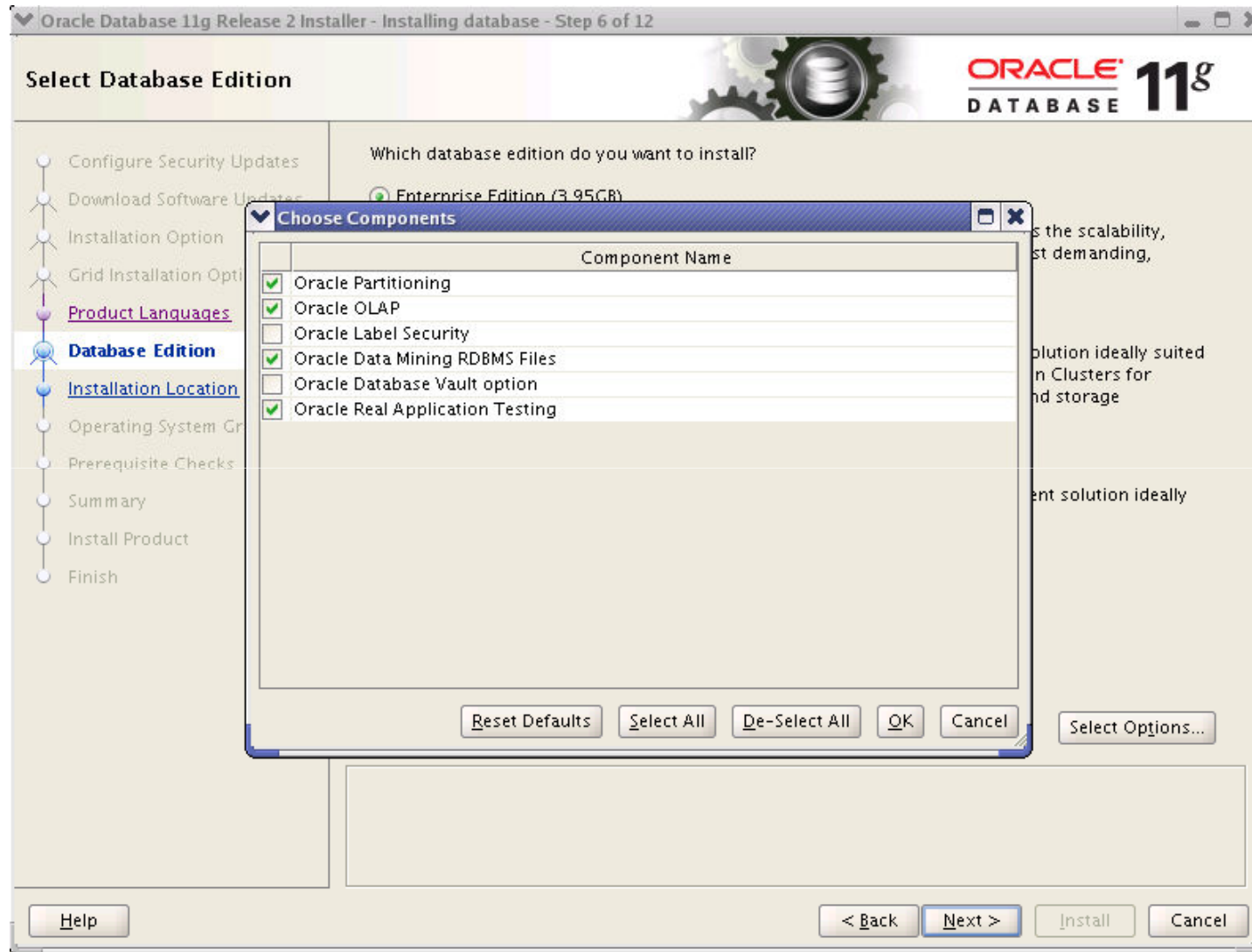
# Installation 11g Release 2



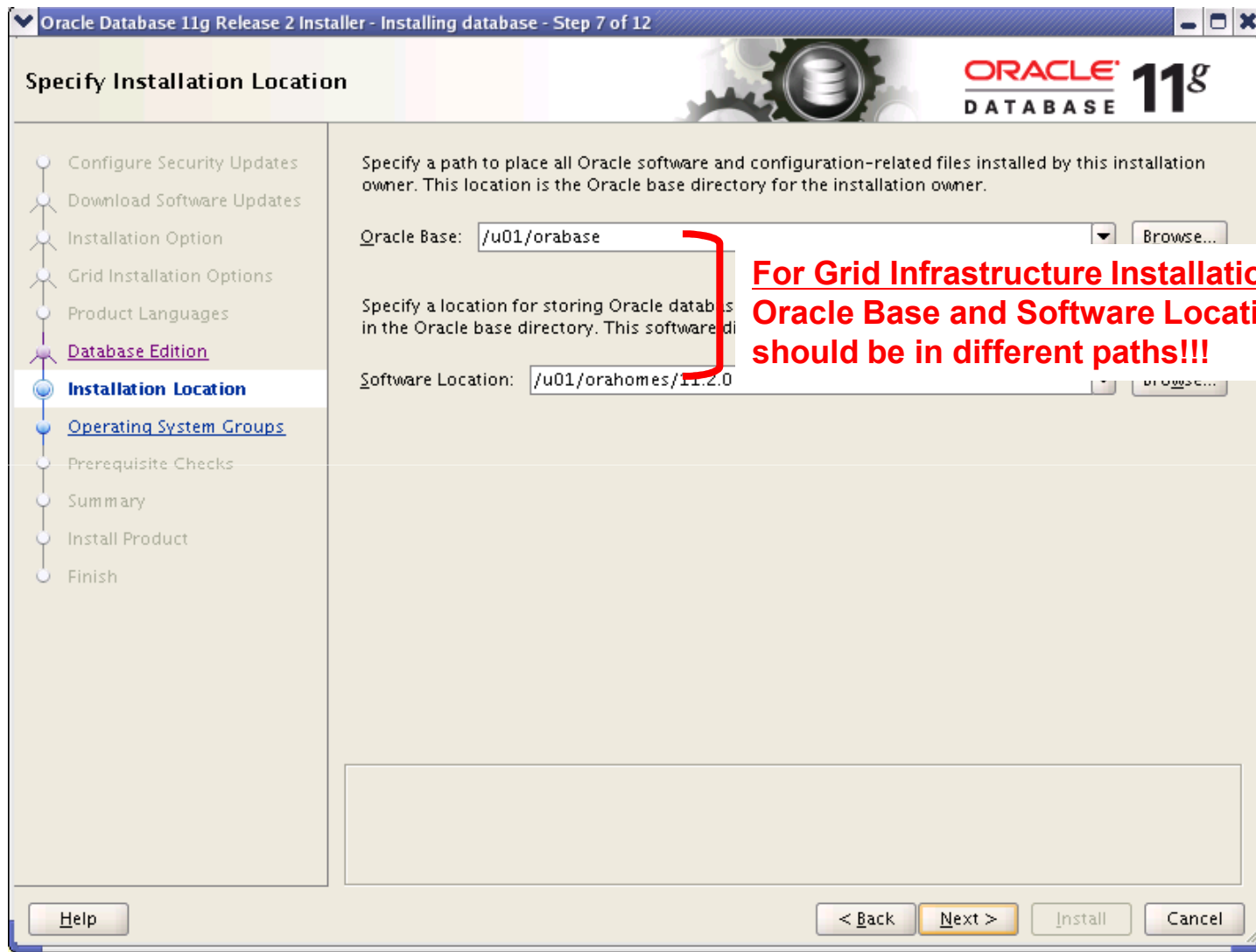
# Installation 11g Release 2



# Installation 11g Release 2

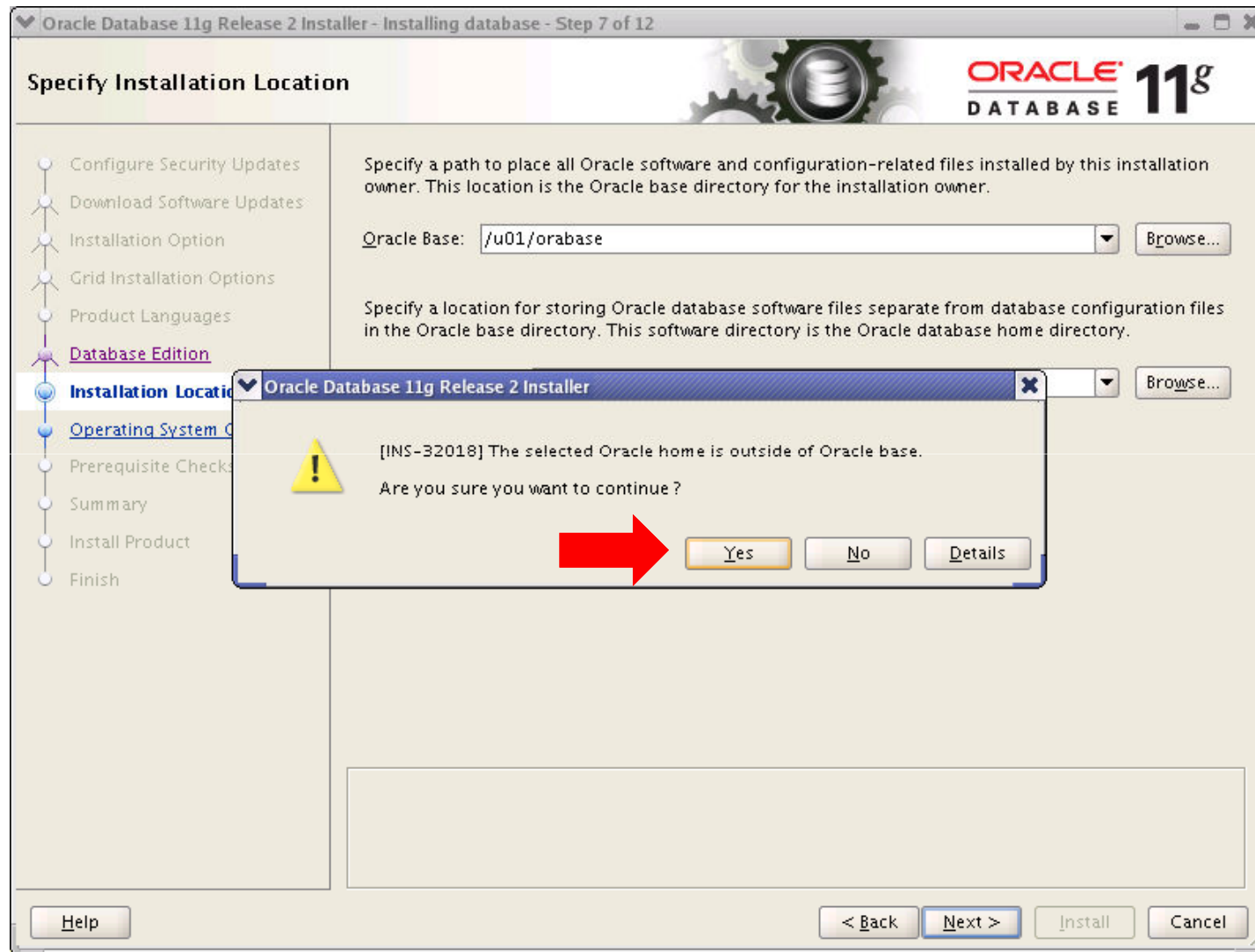


# Installation 11g Release 2

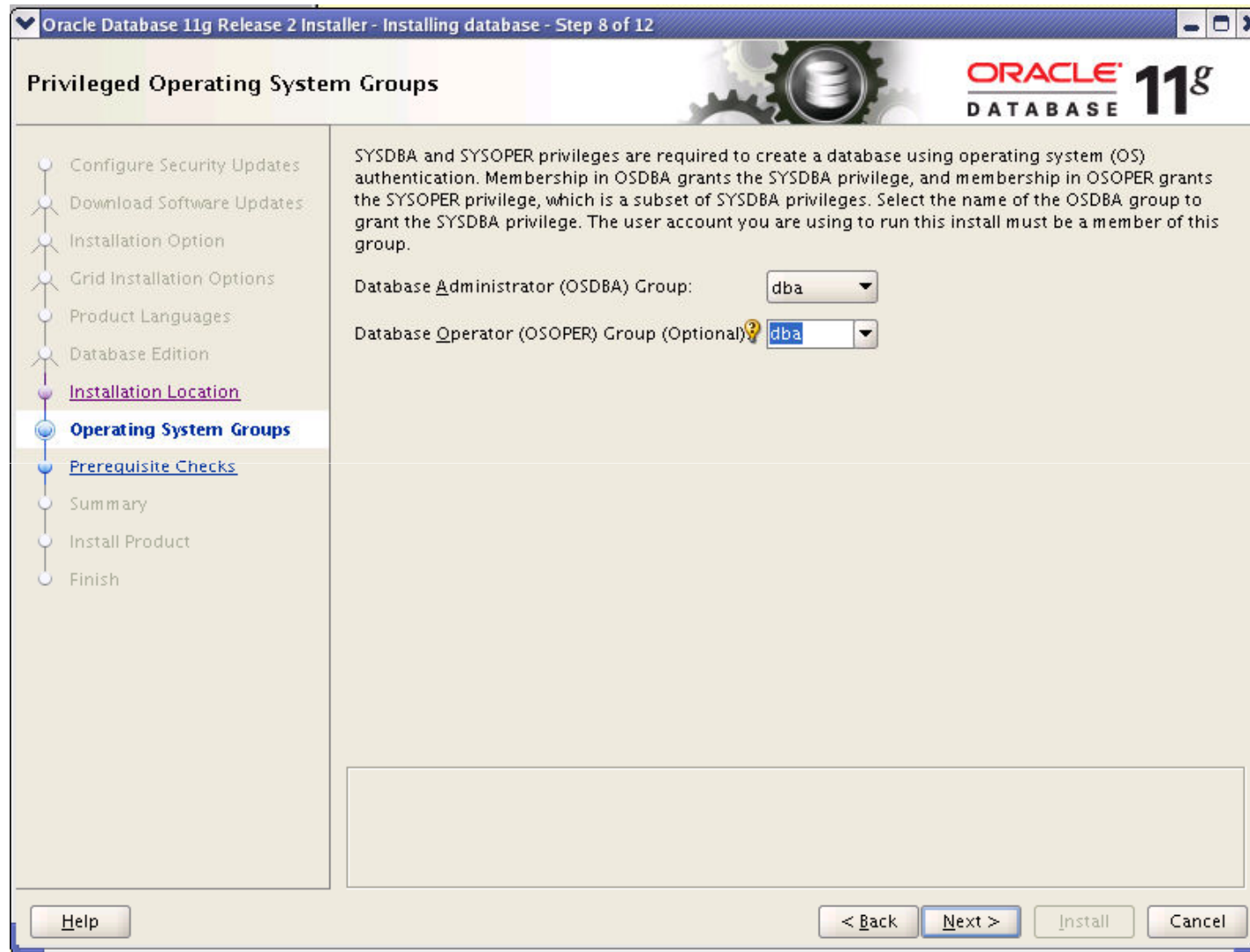


**For Grid Infrastructure Installations:  
Oracle Base and Software Location  
should be in different paths!!!**

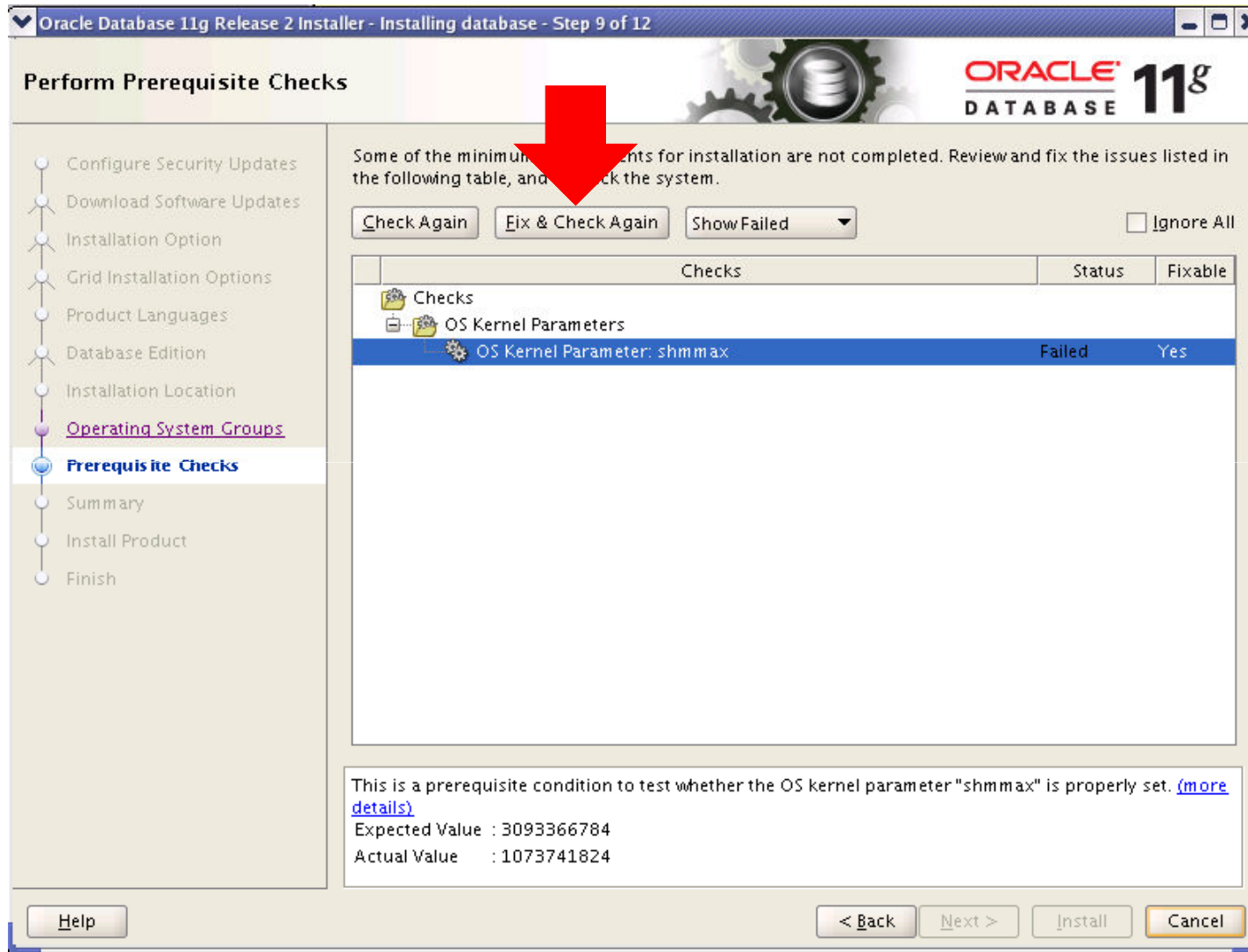
# Installation 11g Release 2



# Installation 11g Release 2



# Installation 11g Release 2



Oracle Database 11g Release 2 Installer - Installing database - Step 9 of 12

### Perform Prerequisite Checks

Some of the minimum requirements for installation are not completed. Review and fix the issues listed in the following table, and check the system.

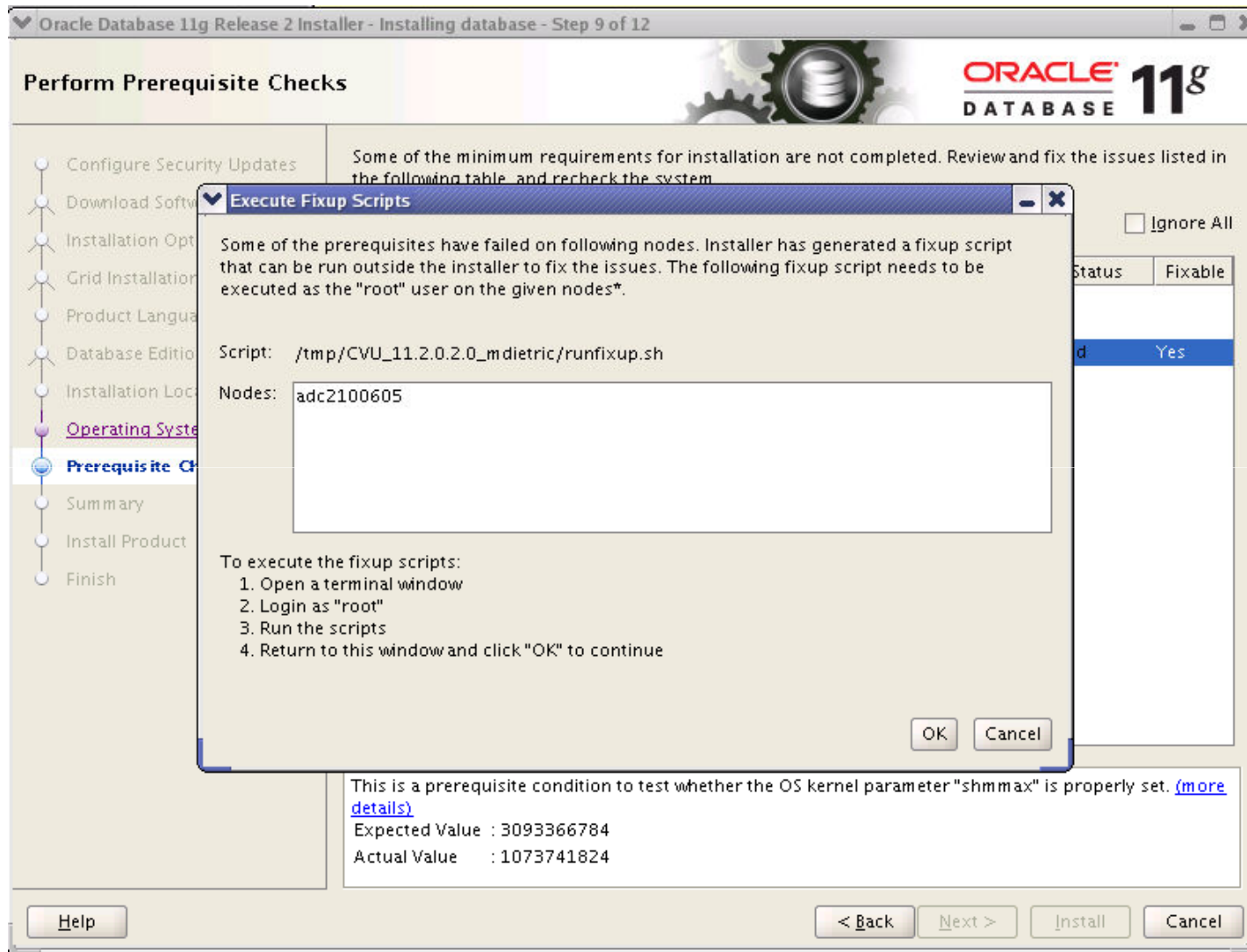
Ignore All

Checks	Status	Fixable
OS Kernel Parameters		
OS Kernel Parameter: shmmax	Failed	Yes

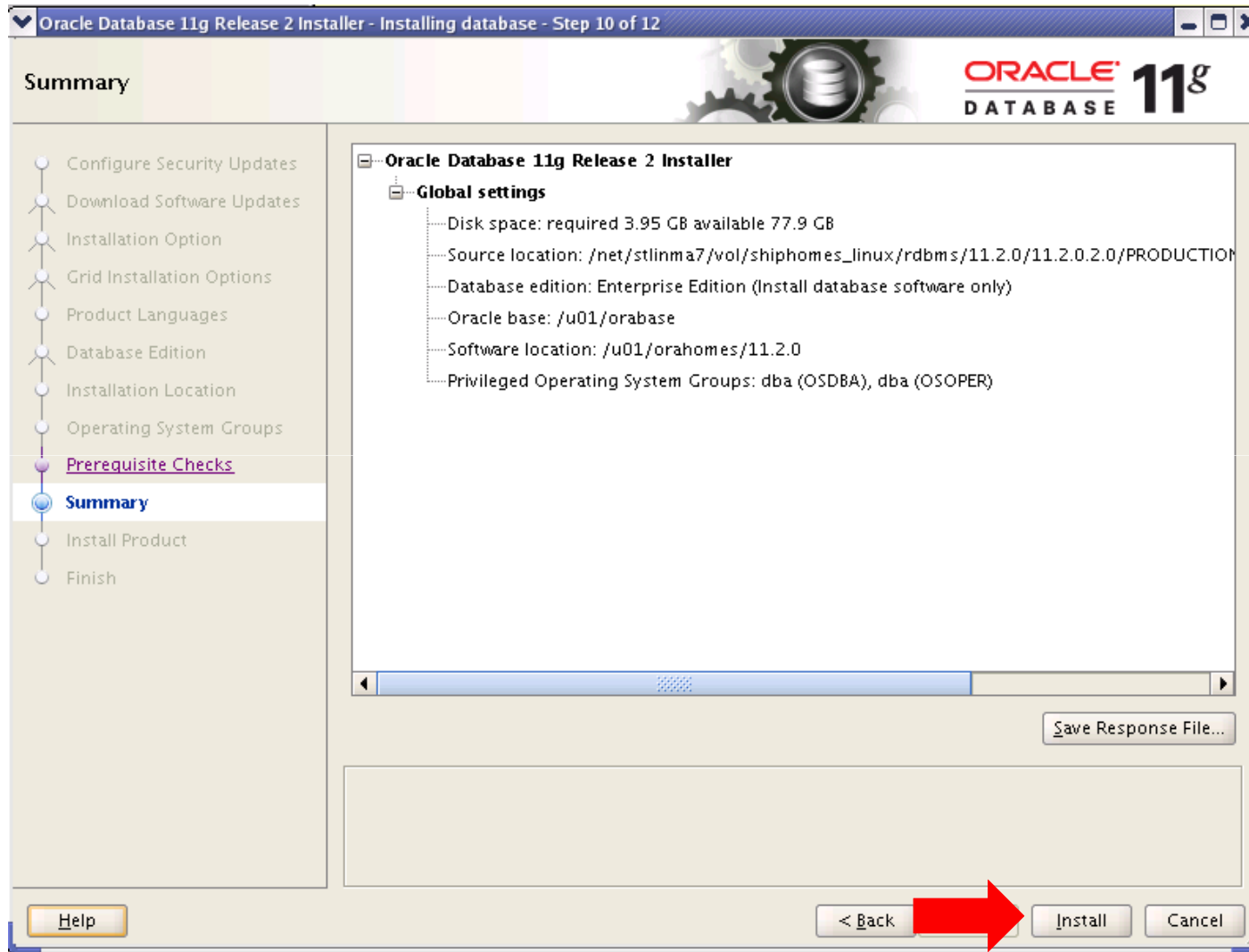
This is a prerequisite condition to test whether the OS kernel parameter "shmmax" is properly set. ([more details](#))  
Expected Value : 3093366784  
Actual Value : 1073741824



# Installation 11g Release 2



# Installation 11g Release 2



# Installation 11g Release 2

Oracle Database 11g Release 2 Installer - Installing database - Step 11 of 12

### Install Product

Progress: 15%  
Extracting files to '/u01/orahomes/11.2.0'.

Status:

Task	Status
Oracle Database installation	In Progress
• Prepare	Succeeded
• Copy files	In Progress
• Link binaries	Pending
• Setup files	Pending
Execute Root Scripts for Oracle Database installation	Pending

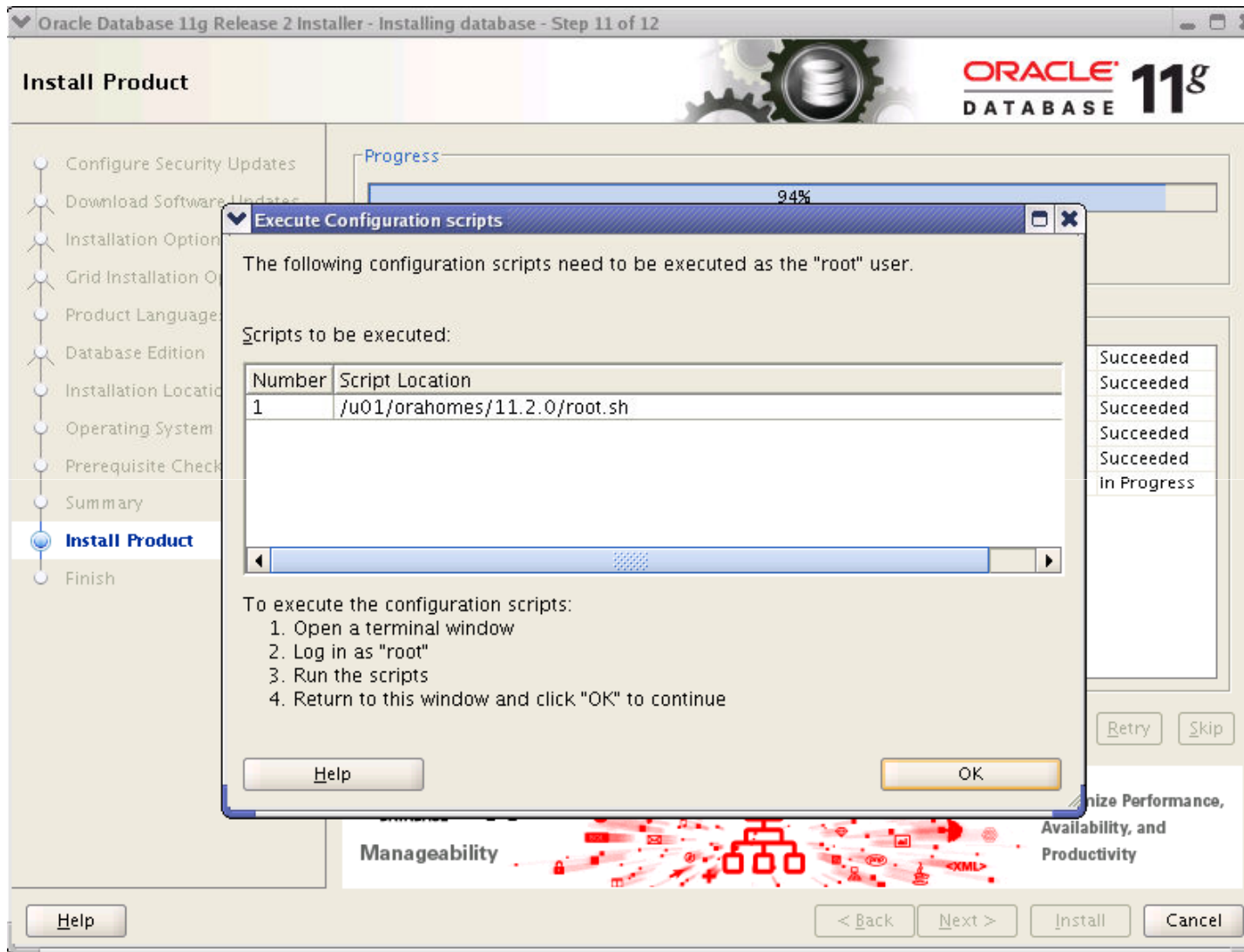
Details:

Verifying whether Central Inventory is locked by any other process  
Central Inventory is not locked.  
Loading products list. Please wait.  
Loading products. Please wait.  
Analyzing dependencies  
Setting up install types  
Executing pre-requisites  
Loading Oracle Database 11g  
Loading Enterprise Edition Options  
Loading Oracle Partitioning  
Loading Oracle Spatial

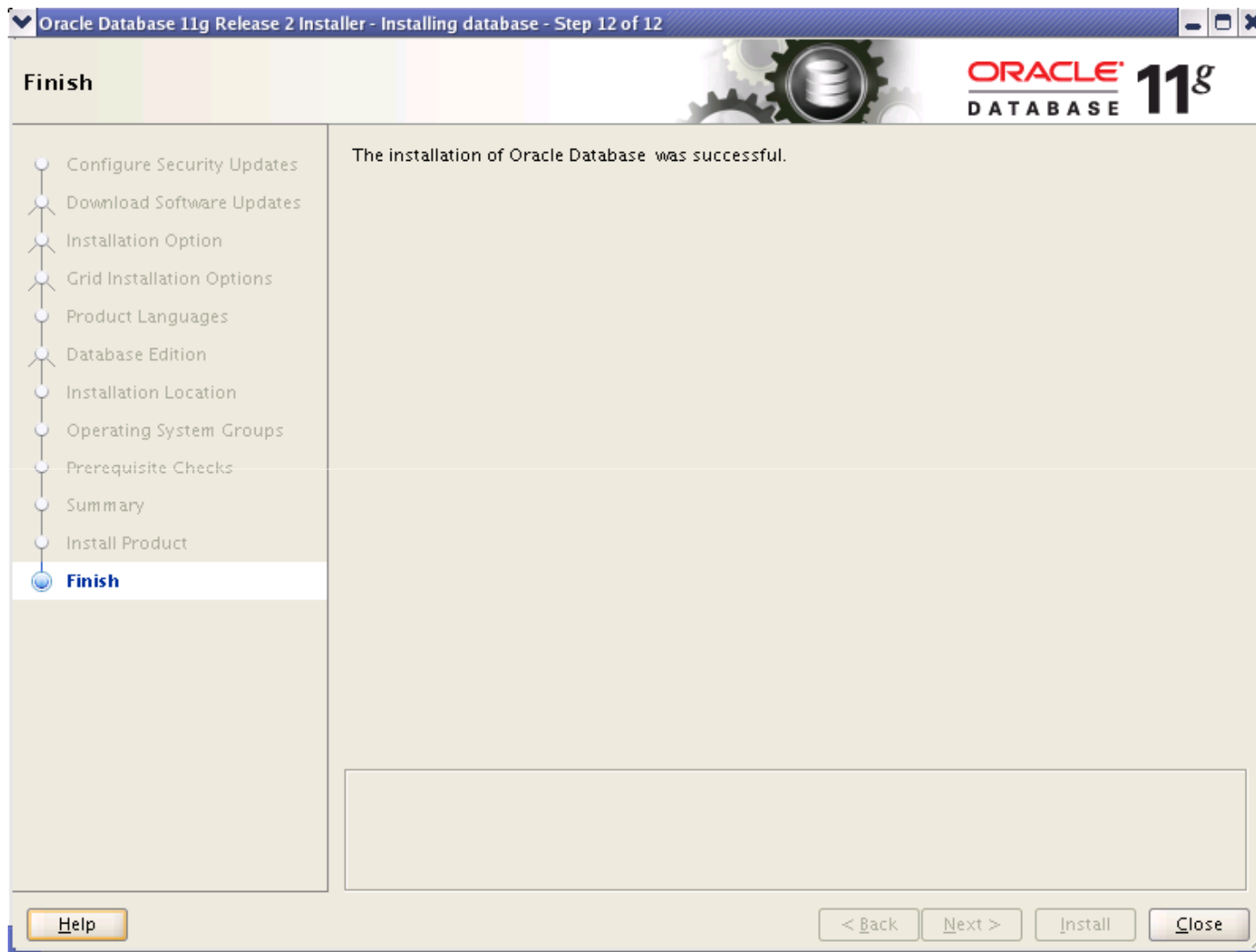
Log File: /u01/orabase/logs/installActions2010-12-01\_0

Buttons: Details, Retry, Skip, < Back, Next >, Install, Cancel

# Installation 11g Release 2



# Installation 11g Release 2



# Agenda

○ Preparation

● Installation

○ Upgrade

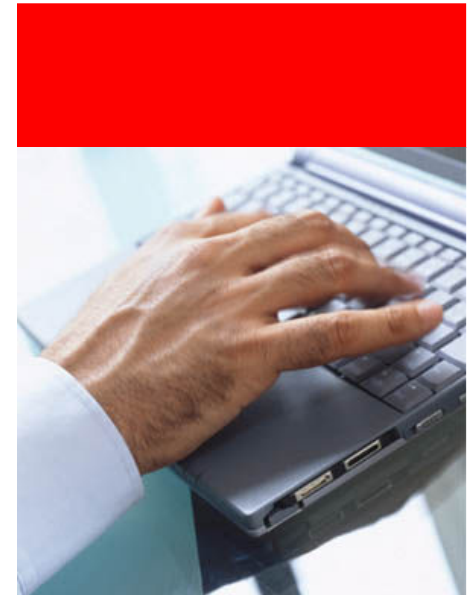
○ News and Task List

○ Diagnostics & Tuning

○ Performance Testing

○ Best Practices

Installation Overview  
Oracle Clusterware & ASM  
Installation  
Patches  
Time Zone  
Unattended



# Patch Set Installation 11.2.0.2

- Download patch set 11.2.0.2 from [support.oracle.com](http://support.oracle.com):

The screenshot shows the Oracle My Oracle Support interface. The 'Patching Quick Links' panel on the left contains several sections: 'Software and Patch Search Sites' with links for 'Updates by E-Delivery' and 'PeopleSoft'; 'Oracle E-Business Suite' with links for 'Latest R12 Packs' and 'Latest 11i Packs'; and 'Oracle Server and Tools' with a link for 'Latest Patchsets'. A red arrow points to this 'Latest Patchsets' link. The 'Patch Search' panel on the right shows search criteria for 'Patch Name, Number or Sun CR ID' and 'Platform' set to 'Linux x86'. Below the search panel, there are tabs for 'Plans' and 'Patch Requests'.

Pat	Description	Release	Updated	Size
<a href="#">10098816</a>	<b>Oracle Database Family:</b> Patchset 11.2.0.2.0 PATCH SET FOR ORACLE DATABASE SERVER	11.2.0.2.0	13-SEP-2010	4.8G
<b>Total: 1</b>				

# Patch Set Installation 11.2.0.2

- Default: **out-of-place patch** upgrade!!! It's a full release!!!
  - If you specify an in-place patch upgrade from 11.2.0.1 to 11.2.0.2:

The screenshot shows the Oracle Database 11g Release 2 Installer window at Step 7 of 12, titled "Specify Installation Location". The "Oracle Base" field is set to "/oracle/u01/app/oracle". An error dialog box is displayed over the installer, with a red 'X' icon and the following text:

**[INS-35432]** The installer has detected that the software location you have specified contains Oracle Database software version 11.2.0.1.0. Oracle recommends that when upgrading to 11.2.0.2.0, you perform an out-of-place installation of the software into a new Oracle home and then upgrade the database using the new software binaries.

The error dialog also includes a "Cause" section: "The installer has detected that the software location you have specified contains Oracle Database software version 11.2.0.1.0." and an "Action" section: "Perform an out-of-place upgrade. This allows you to perform the upgrade with less downtime and more stability, due to the non-destructive nature of the software installation. It is possible to perform the upgrade and maintain the same software location as before. This involves taking a backup of the old Oracle home prior to upgrading and moving the old binaries aside before installing the new binaries into the same location. Refer to the Oracle Database Upgrade Guide for more information." The installer window has buttons for "Help", "< Back", "Next >", "Install", and "Cancel".



# Patch Set Installation 11.2.0.2

- Patch set 11.2.0.2 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 11.2.0.2 into the previous 11.2.0.1 home
- Restore `/dbs` and `/network/admin` files
- Upgrade your database with DBUA or `catupgrd.sql`

# Patch Set Installation 11.2.0.2

- Recommendation: **out-of-place patch** upgrade!!!
  - In case an in-place patch upgrade is required:

## **\*Steps for in-place upgrade\***

### **/\*Single Instance Database\*/**

1. Back up of the configuration data i.e; ORACLE\_HOME/dbs and ORACLE\_HOME/network/admin directories.
2. **Detach the 11.2.0.1 ORACLE\_HOME with the following command**  
`./runInstaller -detachHome ORACLE_HOME=<11.2.0.1.0 software location>`
3. Remove 11.2.0.1.0 ORACLE\_HOME software directory.
4. Install 11.2.0.2.0 Software Only into the same location as 11.2.0.1.
5. Restore the back-ed up configuration data files (dbs and network/admin) onto 11.2.0.2 ORACLE\_HOME software location.
6. Run the DBUA from ORACLE\_HOME/bin directory and select the 11.2.0.1.0 database instance to upgrade it to 11.2.0.2.0.

### **/\*Real Application Clusters Database Instance\*/**

1. Back up ORACLE\_HOME/dbs and ORACLE\_HOME/network/admin directories on all the cluster nodes.
2. Run the following command on each of the node to detach the 11.2.0.1.0 RAC DB ORACLE\_HOME  
`./runInstaller -detachHome ORACLE_HOME=<11.2.0.1.0 software location>`
3. Remove 11.2.0.1.0 RAC DB ORACLE\_HOME directory on all the nodes.
4. Install 11.2.0.2 Software only on all nodes.
5. Restore the back-ed up configuration data file (dbs and network/admin) onto 11.2.0.2 ORACLE\_HOME software location on all the nodes.
6. Run the DBUA from 11.2.0.2 ORACLE\_HOME/bin directory on the local node and select 11.2.0.1.0 rac database instance to upgrade it to 11.2.0.2.0



# Recommended Patches

- Recommended Patches: [Note:756388.1](#)

Introduction to Oracle Recommended Patches [ID 756388.1]

Modified 02-AUG-2010 Type ANNOUNCEMENT Status PUBLISHED

[ Japanese information: 日本語版は [こちら](#) ]

## 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	<a href="#">Note:756671.1</a>
Oracle Enterprise Manager	<a href="#">Note:822485.1</a>
Oracle Fusion Middleware	<a href="#">Note:859115.1</a>

*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 13-OCT-2010    Type ANNOUNCEMENT    Status PUBLISHED

## Oracle Recommended Patches -- Oracle Database

- [Target Configurations](#)
- [Patch Availability](#)
- [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



# Patch Set Update (PSU) Installation

- Install **PSUs** as well
  - [Note:854428.1](#): Introduction to Database Patch Set Updates
  - 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 **50-100 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

# Important Alerts?

- Check for important alerts: [Note:161818.1](#)

Oracle Database Releases Status Summary

<a href="#">Release</a> <small>(Click to see Details)</small>	<a href="#">Current Patch Set</a>	<a href="#">Next Patch Set</a>	<a href="#">Premier Support Ends</a>	<a href="#">Extended Support Ends</a>	Notes
<a href="#">11.2.0.X</a>	11.2.0.2	11.2.0.3	Jan-2015	Jan-2018	Base release is 11.2.0.1. 11.2.0.2 Patch Set is a full release
<a href="#">11.1.0.X</a>	11.1.0.7	None	Aug-2012	Aug-2015	Base release is 11.1.0.6. 11.1.0.7 is the <a href="#">terminal</a> 11.1 Patch Set
<a href="#">10.2.0.X</a>	10.2.0.5	None	Jul-2010	Jul-2013 First year of Extended Support to be free of charge.	10.2.0.5 is the <a href="#">terminal</a> 10.2 Patch Set. Upgrade to 10.2.0.5 is <b>not</b> required immediately upon start of Extended Support. The end patching dates for 10.2.0.4 can be found in <a href="#">Note.742060.1</a> .
<a href="#">10.1.0.X</a>	10.1.0.5	None	Jan-2009	Jan-2012	10.1.0.5 is the <a href="#">terminal</a> 10.1 Patch Set. 10.1 is now in Extended Support - see <a href="#">Note.761713.1</a>
<a href="#">9.2.0.X</a>	9.2.0.8	None	Jul-2007	Jul-2010 Limited Extended Support is available from July 2010 to July 2012 on selected platforms. <a href="#">See the "Extended Support" details here</a>  First year Extended Support was free for 9.2	9.2.0.8 is <a href="#">terminal</a> 9.2 Patch Set. The Free Extended Support period ended on 31-Jul-2008. See <a href="#">Note.392222.1</a>



# Upgrade Information / Alerts

- Known issues in 11.2.0.x? See [Note:880782.1](#)

## Base Release Information

Information in this section is relevant for the 11.2.0.1 Base Release and for 11.2 Patch Sets.

### Support Status

For details of 11.2 desupport dates see the [Lifetime Support Policy](#)

### Upgrade Information / Alerts

Interoperability support between Oracle Releases [Note:207303.1](#)

### Notification of Changes in Future Releases

CURSOR\_SHARING SIMILAR setting to be deprecated [Note:1169017.1](#)

## 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
11.2.0.2	Oracle 11g Release 2 Patch Set 1 <a href="#">Availability and Known issues for 11.2.0.2</a> <a href="#">Note:1179474.1</a> <a href="#">List of fixes included in 11.2.0.2</a> <a href="#">Note:1179563.1</a>
11.2.0.1	Oracle 11g Release 2 Base Release. <a href="#">Availability and Known issues for 11.2.0.1</a> <a href="#">Note:880707.1</a>

# Upgrade Information / Alerts

- Known issues in 11.2.0.2? See [Note:1179474.1](#)

## 11.2.0.2 Alerts / Issues

This section lists alerts and important issues relevant to 11.2.0.2 .

### General Alerts / Issues

Bug/Doc	Description	Updated
<a href="#">Note:1191474.1*</a>	Corrupt Undo. ORA-600 [2015] during transaction rollback in undo block for COMPRESS table	14/Dec/2010

### Upgrade Issues

Bug/Doc	Description	Updated
<a href="#">Note:1268390.1</a>	roothas.pl -patch / rootcrs.pl -patch Fail with 'Undefined subroutine'	14/Dec/2010
<a href="#">10036834P</a>	Linux Platforms: Patches not found upgrading Grid Infrastructure from 11.2.0.1 to 11.2.0.2	16/Sep/2010

## Notable fixes included in 11.2.0.2

This section lists fixes / enhancements in 11.2.0.2 which may cause a notable change in behaviour.

<a href="#">7691270</a>	Crash the DB in case of write errors (rather than just offline files)
-------------------------	---

## Issues introduced in 11.2.0.2

This section lists bugs **introduced** in 11.2.0.2 (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

Bug/Doc	Description	Updated
<a href="#">10196871</a>	ORA-600 [kkfdjoi:kkfdnpart_DIM2] from parallel query	09/Nov/2010
<a href="#">10142788</a>	Using pl/sql ncomp in 11.2.0.2 can result in ORA-4030 "out of process memory" and/or shared object files not being cleaned up	19/Nov/2010
<a href="#">10013431</a>	Hang / ORA-32701 during / after startup in RAC	05/Nov/2010





# Recommended OS patches

- [Note:169706.1](#): OS Installation and Configuration

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* 06-OCT-2010    *Type* BULLETIN    *Status* PUBLISHED

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[HP-UX \(PA-RISC and Itanium\)](#)

[Linux x86](#)

[Linux x86-64](#)

[Linux Itanium](#)

[Linux on Power](#)

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[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



# Standby-First-Patching

- Oracle Data Guard **Standby-First Patch Apply**
  - [Note:1265700.1 - Data Guard Standby-First Patch Apply](#)
  - Apply a patch first on the physical standby site
  - Different software releases allowed between primary and standby
    - Role transitions allowed for rolling upgrades
  - Supported for:
    - Oracle Exadata Database Machine bundled patch
    - Oracle Exadata Storage Server Software patch
    - Patch Set Update (PSU)
    - Critical Patch Update (CPU)
    - One-off patch
  - Available beginning with Oracle Database 11.2.0.1
    - RDBMS COMPATIBLE must remain the same
    - ASM COMPATIBLE can be different

# Agenda

○ Preparation

● Installation

○ Upgrade

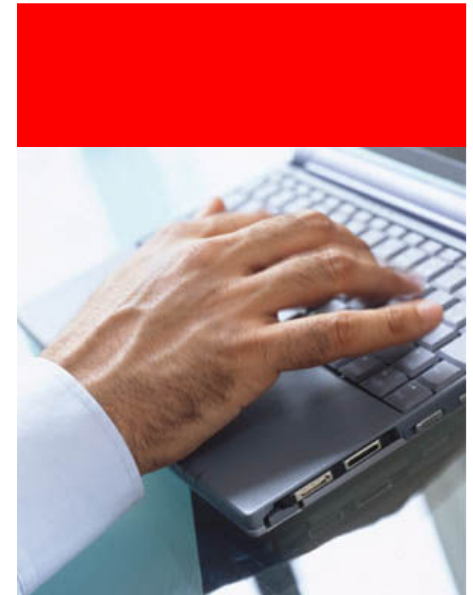
○ News and Task List

○ Diagnostics & Tuning

○ Performance Testing

○ Best Practices

Installation Overview  
Oracle Clusterware & ASM  
Installation  
Patches  
Time Zone  
Unattended



# Time Zone Patches

- Taken from an Oracle internal information email:



## **In the Know** News for Oracle Employees

3 MAR 2010

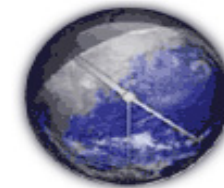
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ARCHIVES  
In the Know  
Archives

### **Take Note: Daylight Saving Time is Beginning and Ending in Several Countries**

Approximately 80 countries observe some form of Daylight Saving Time, and many are moving their clocks backward or forward at this time of year. For example

- **Brazil** Daylight Saving Time ended in most locations on **February 21, 2010** (clocks moved back one hour).
- **U.S. and Canada** Daylight Saving Time begins in most locations on **March 14, 2010** (clocks move forward one hour).
- In many **European countries**, Daylight Saving Time begins on **March 28, 2010** (clocks move forward one hour).
- **Australia** Daylight Saving Time ends in some locations on **April 4, 2010** (clocks will move back one hour).

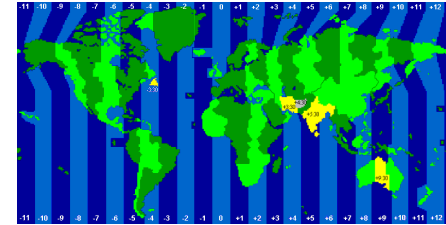


China, India, and Japan are three of many countries that are not observing any form of Daylight Saving Time in 2010. For more details, [view global participation status](#).

Daylight Saving Time (or summertime as it is called in many countries) is a way of getting more light out of the day by advancing clocks by one hour during the summer.

ORACLE

# Time Zone Patches



- Why DST time zone patches? (DST: Daylight Savings Time)
  - Since 2007 DST definitions and time zone names have been changed several times
  - Time zone versions by release:
    - Oracle 9i: TZ V1
    - Oracle 10.1: TZ V2
    - Oracle 10.2.0.1/2: TZ V2
    - Oracle 10.2.0.3: TZ V3
    - Oracle 10.2.0.4: TZ V4
    - Oracle 11.1.0.6/7: TZ V4
      - **Source** release requires TZ V4 – otherwise no upgrade will be possible
    - Oracle 11.2.0.1: TZ V11
      - Beginning with 11.2.0.1 the source release does not have to be patched. Conversion will be done after upgrade
      - **BUT: If your source TZ version is already higher than target, then patch target database installation to the identical TZ version**
    - Oracle 11.2.0.2: TZ V14

# Time Zone Patches - 11g Release 2



- Upgrade to Oracle Database **11g Release 2**:
  - **11.2.0.1**-\$OH has time zone V11, **11.2.0.2**-\$OH has time zone V14
  - No need to patch the source \$OH
    - Except for  $TZ_{source} > TZ_{target}$
  - Determine whether TimeZone updates are needed: [Note:815679.1](#)
  - Oracle recommends that you adjust the time zone version whether or not you use the `TIMESTAMP WITH TIME ZONE` data type
    - This data type may be used in system tables
    - Conversion done **after** the upgrade
    - See [Note:977512.1](#)
    - Package **DBMS\_DST**
      - (1) 

```
DBMS_DST.BEGIN_PREPARE(<tz-version>)
DBMS_DST.FIND_AFFECTED_TABLES
DBMS_DST.END_PEPARE
=> select * from DST$AFFECTED_TABLES;
```
      - (2) 

```
DBMS_DST.BEGIN_UPGRADE
DBMS_DST.UPGRADE_DATABASE
DBMS_DST.END_UPGRADE
```

# Agenda

○ Preparation

● Installation

○ Upgrade

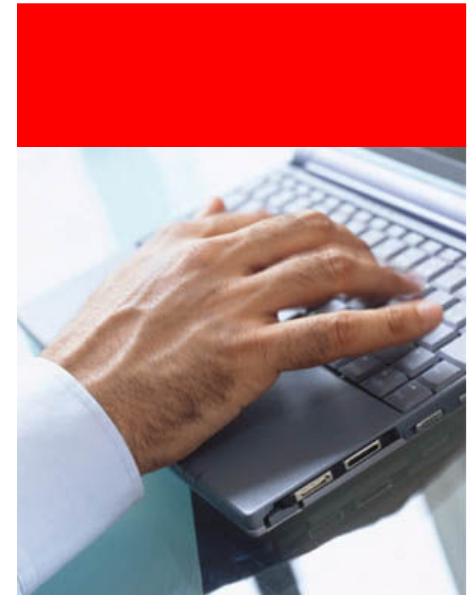
○ News and Task List

○ Diagnostics & Tuning

○ Performance Testing

○ Best Practices

Installation Overview  
Oracle Clusterware & ASM  
Installation  
Patches  
Time Zone  
**Unattended**





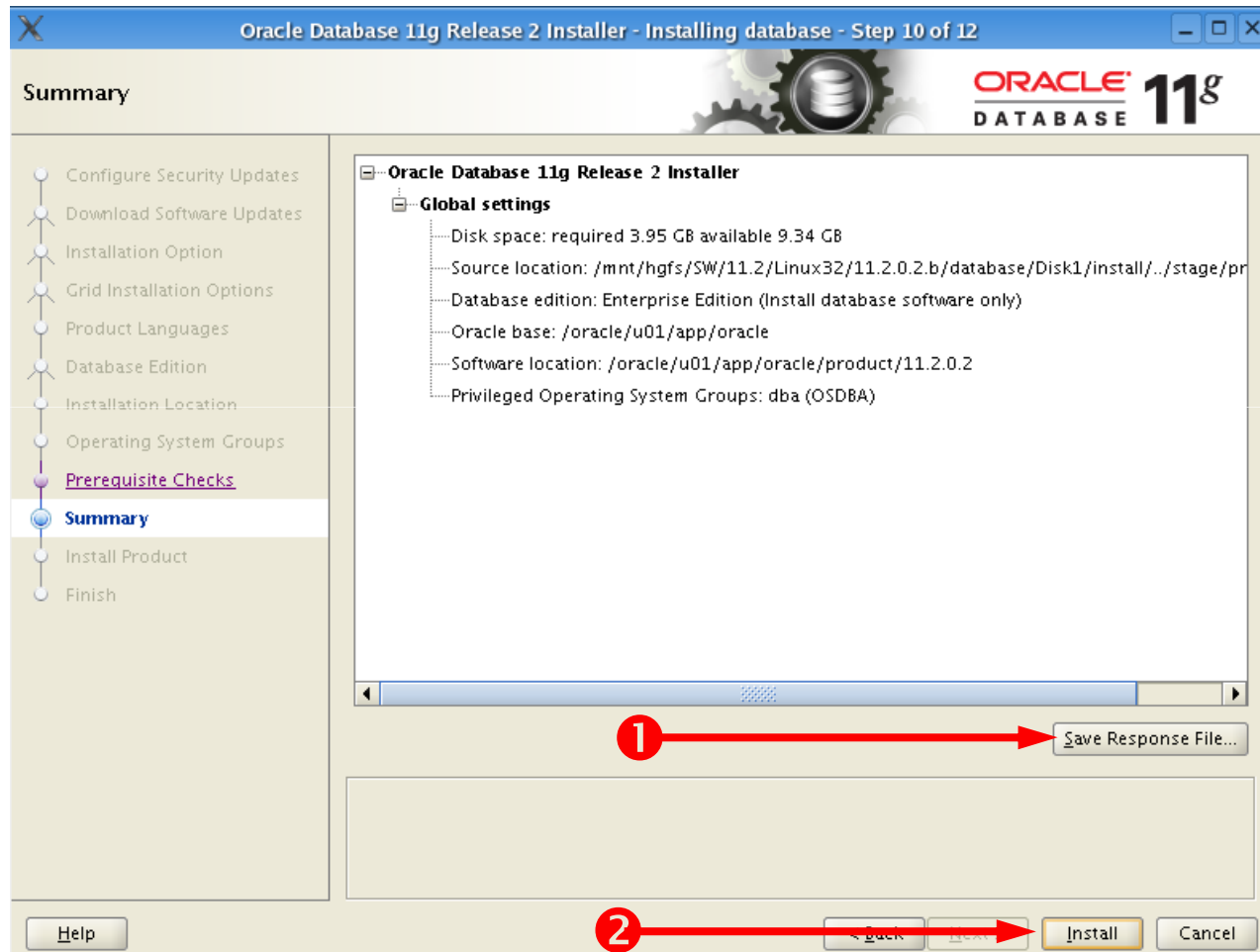
# Unattended Installation/Configuration

- Two options:
  - **Oracle Universal Installer OUI**
    - Until Oracle 11.1
      - `./runInstaller -record -destinationFile ...`
      - `./runInstaller -silent -noconsole -responseFile ...`
    - ⇒ But this has to be done for a patch set, too
    - Oracle 11.2 – see [Note:885643.1](#)
      - SAVE RESPONSEFILE option in OUI available
      - Or: Start OUI “silent” with all required parameters
  - **Home Cloning (script or Provisioning Pack)**
    - Prepare a fully patched Oracle Home
    - Create an archive consisting of all files
      - Exclude \*log, \*dbf, tnsnames/listener/sqlnet.ora
    - Unpack archive and then `./runInstaller -silent -clone -...`
- **Listener Configuration**
  - `./netca /silent /responseFile $OH/inventory/response/netca.rsp`



# Unattended Installation/Configuration

- Oracle Database 11.2:





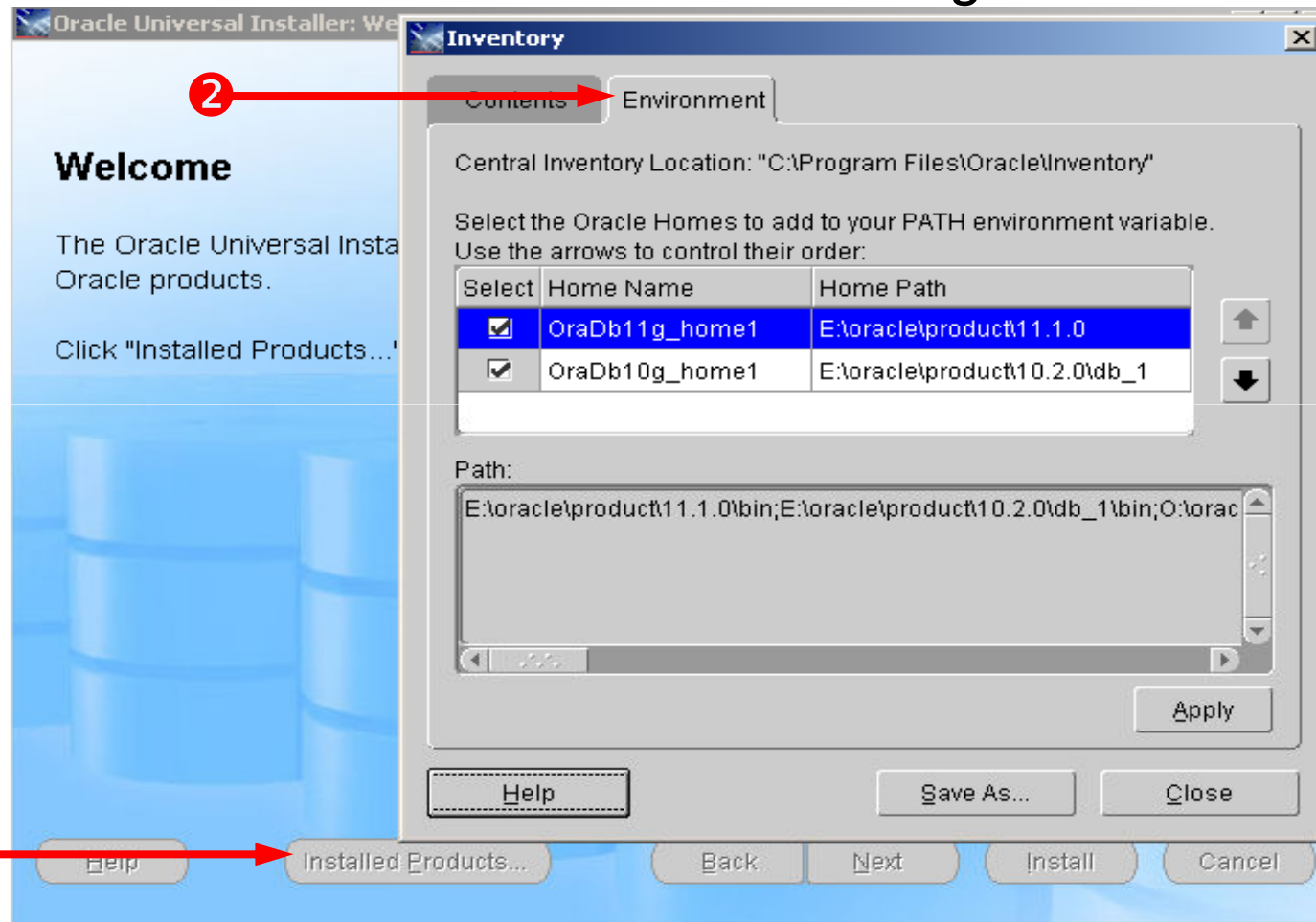
# Installation

- Overview on differences of database editions and available options by edition
  - Oracle® Database Licensing Information  
11g Release 2 (11.2)  
Part Number E10594-08  
[http://download.oracle.com/docs/cd/E11882\\_01/license.112/e10594/toc.htm](http://download.oracle.com/docs/cd/E11882_01/license.112/e10594/toc.htm)

# Installation

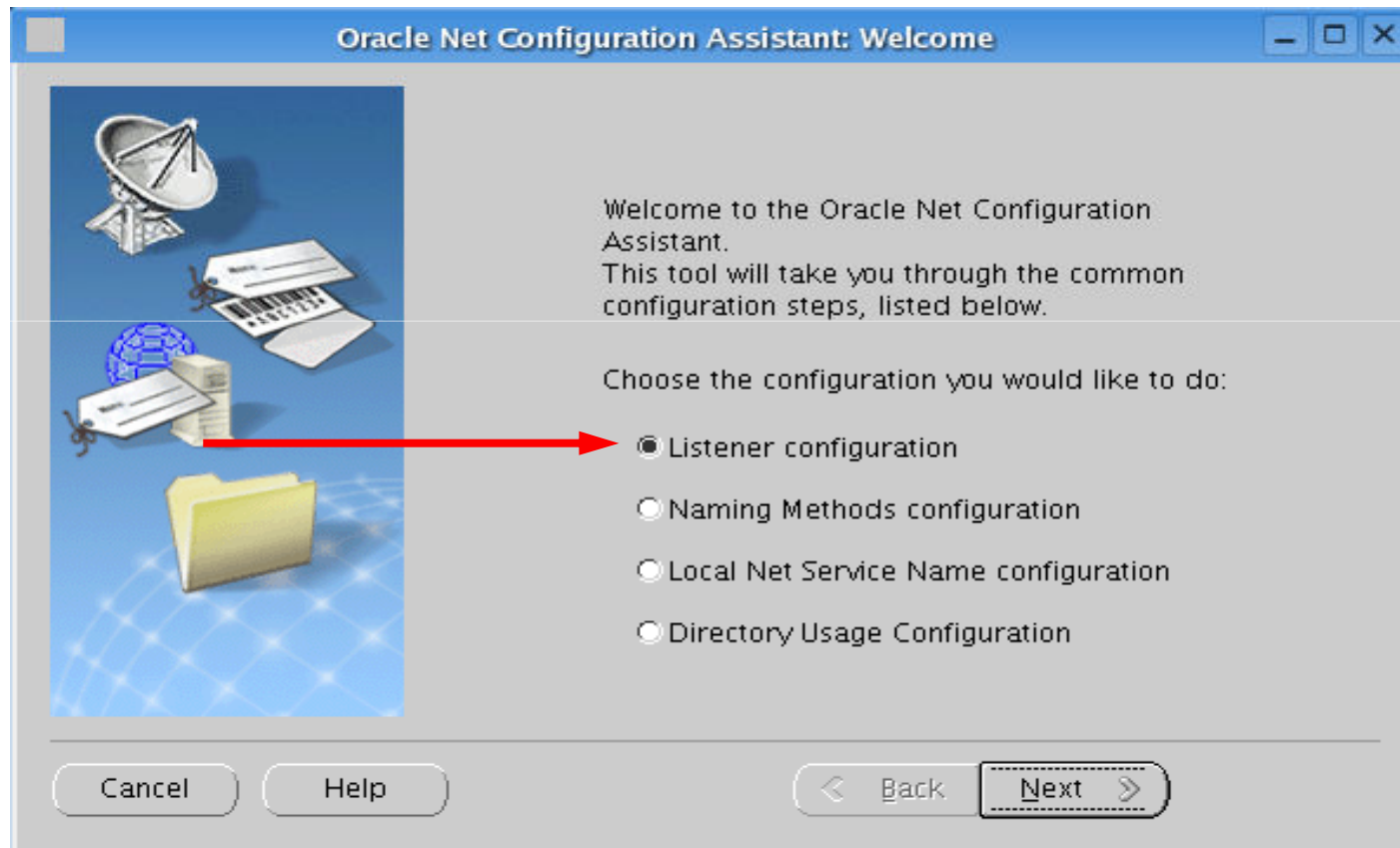


- Windows OS - Home Selector in 11g :



# Listener Configuration

- Best Practices - strongly recommended:  
Create a new listener environment with NETCA:



# Agenda

○ Preparation

○ Installation

● Upgrade

○ News and Task List

○ Diagnostics & Tuning

○ Performance Testing

○ Best Practices

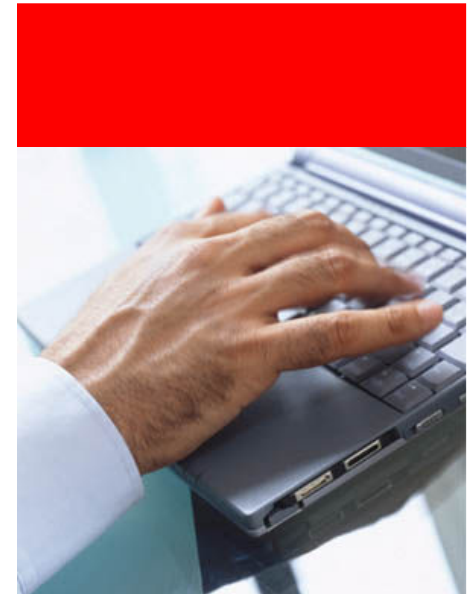
**Database Upgrade Assistant**

Command Line Upgrade

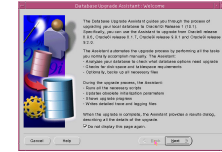
Post Upgrade

Alternatives

Migration



# Database Upgrade Assistant (GUI)



- Features:

- Graphically led upgrade
- Lots of important checks
- RAC *aware* - inclusion of all nodes
  - for RAC (almost) a must !!!
- Offline Backup and Restore possible
- ASM upgrade (until 11.1)
- Oracle XE upgrade
- Patch upgrades

- Logs:

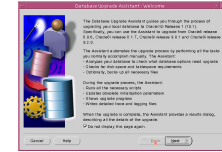
- `$ORACLE_HOME/cfgtoollogs/dbua`

- Documentation:

- Oracle® Database Upgrade Guide

[http://download.oracle.com/docs/cd/E11882\\_01/server.112/e17222/toc.htm](http://download.oracle.com/docs/cd/E11882_01/server.112/e17222/toc.htm)

# Database Upgrade Assistant (GUI)

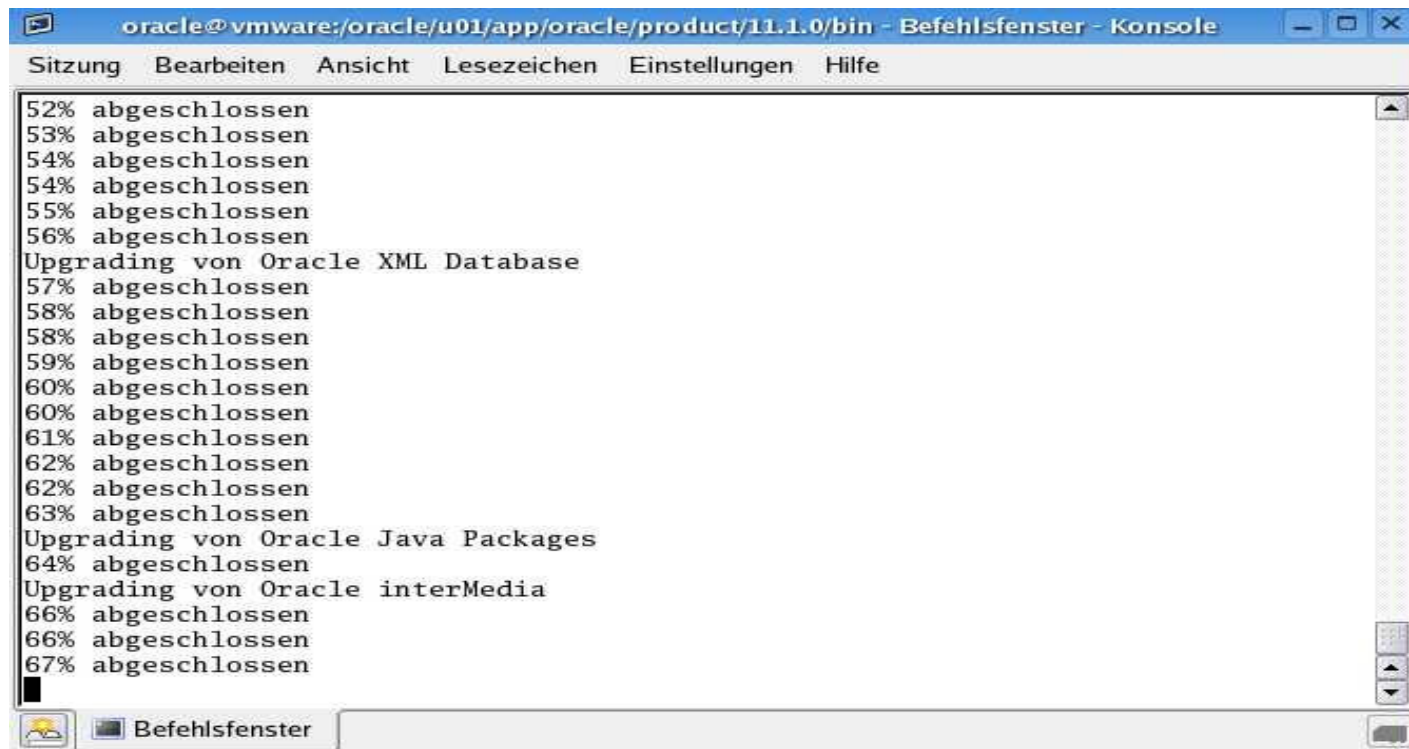


- Silent mode:

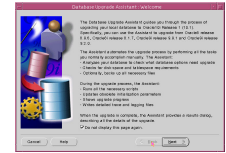
- `$ dbua -help` shows all valid options

- See doc:

- [http://download.oracle.com/docs/cd/E11882\\_01/server.112/e17222/upgrade.htm#sthref170](http://download.oracle.com/docs/cd/E11882_01/server.112/e17222/upgrade.htm#sthref170)

A screenshot of a terminal window titled "oracle@vmware:/oracle/u01/app/oracle/product/11.1.0/bin - Befehlsfenster - Konsole". The window shows the output of the Database Upgrade Assistant (GUI) in silent mode. The output consists of a list of progress bars and status messages, such as "52% abgeschlossen", "53% abgeschlossen", "54% abgeschlossen", "54% abgeschlossen", "55% abgeschlossen", "56% abgeschlossen", "Upgrading von Oracle XML Database", "57% abgeschlossen", "58% abgeschlossen", "58% abgeschlossen", "59% abgeschlossen", "60% abgeschlossen", "60% abgeschlossen", "61% abgeschlossen", "62% abgeschlossen", "62% abgeschlossen", "63% abgeschlossen", "Upgrading von Oracle Java Packages", "64% abgeschlossen", "Upgrading von Oracle interMedia", "66% abgeschlossen", "66% abgeschlossen", and "67% abgeschlossen". The terminal window has a menu bar with "Sitzung", "Bearbeiten", "Ansicht", "Lesezeichen", "Einstellungen", and "Hilfe". The status bar at the bottom shows "Befehlsfenster".

# Database Upgrade Assistant (GUI)



- `dbua [ -silent ] [ -sid SID ] [-oracleHome home_name]  
[-oracleBase base_name] [-diagnosticDest diagnostic_destination]  
[-sysDBAUserName SYSDBA_user] [-sysDBAPassword SYSDBA_pwd]  
[-upgradeASM] [-autoextendFiles] [-newGlobalDbName db_name]  
[-newSid new_SID] [-generateMapFile] [-useASM]  
[-commonFileLocation common_files] [-omfLocation omf_area]  
[-databaseMapFile map_file_name] [-newRecoveryArea recover_area]  
[-newRecoveryAreaSize recover_size] [-apexAdminPassword apex_pwd]  
[-disableUpgradeScriptLogging ] [-backupLocation directory]  
[-sysauxTablespace -datafileName name -datafilesize size  
-datafilesizeNext size -datafilesizeMax size]  
[-postUpgradeScripts script [, script ] ... ]  
[-initParam parameter=value [, parameter=value ] ... ]  
[-disableArchiveLogMode] [-recompile_invalid_objects true | false]  
[-degree_of_parallelism cpu_number]  
[-emConfiguration {CENTRAL|LOCAL|ALL|NOBACKUP|NOEMAIL|NONE}  
-dbsnmpPassword password -sysmanPassword password  
-asmPassword password -hostUserName hostname  
-hostUserPassword password -backupSchedule hh:mm  
[-smtpServer server_name -emailAddress address]  
[-centralAgent location] [-localRacSid SID]]  
[-recoveryAreaDestination directory]  
[-h|-help]`



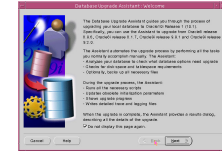
# Database Upgrade Assistant (GUI)



- Example:

```
dbua -silent -sid dwh
-oracleHome /opt/oracle/product/RDBMS10g
-diagnosticDest /opt/oracle/diag
  -sysDBAUserName sys
  -sysDBAPassword manager
-recompile_invalid_objects true
  -degree_of_parallelism 4
-emConfiguration LOCAL
  -dbsnmpPassword manager
  -sysmanPassword manager
```

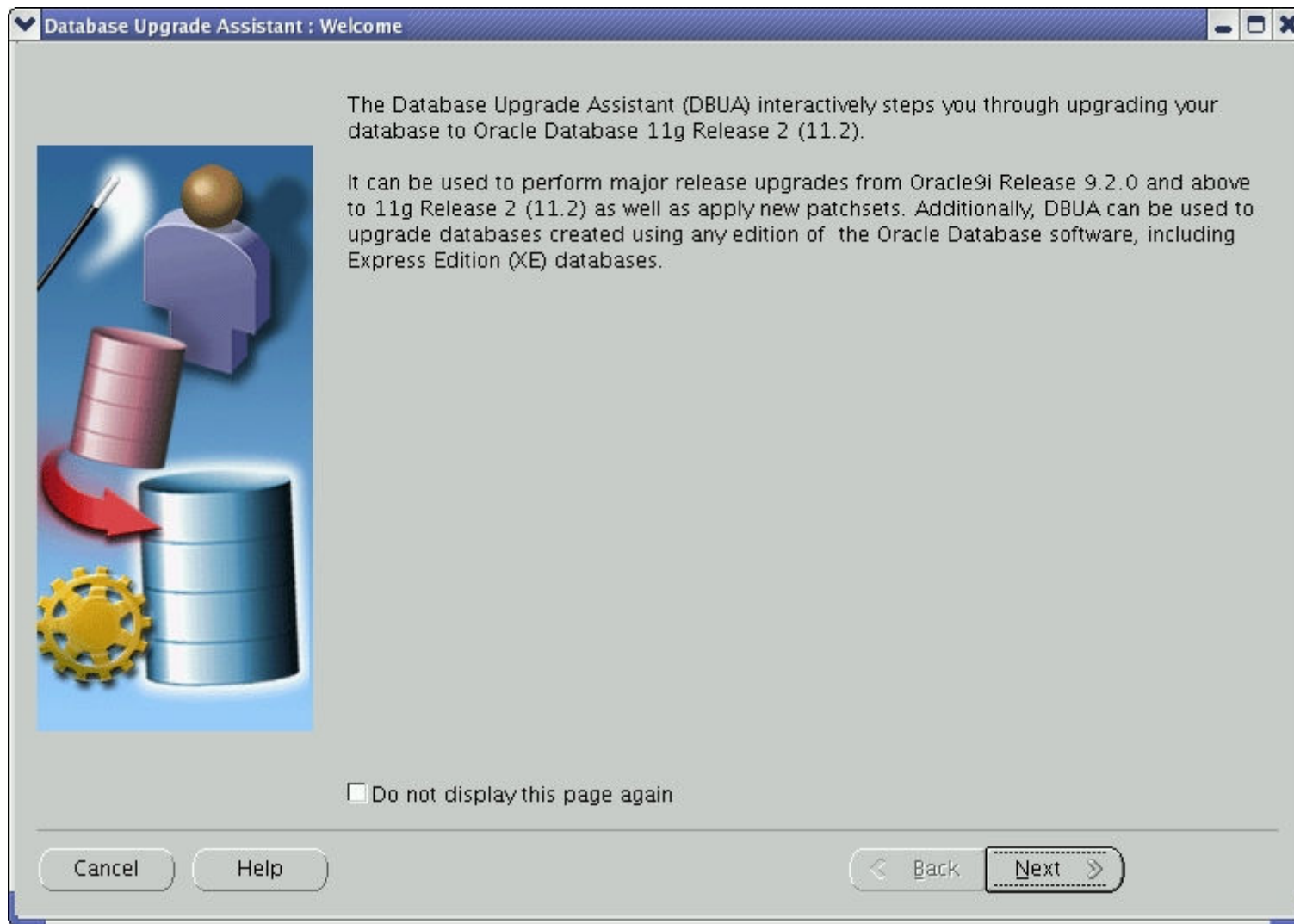
# Database Upgrade Assistant (GUI)



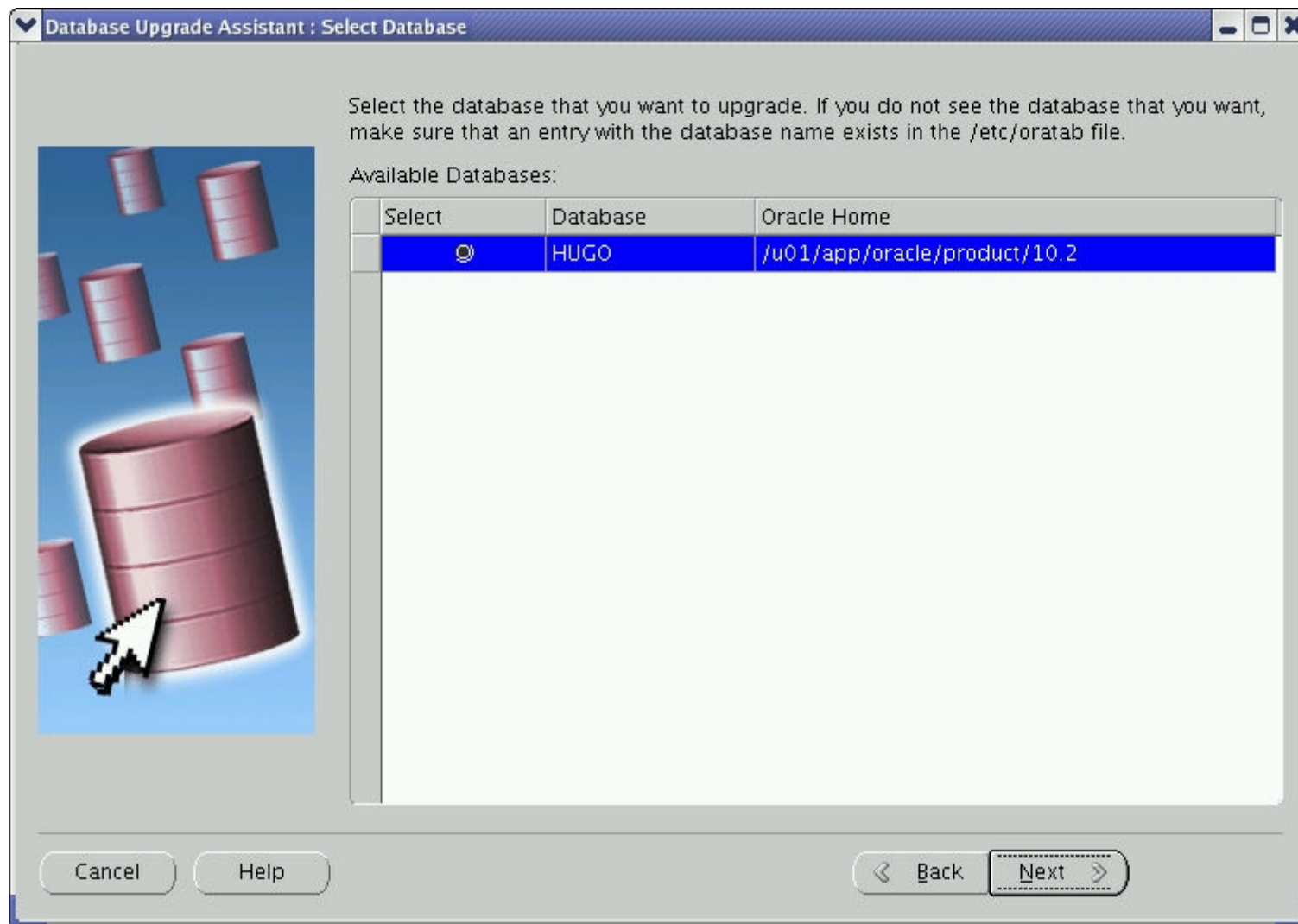
- Best Practice: Before you start DBUA
  - Run `$OH_11g/rdbms/admin/utlu112i.sql` in your current environment
  - Check especially the components status in `DBA_REGISTRY`
    - To remove (or reinstall) components manually:  
[Note:472937.1](#) Information On Installed Database Components  
[Note:753041.1](#) How to diagnose Components with NON VALID status

```
*****
Components: [The following database components will be upgraded or installed]
*****
--> Oracle Catalog Views           [upgrade]  VALID
--> Oracle Packages and Types     [upgrade]  VALID
--> JServer JAVA Virtual Machine [upgrade]  VALID
--> Oracle XDK for Java           [upgrade]  VALID
--> Oracle XML Database           [upgrade]  VALID
--> Oracle Java Packages          [upgrade]  VALID
```

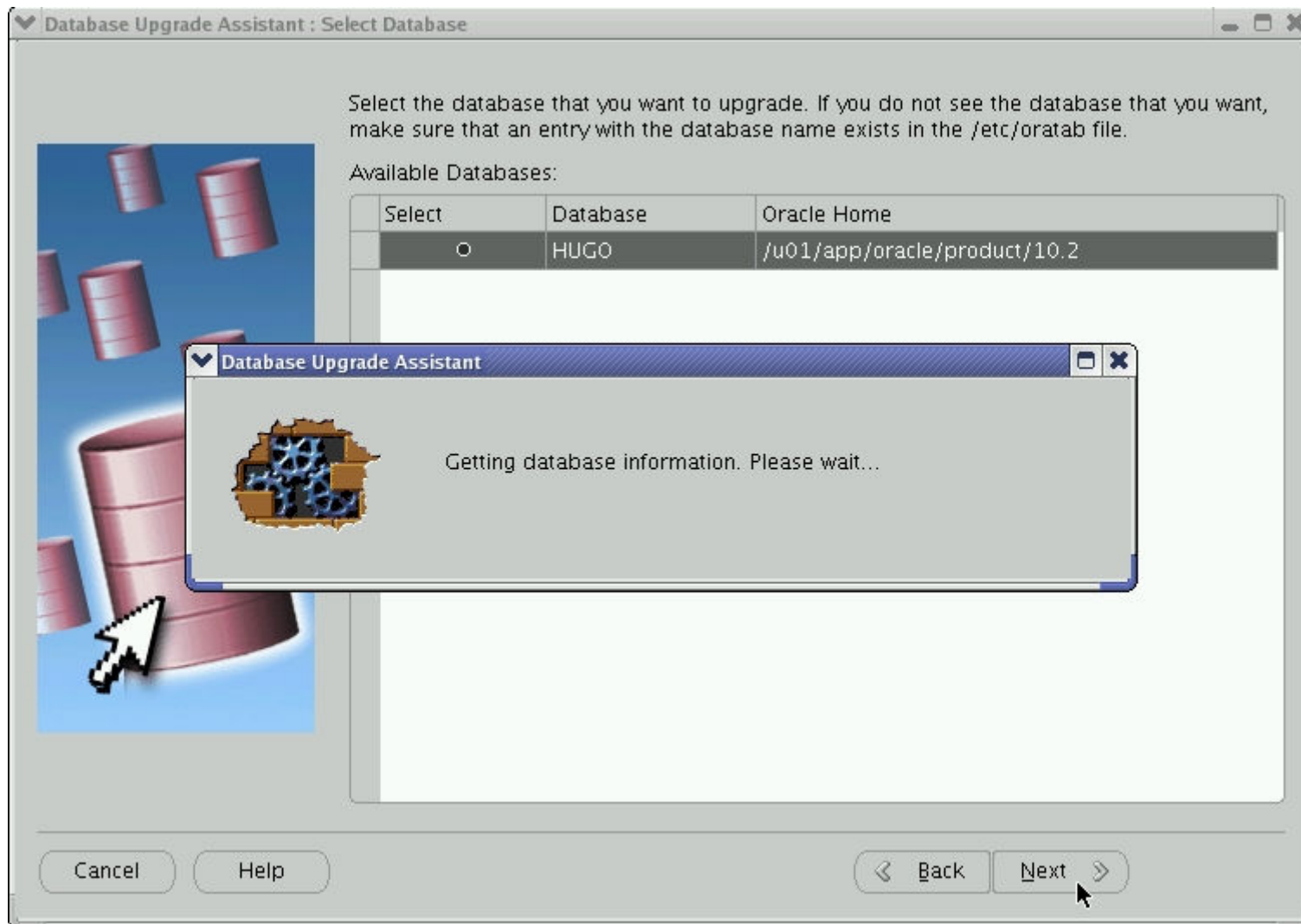
# Database Upgrade Assistant (GUI)



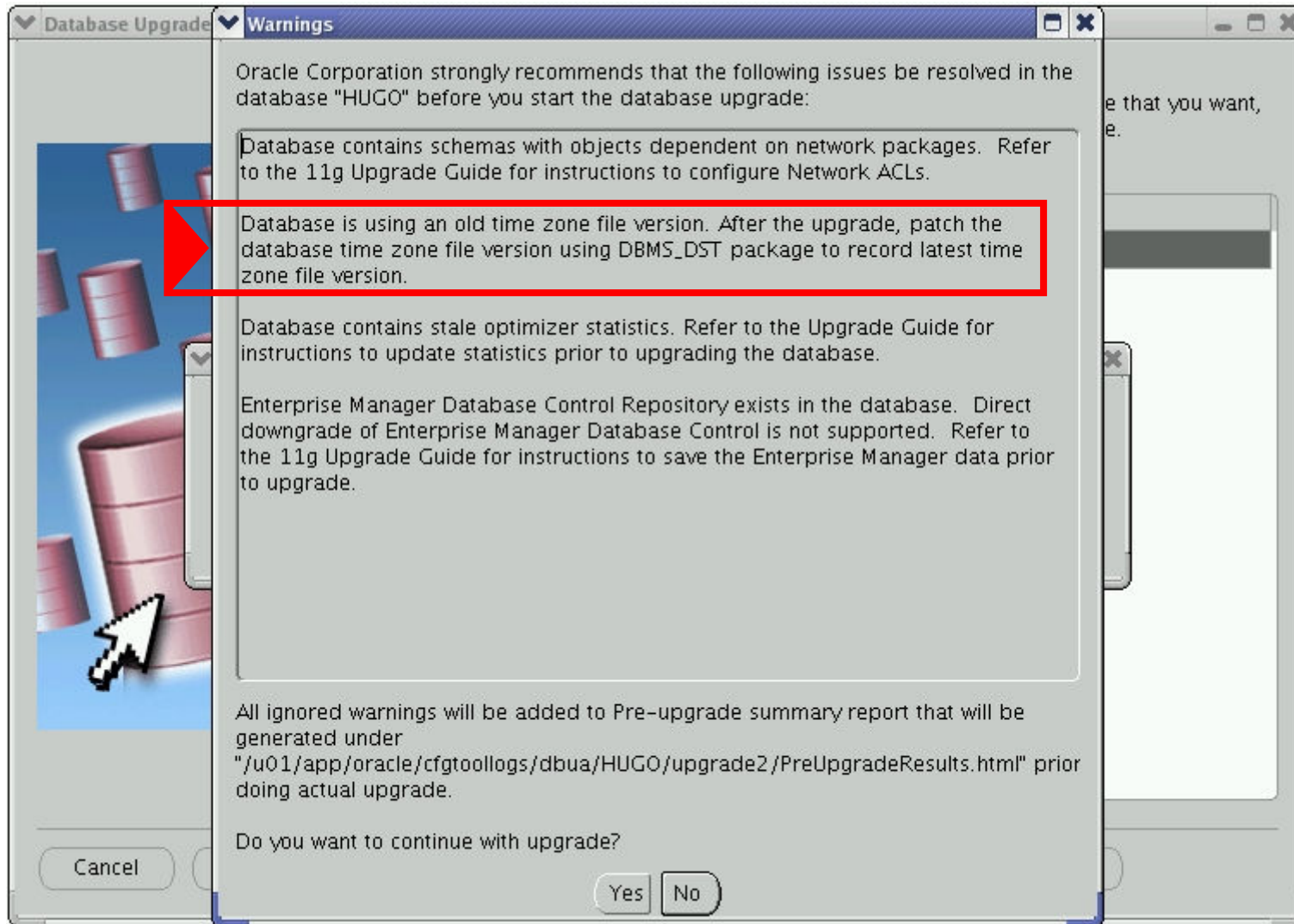
# Database Upgrade Assistant (GUI)



# Database Upgrade Assistant (GUI)



# Database Upgrade Assistant (GUI)

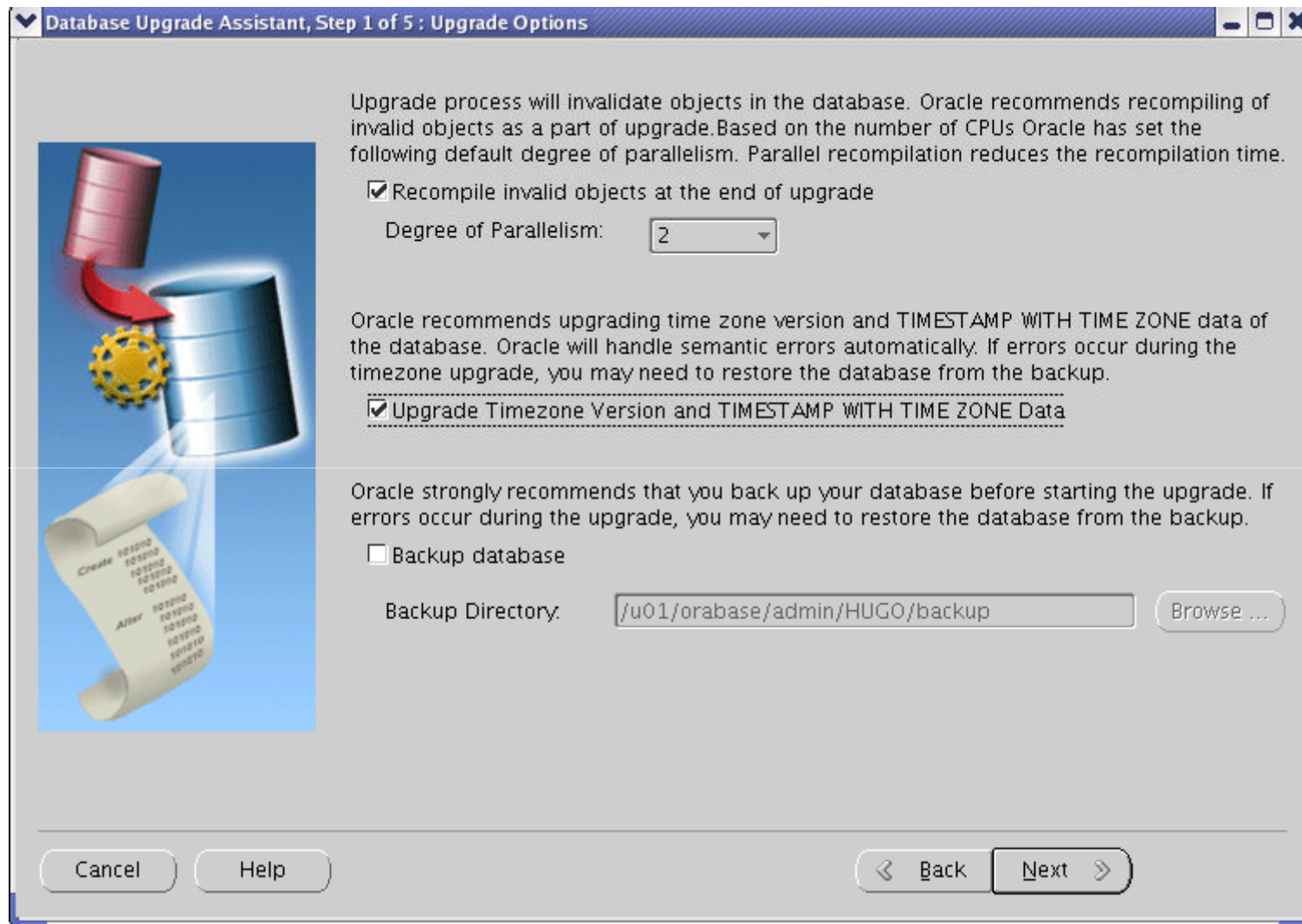




# Network ACLs

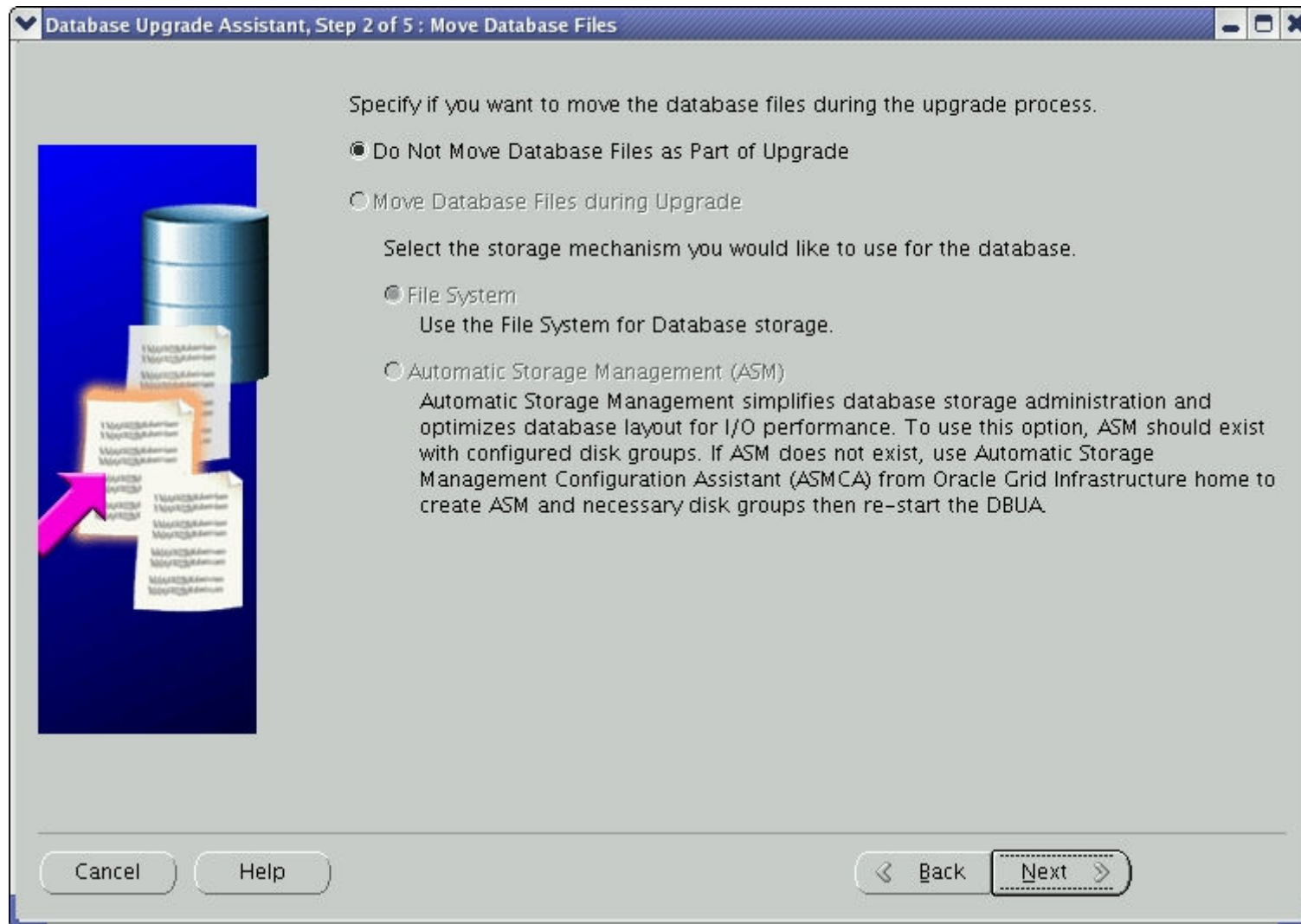
- Make sure Oracle XML DB is installed if you use packages: UTL\_TCP, UTL\_SMTP, UTL\_MAIL, UTL\_HTTP and/or UTL\_INADDR
- You must also configure **network access control lists** (ACLs) in the database after the upgrade before these packages can work as they did in prior releases
- Please see the Database Upgrade Guide for an example: [http://download.oracle.com/docs/cd/E11882\\_01/server.112/e17222/upgrade.htm#sthref148](http://download.oracle.com/docs/cd/E11882_01/server.112/e17222/upgrade.htm#sthref148)

# Database Upgrade Assistant (GUI)





# Database Upgrade Assistant (GUI)



# Database Upgrade Assistant (GUI)

Database Upgrade Assistant, Step 3 of 4 : Recovery and Diagnostic Locations

Flash Recovery Area is an Oracle managed disk location used for storing backup and recovery related files. Oracle strongly recommends configuring a flash recovery area as it significantly enhances speed, reliability and manageability of the database recovery process.

Specify Flash Recovery Area

Oracle recommends that the database files and recovery files be located on physically different disks for data protection and performance.

Flash Recovery Area:

Flash Recovery Area Size:

Diagnostic destination is the default location to store Oracle trace and diagnostic files. It replaces the initialization parameter settings for background dump destination, user dump destination and core dump destination from earlier releases.

Diagnostic Destination:

# Database Upgrade Assistant (GUI)

Database Upgrade Assistant, Step 4 of 4 : Summary

**i** DBUA will shutdown the database during the upgrade process. The Database will not be available for general use during the upgrade process. Oracle strongly recommends that you back up your database before starting the upgrade. If the upgrade fails for some reason, you may need to restore the database from the backup.

### Database Upgrade Summary

	Database	Target Database
<b>Name:</b>	HUGO	HUGO
<b>Version:</b>	10.2.0.4.0	11.2.0.1
<b>Oracle Home:</b>	/u01/app/oracle/product/10.2	/u01/app/oracle/product/11.2.0/dbhome1

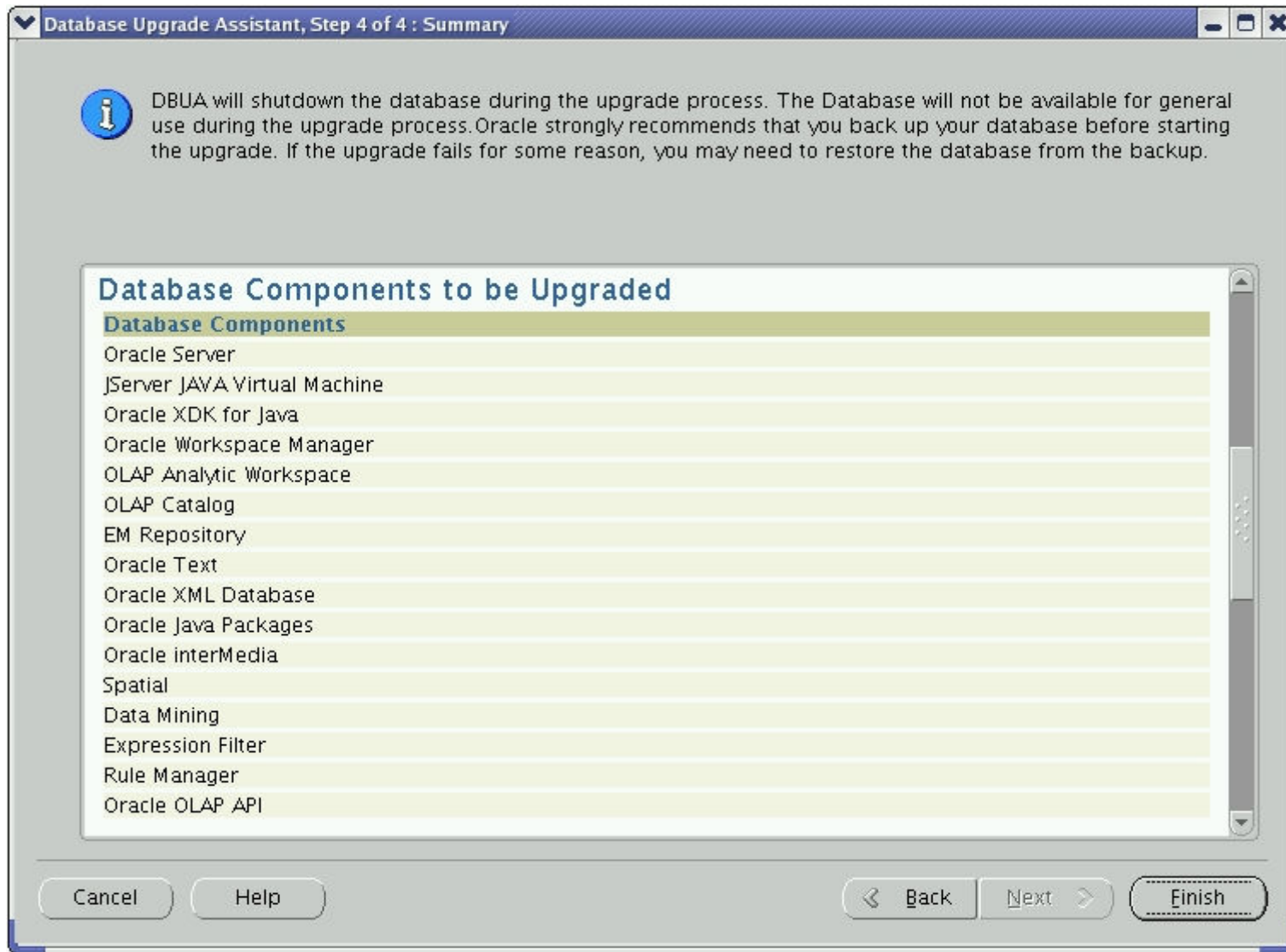
#### Warnings Ignored

**Warnings Ignored**

- Database contains schemas with objects dependent on network packages. Refer to the 11g Upgrade Guide for instructions to configure Network ACLs.
- Database is using an old time zone file version. After the upgrade, patch the database time zone file version using DBMS\_DST package to record latest time zone file version.
- Database contains stale optimizer statistics. Refer to the Upgrade Guide for instructions to update statistics prior to upgrading the database.
- Enterprise Manager Database Control Repository exists in the database. Direct downgrade of Enterprise Manager Database Control is not supported. Refer to the 11g Upgrade Guide for instructions to save the

Cancel Help Back Next Finish

# Database Upgrade Assistant (GUI)



# Database Upgrade Assistant (GUI)

Database Upgrade Assistant, Step 4 of 4 : Summary

**i** DBUA will shutdown the database during the upgrade process. The Database will not be available for general use during the upgrade process. Oracle strongly recommends that you back up your database before starting the upgrade. If the upgrade fails for some reason, you may need to restore the database from the backup.

### Initialization Parameter changes

The following changes will be made in the initialization parameters:

**Parameters to be added:**

Name	Value
java_pool_size	67108864
diagnostic_dest	/u01/app/oracle
local_listener	LISTENER_HUGO

**Parameters to be updated:**

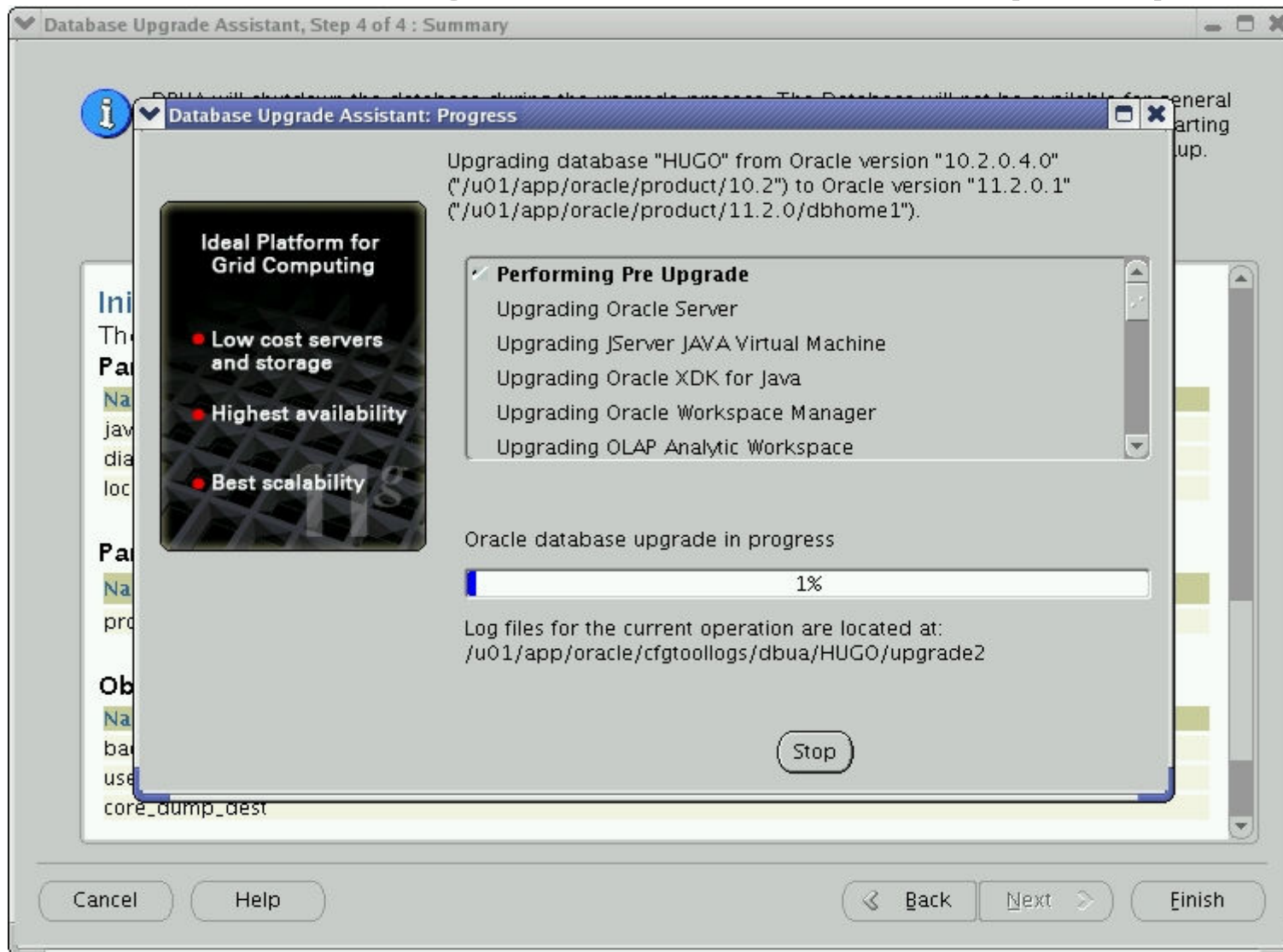
Name	Old Value	New Value
processes	75	100

**Obsolete Parameters to be removed:**

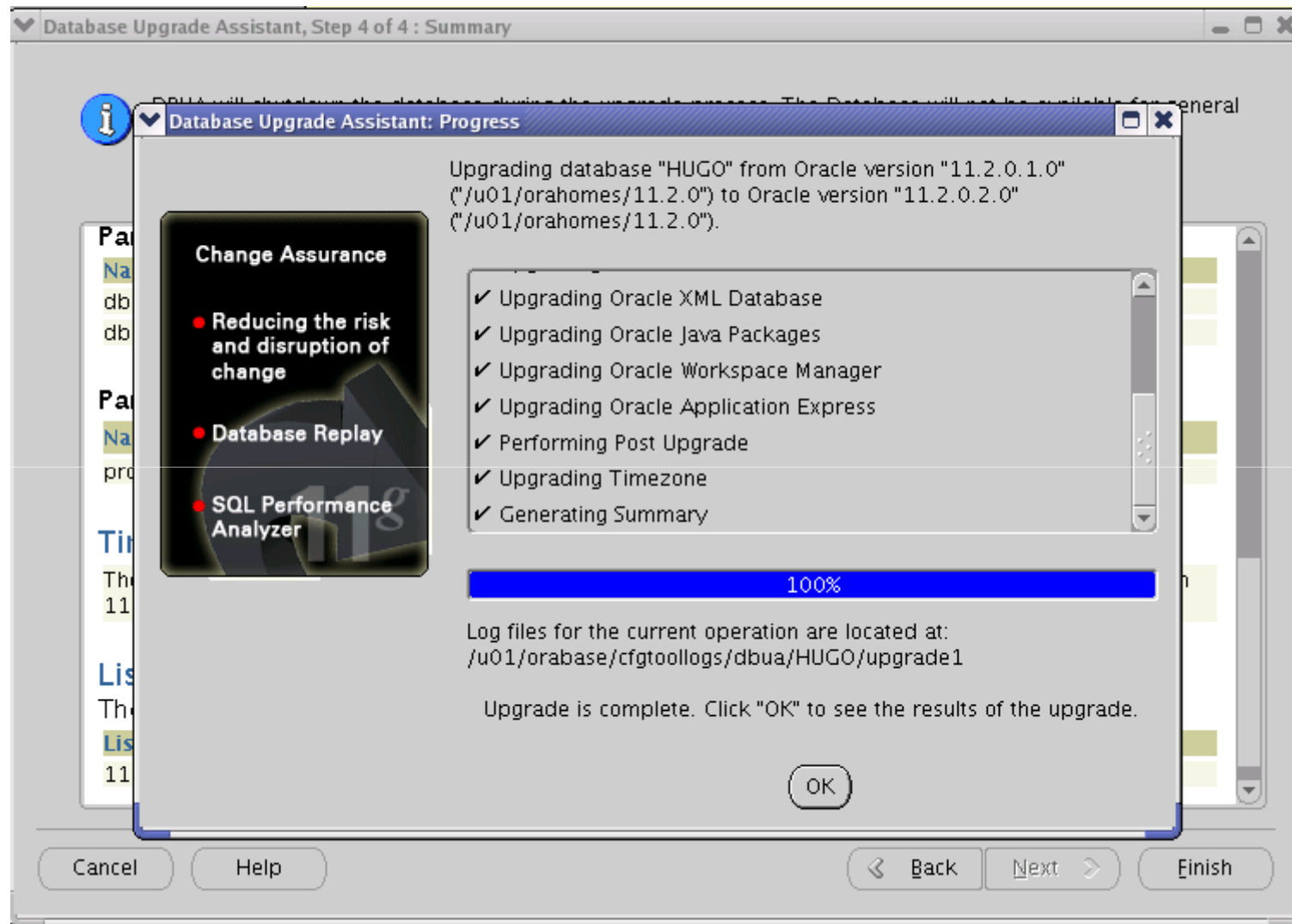
Name
background_dump_dest
user_dump_dest
core_dump_dest

Cancel Help Back Next Finish

# Database Upgrade Assistant (GUI)



# Database Upgrade Assistant (GUI)



# Database Upgrade Assistant (GUI)

The screenshot shows the 'Database Upgrade Assistant: Upgrade Results' window. The main heading is 'Upgrade Results'. Below it, a message states: 'Database upgrade has been completed successfully, and the database is ready to use.' This is followed by a table comparing the source and target database details.

	Database	Target Database
<b>Name:</b>	HUGO	HUGO
<b>Version:</b>	10.2.0.4.0	11.2.0.1
<b>Oracle Home:</b>	/u01/app/oracle/product/10.2	/u01/app/oracle/product/11.2.0/dbhome1

Below the table is the 'Upgrade Details' section, which includes a summary of the steps performed and a log file location. This is followed by another table listing the individual steps and their statuses.

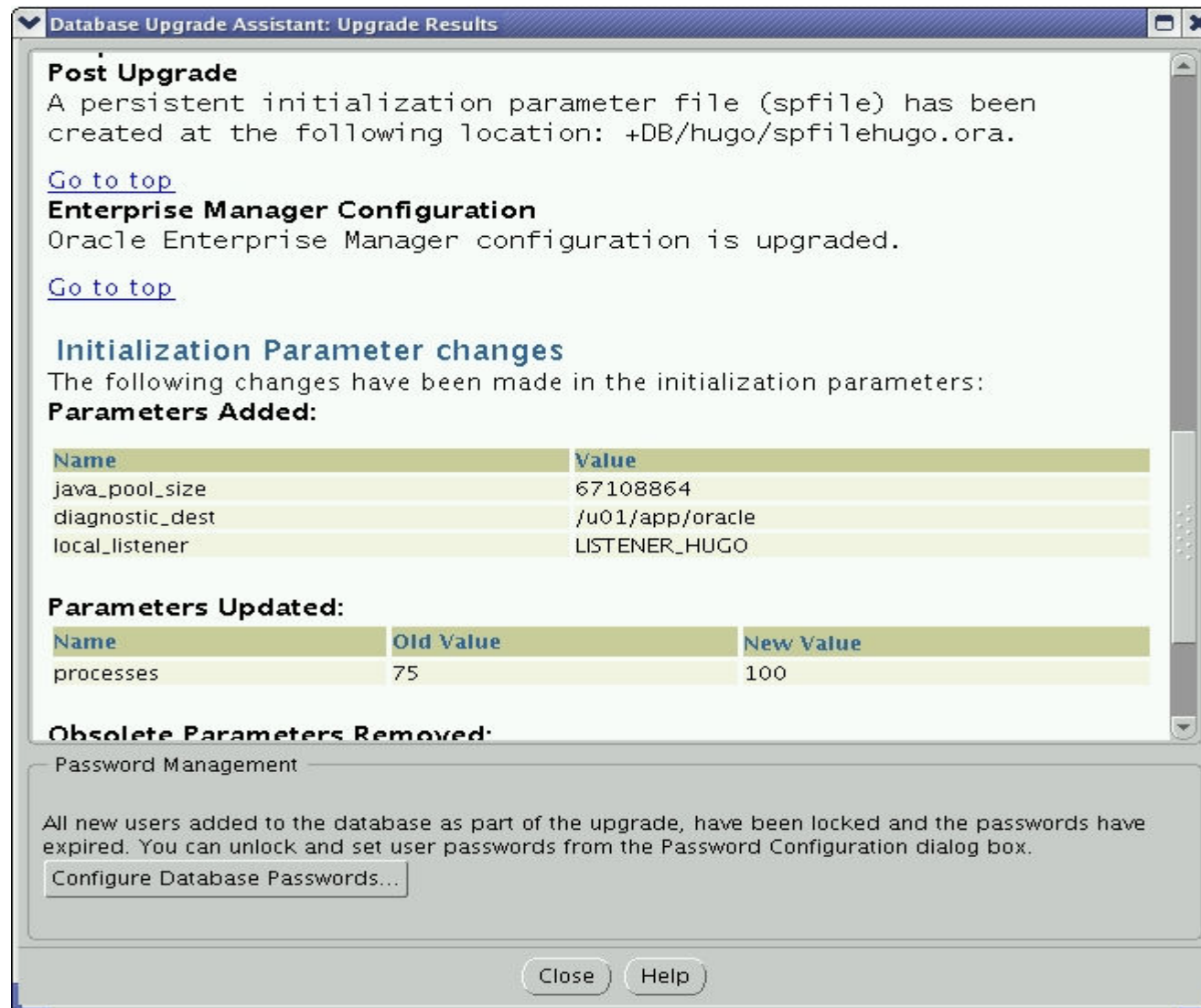
The following is a summary of the steps performed during the database upgrade. **Log files for all the steps, as well as this summary, are available at "/u01/app/oracle/cfgtoollogs/dbua/HUGO/upgrade2".**

Step Name	Log File Name	Status
Pre Upgrade	PreUpgrade.log	Successful
Oracle Server	Oracle_Server.log	Successful
JServer JAVA Virtual Machine	Oracle_Server.log	Successful
Oracle XDK for Java	Oracle_Server.log	Successful
Oracle Workspace Manager	Oracle_Server.log	Successful
OLAP Analytic Workspace	Oracle_Server.log	Successful
OLAP Catalog	Oracle_Server.log	Successful

The bottom section is titled 'Password Management' and contains a message: 'All new users added to the database as part of the upgrade, have been locked and the passwords have expired. You can unlock and set user passwords from the Password Configuration dialog box.' Below this message is a button labeled 'Configure Database Passwords...'. At the very bottom of the window are 'Close' and 'Help' buttons.



# Database Upgrade Assistant (GUI)



The screenshot shows the 'Database Upgrade Assistant: Upgrade Results' window. It contains the following sections:

- Post Upgrade:** A persistent initialization parameter file (spfile) has been created at the following location: +DB/hugo/spfilehugo.ora. Includes a 'Go to top' link.
- Enterprise Manager Configuration:** Oracle Enterprise Manager configuration is upgraded. Includes a 'Go to top' link.
- Initialization Parameter changes:** The following changes have been made in the initialization parameters:
  - Parameters Added:**

Name	Value
java_pool_size	67108864
diagnostic_dest	/u01/app/oracle
local_listener	LISTENER_HUGO
  - Parameters Updated:**

Name	Old Value	New Value
processes	75	100
  - Obsolete Parameters Removed:**
- Password Management:** All new users added to the database as part of the upgrade, have been locked and the passwords have expired. You can unlock and set user passwords from the Password Configuration dialog box. Includes a 'Configure Database Passwords...' button.

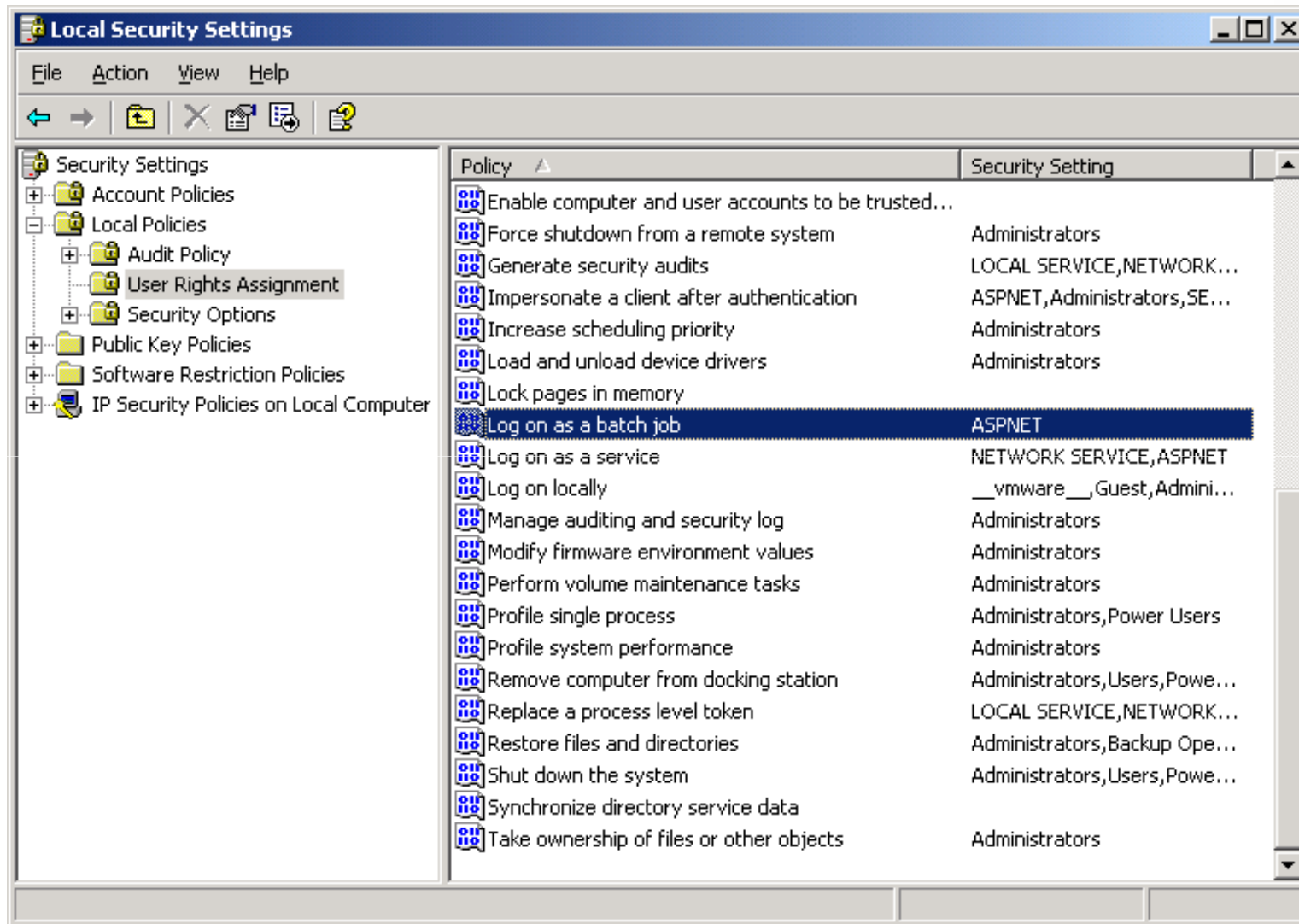
Buttons at the bottom: Close, Help.



# Database Upgrade Assistant (GUI)

- If you'd used the DBUA in an RAC/GI environment and you have a standby database in place make sure:
  - For Oracle **11.2.0.1 to 11.2.0.2/3**:  
Use the `-upgrade` command line option of `srvctl` utility to upgrade OCR resource entries
  - For prior version of databases:  
Use: `srvctl -delete` and `srvctl -add`

# If EM is in use => grant OS user:



# Agenda

○ Preparation

○ Installation

● Upgrade

○ News and Task List

○ Diagnostics & Tuning

○ Performance Testing

○ Best Practices

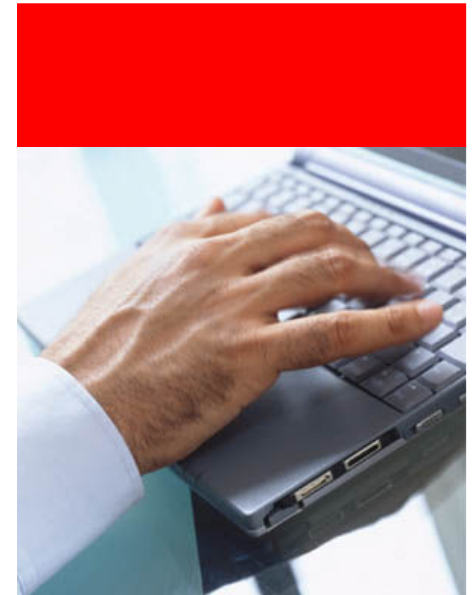
Database Upgrade Assistant

Command Line Upgrade

Post Upgrade

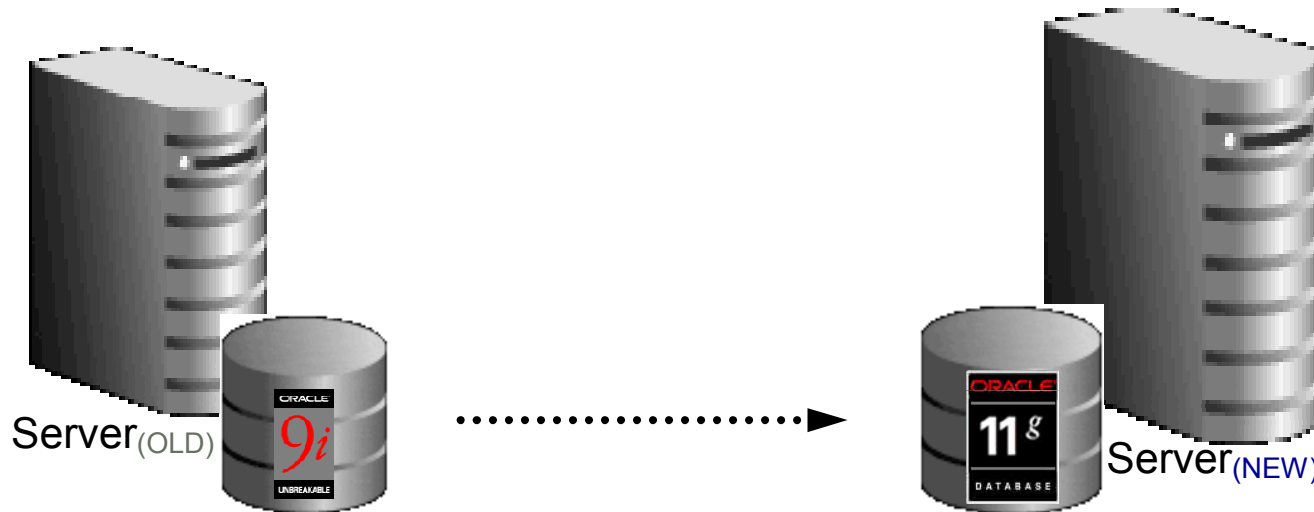
Alternatives

Migration



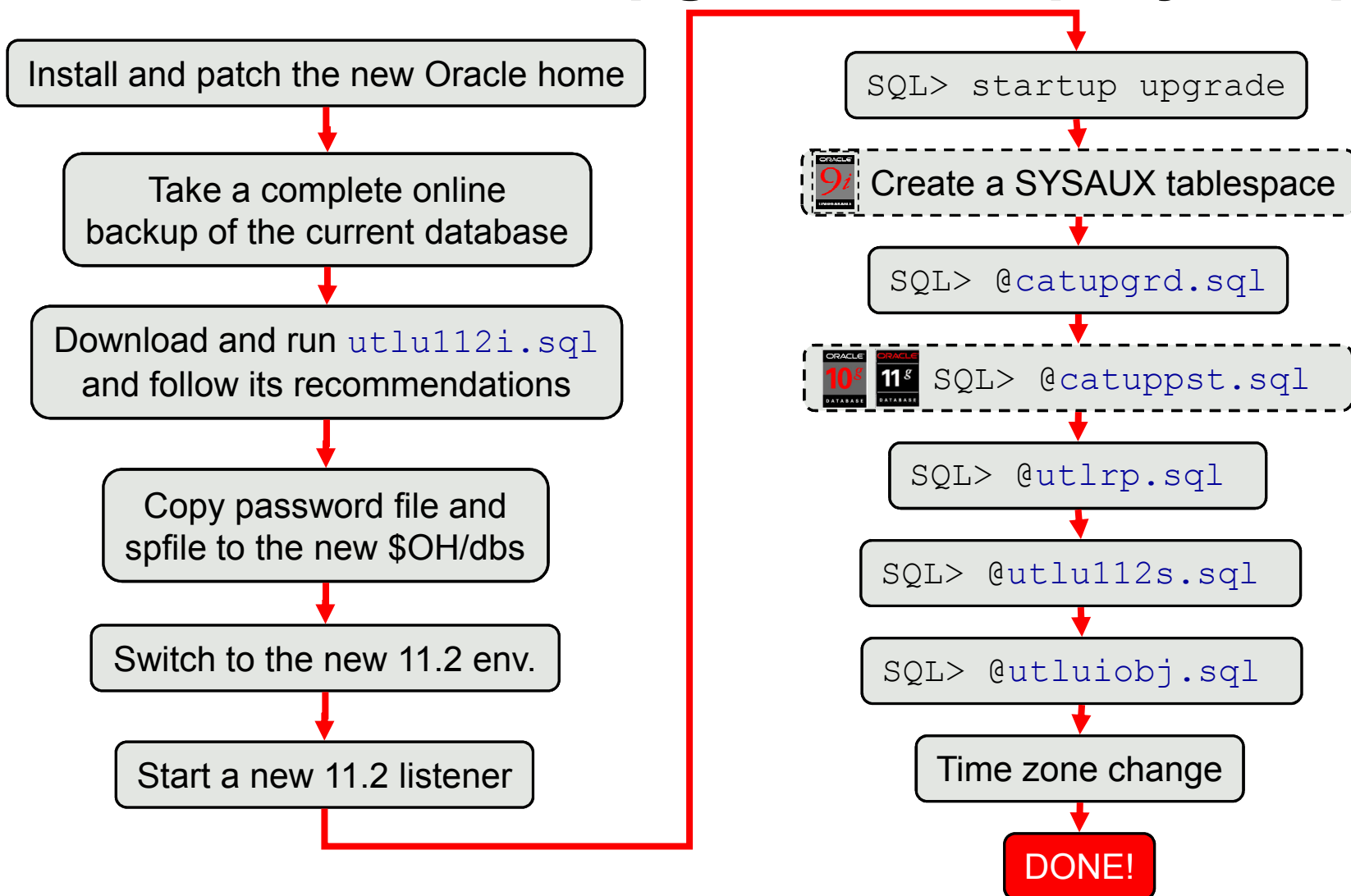
# Command Line Upgrade

- Typical scenario: e.g. changing to a new server



- 1) Install Oracle11g software
- 2) Copy `utlu112i.sql`
- 3) Run `utlu112i.sql`
- 4) Shutdown database
- 5) Copy all relevant files  
(*dbf, ctl, log, spfile, orapw*)
- 6) Apply suggested changes
- 7) Start the upgrade process

# Command Line Upgrade – Step-by-Step





# Command Line Upgrade

Info

- Upgrade information script: `utlu112i.sql`
  - Run in the environment of the source database
  - Checks all init parameters and displays warnings for obsolete and deprecated parameters
  - Checks
    - Components
    - Tablespace SYSAUX
    - Time zone file version check
    - Cluster database check

# Command Line Upgrade

- Get the current version of [utlu<sub>nm</sub>i.sql](#)
  - Download it now!
  - [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	<a href="#">Build 4</a> December 2010	11gR2 (11.2.0.2) - <a href="#">utlu112i_2.sql</a>
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	<a href="#">Build 4</a> December 2010	11gR2 (11.2.0.1) - <a href="#">utlu112i_1.sql</a>
9.2.0 (9.2.0.4 and above), 10.1.0,10.2.0	<a href="#">Build 2</a> December 2010	11gR1- <a href="#">utlu111i.sql</a>
8.1.7, 9.0.1, 9.2.0 (9.2.0.4 and above), 10.1.0	<a href="#">Build 2</a> December 2010	10gR2 - <a href="#">utlu102i.sql</a>



# Command Line Upgrade

- `utlu112i.sql`: DB info

```
*****  
Database:  
*****  
--> name:          V9208  
--> version:       9.2.0.8.0  
--> compatible:    9.2.0  
--> blocksize:     8192  
1 --> timezone file: V1
```

```
*****  
Miscellaneous Warnings  
*****  
WARNING: --> Deprecated CONNECT role granted to some user/roles.  
.... CONNECT role after upgrade has only CREATE SESSION privilege.  
2 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 9.2.0.8.0 database timezone version  
.... to the latest version which comes with the new release.
```

- Time zone conversion should be done after the upgrade has completed
  - Recommended
  - Necessary if datatype `TIMESTAMP WITH TIME ZONE` is used

# Command Line Upgrade

- `utlu112i.sql`: Tablespaces adequate size?

```
*****
Tablespaces: [make adjustments in the current environment]
*****
3 WARNING: --> SYSTEM tablespace is not large enough for the upgrade.
.... currently allocated size: 200 MB
.... minimum required size: 287 MB
.... increase current size by: 87 MB
.... tablespace is NOT AUTOEXTEND ENABLED.
WARNING: --> UNDOTBS1 tablespace is not large enough for the upgrade.
.... currently allocated size: 50 MB
.... minimum required size: 470 MB
.... increase current size by: 420 MB
.... tablespace is NOT AUTOEXTEND ENABLED.
--> TEMPTBS tablespace is adequate for the upgrade.
.... minimum required size: 61 MB
```

# Command Line Upgrade

- **utlu112i.sql**: Init parameter changes?

4

```
*****
Update Parameters: [Update Oracle Database 11.2 init.ora or spfile]
Note: Pre-upgrade tool was run on a lower version 32-bit database.
*****
--> If Target Oracle is 32-Bit, refer here for Update Parameters:
WARNING: --> "compatible" must be set to at least 10.1.0
WARNING: --> "shared_pool_size" needs to be increased to at least 251 MB
WARNING: --> "db_cache_size" needs to be increased to at least 50331648 bytes
.
--> If Target Oracle is 64-Bit, refer here for Update Parameters:
WARNING: --> "compatible" must be set to at least 10.1.0
WARNING: --> "shared_pool_size" needs to be increased to at least 487 MB
WARNING: --> "db_cache_size" needs to be increased to at least 50331648 bytes
.
*****
Renamed Parameters: [Update Oracle Database 11.2 init.ora or spfile]
*****
WARNING: --> "db_block_buffers" new name is "db_cache_size" new value is "16384000"
.
*****
Obsolete/Deprecated Parameters: [Update Oracle Database 11.2 init.ora or spfile]
*****
--> background_dump_dest      11.1      DEPRECATED      replaced by "diagnostic_dest"
--> user_dump_dest            11.1      DEPRECATED      replaced by "diagnostic_dest"
```

# Command Line Upgrade

- `utlu112i.sql`: Components and options?

```
*****
5 Components: [The following database components will be upgraded or installed]
*****
--> Oracle Catalog Views           [upgrade]  VALID
--> Oracle Packages and Types      [upgrade]  VALID
--> JServer JAVA Virtual Machine   [upgrade]  VALID
--> Oracle XDK for Java            [upgrade]  VALID
--> Oracle XML Database            [upgrade]  VALID
--> Oracle Java Packages           [upgrade]  VALID
```

- Annotation:

You'll have to install all options installed for the release you are upgrading from – otherwise some components can't be upgraded

- To remove (or reinstall) components manually:

[Note:472937.1](#) Information On Installed Database Components and Schemas

[Note.300056.1](#) Debug and Validate Invalid Objects

[Note:753041.1](#) How to diagnose Components with NON VALID status

[Note.733667.1](#) How to Determine if XDB is Being Used in the Database?



# Command Line Upgrade

- `utlu112i.sql`: Materialized Views Refresh?
  - WARNING: --> There are materialized view refreshes in progress.  
.... Ensure all materialized view refreshes are complete prior to upgrade.
  - Below query should return "No rows" when you start the upgrade process – otherwise wait for MV refreshes to be completed

```
SELECT * FROM sys.obj$ o, sys.user$ u, sys.sum$ s
WHERE o.obj# = s.obj# AND o.owner# = u.user#
      AND o.type# = 42 AND bitand(s.mflags, 8) = 8;
```



# Command Line Upgrade

- Create Dictionary statistics
- Shutdown the database (`IMMEDIATE/NORMAL`)
- Adjust init parameters:
  - `COMPATIBLE ≥ 10.1.0`
  - `SGA_TARGET ≥ 524MB (32-bit) ... ≥ 748MB (64-bit)`
  - `PGA_AGGREGATE_TARGET ≥ 25MB`
  - `LOG_ARCHIVE_FORMAT` must contain %s, %t and %r
- Move `init.ora/SPFILE` and `PWDsid.ora` to their new location
- Start a new 11g-Listener (*use the NETCA or copy tns files*)
- Change environment to point to the new `$ORACLE_HOME`

# Command Line Upgrade



- Windows only:
  - Delete the old Service:  
**> oradim -DELETE -SID ORCL**
  - Create a new Service:  
**> oradim -NEW**  
**-SID ORCL**  
**-SYSPWD passwd**  
**-STARTMODE a**  
**-PFILE initfile**

*ORADIM creates a logfile in %ORACLE\_HOME%\database*

# Command Line Upgrade

```
SQL> STARTUP UPGRADE;
```

```
ALTER SYSTEM SET _system_trig_enabled=FALSE SCOPE=MEMORY;  
Autotune of undo retention is turned off.  
ALTER SYSTEM SET _undo_autotune=FALSE SCOPE=MEMORY;  
ALTER SYSTEM SET undo_retention=900 SCOPE=MEMORY;  
ALTER SYSTEM SET aq_tm_processes=0 SCOPE=MEMORY;  
ALTER SYSTEM SET enable_ddl_logging=FALSE SCOPE=MEMORY;  
Resource Manager disabled during database migration: plan '' not set  
ALTER SYSTEM SET resource_manager_plan='' SCOPE=MEMORY;  
ALTER SYSTEM SET recyclebin='OFF' DEFERRED SCOPE=MEMORY;  
Resource Manager disabled during database migration
```

*Please note: This is an excerpt from the alert.log – these parameters will be set implicitly during a STARTUP UPGRADE*

- Suppresses unnecessary error messages like **ORA-00942: table or view does not exist** - thus logfiles will be easier to read and check



# Command Line Upgrade



- Create tablespace SYSAUX (only if source is a 9i db) :

```
SQL> CREATE TABLESPACE SYSAUX
      DATAFILE 'file' SIZE 500M
      AUTOEXTEND ON MAXSIZE 8G
      EXTENT MANAGEMENT LOCAL
      SEGMENT SPACE MANAGEMENT AUTO
      ONLINE ;
```

# Command Line Upgrade

- One upgrade script for all releases and all components:

```
SQL> @catupgrd.sql
```

- Useful:

**Best Practice**

```
SQL> set echo on  
SQL> SPOOL c:\temp\upgrade.log
```

- Database will be shutdown when script has been completed



# Command Line Upgrade

- Post upgrade script: `catuppst.sql`
  - Only necessary when upgrading from  $\geq 10.1$
  - Located in `$/rdbms/admin`
  - Runs when database is started up in `normal` mode
  - Will update the following information:
    - Upgrade Automatic Workload repository (AWR) baseline information
    - Upgrade ADDM task metadata
    - Update Oracle Label security (OLS) policies

# Command Line Upgrade

Best Practice

- Generate fixed object stats:

```
SQL> exec DBMS_STATS.GATHER_FIXED_OBJECT_STATS;
```

- Just best practice at this stage to run the next step more efficient
- See [Note:798257.1](#) for more detailed information on gathering fixed object statistics



# Command Line Upgrade

- Recompilation:
  - `utlrp.sql`
    - Calls `utlprp.sql` and determines the parallel degree for recompilation based on CPU cores
    - Recompiles all INVALID objects
    - Utilizes package `utl_recomp`
    - Re-enables functional indexes automatically
    - `utlprp.sql` can be called directly like:
      - `SQL> @utlprp 7`
      - This can be useful to minimize CPU usage

# Command Line Upgrade

Best Practice

- Monitor the progress during recompilation :

1. Query returning the number of invalid **objects remaining**.

This number should decrease with time.

```
SELECT COUNT(*) FROM obj$ WHERE status IN (4, 5, 6);
```

2. Query returning the number of objects **compiled so far**.

This number should increase with time.

```
SELECT COUNT(*) FROM UTL_RECOMP_COMPILED;
```

3. Query showing **jobs created** by UTL\_RECOMP.

```
SELECT job_name FROM dba_scheduler_jobs  
WHERE job_name like 'UTL_RECOMP_SLAVE_%';
```

4. Query showing UTL\_RECOMP **jobs** that are **running**.

```
SELECT job_name FROM dba_scheduler_running_jobs  
WHERE job_name like 'UTL_RECOMP_SLAVE_%';
```



# Command Line Upgrade

Status/Success

- Post upgrade script: `utlu112s.sql`
  - Run against new database in 11g environment
  - Checks the upgrade results according to `DBA_REGISTRY`
  - Displays duration of the upgrade per component and in total

# Command Line Upgrade

- Post upgrade script: `utlu112s.sql`

```
SQL> @?/rdbms/admin/utlu112s.sql
Oracle Database 11.2 Post-Upgrade Status Tool          10-07-2009 11:48:30

Component                               Status          Version         HH:MM:SS
Oracle Server                            VALID           11.2.0.1.0     00:24:32
JServer JAVA Virtual Machine             VALID           11.2.0.1.0     00:06:10
Oracle Workspace Manager                 VALID           11.2.0.1.0     00:01:11
OLAP Analytic Workspace                  VALID           11.2.0.1.0     00:00:44
OLAP Catalog                             VALID           11.2.0.1.0     00:01:33
Oracle OLAP API                          VALID           11.2.0.1.0     00:00:58
Oracle Enterprise Manager                 VALID           11.2.0.1.0     00:15:19
Oracle XDK                               VALID           11.2.0.1.0     00:06:11
Oracle Text                              VALID           11.2.0.1.0     00:01:18
Oracle XML Database                      VALID           11.2.0.1.0     00:07:43
Oracle Database Java Packages            VALID           11.2.0.1.0     00:00:42
Oracle Multimedia                        VALID           11.2.0.1.0     00:09:57
Spatial                                  VALID           11.2.0.1.0     00:10:34
Oracle Expression Filter                  VALID           11.2.0.1.0     00:00:23
Oracle Rules Manager                     VALID           11.2.0.1.0     00:00:20
Gathering Statistics                     VALID           11.2.0.1.0     00:11:31

Total Upgrade Time: 01:39:16
```





# Command Line Upgrade

- Compare invalid objects script: `utluiobj.sql`

```
SQL> @?/rdbms/admin/utluiobj.sql
```

```
Oracle Database 11.1 Post-Upgrade Invalid Objects Tool 08-03-2010 18:23:09
```

```
This tool lists post-upgrade invalid objects that were not invalid  
prior to upgrade (it ignores pre-existing pre-upgrade invalid objects).
```

```
Owner                Object Name          Object Type
```

```
...
```

# Agenda

○ Preparation

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● Upgrade

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○ Diagnostics & Tuning

○ Performance Testing

○ Best Practices

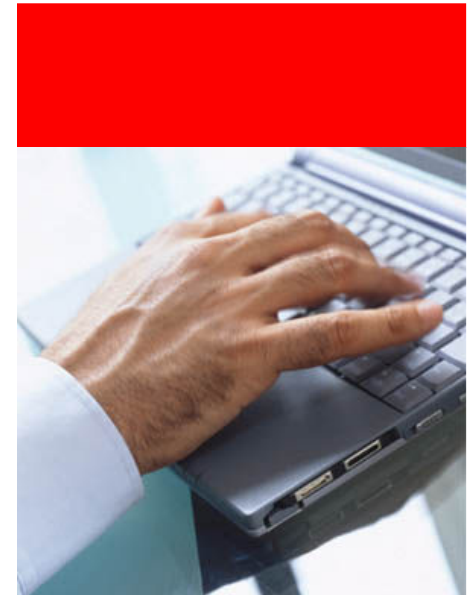
Database Upgrade Assistant

Command Line Upgrade

Post Upgrade

Alternatives

Migration



# Post Upgrade - SPFILE

Best Practice

- 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;
```

- Parameter can be changed by:

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



# Post Upgrade Task – time zone

Only in 11g Release 2

- Adjust time zone data in the database to **DST V11** or higher:

```
startup upgrade
exec dbms_dst.begin_upgrade(new_version => 14);
shutdown immediate;

startup;
set serveroutput on;
declare
  num_of_failures number;
begin
  dbms_dst.upgrade_database(num_of_failures);
  dbms_output.put_line(num_of_failures);
  dbms_dst.end_upgrade(num_of_failures);
  dbms_output.put_line(num_of_failures);
end;
/
```

- For more information see the Globalization Doc:

[http://download.oracle.com/docs/cd/E11882\\_01/server.112/e10729/ch4datetime.htm#NLSPG261](http://download.oracle.com/docs/cd/E11882_01/server.112/e10729/ch4datetime.htm#NLSPG261)



# Network ACLs

- Oracle XML DB must be installed (default!) if one or more of these packages are used:  
UTL\_TCP, UTL\_SMTP, UTL\_MAIL, UTL\_HTTP and/or  
UTL\_INADDR
- See [Note:453786.1](#) for further explanation
- See also the Database Upgrade Guide for an example:  
[http://download.oracle.com/docs/cd/E11882\\_01/server.112/e17222/upgrade.htm#sthref148](http://download.oracle.com/docs/cd/E11882_01/server.112/e17222/upgrade.htm#sthref148)

# Gather Workload Statistics

Best Practice

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

```
SQL> EXECUTE dbms_stats.gather_system_stats('start');  
    << Run it for several hours on a workload – does not generate overhead!!! >>  
SQL> EXECUTE dbms_stats.gather_system_stats('stop');
```

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

NAME	VALUE	INFO
-----	-----	-----
STATUS		COMPLETED
DSTART		04-03-2010 12:30
DSTOP		05-03-2010 12:30
FLAGS		1
CPUSPEEDNW	2498,65	
IOSEEKTIM	11,405	
IOTFRSPEED	25595,605	
...		

# Gather Workload Statistics

INFO

- Calibrate I/O (Orion): Example

```
SET SERVEROUTPUT ON
DECLARE lat INTEGER;
iops INTEGER;
mbps INTEGER;
BEGIN
DBMS_RESOURCE_MANAGER.CALIBRATE_IO (28, 10, iops, mbps, lat);
DBMS_OUTPUT.PUT_LINE ('max_iops = ' || iops);
DBMS_OUTPUT.PUT_LINE ('latency = ' || lat);
DBMS_OUTPUT.PUT_LINE ('max_mbps = ' || mbps);
end;
/
```

- *This is a requirement for AUTODOP (automatic degree of parallelism in 11.2.0.2) – in addition PARALLEL\_DEGREE\_POLICY must be set to AUTO*
- Delete system stats and revert to the default values:

```
SQL> EXECUTE dbms_stats.delete_system_stats;
```



# Workload Stats: Further Information

- See the **Performance Tuning Guide** for all stats:
  - [http://download.oracle.com/docs/cd/E11882\\_01/server.112/e16638/stats.htm#PFGRF94743](http://download.oracle.com/docs/cd/E11882_01/server.112/e16638/stats.htm#PFGRF94743)
  - See also:
  - 13.4.1.2 Multiblock Read Count

If you gather workload statistics, then the `mbrc` value gathered as part of the workload statistics is used to estimate the cost of a full table scan. However, during the gathering process of workload statistics, Oracle Database may not gather the `mbrc` and `mreadtim` values if no table scans are performed during serial workloads, as is often the case with OLTP systems. However, full table scans occur frequently on DSS systems but may run parallel and bypass the buffer cache. In such cases, Oracle Database still gathers the `sreadtim` value because the database performs index lookup using the buffer cache.

- If Oracle Database cannot gather or validate gathered `mbrc` or `mreadtim` values, but has gathered `sreadtim` and `cpuspeed` values, then the database uses only the `sreadtim` and `cpuspeed` values for costing. In this case, the optimizer uses the value of the initialization parameter `DB_FILE_MULTIBLOCK_READ_COUNT` to cost a full table scan. **However, if `DB_FILE_MULTIBLOCK_READ_COUNT` is not set or is set to 0 (zero), then the optimizer uses a value of 8 for costing.**



# Post Upgrade: Fixed Table Stats

Best Practice

- Create **fixed table statistics** directly after catupgrd.sql has been completed:

```
SQL> exec DBMS_STATS.GATHER_FIXED_OBJECT_STATS;
```

- Otherwise it can happen that MMON will cause too much CPU load
- Create fixed table statistics again after a week with regular production workload
- This task should be done only a few times per year

# Agenda

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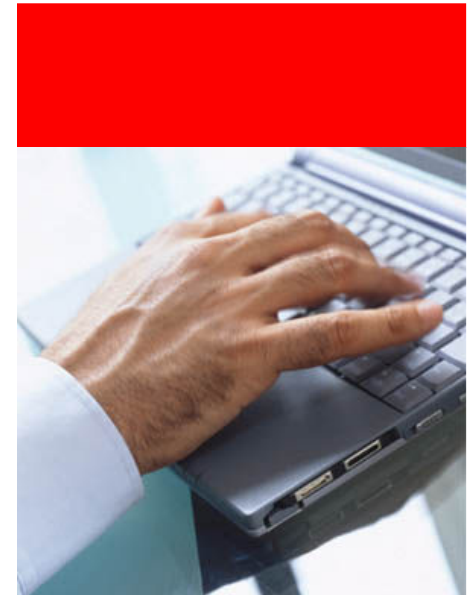
Database Upgrade Assistant

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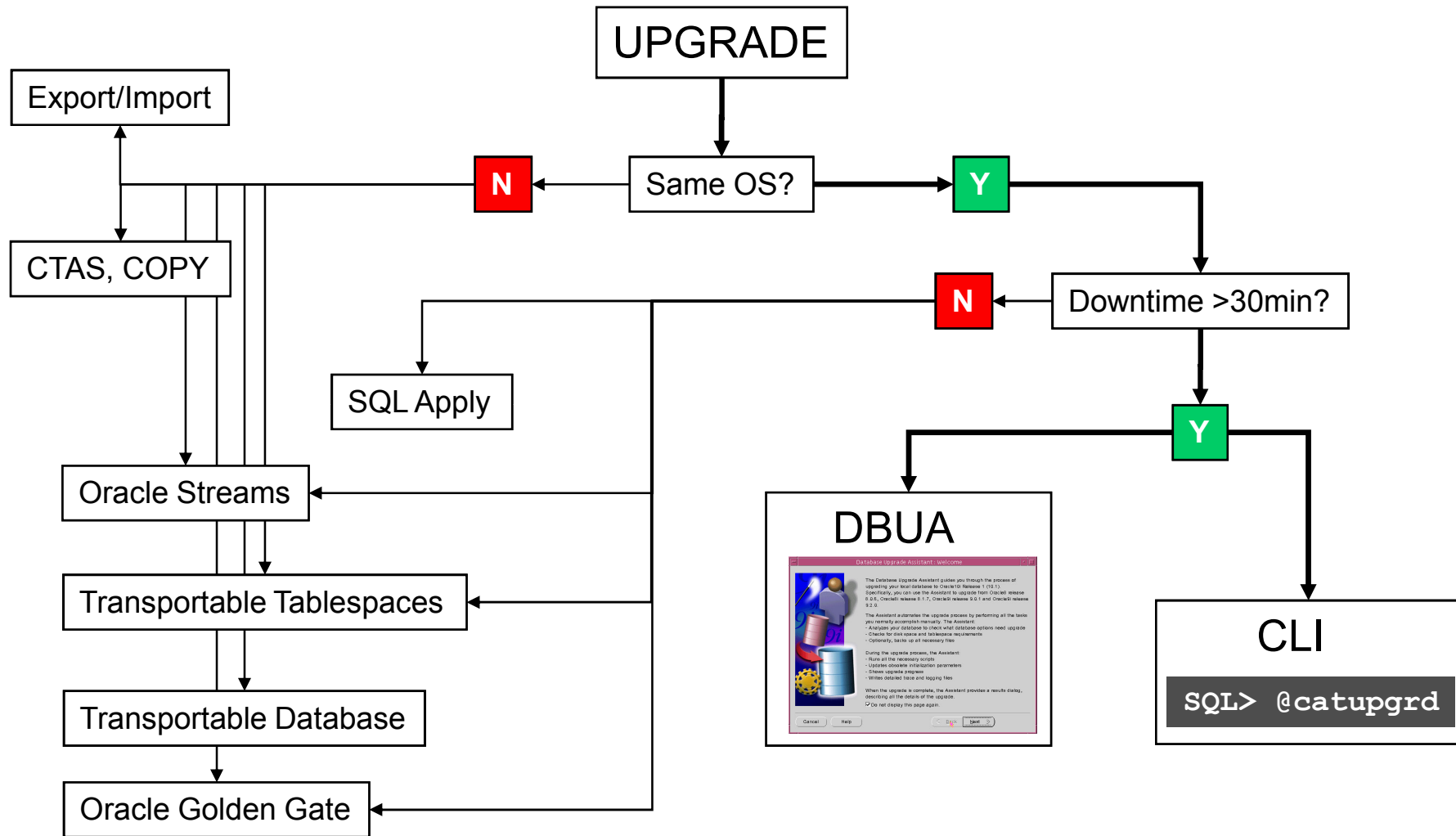




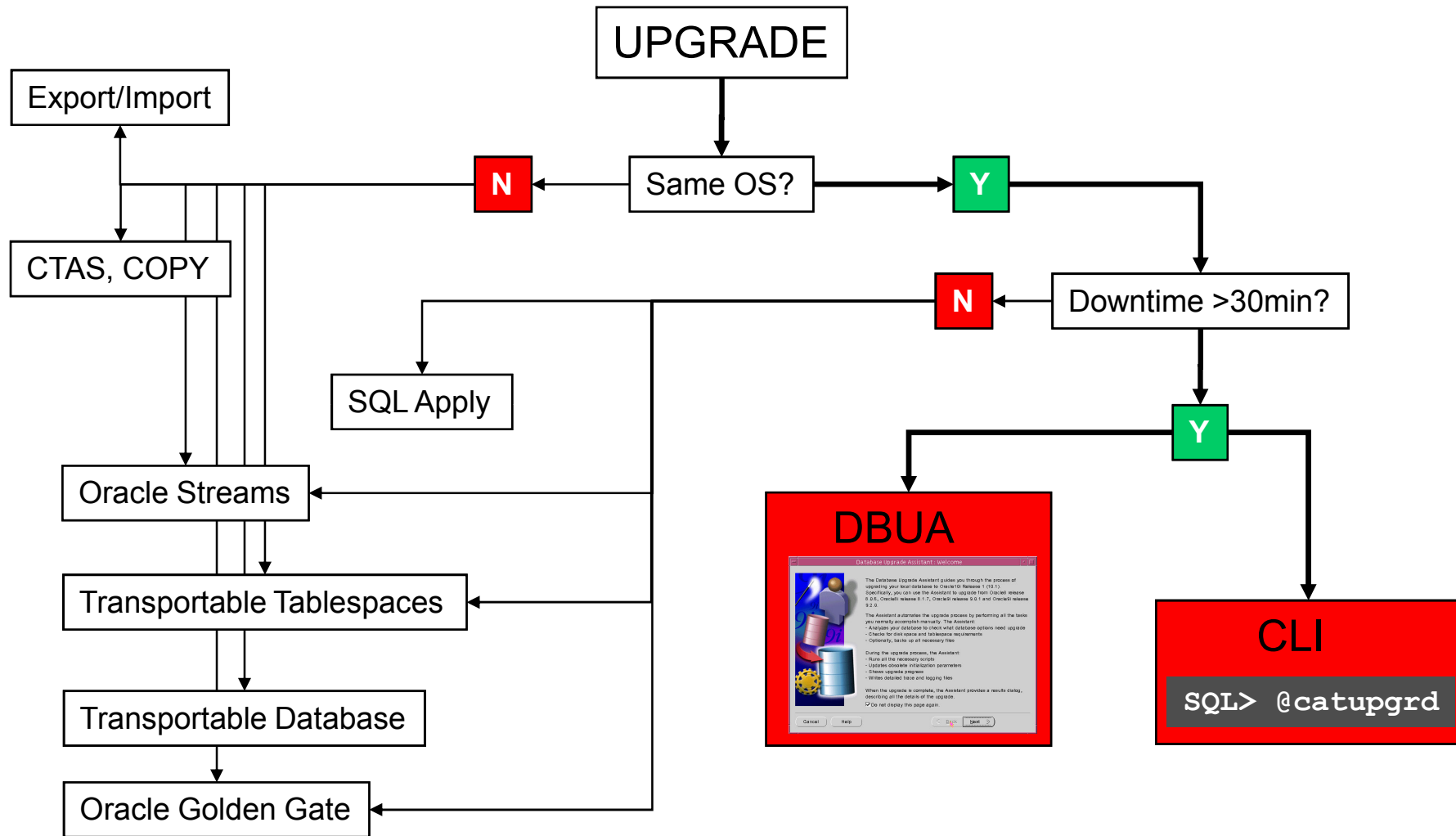
# Upgrade Alternatives

- Migration methods
- Minimal downtime methods
  - What does "minimal downtime" really mean?
    - 12 hours?
    - 60 minutes?
    - 5 minutes?
    - Less?
    - No downtime at all?

# Upgrade Alternatives



# Upgrade Alternatives



# "Regular" Database Upgrade

- Upgrade duration is mainly dependent on the number of installed components
  - Completes usually in 20-90 minutes
    - No difference between DBUA and command line upgrade
  - This is **not a recommendation** to deinstall any components!!!

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

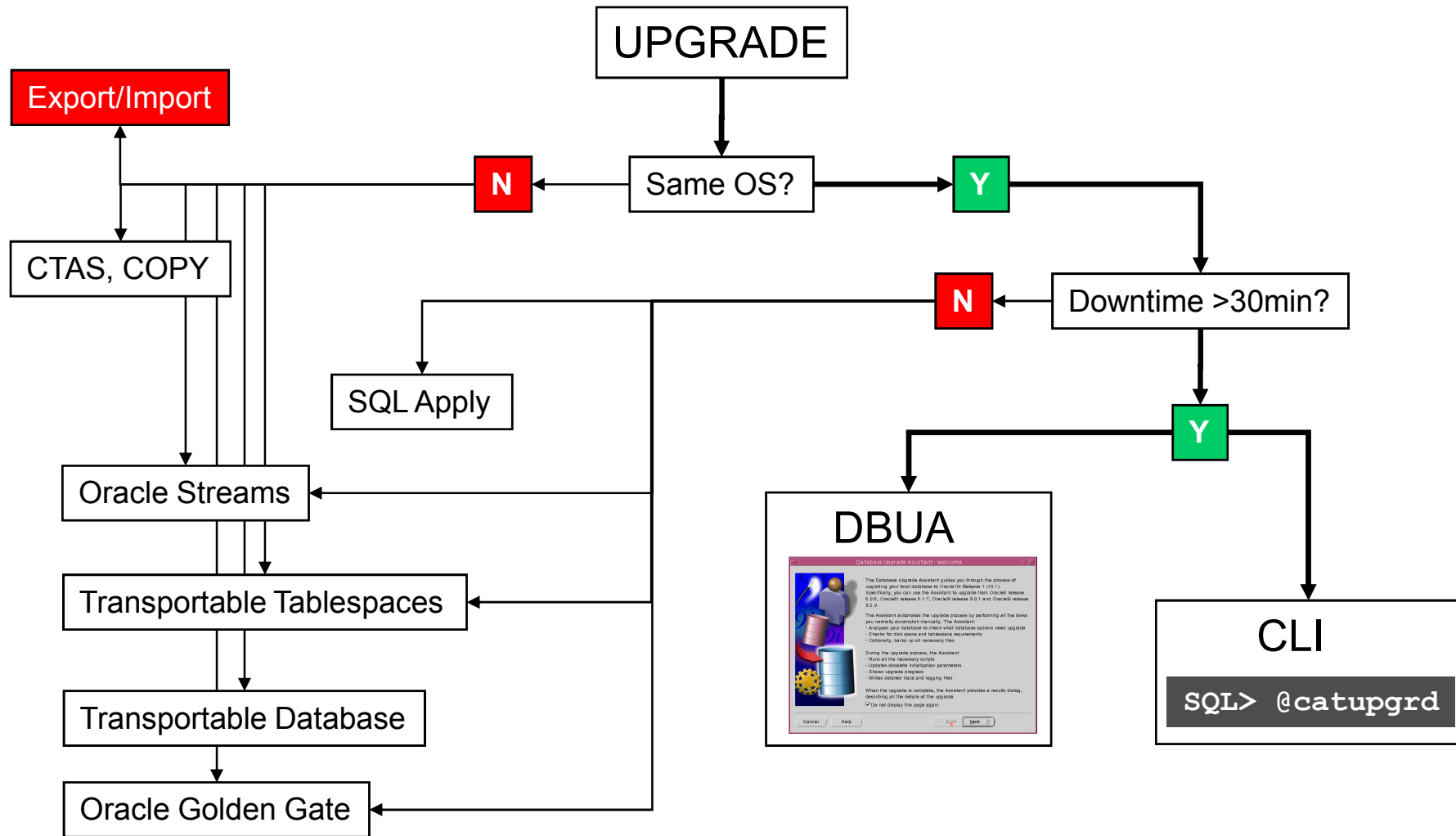
**Total Upgrade Time: 00:52:31**

Component	HH:MM:SS
Oracle Server	00:16:17
JServer JAVA Virtual Machine	00:05:19
Oracle XDK	00:00:48
Oracle Text	00:00:58
Oracle XML Database	00:04:09
Oracle Database Java Packages	00:00:33

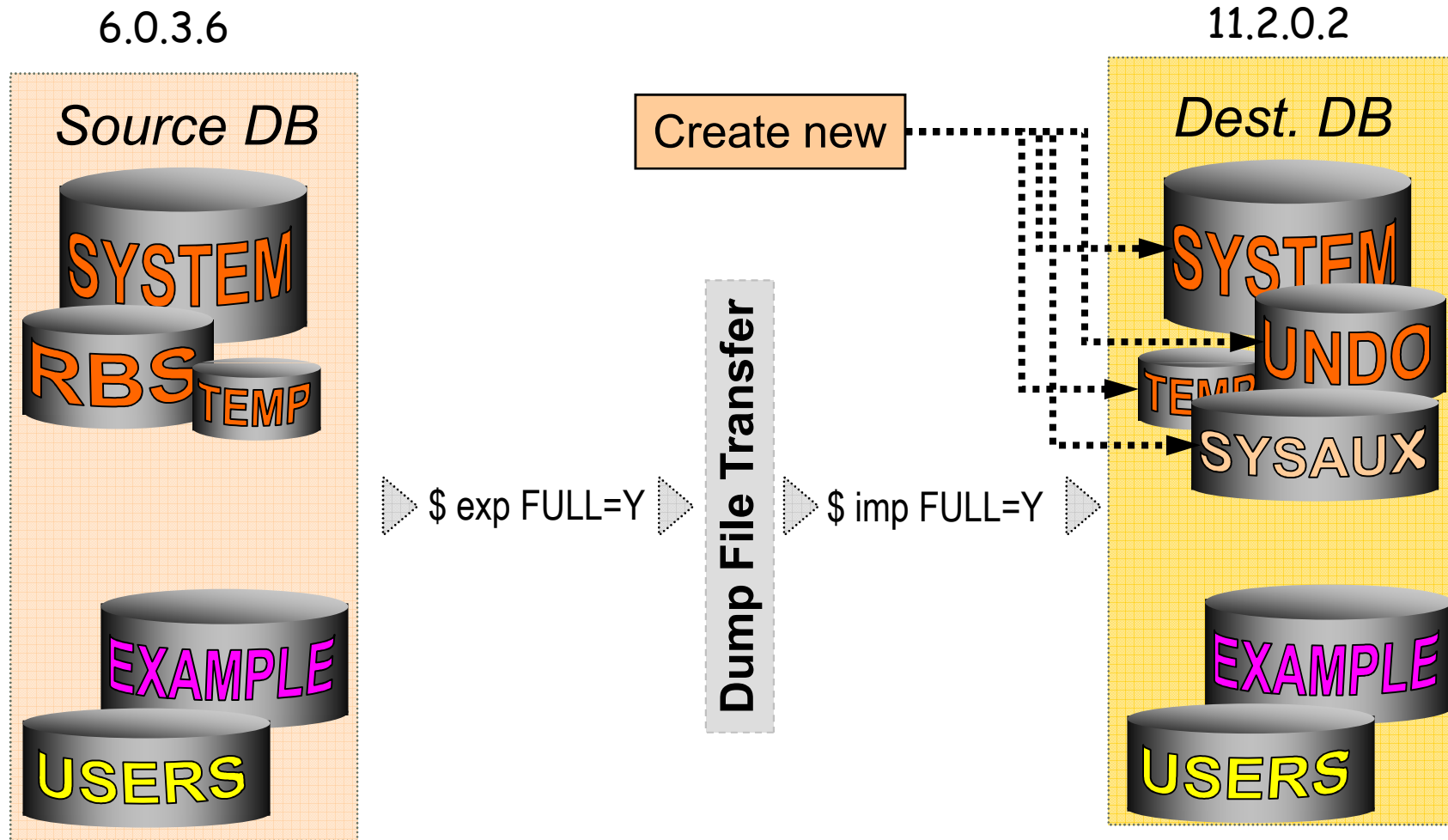
Gathering Statistics 00:02:43

**Total Upgrade Time: 00:30:47**

# Upgrade Alternatives



# Export - Import







# Export - Import

- All purpose
- Import of all versions  $\geq$  Oracle V5 possible
- "exp" is *not supported* in 11g anymore
  - But the utility is still there and can be used
  - "imp" is still supported for importing older dumpfiles
- Not really fast but well known and reliable
  - Relation between amount of data and runtime
- Necessary and helpful :
  - Changing the database charactersets
  - Changing the OS platform
  - Schema consolidation
  - Non-direct-upgrade supported releases such as 8.0.3
- No need to care for source patch release or time zone patches



# Export - Import

- Export/Import
  - Changing the character set
    - Changing the Database Character Set  
[Note:225912.1](#)
    - Use Scanner Utility **CSscan** before altering the DB Character set  
[Note:123670.1](#)
  - Unicode
    - Problem can be special characters, e.g.:  
Umlaut **Ä** in WE8ISO... = 1 Byte  
Umlaut **Ä** in UTF8 = 2 Byte
      - Workaround: `nls_length_semantics=char`
    - Important Unicode Notes on support.oracle.com:  
[Note:260893.1](#) and [Note:788156.1](#)
  - WE8ISO8859P1 ==> P15: [Note:257722.1](#)
- Character Set Migration - Resources:
  - <http://www.oracle.com/technetwork/database/features/globalization/index.html>



# Export - Import

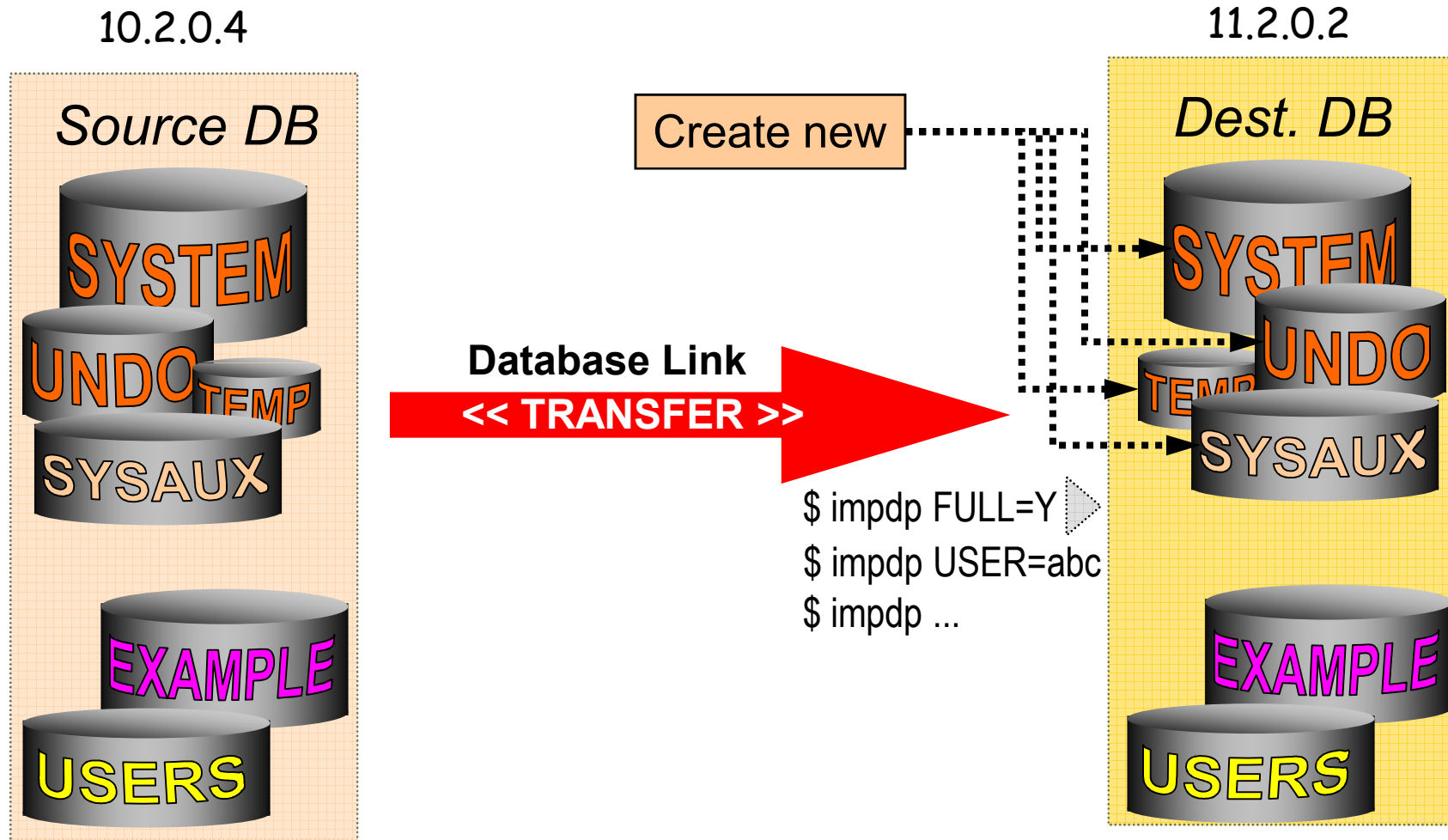
- Hints and tricks
  - Transfer dump files always in **BINARY** mode
  - Do full database export always as user **SYSTEM**
    - GRANTs on SYS's objects have to be exported separately
  - Import takes approximately 3x times as long as Export
  - Export always with the lowest involved database version
  - Import always with **imp** of target database
    - See also: [Note:286775.1](#)
- Export performance
  - **DIRECT=Y** ... bypasses SQL-Layer, but no conversions!
  - Parallelize export by dividing into logical independent chunks of data
- Import performance
  - Increase **BUFFER**
  - **INDEXES=N** ... build indexes later in parallel ... **INDEXFILE=...**
  - Parameter **COMMIT\_WRITE=NOWAIT (10g)** or **COMMIT\_WAIT=NOWAIT (11g)** during import



# Data Pump

- The "new" `exp/imp` - since Oracle Database 10g
  - Faster than `exp/imp`
  - Powerful concept and more capabilities than `exp/imp`
    - EXCLUDE  
For examples see [Note:341733.1](#)
    - COMPRESS=ALL (*Advanced Compression Option* 😊)
    - SQL with WHERE clause
  - Hint: Use **EXCLUDE=STATISTICS** while importing
- Compatibility and version changes: [Note:553337.1](#)

# Data Pump with NETWORK\_LINK



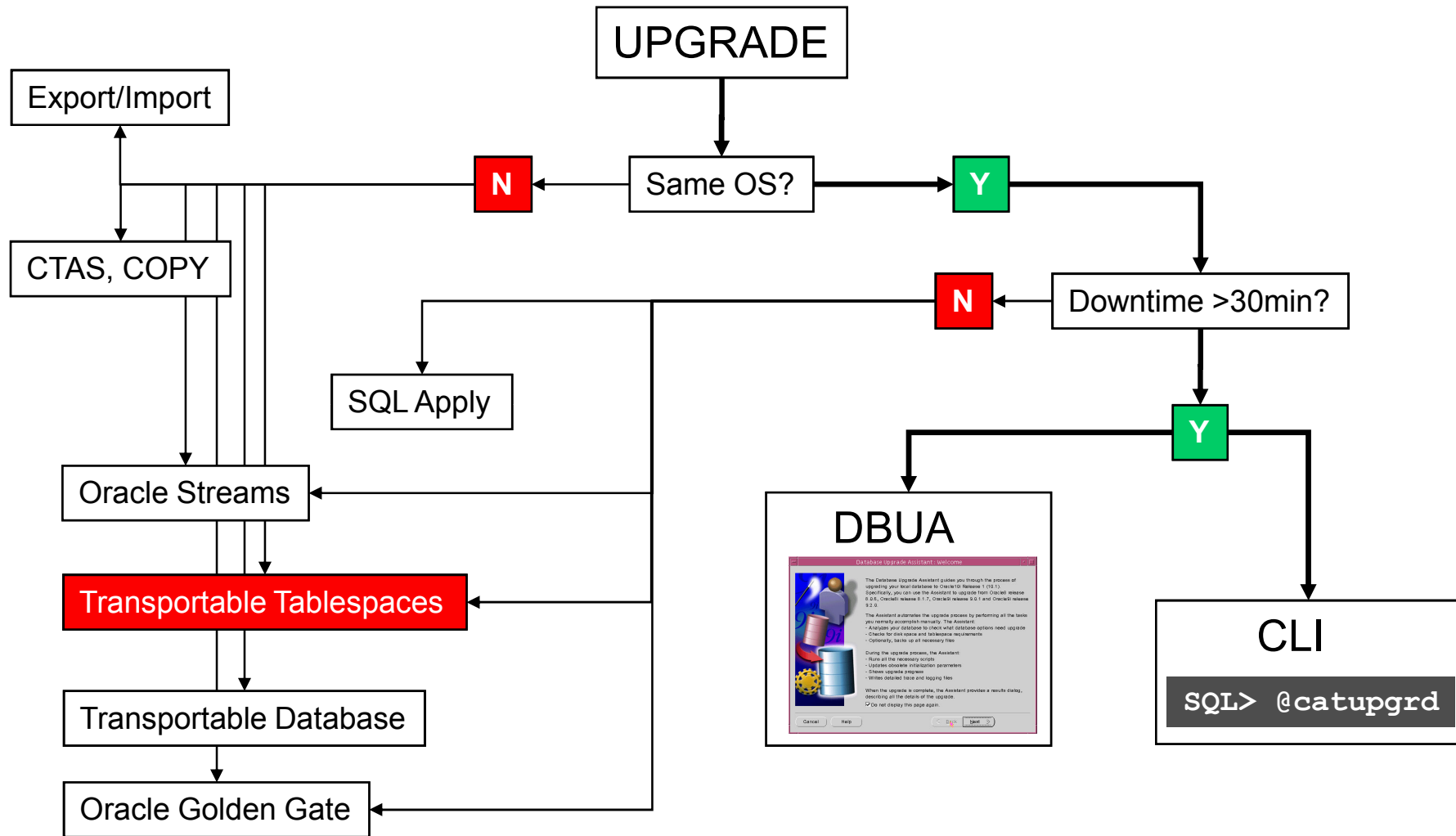


# Data Pump

- Data Pump using a database link
  - Parameter: NETWORK\_LINK
  - Run only `impdp` on the target system
  - No `expdp` necessary
    - Does not work with LONG/LONG RAW and object types
    - No disk-IO and no dump file transfer will be performed
  - Limitation: network bandwidth
  - Example:

```
$ impdp system/pw NETWORK_LINK=mydblink FULL=Y
```

# Upgrade Alternatives





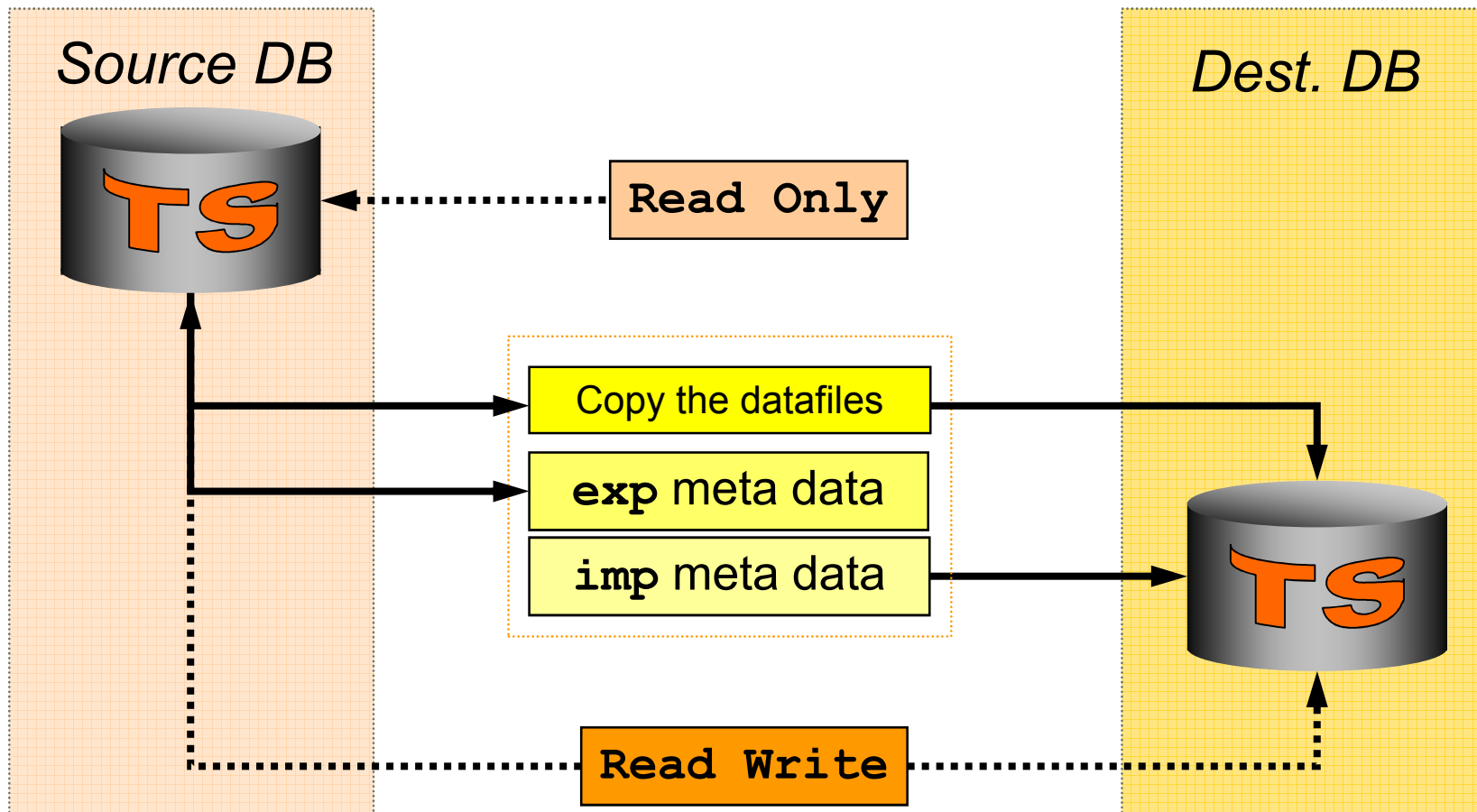
# Transportable Tablespaces

- Concept:
  - Create an "empty" database in the new environment
  - Plug in all data tablespaces from source to target database
    - SYSTEM+SYSAUX tablespaces can't be transported
    - Additional steps necessary to move views, synonyms etc.
  - "Possibly" very fast upgrade
  - Complexity could be constraining
  - Works cross-platform and cross-Endianness since Oracle Database 10g



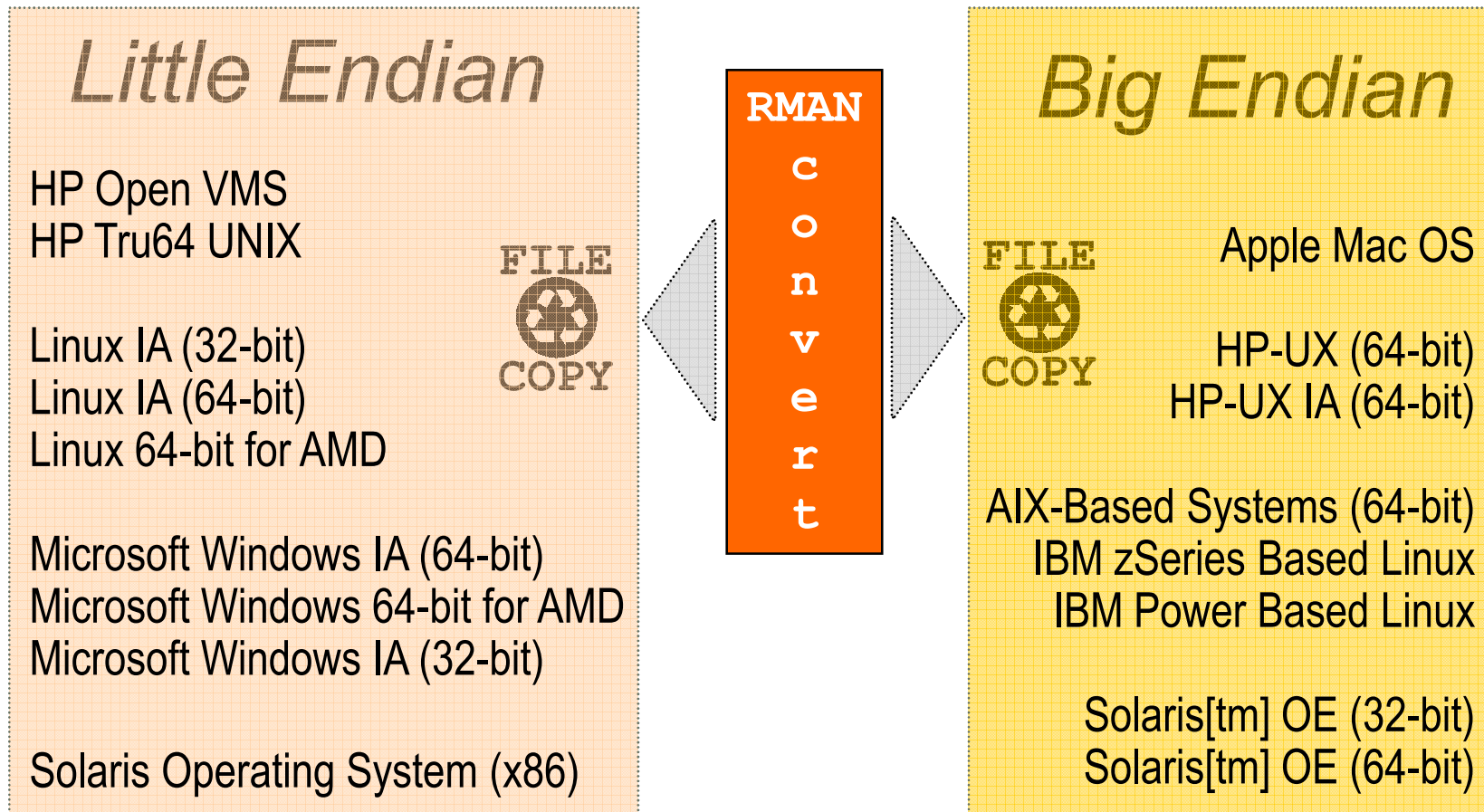
# Transportable Tablespaces

- General facts regarding TTS
  - Feature available since Oracle 8i

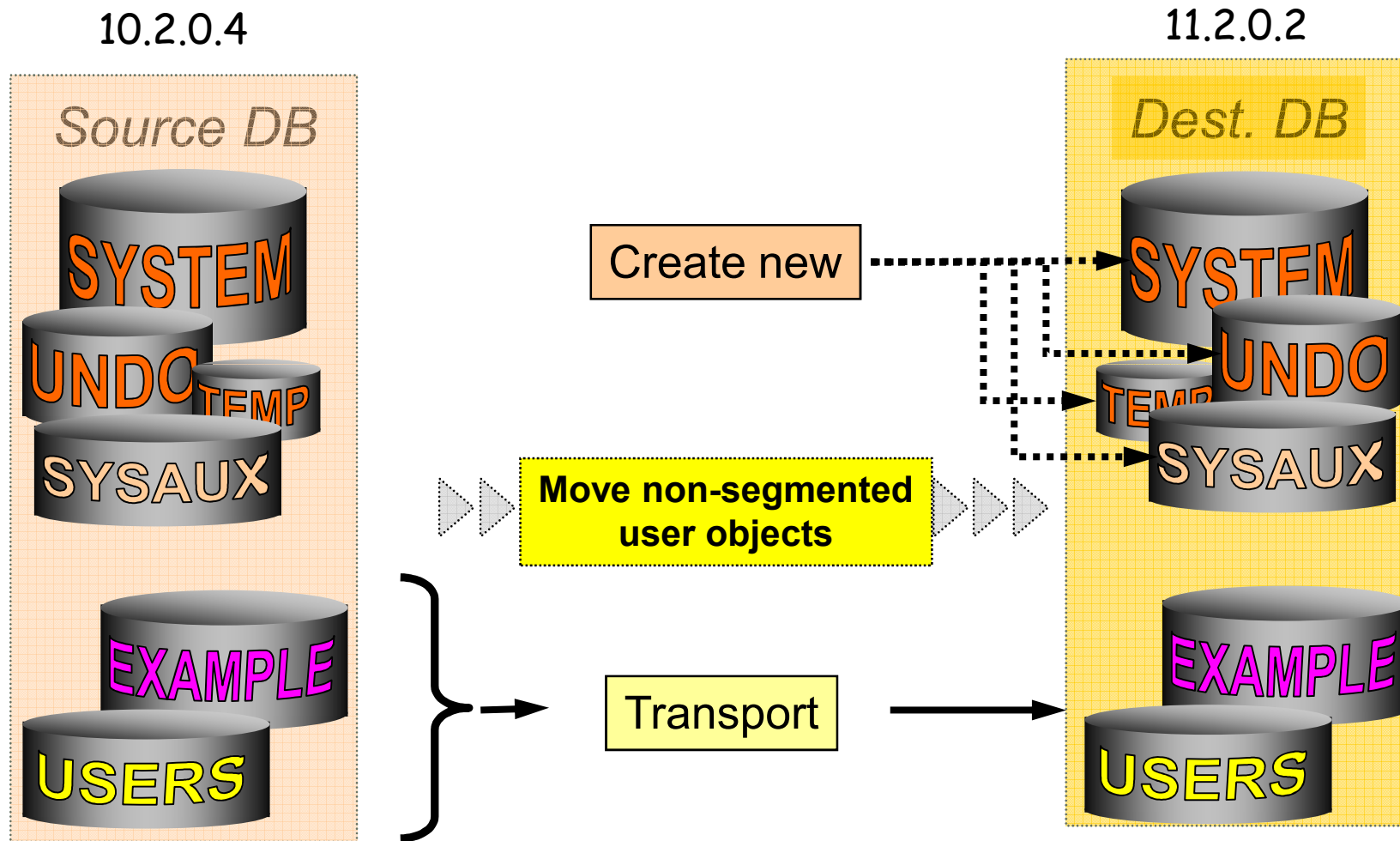


# Portable Tablespaces

- TTS x-platform (v\$transportable\_platform):



# Transportable Tablespaces





# Upgrade Alternatives

- Transportable Tablespaces - 3 ways
  - The "brutal" way
    - Full exp/imp with ROWS=N
  - The "smart" way
    - Generate scripts
      - String concatenation with || ...
      - DBMS\_METADATA
  - The "very smart" way
    - RMAN clone with SKIP TABLESPACES option
- BUT: Be very careful with sequences!!



# Transportable Tablespaces

- Tips & Tricks
  - Talk as early as possible to the application development if TTS will be your upgrade strategy
    - Less complex design is the requirement for fast TTS
  - Use a Physical Standby as transport system
    - Fallback possibility to the old system
  - If you don't move datafiles:
    - Tablespaces can be mounted from both databases simultaneously as long as they are READ ONLY
    - As soon as a tablespace will be set READ WRITE on one database it'll be "lost" for the other one
  - Make sure source and target database have **EQUAL TIME ZONE definitions**
    - If `TZsource=V11` then patch `TZtarget` to `V11` first



# Upgrade Alternatives

- **Transportable Tablespaces - Information**

- For TTS White Papers see the MAA webpage:

<http://www.oracle.com/technetwork/database/features/availability/oracle-database-maa-best-practices-155386.html>

- Database Upgrades using TTS:

<http://www.oracle.com/technetwork/database/features/availability/maa-wp-11g-upgradetts-132620.pdf>

- Platform Migration using Transportable Database (RMAN):

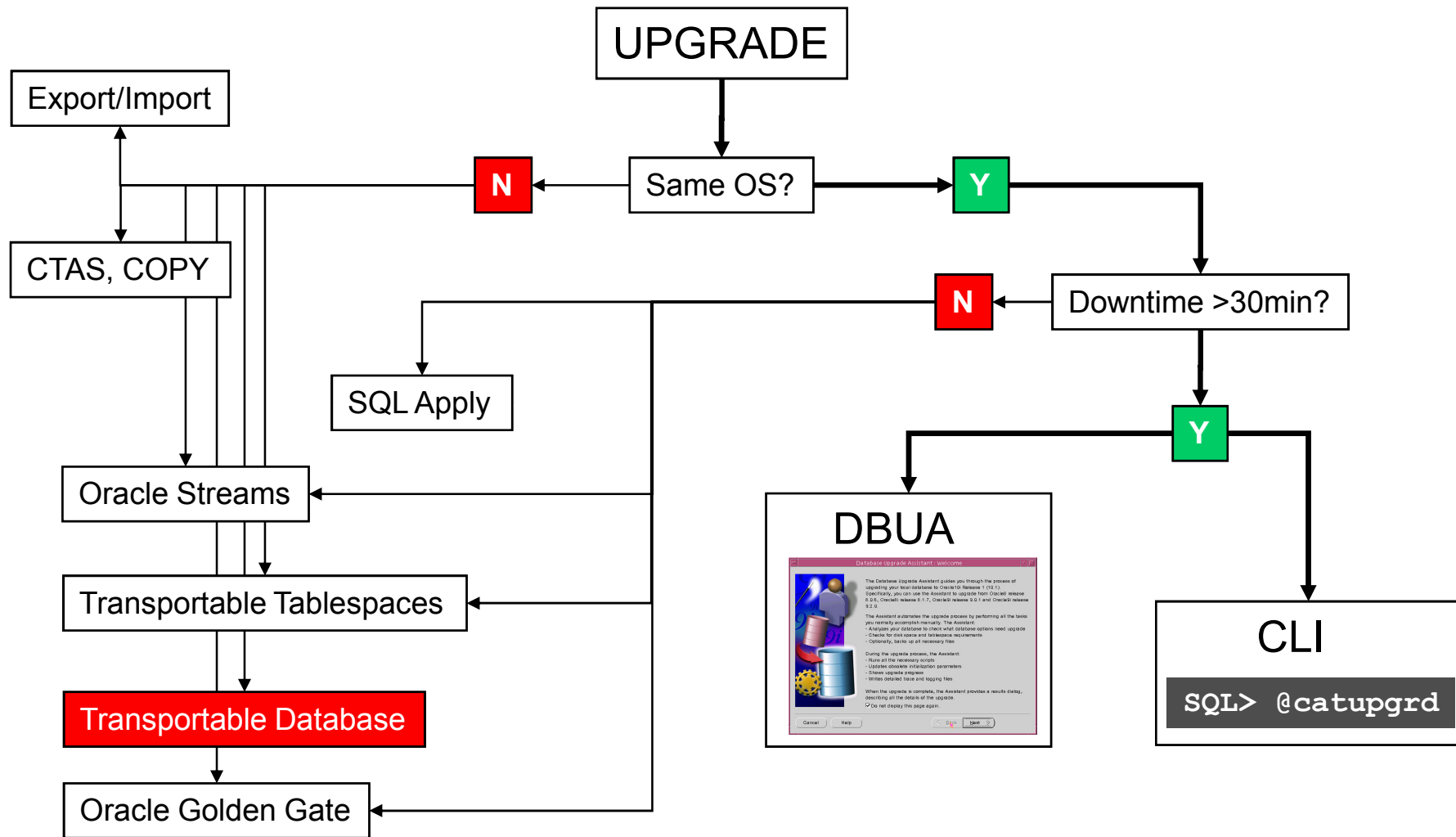
<http://www.oracle.com/technetwork/database/features/availability/maa-wp-10gr2-platformmigrationtdb-131164.pdf>

- Customer example:

- Amadeus Customer Case

<http://www.oracle.com/technetwork/database/features/availability/s281209-amadeus-130978.pdf>

# Upgrade Alternatives





# Transportable Database

- Feature since Oracle Database 10g Release 2
  - Cross-platform
  - Unfortunately not cross-Endianness!!!
  - With RMAN in an automated way
    - Database must be switched to READ ONLY mode
  - Datafiles must be converted with RMAN into target format
    - `RMAN CONVERT DATABASE` command
    - Either on the source or the target system – in most cases completes faster on the target system
  - Not a real minimal downtime concept
    - But very comfortable for migrations in between one Endianness group



# Transportable Database

- TDB x-platform (For OS naming conventions see: v\$transportable\_platform):

## *Little Endian*

HP Open VMS  
HP Tru64 UNIX

Linux IA (32-bit)  
Linux IA (64-bit)  
Linux 64-bit for AMD

Microsoft Windows IA (64-bit)  
Microsoft Windows 64-bit for AMD  
Microsoft Windows IA (32-bit)

Solaris Operating System (x86)

RMAN

c  
o  
n  
v  
e  
r  
t

## *Big Endian*

Apple Mac OS

HP-UX (64-bit)  
HP-UX IA (64-bit)

AIX-Based Systems (64-bit)  
IBM zSeries Based Linux  
IBM Power Based Linux

Solaris[tm] OE (32-bit)  
Solaris[tm] OE (64-bit)

RMAN

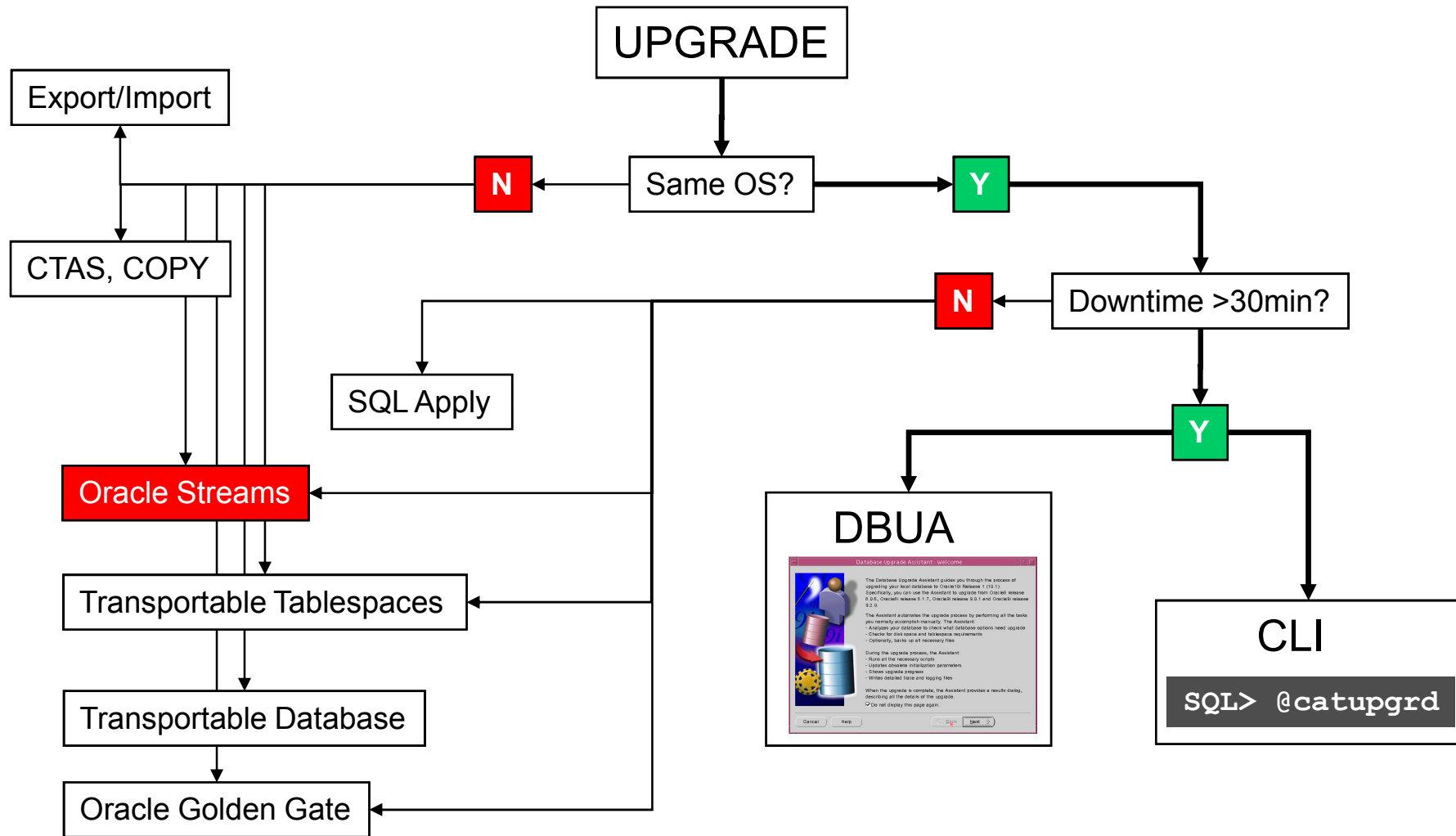
c  
o  
n  
v  
e  
r  
t



# Transportable Database

- Transportable Database - Information
  - Platform Migration using Transportable Database (RMAN):  
<http://www.oracle.com/technetwork/database/features/availability/maa-wp-10gr2-platforimmigrationtdb-131164.pdf>
  - [Note: 413586.1](#)  
How To Use RMAN CONVERT DATABASE for Cross Platform Migration

# Upgrade Alternatives





# Oracle Streams

- Concept

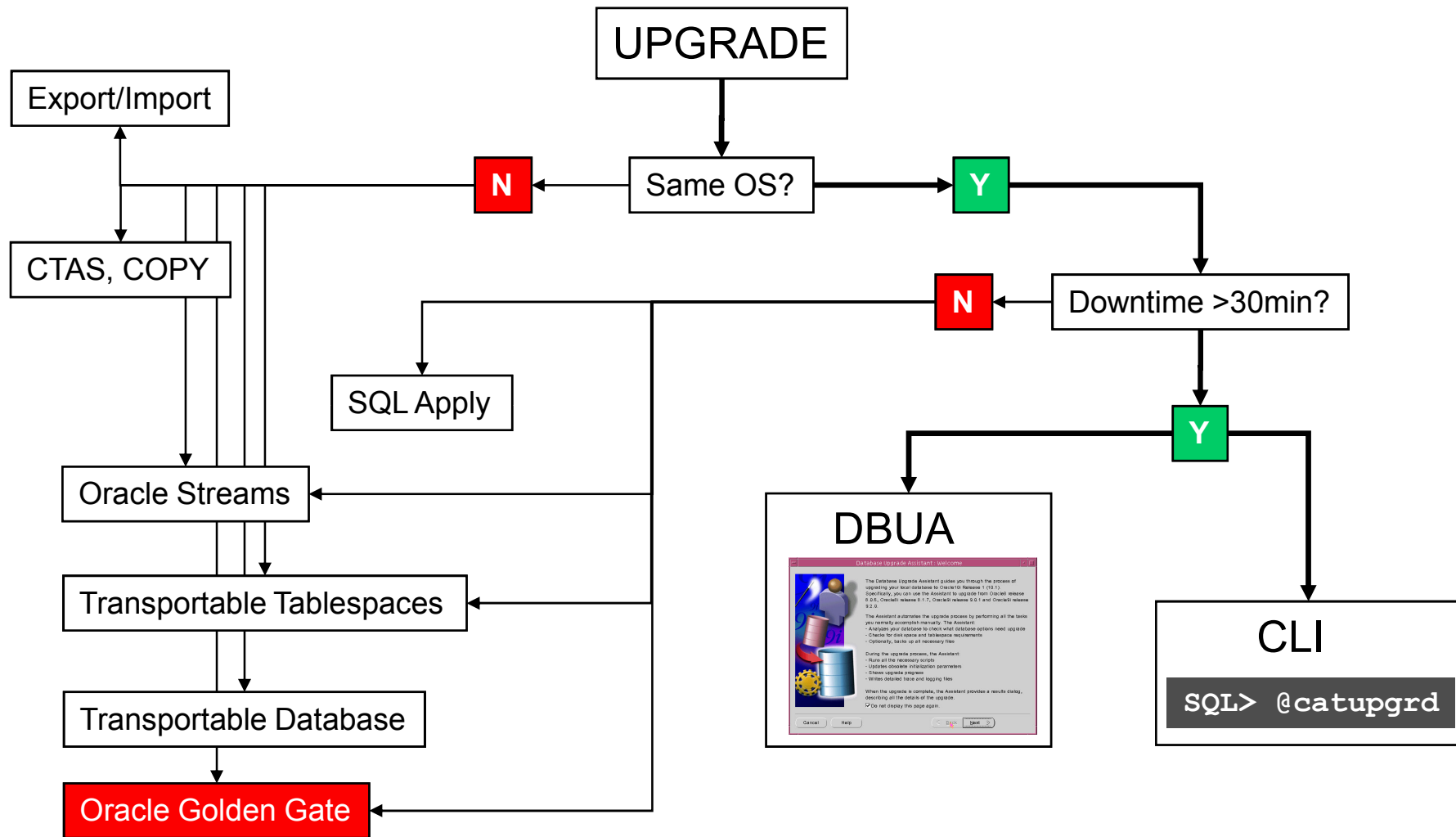
- Build up a copy of your database and upgrade it
- Synchronize it with the source database
- Downtime:
  - Just reconnecting the clients
- Cross platform
- Cross version since Oracle 9iR2
- Some effort necessary to set it up
- Fallback possible
- Logminer
  - Datatype restrictions
  - Performance

- How to:

[Oracle® Streams Concepts and Administration: Appendix D/E](http://download.oracle.com/docs/cd/E11882_01/server.112/e17069/ap_strmnt.htm#CIHJBIAA)

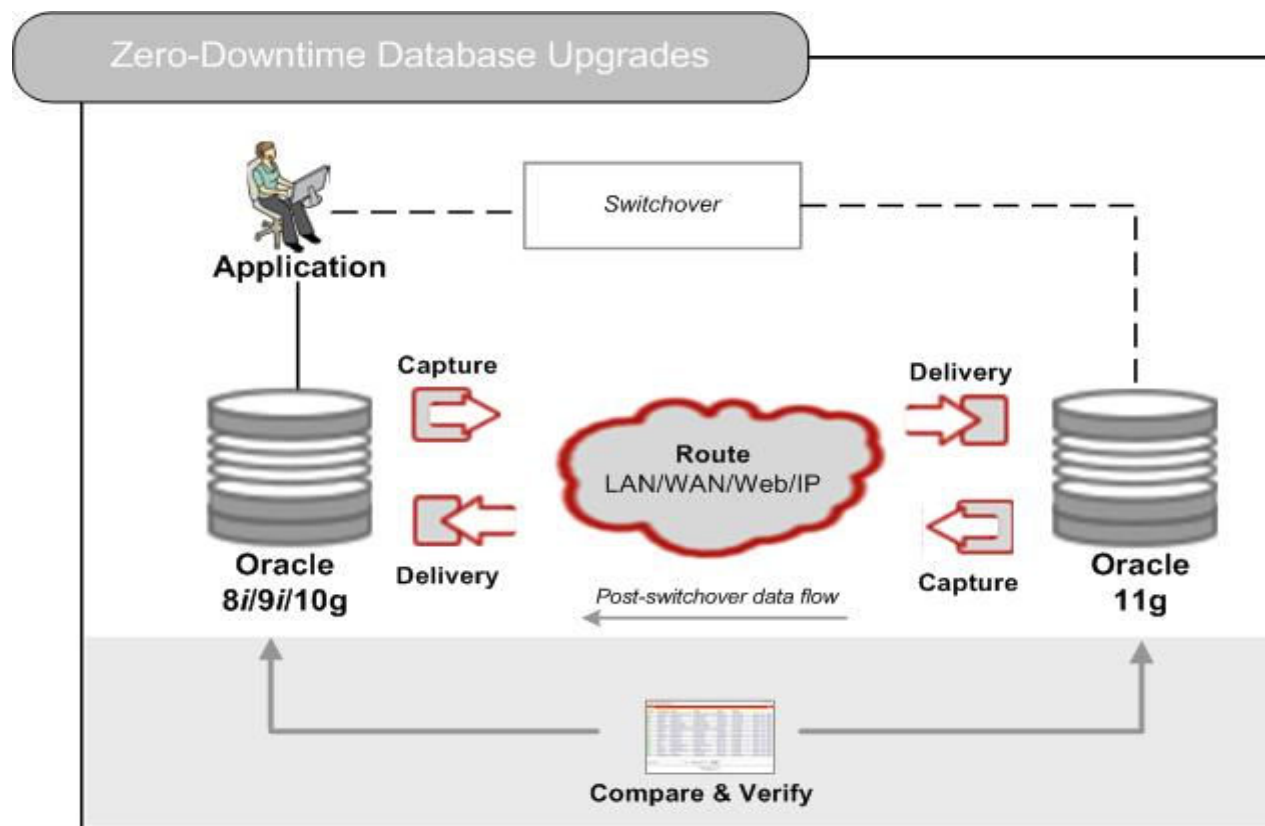
[http://download.oracle.com/docs/cd/E11882\\_01/server.112/e17069/ap\\_strmnt.htm#CIHJBIAA](http://download.oracle.com/docs/cd/E11882_01/server.112/e17069/ap_strmnt.htm#CIHJBIAA)

# Upgrade Alternatives



# Oracle GoldenGate

- Concept
  - Create a copy of your database with TTS or exp/imp
  - GoldenGate CDG mechanism for synchronization



# Oracle GoldenGate

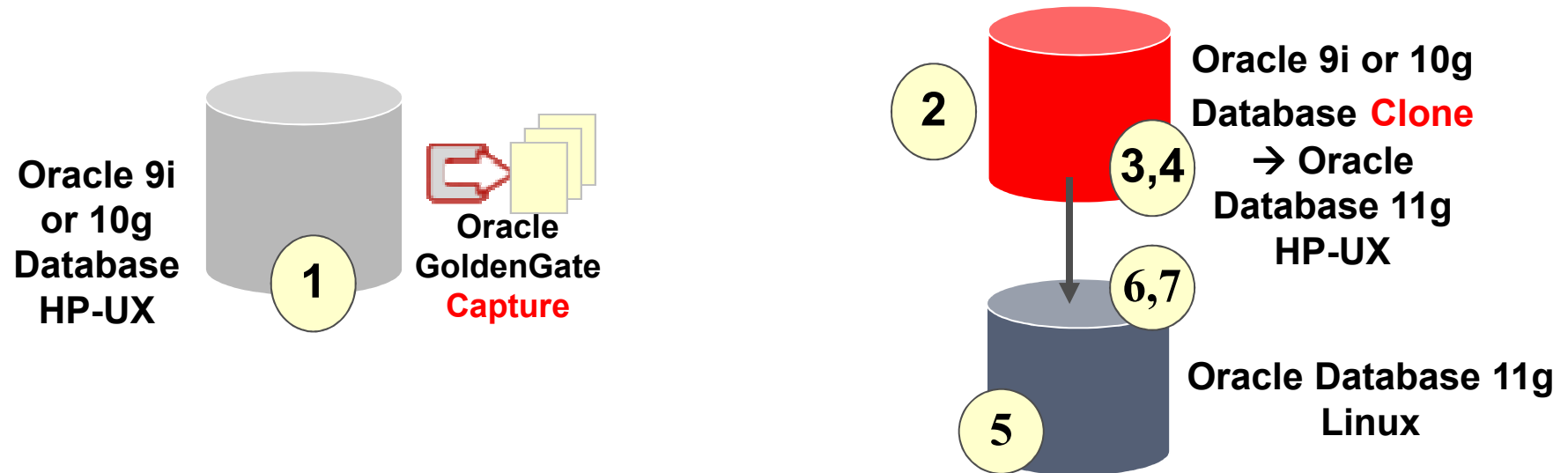
- Example: near-zero-downtime upgrade with Golden Gate



1. Start Oracle GoldenGate Capture module
2. Set up Clone database, then upgrade to Oracle Database 11g
3. Cross platform transportable tablespaces metadata export
4. Use a full database NOROWS export (Views, Packages, etc)

# Oracle GoldenGate

- Example: near-zero-downtime upgrade with Golden Gate

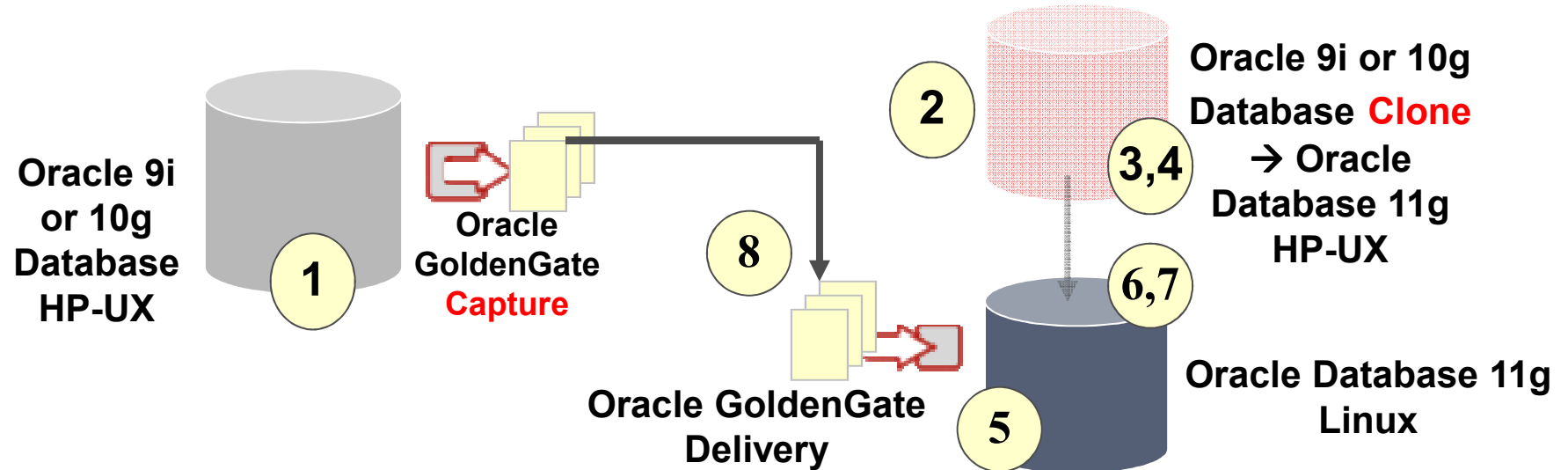


5. Set up a new Oracle Database 11g vanilla target
6. Cross platform transportable tablespaces metadata import
7. Full import with IGNORE option



# Oracle GoldenGate

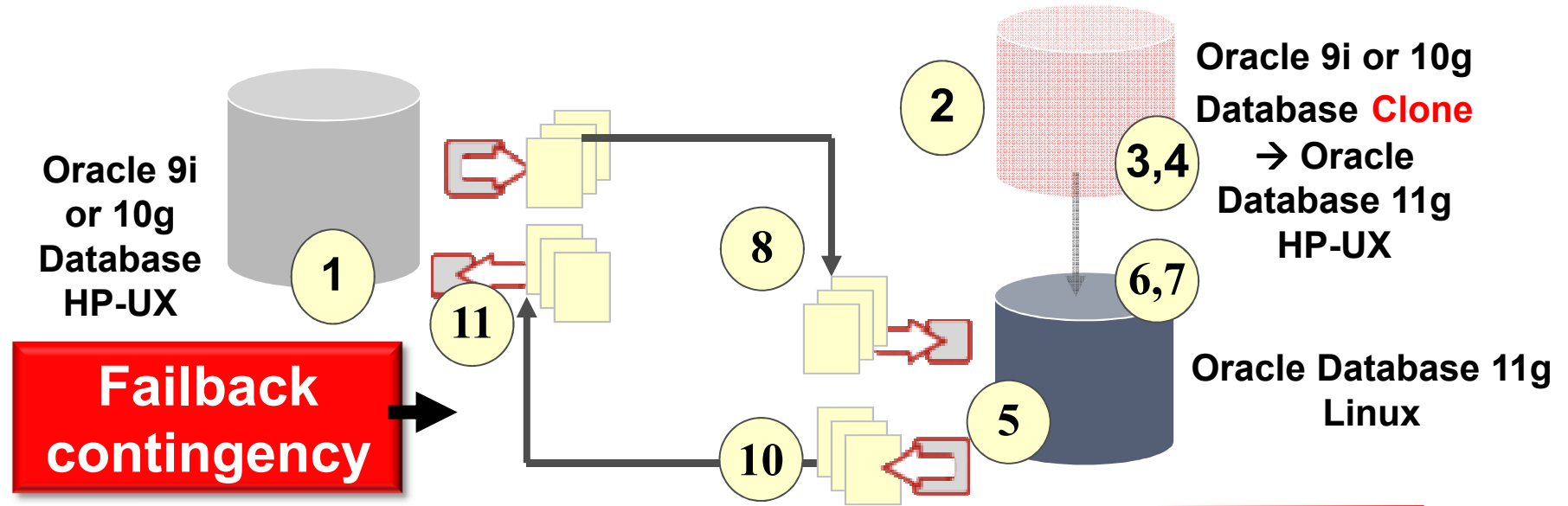
- Example: near-zero-downtime upgrade with Golden Gate



8. Start Oracle Golden Gate delivery module on target
9. \*\* Switchover \*\* (not depicted)

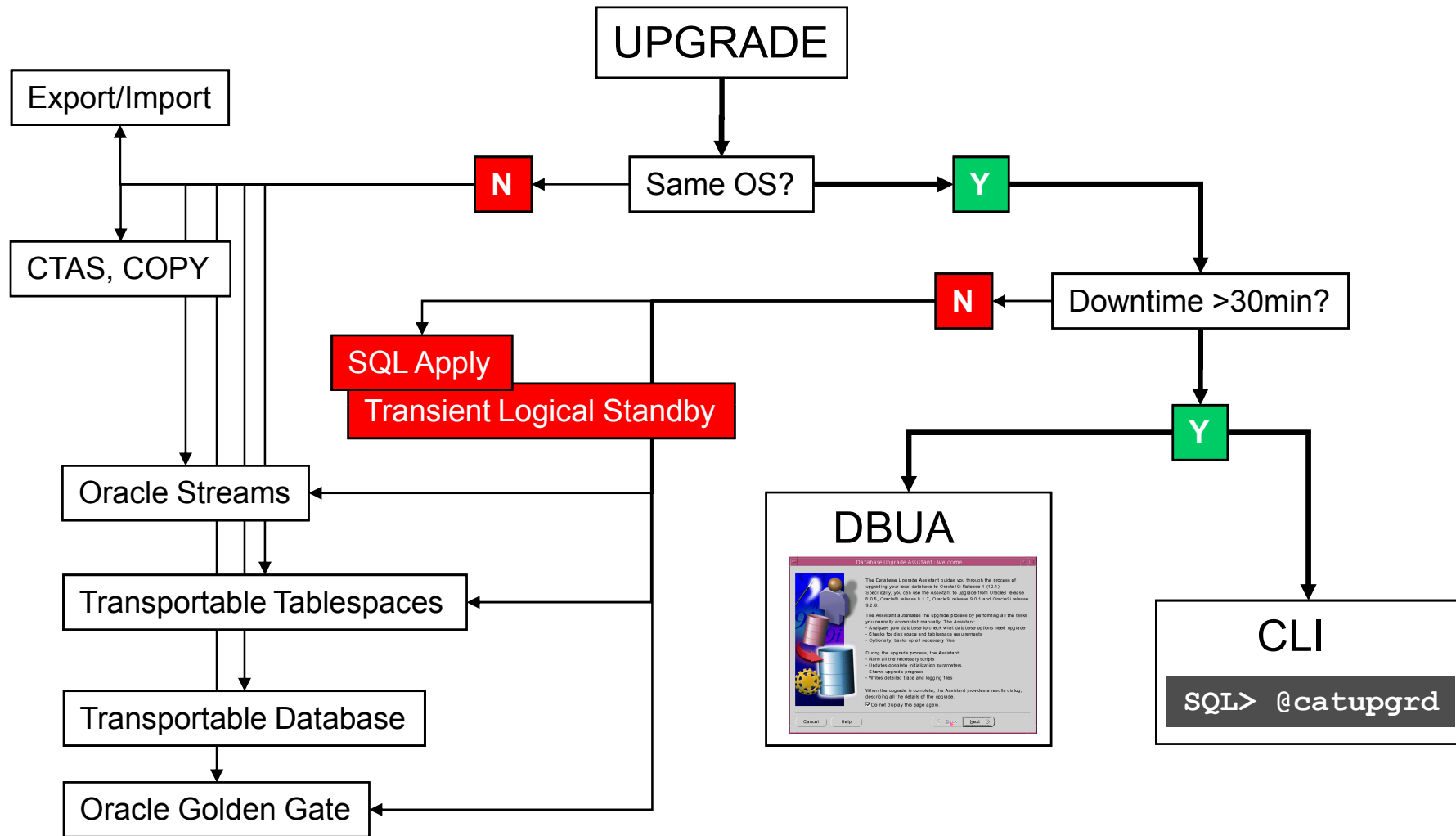
# Oracle GoldenGate

- Example: Fallback with Golden Gate



10. Start Oracle GoldenGate's Capture at Oracle Database 11g
11. Start Oracle GoldenGate's Delivery process Oracle 9i or 10i Database (old source)

# Upgrade Alternatives

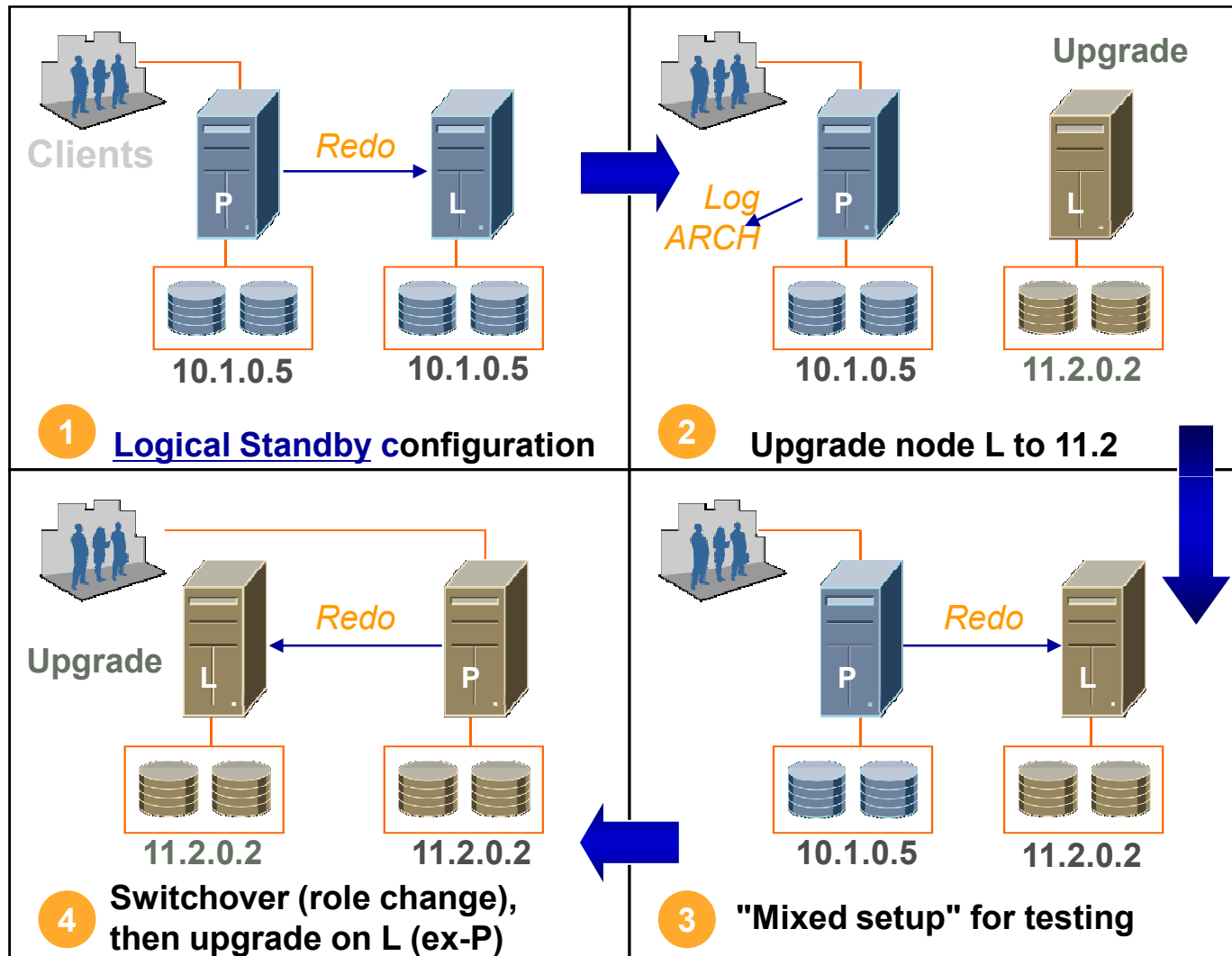




# Logical Standby with Oracle Data Guard

- Concept:
  - Build up a Physical Standby database
  - Convert the Physical Standby into a Logical Standby
  - Upgrade the Logical Standby database
  - Switchover – Standby will be production system now
  - Then: Upgrade of the former production database
  - Eventually: Switchover to the original roles
    - Downtime less 2 minutes
    - BUT:
      - No OS change possible
      - Logminer has known restrictions

# Logical Standby with Oracle Data Guard





# Upgrade Alternatives

- How to:
  - Patches, Links and Restrictions when upgrading from 10g:  
[Note: 300479.1](#)
  - Please see the documentation!!!  
11.1: [http://download.oracle.com/docs/cd/B28359\\_01/server.111/b28294/create\\_ls.htm#g105412](http://download.oracle.com/docs/cd/B28359_01/server.111/b28294/create_ls.htm#g105412)  
11.1: [http://download.oracle.com/docs/cd/B28359\\_01/server.111/b28294/rollup.htm#BABJIDHI](http://download.oracle.com/docs/cd/B28359_01/server.111/b28294/rollup.htm#BABJIDHI)
  - [Note:748595.1](#) (how to create a logical standby from a physical)
  - White Paper (see OTN.oracle.com => High Availability => MAA):  
Database Upgrades using SQL Apply  
<http://www.oracle.com/technetwork/database/features/availability/maa-wp-10gr2-rollingupgradbestprac-1-132006.pdf>  
Database Upgrades using a Transient Logical Standby  
<http://www.oracle.com/technetwork/database/features/availability/maa-wp-11g-transientlogicalrollingu-1-131927.pdf>



# Transient Logical Standby

- Concept:
  - Build up a Physical Standby database
  - Convert the Physical Standby into a Logical Standby
  - Upgrade the Logical Standby database
  - Switchover – Standby will be production system now
  - Then: Flashback the former production database
  - Convert it into a Physical Standby
  - Upgrade just by log apply
  - Eventually: Switchover to the original setup
    - Works pretty straight forward with Oracle Database 11g
      - Will work with Oracle Database 10g as well but requires more steps
- Find shell scripts in [Note:949322.1](#)

1

Rolling ...

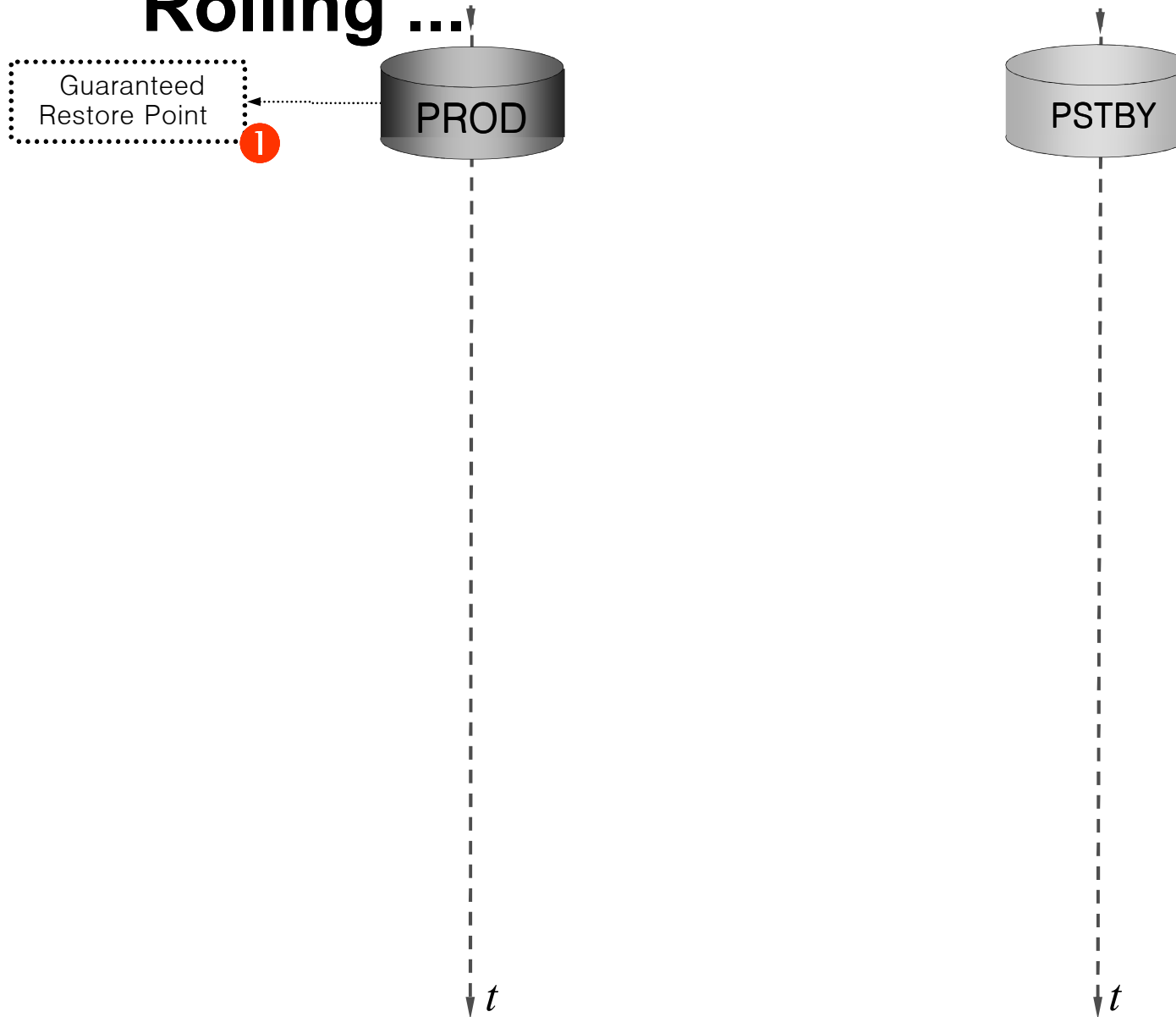


ORACLE



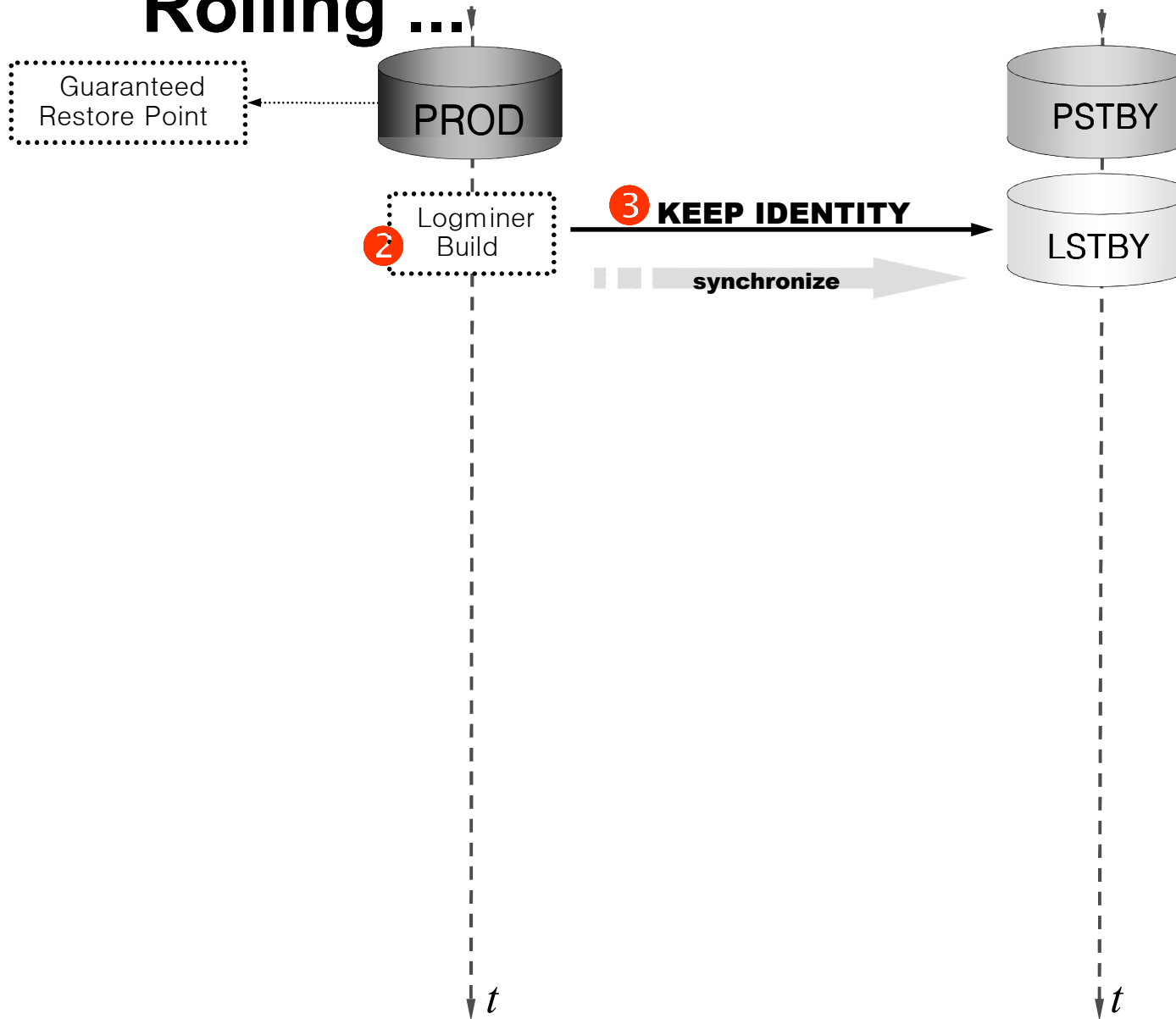
# 2

## Rolling ...



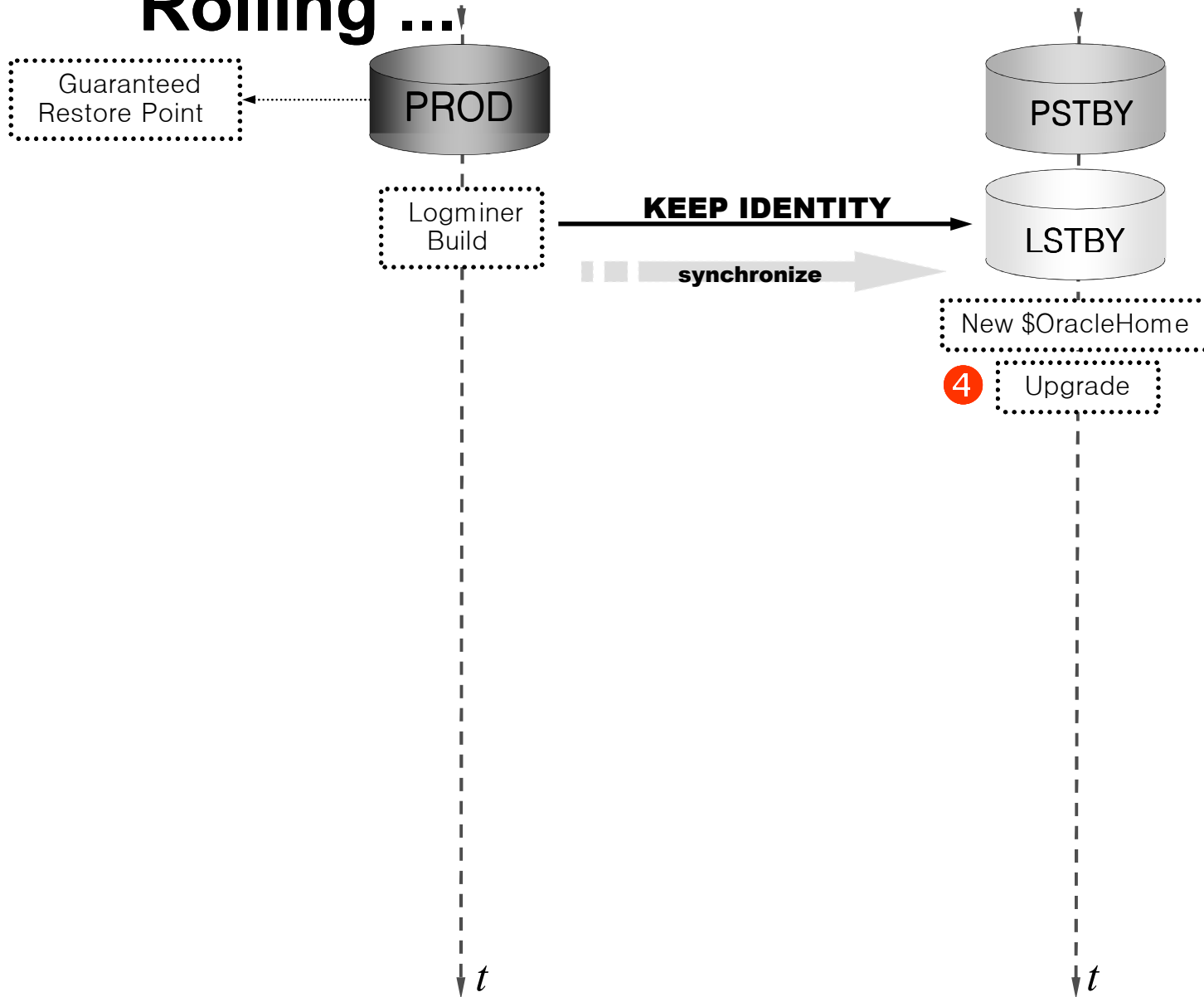
# 3

## Rolling ...



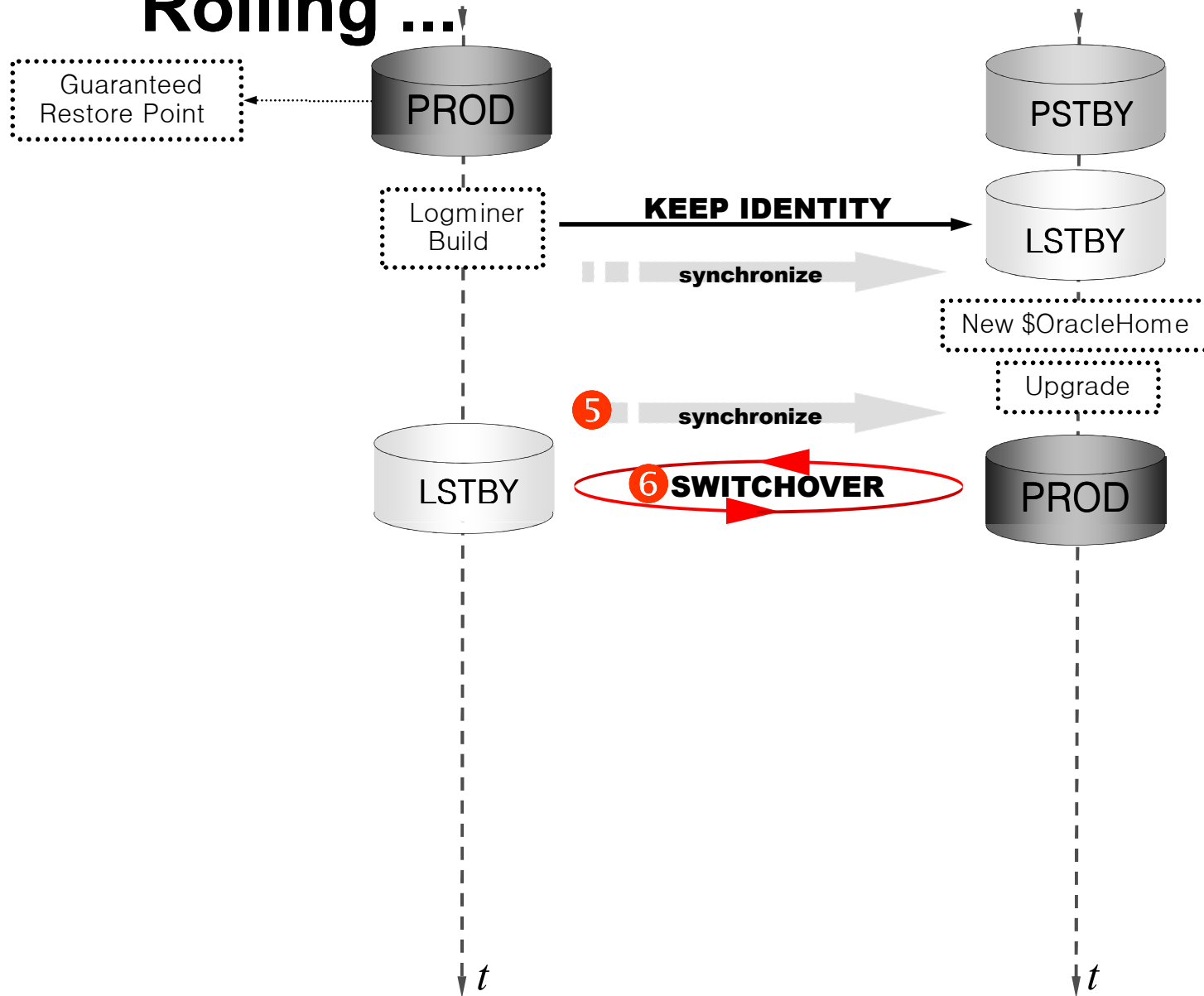
# 4

## Rolling ...



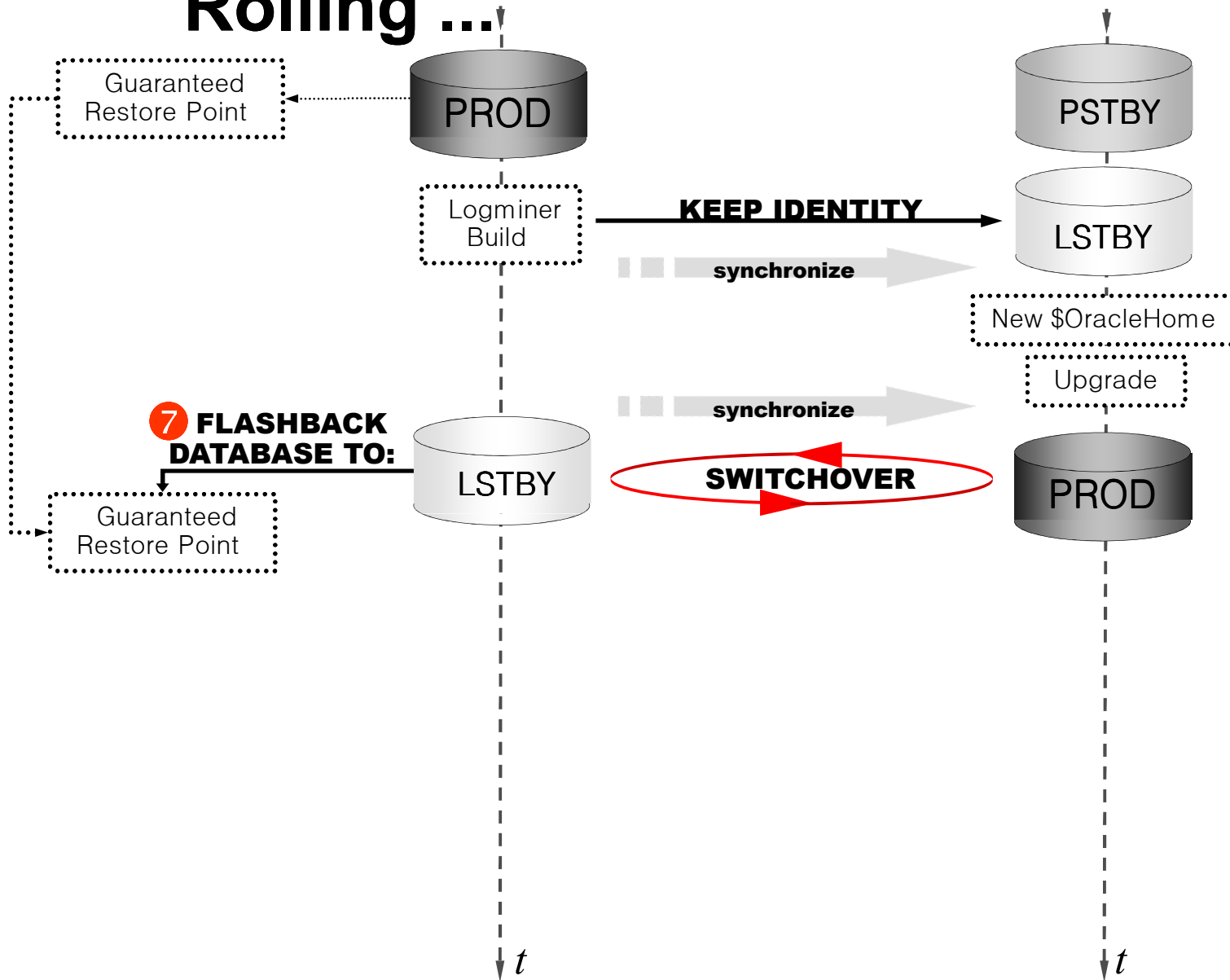
# 5

## Rolling ...



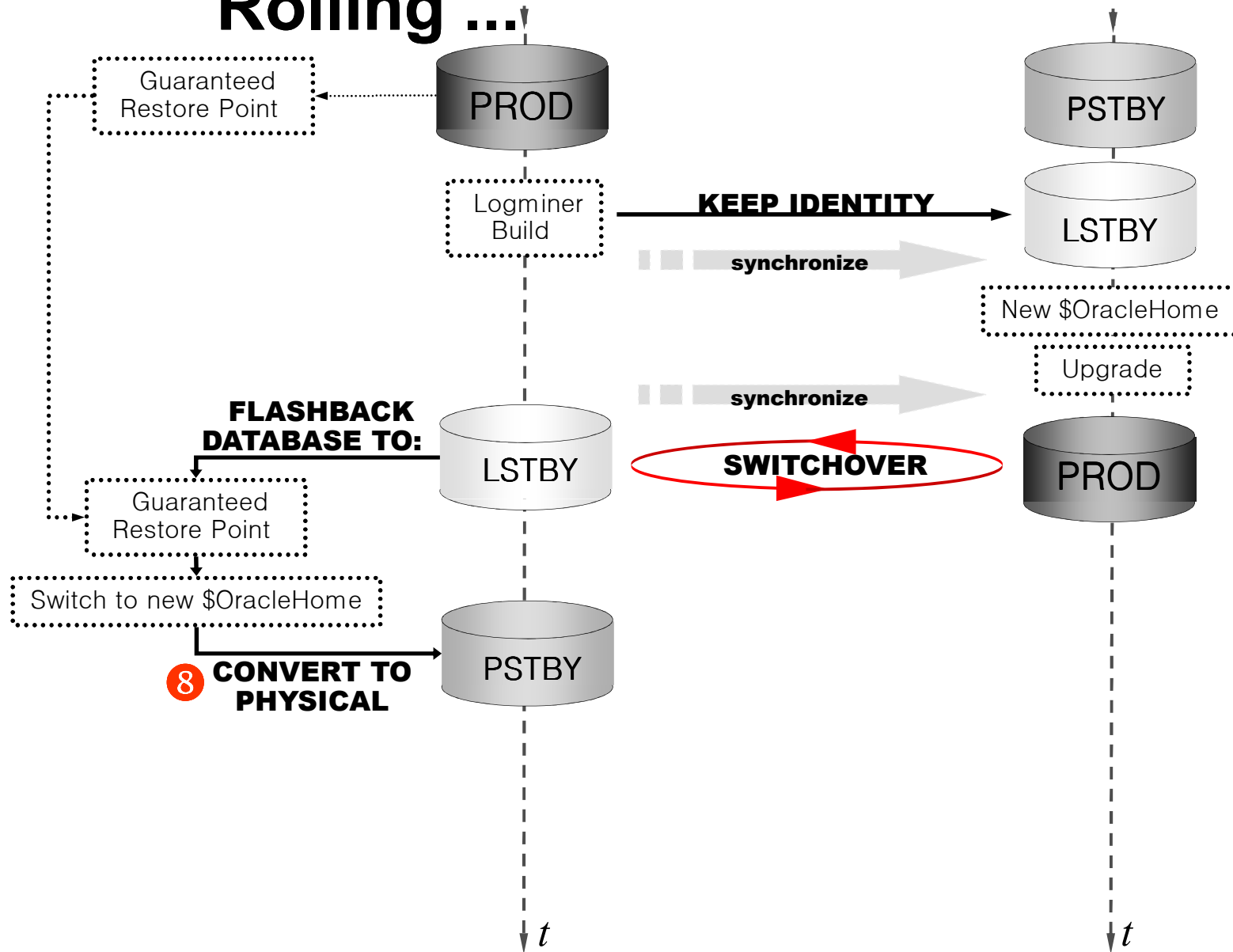
# 6

## Rolling ...



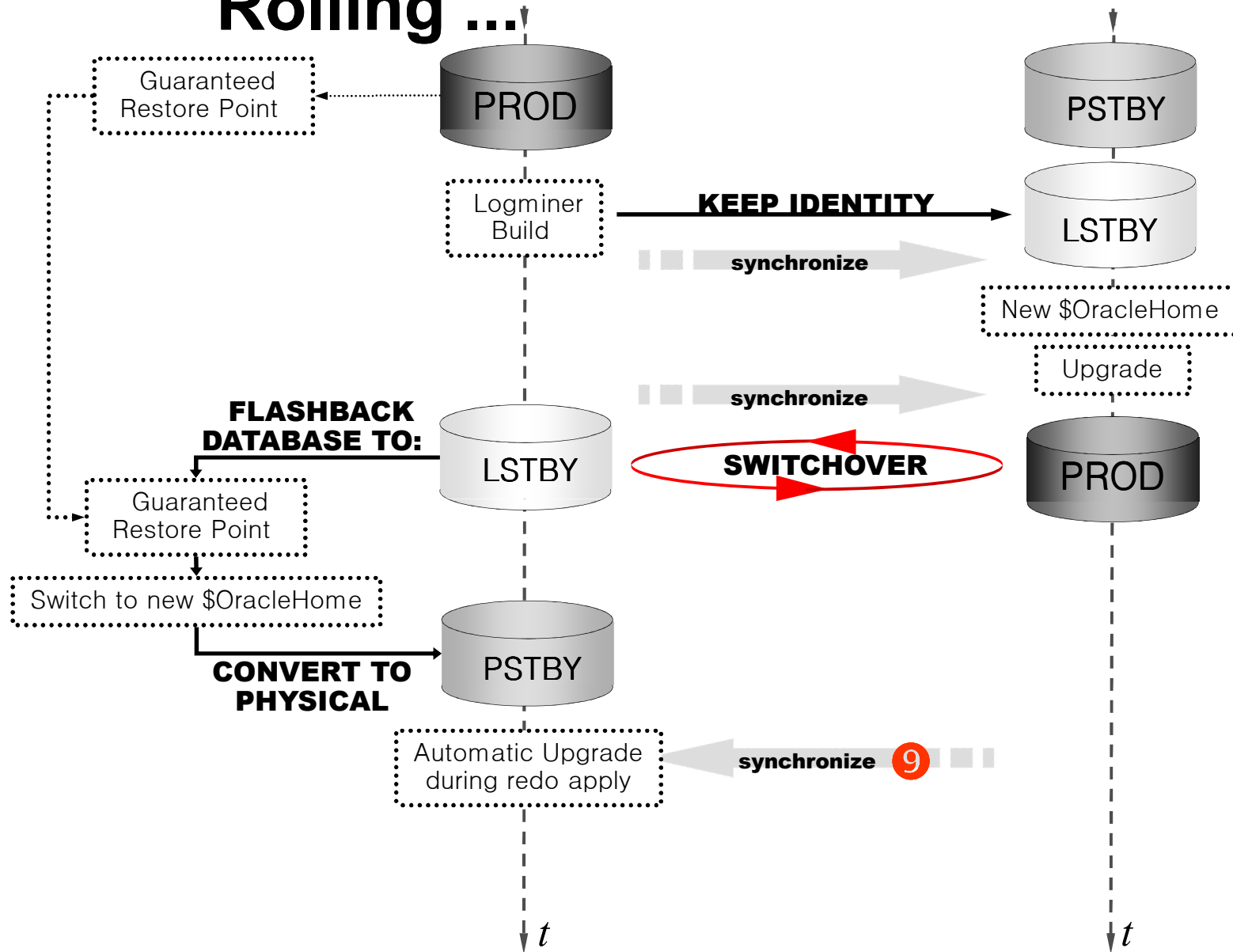
# 7

## Rolling ...



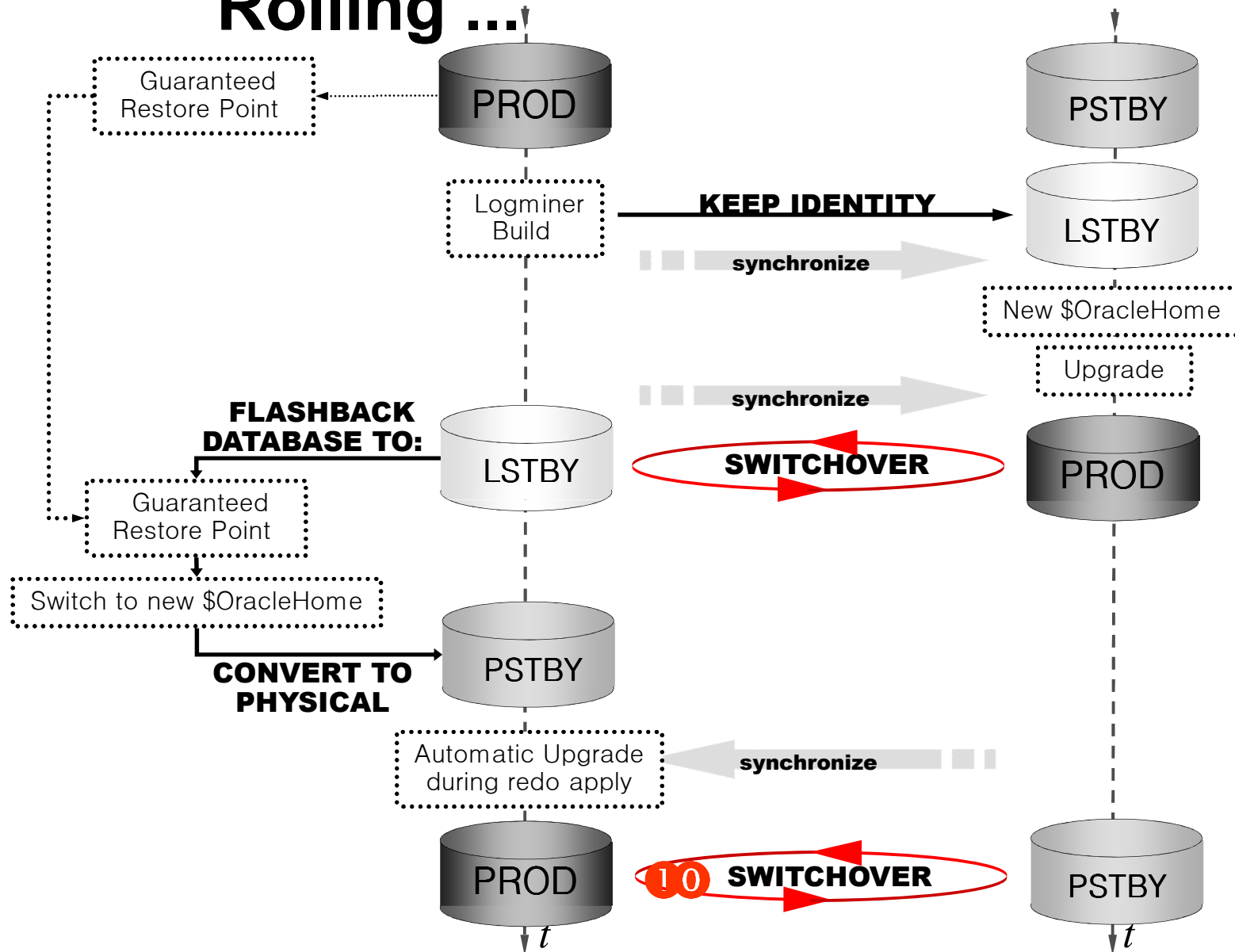
# 8

## Rolling ...



# 9

## Rolling ...







# Transient Logical Standby

- Information:

<http://www.oracle.com/technetwork/database/features/availability/maa-wp-11g-transientlogicalrollingu-1-131927.pdf>

Database Rolling Upgrade Using  
Transient Logical Standby:

Oracle Data Guard 11g

*Oracle Maximum Availability Architecture White Paper  
September 2008*

- Customer example:

- **Bielefeld University** in Germany patches and upgrade with less than 2 minutes of downtime their RAC/ASM/DataGuard production systems
- [OOW 2009 presentation](#)

# Agenda

○ Preparation

○ Installation

● Upgrade

○ News and Task List

○ Diagnostics & Tuning

○ Performance Testing

○ Best Practices

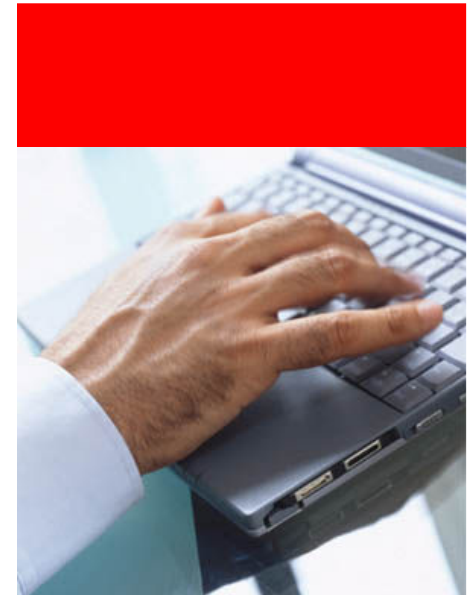
Database Upgrade Assistant

Command Line Upgrade

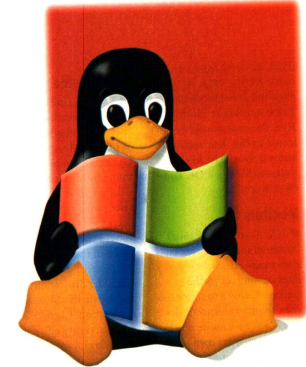
Post Upgrade

Alternatives

Migration



# Platform Migration



- Data Guard Physical Standby
  - Goal:
    - Platform migration with a Physical Standby
  - Concept:
    - Build a physical standby database and do a switchover
  - Pros&Cons:
    - + Only 1 minute downtime for a complete platform migration
    - + Simple to setup
    - + Since Oracle 11g: **Win ↔ Linux**
      - For supported combinations see: [Note:413484.1](#)
    - + For Oracle 9.2.0.7+8 and 10.2.0.2+3+4 and 11.1/2: **HP-PA 11.23 ↔ HP-IA64** – see: [Note:395982.1](#)

# OS change on HP: PA RISC ⇒ IA64

- Migration from HP PA-RISC (64bit) to HP Itanium ia64 [Note:427712.1](#)
  - 1) Complete valid backup
  - 2) Trace the controlfile
    - `SQL> alter database backup controlfile to trace as '/tmp/control_1.ctl';`
  - 3) Shutdown *immediate* (or *normal*)
  - 4) Copy all datafiles
  - 5) Startup nomount
  - 6) Create a new controlfile
  - 7) Possibly rebuild the JVM
    - `SQL> create or replace java system;`
- Or: Use a physical standby!  
Allowed since Oracle 9.2.0.7+8 and 10.2.0.2+3+4 and 11g:  
**HP-PA 11.23 ⇔ HP-IA64** – see: [Note:395982.1](#)



# ASM Migration

- Migration to ASM
  - Option 1: RMAN
  - Option 2: Physical standby
    - Simple switchover will do the migration to ASM
      - Just 1 minute downtime
    - See:

Best Practices for Minimal  
Downtime Migration to ASM  
Oracle 10g Release 2

*Oracle Maximum Availability Architecture White Paper  
May 2007*

<http://www.oracle.com/technetwork/database/features/availability/maa-wp-10gr2-asmmigrationwithdg-133513.pdf>



# RAC Migration

- Migration from Single Instance to RAC:
- See [http://download.oracle.com/docs/cd/E11882\\_01/install.112/e17214/cvrt2rac.htm#BABBAHCH](http://download.oracle.com/docs/cd/E11882_01/install.112/e17214/cvrt2rac.htm#BABBAHCH)
  - Option 1: **rconfig** utility
    - [http://download.oracle.com/docs/cd/E11882\\_01/install.112/e17214/cvrt2rac.htm#BABGGEGJ](http://download.oracle.com/docs/cd/E11882_01/install.112/e17214/cvrt2rac.htm#BABGGEGJ)
      - Modify `$ORACLE_HOME/assistants/rconfig/sampleXMLs/ConvertToRAC.xml`
      - Run `$ORACLE_HOME/bin/rconfig myconvert.xml`
  - Option 2: Enterprise Manager Grid Control
  - Option 3: Manual
    - Install Oracle Clusterware software
    - Install Oracle RAC software (or link with RAC option)
    - Reconfigure database to accommodate RAC settings
      - `@$ORACLE_HOME/rdbms/admin/catclust.sql`
      - `init.ora`
      - Register instances with `srvctl`

# Word size (32bit/64bit) Migration

- Changing between 32bit and 64bit Oracle Homes:
  - As part of an **upgrade** or **patch set**:
    - No action required – happens implicitly during upgrade/downgrade
    - Example: Upgrade of 10.2.0.3 on WinXP 32bit => 11.2.0.2 on Win7 64bit
  - As part of a migration only - **without changing database version**:
    - In the source environment:

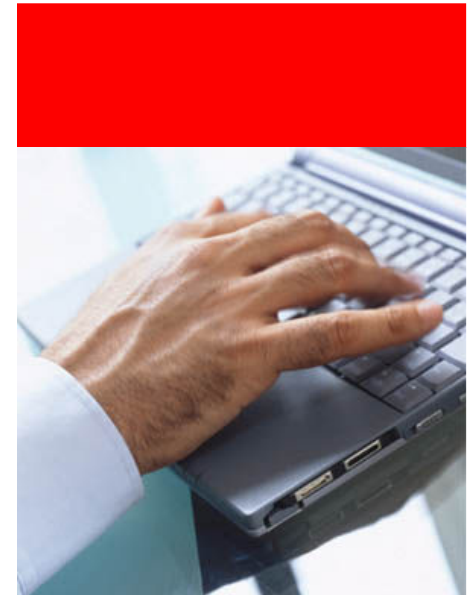
```
startup upgrade; [startup migrate; -- for Oracle 9i]
@?/rdbms/admin/utlirp.sql
shutdown immediate
```
    - In the destination environment:

```
startup upgrade
@?/rdbms/admin/utlirp.sql
```
    - OLAP must be reloaded – see [Note:352306.1](#)
    - Remember to adjust your init.ora memory parameters
    - Example:  
Move of 10.2.0.5 on WinXP 32bit => 10.2.0.5. on Win2008 64bit with 64bit \$OH

# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

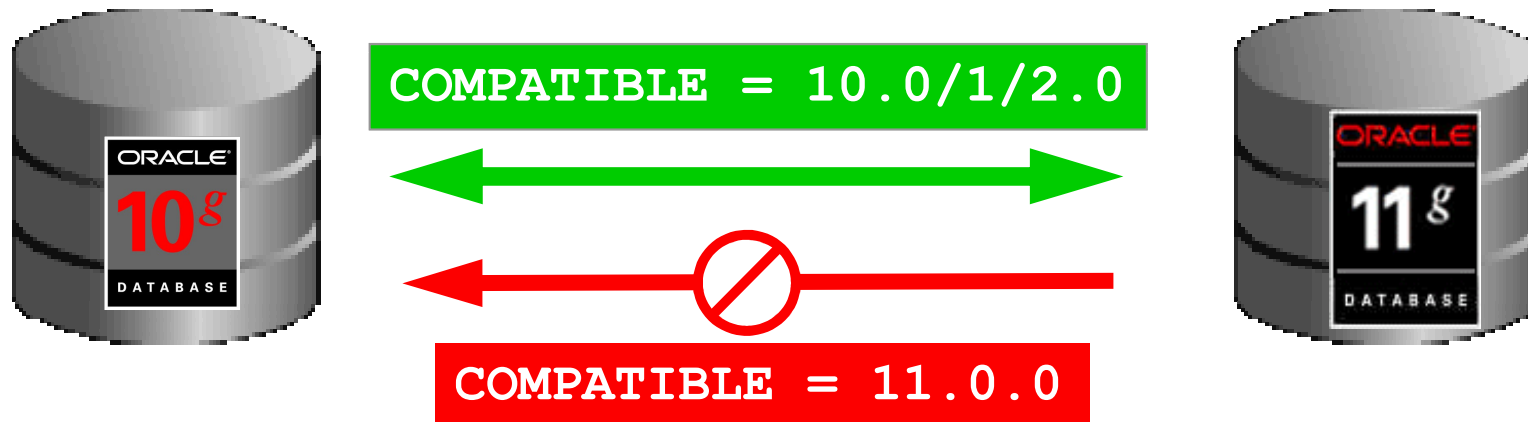
- Parameters
- Processes
- Miscellaneous
- Tools
- Automation
- LOB & SecureFiles
- Flashback
- ADR
- Compression





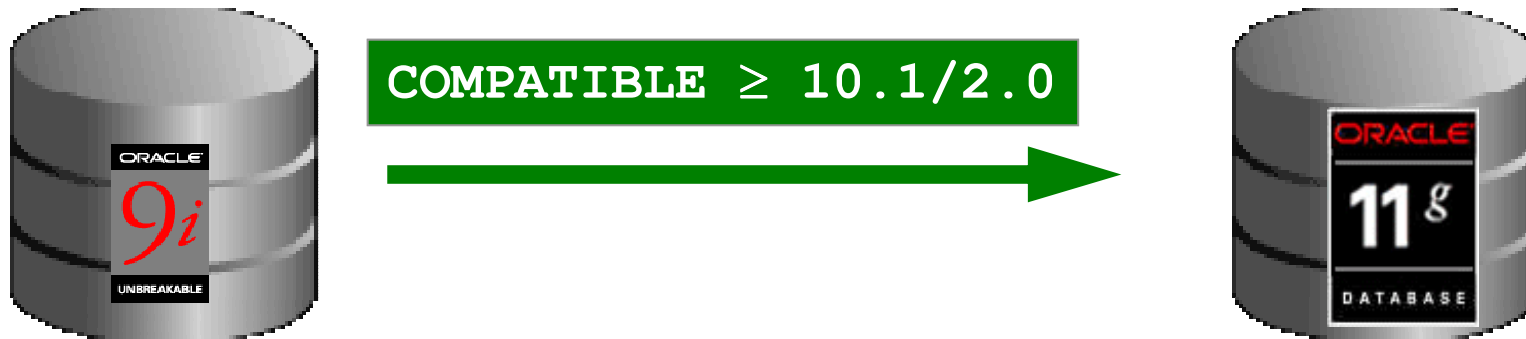
# Parameter COMPATIBLE

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



# Parameter COMPATIBLE

- Upgrade 9*i* ⇒ **11.1** precautions:
  - Make **100%** sure that you've applied DST patches before starting the 9*i* database in an 11.1 environment
    - 9*i* ⇒ 11*g* requires `COMPATIBLE ≥ 10.1`
    - No possibility to have `COMPATIBLE=9.2.0`
    - No way back as soon as the database has be opened with an implicitly raised `COMPATIBLE` setting



# Parameter COMPATIBLE

- DBUA raises COMPATIBLE only for 9i databases
- To enable new features after the upgrade:

- 11.1: 

```
SQL> alter system  
      set compatible='11.1.0' scope=spfile;
```

- 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



# New 11g Parameters

- New in 11.1.0.6:

- ASM\_PREFERRED\_READ\_FAILURE\_GROUPS  
CLIENT\_RESULT\_CACHE\_LAG  
CLIENT\_RESULT\_CACHE\_SIZE  
COMMIT\_LOGGING  
COMMIT\_WAIT  
CONTROL\_MANAGEMENT\_PACK\_ACCESS  
DB\_LOST\_WRITE\_PROTECT  
DB\_SECUREFILE  
DB\_ULTRA\_SAFE  
DDL\_LOCK\_TIMEOUT  
DIAGNOSTIC\_DEST  
GLOBAL\_TXN\_PROCESSES  
JAVA\_JIT\_ENABLED  
LDAP\_DIRECTORY\_SYSAUTH  
MEMORY\_MAX\_TARGET  
MEMORY\_TARGET  
OPTIMIZER\_CAPTURE\_SQL\_PLAN\_BASELINES  
OPTIMIZER\_USE\_INVISIBLE\_INDEXES  
OPTIMIZER\_USE\_PENDING\_STATISTICS  
OPTIMIZER\_USE\_SQL\_PLAN\_BASELINES

PARALLEL\_IO\_CAP\_ENABLED  
PLSCOPE\_SETTINGS  
REDO\_TRANSPORT\_USER  
RESOURCE\_MANAGER\_CPU\_ALLOCATION  
RESULT\_CACHE\_MAX\_RESULT  
RESULT\_CACHE\_MAX\_SIZE  
RESULT\_CACHE\_MODE  
RESULT\_CACHE\_REMOTE\_EXPIRATION  
SEC\_CASE\_SENSITIVE\_LOGON  
SEC\_MAX\_FAILED\_LOGIN\_ATTEMPTS  
SEC\_PROTOCOL\_ERROR\_FURTHER\_ACTION  
SEC\_PROTOCOL\_ERROR\_TRACE\_ACTION  
SEC\_RETURN\_SERVER\_RELEASE\_BANNER  
XML\_DB\_EVENTS

- New in 11.1.0.7 (for Exadata/SAGE):

- CELL\_OFFLOAD\_PROCESSING  
CELL\_OFFLOAD\_DECRYPTION  
CELL\_OFFLOAD\_PARAMETERS

CELL\_OFFLOAD\_COMPACTION  
CELL\_OFFLOAD\_PLAN\_DISPLAY



# New 11g Release 2 Parameters

- New in 11.2.0.1:

- DEFERRED\_SEGMENT\_CREATION  
DST\_UPGRADE\_INSERT\_CONV  
LISTENER\_NETWORKS  
PARALLEL\_DEGREE\_LIMIT  
PARALLEL\_DEGREE\_POLICY  
PARALLEL\_FORCE\_LOCAL  
PARALLEL\_MIN\_TIME\_THRESHOLD  
PARALLEL\_SERVERS\_TARGET

- New in 11.2.0.2:

- CURSOR\_BIND\_CAPTURE\_DESTINATION  
DB\_UNRECOVERABLE\_SCN\_TRACKING  
DB\_FLASH\_CACHE\_SIZE [Solaris and Linux only]  
DB\_FLASH\_CACHE\_FILE [Solaris and Linux only]

- New Parameters can always be found in the **Database Reference** under *What's New in Oracle Database Reference?* or under *New Features*



# New Parameters 11g - Selection

- **CONTROL\_MANAGEMENT\_PACK\_ACCESS**

- Default: DIAGNOSTIC+TUNING

- Values: DIAGNOSTIC+TUNING  
DIAGNOSTIC  
NONE

- Purpose: Controls access to several functionalities of Diagnostic and Tuning Pack

- Example:

```
CONTROL_MANAGEMENT_PACK_ACCESS=NONE
```

```
select count(*) from v$active_session_history;  
==> 0 rows
```

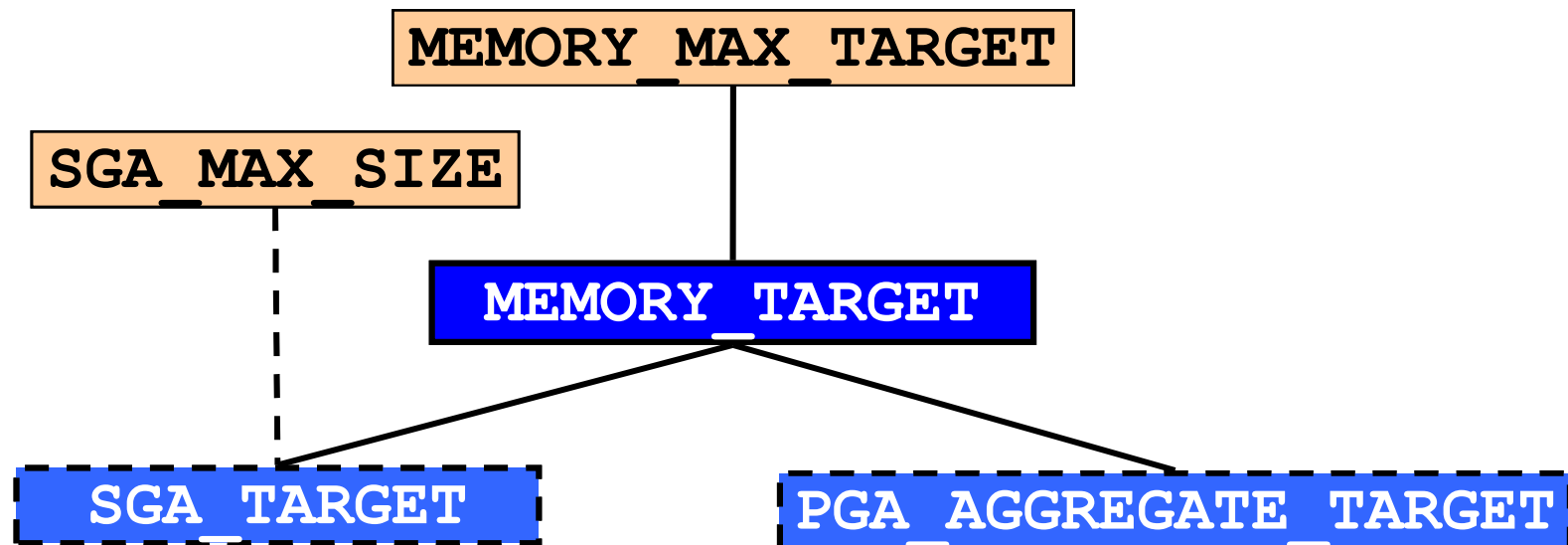


# New Parameters 11g - Selection

- **DIAGNOSTIC\_DEST**
  - Default: \$ORACLE\_BASE
  - Value: OS path/directory
  - Layout: `<diagnostic_dest>/diag/rdbms/<dbname>/<instname>`
  - Purpose: Substitutes `background_dump_dest`, `user_dump_dest`, listener trace etc. and specifies the ADR home (Automatic Diagnostic Repository)

# New Parameters 11g - Selection

- **MEMORY\_TARGET** and **MEMORY\_MAX\_TARGET**
  - Default: 0
  - Value: *integer* [K | M | G]
  - Purpose: Specifies the complete plus the maximum memory available to the Oracle server







# New Parameters 11g - Selection

- **OPTIMIZER\_USE\_INVISIBLE\_INDEXES**

- Default: FALSE
- Values: TRUE  
FALSE
- Purpose: "Invisible" indexes will be ignored by the optimizer if set to FALSE. But DMLs will be still executed to the index.
- Motivation: Isolated testing of performance effects of an index based on a session level

- Example: 

```
CREATE INDEX emp_ename ON emp(ename)
INVISIBLE;

ALTER SESSION SET
OPTIMIZER_USE_INVISIBLE_INDEXES=TRUE;
```

# New Parameters 11g - Selection

- **SEC\_CASE\_SENSITIVE\_LOGON** 1/2
  - Default: TRUE
  - Values: TRUE  
FALSE
  - Purpose: Switches on/off the case sensitivity of passwords  
Attention: also valid for database links!!
  - Info:

```
SELECT username, password_versions FROM dba_users;
```

USERNAME	PASSWORD_VERSIONS
JONES	10G 11G
PRESTON	11G
BLAKE	10G

Changed in:

Created in:



# New Parameters 11g - Selection

- **SEC\_CASE\_SENSITIVE\_LOGON** 2/2
  - Switching on the case sensitivity password mode can have several impacts:
    - Scripts with user/pw like SCOTT/TIGER won't run anymore if the user gets created or altered e.g. as SCOTT/tiger in 11g
      - Annotation: Upon upgrading the "old" mechanism is still valid
    - Check password encrypted database links
  - Can be enabled also for the password file checkings
    - `orapwd file=orapwSID password=GeHeIm ignorecase=n`
  - Very helpful:  
Check view for default passwords: **DBA\_USERS\_WITH\_DEFPWD**



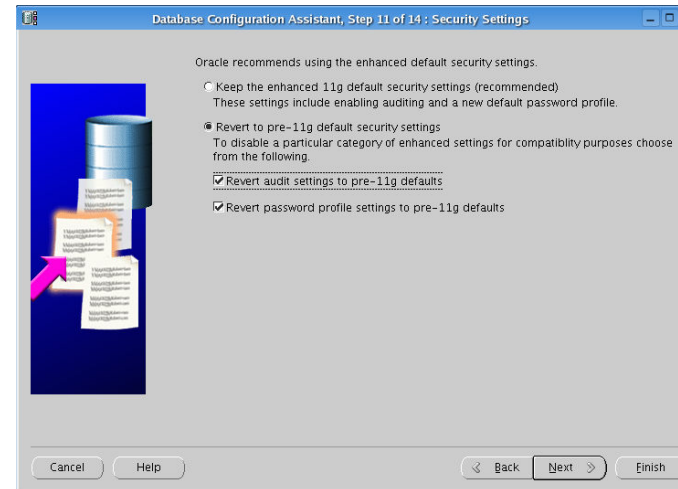
# New Parameters 11g – Known Issue

- **SEC\_CASE\_SENSITIVE\_LOGON=TRUE**
  - Access the database with an **10.2 SQL\*Plus session** and let the user change the password:
    - Result: ORA-1017 => invalid username/password
    - Known issue:  
Bug 6277160 CONNECTION WITH OCIPASSWORDCHANGE FAILS WHEN 10GR2 CLIENT CALLS 11G SERVER
    - Fixed in 10.2.0.5 and with any 11g client
    - Remedy:
      - a) Apply client patch
      - b) Upgrade your clients to 11g clients
    - For further information see [Note:888432.1](#)

# New Parameter Defaults 11g

- **AUDIT\_TRAIL**

- Default: NONE or DB
- Values: NONE  
OS  
XML  
DB  
DB\_EXTENDED



- Purpose: Will help auditing security relevant statements. Upon an upgrade **AUDIT\_TRAIL** keeps its default from 9.2/10.1/10.2 (NONE). If a 11g database is created from scratch then it'll set to DB and statements get logged in **SYS.AUD\$**



# New Parameter **11g Release 2** - Selection

- **DEFERRED\_SEGMENT\_CREATION**

- Default: TRUE
- Values: TRUE  
FALSE

Purpose:

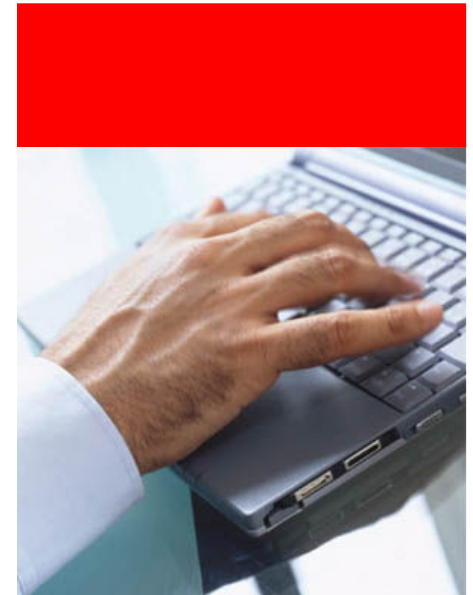
Newly created table will just allocate segments when a row gets inserted

- Tablespace must be locally managed
- COMPATIBLE ≥ 11.2.0
- New behaviour - default in 11g<sup>R2</sup>
- Advantage:
  - Save disk space when a high number of tables will be created but never populated
  - Application installation time is reduced
- Please note:
  - Small performance penalty when the first row is inserted, because the new segment must be created at that time.

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- Flashback
- ADR
- Compression



# Background Processes

- Example:

```
select name, description from v$bgprocess, v$process
where paddr=addr;
```

NAME	DESCRIPTION	NAME	DESCRIPTION
ARC0	Archival Process 0	MMAN	Memory Manager
ARC1	Archival Process 1	MMNL	Manageability Monitor Pr 2
ARC2	Archival Process 2	MMON	Manageability Monitor Pr
ARC3	Archival Process 3	PMON	process cleanup
CJQ0	Job Queue Coordinator	PSP0	process spawner 0
CKPT	checkpoint	QMNC	AQ Coordinator
DBRM	Resource Manager process	RECO	distributed recovery
DBW0	db writer process 0	SMCO	Space Manager Process
DIA0	diagnosibility process 0	SMON	System Monitor Process
DIAG	diagnosibility process	VKRM	Virtual sKeduler for RMgr
DSKM	slave DiSKMon process	VKTM	Virtual Keeper of TiMe pr
FBDA	Flashback Data Archiver Pr.		
GEN0	General Task Execution Pr.		
LGWR	Redo etc.		

RED: New in 11gR1

BLUE: New in 11gR2



# New Background Processes

Process Name	Description	Found
<b>ACMS</b>	In an RAC environment, this per-instance process (Atomic Controlfile to Memory Service) is an agent which contributes to ensuring a distributed SGA memory update is either globally committed on success or globally aborted in the event of a failure.	<b>RAC</b>
<b>DIA0</b>	Responsible for hang detection and deadlock resolution.	<b>ALL</b>
<b>DIAG</b>	Performs diagnostic dumps and executes global oradebug commands.	<b>ALL</b>
<b>DBRM</b>	The Resource Manager process is responsible for setting Resource Plans and other Resource Manager related tasks.	<b>ALL</b>
<b>EMNC / e0xx</b>	The Event Monitor Coordinator coordinates the event management and notification activity in the database which includes Streams Event Notifications, Continuous Query Notifications and Fast Application Notifications.	<b>ALL with any registered event activity (optional non-fatal)</b>
<b>FBDA</b>	The process archives historical rows for tracked tables into flashback data archives and manages the flashback archives.	<b>ALL</b>
<b>GEN0</b>	General Task Execution Process. Performs required tasks including SQL and DML.	<b>ALL</b>
<b>GMON</b>	Maintains disk membership in ASM disk groups	<b>ASM</b>
<b>GTX0-j</b>	Provides transparent support for XA global transactions in a RAC environment. The database autotunes the number of these processes based on the workload of XA global transactions.	<b>RAC only</b>

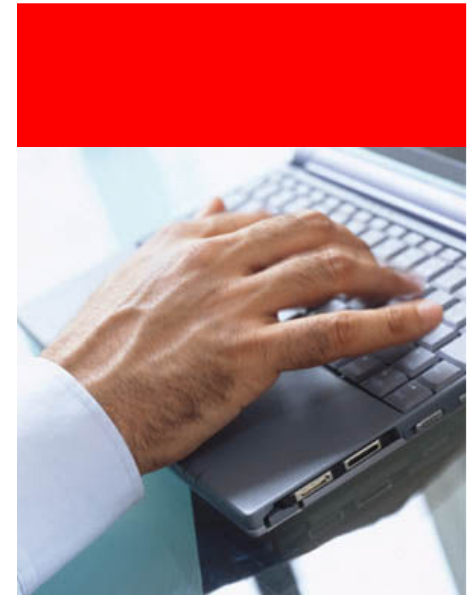
# New Background Processes

Process Name	Description	Found
<b>KATE</b>	ONLY 11.1 -- Performs proxy I/O to an ASM metafile when a disk becomes offline.	<b>ASM, spawned on demand.</b>
<b>MARK</b>	Marks ASM Allocation Units as stale following a missed write to an offline disk.	<b>ASM, spawned on demand.</b>
<b>PING</b>	Interconnect Latency Measurement Process. Assesses latencies associated with communications for each pair of cluster instances.	<b>RAC only</b>
<b>PSP0</b>	Spawns Oracle processes.	<b>ALL</b>
<b>RMSn</b>	The RAC Management Processes perform manageability tasks for RAC, e.g. creation of RAC related resources when new instances are added to the clusters	<b>RAC only</b>
<b>RMSN</b>	In a RAC environment, this process manages background slave process creation and communication on remote instances. These background slave processes perform tasks on behalf of a coordinating process running in another instance.	<b>RAC only</b>
<b>SMCO / Wnnn</b>	The space management coordinator process coordinates the execution of various space management related tasks, such as proactive space allocation and space reclamation. It dynamically spawns slave processes (Wnnn) to implement the task.	<b>ALL (optional non-fatal)</b>
<b>VKRM</b>	VKRM manages the CPU scheduling for all managed Oracle processes. The process schedules managed processes in accordance with an active resource plan. Resource Manager.	<b>ALL (optional)</b>
<b>VKTM</b>	The Virtual Keeper of Time <sup>2</sup> is responsible for providing a Wall-Clock time (updated every second) and Reference-Time Counter (updated every 20ms and available only when running at elevated priority).	<b>ALL</b>

# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

- Parameters
- Processes
- Miscellaneous
- Tools
- Automation
- LOB & SecureFiles
- Flashback
- ADR
- Compression



# CONNECT Role

- The CONNECT Role has been changed since 10g<sup>R2</sup>:



GRANTEE	PRIVILEGE
CONNECT	CREATE VIEW
CONNECT	CREATE TABLE
CONNECT	ALTER SESSION
CONNECT	CREATE CLUSTER
CONNECT	CREATE SESSION
CONNECT	CREATE SYNONYM
CONNECT	CREATE SEQUENCE
CONNECT	CREATE DATABASE LINK



GRANTEE	PRIVILEGE
CONNECT	CREATE SESSION

# CONNECT Role

- Find out affected database users:

```
SELECT grantee
FROM dba_role_privs
WHERE granted_role = 'CONNECT' and
grantee NOT IN ('SYS', 'OUTLN', 'SYSTEM',
               'CTXSYS', 'DBSNMP',
               'LOGSTDBY_ADMINISTRATOR',
               'ORDSYS', 'ORDPLUGINS',
               'OEM_MONITOR', 'WKSYS',
               'WKPROXY', 'WK_TEST',
               'WKUSER', 'MDSYS',
               'LBACSYS', 'DMSYS', 'WMSYS',
               'EXFSYS', 'SYSMAN',
               'MDDATA', 'XDB', 'ODM',
               'SI_INFORMTN_SCHEMA');
```

# Shared Pool calculation since 10g

- Parameter `shared_pool_size` is calculated differently since 10g
  - Real shared pool = `shared_pool_size` – startup overhead

```
SQL> select * from v$sgainfo;
```

NAME	BYTES	RES
-----	-----	---
Fixed SGA Size	1266372	No
Redo Buffers	2924544	No
Buffer Cache Size	16777216	Yes
<b>Shared Pool Size</b>	<b>83886080</b>	Yes
Large Pool Size	0	Yes
Java Pool Size	50331648	Yes
Streams Pool Size	0	Yes
Granule Size	4194304	No
Maximum SGA Size	155189248	No
<b>Startup overhead in Shared Pool</b>	<b>29360128</b>	No
Free SGA Memory Available	0	

# GROUP BY results: unsorted

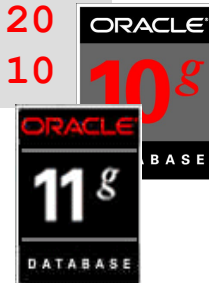
- Hash Group by aggregation which allows a hash algorithm to process group by statements
  - For sorts ORDER BY has to be used

```
select sum(sal), deptno from scott.emp group by deptno;
```

SUM(SAL)	DEPTNO
8750	10
10875	20
9400	30

SUM(SAL)	DEPTNO
9400	30
10875	20
8750	10

- Description see [Note:345048.1](#)
  - `_gby_hash_aggregation_enabled=false`





# Secure-View-Merging Privilege

- To prevent optimizer issues in since 10g<sup>R2</sup> complex view structures security:
  - `optimizer_secure_view_merging=false`
    - Otherwise it is possible for the optimizer to create different execution plans for identical statements on identical objects issued from different user schemas
    - Alternative:  
Grant MERGE ANY VIEW privilege to subordinate users
    - See [Note:468380.1](#)





# Cascading View Issues - 10.2.0.x

- Optimizer sometimes does wrong rewrites with cascading views
  - Requirement:
    - `"_push_join_predicate"` is set to TRUE
  - Solution:
    - Patch on top of 10.2.0.4: **#7445276**
    - Or: `_optimizer_join_elimination_enabled=false`
  - Otherwise sometimes:
    - This Query: `select * from some_view where coll=10;`  
results in:
      - OK: `select * from (select * from base_table where coll=10);`
      - Not OK: `select * from (select * from base_table) where coll=10;`



# Costed query transformations since 10g

- Observation:  
Query execution or parse time problems after upgrade to 10/11g
  - Since 10g CBO has been added costed subquery unnesting and view merging functionality.
  - Can be disabled by:
    - `_optimizer_cost_based_transformation=off`



# CBO verifies more joins orders since 10g

- The CBO since 10g verifies more join orders to find out the least expensive one - this can sometimes lead to **higher parse times**
  - Remedy: `_new_initial_join_orders=false`
  - Example: observation for an explain plan:
    - Set OFE=920: Number of join permutations tried: 187
    - Set OFE=10203: Number of join permutations tried: 986



## PL/SQL cursors not cached **≥10.2.0.4**

- Before 10.2.0.4 PL/SQL cursors will be cached automatically because of `OPEN_CURSORS`. Since 10.2.0.4 `SESSION_CACHED_CURSORS` has to be defined to ensure cursor caching for PL/SQL
  - Remedy: `session_cached_cursors=500`




# New behavior for datafile write errors

- Beginning with patch set 11.2.0.2 the behavior changed when a write error to ANY datafile happens:
  - By default this parameter is now TRUE:  
**`__DATAFILE_WRITE_ERRORS_CRASH_INSTANCE=TRUE`**
  - An I/O write error to a datafile will crash the instance in 11.2.0.2
  - Setting `__DATAFILE_WRITE_ERRORS_CRASH_INSTANCE=FALSE` reverts to the "old" behavior meaning:
    - A write error to a datafile offlines the file if:
      - Database is in archivelog mode
      - Datafile does not belong to SYSTEM tablespace (this would initiate a SHUTDOWN ABORT)

# Table caching has changed **≥11.1.0.6**

- Large tables most likely won't be cached for sequential FTS regardless of ALTER TABLE CACHE attribute
  - Remedy: set `_small_table_threshold`
  - Example:
    - `CREATE TABLE big_has_95000_blks(...);`
    - Force a preload:  
`ALTER SESSION SET "_small_table_threshold"=100000;`  
`SELECT /*+FULL(a) */ ... FROM big_has_95000_blks a;`
    - Now the table is in cache and will be kept there



# Bug 7596023

- ORA-7445 [kkqtutlGenRowid()+157]

- Bug 7596023
- Apply patch on top of 11.1.0.7  
*(fixed in 11.1.0.7.2 and 11.2)*

or:

- Workaround:
  - Set `"_optimizer_join_elimination_enabled"=false`
  - Disable the fix for bug 6167716 eg:  
Set `"_FIX_CONTROL"='6167716:OFF'`



# Bug 9411496

- If `cursor_sharing=similar`
- ORA-979: not a GROUP BY expression
  - ```
select to_char(first_time, 'YYYYMMDD'), sum(blocks*block_size)
from v$archived_log
group by to_char(first_time, 'YYYYMMDD')
order by to_char(first_time, 'YYYYMMDD');
```
  - → results with: ORA-979
  - Bug 9411496
  - Fixed in 11.2.0.2
  - Possible workarounds (please use only ONE of these):
    - `optimizer_features_enable = '11.1.0.7'`
    - `"_optimizer_push_pred_cost_based" = false`
    - `"_optimizer_cost_based_transformation" = off`
    - Disable the fix for bug 5520732 eg:  
Set `"_FIX_CONTROL"='5520732:OFF'`





# DBMS\_SQL got new security checks

- ORA-29471: „DBMS\_SQL Access Denied“ After Upgrade
- Further information: [Note:556301.1](#)
  - **DBMS\_SQL has been recoded** with some security checks in 11.1.0.6
  - **The application must be recoded.** For a temporary work around, a new parameter `security_level` can be added into `DBMS_SQL.OPEN_CURSOR`.
    - `security_level` specifies the level of security protection to enforce on the opened cursor. Valid security level values are 0, 1, and 2. When a NULL argument value is provided to this overload, as well as for cursors opened using the overload of `open_cursor` without the `security_level` parameter, the default security level value 1 will be enforced on the opened cursor.
      - *Level 0 - allows all DBMS\_SQL operations on the cursor without any security checks. The cursor may be fetched from, and even re-bound and re-executed, by code running with a different effective userid or roles than those in effect at the time the cursor was parsed. This level of security is off by default.*
      - *Level 1 - requires that the effective userid and roles of the caller to DBMS\_SQL for bind and execute operations on this cursor must be the same as those of the caller of the most recent parse operation on this cursor.*
      - *Level 2 - requires that the effective userid and roles of the caller to DBMS\_SQL for all bind, execute, define, describe, and fetch operations on this cursor must be the same as those of the caller of the most recent parse operation on this cursor.*



# Apply patch to 11.2.0.1/2 if you use XDB

- Due to [bug10368698](#) the upgrade of the XDB Component will be slow if there are many objects in RESOURCE\_VIEW
  - Bug 10368698 - perf issue with update resource\_view during and after upgrading to 11.2.0.2
  - <https://support.oracle.com/CSP/main/article?cmd=show&type=NOT&doctype=PATCH&id=10368698.8>



# Instant Client

- Universal. small footprint Oracle client
  - Works with OCI, OCCI, Pro\*C, ODBC, JDBC, ODP.NET, ASP.NET, OLE DB and OO4O applications
  - No OUI Oracle Client installation necessary anymore
- Easy and simple deployment
  - Download it from OTN
  - Copy it to the target/client system(s)
  - Add its directory to `PATH/LD_LIBRARY_PATH` and set `TNS_ADMIN`
    - For ODBC run the provided batch script
    - Patching? Just deploy the current version
- More Information on OTN:  
<http://www.oracle.com/technetwork/database/features/instant-client/index-100365.html>

# Instant Client

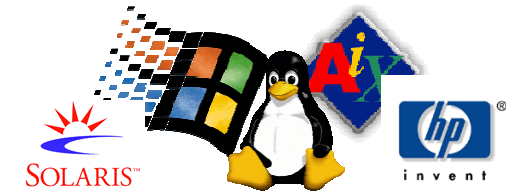


- Instant Client Download:

<http://www.oracle.com/technetwork/database/features/instant-client/index-097480.html>

- ↓ [Instant Client for Microsoft Windows \(32-bit\)](#)
- ↓ [Instant Client for Microsoft Windows 64-bit Itanium](#)
- ↓ [Instant Client for Microsoft Windows \(x64\)](#)
- ↓ [Instant Client for Linux x86](#)
- ↓ [Instant Client for Linux x86-64](#)
- ↓ [Instant Client for Linux Itanium](#)
- ↓ [Instant Client for Linux AMD64 \(32-bit and 64-bit\)](#)
- ↓ [Instant Client for Linux on Power \(32-bit\)](#)
- ↓ [Instant Client for Linux on Power \(64-bit\)](#)
- ↓ [Instant Client for z/Linux](#)
- ↓ [Instant Client for Mac OS X \(Intel x86\) \(32-bit and 64-bit\)](#)
- ↓ [Instant Client for Mac OS X \(PPC\)](#)
- ↓ [Instant Client for Solaris Operating System \(SPARC\) \(64-bit\)](#)
- ↓ [Instant Client for Solaris Operating System \(SPARC\) \(32-bit\)](#)
- ↓ [Instant Client for Solaris x86](#)
- ↓ [Instant Client for Solaris x86-64](#)
- ↓ [Instant Client for HP-UX PA-RISC \(64-bit\)](#)
- ↓ [Instant Client for HP-UX PA-RISC \(32-bit\)](#)
- ↓ [Instant Client for AIX5L \(64-bit\)](#)
- ↓ [Instant Client for AIX5L \(32-bit\)](#)
- ↓ [Instant Client for HP Tru64 UNIX](#)
- ↓ [Instant Client for HP-UX Itanium \(64-bit\)](#)
- ↓ [Instant Client for HP-UX Itanium \(32-bit\)](#)

# Instant Client



- Instant Client Packaging
  - Package Descriptions

| Instant Client Package | Description                                                                                                                               | Notes                                                               |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Basic                  | All files required to run OCI, OCCI, and JDBC-OCI applications                                                                            | <a href="#">OCI</a><br><a href="#">OCCI</a><br><a href="#">JDBC</a> |
| Basic Lite             | Smaller version of the Basic, with only English error messages and Unicode, ASCII, and Western European character set support (10.2 only) | <a href="#">OCI</a><br><a href="#">OCCI</a><br><a href="#">JDBC</a> |
| JDBC Supplement*       | Additional support for XA, Internationalization, and RowSet operations under JDBC                                                         | <a href="#">JDBC</a>                                                |
| SQL*Plus*              | Additional libraries and executable for running SQL*Plus with Instant Client                                                              | <a href="#">SQL*Plus 10.1</a><br><a href="#">SQL*Plus 10.2</a>      |
| ODBC Supplement*       | Additional libraries for enabling ODBC applications with Instant Client (Not all platforms)                                               | <a href="#">ODBC</a>                                                |
| SDK*                   | Additional header files and an example makefile for developing Oracle applications with Instant Client                                    |                                                                     |
| ODAC*                  | Includes ODP.NET, Oracle Services for MTS, Oracle Providers for ASP.NET, Oracle Provider for OLE DB, and OO4O with Oracle Instant Client  |                                                                     |

Optional packages are marked with a \*.

- **Basic:** All files required to run OCI, OCCI, and JDBC-OCI applications (**46 MB**)
- **JDBC Supplement:** Additional support for XA, Internationalization, and RowSet operations under JDBC (**1.5 MB**)
- **SQL\*Plus:** Additional libraries and executable for running SQL\*Plus with Instant Client (**0.8 MB**)
- **SDK:** Additional header files and an example makefile for developing Oracle applications with Instant Client (**1 MB**)
- **ODBC:** Additional libraries for enabling ODBC applications (**0.7 MB**)
- **WRC:** Workload Replay Client used to replay workload for RAT's DB Replay Feature (**6 KB**)
- **Precompiler:** Additional files for "proc" binary and related files to precompile a Pro\*C application and demo (**0.5 MB**)

# Clients & Net

- Client certification - [Note:207303.1](#)

|                            |        | Database Release |        |        |        |       |       |       |
|----------------------------|--------|------------------|--------|--------|--------|-------|-------|-------|
|                            |        | 11.2.0           | 11.1.0 | 10.2.0 | 10.1.0 | 9.2.0 | 9.0.1 | 8.1.7 |
| C<br>l<br>i<br>e<br>n<br>t | 11.2.0 | ☒                | ☒      | ☒      | ☐      | ☒     | ☐     | ☐     |
|                            | 11.1.0 | ☒                | ☒      | ☒      | ☒      | ☒     | ☐     | ☐     |
|                            | 10.2.0 | ☒                | ☒      | ☒      | ☒      | ☒     | ☐     | ☒     |
|                            | 10.1.0 | ☒                | ☒      | ☒      | ☒      | ☒     | ☒     | ☒     |
|                            | 9.2.0  | ☒                | ☒      | ☒      | ☒      | ☒     | ☒     | ☒     |
|                            | 9.0.1  | ☐                | ☐      | ☐      | ☒      | ☒     | ☒     | ☒     |
|                            | 8.1.7  | ☐                | ☐      | ☒      | ☒      | ☒     | ☒     | ☒     |

 Certified

 Supported but ES

 Not supported anymore

 Never supported



# Clients & Net

- Database links
  - Only supported if matrix shows ,Supported' in both directions
  - Not supported means: Use it on your own risk
- JDBC certification
  - [Note:401934.1](#)
- ODBC certification
  - [Note:66403.1](#)
  - ODBC Drivers as part of ODAC  
<http://www.oracle.com/technetwork/topics/dotnet/downloads/index.html>
- Forms/Reports certification
  - support.oracle.com ⇨ *Certifications* ⇨ Middleware ⇨ Developer Tools ⇨ Database & PLSQL ⇨ Oracle Forms



## 32bit Clients in 11g Release 2

- `$ORACLE_HOME/lib32` does not exist in 11g Release 2
- 32-bit libraries are not being shipped with the 64-bit Oracle database server or 64-bit Oracle database client media
- Solution:
  - If you want 32-bit libraries, you need to install 32-bit client which is shipped as a separate media
  - Should be installed only into a new Oracle home
  - See [Note:883702.1](#)





# RMAN - Recovery Manager

- RMAN Compatibility Matrix
  - [Note:73431.1](#)
- Rules:
  - The **RMAN executable** version should be the same as the target database
  - The **RMAN catalog schema** version must be greater than or equal to the RMAN executable
    - Upgrade the catalog:

```
RMAN> upgrade catalog
```
  - The **RMAN catalog** is backwards compatible with target databases from earlier releases



# EBS DB Upgrade Best Practice

- Most Important: Read the interoperability note in MOS
  - Doc ID 1058763.1
  - Save a copy of the note locally so that you have a copy of the version you are working from in case it is updated
- Excellent resource
  - Steven Chan's blog (<http://blogs.oracle.com/stevenChan/>)
- See also:
  - [Migrating Oracle E-Business Suite to Exadata Database Machine Using Oracle Data Pump](http://www.oracle.com/technetwork/database/features/availability/maa-eps-dbm-datapump-167285.pdf)  
<http://www.oracle.com/technetwork/database/features/availability/maa-eps-dbm-datapump-167285.pdf>
  - [Migrating Oracle E-Business Suite to Exadata Database Machine Using Transportable Tablespaces](http://www.oracle.com/technetwork/database/features/availability/maa-eps-exadata-xtts-321616.pdf)  
<http://www.oracle.com/technetwork/database/features/availability/maa-eps-exadata-xtts-321616.pdf>
  - [Installing Oracle E-Business Suite Release 12 with Exadata Database Machine](http://www.oracle.com/technetwork/database/features/availability/maa-eps-dbm-fresh-install-249218.pdf)  
<http://www.oracle.com/technetwork/database/features/availability/maa-eps-dbm-fresh-install-249218.pdf>



# Upgrading your applications

- Compatibility Issues:
  - Check for reserved words
    - Appendix A, Upgrade Guide
  - Check for behaviour changes
    - Appendix A, Upgrade Guide
    - Upgrade Companion
  - Check for changes in the data dictionary
    - Appendix A, Upgrade Guide



# Upgrading your applications

- Reserved words check:

```
select ao.owner, ao.object_name, ao.object_type
  from all_objects ao, v$reserved_words osrw
 where ao.object_name = osrw.keyword
       and ao.owner not in ('SYS','PUBLIC','SYSMAN','XDB',
                            'CTXSYS','SYSTEM','WMSYS', 'OWBSYS','ORDSYS','ORDDATA',
                            'OUTLN','OLAPSYS','MDSYS','APEX_030200') order by 1, 2;
```

```
select atc.owner, atc.table_name, atc.column_name
  from all_tab_columns atc, v$reserved_words osrw
 where atc.column_name = osrw.keyword
       and atc.owner not in ('SYS','PUBLIC','SYSMAN','XDB',
                              'CTXSYS','SYSTEM','WMSYS', 'OWBSYS','ORDSYS','ORDDATA',
                              'OUTLN','OLAPSYS','MDSYS','APEX_030200') order by 1, 2;
```



# Upgrading your applications

- Precompiler and OCI applications:
  - Upgrading the **Oracle Database Server** software
    - If you do not change the client environment than you won't have to precompile, compile or relink
    - Database Server version should be identical or higher than client version
  - Upgrading the **Oracle Client** software
    - It is recommended that Oracle client software has the same release than the server
      - Dynamic Libraries: No relink required
      - Static Libraries: Need to be relinked always



# Upgrading your applications

- Precompiler and OCI applications:
  - Option 1: Leave the application unchanged
    - Don't upgrade the client installation
    - Simple and easy
  - Option 2: Precompile the application and change client
    - Recompile when you change the major release
    - You don't have to recompile for a patch release
  - Option 3: Change the application code to use 11g features
    - Most potential benefits
    - Most difficult option
    - Precompile, compile and relink



# Conversion between XE, SE and EE

- SE ⇒ EE see [Note:117048.1](#)
  - Take a full backup
  - Run `catalog.sql` and `catproc.sql` in the EE environment
- EE ⇒ SE see [Note:139642.1](#)
  - Only Export/Import with `exp/imp` or `expdp/impdp` will be supported
- XE ⇒ SE/SEone/EE
  - [http://download.oracle.com/docs/cd/B28359\\_01/server.111/b28300/intro.htm#BABGDCDD](http://download.oracle.com/docs/cd/B28359_01/server.111/b28300/intro.htm#BABGDCDD)
  - Use the DBUA to upgrade your XE database to Seone/SE/EE

# SYSAUX Tablespace in 11.2

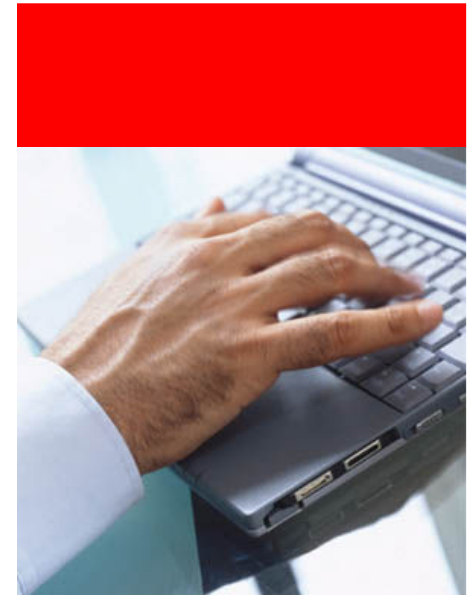
| Occupant name            | Occupant description                    | Schema             | Create       | Drop          | Move method                         |
|--------------------------|-----------------------------------------|--------------------|--------------|---------------|-------------------------------------|
| AO                       | Analytical Workspace Object             | SYS                |              |               | DBMS_AW.MOVE_AWMETA                 |
| AUDIT_TABLES             | DB audit tables                         | SYS                |              |               | DBMS_AUDIT_MGMT.move_dbaudit_tables |
| AUTO_TASK                | Automated Maintenance Tasks             | SYS                |              |               |                                     |
| EM                       | Enterprise Manager Repository           | SYSMAN             |              |               | emd_maintenance.move_em_tbsp        |
| EM_MONITORING_USER       | EM Monitoring User                      | DBSNMP             | catsnmp.sql  | catsnmp.sql   |                                     |
| EXPRESSION_FILTER        | Expression Filter System                | EXFSYS             |              |               |                                     |
| JOB_SCHEDULER            | Unified Job Scheduler                   | SYS                |              |               |                                     |
| LOGMNR                   | LogMiner                                | SYSTEM             | catlmmr.sql  | N/A           | SYS.DBMS_LOGMNR_D.SET_TABLESPACE    |
| LOGSTDBY                 | Logical Standby                         | SYSTEM             | catlsby.sql  | N/A           | SYS.DBMS_LOGSTDBY.SET_TABLESPACE    |
| ORDIM                    | Oracle Multimedia ORDSYS                | ORDSYS             | ordinst.sql  | N/A           | ordsys.ord_admin.move_ordim_tbsp    |
| ORDIM/ORDDATA            | Oracle Multimedia ORDDATA               | ORDDATA            | ordinst.sql  | N/A           | ordsys.ord_admin.move_ordim_tbsp    |
| ORDIM/ORDPLUGINS         | Oracle Multimedia ORDPLUGINS            | ORDPLUGINS         | ordinst.sql  | N/A           | ordsys.ord_admin.move_ordim_tbsp    |
| ORDIM/SI_INFORMTN_SCHEMA | Oracle Multimedia SI_INFORMTN_SCHEMA    | SI_INFORMTN_SCHEMA | ordinst.sql  | N/A           | ordsys.ord_admin.move_ordim_tbsp    |
| PL/SCOPE                 | PL/SQL Identifier Collection            | SYS                |              |               |                                     |
| SDO                      | Oracle Spatial                          | MDSYS              | catmd.sql    | N/A           | MDSYS.MOVE_SDO                      |
| SM/ADVISOR               | SM - Advisor Framework                  | SYS                | catadv.sql   | catnoadv.sql  |                                     |
| SM/AWR                   | SM - Automatic Workload Repository      | SYS                | catawr.sql   | catnoawr.sql  |                                     |
| SM/OPTSTAT               | SM - Optimizer Stats History            | SYS                | catost.sql   | N/A           |                                     |
| SM/OTHER                 | SM - Other Components                   | SYS                |              |               |                                     |
| SMON_SCN_TIME            | Transaction Layer – SCN to time mapping | SYS                |              |               |                                     |
| SQL_MANAGEMENT_BASE      | SQL Management Base                     | SYS                | catsmbvw.sql | N/A           |                                     |
| STATSPACK                | Statspack Repository                    | PERFSTAT           |              |               | Use export/import                   |
| STREAMS                  | Oracle Streams                          | SYS                |              |               |                                     |
| TEXT                     | Oracle Text                             | CTXSYS             | catctx.sql   | catnoctx.sql  | DRI_MOVE_CTXSYS                     |
| TSM                      | Transparent Session Migration           | TMSYS              | cattsm.sql   | N/A           |                                     |
| ULTRASEARCH              | Ultra Search                            | WKSYS              | wk0setup.sql | wk0deinst.sql | MOVE_WK                             |
| ULTRASEARCH_DEMO_USER    | Ultra Search Demo User                  | WK_TEST            | wk0setup.sql | wk0deinst.sql | MOVE_WK                             |
| WM                       | Workspace Manager                       | WMSYS              |              |               | DBMS_WM.move_proc                   |
| XDB                      | XDB                                     | XDB                | catqm.sql    | catnoqm.sql   | XDB.DBMS_XDB.MOVEXDB_TABLESPACE     |
| XSAMD                    | OLAP Catalog                            | OLAPSYS            |              |               | DBMS_AMD.Move_OLAP_Catalog          |
| XSOQHIST                 | OLAP API History Tables                 | SYS                |              |               | DBMS_XSOQ.OLapiMoveProc             |



# Agenda

- Preparation
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- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

- Parameters
- Processes
- Miscellaneous
- Tools
- Automation
- LOB & SecureFiles
- Flashback
- ADR
- Compression



# Enterprise Manager 11g

- Database Control for all database administration tasks

The screenshot displays the Oracle Enterprise Manager 11g Database Control interface for instance HUGO. The page is titled "Database Instance: HUGO" and includes navigation tabs for Home, Performance, Availability, Server, Schema, Data Movement, and Software and Support. The interface is divided into several sections:

- General:** Shows the instance status as "Up", with a "Shutdown" and "Black Out" button. It lists instance details: Instance Name HUGO, Version 11.2.0.1.0, Host stadd57.us.oracle.com, Listener LISTENER\_stadd57.us.oracle.com, and ASM +ASM\_stadd57.us.oracle.com.
- Host CPU:** A bar chart showing CPU usage for HUGO and Other processes. The load is 1.73 and paging is 0.00.
- Active Sessions:** A bar chart showing session types: Wait, User I/O, and CPU. The core count is 2.
- SQL Response Time:** A line graph showing SQL response time. The reference collection is empty, and the SQL response time is unavailable.
- Diagnostic Summary:** Lists ADDM Findings (0), Alert Log (No ORA errors), Active Incidents (0), and Key SQL Profiles (1).
- Space Summary:** Lists Database Size (2,361 GB), Problem Tablespaces (0), Segment Advisor Recommendations (0), Policy Violations (1), and Dump Area Used (84%).
- High Availability:** Lists Console (Details), Oracle Restart (Enabled), Instance Recovery Time (13), Last Backup (n/a), Usable Flash Recovery Area (32.04%), and Flashback Database Logging (Disabled).
- Alerts:** A table showing one warning alert: "User SYS logged on from stadd57" triggered on Oct 7, 2009 12:28:17 AM.

- Grid Control as an IT system administration tool
  - Supports Oracle and non-Oracle IT infrastructures
  - Grid Control 11g has been available since 22-APR-2010
    - Be sure to upgrade the agents when you upgrade to a new version of GC!



# Enterprise Manager 11g

- Components
  - Database Control:  
Agent and standalone OC4J - thus no additional webserver needed
  - Grid Control:  
OMS, Management Agent and Repository Database
- Installation:
  - Database Control:  
Automatically done within the 11g database software installation
  - Grid Control:  
Separate download/DVD
- License:
  - Both products are included in any database license
  - Specific packs and plug-ins may be licensed additionally

# SQL Developer

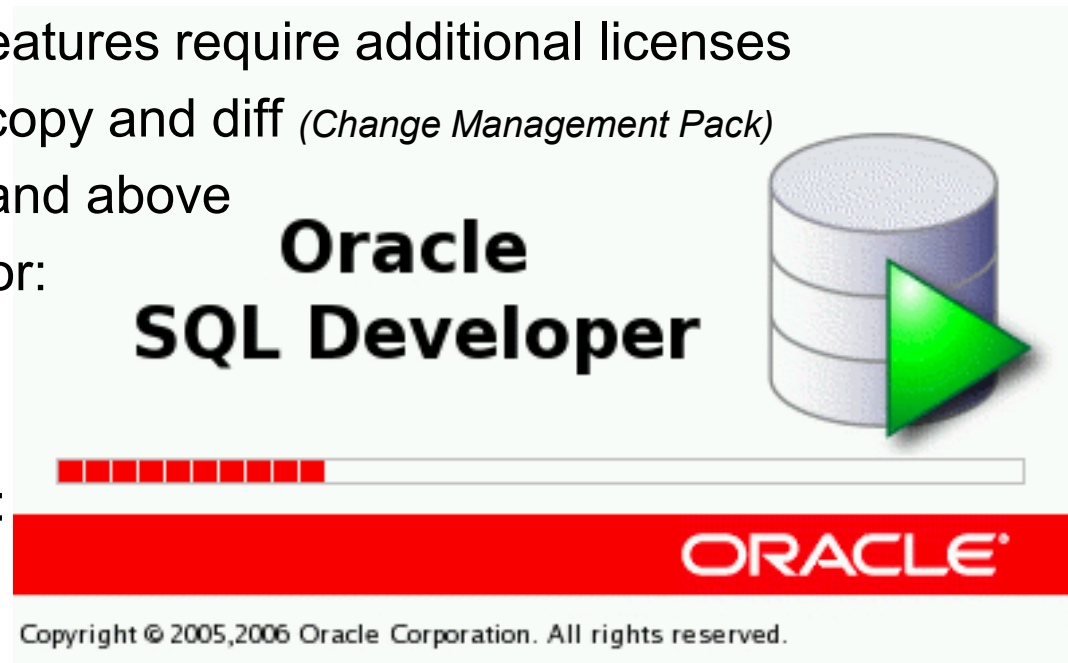


- Developer tool at no extra cost

<http://www.oracle.com/technetwork/developer-tools/sql-developer/overview/index.html>

- Key Features:

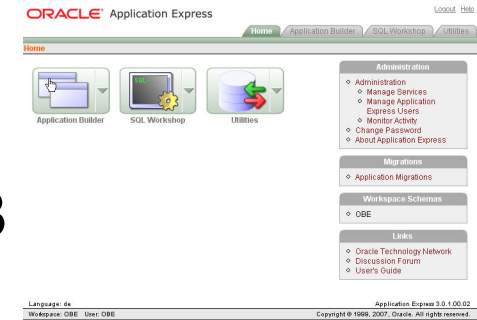
- Excellent PL/SQL development and debugging
- Extremely fast object browser
- Base tool free, some features require additional licenses
  - Schema/database copy and diff (*Change Management Pack*)
- Supports Oracle 9iR2 and above
- Migration workbench for:
- Installed version:
  - 1.5.5
- Current version (OTN):
  - 2.1.1



ORACLE

# APEX

- APEX = Application Express = ex-HTMLDB
  - GUI development environment
  - Easy to use - wizard driven
  - Forms conversion assistant
- APEX is available by default
  - No additional installation or license necessary
  - Oracle Database 11.2 ships with APEX 3.2
    - No webserver necessary – XDB gateway used for http
  - APEX 4.0 available
    - APEX Listener  
<http://www.oracle.com/technetwork/developer-tools/apex-listener/overview/index.html>
- Two configuration steps:
  - `$ORACLE_HOME/apex/apxconf.sql`
  - `ALTER USER anonymous ACCOUNT UNLOCK;`

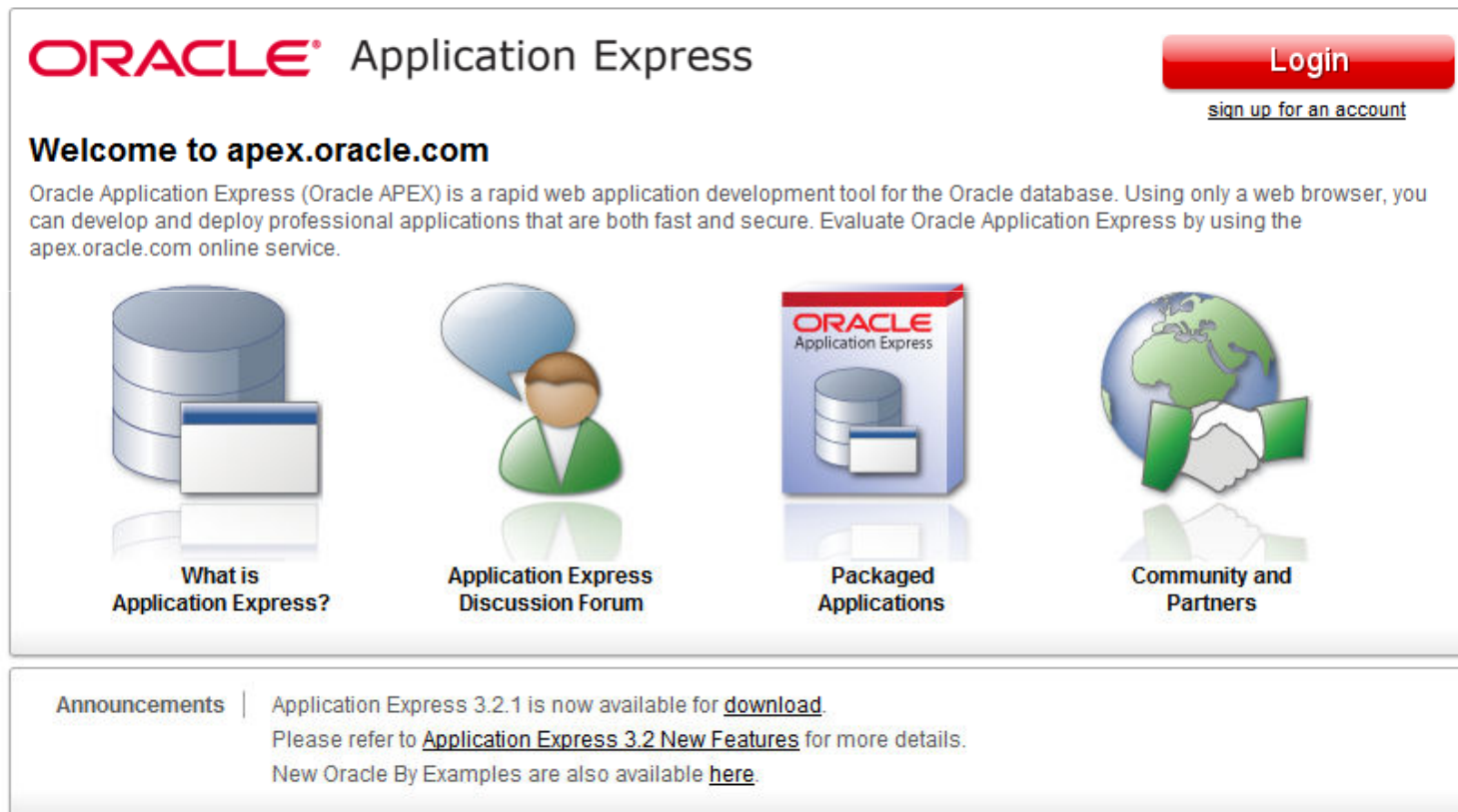


# APEX

- Important APEX pages:

[http://www.oracle.com/technology/products/database/application\\_express/index.html](http://www.oracle.com/technology/products/database/application_express/index.html)

<http://apex.oracle.com>







The screenshot shows the Oracle Application Express homepage. At the top left is the Oracle logo followed by "Application Express". On the top right is a red "Login" button with a link "sign up for an account" below it. The main heading is "Welcome to apex.oracle.com". Below this is a paragraph of introductory text. There are four main navigation icons: a database cylinder for "What is Application Express?", a person with a speech bubble for "Application Express Discussion Forum", a software box for "Packaged Applications", and a globe with hands for "Community and Partners". At the bottom, there is an "Announcements" section with text about version 3.2.1.

**ORACLE** Application Express **Login**  
[sign up for an account](#)

**Welcome to apex.oracle.com**

Oracle Application Express (Oracle APEX) is a rapid web application development tool for the Oracle database. Using only a web browser, you can develop and deploy professional applications that are both fast and secure. Evaluate Oracle Application Express by using the apex.oracle.com online service.

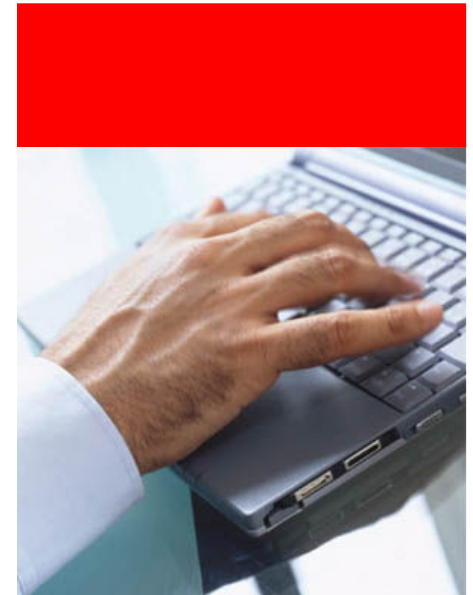
 **What is Application Express?**       **Application Express Discussion Forum**       **Packaged Applications**       **Community and Partners**

**Announcements** | Application Express 3.2.1 is now available for [download](#).  
Please refer to [Application Express 3.2 New Features](#) for more details.  
New Oracle By Examples are also available [here](#).

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# Automation in 11g

- EM: Scheduler Central

ORACLE Enterprise Manager 11g Database Control [Setup](#) [Preferences](#) [Help](#) [Logout](#)

**Database**

Database Instance: HUGO > Logged in As SYS

**Scheduler Central** Page Refreshed Oct 7, 2009 8:13:40 PM EDT

**Schedulers**

[Oracle Scheduler](#)  
User-defined jobs managed by the database server

[Jobs](#)  
User-defined jobs managed by Enterprise Manager

[Automated Maintenance Tasks](#)  
System-defined jobs run automatically for database maintenance

**Scheduler Tasks**

View:

| Name                                           | Schema     | Type                        | Status    | Scheduled                                |
|------------------------------------------------|------------|-----------------------------|-----------|------------------------------------------|
| <a href="#">Optimizer Statistics Gathering</a> | SYS        | Automated Maintenance Tasks | Scheduled | Oct 8, 2009 10:00:00 PM (UTC-04:00)      |
| <a href="#">Segment Advisor</a>                | SYS        | Automated Maintenance Tasks | Scheduled | Oct 8, 2009 10:00:00 PM (UTC-04:00)      |
| <a href="#">Automatic SQL Tuning</a>           | SYS        | Automated Maintenance Tasks | Scheduled | Oct 8, 2009 10:00:00 PM (UTC-04:00)      |
| <a href="#">BSLN_MAINTAIN_STATS_JOB</a>        | SYS        | Oracle Scheduler            | Scheduled | Oct 11, 2009 12:00:00 AM (UTC-04:00)     |
| <a href="#">DRA_REEVALUATE_OPEN_FAILURES</a>   | SYS        | Oracle Scheduler            | Scheduled | <a href="#">MAINTENANCE_WINDOW_GROUP</a> |
| <a href="#">MGMT_CONFIG_JOB</a>                | ORACLE_OCM | Oracle Scheduler            | Scheduled | <a href="#">MAINTENANCE_WINDOW_GROUP</a> |
| <a href="#">MGMT_STATS_CONFIG_JOB</a>          | ORACLE_OCM | Oracle Scheduler            | Scheduled | Nov 1, 2009 1:01:01 AM (UTC-04:00)       |
| <a href="#">ORA\$AUTOTASK_CLEAN</a>            | SYS        | Oracle Scheduler            | Scheduled | Oct 8, 2009 3:00:00 AM (UTC-04:00)       |
| <a href="#">PURGE_LOG</a>                      | SYS        | Oracle Scheduler            | Scheduled | Oct 8, 2009 3:00:00 AM (UTC-04:00)       |
| <a href="#">RLM\$EVTCLEANUP</a>                | EXFSYS     | Oracle Scheduler            | Scheduled | Oct 7, 2009 8:31:39 PM (UTC-04:00)       |
| <a href="#">RLM\$SCHDNEGACTION</a>             | EXFSYS     | Oracle Scheduler            | Scheduled | Oct 8, 2009 2:49:15 AM (UTC+02:00)       |
| <a href="#">RSE\$CLEAN_RECOVERABLE_SCRIPT</a>  | SYS        | Oracle Scheduler            | Scheduled | Oct 8, 2009 12:00:00 AM (UTC-04:00)      |
| <a href="#">SM\$CLEAN_AUTO_SPLIT_MERGE</a>     | SYS        | Oracle Scheduler            | Scheduled | Oct 8, 2009 12:00:00 AM (UTC-04:00)      |



# Automation in 11g

- Check the maintenance windows after upgrading

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: HUGO > Automated Maintenance Tasks > Logged in As SYS

Show SQL Revert Apply

### Automated Maintenance Tasks Configuration

Global Status  Enabled  Disabled

#### Task Settings

Optimizer Statistics Gathering  Enabled  Disabled   
Segment Advisor  Enabled  Disabled  
Automatic SQL Tuning  Enabled  Disabled

#### Maintenance Window Group Assignment

| Window                           | Optimizer Statistics Gathering      |                          | Segment Advisor                     |                          | Automatic SQL Tuning                |                          |
|----------------------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|
|                                  | Select All                          | Select None              | Select All                          | Select None              | Select All                          | Select None              |
| <a href="#">WEDNESDAY_WINDOW</a> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <a href="#">THURSDAY_WINDOW</a>  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <a href="#">FRIDAY_WINDOW</a>    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <a href="#">SATURDAY_WINDOW</a>  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <a href="#">SUNDAY_WINDOW</a>    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <a href="#">MONDAY_WINDOW</a>    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <a href="#">TUESDAY_WINDOW</a>   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Show SQL Revert Apply

# Automation in 11g

- Jobs – Default Maintenance Windows

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: HUGO > Logged in As SYS

### Scheduler Windows

Following are the system windows that specify resource usage limits based on time-duration windows. Create

240min = 4h ... 1200min = 20h

| Select                           | Name                             | Resource Plan                            | Enabled                             | Next Open Date | End Date | Duration (min) | Active | Description                               |
|----------------------------------|----------------------------------|------------------------------------------|-------------------------------------|----------------|----------|----------------|--------|-------------------------------------------|
| <input checked="" type="radio"/> | <a href="#">WEEKNIGHT_WINDOW</a> |                                          |                                     |                |          | 480            | FALSE  | Weeknight window - for compatibility only |
| <input type="radio"/>            | <a href="#">WEEKEND_WINDOW</a>   |                                          |                                     |                |          | 2880           | FALSE  | Weekend window - for compatibility only   |
| <input type="radio"/>            | <a href="#">FRIDAY_WINDOW</a>    | <a href="#">DEFAULT_MAINTENANCE_PLAN</a> | <input checked="" type="checkbox"/> |                |          | 240            | FALSE  | Friday window for maintenance tasks       |
| <input type="radio"/>            | <a href="#">SATURDAY_WINDOW</a>  | <a href="#">DEFAULT_MAINTENANCE_PLAN</a> | <input checked="" type="checkbox"/> |                |          | 1200           | FALSE  | Saturday window for maintenance tasks     |
| <input type="radio"/>            | <a href="#">SUNDAY_WINDOW</a>    | <a href="#">DEFAULT_MAINTENANCE_PLAN</a> | <input checked="" type="checkbox"/> |                |          | 1200           | FALSE  | Sunday window for maintenance tasks       |
| <input type="radio"/>            | <a href="#">MONDAY_WINDOW</a>    | <a href="#">DEFAULT_MAINTENANCE_PLAN</a> | <input checked="" type="checkbox"/> |                |          | 240            | FALSE  | Monday window for maintenance tasks       |
| <input type="radio"/>            | <a href="#">TUESDAY_WINDOW</a>   | <a href="#">DEFAULT_MAINTENANCE_PLAN</a> | <input checked="" type="checkbox"/> |                |          | 240            | FALSE  | Tuesday window for maintenance tasks      |
| <input type="radio"/>            | <a href="#">WEDNESDAY_WINDOW</a> | <a href="#">DEFAULT_MAINTENANCE_PLAN</a> | <input checked="" type="checkbox"/> |                |          | 240            | FALSE  | Wednesday window for maintenance tasks    |
| <input type="radio"/>            | <a href="#">THURSDAY_WINDOW</a>  | <a href="#">DEFAULT_MAINTENANCE_PLAN</a> | <input checked="" type="checkbox"/> |                |          | 240            | FALSE  | Thursday window for maintenance tasks     |

# Automation in 11g

- Segment Advisor job identifies space to free up

## Schedulers

### Oracle Scheduler

User-defined jobs managed by the database server

### Jobs

User-defined jobs managed by Enterprise Manager

### Automated Maintenance Tasks

System-defined jobs run automatically for database maintenance

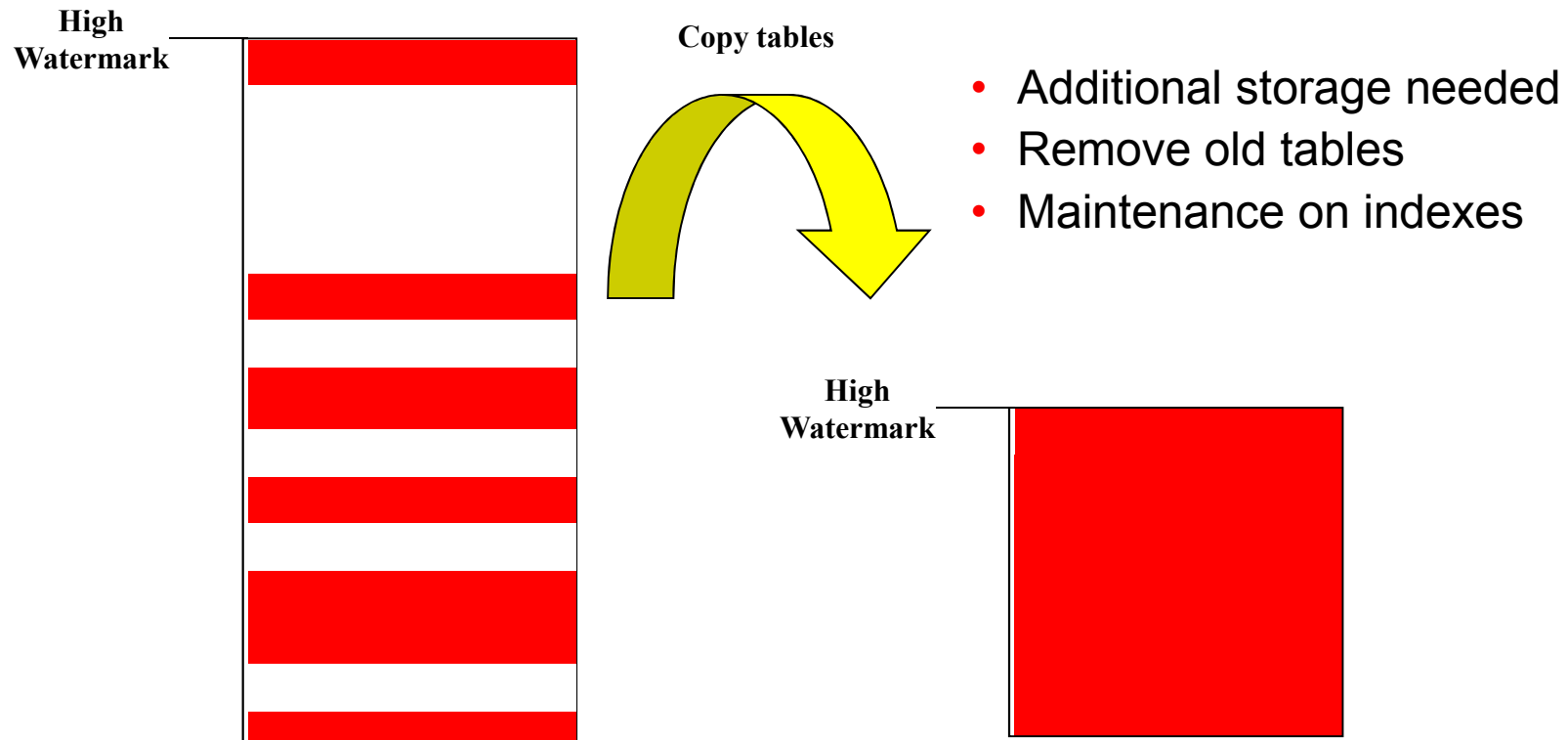
## Scheduler Tasks

View

| Name                                           | Schema     | Type                        | Status    | Scheduled                                |
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| <a href="#">Automatic SQL Tuning</a>           | SYS        | Automated Maintenance Tasks | Scheduled | Oct 8, 2009 10:00:00 PM (UTC-04:00)      |
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| <a href="#">SM\$CLEAN_AUTO_SPLIT_MERGE</a>     | SYS        | Oracle Scheduler            | Scheduled | Oct 8, 2009 12:00:00 AM (UTC-04:00)      |



# Mechanism: scale down tables in

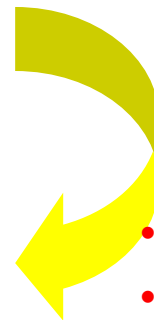
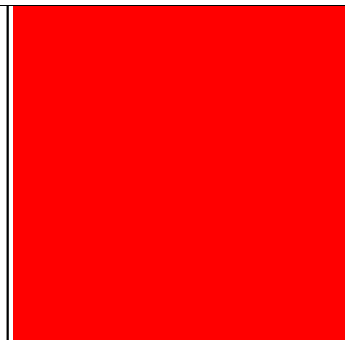


# Mechanism: scale down tables in:



Move data

High  
Watermark



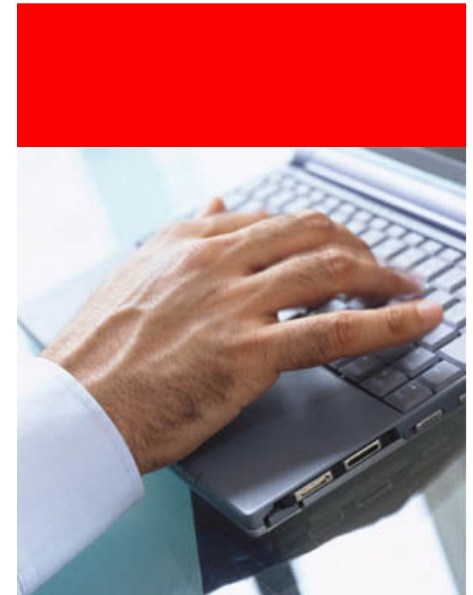
- Online
- Indexes are maintained
- Triggers won't be executed
  - But: TS must be ASSM
  - Exclusive Table Lock for HWM

```
ALTER TABLE <tablename> SHRINK SPACE;
```

# Agenda

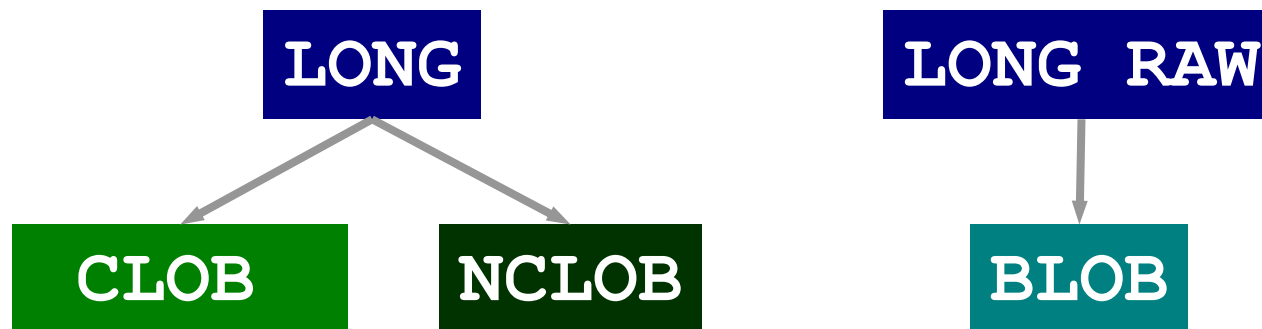
- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
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# LONG ⇒ LOB Conversion

- LONG data type is still supported, but Oracle recommends conversion to LOB types



- Disadvantages of LONG:
  - Maximum number of LONG columns per table : 1
  - No replication possible with LONG und LONG RAW
  - Attention:
    - LONG ⇒ LOB conversion is irreversible



# LONG ⇒ LOB Conversion

- Conversion:

```
ALTER TABLE long_tab MODIFY ( long_col CLOB );
```

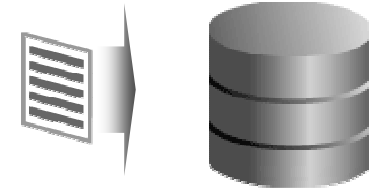
- Online Table Redefinition

- Available for LONG/LOB since 10g
- Package: DBMS\_REDEFINITION
- Regulation:
  - LONG ⇒ CLOB
  - LONG RAW ⇒ BLOB
- Conversion is done implicitly
  - For scripted examples see: [Note:251417.1](#), [Note:556283.1](#) and [Note:1012454.7](#)
- Advantage:  
Source table is available during the whole process



# SecureFiles

- Securefiles = new LOB storage technology
  - Better performance
  - Additional features: deduplication, encryption
- Examples:



```
CREATE TABLE t1 (a CLOB) LOB(a) STORE AS SECUREFILE ;  
CREATE TABLE t2 (a CLOB) LOB(a) STORE AS SECUREFILE  
  (DEDUPLICATE) ;  
CREATE TABLE t3 (a CLOB ENCRYPT USING 'AES128')  
  LOB(a) STORE AS SECUREFILE (CACHE) ;
```

- Tablespace must be ASSM managed
- Initialization parameter

```
DB_SECUREFILE = [NEVER | PERMITTED | ALWAYS | IGNORE]  
→ CREATE TABLE t1 (a CLOB); -- this will be a Securefile!!!
```



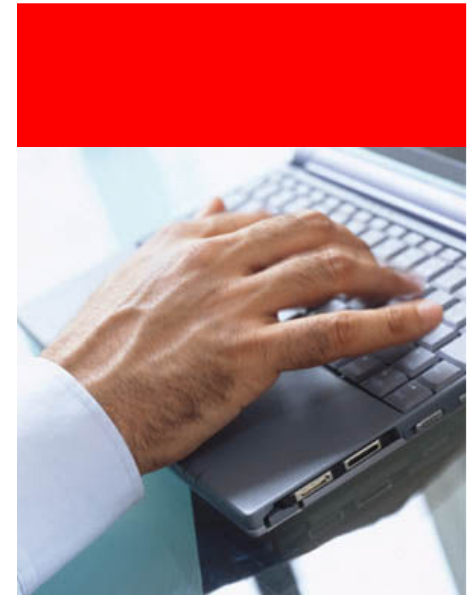
# SecureFiles

- Securefiles are fully transparent
  - Data type still a BLOB/CLOB
  - Definition per storage clause or controlled by init Parameter
  - No functional differences
    - Even "*deduplication*" is fully transparent for developers
- API access:  
PL/SQL (DBMS\_LOB), JDBC, .NET, PHP, ...

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# Flashback

- Different types of flashback and its sources (EE only!)

- Flashback Query
- Versions Query
- Transaction Query
- Flashback Table

Undo

⇒ Enabled by default

- Flashback Drop



⇒ Enabled by default

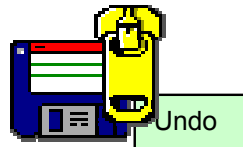
- Flashback Database



Flashback Logs

⇒ Has to be enabled

- Total Recall  
Flashback Data Archive



⇒ Has to be enabled

# Flashback in EM

- Pretty well hidden ....:

The screenshot displays the Oracle Enterprise Manager 11g Database Control interface for instance HUGO. The top navigation bar includes links for Setup, Preferences, Help, and Logout, and a 'Database' button. The main navigation menu contains Home, Performance, **Availability** (highlighted with a red arrow and '1'), Server, Schema, Data Movement, and Software and Support. Below the Availability menu, the 'High Availability Console' is visible. The 'Backup/Recovery' section is expanded, showing three columns of options: Setup (Backup Settings, Recovery Settings, Recovery Catalog Settings), Manage (Schedule Backup, Manage Current Backups, Backup Reports, **Manage Restore Points** (highlighted with a red arrow and '2'), Perform Recovery, View and Manage Transactions), and Oracle Secure Backup (Assign and Manage). A 'Related Links' section at the bottom lists various database management tasks such as Access, Alert History, Baseline Metric Thresholds, Jobs, Metric Collection Errors, Policy Groups, Target Properties, Add Exadata Cell Targets, Alert Log Contents, Blackouts, Metric and Policy Settings, Monitoring Configuration, Scheduler Central, User-Defined Metrics, Advisor Central, All Metrics, EM SQL History, Metric Baselines, Monitor in Memory Access Mode, and SQL Worksheet.

# Flashback in EM

- Perform Recovery

ORACLE Enterprise Manager 11g Database Control Setup Preferences Help Logout

Database Instance: HUGO > Database

### Perform Recovery

**Oracle Advised Recovery**  
Oracle did not detect any failures. Advise and Recover

**Manual Directed Recovery**  
Recovery Scope: Tables Recover

Operation Type:  
 Flashback Existing Tables  
 Flashback Dropped Tables

**Decrypt Backups**

**Host Credentials**  
To perform recovery, supply operating system login credentials to access the target database.

\* Username:   
\* Password:   
 Save as Preferred Credential

**Overview**

- Recover database failures as advised by Oracle
- Restore and/or recover the entire database or selected objects
- Restore files to a new location
- Recover tablespaces to a point-in-time based on a timestamp, system change number (SCN), or log sequence number
- Recover datafile data blocks that are marked as corrupted, or based on datafile block IDs or tablespace block addresses
- Flashback database or tables to a specific system change number (SCN) or timestamp

# Restore Points

- Restore point – specifies a jump label
  - Named Restore Point
    - Similar to a bookmark
    - "Can be" - but no guarantee
    - Will be recorded to the control file

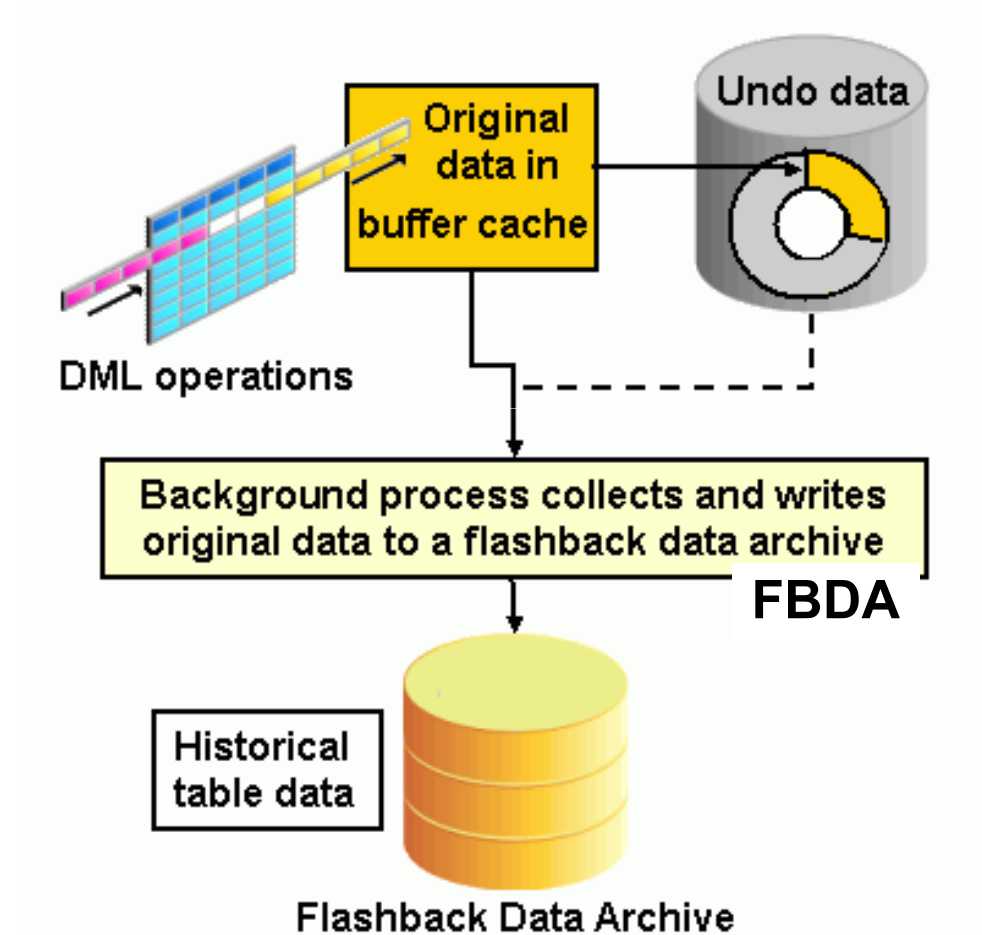
```
SQL> CREATE RESTORE POINT rpt;  
SQL> FLASHBACK DATABASE TO RESTORE POINT rpt;
```

- Guaranteed Restore Point
  - Similar to storage snapshots
  - Overrides the FLASHBACK\_RETENTION\_TARGET
  - **Attention:** A guarantee restore point can stop the whole database 😊

```
SQL> CREATE RESTORE POINT grpt  
      GUARANTEE FLASHBACK DATABASE;  
SQL> FLASHBACK DATABASE TO RESTORE POINT grpt;
```

# Flashback Data Archive - Total Recall

- How does it work?
  - Background process **FBDA** will track **data changes** (only **UPDATES** and **DELETES**) on monitored tables in the **Flashback Data Archive** (asynchronous)
  - Data gets extracted from **undo** information
  - Default capture interval: 5min
  - Capture interval will be changed automatically upon system work load
  - *Licensable option*

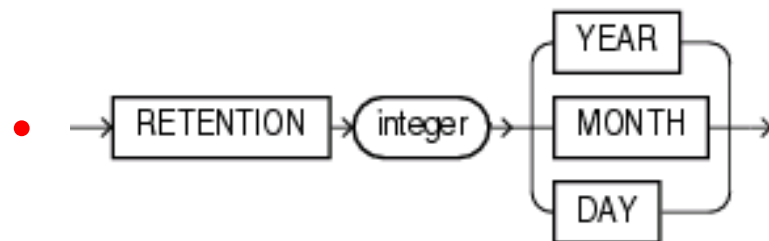




# Flashback Data Archive - Total Recall

- Requirements:
  - Tablespace for FBDA has to be ASSM managed
  - Ideally separate tablespaces get created for the flashback data archives and reside on cheaper storage for cost efficiency
- Create a flashback data archive:

```
CREATE FLASHBACK ARCHIVE fda1  
TABLESPACE fda  
RETENTION 1 year;
```



- Switch on flashback archiving for a specific object:

```
ALTER TABLE t1 FLASHBACK ARCHIVE fda1;
```

# Flashback Data Archive - Total Recall

- Behind the scenes:
  - In tablespace *fda* some structures will be created:

| NAME                     | TYP             |
|--------------------------|-----------------|
| -----                    | -----           |
| SYS_FBA_DDL_COLMAP_23107 | TABLE           |
| SYS_FBA_HIST_23107       | TABLE PARTITION |
| SYS_FBA_TCRV_23107       | TABLE           |
| SYS_FBA_TCRV_IDX_23107   | INDEX           |

- 23107 is the OBJECT\_ID of the table getting monitored/archived

Tracks the changes

- If the defined retention is reached the required data will be deleted automatically
- Absolutely transparent - no changes to any application necessary
- Partitioning happens automatically

# Flashback Data Archive - Total Recall

- Is it possible to change data in the FDA?
  - Data will be stored such as:

| ROWID             | STARTSCN | ENDSCN  | O | COL1 |
|-------------------|----------|---------|---|------|
| AAAFp1AAGAAAAVAAA | 1114797  | 1115141 | I | 1    |
| AAAFp1AAGAAAAVAAB | 1114797  | 1115141 | I | 2    |
| AAAFp1AAGAAAAVAAC | 1114797  | 1115141 | I | 23   |
| AAAFp1AAGAAAAVAAD | 1114797  | 1115141 | I | 24   |
| AAAFp1AAGAAAAVAAE | 1114797  | 1115141 | I | 25   |
| AAAFp1AAGAAAAVAAF | 1115141  | 1116039 | U | 2    |
| ...               |          |         |   |      |

- Data can't be manipulated:

```
SQL> update SYS_FBA_HIST_23107 set coll=coll-1;
update SYS_FBA_HIST_23107 set coll=coll-1
      *
ERROR at line 1:
ORA-55622: DML, ALTER and CREATE UNIQUE INDEX operations are
not allowed on table "SYS"."SYS_FBA_HIST_23107"
```

# Flashback Data Archive - Total Recall

- How to access the historical data?

```
SELECT * FROM t1
  AS OF TIMESTAMP '27-AUG-07 2:15:00pm' ;
```

```
COL1
-----
    1
    2
   23
```

```
SELECT * FROM t1
  AS OF TIMESTAMP '14-SEP-08 2:30:00pm' ;
```

```
COL1
-----
    2
    3
   24
```

# Flashback Data Archive - Total Recall

- **11.1 only:** Switch off background process FBDA in 11g?

```
SQL> ALTER SYSTEM SET
      "_disable_flashback_archiver"=1
      scope=spfile;

SQL> STARTUP FORCE

$ ps -ef | grep fbda
```



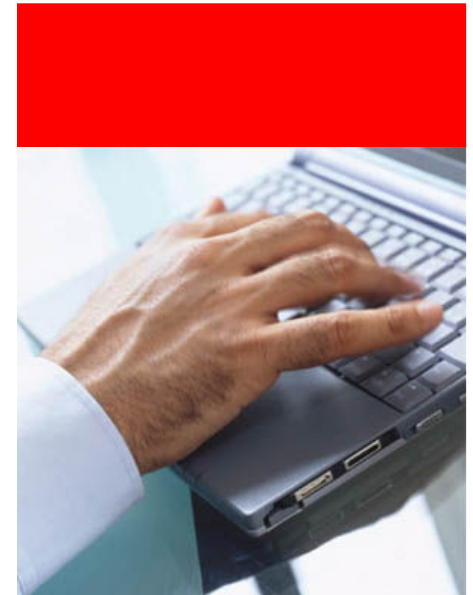
# Flashback Data Archive – New in 11.2

- Most **DDL commands** on tables now **supported**
  - Add, Drop, Rename, Modify Column
  - Drop, Truncate Partition
  - Rename, Truncate Table
  - Add, Drop, Rename, Modify Constraint
- **Disassociate** and **associate** PL/SQL procedures can be used to temporarily disable Total Recall on specified tables
  - `DBMS_FLASHBACK_ARCHIVE.DISASSOCIATE_FBA`
  - `DBMS_FLASHBACK_ARCHIVE.REASSOCIATE_FBA`

# Agenda

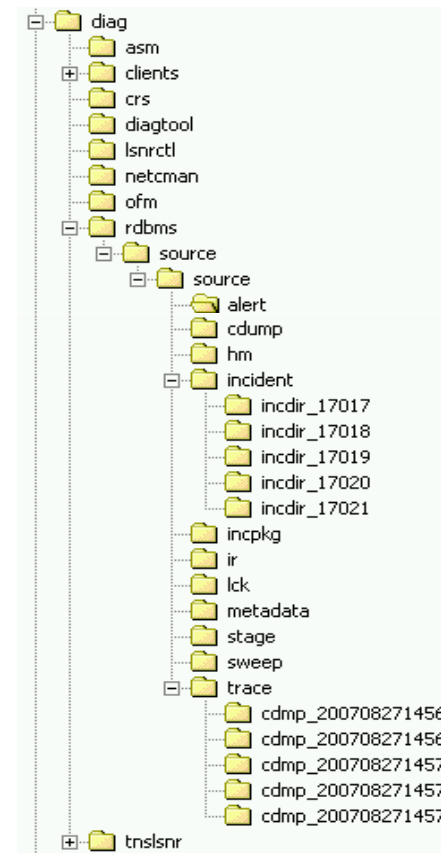
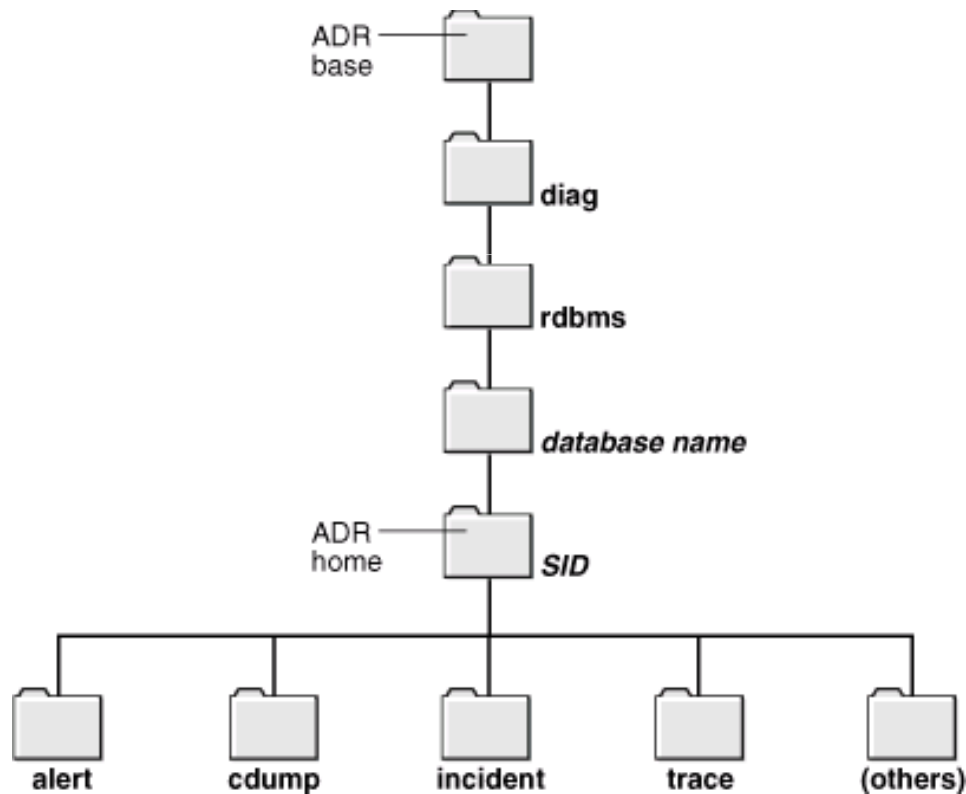
- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

- Parameters
- Processes
- Miscellaneous
- Tools
- Automation
- LOB & SecureFiles
- Flashback
- ADR
- Compression



# Automatic Diagnostic Repository

- ADR: systemwide logging and tracing directory
  - Set via `diagnostic_dest` parameter
  - Default: `ORACLE_BASE`





# Automatic Diagnostic Repository

- ADR: systemwide logging/tracing directory
  - "Oh ... my alert.log is now in XML format ...?"

- No panic:
  - Files are still kept also in text mode
  - There are two very comfortable interfaces:
    - **adrci**
    - EM interface

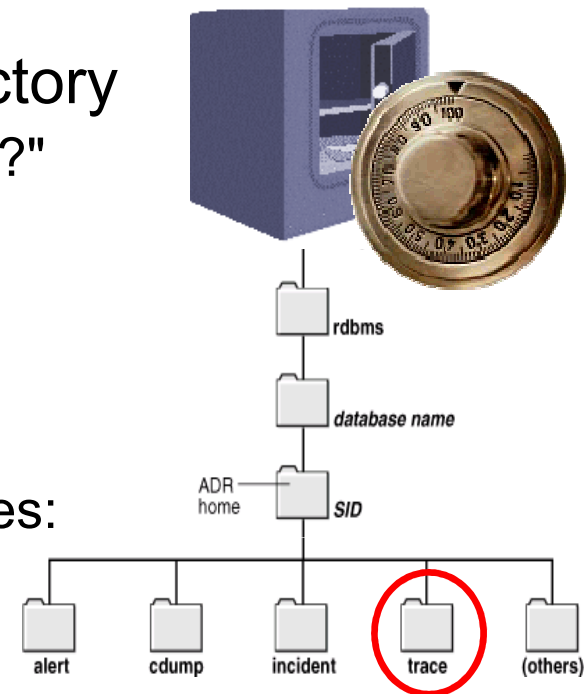
- Error categories based on ITIL standards:

- **Problem**

- Critical error such as ORA-600, ORA-7445, ORA-4031 ...

- **Incident**

- Singular error - if it gets raised more often it'll become a PROBLEM!!



# Automatic Diagnostic Repository

- V\$DIAG\_INFO:

```
SQL> SELECT name, value FROM v$diag_info;
```

| NAME                  | WERT                                             |
|-----------------------|--------------------------------------------------|
| Diag Enabled          | TRUE                                             |
| ADR Base              | /u01/orabase                                     |
| ADR Home              | /u01/orabase/diag/rdbms/v11201/V11201            |
| Diag Trace            | /u01/orabase/diag/rdbms/v11201/V11201/trace      |
| Diag Alert            | /u01/orabase/diag/rdbms/v11201/V11201/alert      |
| Diag Incident         | /u01/orabase/diag/rdbms/v11201/V11201/incident   |
| Diag Cdump            | /u01/orabase/diag/rdbms/v11201/V11201/cdump      |
| Health Monitor        | /u01/orabase/diag/rdbms/v11201/V11201/hm         |
| Default Trace File    | /u01/orabase/diag/rdbms/v11201/V11201/trace/V112 |
| Active Problem Count  | 1                                                |
| Active Incident Count | 13                                               |



# Automatic Diagnostic Repository

- **adrci**

```
ADRCI: Release 11.1.0.7.0 - Production on Mon Apr 27 16:58:37 2009
```

```
Copyright (c) 1982, 2007, Oracle. All rights reserved.
```

```
ADR base = "c:\oracle"  
adrci> help | help extended
```

- Step 1: Check and set ADRCI homes
  - `adrci> show home`
  - `adrci> set home /diag/rdbms/v11201/V11201`
- Step 2: Define the editor, e.g.:
  - `adrci> set editor uedit32`
- Step 3: Check alert.log, problems and incidents
  - `adrci> show alert -tail 50 -f`
  - `adrci> show problem`
  - `adrci> show incident`



# Automatic Diagnostic Repository

- **adrci**

- Helpful notes:

- [Note: 443529.1](#)

- 11g Quick Steps to Package and Send Critical Error Diagnostic Information to Support

- [Note:738732.1](#)

- ADR Different Methods to Create IPS Package

- [Note: 564269.1](#)

- Retention Policy for ADR Incidents

- **SHORTP\_POLICY:**

- Used to purge information that has a short life.

- Default: 720 [hours] => 30 days

- Applies to: TRACE, CDUMP, UTSCDMP, IPS

- **LONGP\_POLICY:**

- To purge ADR contents that have a long life.

- Default: 8760 [hours] => 365 days

- Applies to: ALERT, INCIDENT, SWEEP, STAGE, HM



# Automatic Diagnostic Repository

- **adrci**: Trace file housekeeping

```
/* Check the current settings for retention policies */
```

```
adrci> show control
```

```
/* Change the retention policies */
```

```
adrci> set control (SHORTP_POLICY = 96)
```

```
adrci> set control (LONGP_POLICY = 240)
```

```
adrci> help purge
```

```
Usage: PURGE [[-i <id1> | <id1> <id2>] |  
[-age <mins> [-type ALERT|INCIDENT|TRACE|CDUMP|HM|UTSCDMP]]]:
```

Purpose: Purge the diagnostic data in the current ADR home. If no option is specified, the default purging policy will be used.

Options:

[-i id1 | id1 id2]: Users can input a single incident ID, or a range of incidents to purge.

[-age <mins>]: Users can specify the purging policy either to all the diagnostic data or the specified type. The data older than <mins> ago will be purged

[-type ALERT|INCIDENT|TRACE|CDUMP|HM|UTSCDMP]:  
Users can specify what type of data to be purged.



# Automatic Diagnostic Repository

- **adrci**: alert.log housekeeping

```
/* Delete the whole alert.log */
```

```
adrci> purge -age 0 -type alert
```

```
/* Delete traces older than 120 minutes*/
```

```
adrci> purge -age 120 -type trace
```

# Automatic Diagnostic Repository

- Support Workbench

The screenshot displays the Oracle Enterprise Manager 11g Database Control interface. At the top, the page title is "ORACLE Enterprise Manager 11g Database Control" with navigation links for "Setup", "Preferences", "Help", and "Logout". A "Database" button is visible in the top right. The user is logged in as "SYS". The main content area is titled "Database Instance: HUGO" and features a navigation menu with options: "Home", "Performance", "Availability", "Server", "Schema", "Data", and "Software and Support". A red arrow labeled "1" points to the "Software and Support" menu item. Below this menu, the "Software" section is expanded, showing sub-sections: "Configuration" (with links for Search, Last Collected Configuration, Collection Status, Clone Oracle Home, Host Configuration, Oracle Home Inventory), "Real Application Testing" (with links for Database Replay, SQL Performance Analyzer), "Database Software Patching" (with links for Patch Advisor, View Patch Cache, Patch Prerequisites, Apply Patch), and "Deployment Procedure Manager" (with links for Getting Started with Deployment Procedure Manager, Deployment Procedures, RAC Provisioning Deployment Procedures, Procedure Completion Status, and Deployment and Provisioning Software Library). At the bottom left, a red arrow labeled "2" points to the "Support" section, which includes the "Support Workbench" link.

# Automatic Diagnostic Repository

- Support Workbench – Any problems?

ORACLE Enterprise Manager 11g Database Control [Setup](#) [Preferences](#) [Help](#) [Logout](#)

Database Instance: HUGO > Database

Database Instance: HUGO > Logged in As SYS

## Support Workbench

Page Refreshed October 7, 2009 10:54:48 PM EDT

[Problems \(1\)](#) [Checker Findings \(0\)](#) [Packages \(0\)](#)

|                                |   |                      |   |               |   |
|--------------------------------|---|----------------------|---|---------------|---|
| New Problems in Last 24 Hours  | 1 | All Active Problems  | 0 | All Problems  | 1 |
| New Incidents in Last 24 Hours | 1 | All Active Incidents | 0 | All Incidents | 1 |

View  Search   [Advanced Search](#)

[Select All](#) | [Select None](#) | [Show All Details](#) | [Hide All Details](#)

| Select                              | Details              | ID | Description                            | Number Of Incidents | Last Incident                   | Last Comment | Active | Packaged | SR# |
|-------------------------------------|----------------------|----|----------------------------------------|---------------------|---------------------------------|--------------|--------|----------|-----|
| <input checked="" type="checkbox"/> | <a href="#">Hide</a> | 1  | ORA-7445 [____strtol_l_internal()+124] | 1                   | October 7, 2009 10:24:04 PM EDT |              | No     | No       |     |

**Incidents (1)**

|                      |                                                                               |                                 |
|----------------------|-------------------------------------------------------------------------------|---------------------------------|
| <a href="#">8249</a> | ORA-7445 [____strtol_l_internal()+124] [SIGSEGV] [ADDR:0x0] [PC:0x8F71EC] ... | October 7, 2009 10:24:04 PM EDT |
|----------------------|-------------------------------------------------------------------------------|---------------------------------|

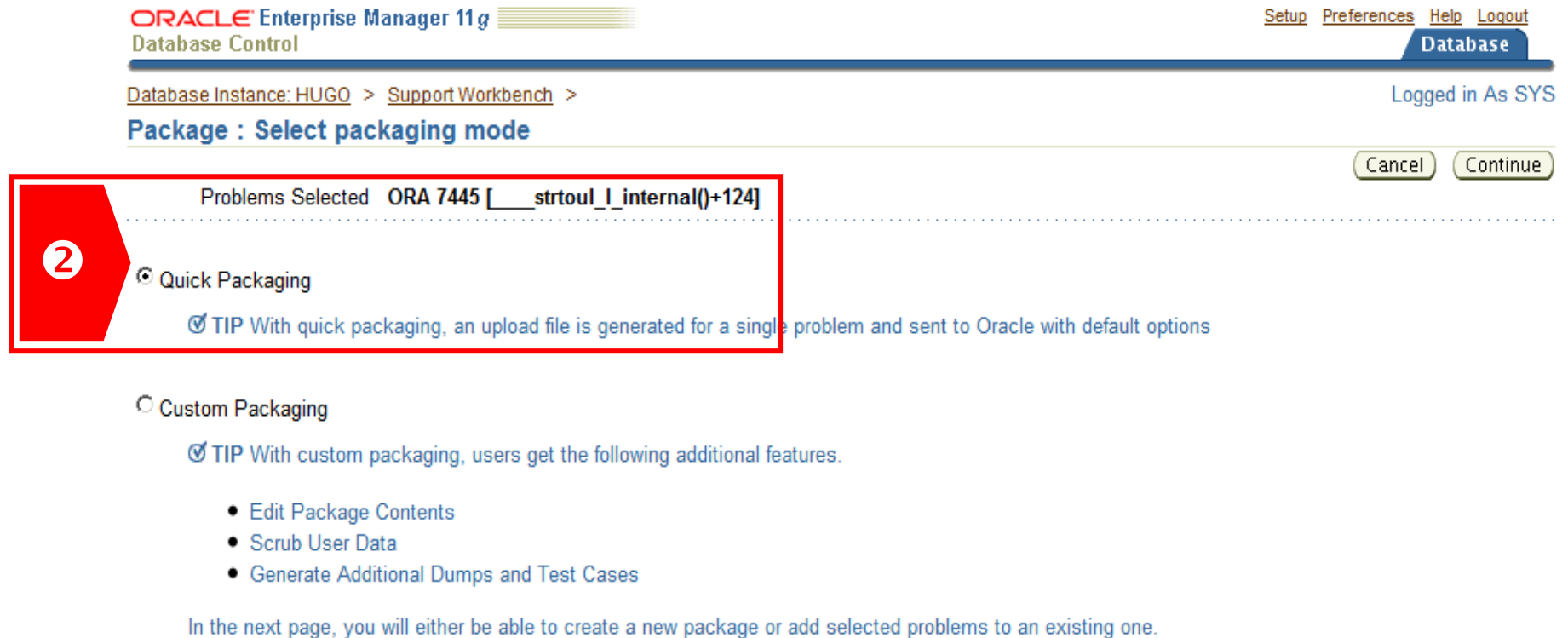
[▶ Performance and Critical Error](#)

[Problems \(1\)](#) [Checker Findings \(0\)](#) [Packages \(0\)](#)



# Automatic Diagnostic Repository

- Support Workbench – Package the problem



ORACLE® Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: HUGO > Support Workbench > Logged in As SYS

Package : Select packaging mode

Cancel Continue

Problems Selected ORA 7445 [\_\_strtol\_l\_internal()+124]

2

Quick Packaging

TIP With quick packaging, an upload file is generated for a single problem and sent to Oracle with default options

Custom Packaging

TIP With custom packaging, users get the following additional features.

- Edit Package Contents
- Scrub User Data
- Generate Additional Dumps and Test Cases

In the next page, you will either be able to create a new package or add selected problems to an existing one.

# Automatic Diagnostic Repository

- Support Workbench – Metalink credentials

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Create New Package View Contents View Manifest Schedule

**Quick Packaging: Create New Package**

Target HUGO Problems Selected ORA 7445 [\_\_strtol\_l\_internal()+124] Logged in As SYS

Cancel Step 1 of 4 Next

Use quick packaging to generate an upload file for a single problem and send it to Oracle with default options. If Oracle Configuration Manager is not set up, the upload file will still be created but it will not be sent to Oracle.

3

\* Package Name ORA7445\_\_INSTANCE\_HUGO\_MACHINE\_myADEBOX

Package Description Manually created ORA-7445

Send to Oracle Support  Yes  No

My Oracle Support Username mike.dietrich@oracle.com

My Oracle Support Password .....

Customer Support Identifier (CSI)

Country Germany

Create new Service Request (SR)  Yes  No

# Automatic Diagnostic Repository

- Support Workbench – Problem is packaged

ORACLE Enterprise Manager 11g Database Control Setup Preferences Help Logout

Create New Package **View Contents** View Manifest Schedule

---

**Quick Packaging: View Contents** Cancel Back Step 2 of 4 Next

Target HUGO Logged in As SYS  
 Problems Selected ORA 7445 [\_\_strtoul\_l\_internal()+124] Service Request Number (SR#)  
 Package Name ORA7445\_\_INSTANCE\_HUGO\_MACHINE\_myADEBOX Total Size (uncompressed) 2.9 MB

---

**Incidents to be Packaged**

| ID   | Type | Problem |                                                                                                         | Size (MB) | Timestamp                       |
|------|------|---------|---------------------------------------------------------------------------------------------------------|-----------|---------------------------------|
|      |      | ID      | Description                                                                                             |           |                                 |
| 8249 | Main | 1       | ORA-7445 [__strtoul_l_internal()+124] [SIGSEGV] [ADDR:0x0] [PC:0x8F71EC] [Address not mapped to object] | 2.9       | October 7, 2009 10:24:04 PM EDT |

4

# Automatic Diagnostic Repository

- Support Workbench – View contents

ORACLE Enterprise Manager 11g Database Control Setup Preferences Help Logout

Database

Create New Package View Contents **View Manifest** Schedule

**5** Quick Packaging: View Manifest Cancel Back Step 3 of 4 Next

Target HUGO Logged in As SYS

Problems Selected ORA 7445 [\_\_strtol I internal()+124] Service Request Number (SR#)

Package Name ORA7445 INSTANCE\_HUGO\_MACHINE\_myADEBOX Total Size (uncompressed) 2.9 MB

Path /u01/app/oracle/diag/rdbms/hugo/HUGO/incpkg/pkg\_1/seq\_1/manifest\_1\_1.txt

```

| | | [PC:0x8F71EC] [Address not |
| | | mapped to object] |
-----
Correlated incidents
-----
| Incident ID | Problem ID | Error Message | Incident time |
-----
Files
-----
| File name | Location | Size | File time |
-----
HUGO_ora_27599_i824	<ADR_HOME>/incident	2834325	2009-10-07
9.trc	/incdir_8249		21:24:05.000000
			-05:00
-----
HUGO_ora_27599_i824	<ADR_HOME>/incident	204426	2009-10-07
9.trm	/incdir_8249		21:24:05.000000
			-05:00
-----
HUGO_ora_27599.trc	<ADR_HOME>/trace	1873	2009-10-07
			21:24:05.000000
			-05:00
-----
HUGO_ora_27599.trm	<ADR_HOME>/trace	241	2009-10-07
			21:24:04.000000
			-05:00
-----

```

# Automatic Diagnostic Repository

- Support Workbench – Upload it to Oracle Support

The screenshot shows the Oracle Enterprise Manager 11g Database Control interface. At the top, there is a navigation bar with 'ORACLE Enterprise Manager 11g Database Control' on the left and 'Setup Preferences Help Logout' on the right. Below this is a breadcrumb trail: 'Create New Package' > 'View Contents' > 'View Manifest' > 'Schedule'. The 'Schedule' step is highlighted with a blue circle. Below the breadcrumb trail, there is a section titled 'Quick Packaging: Schedule'. This section contains several fields and buttons. On the right side, there are buttons for 'Cancel', 'Back', 'Step 4 of 4', and 'Submit'. The main content area displays the following information:

|                   |                                         |                              |        |
|-------------------|-----------------------------------------|------------------------------|--------|
| Target            | HUGO                                    | Logged in As                 | SYS    |
| Problems Selected | ORA 7445 [__strtol__internal()+124]     | Service Request Number (SR#) |        |
| Package Name      | ORA7445__INSTANCE_HUGO_MACHINE_myADEBOX | Total Size (uncompressed)    | 2.9 MB |

Below the table, there is a red box containing a white number '6' and the text: 'Larger upload files may take longer to generate and send to Oracle.' Below this text are two radio button options: 'Immediately' (selected) and 'Later'.

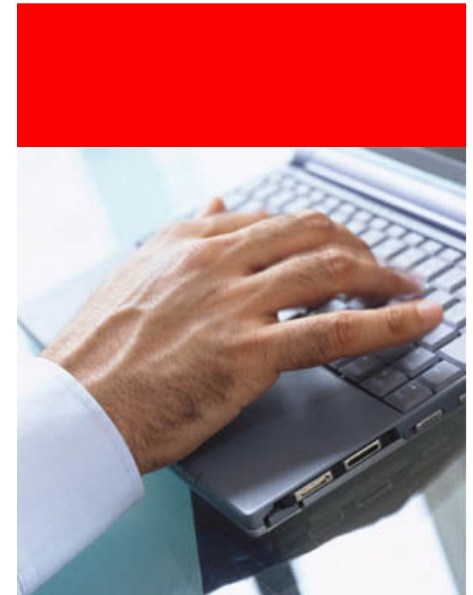
Please note:

Opening an SR on MyOracleSupport directly with Database/Grid Control requires the use of OCM (Oracle Configuration Manager)

# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

- Parameters
- Processes
- Miscellaneous
- Tools
- Automation
- LOB & SecureFiles
- Flashback
- ADR
- Compression





# Compression

- Index compression available since 8i
- Table compression available since 9.2
  - Designated for DWH
  - Direct path and bulk INSERTs, CREATE TABLE .. AS SELECT
  - Didn't work for INSERT/UPDATE/DELETE
- Before 11g syntax:

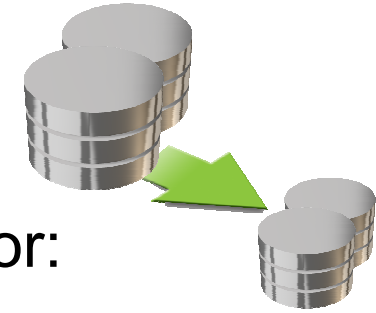
```
CREATE TABLE sales_history.. COMPRESS
```

- New 11g syntax:

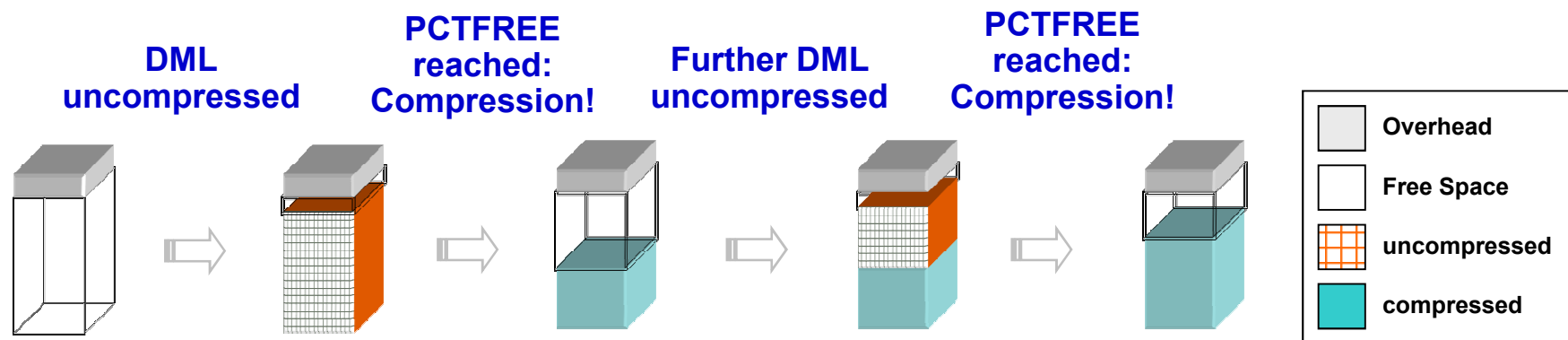
```
CREATE TABLE sales_history..  
COMPRESS BASIC
```

- *BASIC has superseded the clause FOR DIRECT\_LOAD OPERATIONS in 11.2*

# Advanced Compression



- Advanced Compression in Oracle 11g works for:
  - Structured and unstructured data
  - Backups
  - Data Pump exports
  - Data Guard gap resolution (11.1.0.7 => LGWR ASYNC)
- Reduces resource requirements and costs!!!
  - Storage
- Typically 2x to 4x compression possible

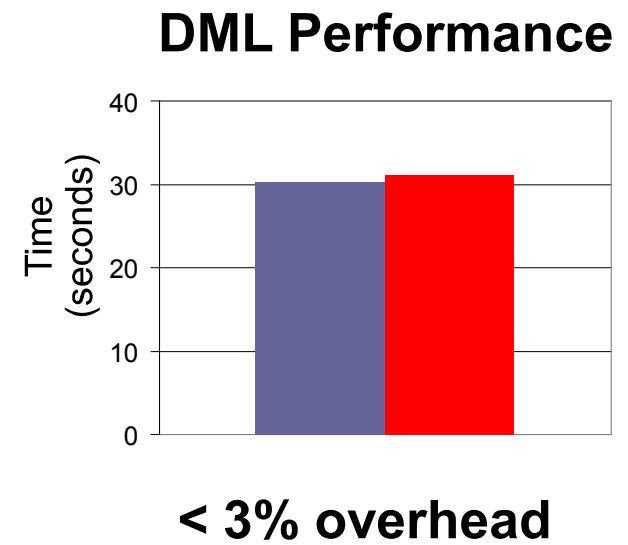
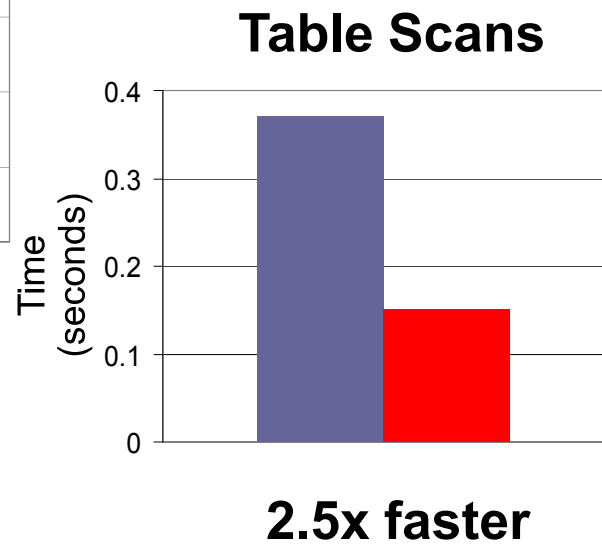
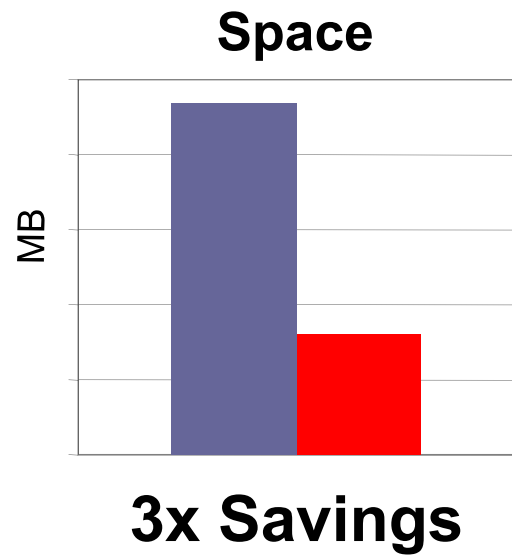






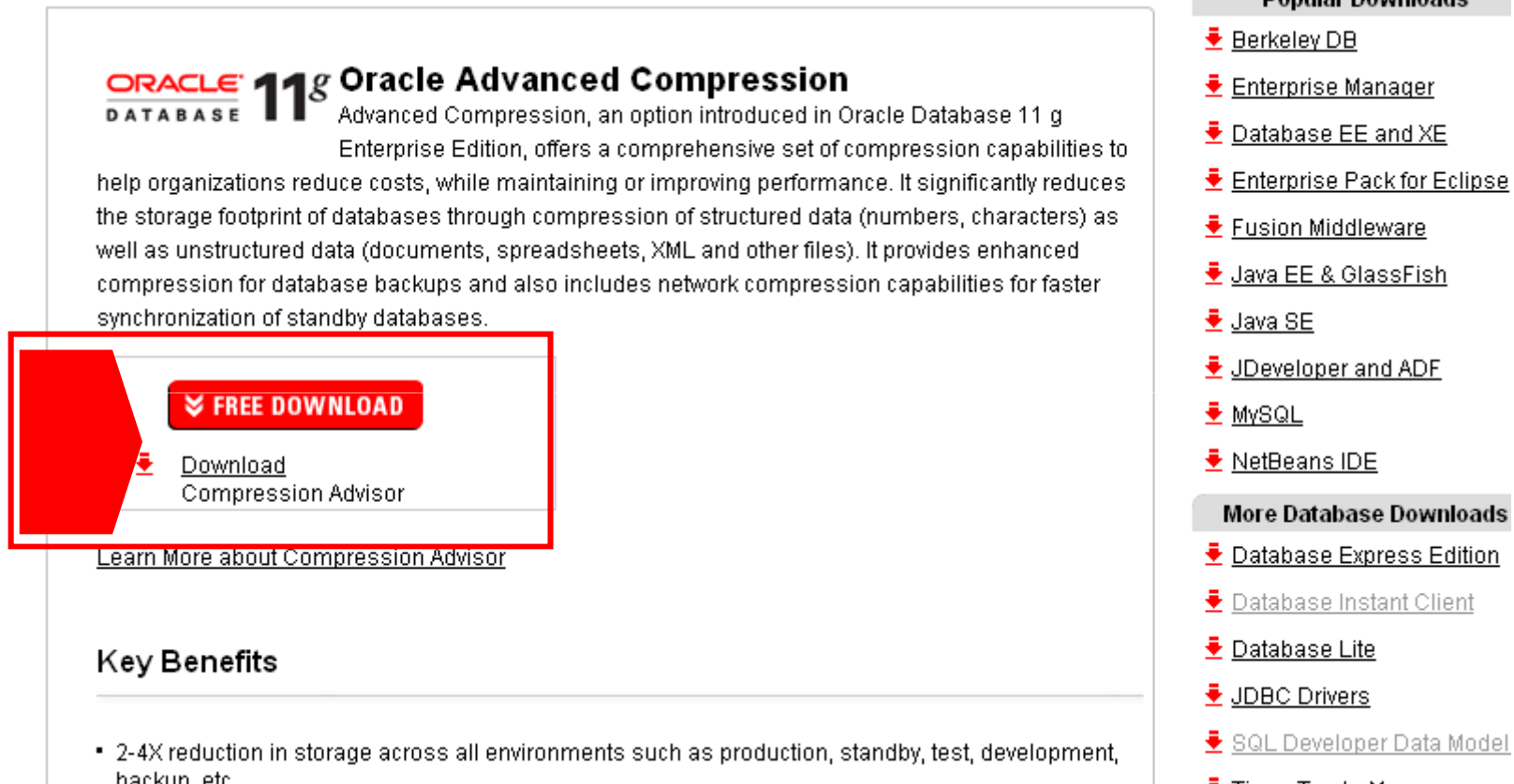
# 'Real World' Compression

10 largest ERP database tables



# Compression Advisor - Free Download

- <http://www.oracle.com/technetwork/database/options/compression/index.html>



**ORACLE** **11g** Oracle Advanced Compression  
DATABASE

Advanced Compression, an option introduced in Oracle Database 11 g Enterprise Edition, offers a comprehensive set of compression capabilities to help organizations reduce costs, while maintaining or improving performance. It significantly reduces the storage footprint of databases through compression of structured data (numbers, characters) as well as unstructured data (documents, spreadsheets, XML and other files). It provides enhanced compression for database backups and also includes network compression capabilities for faster synchronization of standby databases.

**FREE DOWNLOAD**

[Download Compression Advisor](#)

[Learn More about Compression Advisor](#)

**Key Benefits**

- 2-4X reduction in storage across all environments such as production, standby, test, development, backup etc

**Popular Downloads**

- [Berkeley DB](#)
- [Enterprise Manager](#)
- [Database EE and XE](#)
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- [Java SE](#)
- [JDeveloper and ADF](#)
- [MySQL](#)
- [NetBeans IDE](#)

**More Database Downloads**

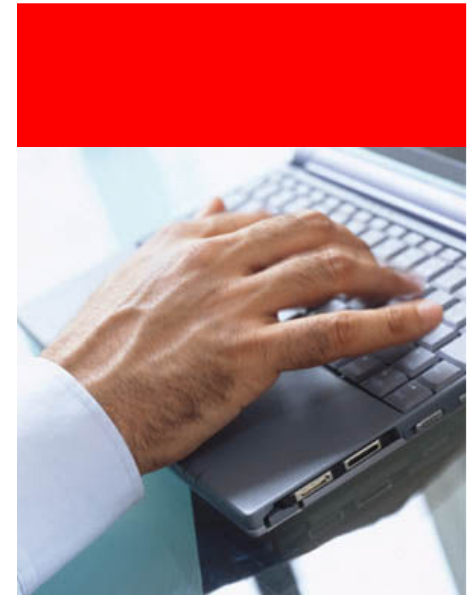
- [Database Express Edition](#)
- [Database Instant Client](#)
- [Database Lite](#)
- [JDBC Drivers](#)
- [SQL Developer Data Model](#)

- Since 11.2: `DBMS_COMPRESSION` package

# Agenda

- Preparation
- Installation
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- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

Object Statistics  
Monitoring  
SQL Tuning



# Tuning with the right tools ...



ORACLE Enterprise Manager 10g  
Database Control

Setup Preferences Help Logout  
Database

Logged in As SYS

Database Instance: TEST

Home Performance Administration Maintenance

Page Refreshed Aug 10, 2005 6:14:29 PM (Refresh) View Data Automatically (60 sec)

**General**

Status **Up** [Shutdown](#)

Up Since **Aug 10, 2005 5:00:57 PM CEST**

Instance Name **TEST**

Version **10.2.0.1.0**

Host [dhcp-munich-140-86-199-137...](#)

Listener [LISTENER\\_dhcp-munich-140-86...](#)

[View All Properties](#)

**Host CPU**

Load **0.19** Paging **0.00** Maximum CPU **1**

**Active Sessions**

Maximum CPU **1**

**SQL Response Time**

⚠ Baseline is empty.

[Reset Baseline](#)

**Diagnostic Summary**

ADDM Findings **0**

All Policy Violations **7**

Alert Log [Aug 2, 2005 8:27:26 PM](#)

**Space Summary**

Database Size (GB) **0.63**

Problem Tablespaces **0**

Segment Advisor Recommendations **0**

Space Violations **0**

Dump Area Used (%) **84**

**High Availability**

Instance Recovery Time (sec) **28**

Last Backup **n/a**

Usable Flash Recovery Area (%) **63.38**

Flashback Time [Aug 3, 2005 12:24:56 AM](#)

```
SQL> set autotrace traceonly explain

SQL> select *
2 from emp, dept
3 where emp.deptno = dept.deptno
4 and emp.job = 'CLERK';

Execution Plan
-----
Plan hash value: 877088642

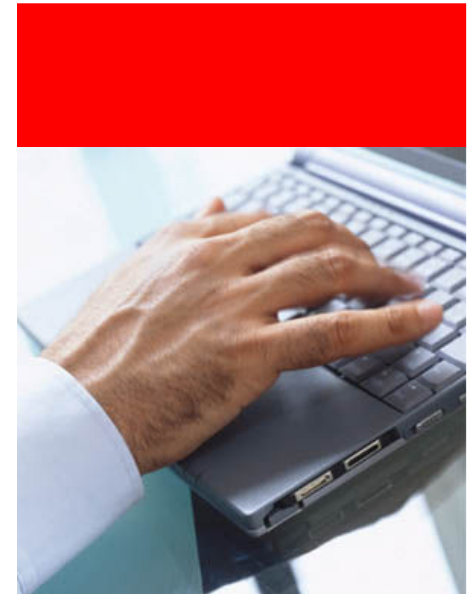
-----
Id	Operation	Name	Rows	Bytes	Cost	(CPU)
0	SELECT STATEMENT		4	468	7	(15)
* 1	HASH JOIN		4	468	7	(15)
* 2	TABLE ACCESS FULL	EMP	4	348	3	(0)
3	TABLE ACCESS FULL	DEPT	4	120	3	(0)
-----
Predicate Information (identified by operation id):
-----
 1 - access("EMP"."DEPTNO"="DEPT"."DEPTNO")
 2 - filter("EMP"."JOB"='CLERK')

Note
-----
- dynamic sampling used for this statement
```

# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

Object Statistics  
Monitoring  
SQL Tuning





# Optimizer Statistics Gathering

- DML Monitoring is switched **ON** for all tables
- INSERTS, UPDATES and DELETES will be monitored
- To exclude tables lock their statistics

- ```
SQL> exec DBMS_STATS.LOCK_TABLE_STATS('SH', 'TAB1');
```

- For statistics collection always use DBMS\_STATS, never use ANALYZE anymore

# Optimizer Statistics Gathering

- Default maintenance job

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: HUGO > Logged in As SYS

Scheduler Central

Page Refreshed Oct 7, 2009 8:13:40 PM EDT Refresh

### Schedulers

[Oracle Scheduler](#)  
User-defined jobs managed by the database server

[Jobs](#)  
User-defined jobs managed by Enterprise Manager

[Automated Maintenance Tasks](#)  
System-defined jobs run automatically for database maintenance

### Scheduler Tasks

View: All

Name	Schema	Type	Status	Scheduled
<a href="#">Optimizer Statistics Gathering</a>	SYS	Automated Maintenance Tasks	Scheduled	Oct 8, 2009 10:00:00 PM (UTC-04:00)
<a href="#">Segment Advisor</a>	SYS	Automated Maintenance Tasks	Scheduled	Oct 8, 2009 10:00:00 PM (UTC-04:00)
<a href="#">Automatic SQL Tuning</a>	SYS	Automated Maintenance Tasks	Scheduled	Oct 8, 2009 10:00:00 PM (UTC-04:00)
<a href="#">BSLN_MAINTAIN_STATS_JOB</a>	SYS	Oracle Scheduler	Scheduled	Oct 11, 2009 12:00:00 AM (UTC-04:00)
<a href="#">DRA_REEVALUATE_OPEN_FAILURES</a>	SYS	Oracle Scheduler	Scheduled	<a href="#">MAINTENANCE_WINDOW_GROUP</a>
<a href="#">MGMT_CONFIG_JOB</a>	ORACLE_OCM	Oracle Scheduler	Scheduled	<a href="#">MAINTENANCE_WINDOW_GROUP</a>
<a href="#">MGMT_STATS_CONFIG_JOB</a>	ORACLE_OCM	Oracle Scheduler	Scheduled	Nov 1, 2009 1:01:01 AM (UTC-04:00)
<a href="#">ORA\$AUTOTASK_CLEAN</a>	SYS	Oracle Scheduler	Scheduled	Oct 8, 2009 3:00:00 AM (UTC-04:00)
<a href="#">PURGE_LOG</a>	SYS	Oracle Scheduler	Scheduled	Oct 8, 2009 3:00:00 AM (UTC-04:00)
<a href="#">RLM\$EVTCLEANUP</a>	EXFSYS	Oracle Scheduler	Scheduled	Oct 7, 2009 8:31:39 PM (UTC-04:00)
<a href="#">RLM\$SCHDNEGACTION</a>	EXFSYS	Oracle Scheduler	Scheduled	Oct 8, 2009 2:49:15 AM (UTC+02:00)
<a href="#">RSE\$CLEAN_RECOVERABLE_SCRIPT</a>	SYS	Oracle Scheduler	Scheduled	Oct 8, 2009 12:00:00 AM (UTC-04:00)
<a href="#">SM\$CLEAN_AUTO_SPLIT_MERGE</a>	SYS	Oracle Scheduler	Scheduled	Oct 8, 2009 12:00:00 AM (UTC-04:00)

# Optimizer Statistics Gathering

- Configure maintenance schedule

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: HUGO > Automated Maintenance Tasks > Logged in As SYS

Show SQL Revert Apply

### Automated Maintenance Tasks Configuration

Global Status  Enabled  Disabled

#### Task Settings

Optimizer Statistics Gathering  Enabled  Disabled [Configure](#)

Segment Advisor  Enabled  Disabled

Automatic SQL Tuning  Enabled  Disabled [Configure](#)

#### Maintenance Window Group Assignment

[Edit Window Group](#)

Window	Optimizer Statistics Gathering	Segment Advisor	Automatic SQL Tuning
	Select All   Select None	Select All   Select None	Select All   Select None
<a href="#">WEDNESDAY_WINDOW</a>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<a href="#">THURSDAY_WINDOW</a>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<a href="#">FRIDAY_WINDOW</a>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<a href="#">SATURDAY_WINDOW</a>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<a href="#">SUNDAY_WINDOW</a>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<a href="#">MONDAY_WINDOW</a>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<a href="#">TUESDAY_WINDOW</a>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



# Optimizer Statistics Gathering

- Configure settings and parameters

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: HUGO > Manage Optimizer Statistics > Logged in As SYS

### Global Statistics Gathering Options

Database HUGO Cancel Show SQL Apply

#### Statistics History

Retention Period (days)   
The number of days for which optimizer statistics history will be retained.

#### Gather Optimizer Statistics Default Options

Oracle recommends that you use the Gather Auto choice for the Gather Objects options when you use the Gather Optimizer Statistics process for Database and Schemas. If you choose not to use Gather Auto, the defaults for the other options are set here. Changing the options will impact the automated Optimizer Statistics Gathering task and user defined jobs. Reset Defaults

Estimate Percentage  Auto (Oracle recommended)  100%  Percentage

Degree of Parallelism  Table default  Auto  System default  Degree

Granularity

Cursor Invalidation  Auto (Oracle recommended)  Immediate  None

Cascade  Auto (Oracle recommended)  True  False

Target Object Class (Auto Job)  Auto (Oracle recommended)  All  Oracle

Stale Percentage

Incremental  True  False

Publish  True  False

Histograms



# GATHER\_STATS\_JOB in 11g

- Starting the job manually:

- Start:

```
SQL> exec DBMS_AUTO_TASK_IMMEDIATE.GATHER_OPTIMIZER_STATS
```

- Monitoring progress:

```
SELECT job_name, state  
FROM dba_scheduler_jobs  
WHERE program_name='GATHER_STATS_PROG';
```

# GATHER\_STATS\_JOB

Table-Monitoring ON

**SMON**

Every 3hrs

manually:

```
SQL> exec DBMS_STATS.
      FLUSH_DATABASE_MONITORING_INFO();
```

No# of DMLs in: DBA/USER\_TAB\_MODIFICATIONS:

TABLE_NAME	PARTITION_NAME	SUBPARTITION_NAME	INSERTS	UPDATES	DELETES	TIMESTAM
EMP			0	42	0	12.08.05
EMPTTEST			14	0	0	12.08.05

1

Tables without statistics:  
⇒ **EMPTY**

2

Table changed >10%:  
⇒ **STALE**

Automatic Job – once a day:

Optimizer Statistics Gathering	SYS	Automated Maintenance Tasks
--------------------------------	-----	-----------------------------

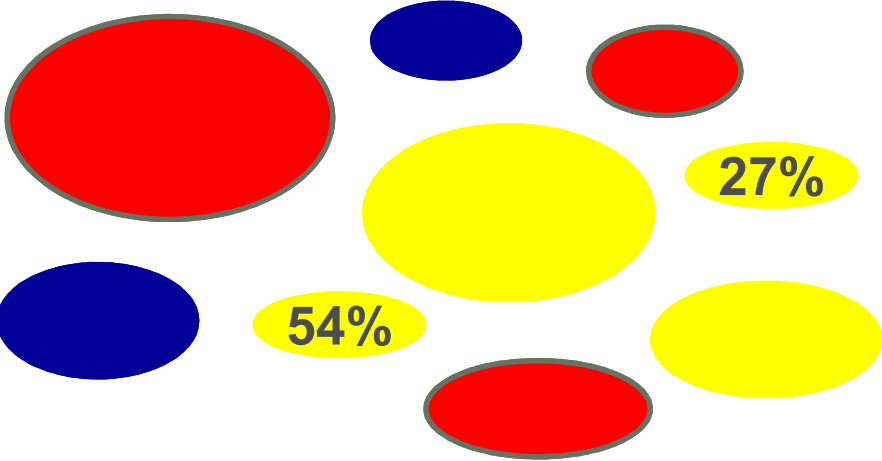
manually:

```
SQL> exec DBMS_STATS.GATHER_SCHEMA_STATS('SCOTT');
```



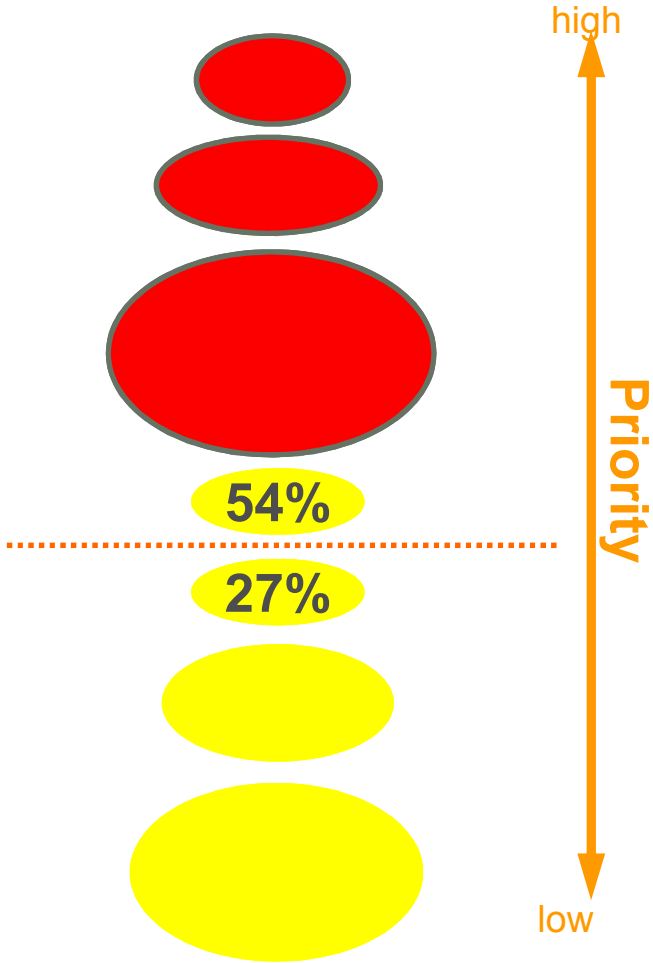
# GATHER\_STATS\_JOB

Objects:



	Statistics: EMPTY
	Statistics: STALE
	Statistics: OK

Analysis order:





# Optimizer without statistics

- What happens if there are no object statistics?
  - The optimizer (CBO) will estimate (at parsing time) the statistics for tables and indexes
  - Prerequisite:  
**OPTIMIZER\_DYNAMIC\_SAMPLING=2** [Default since 10g]
    - Level 0 - Dynamic Sampling off (~OLTP)
    - Level 2 – Optimizer checks first 64 blocks of object
      - For descriptions of all levels:  
Performance Tuning Guide



# Adaptive Cursor Sharing

- Adaptive cursor sharing introduced in 11g
- Common problem:
  - When bind variables are used, the initial plan can be suboptimal due to the fact that
    - Future values used in future executions share the initial plan
    - The first set of binds used may not be representative of the majority of executions
  - For an example and more explanation see [Note:836256.1](#)



# Extended Optimizer Statistics

- Business problem - Correlated Columns
  - Real data often shows correlations between various attributes
    - E.g. job title influences salary, car model influences make, seasons affect the amount of sold goods (e.g. snow shoes in winter)
  - Optimizer has to estimate the correct cardinality
    - *“Does an additional filter reduce the result set or not?”*
- Solution
  - Extended Optimizer Statistics provides a mechanism to collect statistics on a group of columns
  - Full integration into existing statistics framework
    - Automatically maintained with column statistics
    - Instantaneous and transparent benefit for any migrated application

Improved Cardinality leads to Improved Plans

# Example

## Single column

```
SELECT .....FROM..  
WHERE model = '530xi'
```

BMW	530xi	RED
BMW	530xi	BLACK
BMW	530xi	SILVER

Make	Model	Color
BMW	530xi	RED
BMW	530xi	BLACK
BMW	530xi	SILVER
PORSCHE	911	RED
MERC	SLK	BLACK
MERC	C320	SLIVER

- Three records selected.
  - Single column statistics are accurate

```
-----  
| Id | Operation | Name | Starts | E-Rows | A-Rows |  
-----  
| * 1 | TABLE ACCESS FULL | CARS | 1 | 3 | 3 |  
-----
```



# Example

## Non-correlated columns

```
SELECT .....FROM..  
WHERE model = '530xi'  
AND color = 'RED'
```

BMW	530xi	RED
-----	-------	-----

Make	Model	Color
BMW	530xi	RED
BMW	530xi	BLACK
BMW	530xi	SILVER
PORSCHE	911	RED
MERC	SLK	BLACK
MERC	C320	SLIVER

- One record selected
  - No correlated columns
  - Additional predicate reduces result set
  - Single column statistics are sufficient

```
-----  
| Id  | Operation                | Name          | Starts | E-Rows | A-Rows |  
-----  
|* 1  | INDEX RANGE SCAN| C_MC          | 1      | 1      | 1      |  
-----
```

# Example

## Correlated columns - no extended statistics

```
SELECT .....FROM..  
WHERE model = '530xi'  
AND make = 'BMW';
```

BMW	530xi	RED
BMW	530xi	BLACK
BMW	530xi	SILVER

Make	Model	Color
BMW	530xi	RED
BMW	530xi	BLACK
BMW	530xi	SILVER
PORSCHE	911	RED
MERC	SLK	BLACK
MERC	C320	SLIVER

- Three records selected.
  - Correlated columns
  - Additional predicate has no effect
  - Single column statistics are **NOT** sufficient

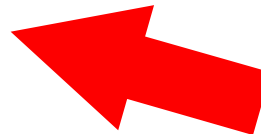
```
-----  
| Id | Operation | Name | Starts | E-Rows | A-Rows |  
-----  
|* 1 | INDEX RANGE SCAN| C_MC | 1 | 1 | 3 |
```

# Example

## Correlated columns - extended statistics

```
SELECT .....FROM..  
WHERE model = '530xi'  
AND make = 'BMW';
```

BMW	530xi	RED
BMW	530xi	BLACK
BMW	530xi	SILVER



Make	Model	Color
BMW	530xi	RED
BMW	530xi	BLACK
BMW	530xi	SILVER
PORSCHE	911	RED
MERC	SLK	BLACK
MERC	C320	SLIVER

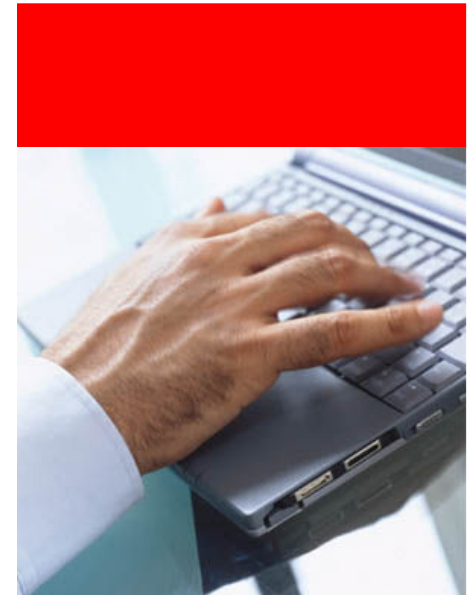
- Three records selected.
  - Multi-column statistics **solve the problem**

```
-----  
| Id | Operation | Name | Starts | E-Rows | A-Rows |  
-----  
|* 1 | TABLE ACCESS FULL | CARS | 1 | 3 | 3 |  
-----
```

# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

Object Statistics  
**Monitoring**  
SQL Tuning

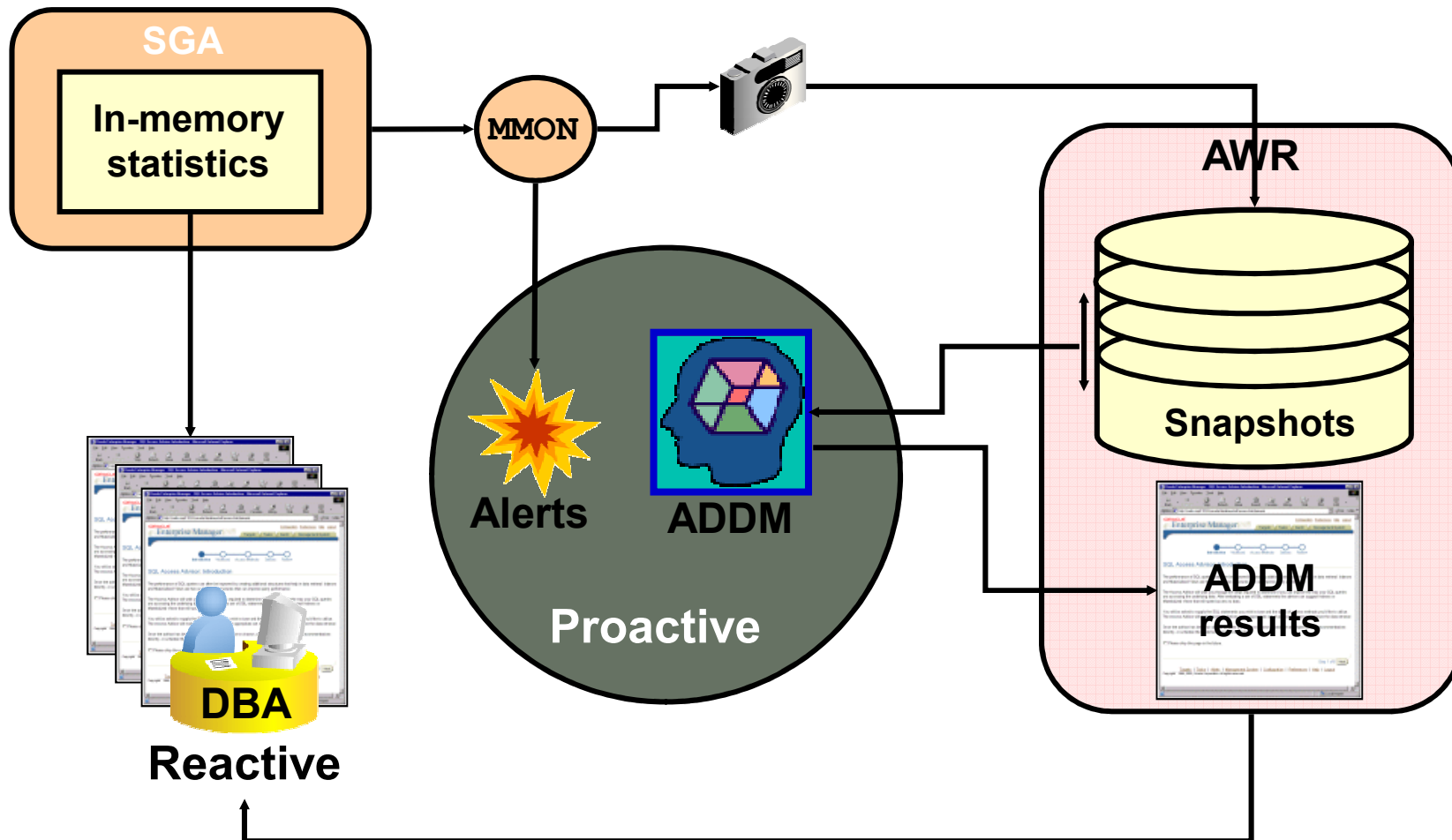




# Requirements for Diagnostics & Tuning

- `STATISTICS_LEVEL=TYPICAL` [default]
  - Alternative Settings:
    - BASIC
    - ALL
  - `TYPICAL` (recommended setting) will enable:
    - Automatic SGA Tuning
    - Automatic Statistics Collection
    - Active Session History
    - DML Monitoring

# Diagnostics & Tuning Concept since 10g





# Tuning Basics since 10g

- **AWR** (Automatic Workload Repository)
  - Statistics repository in SYSAUX tablespace for AWR snapshots
  - Self managing
  - Data stored in the AWR is collected by MMON
    - Every 60 minutes and kept for 8 days [default]
    - Query AWR contents: DBA\_HIST-Views
  - The automatic removal of certain snapshots can be suppressed for later analysis by defining them as a baseline
  - Snapshots can be created on demand at every time:
    - `EXEC dbms_workload_repository.create_snapshot();`

# Tuning Basics since 10g

- **AWR** – Most important reports and scripts:

- AWR size, trend, analysis and SYSAUX usage:

- `SQL> @?/rdbms/admin/awrinfo.sql`

```
(2) Size estimates for AWR snapshots
*****
| Estimates based on 60 mins snapshot INTERVAL:
|   AWR size/day                35.0 MB (1,492 K/snap * 24 snaps/day)
|   AWR size/wk                 244.8 MB (size_per_day * 7) per instance
```

- AWR Reports:

- SI: `SQL> @?/rdbms/admin/awrrpt.sql`
    - RAC: `SQL> @?/rdbms/admin/awrrpti.sql`
    - Evaluate single statements using the SQLID:  
`SQL> @?/rdbms/admin/awrsqrpt.sql`
    - Global AWR Diff report: `SQL> @?/rdbms/admin/awrgrrpt.sql`

- AWR Extract and Load:

- Extract: `SQL> @?/rdbms/admin/awrextr.sql`  
(will generate a Data Pump dump file)
    - Load: `SQL> @?/rdbms/admin/awrload.sql`



# Tuning Basics since 10g

- AWR
- Recommendation: Change retention:

ORACLE Enterprise Manager 11g  
Database Control

Database Instance: HUGO

Home Performance Availability **Server**

**Storage**  
Control Files  
Tablespaces  
Temporary Tablespace Groups  
Datafiles  
Rollback Segments  
Redo Log Groups  
Archive Logs  
Disk Groups  
Migrate to ASM  
Make Tablespace Locally Managed

Database Instance: HUGO >  
**Automatic Workload Repository**

The Automatic Workload Repository is used for storing database statistics that are used for performance tuning.

**General**

Snapshot Retention (days) 8  
Snapshot Interval (minutes) 60  
Collection Level TYPICAL  
Next Snapshot Capture Time Nov 19, 2010 5:00:49 PM

**Manage Snapshots and Baselines**

Run AWR Report Run Compare Periods Report

Snapshots 2  
Baselines 1  
Latest Snapshot Time Nov 19, 2010 4:00:49 PM  
Earliest Snapshot Time Nov 19, 2010 3:03:57 PM

# Tuning Basics since 10g

- AWR
  - Typical production database values
    - Interval: 30-60 minutes ... retention: 20-31 days

ORACLE Enterprise Manager 11g  
Database Control  
Database Instance: HUGO > Automatic Workload Repository >  
[Edit Settings](#)

1 Snapshot Retention  Use Time-Based Retention  
Retention Period (Days)

Retain Forever

2 Snapshot Collection  System Snapshot Interval  
Interval

Turn off Collection

Collection Level TYPICAL

- 10 Minutes
- 15 Minutes
- 20 Minutes
- 30 Minutes
- 1 Hour
- 2 Hours

```
begin DBMS_WORKLOAD_REPOSITORY.MODIFY_SNAPSHOT_SETTINGS(44640,60); end;
```

# Tuning Basics since 10g



- **ASH** (Active Session History)
  - ASH is key for database diagnosis
  - Circular buffer inside the SGA
  - Fixed size:  $2\text{MB} \times \#\text{CPUs}$  (max. 5% of the SGA or  $<30\text{MB}$ )
  - Contains information about active sessions
  - ~10% of the information gets written to the AWR by `MMNL`
  - View: `V$ACTIVE_SESSION_HISTORY`
  - Further info: [Note:243132.1](#)
  - Report:
    - SI: `SQL> @?/rdbms/admin/ashrpt.sql`
    - RAC: `SQL> @?/rdbms/admin/ashrpti.sql`

# Tuning Basics since 10g




- Define ASH reporting interval


Run ADDM Now    Run ASH Report → Database Instance: V11G >

### Run ASH Report

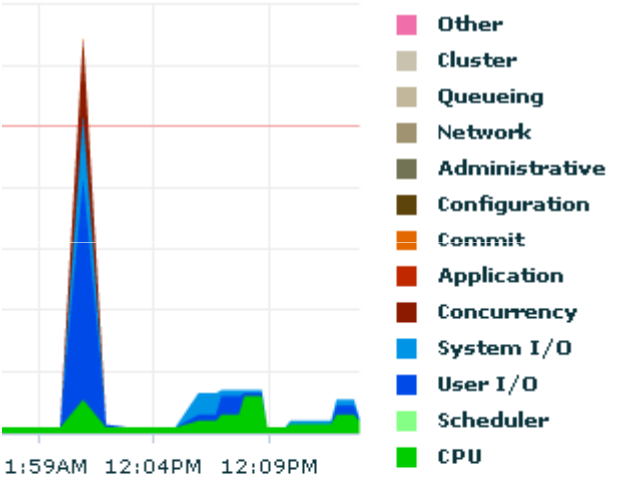
Specify the time period for the report.

Start Date:    
(Example: 12/15/03)

Start Time:    AM  PM

End Date:    
(Example: 12/15/03)

End Time:    AM  PM



**Top Activity**

# Tuning Basics since 10g



## • ASH Report For V11G/v11g

DB Name	DB Id	Instance	Inst num	Release	RAC	Host
V11G	2840163171	v11g	1	11.1.0.7.0	NO	VMTKEXP1


CPUs	SGA Size	Buffer Cache	Shared Pool	ASH Buffer Size
1	511M (100%)	156M (30.5%)	168M (32.9%)	2.0M (0.4%)

	Sample Time	Data Source
Analysis Begin Time:	13-Mar-09 11:58:13	V\$ACTIVE_SESSION_HISTORY
Analysis End Time:	13-Mar-09 12:02:13	V\$ACTIVE_SESSION_HISTORY
Elapsed Time:	4.0 (mins)	
Sample Count:	91	
Average Active Sessions:	0.38	
Avg. Active Session per CPU:	0.38	
Report Target:	None specified	

## ASH Report

- Top Events
- Load Profile
- Top SQL
- Top PL/SQL
- Top Java
- Top Sessions
- Top Objects/Files/Latches
- Activity Over Time





# Tuning Basics - STATSPACK

- **STATSPACK** is still available in 10g and 11g
  - Use either AWR/ASH (Diagnostic Pack license required) or STATSPACK
  - See [Note:394937.1](#) STATSPACK Guide



# Tuning Basics since 10g


- **ADDM** (Automatic Database Diagnostic Monitor)
  - Knowledge base for performance diagnostics
  - Analyze performance snapshots and give recommendations
  - Runs proactively every hour (upon AWR snapshot) or can be invoked manually:
    - SI: `SQL> @?/rdbms/admin/addmrpt.sql`
    - RAC: `SQL> @?/rdbms/admin/addmrpti.sql`

# Tuning Basics since 10g

- ADDM findings – example:



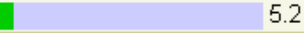
## Performance Finding Details

Database Time (minutes)	13.7	Period Start Time	May 8, 2006 5:19:35 PM CEST	Period Duration (minutes)	70.5
Task Owner	SYS	Task Name	TASK_1326	Average Active Sessions	0.2

Finding **Individual database segments responsible for significant user I/O wait were found.**  
 Impact (minutes) **1.6**  
 Impact (%)  11.5

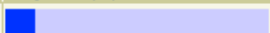
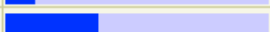
## Recommendations

[Show All Details](#) | [Hide All Details](#)

Details	Category	Benefit (%)
▼ Hide	Segment Tuning	 6.3
Action	<b>Investigate application logic involving I/O on TABLE "TPCC.STOCK" with object id 53361.</b> Database Object <a href="#">TPCC.STOCK</a>	
Action	<b>Run "Segment Advisor" on TABLE "TPCC.STOCK" with object id 53361.</b> <input type="button" value="Run Segment Advisor"/> 	
Rationale	<b>The I/O usage statistics for the object are: 6 full object scans, 51273 physical reads, 1 physical writes and 0 direct reads.</b>	
▶ Show	Segment Tuning	 5.2

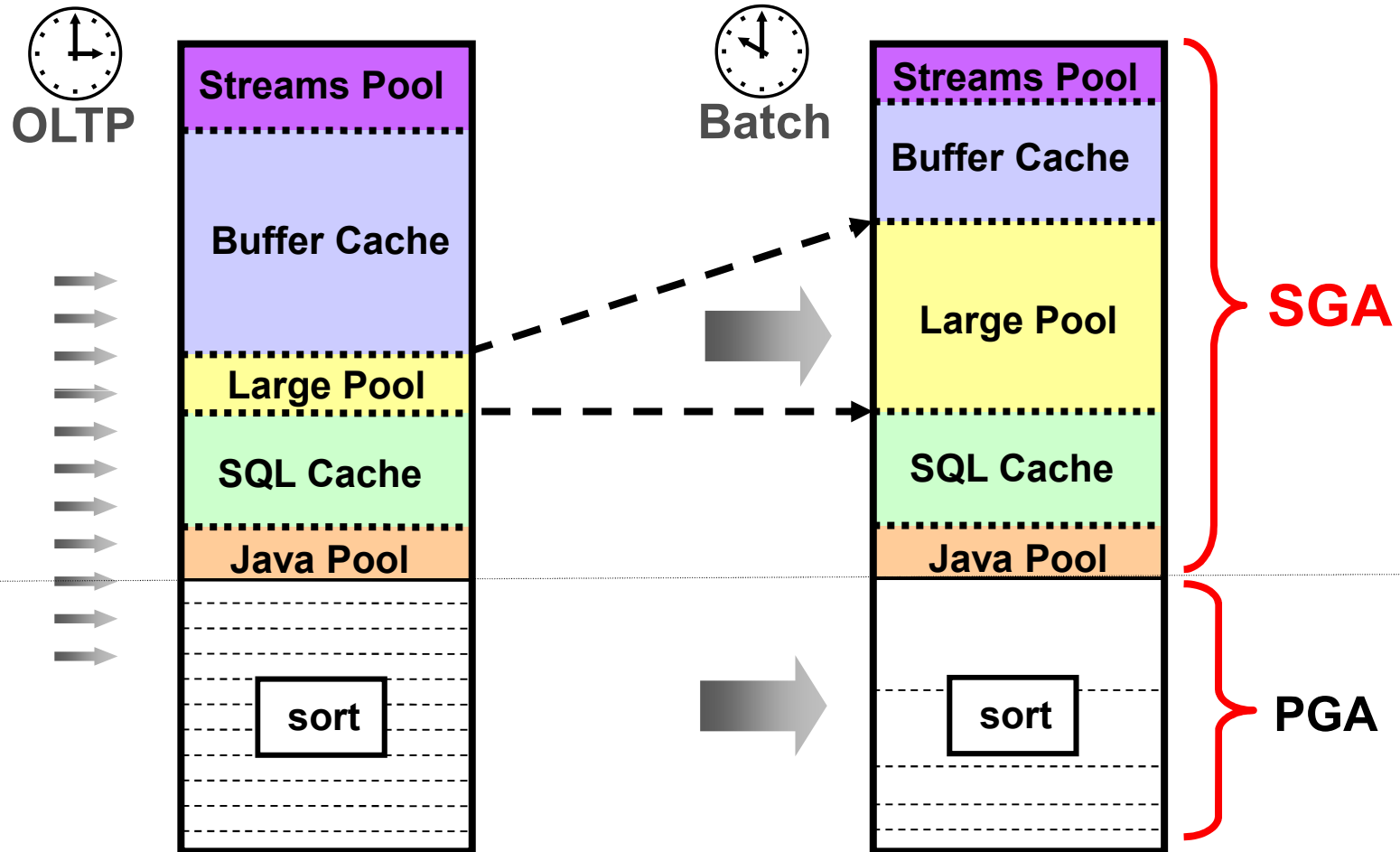
## Findings Path

[Expand All](#) | [Collapse All](#)

Findings	Impact (%)	Additional Information
▼ Individual database segments responsible for significant user I/O wait were found.	 11.5	
Wait class "User I/O" was consuming significant database time.	 35.6	

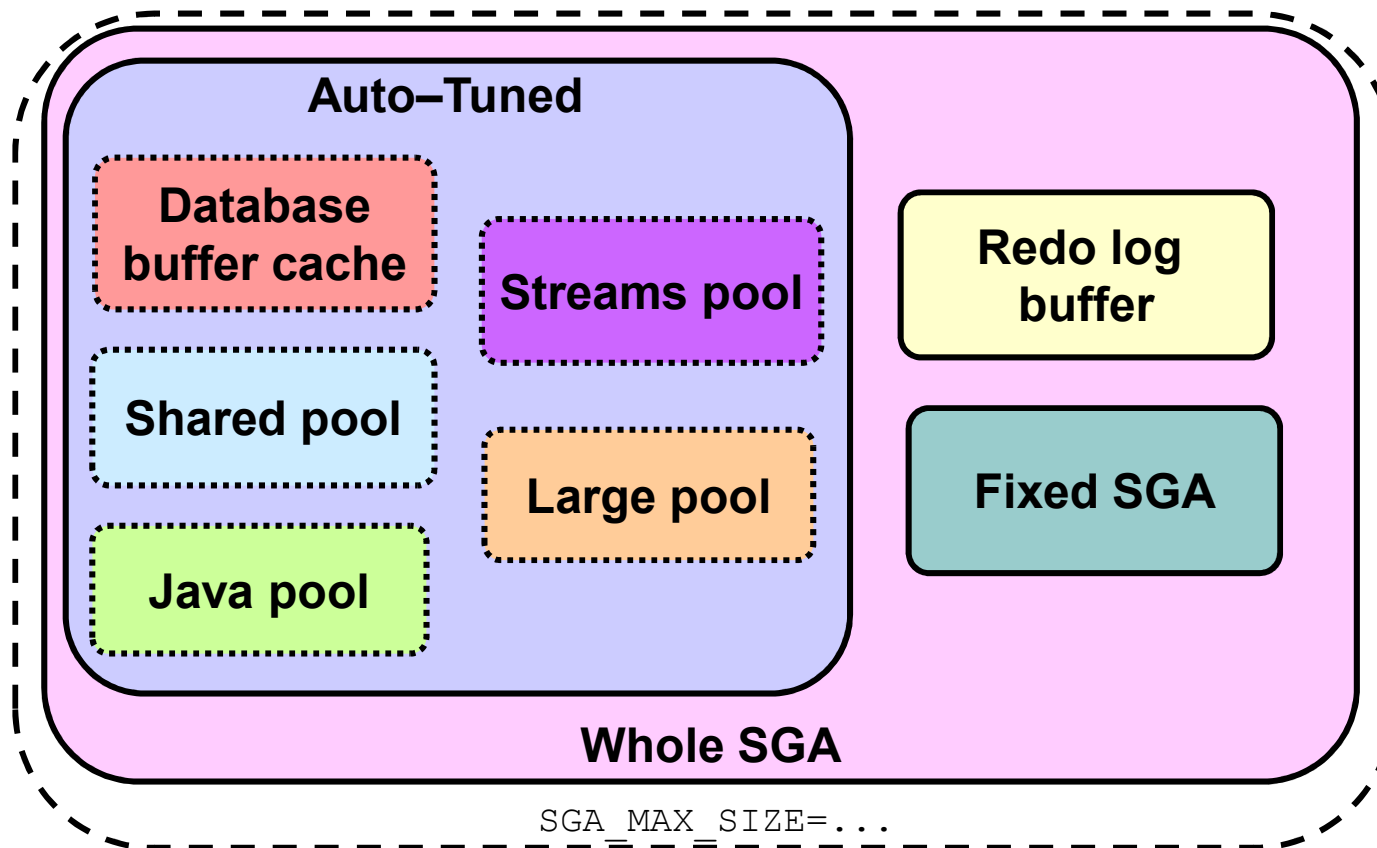


# Memory Tuning - SGA & PGA



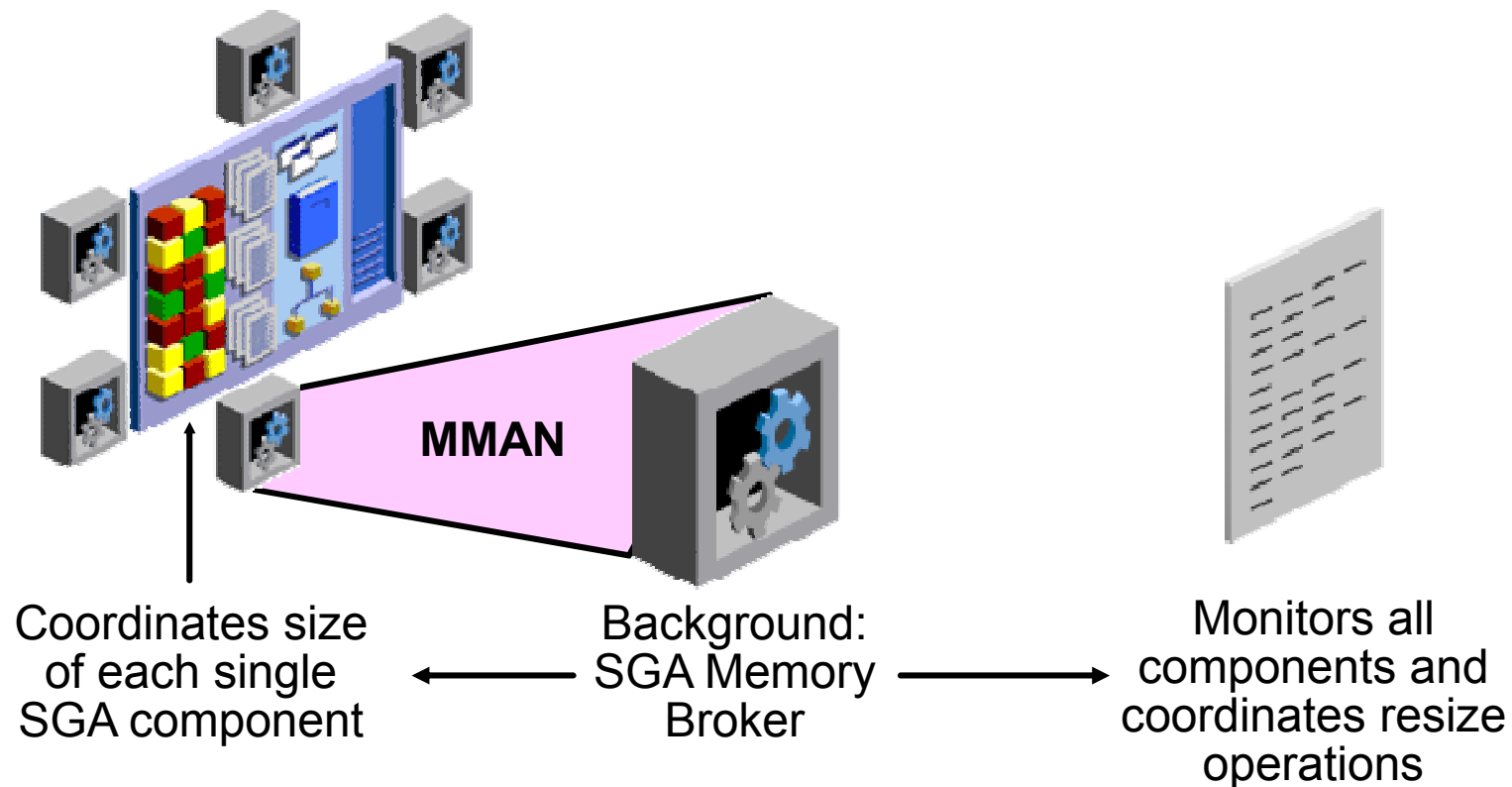
# Automatic Shared Memory Management

- To enable ASMM `SGA_TARGET` (or `MEMORY_TARGET`) and `STATISTICS_LEVEL=TYPICAL` must be set



# Automatic Shared Memory Management

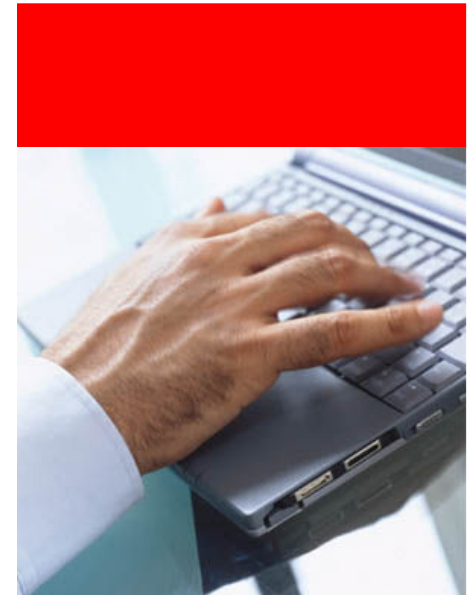
- Statistics collection driven by MMAN in the background



# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

Object Statistics  
Monitoring  
SQL Tuning





# SQL Real-Time Monitoring

- Dedicated statistics collected for a **single execution** of a SQL statement when its **execution becomes high-load**
  - Target:
    - Parallel queries, parallel DML or parallel DDL
    - Execution that exceed **5 sec of CPU** or **I/O time**
  - Global SQL level statistics are collected: `V$SQL_MONITOR`
  - Plan level statistics are collected (#rows, memory, temp space, start/end date): `V$SQL_PLAN_MONITOR`
  - Statistics are updated quasi real-time while the query executes
  - Statistics for completed executions are retained for at least 5 minutes
  - Feature switched on by default
    - [Note:1229904.1](#): Real-Time SQL Monitoring in 11g

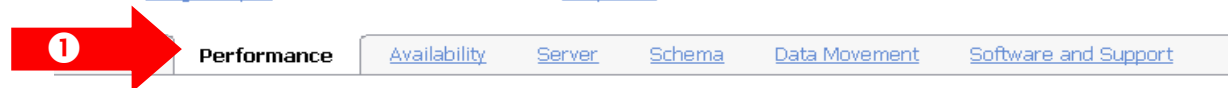
# SQL Real-Time Monitoring Report

- `DBMS_SQLTUNE.REPORT_SQL_MONITOR()` allows to display monitoring information
  - Format: xml, text and html
  - Join with ASH data
- SQL Real-time monitoring with GUI integrated since 11.1.0.7

## Additional Monitoring Links

Top Sessions and Top SQL data from ASH can be found on the Top Activity page.

- [Top Activity](#)
- [Top Consumers](#)
- [Duplicate SQL](#)
- [Blocking Sessions](#)
- [Hang Analysis](#)
- [Instance Locks](#)
- [Instance Activity](#)
- [Search Sessions](#)
- [Search SQL](#)
- [Snapshots](#)
- [AWR Baselines](#)
- [SQL Tuning Sets](#)
- [SQL Performance Analyzer](#)
- [SQL Monitoring](#)



ORACLE Enterprise Manager 11g  
Database Control

[Setup](#) [Preferences](#) [Help](#) [Logout](#)

Database

Database Instance: V11G >  
Monitored SQL Executions

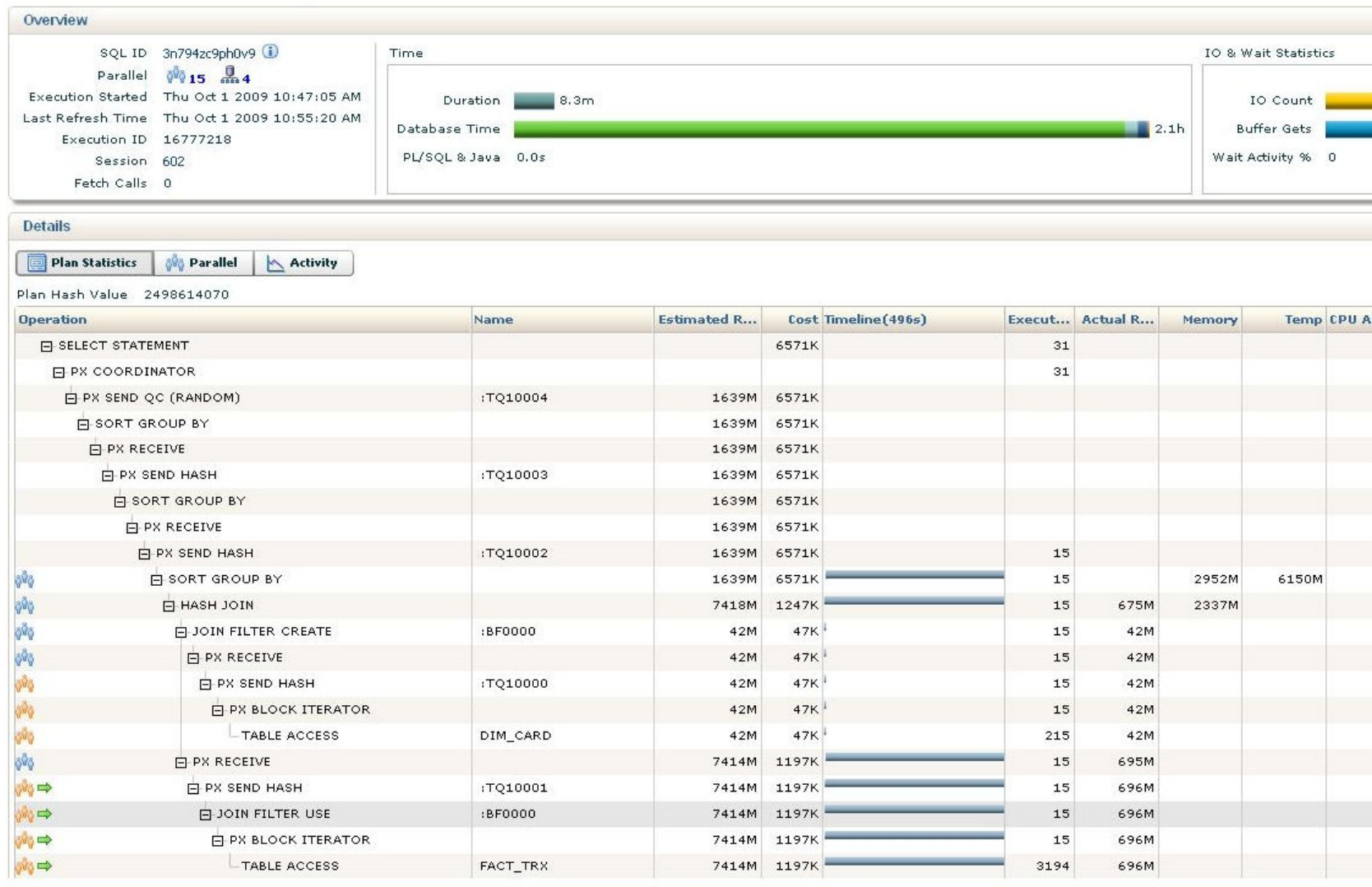
Logged in As SYS

Refresh 5 seconds Stop Refresh

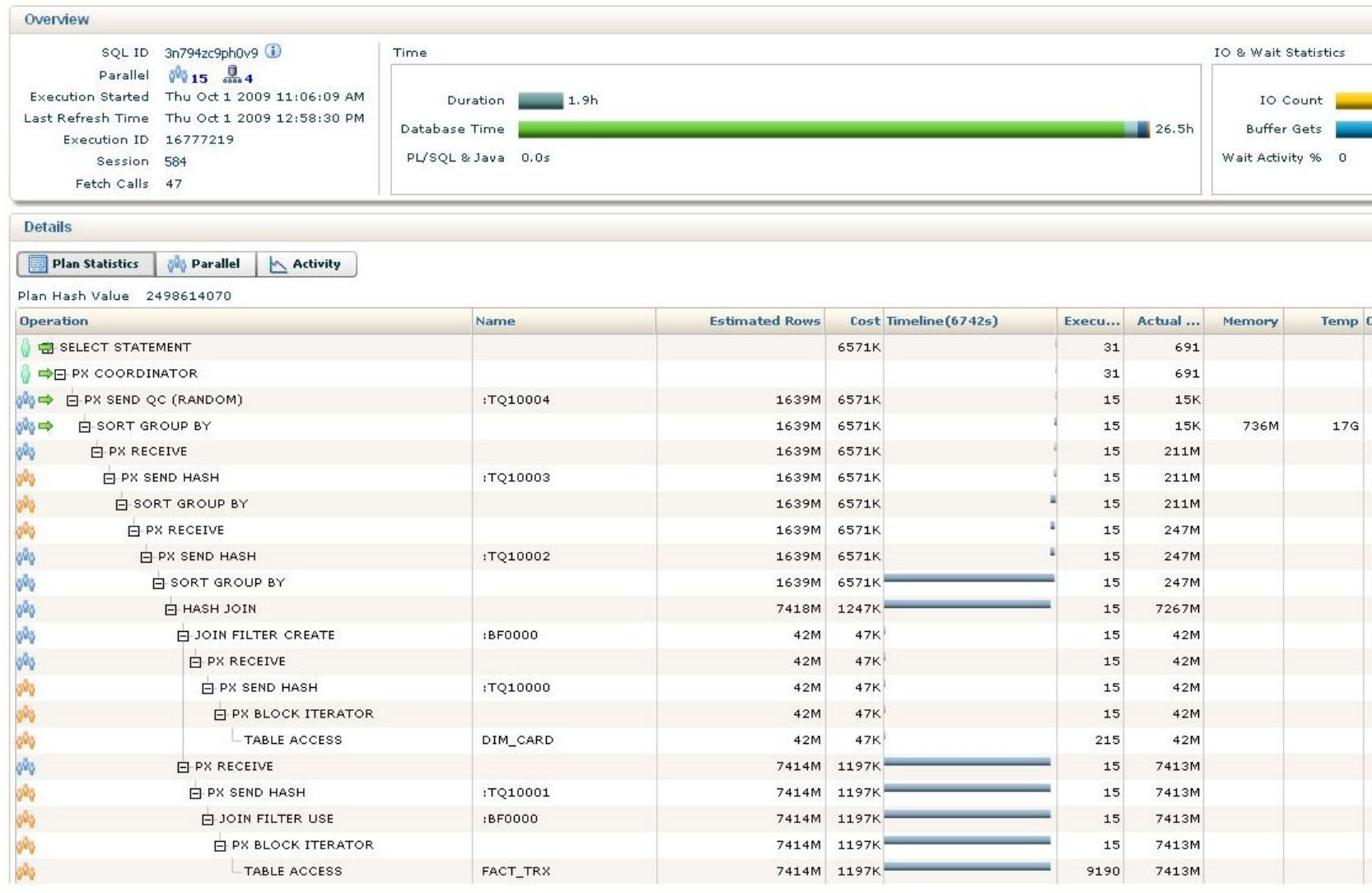
Status	Duration	SQL ID	Session	Parallel	Database Time	IO	Start	Ended	SQL Text
	8.0s	40yqk9cdfgqk	88		8.7s	2155	11:48:06 AM	11:48:14 AM	select /*+ use_nl(c)...

ORACLE

# SQL Real-Time Monitoring – Example 1



# SQL Real-Time Monitoring – Example 2







# Manual SQL Tuning Challenges

- **Complex** - requires expertise in several domains
  - SQL optimization: adjust the execution plan
  - Access design: provide fast data access
  - SQL design: use appropriate SQL constructs
- **Time consuming**
  - Each SQL statement is unique
  - Potentially large number of statements to tune
- **Never ending task**
  - SQL workload always evolving
  - Plan regressions can happen



# SQL Tuning Automation in 11g

- Fully automatic SQL Tuning task
  - Runs automatically in the Maintenance Window
  - Identifies, ranks and tunes candidate SQL
  - Leverages SQL Tuning Advisor
- Candidate SQL automatically chosen
  - Excluded: parallel queries, DML/DDDL, recursive, ad-hoc (infrequent)
- Tests and (optionally) implements SQL profiles
  - Only implements significantly improved plans (3x)
  - Time budgeted to avoid run-away plans
- DBA can still invoke the advisor manually for reactive tuning, like in 10g

# SQL Tuning Automation in 11g

- Configure Automatic SQL Tuning

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: HUGO > Automated Maintenance Tasks > Logged in As SYS

Show SQL Revert Apply

### Automated Maintenance Tasks Configuration

Global Status  Enabled  Disabled

#### Task Settings

Optimizer Statistics Gathering  Enabled  Disabled [Configure](#)

Segment Advisor  Enabled  Disabled

**Automatic SQL Tuning  Enabled  Disabled [Configure](#)**

#### Maintenance Window Group Assignment

[Edit Window Group](#)

Window	Optimizer Statistics Gathering		Segment Advisor		Automatic SQL Tuning	
	Select All	Select None	Select All	Select None	Select All	Select None
WEDNESDAY_WINDOW		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
THURSDAY_WINDOW		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
FRIDAY_WINDOW		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
SATURDAY_WINDOW		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
SUNDAY_WINDOW		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
MONDAY_WINDOW		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
TUESDAY_WINDOW		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>

# SQL Tuning Automation in 11g

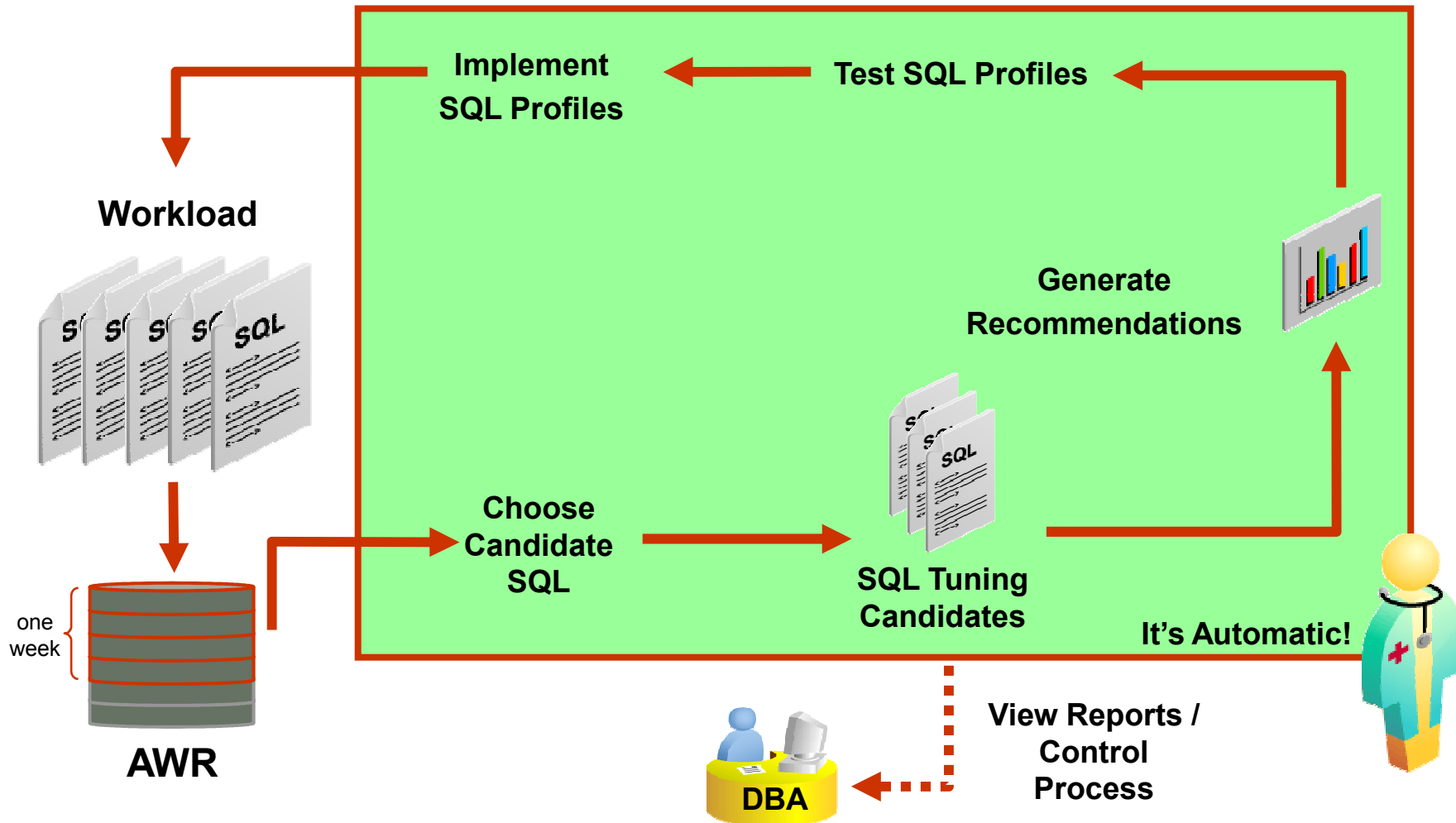
- Configure Automatic SQL Tuning

The screenshot displays the Oracle Enterprise Manager 11g Database Control interface. At the top, the breadcrumb navigation shows 'Database Instance: ORCL > Automated Maintenance Tasks Configuration > Automatic SQL Tuning Settings'. The page is titled 'Automatic SQL Tuning Settings' and includes a 'Database' tab. The current user is logged in as 'SYS'. The settings are as follows:

Maximum Time Spent Per SQL During Tuning (sec)	1200
Automatic Implementation of SQL Profiles	<input type="radio"/> Yes <input checked="" type="radio"/> No
Maximum SQL Profiles Implemented Per Execution	20
Maximum SQL Profiles Implemented (Overall)	10000

A red box highlights the 'Automatic Implementation of SQL Profiles' setting, which is currently set to 'No'. Below the settings, a tip states: 'TIP You need to login as SYS to make the change.' The interface includes 'Show SQL', 'Revert', and 'Apply' buttons at the top right and bottom right of the settings area.

# Automatic SQL Tuning in 11g



# Result Summary

## Automatic SQL Tuning Result Summary

The Automatic SQL Tuning runs during system maintenance windows as an automated maintenance task, searching for ways to improve the execution plans of high-load SQL statements.

### Task Status

Automatic SQL Tuning (SYS\_AUTO\_SQL\_TUNING\_TASK) is currently **Enabled** [Configure](#)  
Automatic Implementation of SQL Profiles is currently **Enabled**

### Task Activity Summary

The activity summary graph shows the benefit of the task activities on the systems high-load SQL. Only profiles that significantly improve SQL performance were implemented.

Time Period

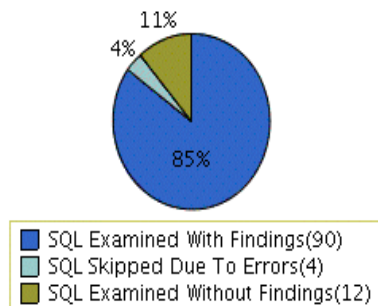
Begin Date **Jan 28, 2007 6:00:01 AM (UTC-08:00)**

End Date **Feb 8, 2007 10:03:10 AM (UTC-08:00)**

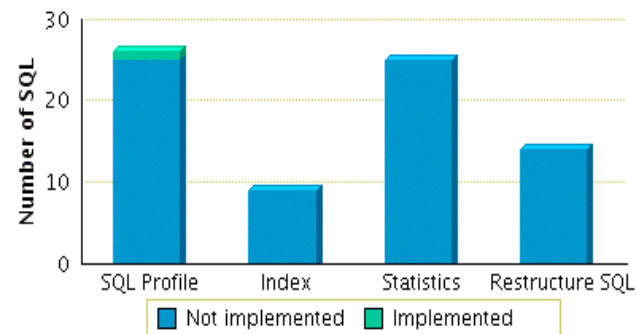
### Overall Task Statistics


Executions **10** Candidate SQL **668** Distinct SQL Examined **106**

#### SQL Examined Status



#### Breakdown by Finding Type





# SQL Tuning - step-by-step

1. Monitoring
2. Identify statement(s) requiring tuning
3. Use tuning advisors
  - SQL Access Advisor:
    - Indexes
    - Materialized Views
    - Indexes on Materialized Views
    - **Requires a workload**
  - SQL Tuning Advisor
    - Optimizer in Tuning Mode
    - Create profiles for the statements
    - **Can operate on a single SQL statement**
4. Implement recommendations



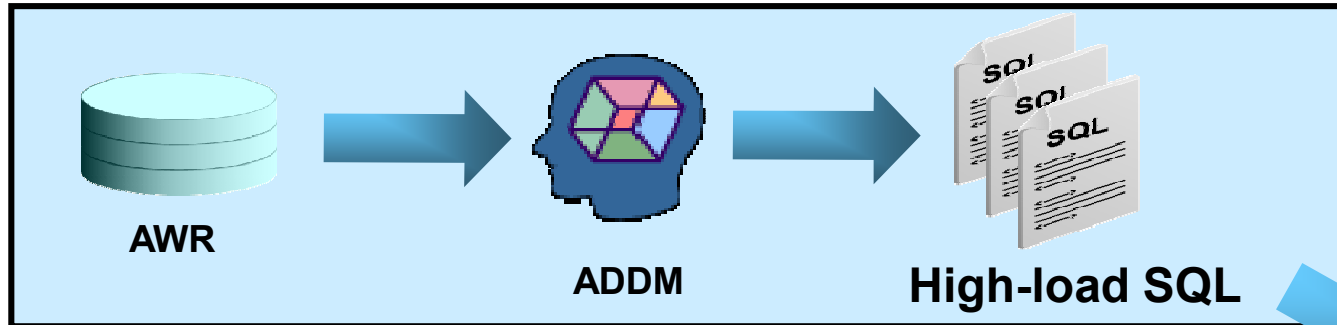
# SQL Tuning Advisor

- Can be used in EM or on CLI (via `DBMS_SQLTUNE`)
- 2 Different tuning modes are available:
  - “Limited mode” will not generate a SQL Profile
  - “**Comprehensive mode**” runs through all possible analysis options
- SQL Profiles contain information that lead to improved execution plans without changing the application code
  - Use different optimizer settings
  - Correct wrong/missing statistics and wrong estimates
  - SQL Profiles are persistent
  - SQL Profiles don't change the original SQL statement
  - SQL Profiles can be transported within SQL Tuning Sets (STS)
    - See [Note:751068.1](#) for an example
  - SQL Profiles can be tested and verified without any risk

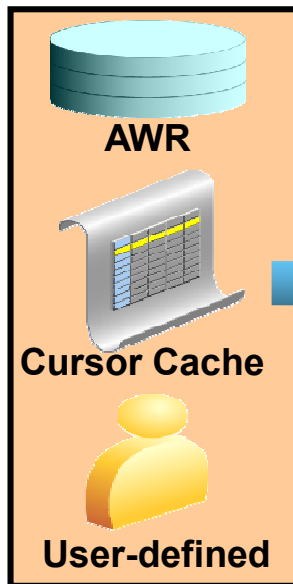


# SQL Tuning - Sources

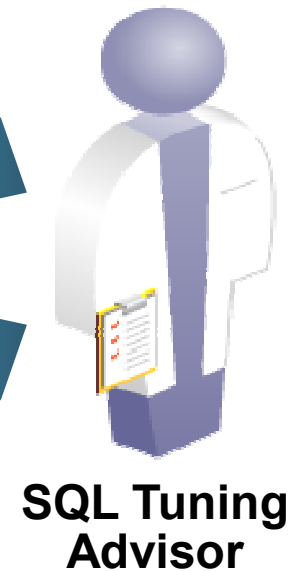
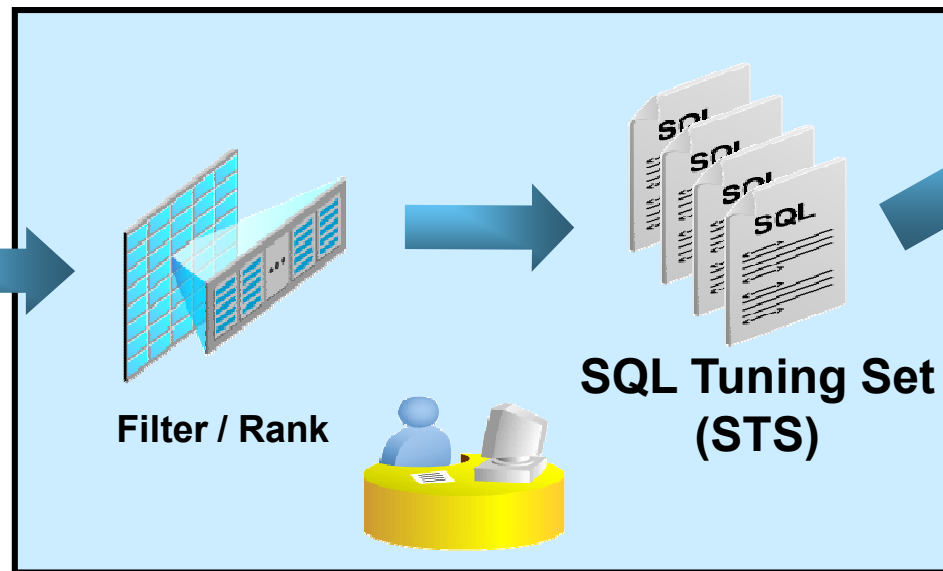
## Automatic selection



## SQL Sources



## Manual choice



SQL Tuning Advisor

# SQL Tuning

- Example: Results „Tuning Advisor“ → SQL Profile

## Recommendations for SQL ID:40yqk9cdfgvgk

Return

Only one recommendation should be implemented.

### SQL Text

```
select /*+ use_nl(c) ordered */ count(*) from sh.sales s, sh.customers c where c.cust_id=s.cust_id and cust_first_name='Dina'
```

### Select Recommendation

Original Explain Plan (Annotated)

Implement

Select	Type	Findings	Recommendations	Rationale	Benefit (%)	New Explain Plan	Compare Explain Plans
<input checked="" type="radio"/>	SQL Profile	A potentially better execution plan was found for this statement.	Consider accepting the recommended SQL profile.		99.77		
<input type="radio"/>	Index	The execution plan of this statement can be improved by creating one or more indices.	Consider running the Access Advisor to improve the physical schema design or creating the recommended index. SH.CUSTOMERS("CUST_FIRST_NAME") SH.SALES("CUST_ID")	Creating the recommended indices significantly improves the execution plan of this statement. However, it might be preferable to run "Access Advisor" using a representative SQL workload as opposed to a single statement. This will allow to get comprehensive index recommendations which takes into account index maintenance overhead and additional space consumption.	69.68		

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# SQL Tuning

- Example: Compare original to new explain plan

## Compare Explain Plans

### 1 Original Explain Plan (Annotated)

• Indicates an adjustment from the original plan by the SQL Tuning Advisor  
Plan Hash Value **308913612**

Operation	Line ID	Object	Object Type	Order	Rows	Bytes	Cost	Time	CPU Cost	I/O Cost
SELECT STATEMENT	0			9		0.017	919,732	11,037	8,498,774,016	919,271
SORT AGGREGATE	1			8		0.017				
NESTED LOOPS	2			7						
NESTED LOOPS	3			5	16,552		919,732	11,037	8,498,774,016	919,271
PARTITION RANGE ALL	4			3	4,486,538		428	6	7,341,376	428
BITMAP CONVERSION TO ROWIDS	5			2	4,486,538		428	6	7,341,376	428
BITMAP INDEX FAST FULL SCAN	6	SH.SALES_CUST_BIX	INDEX (BITMAP)	1						
INDEX UNIQUE SCAN	7	SH.CUSTOMERS_PK	INDEX (UNIQUE)	4			0	1	1,900	0
TABLE ACCESS BY INDEX ROWID	8	SH.CUSTOMERS	TABLE	6	0.012		1	1	9,241	1

### 2 New Explain Plan With SQL Profile

Plan Hash Value **1818178872**

Operation	Line ID	Object	Object Type	Order	Rows	Bytes	Cost	Time	CPU Cost	I/O Cost
SELECT STATEMENT	0			7		0.017	839	11	131,239,648	832
SORT AGGREGATE	1			6		0.017				
HASH JOIN	2			5	16,552		839	11	131,239,648	832
TABLE ACCESS FULL	3	SH.CUSTOMERS	TABLE	1	1.371		405	5	22,792,460	404
PARTITION RANGE ALL	4			4	4,486,538		428	6	7,341,376	428
BITMAP CONVERSION TO ROWIDS	5			3	4,486,538		428	6	7,341,376	428
BITMAP INDEX FAST FULL SCAN	6	SH.SALES_CUST_BIX	INDEX (BITMAP)	2						



# SQL Tuning with DBMS\_SQLTUNE

- 4 steps to get an SQL Profile
  - `DBMS_SQLTUNE.CREATE_TUNING_TASK`
  - `DBMS_SQLTUNE.EXECUTE_TUNING_TASK`
  - `DBMS_SQLTUNE.REPORT_TUNING_TASK`
  - `DBMS_SQLTUNE.ACCEPT_SQL_PROFILE`

# SQL Tuning - DBMS\_SQLTUNE

## Tuning Task Management

- CANCEL\_TUNING\_TASK
- CREATE\_TUNING\_TASK
- DROP\_TUNING\_TASK
- EXECUTE\_TUNING\_TASK
- IMPLEMENT\_TUNING\_TASK
- INTERRUPT\_TUNING\_TASK
- REPORT\_AUTO\_TUNING\_TASK
- REPORT\_TUNING\_TASK
- RESUME\_TUNING\_TASK
- SCRIPT\_TUNING\_TASK
- RESET\_TUNING\_TASK
- SET\_TUNING\_TASK\_PARAMETER

## Staging Table Management

- CREATE\_STGTAB\_SQLPROF
- CREATE\_STGTAB\_SQLSET
- PACK\_STGTAB\_SQLPROF
- PACK\_STGTAB\_SQLSET
- REMAP\_STGTAB\_SQLPROF
- REMAP\_STGTAB\_SQLSET
- UNPACK\_STGTAB\_SQLPROF
- UNPACK\_STGTAB\_SQLSET

## SQL Profile Management

- ACCEPT\_SQL\_PROFILE
- ALTER\_SQL\_PROFILE
- DROP\_SQL\_PROFILE

## Select SQL Statements

- CAPTURE\_CURSOR\_CACHE\_SQLSET
- SELECT\_CURSOR\_CACHE
- REPORT\_SQL\_MONITOR
- SELECT\_WORKLOAD\_REPOSITORY
- SQLTEXT\_TO\_SIGNATURE

## SQL Tuning Set Management

- ADD\_SQLSET\_REFERENCE
- CREATE\_SQLSET
- DELETE\_SQLSET
- DROP\_SQLSET
- LOAD\_SQLSET
- REMOVE\_SQLSET\_REFERENCE
- SELECT\_SQLSET
- UPDATE\_SQLSET

# SQL Tuning Task Command Line Example

```
exec DBMS_SQLTUNE.DROP_TUNING_TASK('my_tuning_task');

DECLARE
  my_task_name VARCHAR2(30);
  my_sqltext CLOB;
BEGIN
  my_sqltext := q'!<your SQL - concatenate lines with ||>!';
  my_task_name := DBMS_SQLTUNE.CREATE_TUNING_TASK(sql_text => my_sqltext,
    user_name => XY, scope => 'COMPREHENSIVE', time_limit => 60,
    task_name => 'my_tuning_task', description => 'test');
END;
/


exec DBMS_SQLTUNE.EXECUTE_TUNING_TASK( task_name => 'my_tuning_task' );

SELECT sofar, totalwork FROM V$ADVISOR_PROGRESS WHERE task_id =
  (SELECT task_id FROM USER_ADVISOR_TASKS WHERE task_name='my_tuning_task');

SET LONG 100000
SET LONGCHUNKSIZE 100000
SET LINESIZE 10000
SET PAGESIZE 10000
SELECT DBMS_SQLTUNE.REPORT_TUNING_TASK( 'my_tuning_task' ) FROM DUAL;
```

# SQL Profile containing literals - not binds

- SQL Profiles can handle statements containing literals (instead of binds) as well:

- Since 11.1.0.6 possible in EM:  Confirmation  
Do you want to implement new profile(s) ?  
 Implement the new profile(s) with forced matching

- In 10.2 only possible on command line:

```
exec
:p_name:=dbms_sqltune.accept_sql_profile
(task_name=>'XT',name=>'XT_PROFILE', FORCE_MATCH=>TRUE);
```

```
SQL> select name, status, force_matching, sql_text
       from dba_sql_profiles;
```

```
NAME      STATUS  FOR  SQL_TEXT
-----
```

```
MY_PROF  ENABLED  YES  select /*+ use_nl(c) ordered */ count(*)
       from sh.sales s, sh.customers c
       where c.cust_id = s.cust_id
              and CUST_FIRST_NAME = 'Mike'
```

# SQL Profile - evaluation

- SQL Profiles should be evaluated before making them available to every user:

```
exec
:p_name:=dbms_sqltune.accept_sql_profile
task_name=>'XT',name=>'XT_PROFILE',
category=>'TEST_ENV', FORCE_MATCH=>TRUE)
```

```
alter session set SQLTUNE_CATEGORY='TEST_ENV';
```

- Now evaluate the statement's profile in a limited user context
- If verification went fine, make it accessible to everybody

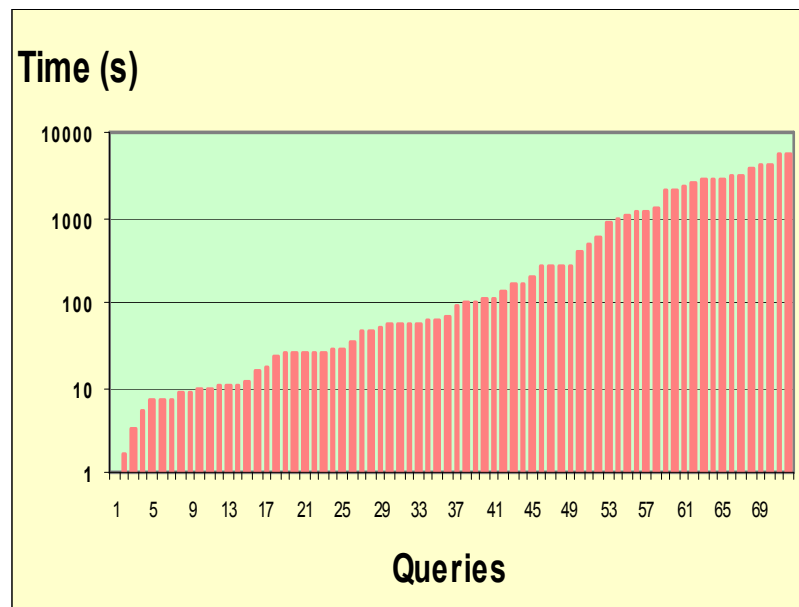
```
exec
dbms_sqltune.alter_sql_profile
(name=>'XT_PROFILE',
attribute_name=>'CATEGORY',value=>'DEFAULT')
```



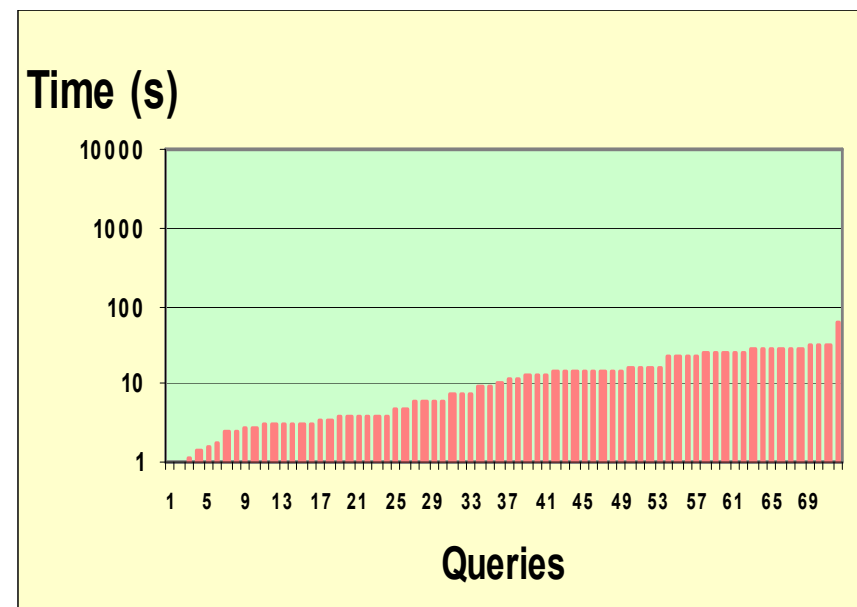
# SQL Profiling Effectiveness

- Workload of a big market research customer in EMEA - 73 high load queries identified requiring tuning
  - Query execution time Before vs. After

**Before ...**



**... After**



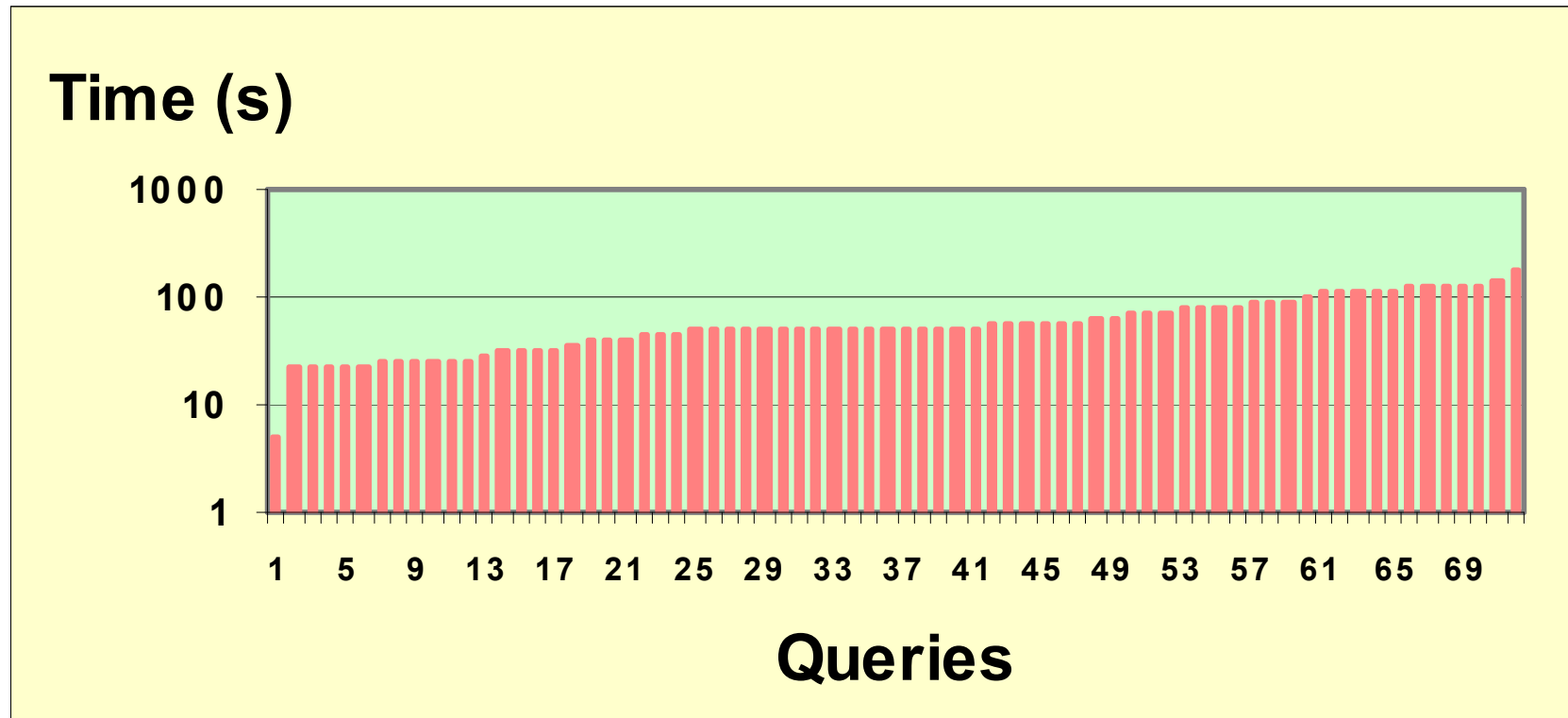
# SQL Profiling Effectiveness

- Workload of a big market research customer in EMEA - 73 high load queries identified requiring tuning
  - Manual tuning compared to automatic tuning of these 73 complex DWH statements

	<b>Average Response Time</b>	<b>Worst Response Time</b>	<b>Cumulative Response Time</b>
<b>No Tuning</b>	817s	5751s	58821s
<b>Manual Tuning</b>	30s	275s	2131s
<b>Automatic Tuning (SQL Pr)</b>	13s	59s	929s

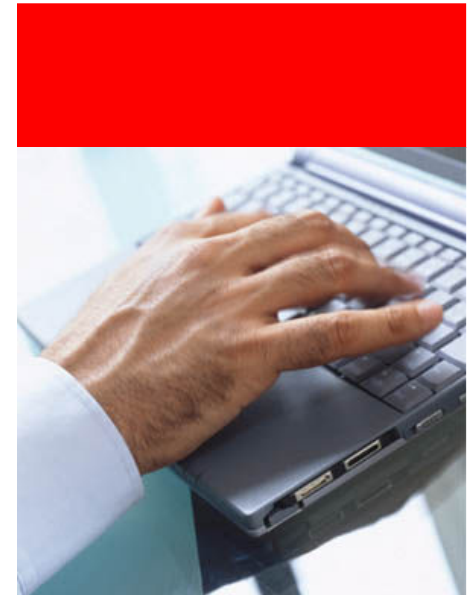
# SQL Profiling Time

- All together the optimization for all 73 statements took approximately 1½h !!!



# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices



**Challenges**  
SQL Plan Management  
Database Replay  
SQL Performance Analyzer



# Challenges

- >90% of so-called upgrade problems aren't really upgrade problems but performance issues after the upgrade
  - It's important to use sufficient test scenarios and methods
  - Typical problem areas:
    - Optimizer - execution plans
      - Queries are slow
      - Reports or batches take longer to complete
    - Increased resource requirements
    - Code path changes

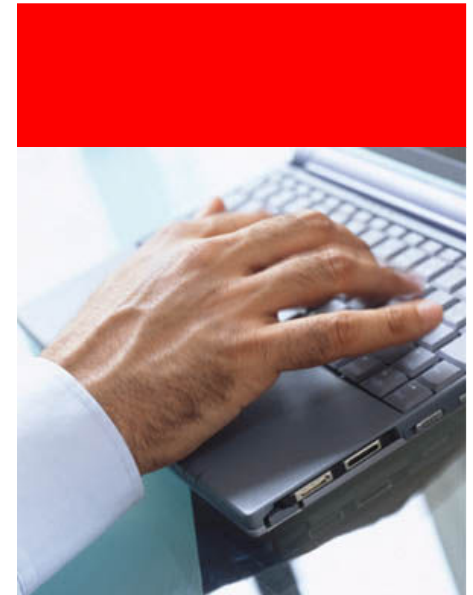


# Challenges

- Optimizer - prevent execution plan changes:
  - Classical approach:
    - Rule Based Optimizer (RBO desupport since Oracle 10g - Note:189702.1)
    - Hints
    - Stored Outlines
    - Rewriting SQL statements
    - `optimizer_features_enabled=n.n.n`
    - Change specific optimizer parameters
    - Import and fix object and systems statistics
  - Modern, efficient and better resource consumption:
    - SQL Plan Management
    - SQL Profiling

# Agenda

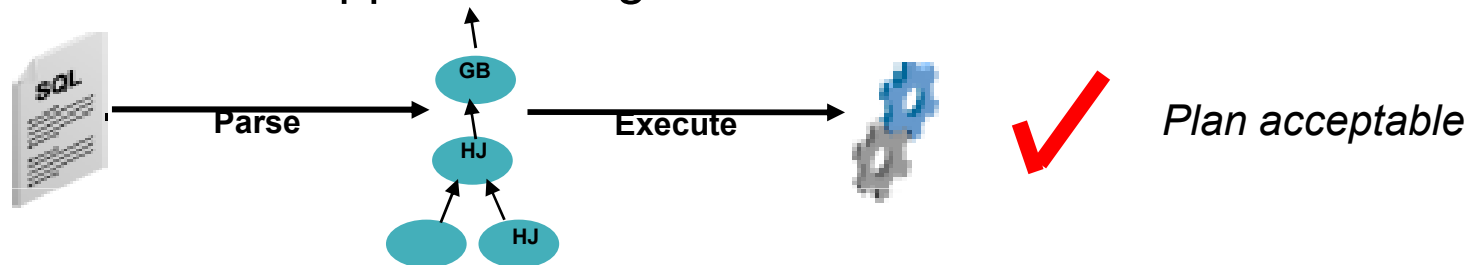
- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices



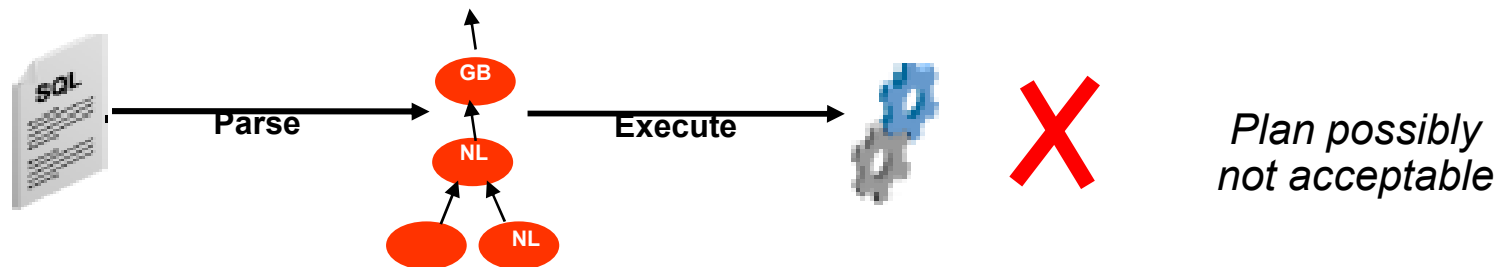
Challenges  
**SQL Plan Management**  
Database Replay  
SQL Performance Analyzer

# Without SQL Plan Management

- Challenging to "freeze" execution plans and statistics
  - Difficulty:
    - Statement has been parsed and a plan got created
- Verification happens during execution:



- Now some conditions get changed (statistics, upgrade, parameters)
  - A new plan will be created - is it better or worse???







# SQL Plan Management

- First **preventive** and **fully transparent** database mechanism to ensure plan stability
- SQL execution plans will be recorded
- A SQL Baseline will be created
  - Consist of accepted execution plans
  - Contains only plans for statements being parsed/executed more than once
- Only known, verified and accepted plans will be used
- Package: **DBMS\_SPM**



# SQL Plan Management

- 3 phases for plan stability:
  - Capture
    - Create a SQL Baseline representing **trusted** execution plans
      - Baseline is stored in SQL Management Base in SYSAUX
  - Selection
    - Only accepted plans will be used
    - New execution plans will be recorded to the plan history
  - Evolution
    - Evaluate all unverified plans for a given statement in the plan history to become either accepted or rejected



# SQL Plan Management

- White Paper:
  - <http://www.oracle.com/technetwork/database/features/performance/spm-white-paper-ow07-130435.pdf>

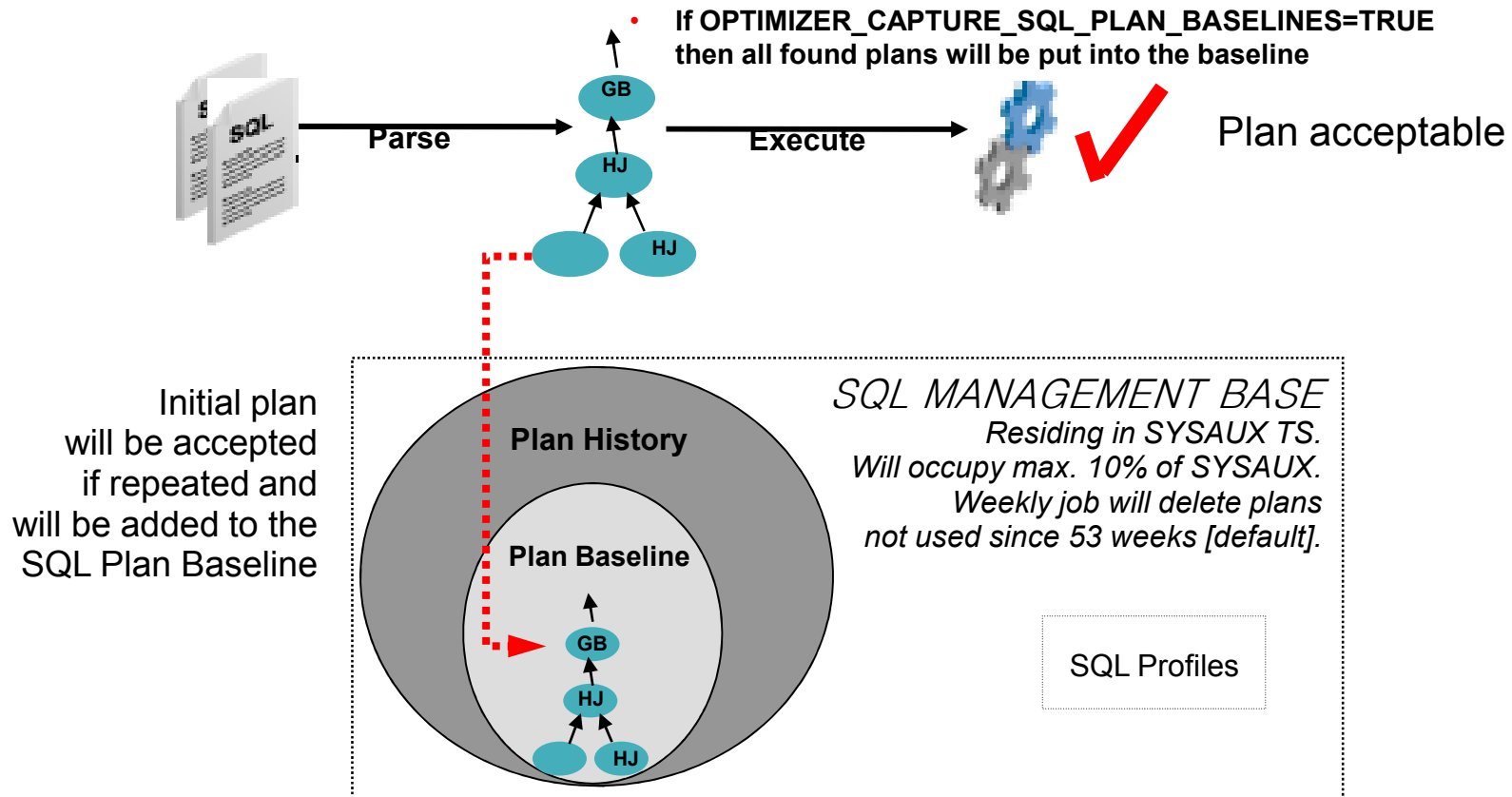
## SQL Plan Management in Oracle Database 11g

*An Oracle White Paper  
June 2007*

# SQL Plan Management

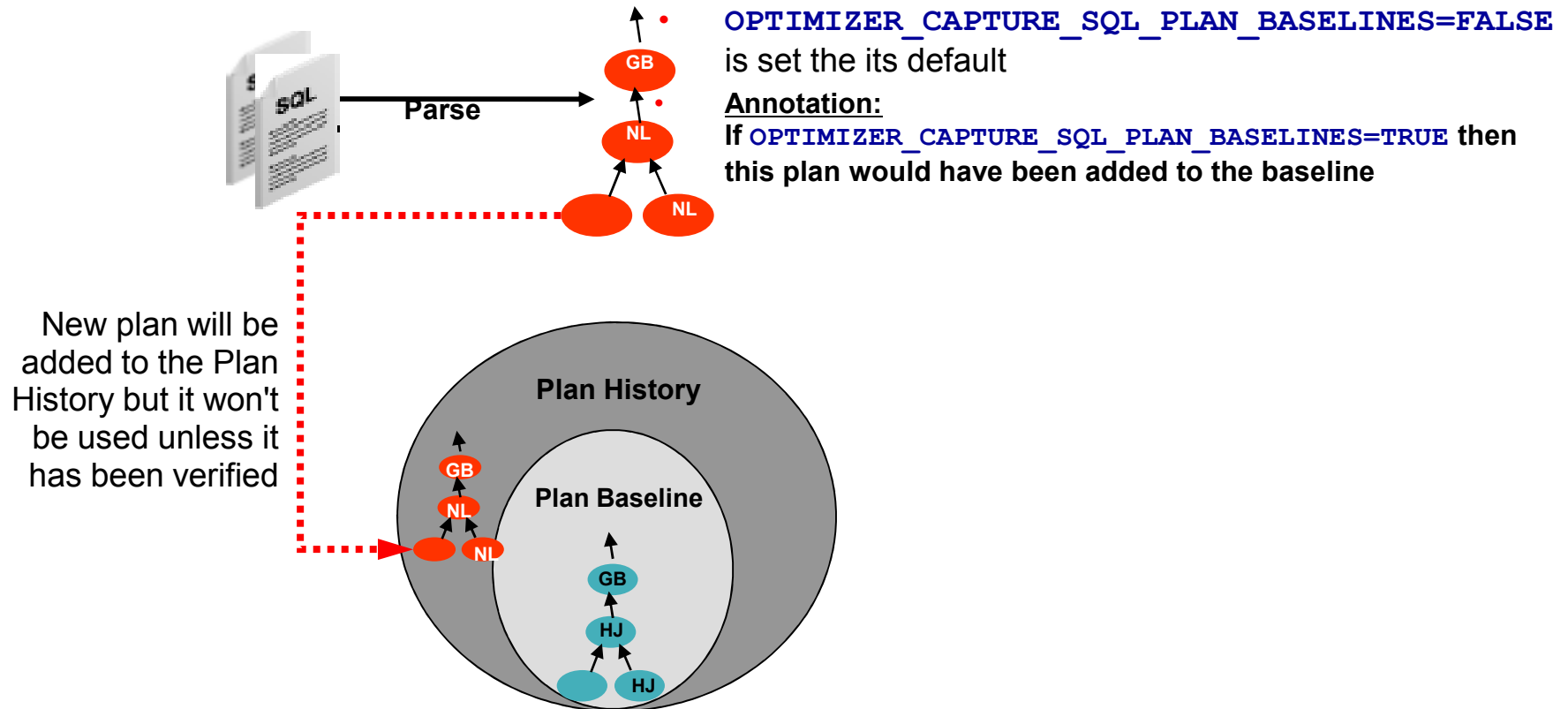
- Phase 1 – Baseline Capture

- Schematically - `OPTIMIZER_CAPTURE_SQL_PLAN_BASELINES=TRUE`



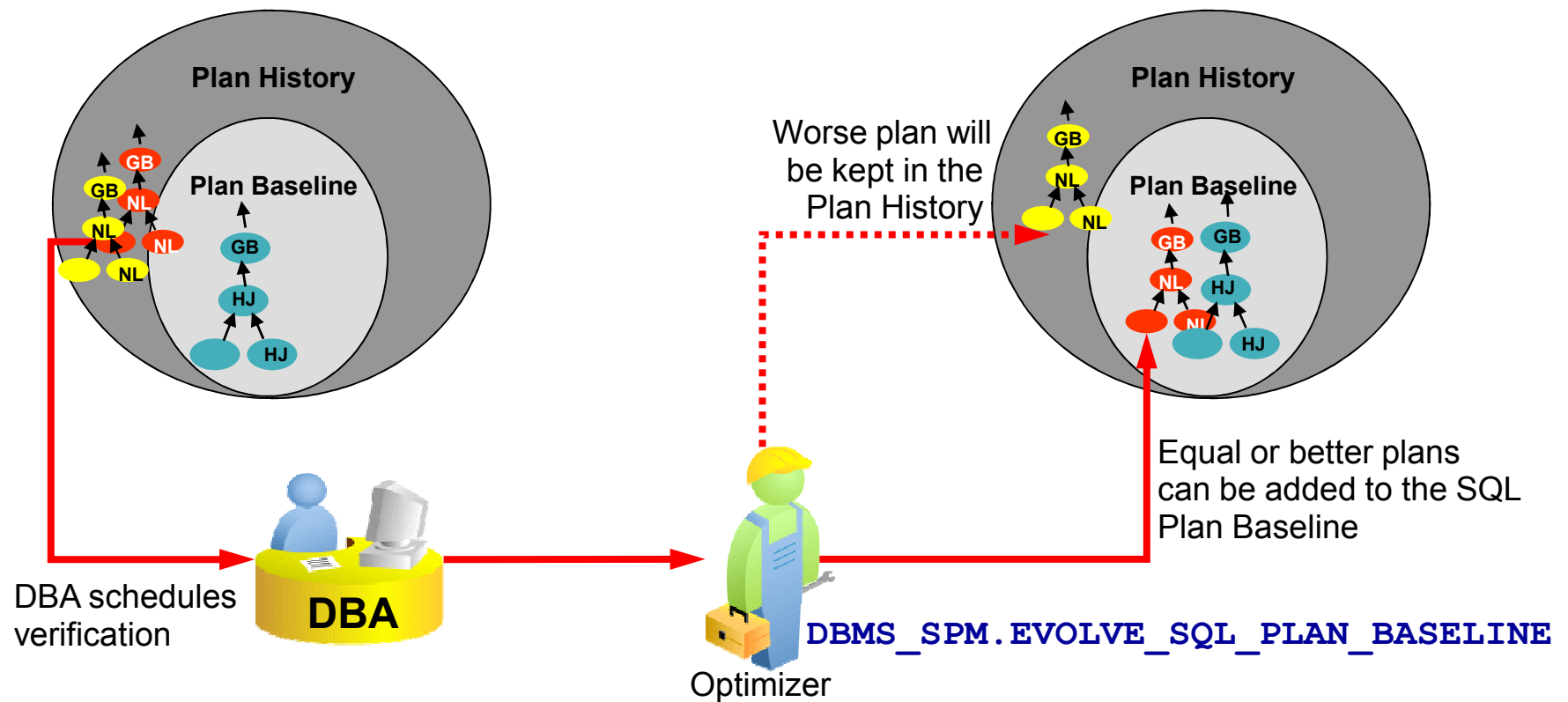
# SQL Plan Management

- Phase 2 - Selection
  - Same statement parsed again but a different plan will be created



# SQL Plan Management

- Phase 3 - Evolution
  - Schematically:



# SQL Plan Management

ORACLE Enterprise Manager 11g  
Database Control

[Setup](#) [Preferences](#) [Help](#) [Logout](#)

Database

Logged in As SYS

Database Instance: HUG

[Home](#)

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# SQL Plan Management

- DatabaseControl - Configuration:

The screenshot shows the Oracle Enterprise Manager 11g Database Control interface. The page title is "ORACLE Enterprise Manager 11g Database Control". The navigation bar includes "Setup", "Preferences", "Help", and "Logout". The current page is "Database" and "SQL Plan Control". The database instance is "orcl.de.oracle.com".

Step 1: The "SQL Plan Baseline" tab is selected.

Step 2: The "Settings" section is shown. The "Plan Retention(Weeks)" is set to 53. A red box highlights the "Configure" button. A callout box contains the SQL command: `exec DBMS_SPM.CONFIGURE('plan_retention_weeks',5);`

Step 3: The "Search" section is shown. The "SQL Text" field is empty. The "Go" button is highlighted. Below the search section, there are buttons for "Enable", "Disable", "Drop", "Evolve", "Pack", and "Fixed - Yes". The "Go" button is highlighted. Below the buttons, there is a table with columns: "Select", "Name", "SQL Text", "Enabled", "Accepted", "Fixed", "Auto Purge", "Created", and "Last Modified".

Select	Name	SQL Text	Enabled	Accepted	Fixed	Auto Purge	Created	Last Modified
<input type="checkbox"/>	SYS_SQL_PLAN_fffd2e0664c0ef6a	select end_time, wait_class#, (time waited)...	YES	YES	NO	YES	Aug 20, 2007 7:45:26 PM	Aug 20, 2007 7:45:26 PM
<input type="checkbox"/>	SYS_SQL_PLAN_ff7b3f95f59a06ad	SELECT timezone_region FROM mgmt_targets WHERE tar...	YES	YES	NO	YES	Aug 21, 2007 8:42:53 AM	Aug 21, 2007 8:42:53 AM



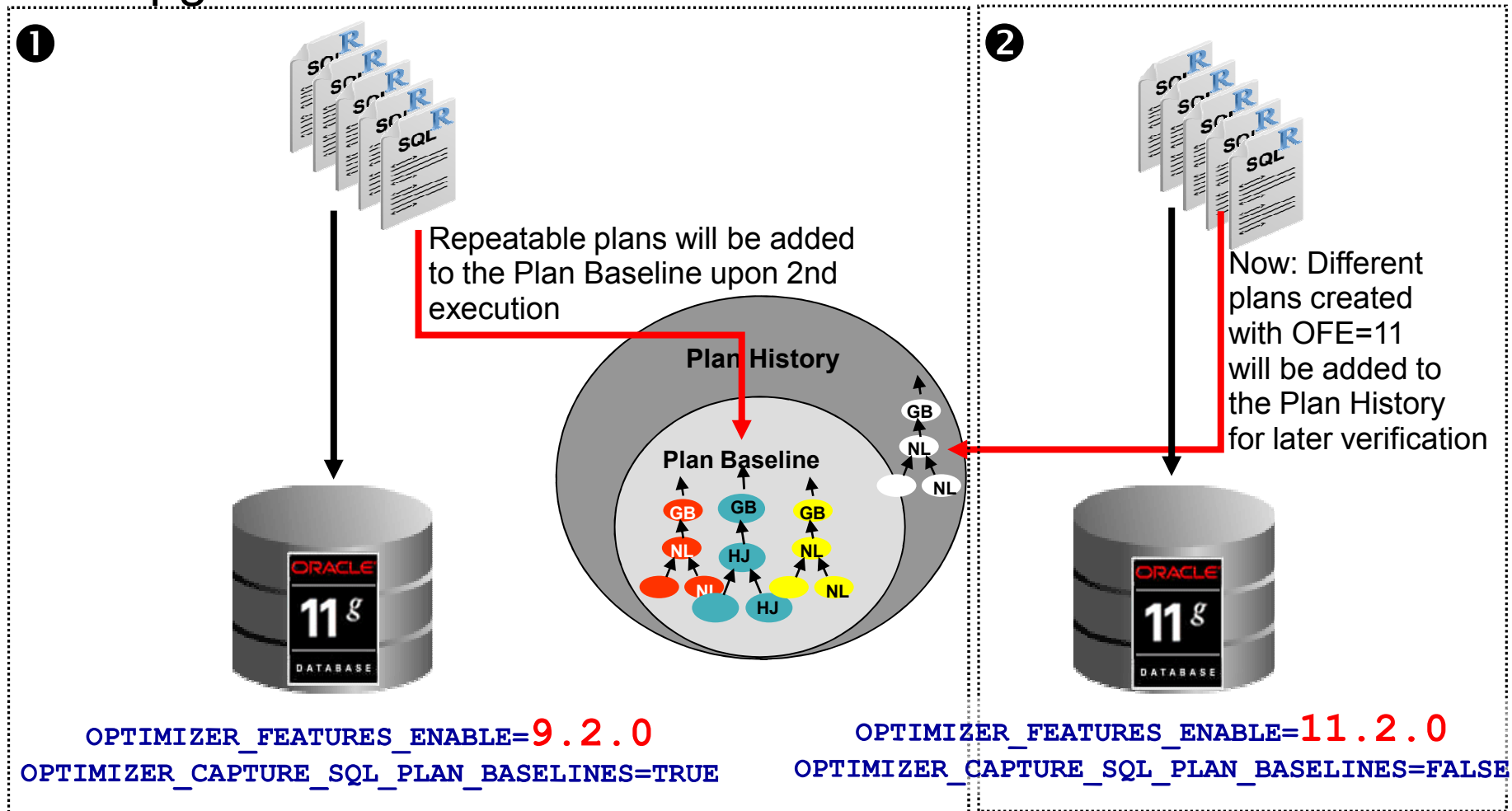


# SQL Plan Management - Scenarios

- Upgrade scenario 1:
  - Parameterize the optimizer back to the "old" behaviour
  - Works for all database releases since 8.0.3
- Upgrade scenario 2:
  - Create stored outlines and use them to record your plans in 11g
- Upgrade scenario 3:
  - Transport the well known plans to the new release
  - Works since 10gR2
- Ship a new application (module) along with appropriate SQL plan baselines:
  - Ship the best execution plans for the new statements within a staging table and ensure that they'll be used
  - Works since 11g

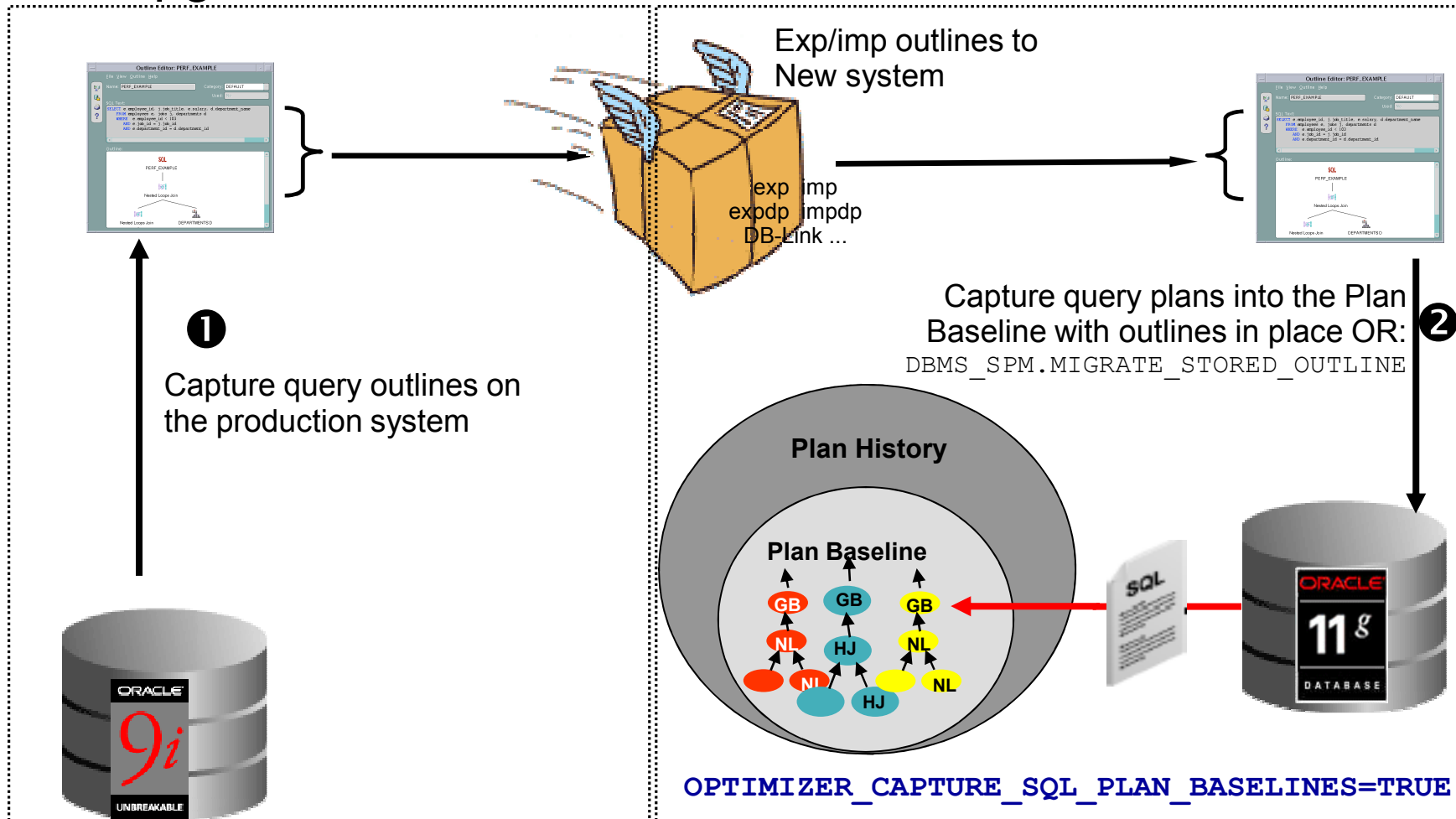
# SQL Plan Management – Upgrade/OFE

- Upgrade scenario 1



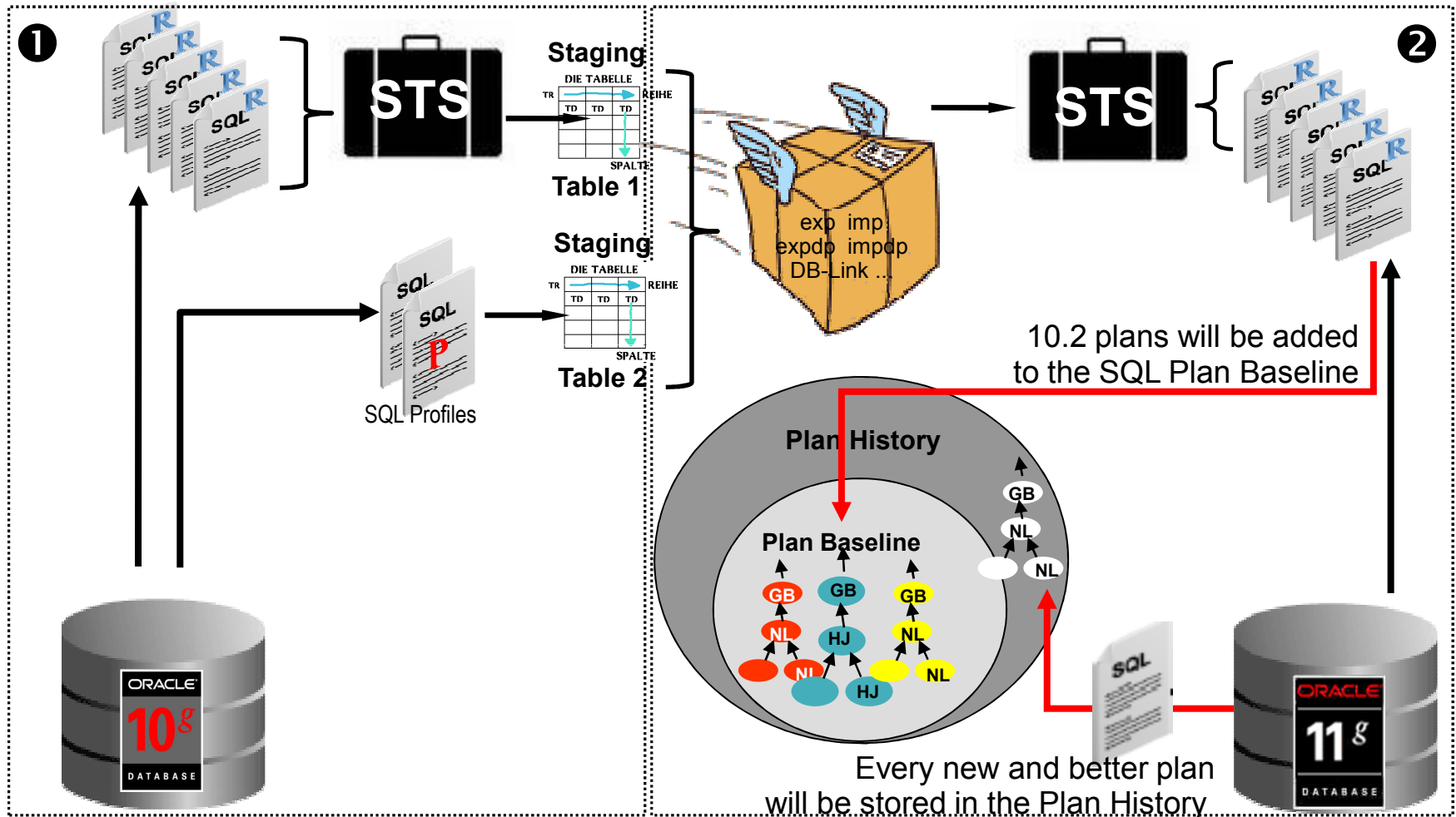
# SQL Plan Management – Upgrade/Outlines

- Upgrade scenario 2



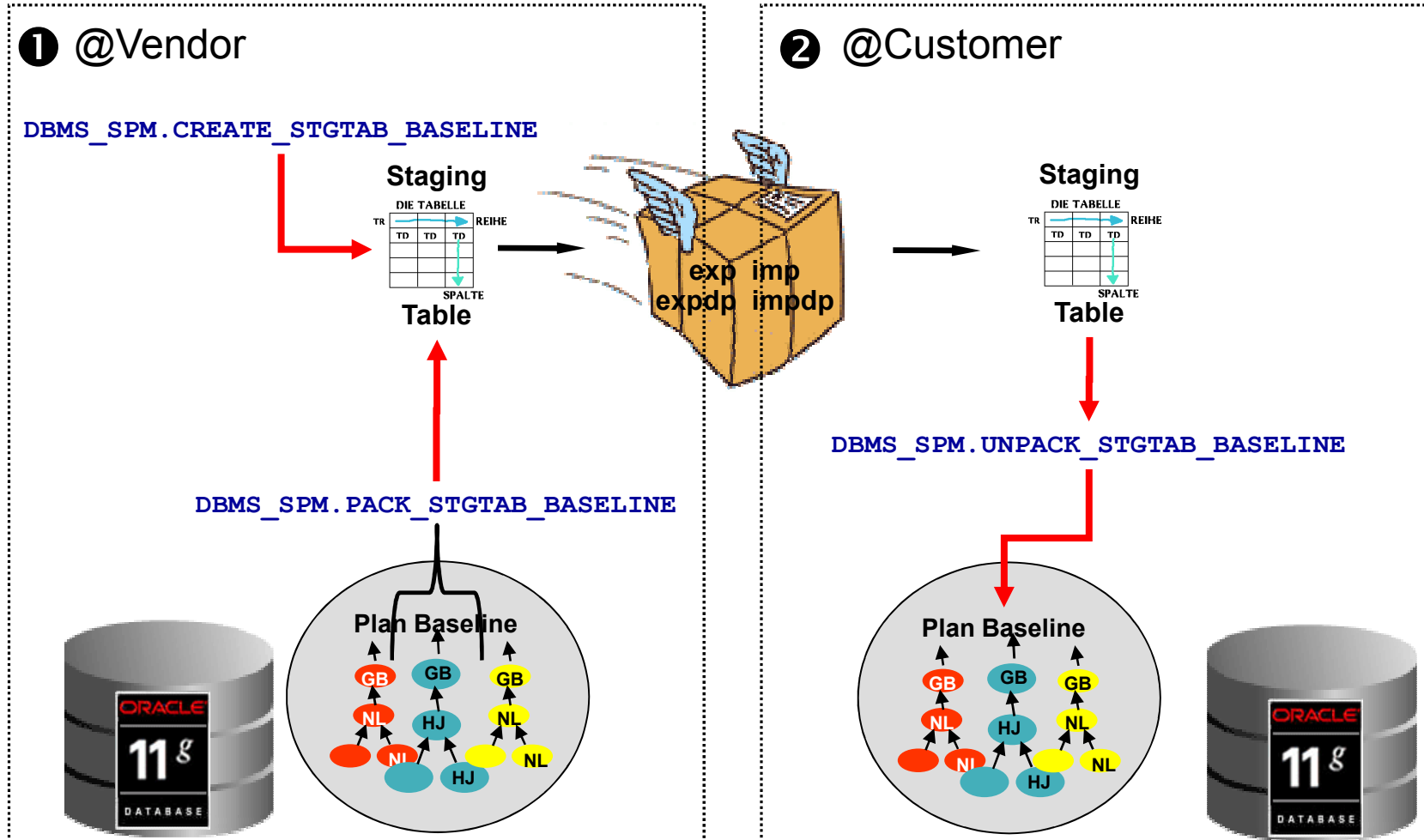
# SQL Plan Management - Upgrade

- Upgrade scenario 3



# SQL Plan Management - New Application

- New application (module) gets delivered





# SQL Plan Management - New Application

- New application (module) gets delivered - and it's possible to deliver the right execution plans, too:
  - @Software Vendor:
    - Create a staging table using `DBMS_SPM.CREATE_STGTAB_BASELINE`
    - Pack the required baselines into the staging table using `DBMS_SPM.PACK_STGTAB_BASELINE`
    - Export the staging table into a dump file using Data Pump or Export and transport it to the destination system
  - @Customer:
    - Import the dump file into the destination database
    - Unpack the SQL Plan Baselines from the staging table into the SQL Management Base of the target system
      - `DBMS_SPM.UNPACK_STGTAB_BASELINE`

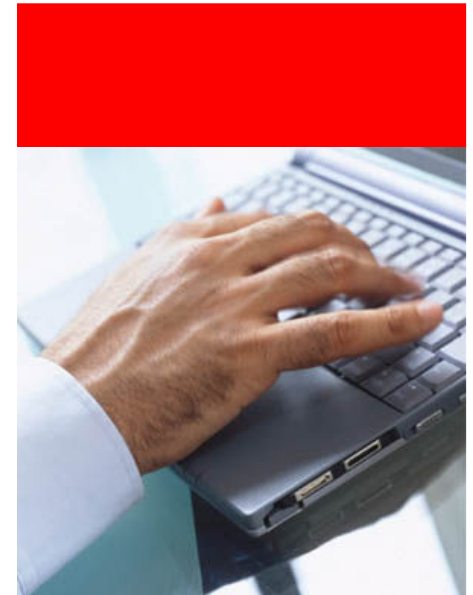


# SQL Plan Management - Outlines

- Oracle **11.2** supports simple Stored Outline migration
  - `DBMS_SPM.MIGRATE_STORED_OUTLINE`
  - [http://download.oracle.com/docs/cd/E11882\\_01/server.112/e10821/optplanmgmt.htm#PFGRF3616](http://download.oracle.com/docs/cd/E11882_01/server.112/e10821/optplanmgmt.htm#PFGRF3616)
- Oracle **11g**: Manual migration of Stored Outlines to SQL Plan Management:
  - Tuning-Pack:  
Record execution plans in 10.2 and transport them (see Upgrade Case 1)
  - No Tuning-Pack license:
    - Upgrade your database with Outlines to 11g
    - Set `CAPTURE_SQL_PLAN_BASELINES=TRUE`
    - Make sure you run your outlined queries 2x
      - Plans will be recorded to the Baseline
    - Switch `CAPTURE_SQL_PLAN_BASELINES=FALSE`
    - Delete the Stored Outlines

# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices



Challenges  
SQL Plan Management  
**Database Replay**  
**SQL Performance Analyzer**





# Real Application Testing

- Goal:
  - Record and replay a real workload to see how the new system performs
  - Find regressions and changing plans **before** the upgrade
- Licensable database pack "Real Application Testing"
  - ⇒ Available since Oracle Database 11.1.0.6
  - ⇒ Available with patch set 10.2.0.4/5
  - ⇒ Available as single patch for 9.2.0.8 and 10.2.0.2/3
    - ⇒ For patch numbers please see [Note:560977.1](#)



# Real Application Testing

- Real Application Testing consists of:
  - Database Replay
    - Package `DBMS_WORKLOAD_CAPTURE`
      - ⇒ Capture works in 9.2.0.8 and 10.2.0.2/3/4/5 and 11.1.0.x and 11.2.0.x
    - Package `DBMS_WORKLOAD_REPLAY`
      - ⇒ Replay works in 11.1.0.x and 11.2.0.x
  - SQL Performance Analyzer (SPA)
    - Package `DBMS_SQLPA`
      - ⇒ Collecting statements works in:
        - ⇒ 9.2.0.x and 10.1.0.x with sql tracing
        - ⇒ 10.2.0.2/3/4/5 and 11.1.0.x and 11.2.0.x by capturing from cursor cache
      - ⇒ Evaluation and comparison works with:
        - ⇒ 10.2.0.2/3/4/5 and 11.1.0.x and 11.2.0.x
  - SQL Tuning Sets (STS)
    - Package `DBMS_SQLTUNE`



# Real Application Testing

- White Paper:
  - Database Replay:
    - <http://www.oracle.com/technetwork/database/features/manageability/db-replay-white-paper-ow07-1-2-133325.pdf>
  - SQL Performance Analyzer:
    - <http://www.oracle.com/technetwork/database/features/performance/spa-white-paper-ow07-132047.pdf>
  - OTN:
    - <http://www.oracle.com/technetwork/database/features/manageability/index.html>
  - Command line examples for REPLAY and SPA:
    - <http://www.oracle.com/technetwork/database/features/manageability/db-replay-cli-128678.zip>
    - <http://www.oracle.com/technetwork/database/features/manageability/spa-scripts-128620.zip>

# Real Application Testing

- Database Control:

ORACLE<sup>®</sup> Enterprise Manager 11g Database Control

Setup Preferences Help Logout

Database

Logged in As SYS

Database Instance: HUGO

Home Performance Availability Server Schema Data **1** Software and Support

**2** Real Application Testing

Software

- Configuration
  - Search
  - Last Collected Configuration
  - Collection Status
  - Clone Oracle Home
  - Host Configuration
  - Oracle Home Inventory
- Database Software Patching
  - Patch Advisor
  - View Patch Cache
  - Patch Prerequisites
  - Apply Patch
- Deployment Procedure Manager
  - Getting Started with Deployment Procedure Manager
  - Deployment Procedures
  - RAC Provisioning Deployment Procedures
  - Procedure Completion Status
  - Deployment and Provisioning Software Library

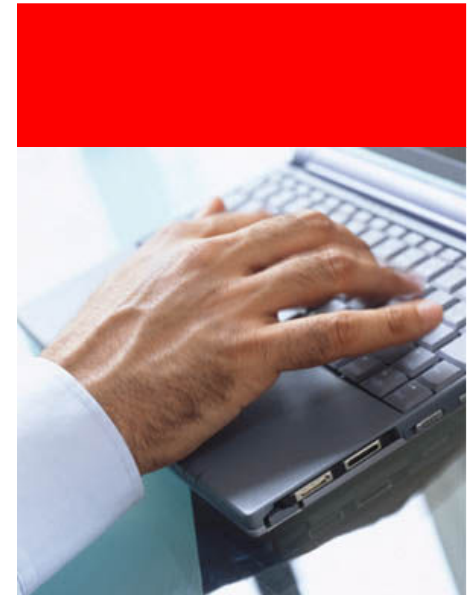
Support

- Support Workbench

# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

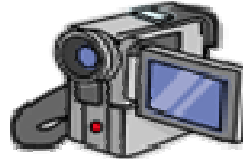
Challenges  
SQL Plan Management  
**Database Replay**  
SQL Performance Analyzer



# Database Replay

- Replay actual production database workload in test environment
- Identify, analyze and fix potential instabilities before making changes to production

- **Capture Workload in Production**



- Capture full production workload with real load, timing & concurrency characteristics
- Move the captured workload to test system

- **Replay Workload in Test**

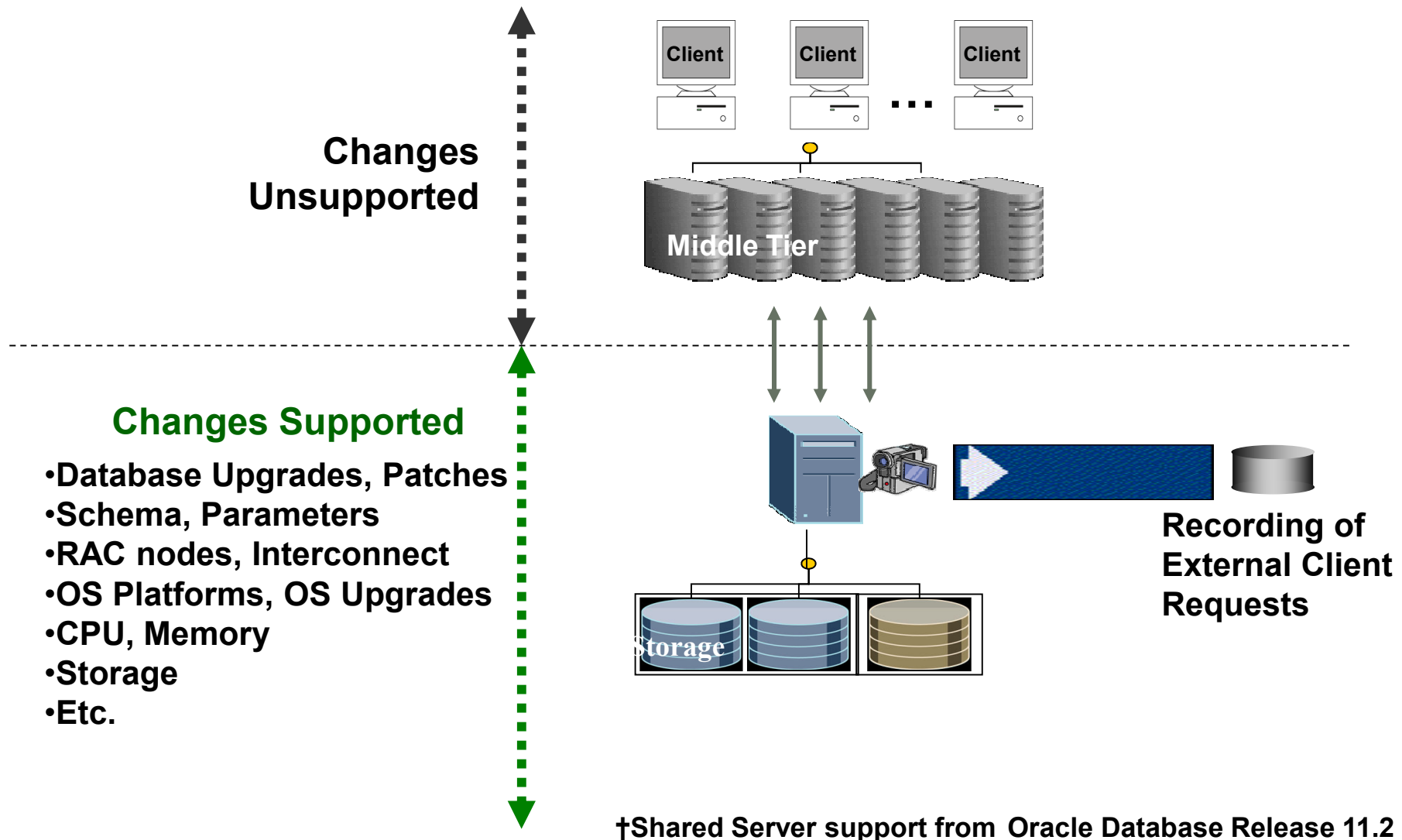
- Make the desired changes in test system
- Replay workload with full production characteristics
- Honor commit ordering

- **Analyze & Report**

- Errors
- Data divergence
- Performance divergence

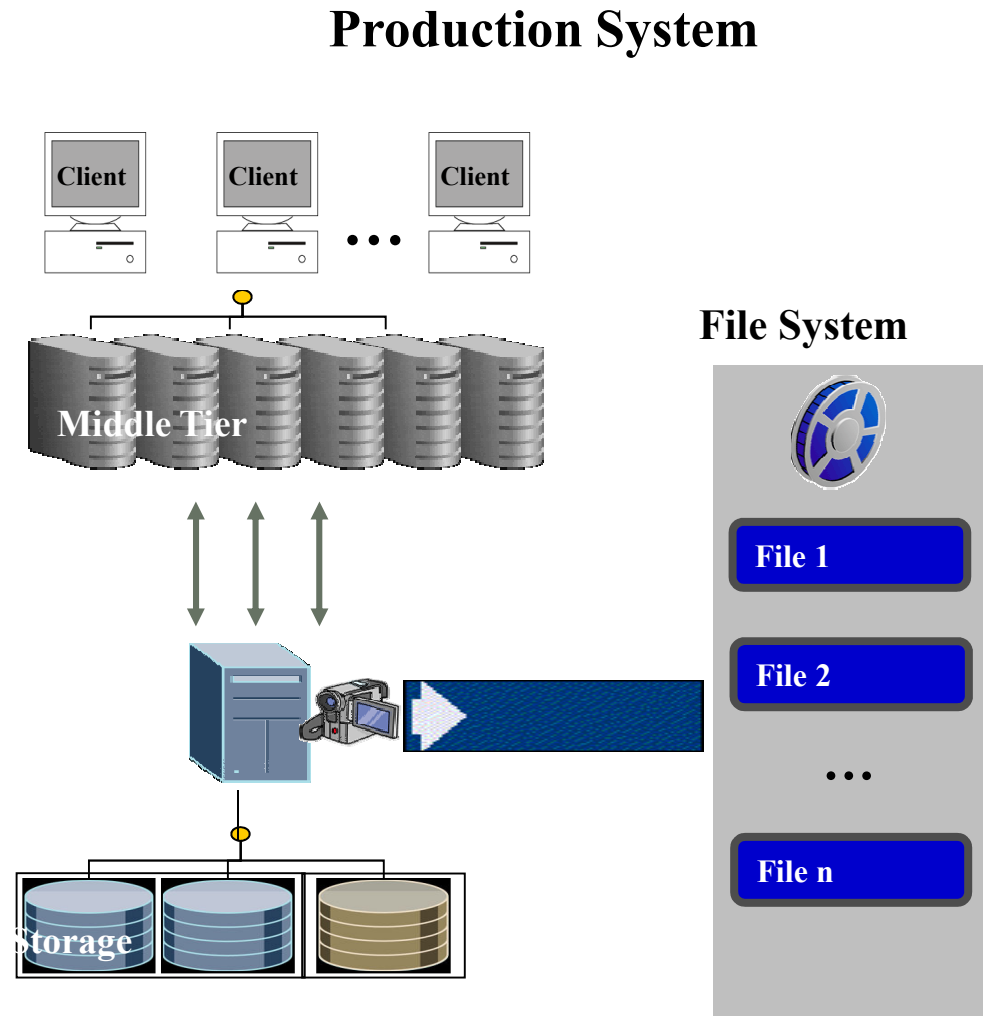


# Supported Changes



# Step 1: Workload Capture

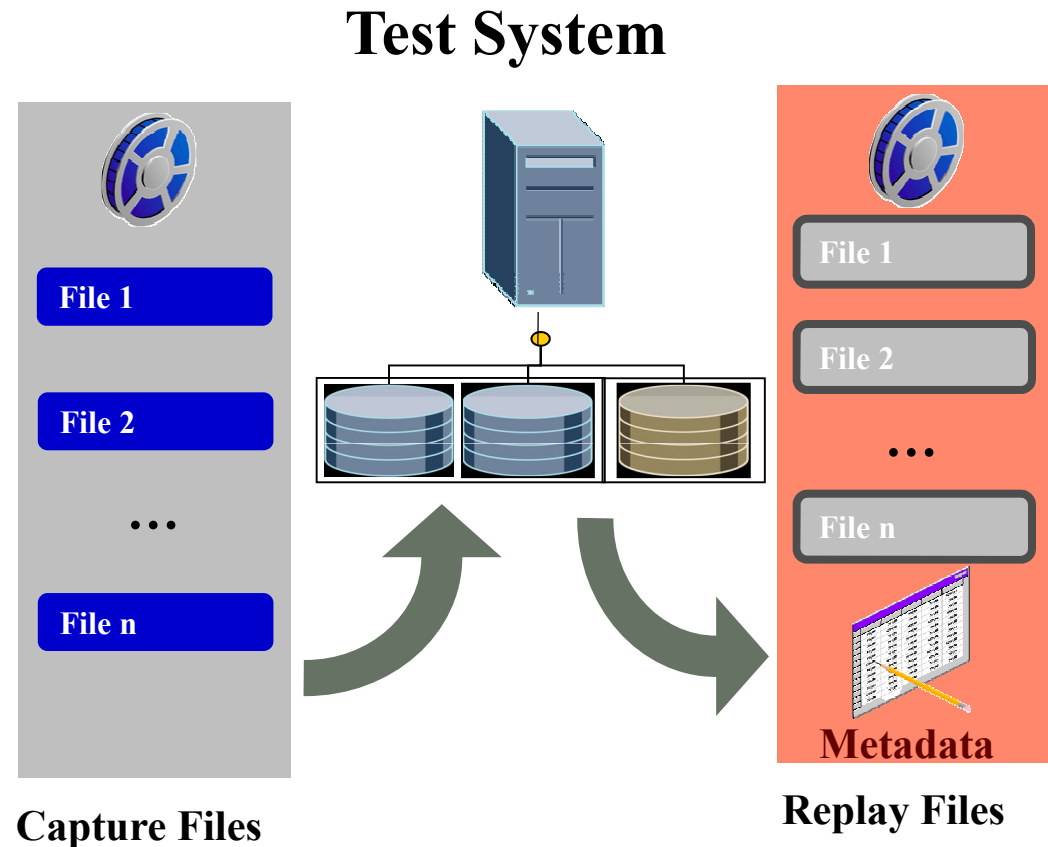
- All external client requests captured in binary files
- System background and internal activity excluded
- Minimal overhead
  - Avoids function call when possible
  - Buffered I/O
- Independent of client protocol
- Can capture on 9.2.0.8 and replay on 11g
- Capture load for interesting time period, e.g., peak workload, month-end processing, etc.





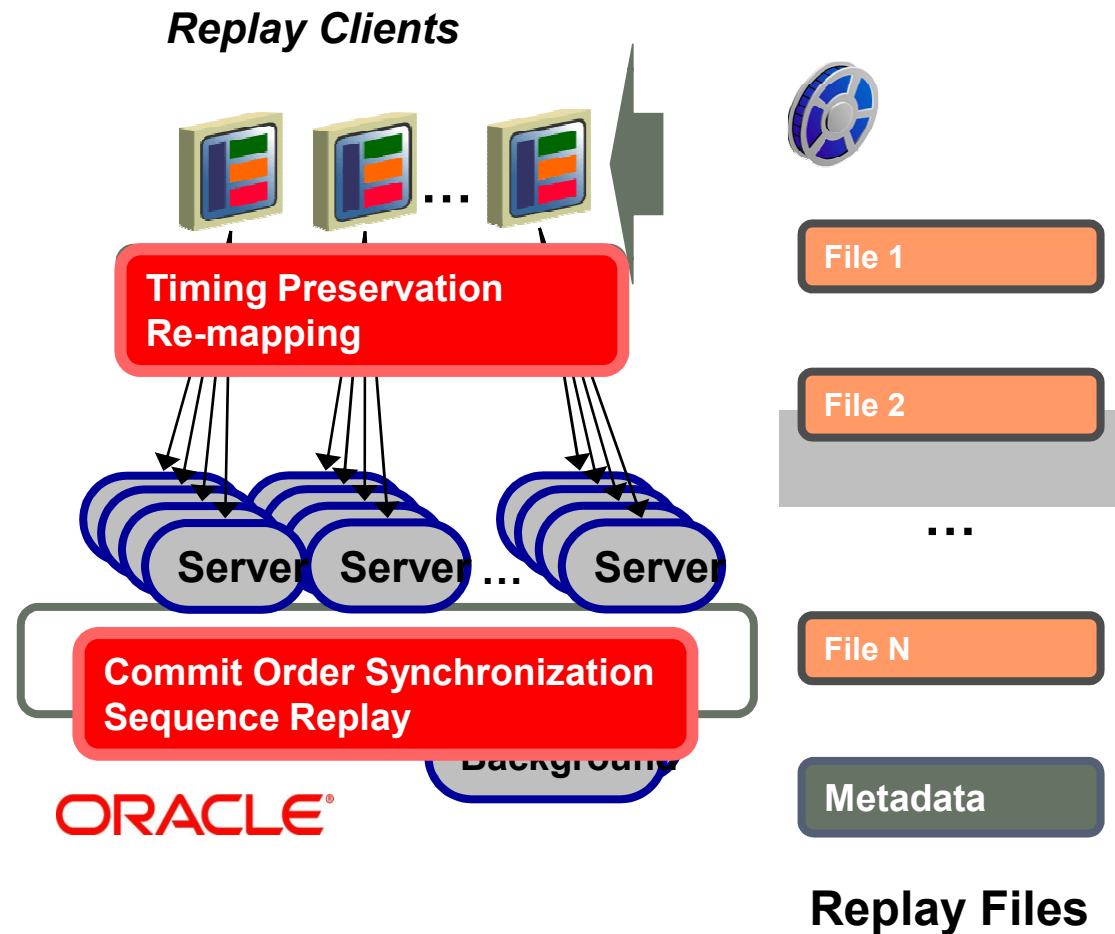
## Step 2: Process Workload Files

- Setup test system
  - Application data should be same as production system as of capture start time
  - Use RMAN, Snapshot Standby, imp/exp, Data Pump, etc. to create test system
  - Make change: upgrade db and/or OS, change storage, migrate platforms, etc.
- Processing transforms captured data into replayable format
- Once processed, workload can be replayed many times
- For RAC copy all capture files to single location for processing



# Step 3: Replay Workload

- Replay captured workload
  - Replayed operations see the same data and perform the same work
  - Preserve timing and concurrency characteristics
  - Same number of user connections
- Replay Client
  - Multithreaded OCI Client
  - Drives multiple captured processes
  - Scalable Architecture
  - Interprets capture into sequence of OCI calls
  - Functional replay



# Step 4: Analysis & Reporting



- **Error Divergence:** For each call error divergence is reported
  - New: Error encountered during replay not seen during capture
  - Not Found: Error encountered during capture not seen during replay
  - Mutated: Different error produced in replay than during capture
- **Data Divergence**
  - *Replay:* Number of rows returned by each call are compared and divergences reported
  - *User:* Application level validation scripts
- **Performance Reporting**
  - Capture and Replay Report: Provides high-level performance information
  - ADDM Report: Provides in-depth performance analysis
  - AWR, ASH Report: Facilitates comparative or skew analysis

# Current Restrictions

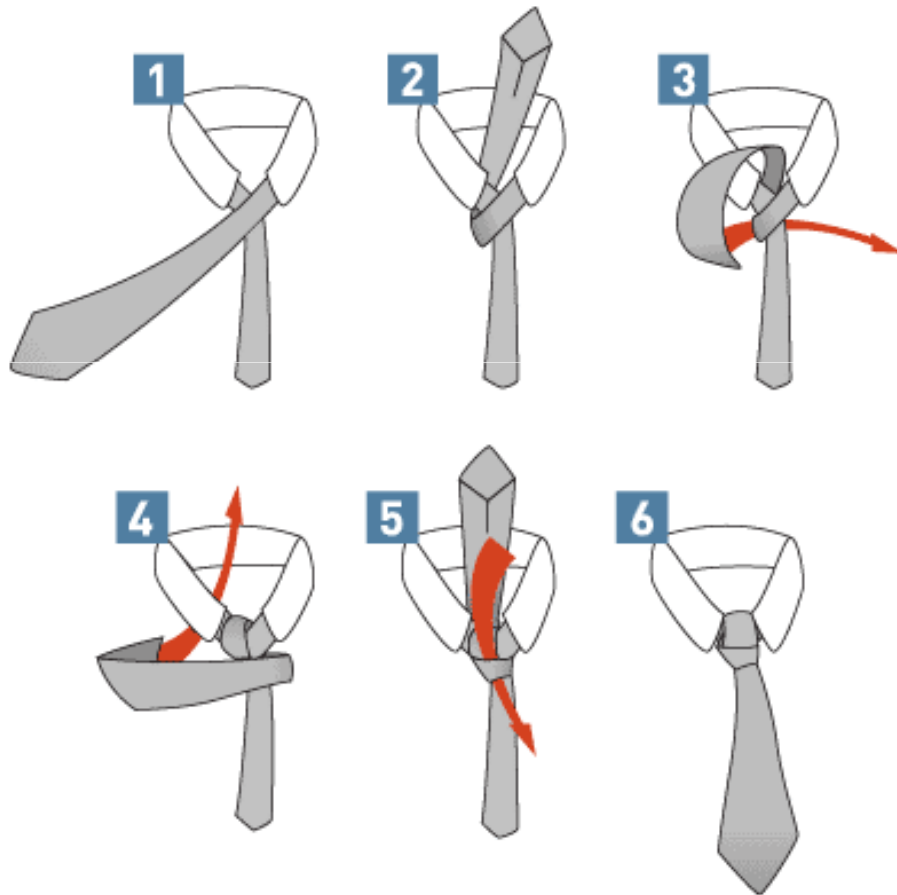
- Database Replay does not support the following features in the current release
  - SQL Loader direct path load, import/export
  - OCI based object navigation (ADTs) and REF binds
  - Non-PL/SQL based AQ
  - Distributed transactions, remote describe/commit operations
  - Flashback queries





# Database Replay

- Step-By-Step





# Database Replay

1. Create a copy of the database to replay the workload
  - RMAN Duplicate
  - Snapshot Standby
    - Possibly create a guaranteed restore point



# Database Replay

## 2. Some guidelines for **Workload Capture**

- Ideally restart prod database
  - Why? All transactions can be closed correctly
- RAC: Just one instance up and running, then start Capture and now start the other instances
- Start Capture before users logon to the database
  - Therefore start database in **RESTRICTED** mode
  - As soon as Capture begins it will switch to **UNRESTRICTED**

# Database Replay

## 2. Workflow in EM: Workload Capture

ORACLE Enterprise Manager 11g Database Control

Setup Preferences Help Logout Database

Database Instance: HUGO > Logged in As SYS

Database Replay

Database Replay allows workloads to be captured from production systems and re-executed with high fidelity on test copies of production databases. This enables detailed analysis of how the proposed changes may affect production systems; for instance, patching or upgrading database software.

Page Refreshed Oct 8, 2009 12:52:02 AM EDT Refresh

Task	Task Name	Description	Go to Task
1	Capture Workload	Capture a workload from the production environment. This can be scheduled to accommodate a database restart if desired.	
2	Preprocess Workload	Preprocessing prepares a captured workload for replay. You must do this once for every captured workload. Preprocessing is best performed in the test database. The captured workload must be accessible from the test database.	
3	Replay Workload	Replay the preprocessed workload on a test copy of the production database.	

[View Workload Capture History](#)

Active Capture and Replay

Select	Name	Type	Directory Object	Start Time
	No items found			

**Overview**

The following are the typical steps to perform Database Replay:

1. Capture the workload on a database. (Task 1)
2. Optionally export the AWR data. (Task 1)
3. Restore the replay database on a test system to match the capture database at the start of the workload capture.
4. Make changes (such as perform an upgrade) to the test system as needed.
5. Copy the captured workload to the test system.
6. Preprocess the captured workload. (Task 2)
7. Configure the test system for the replay.
8. Replay the workload on the restored database. (Task 3)



# Database Replay

## 2. Preparation steps in EM: Workload Capture

ORACLE® Enterprise Manager 11g Database Control Setup Preferences Help Logout

**Database**

● — ○ — ○ — ○ — ○  
Plan Environment Options Parameters Schedule Review

---

### Capture Workload: Plan Environment

Database HUGO Cancel Step 1 of 5 Next  
Logged In As SYS

The following prerequisites should be met to avoid potential problems before proceeding to capture the workload.

Prerequisite	Acknowledge
Make sure there is enough disk space to hold the captured workload. Consider doing a short duration workload capture and using it for estimating the disk space requirement of a full workload capture.	<input type="checkbox"/>
Make sure you can restore the replay database to match the capture database at the start of the workload capture. A successful workload replay depends on application transactions accessing application data identical to that on a capture system. Common ways to restore application data state include point-in-time recovery, flashback, and import/export.	<input type="checkbox"/>



# Database Replay

## 3. Define Workload Filter:

- Default:  
All user sessions will be recorded
- **Inclusion** filter:  
Only specified user session will be recorded
- **Exclusion** filter:  
All but specified user sessions will be recorded
  - For instance exclude "OMS" and "emagent%"
- Both filters can't be combined
- Package:

```
DBMS_WORKLOAD_CAPTURE.ADD_FILTER (fname=>'myFilter',  
                                  fattribute=>'USER',  
                                  fvalue=>'SCOTT');  
  
DBMS_WORKLOAD_CAPTURE.DELETE_FILTER (fname=>'myFilter');
```

# Database Replay

## 3. Define Workload Filter in EM:

ORACLE Enterprise Manager 11g Database Control Setup Preferences Help Logout

Plan Environment **Options** Parameters Schedule Review

---

**Capture Workload: Options**

Database HUGO  
Logged In As SYS Cancel Back Step 2 of 5 Next

---

**Database Restart Options**

A database restart prior to a workload capture is recommended to ensure a complete and accurate capture. Not restarting could capture in-flight transactions, which may adversely affect the replay of subsequent captured transactions.

- Do not restart the database prior to the capture.
- Restart the database prior to the capture.

**Workload Filters**

Workload filters can customize the workload to be captured. By default, most external client requests made to the database are captured. Refer to the Oracle Real Application Testing User's Guide for more information.

Filter Mode: Exclusion

**Excluded Sessions**

All sessions will be captured except for those listed below.

Filter Name	Type	Session Attribute	Value	Remove
Oracle Management Service (DEFAULT)	Excluded	Program	OMS	
Oracle Management Agent (DEFAULT)	Excluded	Program	emagent%	

Add Another Row

[TIP: You cannot use wildcards in a filter value.](#)

# Database Replay

## 4. Define the capture name:

The screenshot shows the Oracle Enterprise Manager 11g Database Control interface. At the top, the title bar reads "ORACLE Enterprise Manager 11g Database Control" and "Database". Navigation links for "Setup", "Preferences", "Help", and "Logout" are visible. A progress bar below the title bar shows five steps: "Plan Environment", "Options", "Parameters", "Schedule", and "Review". The "Parameters" step is currently selected and highlighted in blue. Below the progress bar, the section "Capture Workload: Parameters" is displayed. It shows the database name "HUGO" and the user "SYS". Navigation buttons include "Cancel", "Back", "Step 3 of 5", and "Next". The "Workload Capture Parameters" section contains a text input field for "Capture Name" with the value "CAPTURE-HUGO-20091008005325" and a dropdown menu for "Directory Object" set to "SUBDIR". A "Create Directory Object" button is next to the dropdown. A note below the dropdown states: "Select a directory object to hold the captured workload. The selected directory must be empty."

# Database Replay

## 4. Schedule the capture run:

ORACLE Enterprise Manager 11g Database Control Setup Preferences Help Logout Database

Plan Environment Options Parameters **Schedule** Review

---

**Capture Workload: Schedule**

Database HUGO  
Logged In As SYS Cancel Back Step 4 of 5 Next

---

**Job Parameters**

\* Job Name   
Description

---

**Job Schedule**

Choose a start time and a capture duration so that the workload you are interested in replaying at a later time can be captured.

**Start** **Capture Duration**

Immediately  
 Later

Date    
(example: Oct 8, 2009)

Time     AM  PM

Not Specified  
Capture must be stopped manually if duration is not specified

Duration

Hours  Minutes

---

**Job Credentials**

**Host Credentials**

\* Username   
\* Password   
\* Confirm Password

Save as Preferred Credential

# Database Replay

## 4. Schedule the capture run:

ORACLE Enterprise Manager 11g Database Control [Setup](#) [Preferences](#) [Help](#) [Logout](#)

**Database**

Plan Environment Options Parameters Schedule **Review**

---

**Capture Workload: Review**

Database **HUGO** Cancel Back Step 5 of 5 Submit  
Logged In As **SYS**

---

Review the following settings for capturing the workload.

Job Name **CAPTURE-HUGO-20091008005325**  
Capture Name **CAPTURE-HUGO-20091008005325**  
Directory Object **SUBDIR**  
Start Time **Immediately**  
Capture Duration **0 Hours 5 Minutes**

**Database Restart**

Restart Database **No**

**Workload Filters: Excluded Sessions**

Filter Name	Type	Session Attribute	Value
Oracle Management Service (DEFAULT)	Excluded	Program	OMS
Oracle Management Agent (DEFAULT)	Excluded	Program	emagent%

# Database Replay

## 4. Start Capture in line mode:

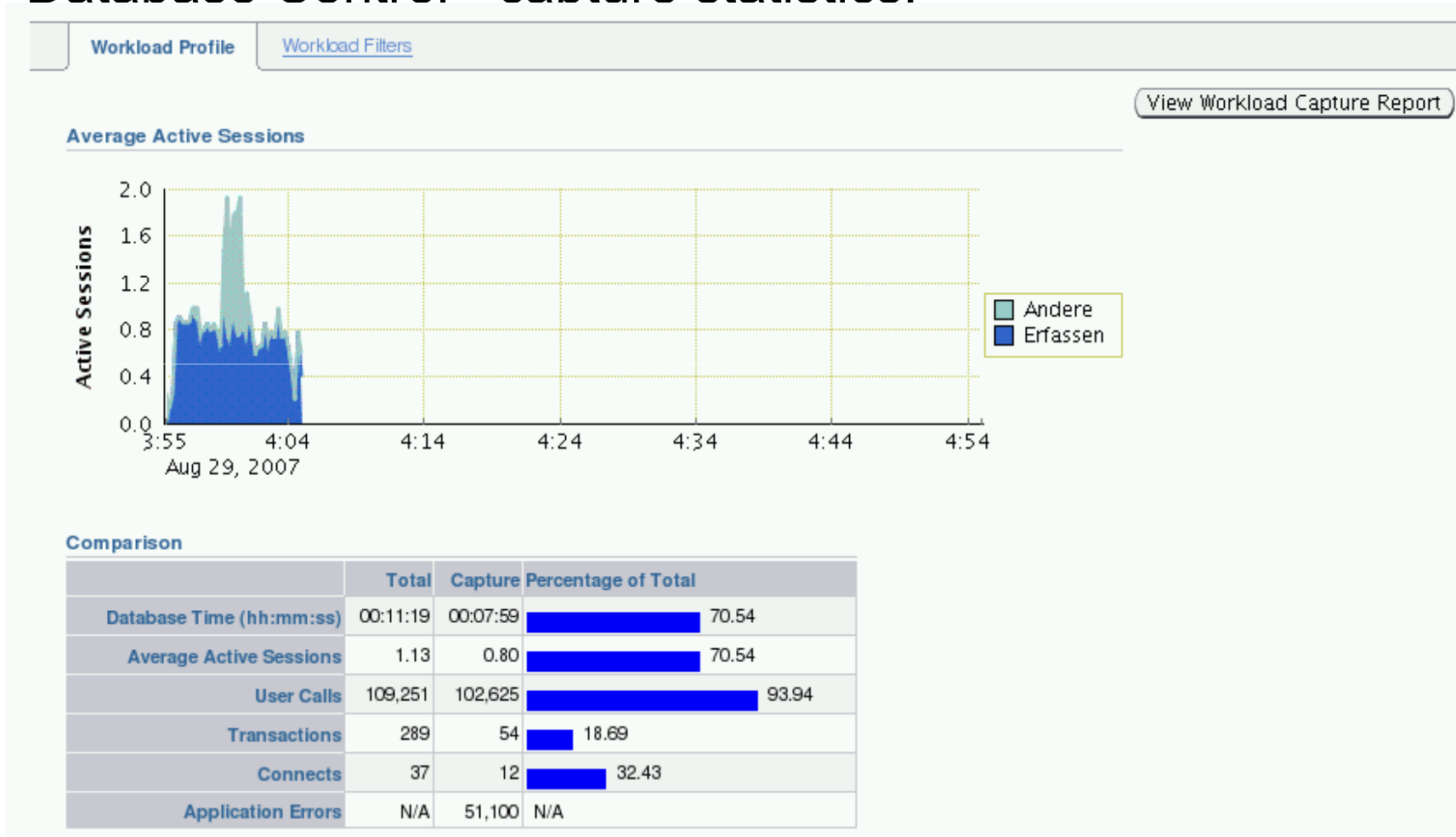
- ```
BEGIN
  DBMS_WORKLOAD_CAPTURE.START_CAPTURE
  (name => 'hammerora_single_01',
   dir => 'TESTING',
   default_action => 'EXCLUDE');
END;
/
```

## 5. Stop Capture:

- ```
BEGIN
  DBMS_WORKLOAD_CAPTURE.FINISH_CAPTURE ();
END;
/
```

# Database Replay

- Database Control - capture statistics:







# Database Replay

- Export AWR in line mode:

- ```
BEGIN
  DBMS_WORKLOAD_CAPTURE.EXPORT_AWR
    (capture_id => 5);
END;
/
```

# Database Replay

- Preprocessing captured workload:

ORACLE Enterprise Manager 11g Database Control Setup Preferences Help Logout

Database

Database Instance: HUGO > Logged in As SYS

### Database Replay

Database Replay allows workloads to be captured from production systems and re-executed with high fidelity on test copies of production databases. This enables detailed analysis of how the proposed changes may affect production systems; for instance, patching or upgrading database software. Page Refreshed Oct 8, 2009 12:52:02 AM EDT Refresh

| Task | Task Name           | Description                                                                                                                                                                                                                      | Go to Task |
|------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1    | Capture Workload    | Capture a workload from the production environment. This can be scheduled to accommodate a database restart if desired.                                                                                                          |            |
| 2    | Preprocess Workload | Preprocessing prepares a captured workload for replay. You must do this once for every captured workload. Preprocessing is best performed in the test database. The captured workload must be accessible from the test database. |            |
| 3    | Replay Workload     | Replay the preprocessed workload on a test copy of the production database.                                                                                                                                                      |            |

#### Overview

The following are the typical steps to perform Database Replay:

1. Capture the workload on a database. (Task 1)
2. Optionally export the AWR data. (Task 1)
3. Restore the replay database on a test system to match the capture database at the start of the workload capture.
4. Make changes (such as perform an upgrade) to the test system as needed.
5. Copy the captured workload to the test system.
6. Preprocess the captured workload. (Task 2)
7. Configure the test system for the replay.
8. Replay the workload on the restored database. (Task 3)

[View Workload Capture History](#)

#### Active Capture and Replay

| Select         | Name | Type | Directory Object | Start Time |
|----------------|------|------|------------------|------------|
| No items found |      |      |                  |            |



# Database Replay

- Preprocessing in line mode:

- ```
BEGIN
  DBMS_WORKLOAD_REPLAY.PROCESS_CAPTURE
(capture_dir => 'TESTING');
END;
/
```

- Restore database from backup



# Database Replay

- Import AWR snap

```
•  
  DECLARE db_id number;  
  BEGIN  
    db_id := DBMS_WORKLOAD_CAPTURE.IMPORT_AWR  
    (capture_id => 5, staging_schema => 'TPCC');  
  END;  
  /
```

# Database Replay

- Workload Replay: replay parameters

ORACLE Enterprise Manager 11g Database Control Setup Preferences Help Logout

**Database**

Choose Initial Options — **Customize Options** — Prepare Replay Clients — Wait for Client Connections — Review

---

### Replay Workload: Customize Options

Database **ORCL** Cancel Back Step 2 of 5 Next  
 Capture Name **CAPTURE\_ORCL\_TEST01**  
 Logged In As **SYS**

[Connection Mappings](#) | **Replay Parameters**

Some replay parameters can be modified to change the behavior of the replay. Refer to system documentation for more information.

Name	Description	Value
synchronization	This parameter determines if synchronization will be used during workload replay. If this parameter is set to TRUE, the COMMIT order in the captured workload will be preserved during replay and all replay actions will be executed only after all dependent COMMIT actions have completed. The default value is TRUE.	TRUE
connect_time_scale	This parameter scales the elapsed time from when the workload capture started to when the session connects with the specified value and is interpreted as a % value. The default value is 100.	100 %
think_time_scale	This parameter scales the elapsed time between two successive user calls from the same session and is interpreted as a % value. Setting this parameter to 0 will send user calls to the database as fast as possible during replay. The default value is 100.	100 %
think_time_auto_correc	This parameter reduces the think time if workload replay goes slower than workload capture. If this parameter is set to TRUE, the system will correct the think time (based on the think_time_scale parameter) between calls when user calls take longer to complete during replay than during capture. The default value is TRUE.	TRUE



# Database Replay

- Initialize and parameterize workload replay clients (wrc):

- **BEGIN**

```
DBMS_WORKLOAD_REPLAY.INITIALIZE_REPLAY  
(replay_name => 'play_hammerora_01',  
 replay_dir => 'TESTING');
```

```
DBMS_WORKLOAD_REPLAY.PREPARE_REPLAY  
(synchronization => TRUE);
```

```
END;  
/
```



# Database Replay

- Workload Replay Clients: Calibrate
  - `$> wrc mode=calibrate replaydir=/tmp/testing`
- Workload Replay Clients: Start
  - `$> wrc system/oracle mode=replay`

```
$ wrc system/oracle@orcl mode=replay
```

```
Workload Replay Client: Release 11.2.0.1.0 - Production on Thu Oct 8 01:21:55 2009
```

```
Copyright (c) 1982, 2009, Oracle and/or its affiliates. All rights reserved.
```

```
Wait for the replay to start (09:02:10)
```



# Database Replay

- Start Workload Replay in command line mode:

- ```
BEGIN
  DBMS_WORKLOAD_REPLAY.START_REPLAY ();
END;
/
```







# Database Replay

- Monitor divergence stats:

| Divergence                                    |                 |                           |
|-----------------------------------------------|-----------------|---------------------------|
|                                               | Number of Calls | Percentage of Total Calls |
| <b>Error Divergence:</b>                      |                 |                           |
| Session Failures Seen During Replay           | 0               | 0.00                      |
| Errors No Longer Seen During Replay           | 0               | 0.00                      |
| Errors Mutated During Replay                  | 0               | 0.00                      |
| New Errors Seen During Replay                 | 0               | 0.00                      |
| <b>Data Divergence:</b>                       |                 |                           |
| DMLs with Different Number of Rows Modified   | 0               | 0.00                      |
| SELECTs with Different Number of Rows Fetched | 0               | 0.00                      |

| Detailed Comparison      |          |          |                                                                                            |
|--------------------------|----------|----------|--------------------------------------------------------------------------------------------|
|                          | Capture  | Replay   | Percentage of Capture                                                                      |
| Duration (hh:mm:ss)      | 00:10:25 | 00:10:00 |  96.00 |
| Database Time (hh:mm:ss) | 00:17:06 | 00:15:22 |  89.86 |
| Average Active Sessions  | 1.64     | 1.54     |  93.61 |
| User Calls               | 18,141   | 18,133   |  99.96 |

# Database Replay

- Workload Replay result:

**Summary**

|                      |               |                     |                              |
|----------------------|---------------|---------------------|------------------------------|
| Replay Name          | REPLAY_TEST02 | Capture Name        | CAPTURE_ORCL_TEST01          |
| Directory Object     | CAPDIR ⓘ      | Duration (hh:mm:ss) | 00:10:00                     |
| Database Name        | ORCL          | Prepare Time        | Aug 30, 2007 8:59:45 AM CEST |
| DBID                 | 1159492831    | Start Time          | Aug 30, 2007 9:03:28 AM CEST |
| Replay Error Code    | N/A           | End Time            | Aug 30, 2007 9:13:28 AM CEST |
| Replay Error Message | None          |                     |                              |

[Workload Profile](#) | [Connection Mappings](#) | [Replay Parameters](#) | [Report](#)

Network Time (hh:mm:ss) 00:00:01      Clients 1  
Think Time (hh:mm:ss) 00:00:00      Clients Finished 1

**Elapsed Time Comparison**

|         |       |
|---------|-------|
| Capture | ~10.5 |
| Replay  | ~10.0 |

Legend:   
■ Replay Elapsed (Green)   
■ Capture Elapsed (Blue)   
■ Not Yet Replayed (Grey)

**Assessing the Replay**

The Elapsed Time Comparison chart shows how much time the replayed workload has taken to accomplish the same amount of work as captured.

When the Replay bar is shorter than the Capture bar then the replay environment is processing the workload faster than the capture environment.

The divergence table gives information about both the data and error discrepancies between the replay and capture environments, which can be used as a measure of the replay quality.

[View Workload Replay Report](#)

**Divergence**

# Database Replay

- Workload replay reporting in CLI:

```
• DECLARE
  cap_id          NUMBER;
  rep_id          NUMBER;
  rep_rpt         CLOB;
BEGIN
  cap_id := DBMS_WORKLOAD_REPLAY.GET_REPLAY_INFO
            (dir => 'TESTING');

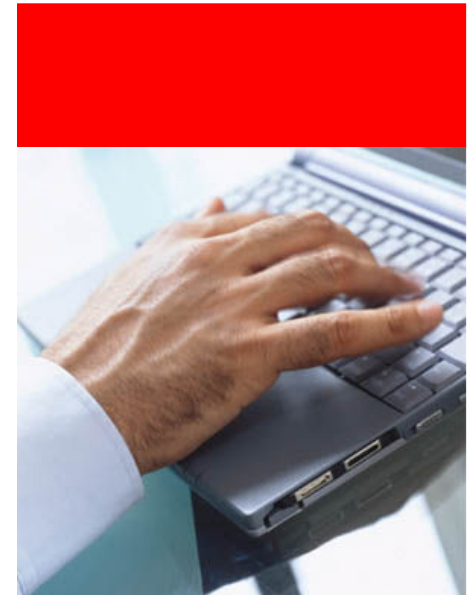
  /* Get the latest replay for that capture */
  SELECT max(id) INTO rep_id
  FROM    dba_workload_replays WHERE capture_id=cap_id;

  rep_rpt := DBMS_WORKLOAD_REPLAY.REPORT
            (replay_id => rep_id,
             format => DBMS_WORKLOAD_REPLAY.TYPE_TEXT);
END;
/
```

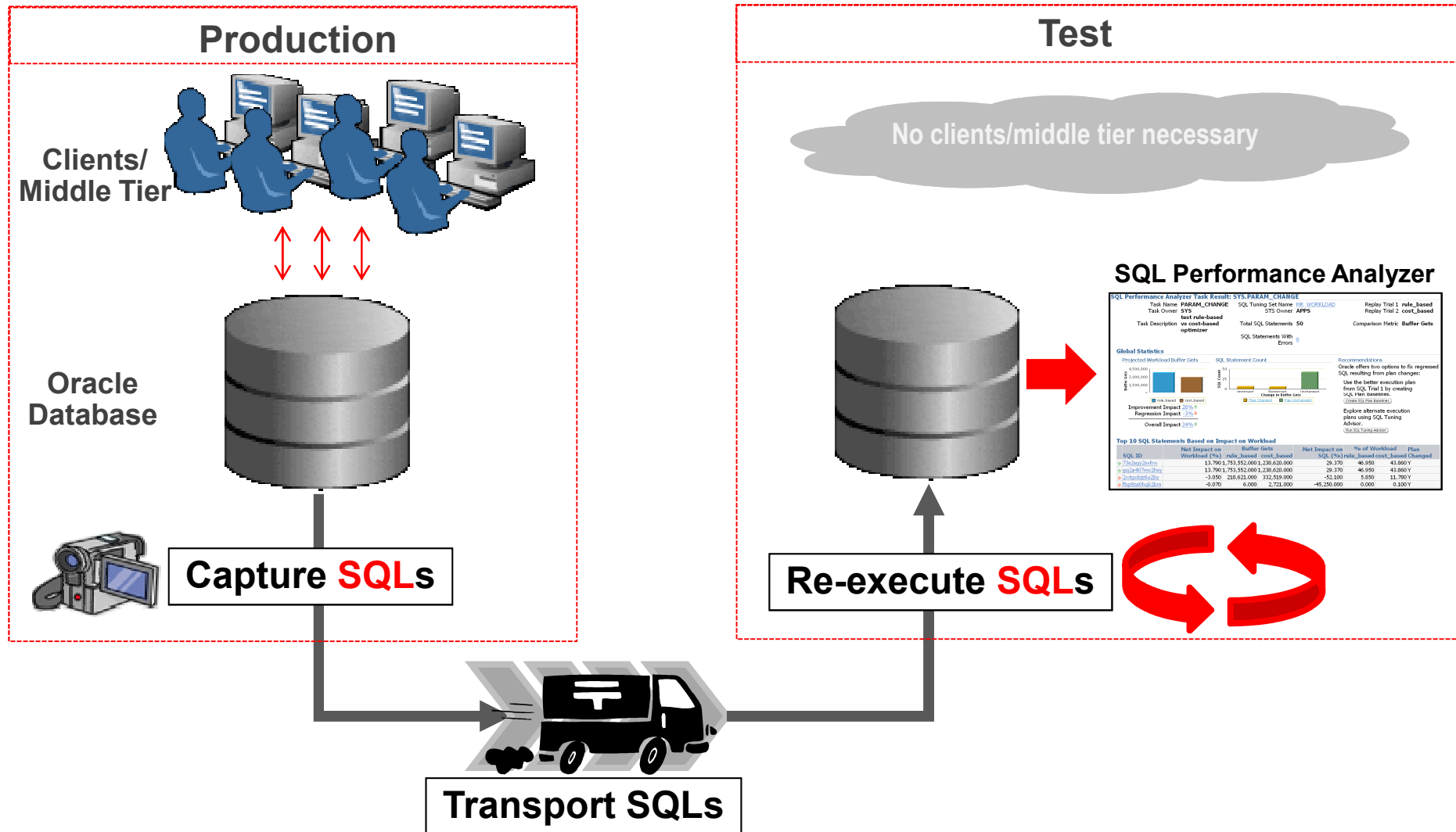
# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices

Challenges  
SQL Plan Management  
Database Replay  
SQL Performance Analyzer



# SQL Performance Analyzer: Overview



# SPA in Enterprise Manager

## SQL Performance Analyzer

Page Refreshed Oct 8, 2009 1:25:46 AM EDT  [View Data](#) Real Time: 15 Second Refresh ▾

SQL Performance Analyzer allows you to test and to analyze the effects of changes on the execution performance of SQL contained in a SQL Tuning Set.

### SQL Performance Analyzer Workflows

Create and execute SQL Performance Analyzer Task experiments of different types using the following links

|                                          |                                                                                                          |
|------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <a href="#">Upgrade from 9i or 10.1</a>  | Test and analyze the effects of database upgrade from 9i or 10.1 on SQL Tuning Set performance.          |
| <a href="#">Upgrade from 10.2 or 11g</a> | Test and analyze the effects of database upgrade from 10.2 or 11g on SQL Tuning Set performance.         |
| <a href="#">Parameter Change</a>         | Test and compare an initialization parameter change on SQL Tuning Set performance.                       |
| <a href="#">Exadata Simulation</a>       | Simulate the effects of a Exadata Storage Server installation on SQL Tuning Set performance.             |
| <a href="#">Guided Workflow</a>          | Create a SQL Performance Analyzer Task and execute custom experiments using manually created SQL trials. |

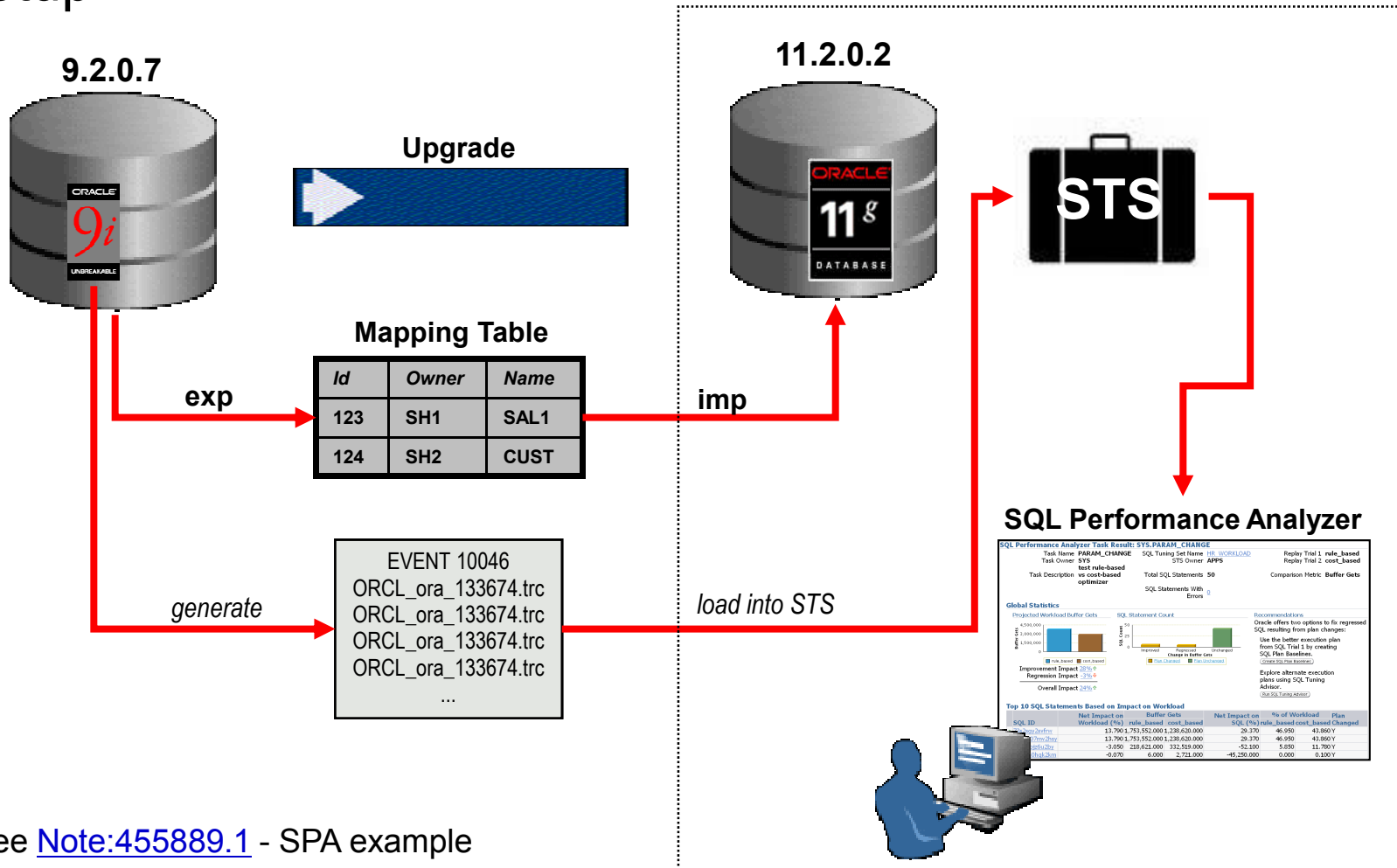
### SQL Performance Analyzer Tasks

| Select | Name                                         | Owner | Last Modified | Current Step Name | Type | Status | SQLs Processed | Steps Completed |
|--------|----------------------------------------------|-------|---------------|-------------------|------|--------|----------------|-----------------|
|        | No SQL Performance Analyzer Tasks available. |       |               |                   |      |        |                |                 |

 **TIP** For an explanation of the icons and symbols used in the following table, see the [Icon Key](#)

# SPA with a 9i workload

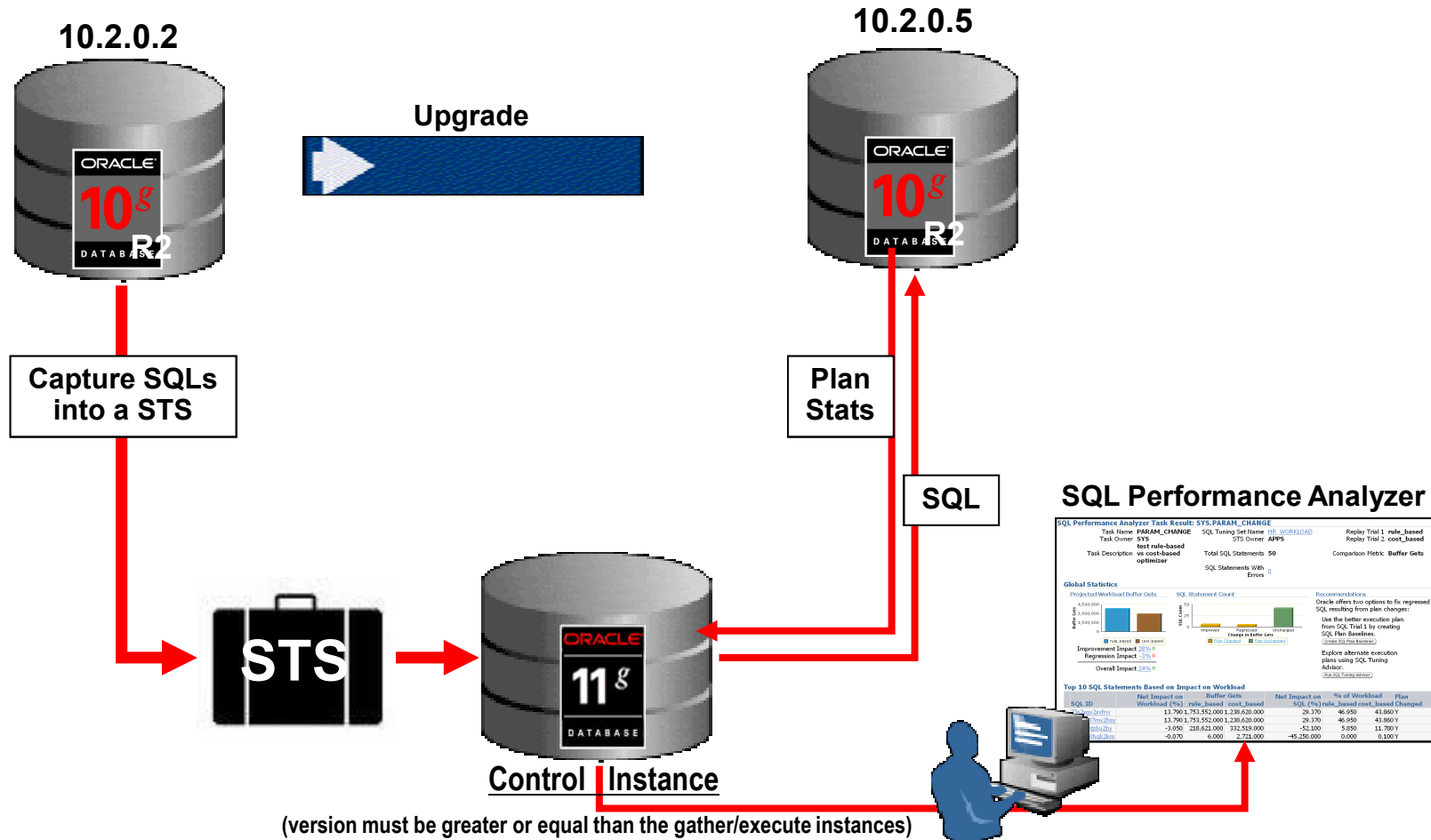
- Setup



See [Note:455889.1](#) - SPA example

# SPA for patch upgrades: 10.2.0.2 => 10.2.0.5

- Setup







# SPA for a 9i workload against 11g

- Enable statistics timing:

- `alter system set timed_statistics=true;`

- Enable tracing on 9i:

- `alter system set events  
'10046 trace name context forever, level 4';`

# SPA for a 9i workload against 11g

- Create the mapping table in 9i:

```
• create table MAPPING_TABLE as
  select object_id id, owner, substr(object_name, 1, 30) name
  from dba_objects
  where object_type NOT IN ('CONSUMER GROUP', 'EVALUATION
  CONTEXT', 'FUNCTION', 'INDEXTYPE', 'JAVA CLASS', 'JAVA
  DATA', 'JAVA RESOURCE', 'LIBRARY', 'LOB', 'OPERATOR',
  'PACKAGE', 'PACKAGE BODY', 'PROCEDURE', 'QUEUE', 'RESOURCE
  PLAN', 'SYNONYM', 'TRIGGER', 'TYPE', 'TYPE BODY,')
  union all select user_id id, username owner, null name
  from dba_users;
```

- Disable tracing in 9i afterwards:

```
• alter system set events '10046 trace name context forever off';
```

- Export mapping table with `exp`



# SPA for a 9i workload against 11g

- Create a directory object in 11g:
  - `create or replace DIRECTORY 'SPA_DIR' as '/tmp/spa';`
- Use 11.1.0.7 or above
  - See [Note:562899.1](#)  
Testing SQL performance impact of an Oracle 9i to Oracle Database 10gR2 upgrade with SPA
- Transport *event 10046 trace files* to the 11g system
- Import mapping table

# SPA for a 9i workload against 11g

- Create a SQL Tuning Set (STS) in 11g:

```
• declare
  mycur      DBMS_SQLTUNE.SQLSET_CURSOR;
begin
  DBMS_SQLTUNE.CREATE_SQLSET('SPA_9iWKLD');
  open mycur for
    select value(p) from
      table(DBMS_SQLTUNE.SELECT_SQL_TRACE(
        directory => 'SPA_DIR',
        file_name => '%ora%',
        mapping_table_name => 'MAPPING_TABLE',
        select_mode => DBMS_SQLTUNE.SINGLE_EXECUTION)) p;
  DBMS_SQLTUNE.LOAD_SQLSET('SPA_9iWKLD', mycur);
  close mycur;
end;
/
```

- Monitor progress in DBA\_SQLSET



# SPA for a 9i workload against 11g

- Create a SPA task in 11g:

- `var tname varchar2(200);`

```
execute
```

```
  :tname := DBMS_SQLPA.CREATE_ANALYSIS_TASK(  
    sqlset_name => 'SPA_9iWKLD',  
    task_name   => 'SPA_TASK_9i_11g',  
    description => 'Test 9i to 11g upgrade');
```

```
print tname
```

# SPA for a 9i workload against 11g

- Parameterize the SPA task

```
begin
  DBMS_SQLPA.SET_ANALYSIS_TASK_PARAMETER(
    task_name => 'SPA_TASK_9i_11g',
    parameter => 'WORKLOAD_IMPACT_THRESHOLD',
    value => 0);
  DBMS_SQLPA.SET_ANALYSIS_TASK_PARAMETER(
    task_name => 'SPA_TASK_9i_11g',
    parameter => 'SQL_IMPACT_THRESHOLD',
    value => 5);
end;
/
```

- To filter "noise" use "SQL\_IMPACT\_THRESHOLD"=5 (means only regressed SQL 5% above this threshold will be shown)

# SPA for a 9i workload against 11g

- Establish "Before Change" trial (from collected 9i info)

```
begin
  DBMS_SQLPA.EXECUTE_ANALYSIS_TASK(
    task_name      => 'SPA_TASK_9i_11g',
    execution_name => 'SPA_RUN1_9i',
    execution_type => 'CONVERT SQLSET',
    execution_desc => '9i run generated from STS');
end;
/
```

- Run 11g execution

- ```
begin
  DBMS_SQLPA.EXECUTE_ANALYSIS_TASK(
    task_name      => 'SPA_TASK_9i_11g',
    execution_name => 'SPA_RUN2_11g',
    execution_type => 'TEST EXECUTE',
    execution_desc => 'Test now against 11g');
end;
/
```

# SPA for a 9i workload against 11g

- Compare results

```
•  
execute  
  DBMS_SQLPA.EXECUTE_ANALYSIS_TASK(  
    task_name          => 'SPA_TASK_9i_11g',  
    execution_name     => 'COMPARE_9i_11g_CPU',  
    execution_type     => 'COMPARE PERFORMANCE',  
    execution_params  => DBMS_ADVISOR.ARGLIST(  
                          'COMPARISON_METRIC', 'CPU_TIME',  
                          'EXECUTION_NAME1', 'SPA_RUN1_9i',  
                          'EXECUTION_NAME2', 'SPA_RUN2_11g'),  
    execution_desc     => 'Compare 9i vs. 11g on CPU_TIME');
```

- Comparison metrics options:

- CPU\_TIME
  - BUFFER\_GETS
  - PARSE\_TIME
  - ELAPSED\_TIME
  - USER\_IO\_TIME
  - DISK\_READS
  - DIRECT\_WRITES
  - OPTIMIZER\_COST
- } Compare performance for at least these two metrics



# SPA for a 9i workload against 11g

- Generate **summary** report

```
• set heading off
  set long 1000000000
  set longchunksize 10000
  set echo off;
  set linesize 1000;

  spool /tmp/spa_9i_11g_cpu_summary.html

  select
    xmltype(DBMS_SQLPA.REPORT_ANALYSIS_TASK(
      'SPA_TASK_9i_11g',      /* task_name */
      'html',                /* type */
      'typical',             /* level */
      'summary',             /* section */
      null,                  /* object_id */
      100,                   /* top_sql */
      'COMPARE_9i_11g_CPU')) .getclobval(2,2) /* execution_name */
  from dual;

  spool off
```

# SPA for a 9i workload against 11g

- Generate **regressed SQL** report

```
• set heading off
  set long 1000000000
  set longchunksize 10000
  set echo off;
  set linesize 1000;

  spool /tmp/spa_9i_11g_cpu_regressed.html

  select
    xmltype(DBMS_SQLPA.REPORT_ANALYSIS_TASK(
      'SPA_TASK_9i_11g',           /* task_name */
      'html',                     /* type */
      'regressed',               /* level */
      'all',                      /* section */
      null,                       /* object_id */
      null,                       /* top_sql */
      'COMPARE_9i_11g_CPU')) .getclobval(2,2) /* execution_name */
  from dual;

  spool off
```

# SPA for a 9i workload against 11g

- Generate **changed plans** report

```
• set heading off
  set long 1000000000
  set longchunksize 10000
  set echo off;
  set linesize 1000;

  spool /tmp/spa_9i_11g_changed_plans.html

  select
    xmltype(DBMS_SQLPA.REPORT_ANALYSIS_TASK(
      'SPA_TASK_9i_11g',           /* task_name */
      'html',                     /* type */
      'changed_plans',           /* level */
      'all',                      /* section */
      null,                       /* object_id */
      null,                       /* top_sql */
      'COMPARE_9i_11g_CPU')) .getclobval(2,2) /* execution_name */
  from dual;

  spool off
```

# Real World Experience: SPA

- Regressed report in detail:

**Report Summary**

---

**Projected Workload Change Impact:**

Overall Impact : 0%  
 Improvement Impact : 0%  
 Regression Impact : 0%

**SQL Statement Count**

SQL Category	SQL Count	Plan Change Count
Overall	3552	1593
Improved	658	410
Regressed	99	45
Unchanged	1756	1138
With Errors	1000	0

**SQL Statements Sorted by their Absolute Value of Change Impact on the Workload**

object_id	sql_id	Impact on Workload	Metric Before	Metric After	Impact on SQL	% Workload Before	% Workload After	Plan Change
7277	<a href="#">a304c09qqxxf3</a>	-,4%	20	220	-1000%	,04%	1,3%	y
8144	<a href="#">f26jufdtij0zm</a>	-,26%	20	150	-650%	,04%	,89%	y
7283	<a href="#">a4vrsq0i6v2fc</a>	-,22%	360	470	-30,56%	,73%	2,78%	y
7121	<a href="#">acnhk0m3z1u8x</a>	-,2%	520	620	-19,23%	1,05%	3,66%	n
10654	<a href="#">99nvqcudjk24p</a>	-,16%	40	120	-200%	,08%	,71%	y
10370	<a href="#">8154ppykrdwip</a>	-,1%	100	150	-50%	,2%	,89%	y
7432	<a href="#">bssxzb5u2r4s8</a>	-,04%	10	30	-200%	,02%	,18%	n
8191	<a href="#">f7urp05wu65qc</a>	-,04%	10	30	-200%	,02%	,18%	n
10076	<a href="#">7q35p71hppfwc</a>	-,04%	70	90	-28,57%	,14%	,53%	y
7122	<a href="#">acp131vy307d6</a>	-,02%	0	10	-1000%	0%	,06%	n
7125	<a href="#">adc1mqhj6vq2k</a>	-,02%	0	10	-1000%	0%	,06%	y
7246	<a href="#">a0c4hh6vqm0k1</a>	-,02%	0	10	-1000%	0%	,06%	n
7318	<a href="#">a9nrj45s4c0bk</a>	-,02%	0	10	-1000%	0%	,06%	n
7321	<a href="#">baqpudrqswspw</a>	-,02%	0	10	-1000%	0%	,06%	y

# Real World Experience: SPA

- Regressed report in detail:

## Report Details: statements Sorted by their Absolute Value of Change Impact on the Workload

### SQL Details:

**Object ID** : 7277  
**Schema Name** : UHRZS006  
**SQL ID** : a304c09gqxxf3  
**Execution Frequency** : 1  
**SQL Text** : select a,b,c from ( select ware a,kommentar b, p.nachname c from BUCHUNGEN b, PERSON p where zeit > '20080710000000' and eid = 349905 and kommentar like 'show\_user%' and b.ware = p.id and p.status != 'I' order by zeit desc) where rownum < 60

### Execution Statistics:

Stat Name	Impact on Workload	Value Before	Value After	Impact on SQL	% Workload Before	% Workload After
elapsed_time	-1,61%	,022	1,206	-5381,82%	,03%	4,08%
parse_time			,001			,02%
cpu_time	-,4%	,02	,22	-1000%	,04%	1,3%
buffer_gets	-,01%	1721	1802	-4,71%	,2%	,28%
cost			7			0%
reads	-20,66%	0	2215	-221500%	0%	7,09%
writes	0%	0	0	0%	0%	0%
rows		36	33			

### Findings (3):

1. Die Performance dieser SQL-Anweisung wurde vermindert.
2. Die Struktur des SQL-Ausführungsplans wurde geändert.
3. Die Anzahl von zurückgegebenen Zeilen in Ausführung 'CONV\_SPA\_TASK\_KLAUS' unterscheidet sich von Ausführung 'EXEC\_SPA\_TASK\_KLAUS'.

# Real World Experience: SPA

- Regressed report in detail:

## Execution Plan Before Change:

Plan Hash Value : Unknown

Id	Operation	Name	Rows	Bytes	Cost	Time
0	SELECT STATEMENT					
1	COUNT STOPKEY					
2	VIEW					
3	SORT ORDER BY STOPKEY					
4	NESTED LOOPS					
5	TABLE ACCESS BY INDEX ROWID	BUCHUNGEN				
6	INDEX RANGE SCAN	I_EID_BUCHUNGEN				
7	TABLE ACCESS BY INDEX ROWID	PERSON				
8	INDEX UNIQUE SCAN	SYS_C0010236				

Empty because source db was an Oracle 9i database

## Execution Plan After Change:

Plan Id : 27959

Plan Hash Value : 4020578872

Id	Operation	Name	Rows	Bytes	Cost	Time
0	SELECT STATEMENT		1	2154	7	00:00:01
* 1	COUNT STOPKEY					
2	VIEW		1	2154	7	00:00:01
* 3	SORT ORDER BY STOPKEY		1	220	7	00:00:01
4	NESTED LOOPS					
5	NESTED LOOPS		1	220	6	00:00:01
* 6	TABLE ACCESS BY INDEX ROWID	BUCHUNGEN	1	201	5	00:00:01
* 7	INDEX RANGE SCAN	I_EID_BUCHUNGEN	52		1	00:00:01
* 8	INDEX UNIQUE SCAN	SYS_C0012673	1		1	00:00:01
* 9	TABLE ACCESS BY INDEX ROWID	PERSON	1	19	1	00:00:01



# SPA for a 9i workload against 11g

- Compare results
  - Be cautious in interpreting trial results
  - Environmental traps:
    - SPA is agnostic of the environment used for pre- and post-change trials
  - Data changes during SQL tracing
  - Bias caused by SQL tracing in 9i
  - Reports may be overly optimistic or pessimistic due to above reasons
- Recommended approach is to investigate as follows:
  - Summary of change impact by `CPU_TIME` and `BUFFER_GETS`
  - Detailed regressed SQL based on `CPU_TIME` and `BUFFER_GETS`
  - SQL with changed plans

# Capturing a SQL Workload for SPA

- Capture from cursor cache
  - Create a SQL Tuning Set (STS)

```
• BEGIN
  DBMS_SQLTUNE.CREATE_SQLSET (
    sqlset_name => 'SPA_STS',
    description => 'Upgrade test STS for SPA');
END;
/
```

- Capture SQL directly from the cursor cache into STS

```
• BEGIN
  DBMS_SQLTUNE.CAPTURE_CURSOR_CACHE_SQLSET (
    sqlset_name      => 'SPA_STS',
    time_limit       => 15*60,
    repeat_interval  => 10,
    capture_mode     => dbms_sqltune.MODE_ACCUMULATE_STATS);
END;
/
```



# Capturing a SQL Workload for SPA

- Filter statements from a STS:

```
EXEC
  DBMS_SQLTUNE.DELETE_SQLSET (
    sqlset_name => 'SPA_STS',
    basic_filter => 'parsing_schema_name='MDSYS'');
```

- This will delete all statements belonging to MDSYS from the STS
  - BASIC\_FILTER will be treated like a WHERE clause for this DELETE action
- Proceed with creation of a SPA analysis task:

```
EXECUTE
  DBMS_SQLPA.CREATE_ANALYSIS_TASK (
    task_name      => 'SPA_TASK_CURSOR_CACHE',
    description    => 'SPA with statements from CC',
    sqlset_name    => 'SPA_STS');
```

# Parameter Changes

- SPA Recommendation: SQL Tuning Advisor

**SQL Performance Analyzer Task Result: SYS.PARAM\_CHANGE**

Task Name	PARAM_CHANGE	SQL Tuning Set Name	HR_WORKLOAD	Replay Trial 1	rule_based
Task Owner	SYS	STS Owner	APPS	Replay Trial 2	cost_based
Task Description	test rule-based vs cost-based optimizer	Total SQL Statements	50	Comparison Metric	Buffer Gets
		SQL Statements With Errors	0		

**Global Statistics**

**Projected Workload Buffer Gets**

Improvement Impact **28%** ↑  
Regression Impact **-3%** ↓  
**Overall Impact 24%** ↑ 1

**SQL Statement Count**

Change in Buffer Gets

Plan Changed (yellow), Plan Unchanged (green)

**Recommendations**

Oracle offers two options to fix regressed SQL resulting from plan changes:

Use the better execution plan from SQL Trial 1 by creating SQL Plan Baselines.  
[Create SQL Plan Baselines](#)

Explore alternate execution plans using SQL Tuning Advisor.  
[Run SQL Tuning Advisor](#) 3

**Top 10 SQL Statements Based on Impact on Workload**

SQL ID	Net Impact on Workload (%)	Buffer Gets		Net Impact on SQL (%)	% of Workload		Plan Changed
		rule_based	cost_based		rule_based	cost_based	
↑ <a href="#">73s2sqy2svfrw</a>	13.790	1,753,552.000	1,238,620.000	29.370	46.950	43.860	Y
↑ <a href="#">gq2a407mv2hsy</a>	13.790	1,753,552.000	1,238,620.000	29.370	46.950	43.860	Y
↓ <a href="#">2wtgxbjz6u2by</a>	-3.050	218,621.000	332,519.000	-52.100	5.850	11.780	Y
↓ <a href="#">fbp9za0hqk2km</a>	-0.070	6.000	2,721.000	-45,250.000	0.000	0.100	Y

# Parameter Changes

- SQL Tuning Advisor offers SQL Profiles

**SQL Tuning Results:TUNEREG**

Status **COMPLETED**  
Started **Jul 17, 2007 2:03:03 PM**  
Completed **Jul 17, 2007 2:03:34 PM**

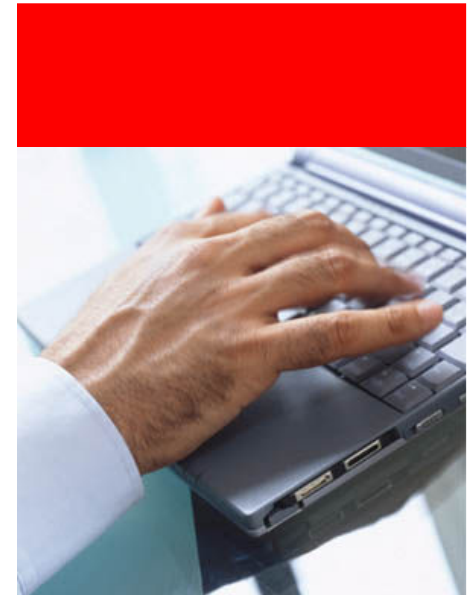
Page Refreshed **Oct 18, 2007 6:01:09 PM**  
Tuning Set Owner **APPS**  
Tuning Set Name **HR\_WORKLOAD**  
Time Limit (seconds) **1800**  
Running Time (seconds) **31**

**Recommendations**

Select	SQL Text	Parsing Schema	SQL ID	Statistics	SQL Profile	Index	Restructure SQL	Miscellaneous
<input checked="" type="radio"/>	SELECT /* my_query_14_scott */ /*+ ORDERED INDEX(t1) USE_HASH(t1) */ 'B'    t2.pg_featurevalue_0...	APPS	<a href="#">2wtgxbjz6u2by</a>		✓		✓	
<input type="radio"/>	SELECT /* my_query_4_scott */ DISTINCT 'B'    t1.pg_featurevalue_47_id pg_featurevalue_47_id FRO...	APPS	<a href="#">fbp9za0hqk2km</a>		✓			
<input type="radio"/>	SELECT /* my_query_1_scott */ DISTINCT 'B'    t1.pg_featurevalue_15_id pg_featurevalue_15_id FRO...	APPS	<a href="#">1h3c2y092ds9d</a>		✓			
<input type="radio"/>	SELECT /* my_query_2_scott */ DISTINCT 'B'    t1.pg_featurevalue_15_id pg_featurevalue_15_id FR...	APPS	<a href="#">654xs8xs5wp42</a>		✓			

# Agenda

- Preparation
- Installation
- Upgrade
- News and Task List
- Diagnostics & Tuning
- Performance Testing
- Best Practices



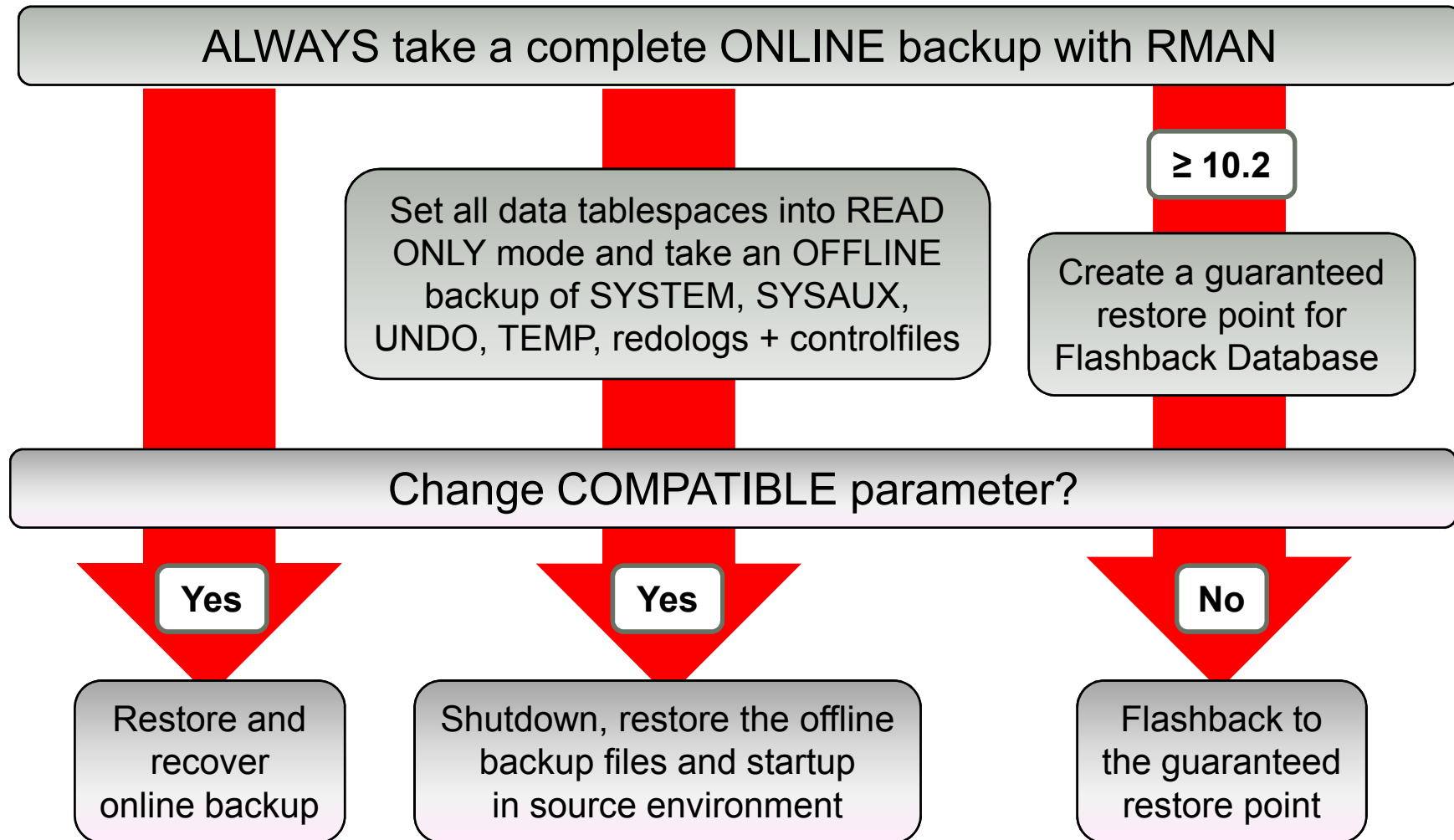
Fallback Strategies  
Guidelines  
Real World Experiences



# Fallback Strategy - Concepts

- Fallback concepts:
  - Always take a complete online backup first!
  - Differentiate between fallback concepts:
    - Are you allowed to lose data in case of a fallback?
    - Deal with problems ...
      - ... encountered during the upgrade
      - ... found days *after* the upgrade
    - Will you get additional downtime to change COMPATIBLE?
    - Fallback requirements in minutes/hours?

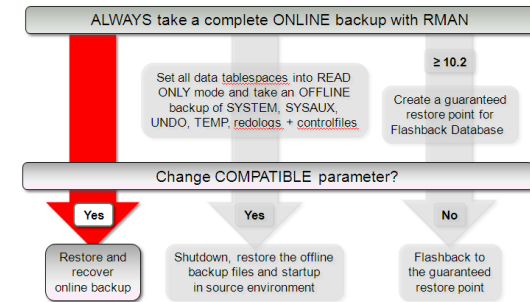
# Fallback Strategy - Issues during upgrade



# Fallback Strategy

## Online Backup

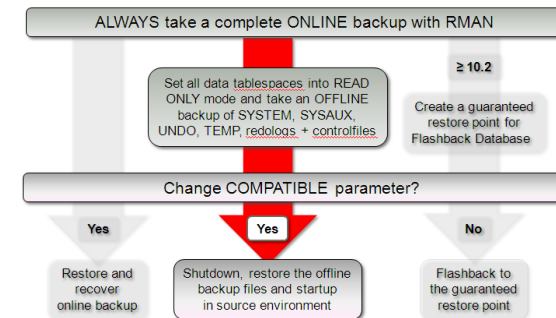
- Restore a backup
  - Complete online backup (RMAN)
  - Please verify:
    - Where is your backup located? Tapes, HD, off site...
    - Does the restore work?
    - How long will it take?
      - Check the priority of your restoration jobs especially in Virtual Tape Drives?
    - How long will the recovery take?



# Fallback Strategy

## Offline Backup

- No possibility to take a complete backup??
  - Put all data tablespaces into read-only mode
  - Shutdown the database immediate
  - Copy SYSTEM, TEMP, UNDO and SYSAUX datafiles and controlfiles/redologs
  - Startup database again
- If something fails during the upgrade:
  - Shutdown the database
  - Copy SYSTEM, TEMP, UNDO, SYSAUX, controlfile and redologs from the backup location
  - Startup the database in the old environment
- Advantages:
  - Fast and simple
  - COMPATIBLE can be changed



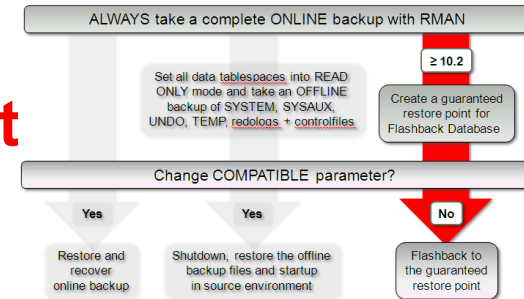


# Fallback Strategy

## Flashback – Guaranteed Restore Point

- Flashback Database

- Much faster than restore/recover
  - **BUT: Don't change COMPATIBLE**
- A good solution just in case something happens during upgrade
- Works beginning from 10.2
  - Create a GUARANTEED RESTORE POINT
  - Upgrade your database
  - In case of failure flashback to the restore point
  - In case of success: **DON'T FORGET** to delete it



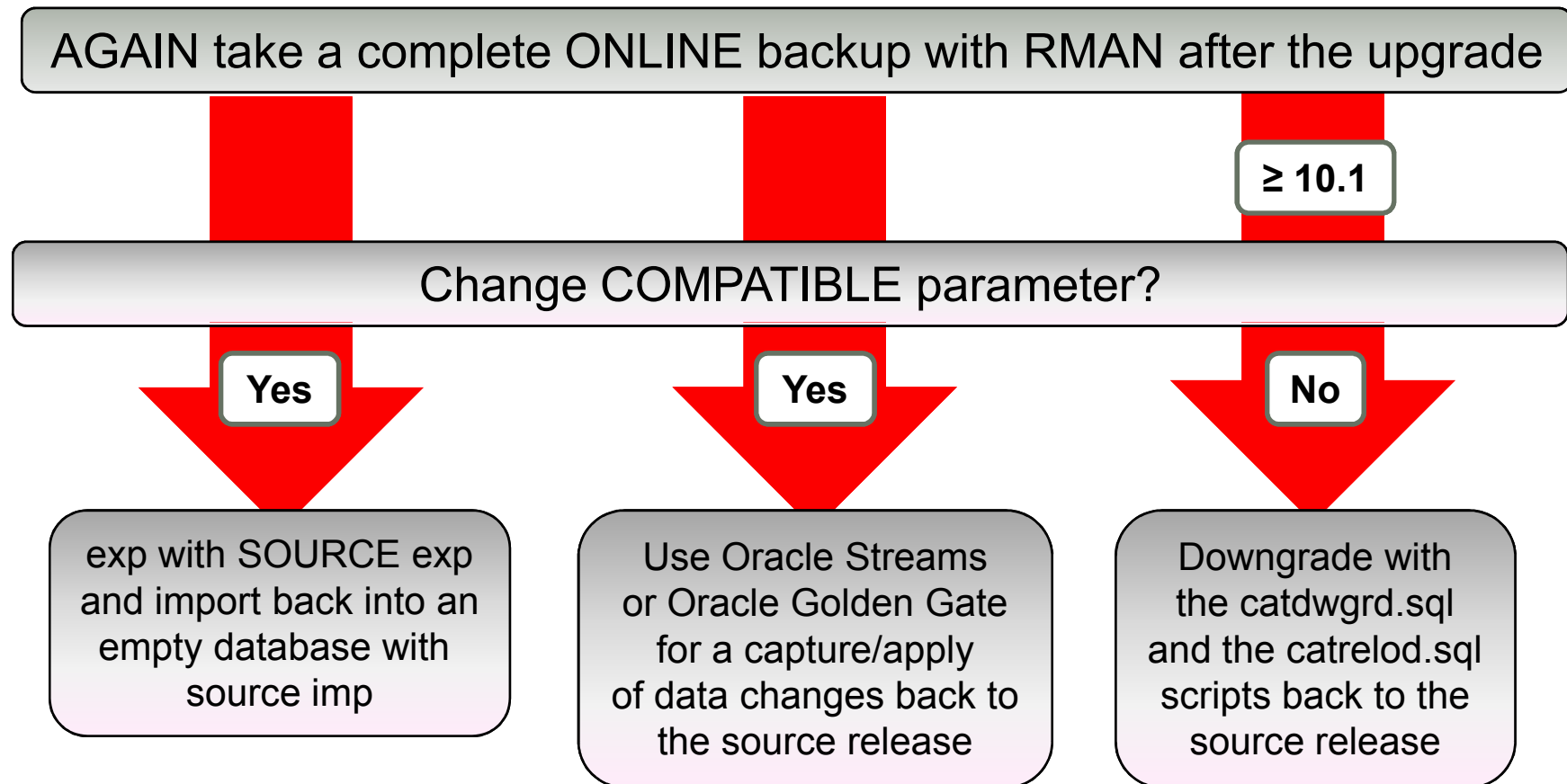
```
SQL> CREATE RESTORE POINT grpt
      GUARANTEE FLASHBACK DATABASE;

SQL> FLASHBACK DATABASE TO RESTORE POINT grpt;

SQL> SELECT * FROM V$RESTORE_POINT;
SQL> DROP RESTORE POINT grpt;
```

# Fallback Strategy – Issues **after** upgrade

- Assumption: No data loss allowed



# Fallback Strategy - exp/imp

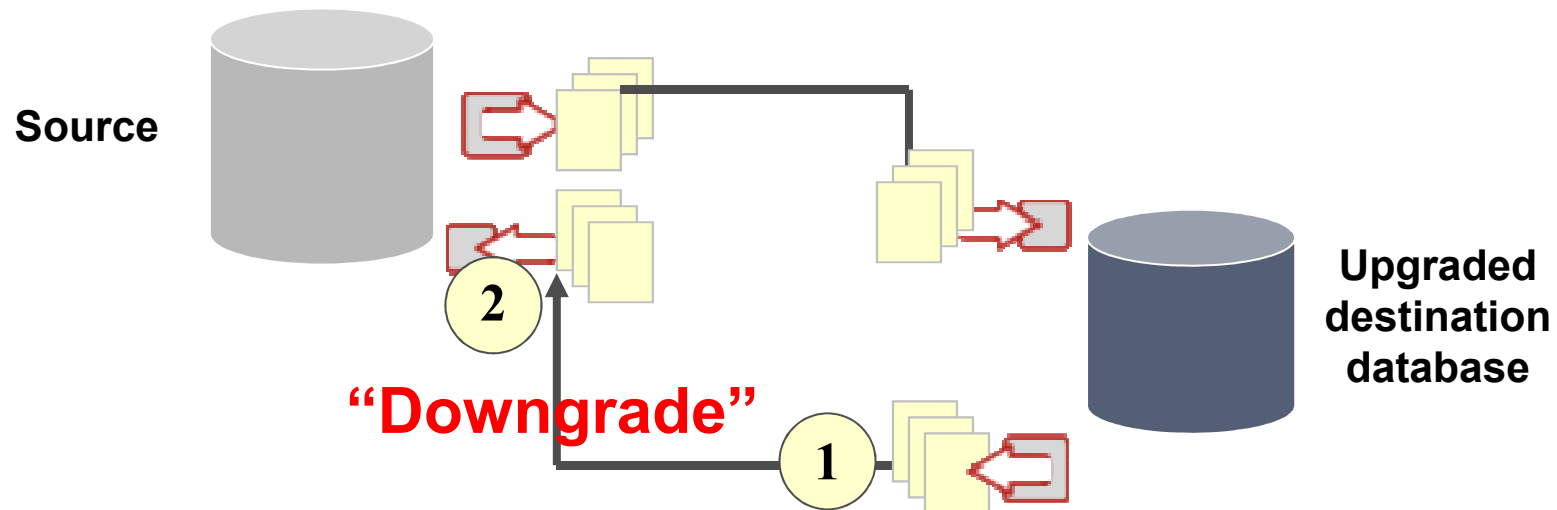
- Downgrade with `exp/imp` to 9.2.0.x
  - [Note:158845.1](#)
    - Prepare an empty database for the import just in case you'll have to step back
    - Then:
      - Run the appropriate `?/rdbms/admin/catexp.sql` to create the 9.2 export views in the upgraded database
      - Use "old" 9.2 `exp` for the export
      - Use "old" 9.2 `imp` for the import
  - Annotation for 11.1.0.7:  
See [Note:550740.1](#)  
Export from 11g using EXP Utility Version 9iR2 produces corrupt export dump

```
• CREATE OR REPLACE VIEW exu9defpswitches (  
    compflgs, nlslensem ) AS  
    SELECT a.value, b.value  
    FROM sys.v$parameter a, sys.v$parameter b  
    WHERE a.name = 'plsql_code_type' AND  
          b.name = 'nls_length_semantics'
```

/

# Fallback Strategy – Golden Gate

- Downgrade with Oracle Golden Gate
  - Oracle Streams would be similar in concept





# Fallback Strategy - `catdwgrd.sql`

- Downgrade with `catdwgrd.sql`
  - [Note:443890.1](#)
    - Downgrade to the release you've upgraded from
      - 10.1.0.5
      - 10.2.0.2/3/4/5
      - 11.1.0.6/7
    - Only possible **if COMPATIBLE hasn't been raised!!!**
      - **Please note:**  
A downgrade will only be possible to the release you've upgraded from - so if a patch set has been applied always apply it before the upgrade starts - otherwise you'll only be able to downgrade to the release you've patched

# Fallback Strategy - `catdwgrd.sql`

- Downgrade with `catdwgrd.sql` to 10g
  - Task in 11g environment:

```
SQL> SPOOL /tmp/downgrade.log
SQL> STARTUP DOWNGRADE
SQL> @catdwgrd.sql
SQL> SPOOL OFF
```

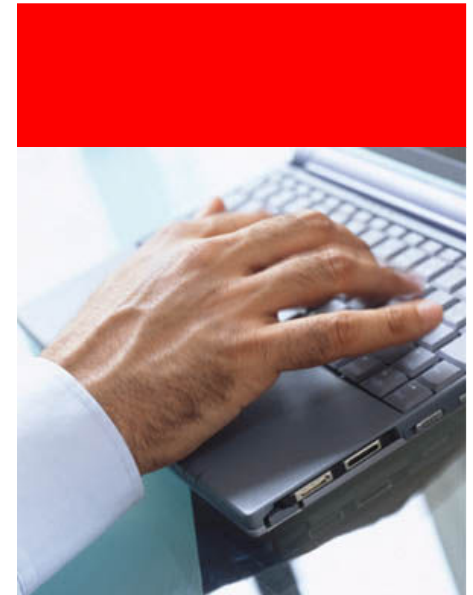
- Switch to your **pre-upgrade** 10g environment:

```
SQL> STARTUP UPGRADE
SQL> SPOOL /tmp/reload.log
SQL> @catrelod.sql
-- The catrelod.sql script reloads the appropriate version of
-- all of the database components in the downgraded database.
SQL> SPOOL OFF
```

- Please note: additional steps are required if EM repository resides in the database - please see chapter 6 **Downgrading a Database** in the Oracle 11g Upgrade Guide

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Fallback Strategies  
**Guidelines**  
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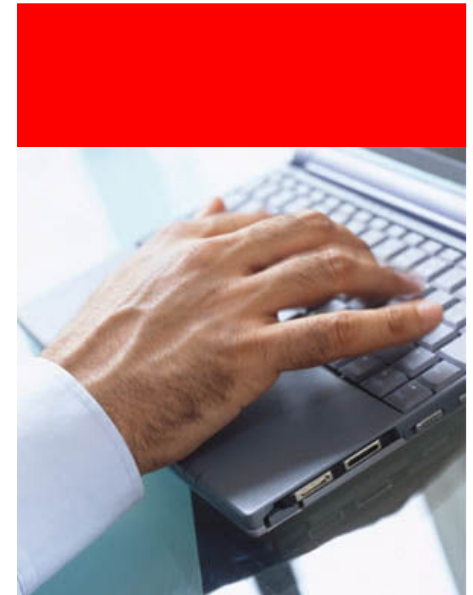
# Guidelines

- **Never ever** change too many system components at once!
- Document **all** changes detailed and clearly into a change log!
- **Always (!!!)** use real world data for testing!
- Don't underestimate the test efforts. Reserve enough time and resources for testing.
- **ALWAYS** collect as much performance data BEFORE the upgrade will be started!!
- Create a fallback strategy!
- **PLEASE** test your fallback strategy - does it really work??
- Please remember:  
**Upgrade has never been easier - but you still have to test!!!**



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Fallback Strategies  
Guidelines  
Real World Experiences



# Overview

- 6 customer cases
  1. Move 400 database from 9i to 11g
  2. Move from Single Instance to RAC, ASM and Data Guard
    - And upgrade/patch with 2 minutes downtime
  3. Upgrade 50 DWHs from 10.2 to 11g – fully unattended
  4. Upgrade from 10.2.0.3 RAC to 11.1.0.7 RAC and get tremendous performance
  5. Move 7TB from Oracle 9.2 to Exadata V1 in 24 hours
    - Cross-platform
    - Cross-Endianness
    - Cross-Version
  6. Move 10.1.0.5 RAC to 11.2.0.2 RAC on new hardware
    - Less than 4 hours downtime



# 400 databases from 9i to 11g

- Customer facts & figures
  - One of the most important international retailing companies
  - 2,195 outlets in 32 countries in Europe, Africa and Asia
  - ~290,000 employees
  - Revenue in 2008: € 68 billion



# 400 databases from 9i to 11g

- Tech facts:
  - Oracle 9.2.0.8
  - 400 databases
    - IBM AIX5L servers - each running 3 databases
    - Each database hosting 10 retail stores
  - Nightly OLTP batches
    - 25 GB redo per batch
    - Extremely tight timing constraints
  - Experience in the past when upgrading from 8.1.7 to 9.2:
    - Optimizer issues
    - Application changes were necessary



# 400 databases from 9i to 11g

- Goal:
  - Upgrade directly from Oracle 9i to Oracle Database 11g
  - Leverage new 11g features for performance optimization
    - Automatic SQL Profiling
  - Use SQL Performance Analyzer
    - Detection of plan changes
  - Use Database Replay
    - Functional Tests
  - Automate all steps for reusability



# 400 databases from 9i to 11g

- Setup:
  - IBM P670 - 16 CPUs - 32 GB RAM
  - EMC Storage DMX2000
  - 3 production database copies (Oracle 9.2.0.8)
  - Recorded nightly batch run - can be replayed anytime
    - Reference run time of batch run: *1:45:03*

# Real World Experience: Upgrade

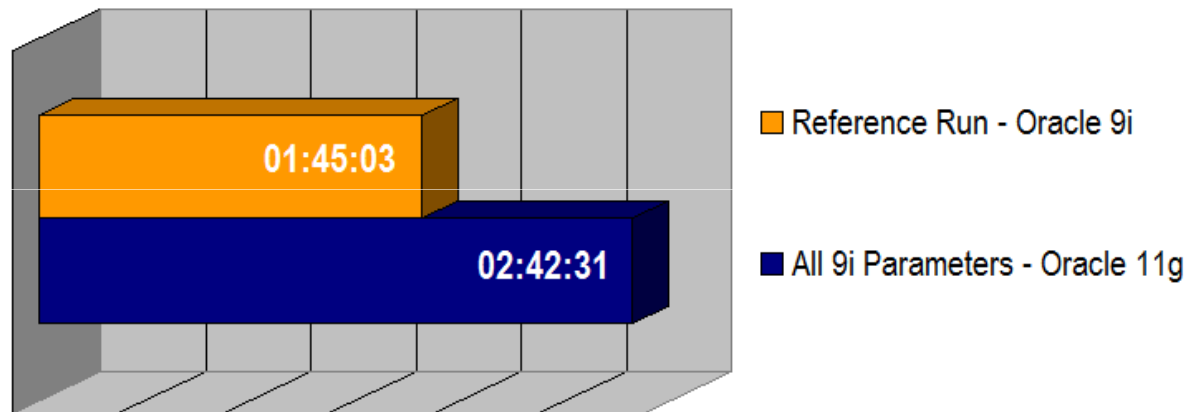
- Upgrade directly from Oracle 9.2.0.8 to 11.1.0.6
  - Upgrade has been done with catupgrd.sql as part of a shell script starting a backup and doing additional sanity operations
  - Result:
    - Extremely easy
    - Just a few patches were necessary - no show-stoppers
    - Fully scriptable
    - Production rollout will be with 11.1.0.7

Component	Status	Version	HH:MM:SS
Oracle Server	VALID	11.1.0.6.0	03:06:48
JServer JAVA Virtual Machine	VALID	11.1.0.6.0	00:15:43
Oracle Workspace Manager	VALID	11.1.0.6.0	00:01:38
Oracle XDK	VALID	11.1.0.6.0	00:35:35
Oracle XML Database	VALID	11.1.0.6.0	00:04:28
Oracle Database Java Packages	VALID	11.1.0.6.0	00:00:33
Oracle Multimedia	VALID	11.1.0.6.0	00:05:49
Spatial	VALID	11.1.0.6.0	00:08:53
Gathering Statistics			00:08:18

Total Upgrade Time: 04:27:49

## Test run 1: Use all 9i parameters

- Database successfully upgraded to 11g
- No adjustments had been done except for the required changes like `diagnostic_dest`
- Result:

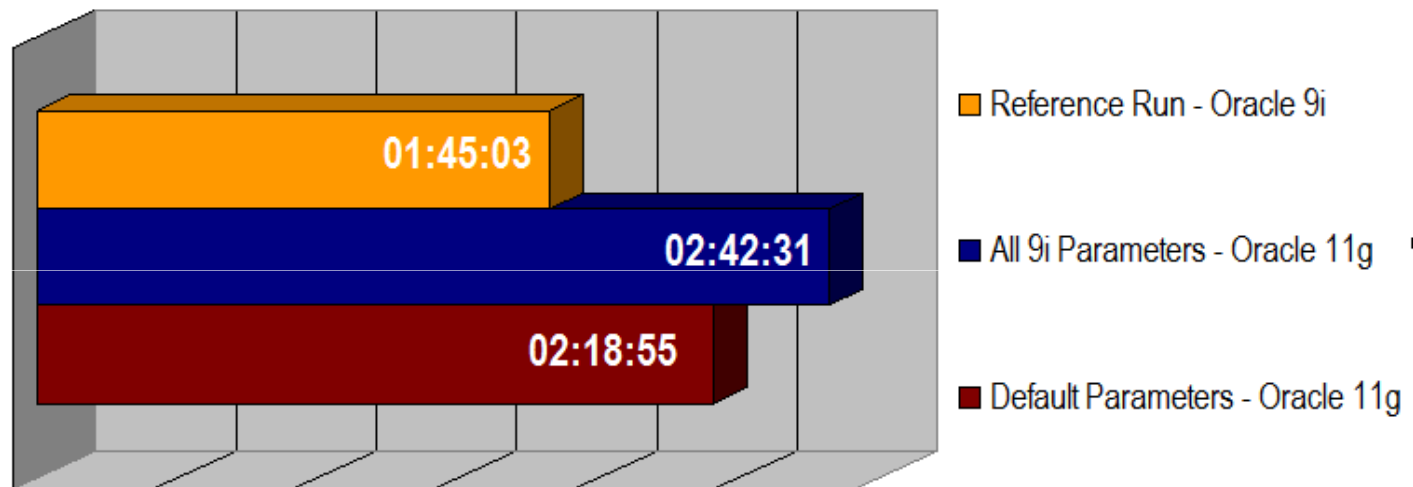


- Conclusion:
  - While upgrade went very smoothly some tuning is clearly needed



## Test run 2: Use 11g defaults

- Database successfully upgraded to 11g
- Oracle Database 11g default parameters have been set
- Result:

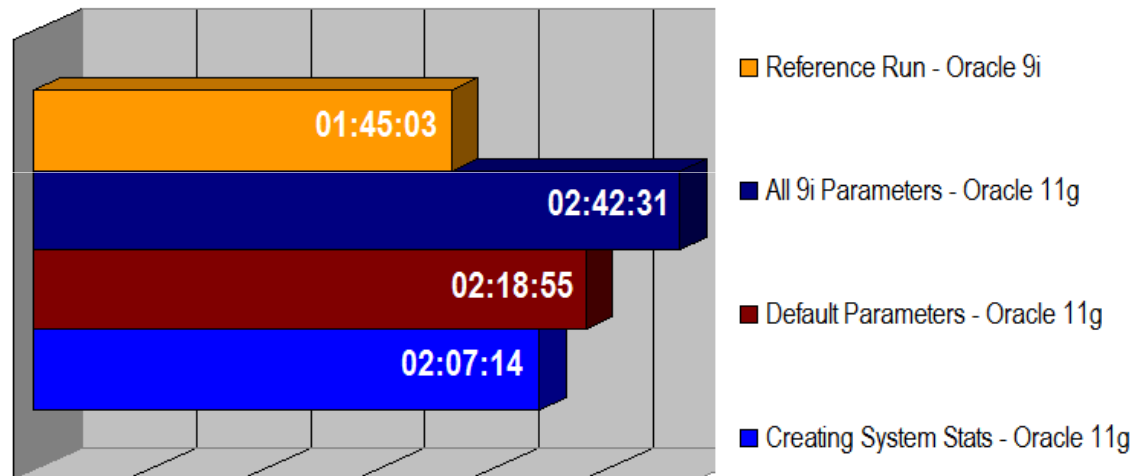


- Conclusion:
  - It is recommended to remove relics from previous releases and start with the 11g defaults

## Test run 3: Create system statistics

- System statistics get created for a workload period
  - `exec DBMS_STATS.GATHER_SYSTEM_STATS('start');`
  - `exec DBMS_STATS.GATHER_SYSTEM_STATS('stop');`
  - See view `AUX_STATS$`

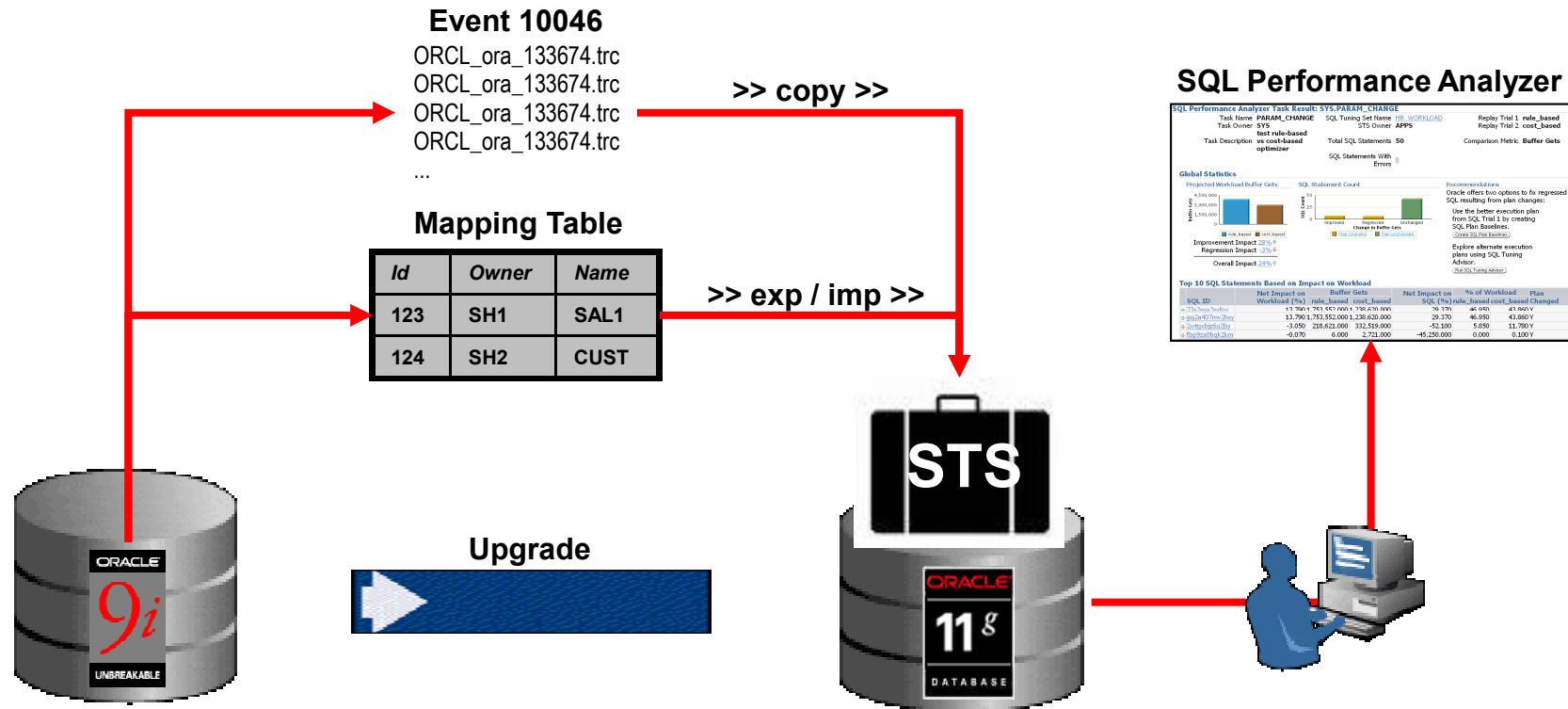
- Result:



- Conclusion:
  - Valid system statistics will help the optimizer to find better execution plans

# Test run 4: **init.ora** optimization with SPA

- Using the SQL Performance Analyzer for 9i ⇒ 11g



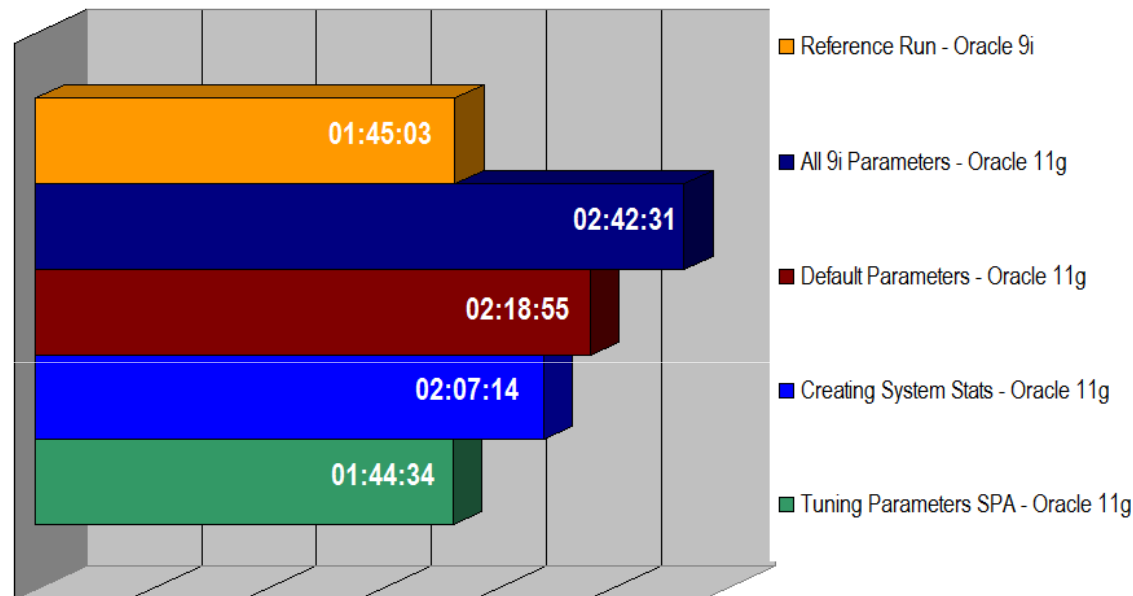
# Test run 4: **init.ora optimization with SPA**

- Using SPA reports to find the ideal init.ora settings:

↓Parameters / Reports ⇒	CPU_TIME	BUFFER_GETS																																				
optimizer_features_enable=9.2.0	<table border="1"> <thead> <tr><th colspan="3">SQL Statement Count</th></tr> <tr><th>SQL Category</th><th>SQL Count</th><th>Plan Change Count</th></tr> </thead> <tbody> <tr><td>Overall</td><td>2397</td><td>2127</td></tr> <tr><td>Improved</td><td>750</td><td>734</td></tr> <tr><td>Regressed</td><td>302</td><td>260</td></tr> <tr><td>Unchanged</td><td>1345</td><td>1133</td></tr> </tbody> </table>	SQL Statement Count			SQL Category	SQL Count	Plan Change Count	Overall	2397	2127	Improved	750	734	Regressed	302	260	Unchanged	1345	1133	<table border="1"> <thead> <tr><th colspan="3">SQL Statement Count</th></tr> <tr><th>SQL Category</th><th>SQL Count</th><th>Plan Change Count</th></tr> </thead> <tbody> <tr><td>Overall</td><td>2397</td><td>2127</td></tr> <tr><td>Improved</td><td>1219</td><td>1125</td></tr> <tr><td>Regressed</td><td>116</td><td>80</td></tr> <tr><td>Unchanged</td><td>952</td><td>922</td></tr> </tbody> </table>	SQL Statement Count			SQL Category	SQL Count	Plan Change Count	Overall	2397	2127	Improved	1219	1125	Regressed	116	80	Unchanged	952	922
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optimizer_features_enable=11.1.0.6	<table border="1"> <thead> <tr><th colspan="3">SQL Statement Count</th></tr> <tr><th>SQL Category</th><th>SQL Count</th><th>Plan Change Count</th></tr> </thead> <tbody> <tr><td>Overall</td><td>2397</td><td>1704</td></tr> <tr><td>Improved</td><td>775</td><td>640</td></tr> <tr><td>Regressed</td><td>207</td><td>173</td></tr> <tr><td>Unchanged</td><td>1415</td><td>891</td></tr> </tbody> </table>	SQL Statement Count			SQL Category	SQL Count	Plan Change Count	Overall	2397	1704	Improved	775	640	Regressed	207	173	Unchanged	1415	891	<table border="1"> <thead> <tr><th colspan="3">SQL Statement Count</th></tr> <tr><th>SQL Category</th><th>SQL Count</th><th>Plan Change Count</th></tr> </thead> <tbody> <tr><td>Overall</td><td>2397</td><td>1704</td></tr> <tr><td>Improved</td><td>1139</td><td>899</td></tr> <tr><td>Regressed</td><td>170</td><td>143</td></tr> <tr><td>Unchanged</td><td>978</td><td>662</td></tr> </tbody> </table>	SQL Statement Count			SQL Category	SQL Count	Plan Change Count	Overall	2397	1704	Improved	1139	899	Regressed	170	143	Unchanged	978	662
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optimizer_index_cost_adj=75	<table border="1"> <thead> <tr><th colspan="3">SQL Statement Count</th></tr> <tr><th>SQL Category</th><th>SQL Count</th><th>Plan Change Count</th></tr> </thead> <tbody> <tr><td>Overall</td><td>2397</td><td>1174</td></tr> <tr><td>Improved</td><td>827</td><td>649</td></tr> <tr><td>Regressed</td><td>181</td><td>100</td></tr> <tr><td>Unchanged</td><td>1389</td><td>425</td></tr> </tbody> </table>	SQL Statement Count			SQL Category	SQL Count	Plan Change Count	Overall	2397	1174	Improved	827	649	Regressed	181	100	Unchanged	1389	425	<table border="1"> <thead> <tr><th colspan="3">SQL Statement Count</th></tr> <tr><th>SQL Category</th><th>SQL Count</th><th>Plan Change Count</th></tr> </thead> <tbody> <tr><td>Overall</td><td>2397</td><td>1174</td></tr> <tr><td>Improved</td><td>1175</td><td>881</td></tr> <tr><td>Regressed</td><td>142</td><td>110</td></tr> <tr><td>Unchanged</td><td>970</td><td>183</td></tr> </tbody> </table>	SQL Statement Count			SQL Category	SQL Count	Plan Change Count	Overall	2397	1174	Improved	1175	881	Regressed	142	110	Unchanged	970	183
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optimizer_mode=first_rows_10	<table border="1"> <thead> <tr><th colspan="3">SQL Statement Count</th></tr> <tr><th>SQL Category</th><th>SQL Count</th><th>Plan Change Count</th></tr> </thead> <tbody> <tr><td>Overall</td><td>2397</td><td>1707</td></tr> <tr><td>Improved</td><td>821</td><td>687</td></tr> <tr><td>Regressed</td><td>158</td><td>126</td></tr> <tr><td>Unchanged</td><td>1318</td><td>894</td></tr> </tbody> </table>	SQL Statement Count			SQL Category	SQL Count	Plan Change Count	Overall	2397	1707	Improved	821	687	Regressed	158	126	Unchanged	1318	894	<table border="1"> <thead> <tr><th colspan="3">SQL Statement Count</th></tr> <tr><th>SQL Category</th><th>SQL Count</th><th>Plan Change Count</th></tr> </thead> <tbody> <tr><td>Overall</td><td>2397</td><td>1707</td></tr> <tr><td>Improved</td><td>1085</td><td>845</td></tr> <tr><td>Regressed</td><td>145</td><td>118</td></tr> <tr><td>Unchanged</td><td>1057</td><td>744</td></tr> </tbody> </table>	SQL Statement Count			SQL Category	SQL Count	Plan Change Count	Overall	2397	1707	Improved	1085	845	Regressed	145	118	Unchanged	1057	744
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# Test run 4: **init.ora optimization with SPA**

- Using SPA to optimize the init.ora
- Result:



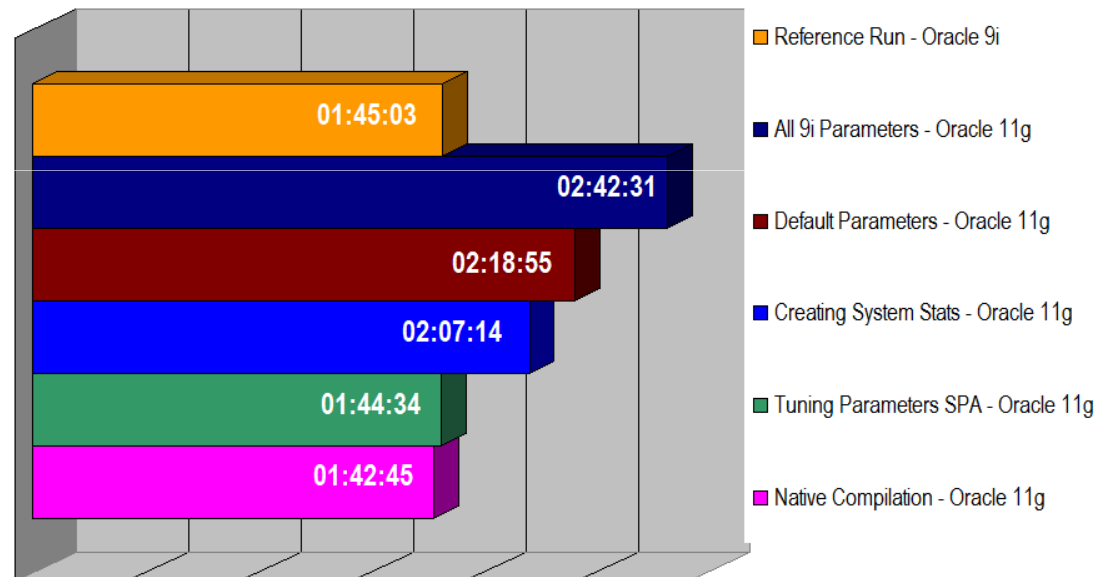
- Conclusion:
  - SPA is a great tool to detect plan regressions before the upgrade

# Test run 5: PL/SQL Native Compilation

- PL/SQL native compilation parameters:

- `plsql_code_type=native`
- `plsql_optimize_level=3`
- **Recompilation:** `exec DBMS_UTILITY.COMPILE_SCHEMA('<username>');`

- Result:



- Conclusion:

- Native compilation lead to a slightly better overall completion timing

# Test run 6: SQL Profiling

- Automatic SQL Tuning switched on
  - Upon every AWR snapshot the database will evaluate high-load SQL from the snapshot as possible candidates for the SQL Tuning Advisor
  - Goal is to create SQL Profiles automatically

The image shows two screenshots from an Oracle database configuration interface. The top screenshot, titled "Automated Maintenance Tasks Configuration", shows the "Global Status" as "Enabled" and "Task Settings" for "Automatic SQL Tuning" as "Enabled". A red box highlights the "Automatic SQL Tuning" row. An arrow points from this row to the bottom screenshot, titled "Automatic SQL Tuning Settings". This second screenshot shows various settings: "Maximum Time Spent Per SQL During Tuning (sec)" set to 1200, "Automatic Implementation of SQL Profiles" set to "No" (highlighted with a red box), "Maximum SQL Profiles Implemented Per Execution" set to 20, and "Maximum SQL Profiles Implemented (Overall)" set to 10000.

**Automated Maintenance Tasks Configuration**

Global Status  Enabled  Disabled

**Task Settings**

Optimizer Statistics Gathering  Enabled  Disabled

Segment Advisor  Enabled  Disabled

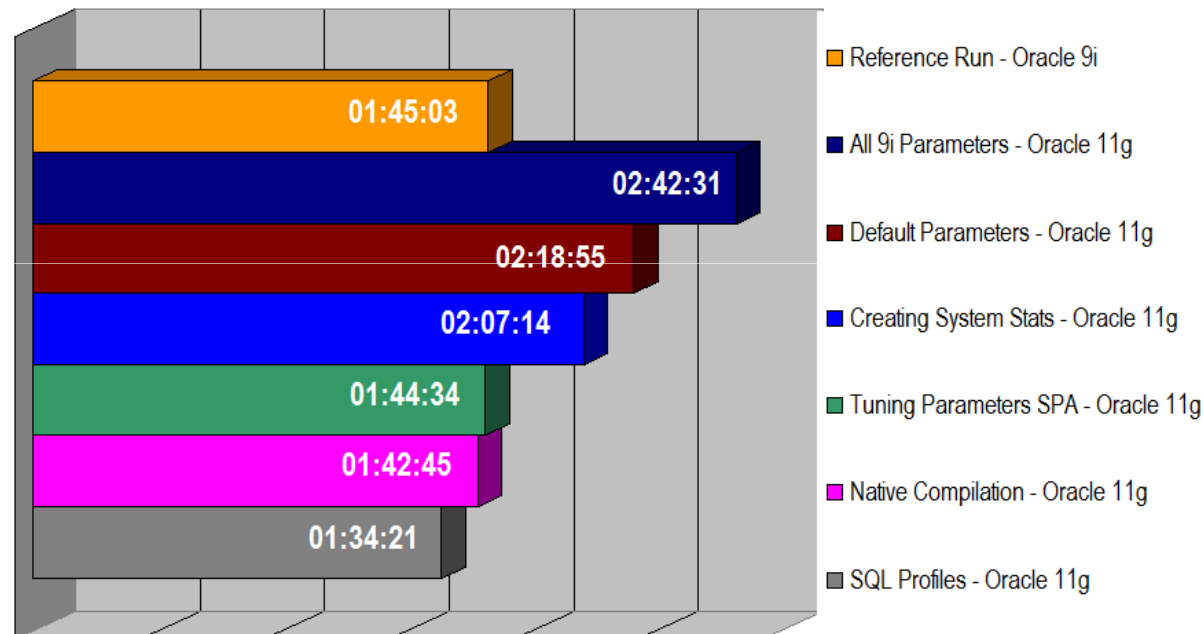
**Automatic SQL Tuning**  Enabled  Disabled

**Automatic SQL Tuning Settings**

Maximum Time Spent Per SQL During Tuning (sec)	1200
Automatic Implementation of SQL Profiles	<input type="radio"/> Yes <input checked="" type="radio"/> No
Maximum SQL Profiles Implemented Per Execution	20
Maximum SQL Profiles Implemented (Overall)	10000

# Test run 6: SQL Profiling

- Automatic SQL Tuning switched on
  - Performance boost with 6 SQL Profiles - no DBA intervention necessary
  - No changes to the applications were required
- Result:

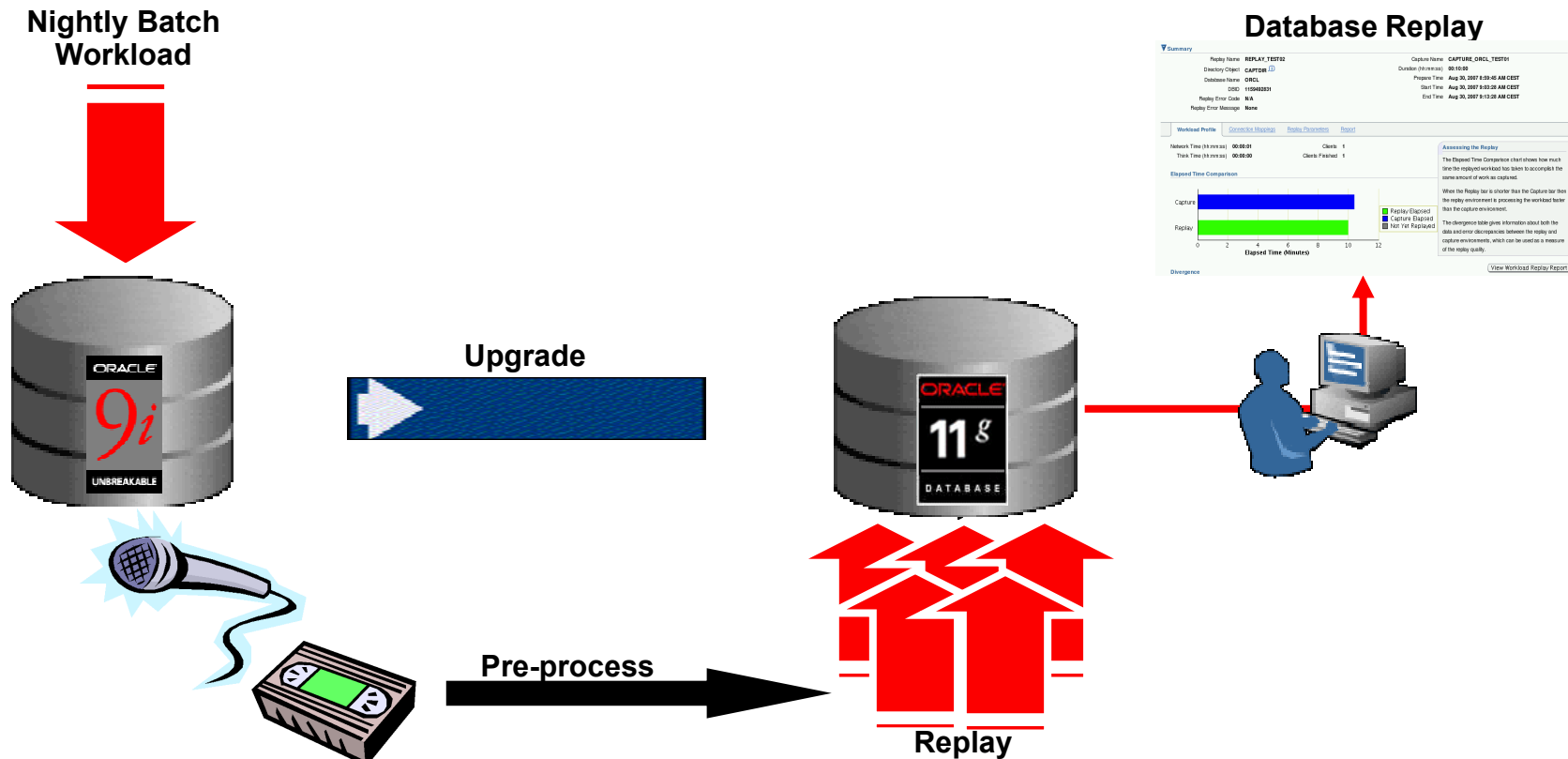


- Conclusion:
  - SQL Profiling speeds up SQL but doesn't change the application!!!



# Real World Experience: Database Replay

- Using Database Replay for 9i ⇒ 11g



- Conclusion: No application changes were necessary



## Real World Experience: Results

- Upgrade directly from Oracle 9.2.0.8 to 11.1.0.7
  - Works extremely well and easier than expected
- SQL Performance Analyzer
  - Helps to detect plan changes right before the upgrade
  - Does a great job to optimize the init.ora
- Database Replay
  - Ensures that all application statements complete error-free
- SQL Profiling
  - Speed up queries and reports
- **50% less testing effort for upgrades to the new release**
- **Biggest surprise: No application changes necessary**
- **Production rollout has been started in May 2009**



# Real World Experience

- White Paper available on OTN
  - <http://www.oracle.com/technetwork/database/features/manageability/9i-to-11g-real-world-customer-exper-133754.pdf>

Upgrading from Oracle 9i to  
Oracle Database 11g:  
A Real World Customer Experience

*An Oracle White Paper*  
*October 2008*

*“Moving directly from Oracle 9i to Oracle Database 11g with Real Application Clusters, ASM and Data Guard was much easier and smoother than we’d expected.”*

Dr. Lars Köller  
Departmental Manager  
Computing Center  
Bielefeld University



## Project 2: Bielefeld University

- Bielefeld University
  - 18000 students
  - 1500 employees
  - Initiative of Excellence
  - Bielefeld University will lead the way for 23 universities in Germany
- Setup before the upgrade:
  - Sun Solaris - Sun hardware
  - 10 databases - all Oracle 9.2.0.8
  - Highly critical applications
- Goals:
  - Move from single instance to RAC with ASM and Data Guard
  - Ensure very good performance
  - Run different Oracle versions in the same RAC environment



## Project 2: Bielefeld University

- 5 phases:
  - Setup phase
  - Test phase
  - Performance phase
  - High Availability phase
  - Rollout phase



## Project 2: Setup phase

- Phase 1 - Setup:
  - 2-node Sun Solaris cluster with shared storage
  - 3x Oracle 11.1.0.6 homes
    - 1 for the Oracle Clusterware
    - 1 for ASM
    - 1 as Database Home
  - 1x Oracle 10.2.0.4 home
  - 1 powerful Solaris machine has been set up as well to handle the standby
  - Identical test systems setup as well
  - Monitoring with Oracle Grid Control 10.2.0.4. and Grid Control 10.2.0.4 agents



## Project 2: Test phase

- Phase 2 - Test:
  - All current database were successfully either upgraded or migrated (UTF8 changes involved) to their target releases
  - Mission-critical applications such as the University Class Schedule, the Central User Management System and the web presence received careful testing with internal test tools
    - Only a few changes were required because of the character set conversion



# Project 2: Performance phase

- Phase 3 - Performance:
  - Using the SQL Performance Analyzer (SPA) to detect plan regressions and to perfect performance:

Initial run – no tuning:

SQL Statement Count

SQL Category	SQL Count	Plan Change Count
Improved	624	384
Regressed	147	74
Unchanged	1742	1132

Second run – init.ora tuning:

SQL Statement Count

SQL Category	SQL Count	Plan Change Count
Improved	658	410
Regressed	99	45
Unchanged	1756	1138

Third run: final changes:

SQL Statement Count

SQL Category	SQL Count	Plan Change Count
Improved	642	394
Regressed	94	48
Unchanged	1777	1151



## Project 2: Performance phase

- Phase 3 - Performance:
  - Remedy the remaining 94 regressed statements with SQL Tuning Advisor
    - 34 SQL Profiles had been found and implemented
    - Some speed up SQL statement's performance by 99%



## Project 2: High Availability phase

- Phase 4 - High Availability:
  - Standby database has been built up with RMAN automatically
  - Since Oracle 11g RMAN is able to build up the standby from the current production database without taking a backup and restores the standby through network transfer
  - Target: *Rolling Upgrade with a Transient Standby* will be used to apply patch set 11.1.0.7 with only 2 minutes of downtime
    - <http://www.oracle.com/technetwork/database/features/availability/maa-wp-11g-transientlogicalrollingu-1-131927.pdf>

Database Rolling Upgrade Using  
Transient Logical Standby:

Oracle Data Guard 11g

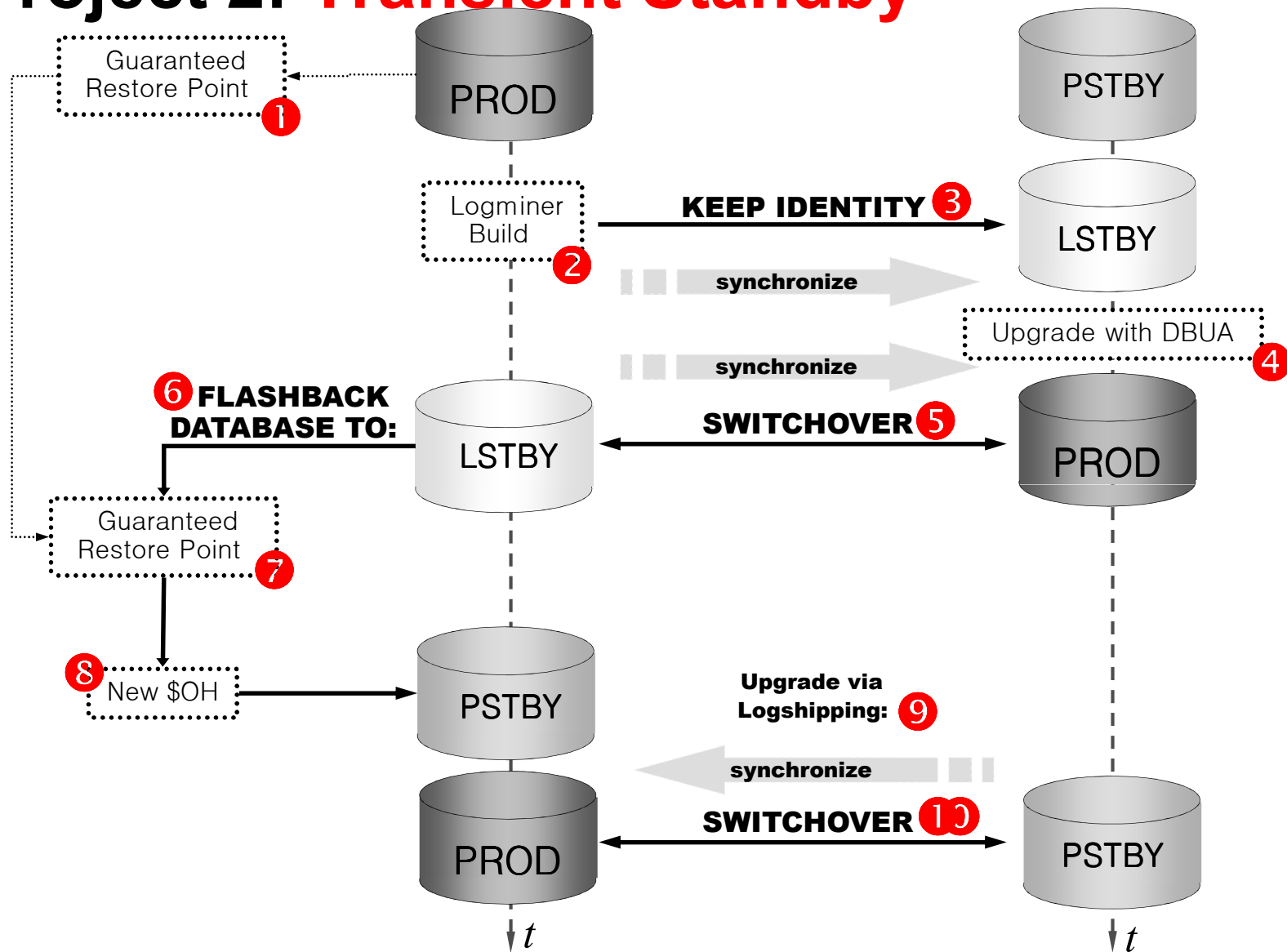
*Oracle Maximum Availability Architecture White Paper  
September 2008*



## Project 2: Rollout phase


- Phase 5 - Rollout:
  - Go-live date: 12-September 2008
  - Rollout finished mid-October 2008
  - Already highest load on the system during start of the winter semester
    - 30% more logins
    - Response times decreased by 50%
  - Rolling Upgrade with a Transient Standby done:
    - Friday, 13th of February 2009

# Project 2: Transient Standby





# Project 3: Upgrading 50 DWHs unattended

- **Anritsu Italy** 
  - ~50 DWH solutions mostly installed at large TelCos
  - Database sizes vary between 8 TB and 12 TB
  - Application monitors network performance and bottlenecks
  - Up to 200,000 partitions in the database
- **Goal:**
  - Upgrade all databases from 10.2.0.2 to 11.1.0.7
  - Platform is RH Linux 64bit
  - Installation, configuration and upgrade: unattended



# Project 3: Upgrading 50 DWHs unattended

- Silent installation:
  - Record a response file with OUI:  
`./runInstaller -record -destinationFile /tmp/inst.rsp`
  - Customize the response file and use it for an unattended installation:  
`./runInstaller -silent -responseFile /tmp/inst.rsp`
- Silent patch installation:
  - Install patch set with OUI in record mode and use the response file for a silent installation of the patch set
- Silent listener configuration:
  - Modify the delivered NETCA response file
  - Run: `./netca /silent /responseFile netca.rsp`

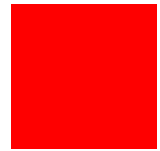


# Project 3: Upgrading 50 DWHs unattended

- Silent upgrade with DBUA:

- `dbua -silent -sid dwh`
  - `-oracleHome /opt/oracle/product/RDBMS10g`
  - `-diagnosticDest /opt/oracle/diag`
  - `-sysDBAUserName sys`
  - `-sysDBAPassword manager`
  - `-recompile_invalid_objects true`
  - `-degree_of_parallelism 4`
  - `-emConfiguration LOCAL`
    - `-dbsnmpPassword manager`
    - `-sysmanPassword manager`





## **Project 3: Upgrading 50 DWHs unattended**

- First successful production upgrade to 11.1.0.7 done: 22th of November 2008

## Project 4: 10.2.0.3 => 11.1.0.7



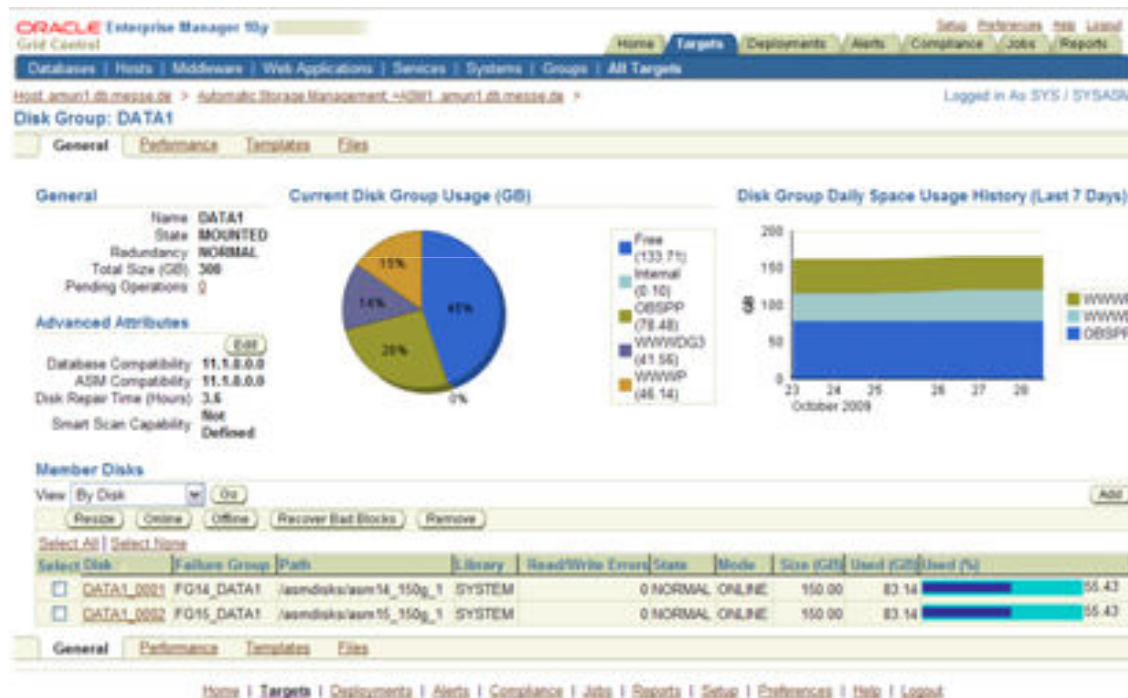
- Deutsche Messe is the largest trade fair worldwide
  - Key trade fairs:
    - CeBIT
    - Hannover Messe
  - ~500,000 m<sup>2</sup> exhibition space
- Motivation to upgrade to Oracle Database 11g
  - Move from raw devices to 11g ASM
  - Automatic SQL Tuning
  - Snapshot Standby
- 3-node RAC with Oracle Database 10.2.0.3

# Project 4: Deutsche Messe



Deutsche Messe  
Hannover · Germany

- **Real world example:** ASM Management in Grid Control
  - Much easier to manage
  - HA features: Fast Mirror Resynch & Preferred Read



ORACLE

# Project 4: Deutsche Messe



Deutsche Messe  
Hannover · Germany

- **Real world example:** Data Guard with Snapshot Standby
  - Convert standby database to test database with one click/command



ORACLE

# Project 4: Deutsche Messe

- **Real world example:** Automatic Tuning with Tuning Pack

## Original Explain Plan (Annotated)

• Indicates an adjustment from the original plan by the SQL Tuning Advisor  
Plan Hash Value 2912659397

Expand All | Collapse All

Operation	Line ID	Object	Object Type	Order	Rows	Bytes	Cost	Time	CPU Cost	I/O Cost
SELECT STATEMENT	0			5		0.077	1,073,542	12,883	10,571,555,840	1,072,686
COUNT STOPKEY	1			4						
VIEW	2			3		0.077	1,073,542	12,883	10,571,555,840	1,072,686
TABLE ACCESS BY INDEX ROWID	3	XPOBS.dmag_xpobs_changes	TABLE	2		0.030	1,073,542	12,883	10,571,555,840	1,072,686
INDEX FULL SCAN	4	XPOBS.C_45CA075D_PK	INDEX (UNIQUE)	1			9.750	117	950,185,280	9,673



## New Explain Plan With SQL Profile

Plan Hash Value 3211123922

Expand All | Collapse All

Operation	Line ID	Object	Object Type	Order	Rows	Bytes	Cost	Time	CPU Cost	I/O Cost
SELECT STATEMENT	0			6		0.077	5	1	12,376,813	4
COUNT STOPKEY	1			5						
VIEW	2			4		0.077	5	1	12,376,813	4
SORT ORDER BY STOPKEY	3			3		0.030	5	1	12,376,813	4
TABLE ACCESS BY INDEX ROWID	4	XPOBS.dmag_xpobs_changes	TABLE	2		0.030	4	1	29,706	4
INDEX RANGE SCAN	5	XPOBS.IDX\$\$CHANGES01	INDEX	1			3	1	21,764	3



- Improvement: **factor 250,000!!!**
  - Third party application

# Project 4: Deutsche Messe

- **Result:**
  - Upgrade has been done with Data Pump to consolidate space
  - Go-live on 11.1.0.7 in September/October 2009
  - Performance is excellent – no need to change hardware
- **Current status:**
  - Highest load happened in March 2010 during CeBIT
    - No problem at all 😊
  - Current PSU has been applied by a rolling upgrade
  - Tests with 11.2.0.2 have been started already

# Project 5: Move to Exadata V1



-  LOYALTY PARTNER SOLUTIONS

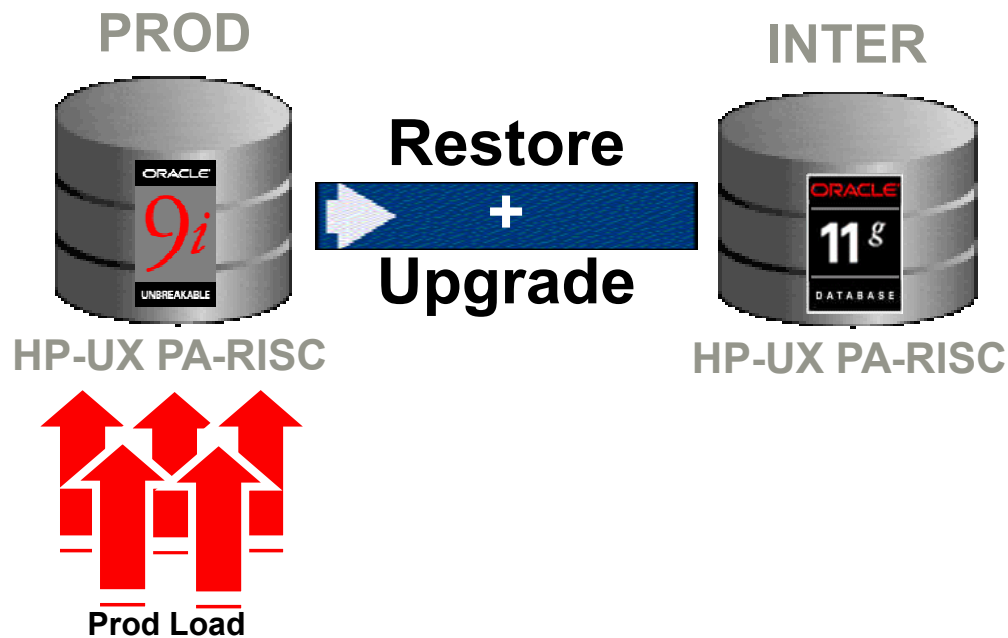
=> Payback bonus card program



- Setup:
  - Source: 7 TB and 1.5 TB on HP-UX PA-RISC with Oracle 9.2.0.7
  - Target: Exadata V1, i.e. Oracle Enterprise Linux 64bit with Oracle Database 11.1.0.7
- Restrictions:
  - 24 hour downtime window
  - 4 months planning and migration phase
    - August – November 2009
  - Fallback
    - Parallel processing for 1 month
  - Proposed go-live date: 15-NOV-2009

# Project 5: Move to Exadata V1

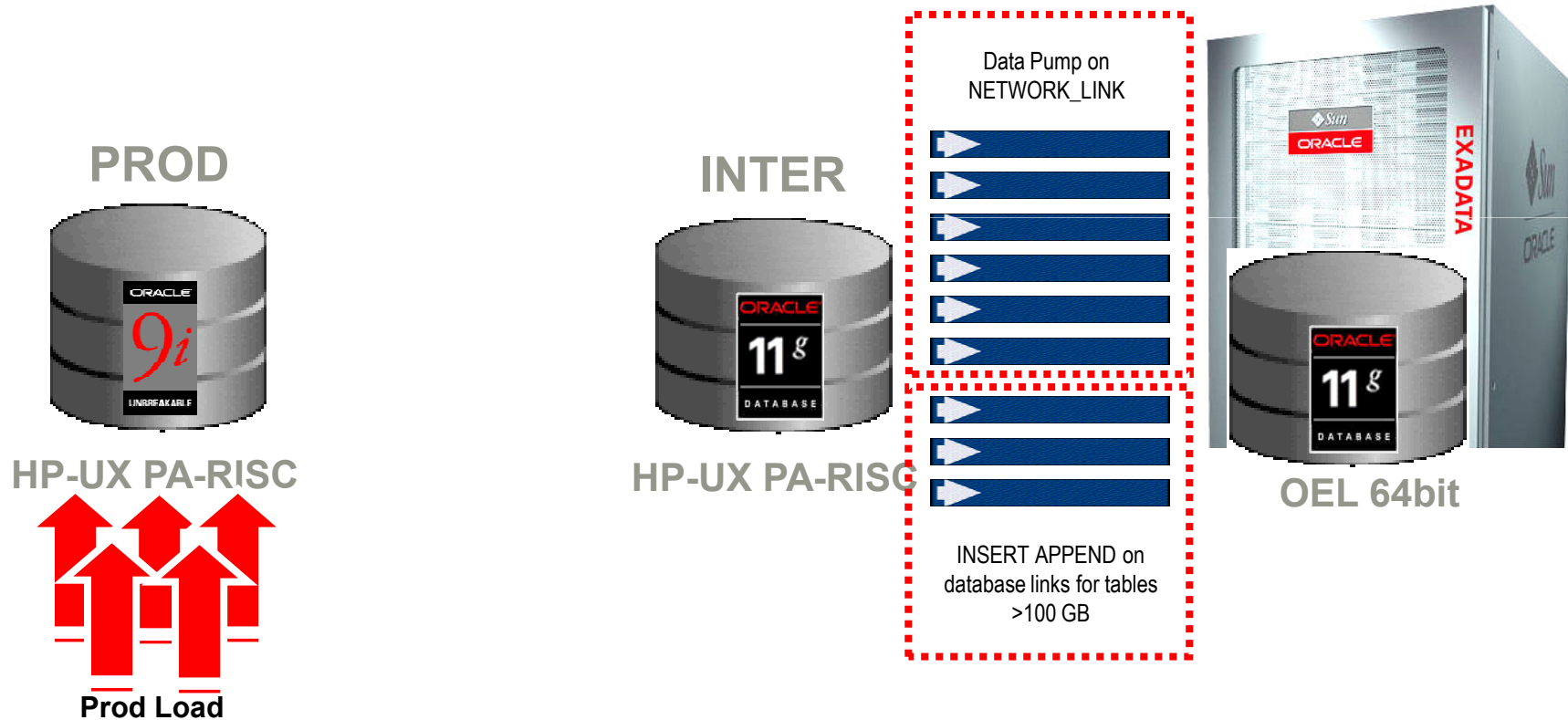
- Step-by-step
  1. Build up an intermediate system
  2. Restore the backup to the intermediate system
  3. Upgrade this database to 11.1.0.7





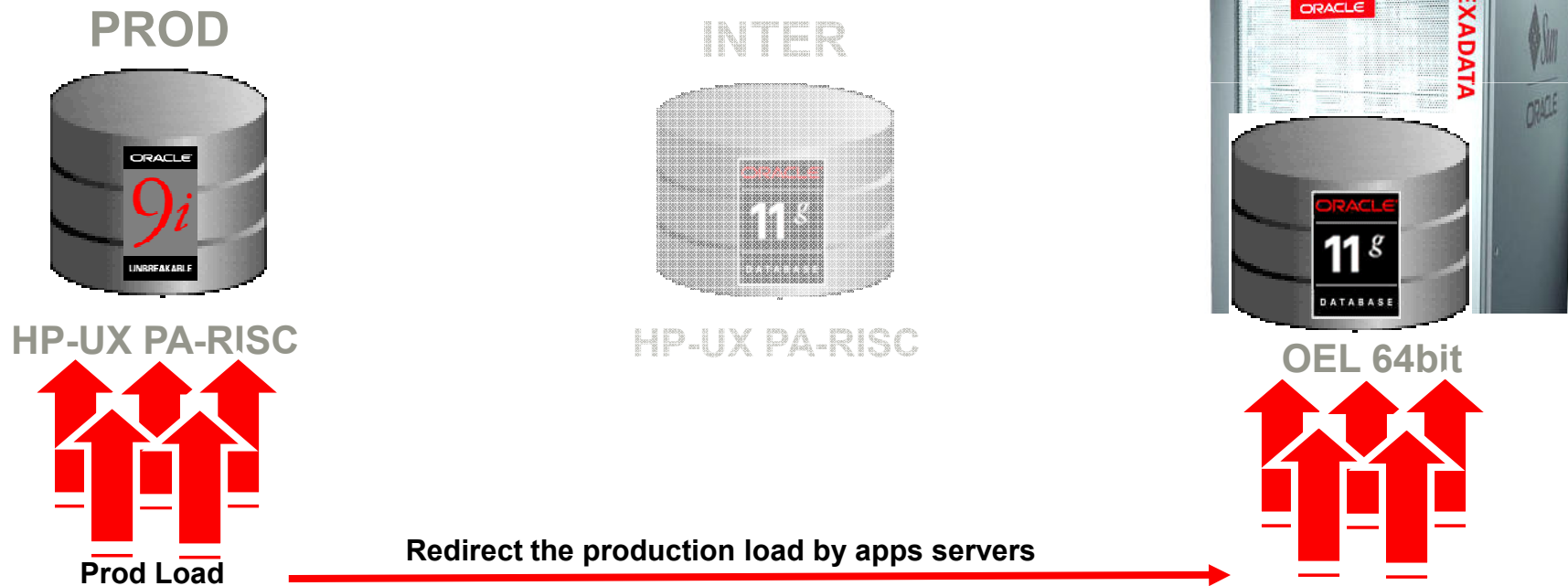
# Project 5: Move to Exadata V1

- Step-by-step
  4. Move schemas and data with Data Pump using NETWORK\_LINK
  5. Move larger tables (>100GB) using database links



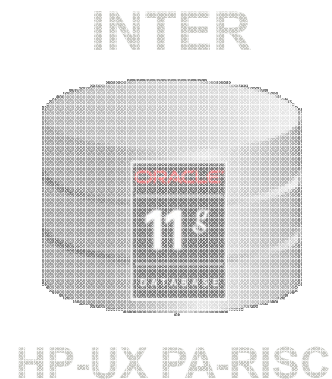
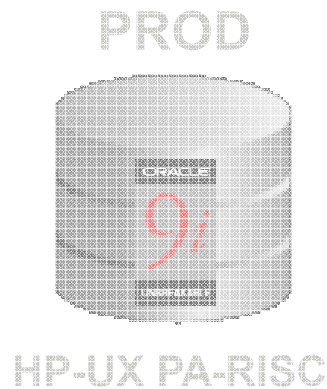
# Project 5: Move to Exadata V1

- Step-by-step
  6. Test by running the production load on the Exadata V1 as well
  7. Run all reports and evaluations on Exadata V1 as well

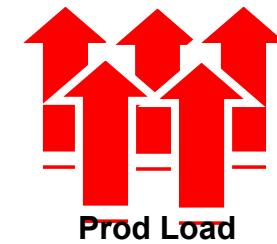


# Project 5: Move to Exadata V1

- Step-by-step
  8. Went live two weeks earlier
  9. Dramatic performance improvement on Exadata
    - Jobs went from 32 hours to 2 hours
    - User complained about too fast performance



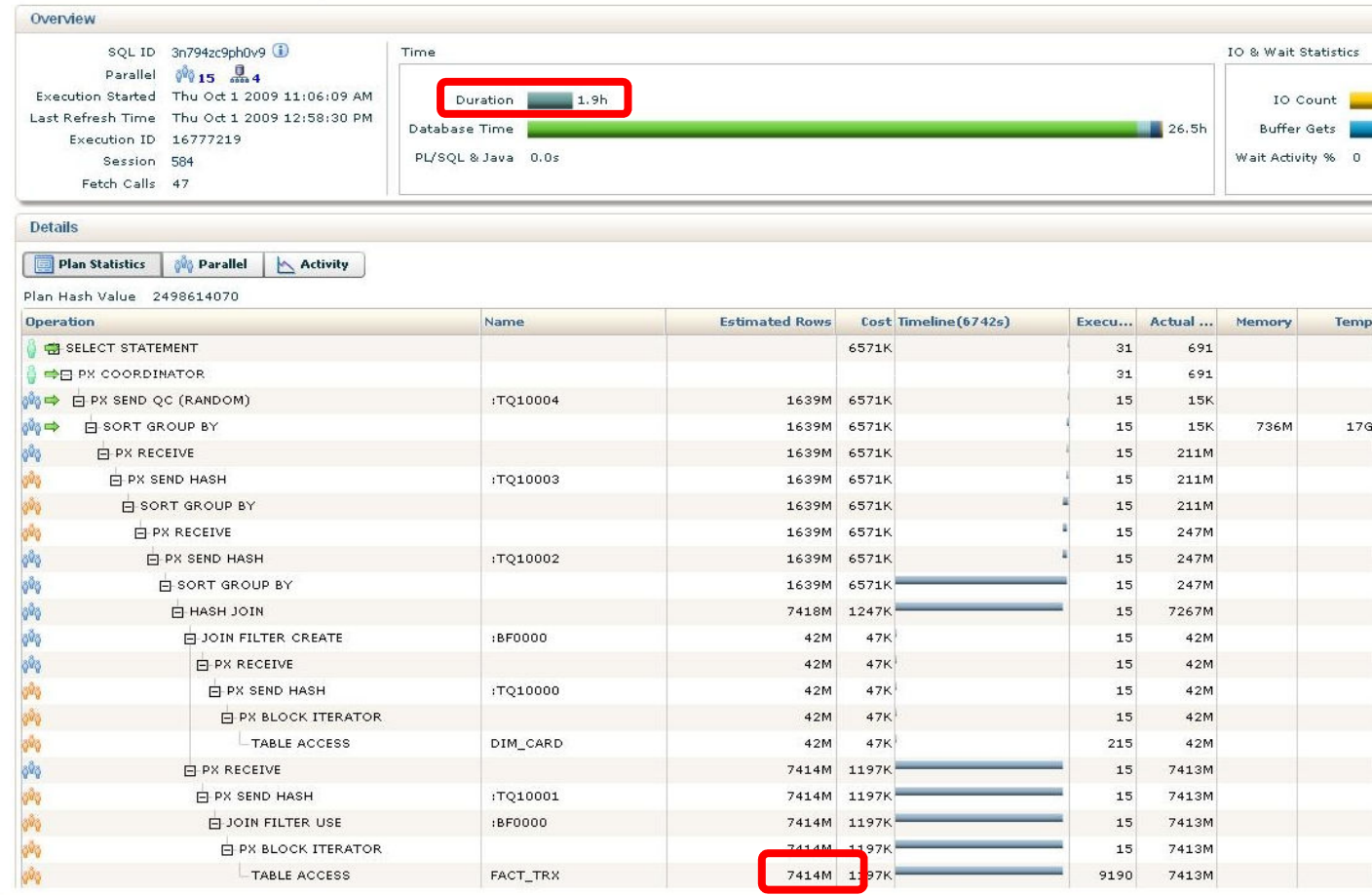
OEL 64bit



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# Project 5: Move to Exadata V1

- Example: Performance gain → 30hrs vs 2hrs

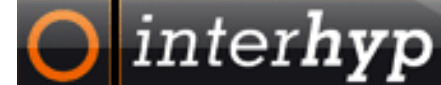


# Project 6: Interhyp



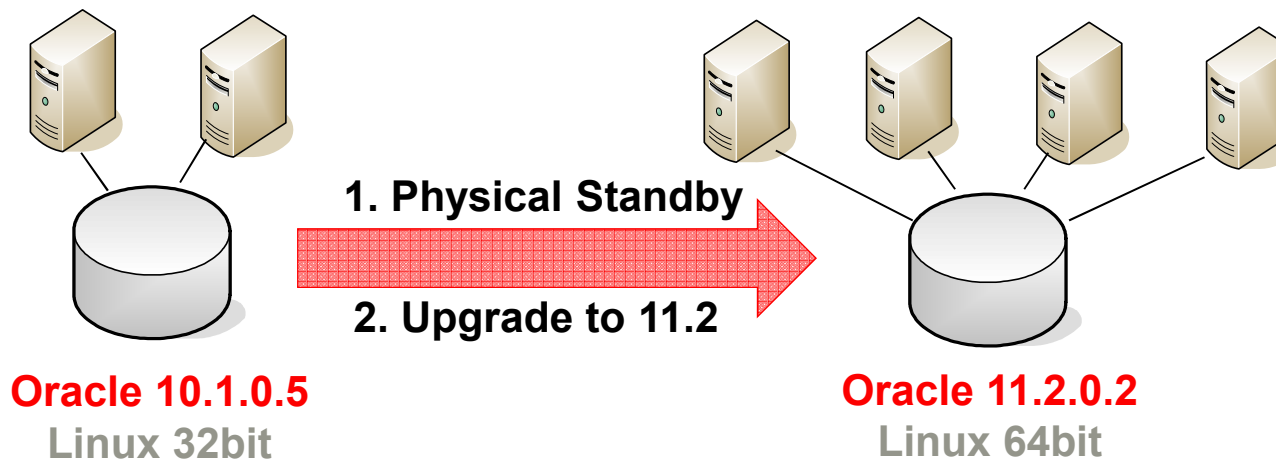
- Interhyp does residential and development financing
  - Offering banking service to other German key banks as well
  - Headquartered in Munich/Germany
  - 100% subsidiary of Dutch ING Bank
- Tech setup:
  - 6x 2-node-RAC systems on Oracle 10.1.0.5 on RH Linux 32bit
    - Clustered File System
- Target:
  - Oracle RAC 11.2.0.2 with ASM
  - RH Linux 64bit
    - Hardware exchange for key systems  $\Rightarrow$  4-node cluster
  - Maximum downtime: 4 hours
  - Keep “old” system as fallback

# Project 6: Interhyp



- Road to success:

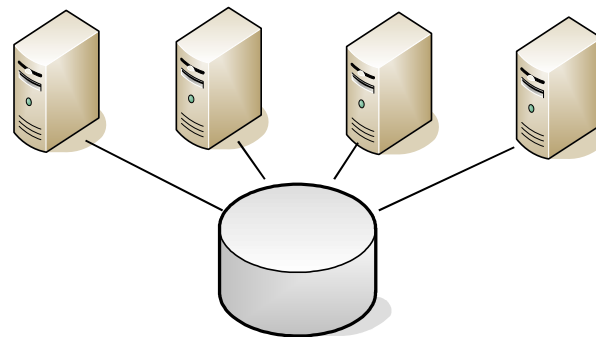
- Install Grid Infrastructure 11.2 on new hardware and patch it
- Remove unused components from production database
  - Goal: Decrease upgrade duration to ~30 minutes
- Build a physical standby database (10.1.0.5 ⇒ 10.1.0.5) in 11.2 ASM
- Activate the standby and start in `STARTUP UPGRADE` mode
  - Invalidate and compile all packages/code (32bit ⇒ 64bit!)
- Register database to Clusterware and move OCR/Voting to ASM



# Project 6: Interhyp



- Road to success:
  - Go Live: 27-NOV-2010
  - Total downtime: ~2 hours
  - Database upgrade time: 24 minutes + recompilation 5 minutes
  - Database, ASM and GI is very robust
- But ...
  - Found some optimizer issues with 11.2.0.2 after the upgrade ...



**Oracle 11.2.0.2**  
Linux 64bit

# Get the slides: [blogs.oracle.com/UPGRADE](http://blogs.oracle.com/UPGRADE)

## Upgrade your Database - NOW!

Ease your Oracle Database upgrades - Best Practices, Workshops, Projects ...

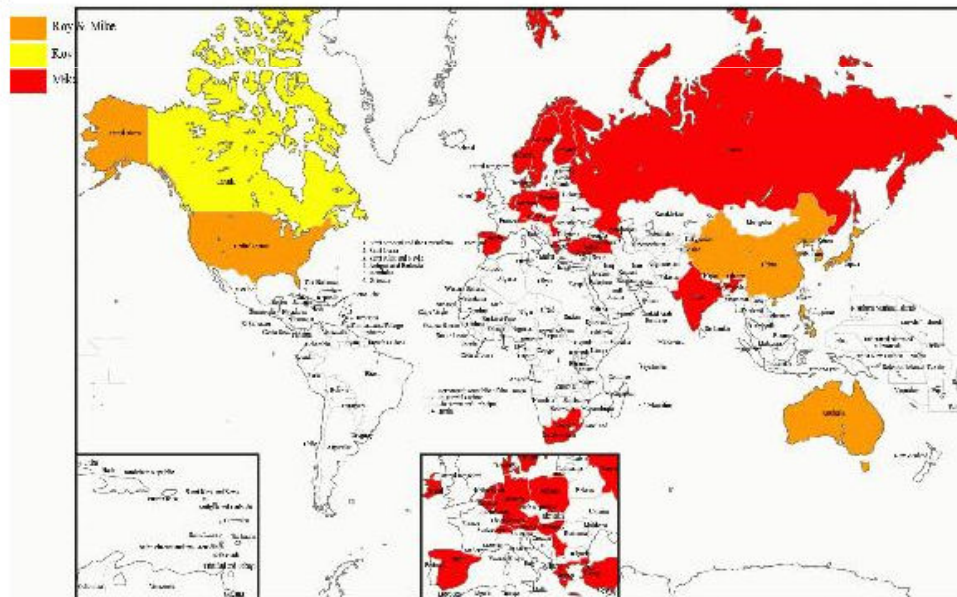
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### Thank you for your support throughout 2010!!!

By [Mike Dietrich](#) on [December 23, 2010 6:40 PM](#)

Now as the calendar year **2010** is close to its end, it's time for a quick wrap-up. The TV stations have shown all their flashbacks already in early December but we'll wait until end of the year ;-)

I will post some **pictures** done by Roy or me throughout our travel in the next days. We've visited a lot of countries - and did **more than 60 full-day Upgrade Workshops** in **28 different countries**:



About



**Mike Dietrich**  
Consulting Member Technical Staff  
Database Upgrade Development  
ORACLE Corporation

Working out of the [Oracle's Munich office in Germany](#) acting as interlink between customers and Oracle's Upgrade Development.  
You'd like to connect with me?  
[LinkedIn](#) or [XING](#) :-)

Slide Downloads

[Upgrade to Oracle 11.2](#)  
[Upgrade Workshop +500 Slides](#)  
Keyword: [upgrade112](#)

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# Summary

- Upgrade to Oracle Database 11g & 11g Release 2 is easy
  - Stable database release
  - Great features
  - Let's go ... :-)
- 
- Any questions – would you like to become an Oracle 11.2 reference customer? Let us know about your upgrades ...
    - `Mike.Dietrich@oracle.com`
    - `Roy.Swonger@oracle.com`



# Credits

... to all the people inside and outside of Oracle who have provided most valuable input, corrections, recommendations, annotations, experiences!!! And to everybody who has visited one of our more than 100 workshops since October 2008!!!

## **Many thanks to:**

Marco Patzwahl (MuniQSoft GmbH), Paul Jones (Elsevier), Jurgen Plettinckx (TomTom) ...

## **And many thanks to our colleagues from Oracle:**

Raymond Dutcher, Mark Richwine, Mike Hallas, Antonio Flores, Kerry Sesker, Torsten Senft, Robert Pastijn, Zulfikar Qureshi, Prabhaker Gongolloor (GP), Leonidas Galanis, Pete Belknap, Takuya Abe, Kota Uchino, Mike Appleyard, Wachyu Danyanto, Roland Knapp ... and the whole Upgrade Development Group

(If your name is missing we apologize but we've just started this Credits slide on 10-AUG-2010, so more names will be added soon)

# **Hardware and Software Engineered to Work Together**

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