

ORACLE®

Hitchhiker's Guide to upgrade to Oracle Database 12c

Mike Dietrich

Senior Principal Technologist
Database Upgrades
Oracle Corporation



Upgrade your Database - NOW!

**HARDWARE
AND SOFTWARE
ENGINEERED
TO WORK
TOGETHER**

Updated: 3-APR-2014

Hitchhiker's Guide to Oracle Database Upgrades

- Introduction
- When?
- Why?
- How?
- News?
- The Real World
- Wrap Up



\$> whoami

Mike Dietrich

6 years
RDBMS Core & Mission Critical Support

6 years
Technology Presales for DataGuard, Upgrades

6 years
ST Upgrade Development Team

50%
Reference Projects

50%
Workshops Worldwide

+ x%
Development Work

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Reference Involvement

Customer Success
Your success is our aim!



Non-binding Reference Proposal
for

Oracle Database Upgrade Development: Customer Reference Program



Company Name and Logo

You agree that your company name (where necessary including your logo) will be called "customer" or "reference customer" for relevant products and projects. Typically we will then use your company name during internal and external presentations or events.

Agree: Yes ☐ No ☐

Comments:

Customer Quote

The quote is a brief statement about how your company has achieved a technological head start or has benefited economically from using Oracle products. Example: "Since we have been using Oracle iProcurement our acquisition costs have fallen by around 20%" – John Doe, CIO, IT Company Inc. With your agreement we will use your quote, for instance, in product brochures.

Agree: Yes ☐ No ☐

Comments:

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Reference Involvement: Results

Real World Checkpoint 199

- Customer:** Payback GmbH
- Project:** Belongs to Loyalty Partner GmbH which belongs to American Express
- Constraints:** HQ in Munich, Germany
- Preparation:** Develops and operates professional customer loyalty programs based on customized IT solutions
- Upgrade:** Provider for Payback
- Success?** Active in Germany, Poland, India and Mexico

Real World Checkpoint 200

- Project:** Migrate 7TB / 1.5TB from HP-UX to Exadata V1
- Constraints:** Cross platform, cross Endianness, cross version
- Preparation:** Oracle 9.2.0.7 on HP-UX → Oracle 11.1.0.7 on OL
- Upgrade:** 4 months planning and migration phase
- Success?** August November 2009
- Remarks:** Proposed go-live date: 15-Nov-2009

Real World Checkpoint 204

- Project:** Move everything in less than 24 hrs. x1.5x
- Constraints:** Network bottlenecked
- Preparation:** Customer installed 4x 3GB/sec thro

Real World Checkpoint 202

Setup:

PROG → Restore → Upgrade → 11g → OL 11g

Real World Checkpoint 203

Test migrations:

PROG → 11g → OL 11g

Real World Checkpoint 205

- Project:** Final test became LIVE migration

Real World Checkpoint 206

- Project:** Live? And alive?
- Constraints:** Test Go-live in early November 2009
- Preparation:** Thinks earlier than proposed
- Upgrade:** Total upgrade and migration time: ~30 hours
- Success?** ~9 hours: Restore and backup
- Remarks:** ~1 hour: Database upgraded Oracle 11.1.0.7
- Remarks:** ~10 hours: Data migration to Exadata V1
- Remarks:** ~1 hour: Smoke testing and final verification
- Remarks:** Dramatic performance improvements
- Remarks:** Job runtimes decreased by 60%
- Remarks:** User complaints abound fast performance... really!

Real World Checkpoint 207

"The new parallel upgrade script promises to drastically reduce downtime due to planned maintenance. We saw a 37% improvement over the previous upgrade process in our environment."

Harald Stefan
Leiter Datenbanken
Payback GmbH

>16000 Downloads
since June 2013

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Slides and Dates?

- Download slides from:
 - blogs.oracle.com/UPGRADE



19-MAY-2014
Copenhagen/Denmark
Upgrade/Migrate/Consolidate to 12c
==> Register Now!

20-May-2014: Oslo/Norway
Upgrade/Migrate/Consolidate to 12c
==> Register Now!

JUN 2014
4-JUN-2014
Stockholm/Sweden
Upgrade/Migrate/Consolidate to 12c
==> Register Now!

5-JUN-2014
Helsinki/Finland
Upgrade/Migrate/Consolidate to 12c
==> Register Now!

lived first year of free...
to Oracle Database 12c...
11.2.0.4 within the next months start drinking more...
instead. There won't be much difference in efforts and th...
dless if you'd like to Oracle Database 11.2.0.4 or Oracle

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[Main](#) | [Next page](#) »

About



Mike Dietrich
Senior Principal Technologist -
Database Upgrade Development Group
- Oracle Corporation

Based near Munich/Germany and
spending plenty of time in airplanes to
run either upgrade workshops or work
onsite with reference customers. Acting
as interlink between customers and the
Upgrade Development.

Contact me either via [XING](#) or [LinkedIn](#)

Slides Download Center

Upgrade, Migrate & Consolidate to
Oracle Database 12c
Refreshed 12-MAR-2014

Multitenant in the Real World
DOAG 2013
Uploaded 20-NOV-2013

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Further material?

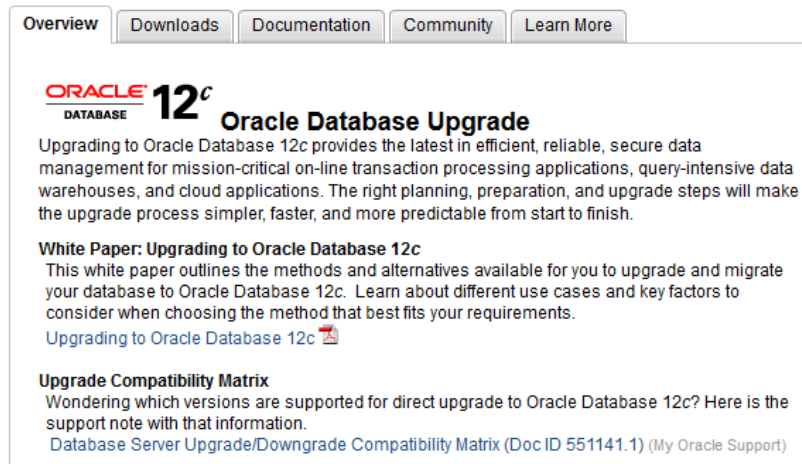
- 90 Minute Webcast:

Upgrade, Migrate & Consolidate to Oracle Database 12c

- <http://event.on24.com/r.htm?e=750382&s=1&k=4F42244E75402FC0D8DEBBD12F134906>

- OTN Page:

- <http://otn.oracle.com/goto/upgrade>



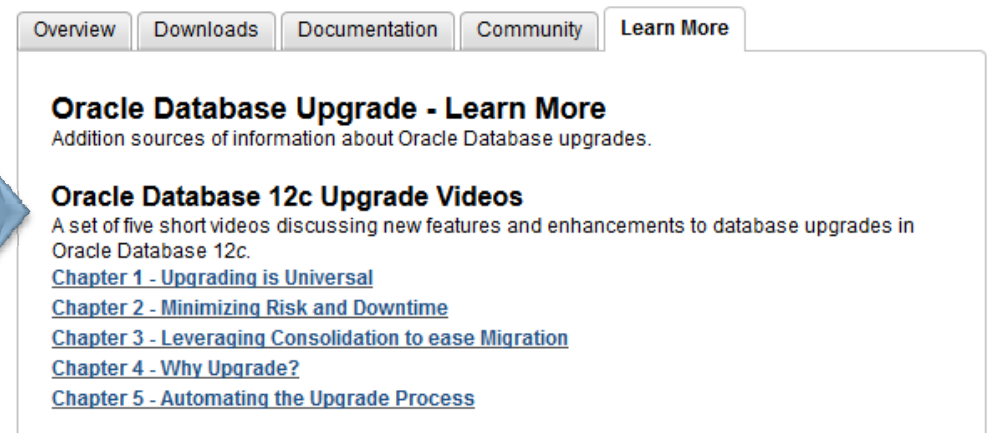
ORACLE DATABASE 12c Oracle Database Upgrade

Upgrading to Oracle Database 12c provides the latest in efficient, reliable, secure data management for mission-critical on-line transaction processing applications, query-intensive data warehouses, and cloud applications. The right planning, preparation, and upgrade steps will make the upgrade process simpler, faster, and more predictable from start to finish.

White Paper: Upgrading to Oracle Database 12c
This white paper outlines the methods and alternatives available for you to upgrade and migrate your database to Oracle Database 12c. Learn about different use cases and key factors to consider when choosing the method that best fits your requirements.

[Upgrading to Oracle Database 12c](#)

Upgrade Compatibility Matrix
Wondering which versions are supported for direct upgrade to Oracle Database 12c? Here is the support note with that information.
[Database Server Upgrade/Downgrade Compatibility Matrix \(Doc ID 551141.1\)](#) (My Oracle Support)



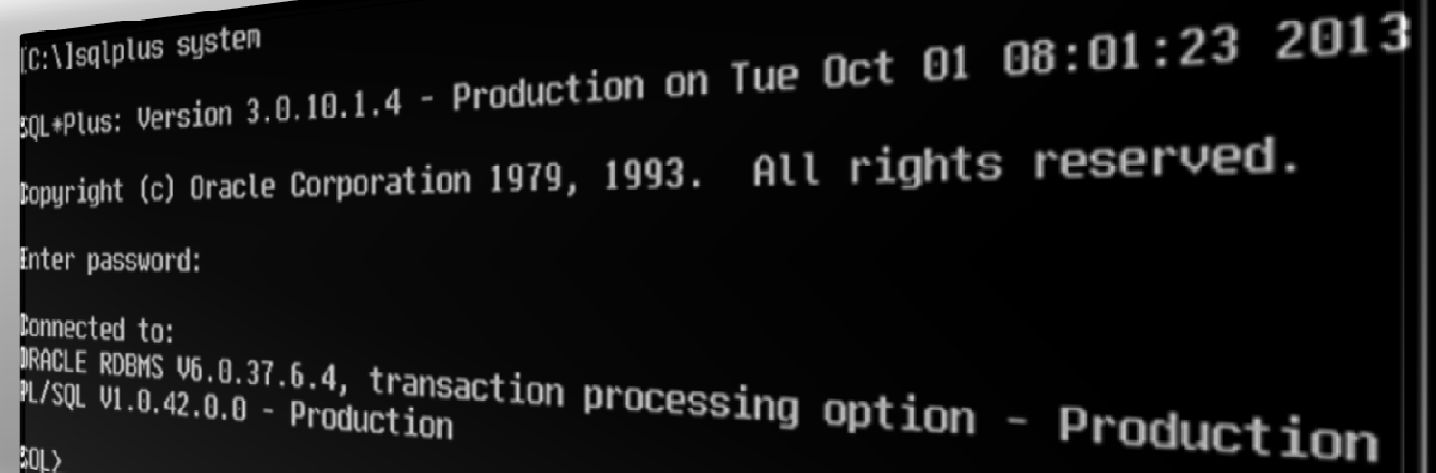
Oracle Database Upgrade - Learn More
Additional sources of information about Oracle Database upgrades.

Oracle Database 12c Upgrade Videos
A set of five short videos discussing new features and enhancements to database upgrades in Oracle Database 12c.

- [Chapter 1 - Upgrading is Universal](#)
- [Chapter 2 - Minimizing Risk and Downtime](#)
- [Chapter 3 - Leveraging Consolidation to ease Migration](#)
- [Chapter 4 - Why Upgrade?](#)
- [Chapter 5 - Automating the Upgrade Process](#)

Hitchhiker's Guide to Oracle Database Upgrades

- Introduction
- **When?**
- Why?
- How?
- News?
- The Real World
- Wrap Up



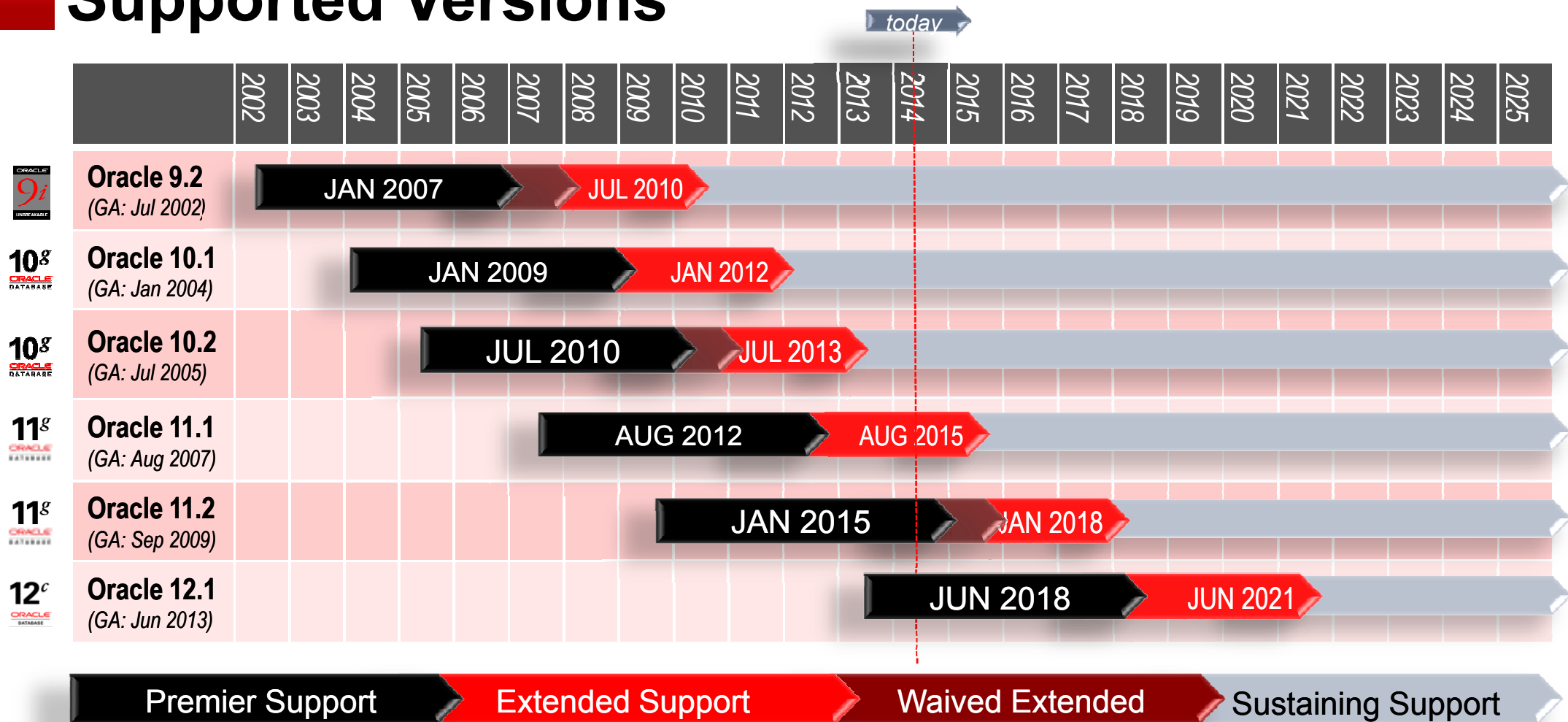
```
(C:\)sqlplus system  
SQL*Plus: Version 3.0.10.1.4 - Production on Tue Oct 01 08:01:23 2013  
Copyright (c) Oracle Corporation 1979, 1993. All rights reserved.  
Enter password:  
Connected to:  
ORACLE RDBMS V6.0.37.6.4, transaction processing option - Production  
PL/SQL V1.0.42.0.0 - Production  
SQL>
```



When does **Oracle Database 11.2** run **out** of **Premier Support?**

303 days < 10 months!

Supported Versions



Upgrade, Migrate and Consolidate to Oracle 12c

- Introduction
- When?
- **Why?** Or *why not?*
- How?
- News?
- The Real World
- Wrap Up



Why customers don't upgrade

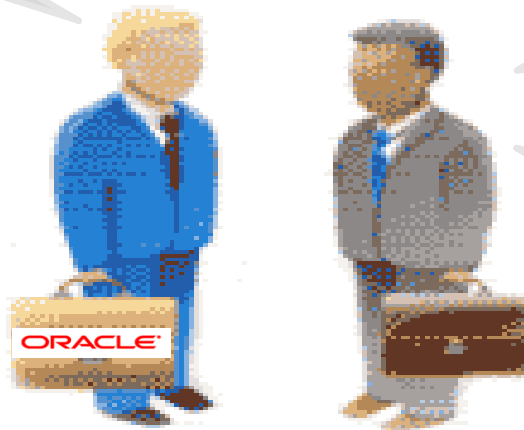
"You need to upgrade now as your release is going out of support soon!!!"

"Upgrading just costs a lot!"

"I don't see any benefits by upgrading to a newer release"

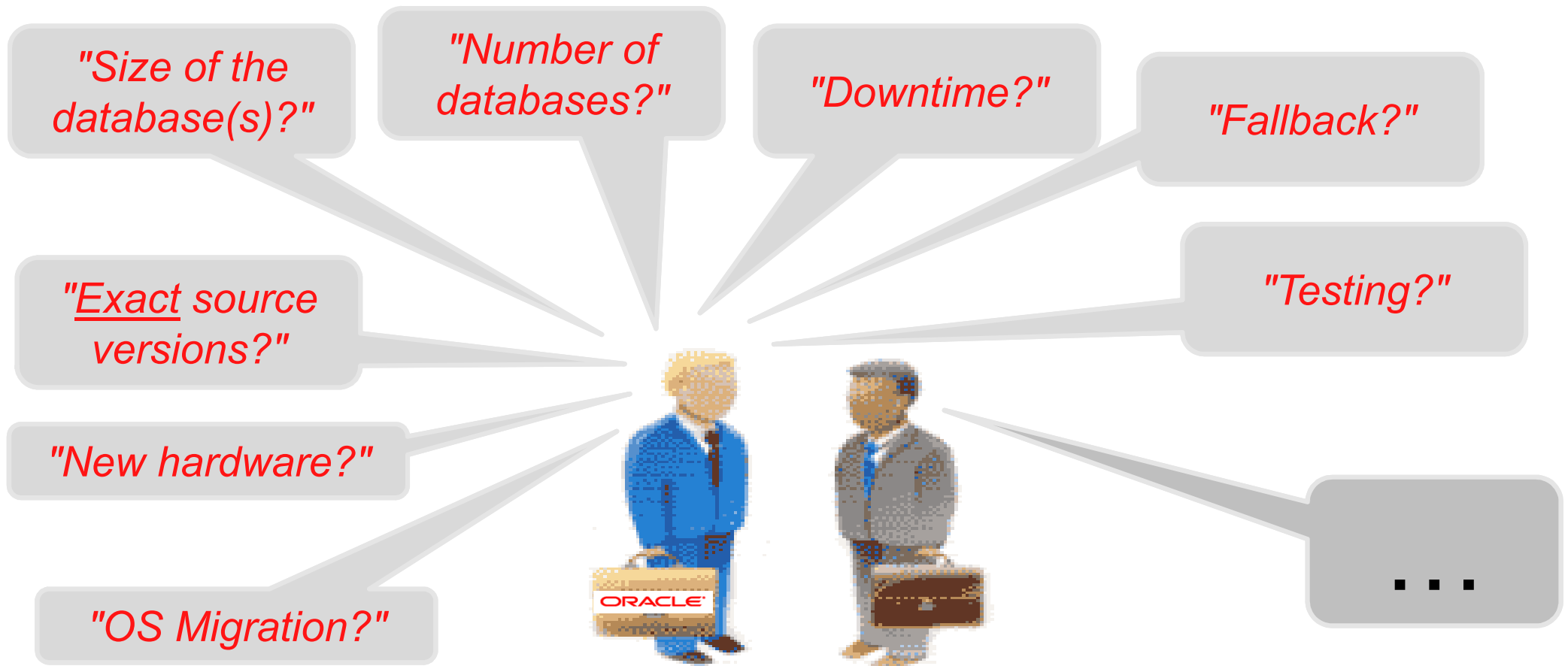
"I'm happy with the features of Oracle 8i"

"It will just introduce new bugs and issues"



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Examination



Are you maintaining a Zoo?

ENTPRC ARCH	7.3	8.1	9.2	10.1	10.2	11.1	11.2
AIX 5.3.X			4	3			
HP-UX 10	1	3					
HP-UX 11.11		1	4	1	2		
HP-UX 11.2x		3			2		
HP-UX 11.31			1		15	1	
SOLARIS 8		3					
SOLARIS 9		3	15	2			
SOLARIS 10					14	1	1



3 different OS families ⇔ 7 different major Oracle releases

6 of 8 OS desupported ⇔ 77 of 80 databases out of Support

Maintaining a Zoo is **EXPENSIVE**

ENTPRC ARCH	7.3	8.1	9.2	10.1	10.2	11.1	11.2
AIX 5.3.X			4	3			
HP-UX 10	1	3					
HP-UX 11.11		1	4	1	2		
HP-UX 11.2x		3			2		
HP-UX 11.31			1		15	1	
SOLARIS 8		3					
SOLARIS 9		3	15	2			
SOLARIS 10					14	1	1

↓

Maintenance Costs

↓

Upgrade/Migration Costs



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Another example from the Real World

----- Original Message -----

Subject:

Re: & Oracle- Data replication follow up

Date:

Tue, 21 Jan 2014 16:06:30 -0600

From: [REDACTED]

To: [REDACTED]

CC: [REDACTED]

OS change

Application change

Client change

HW change

HI [REDACTED]

Thanks for the assistance and connections.

What would be

Downtime Required

RT0 20 m

RPO as close to zero as possible. CTO did not state specifically zero however.

Size: unknown, these are WMS type applications for their inventory, orders, etc,

How Many: Estimated 10-15 instances based on conversation.

10-15 databases

Minimal Downtime between Oracle 7.3 and Oracle 11.2

No upgrade done for ~17 years!!!

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Upgrade, Migrate and Consolidate to Oracle 12c

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Upgrade/Migration Strategies?

Step-by-Step Strategy

- In pieces over time
- Risk mitigating



Big-Bang Strategy

- All in one downtime window
- Sometimes necessary due to dependencies



Least Critical First

- Learn more with every step



Most Critical First

- Learn about almost all from the beginning

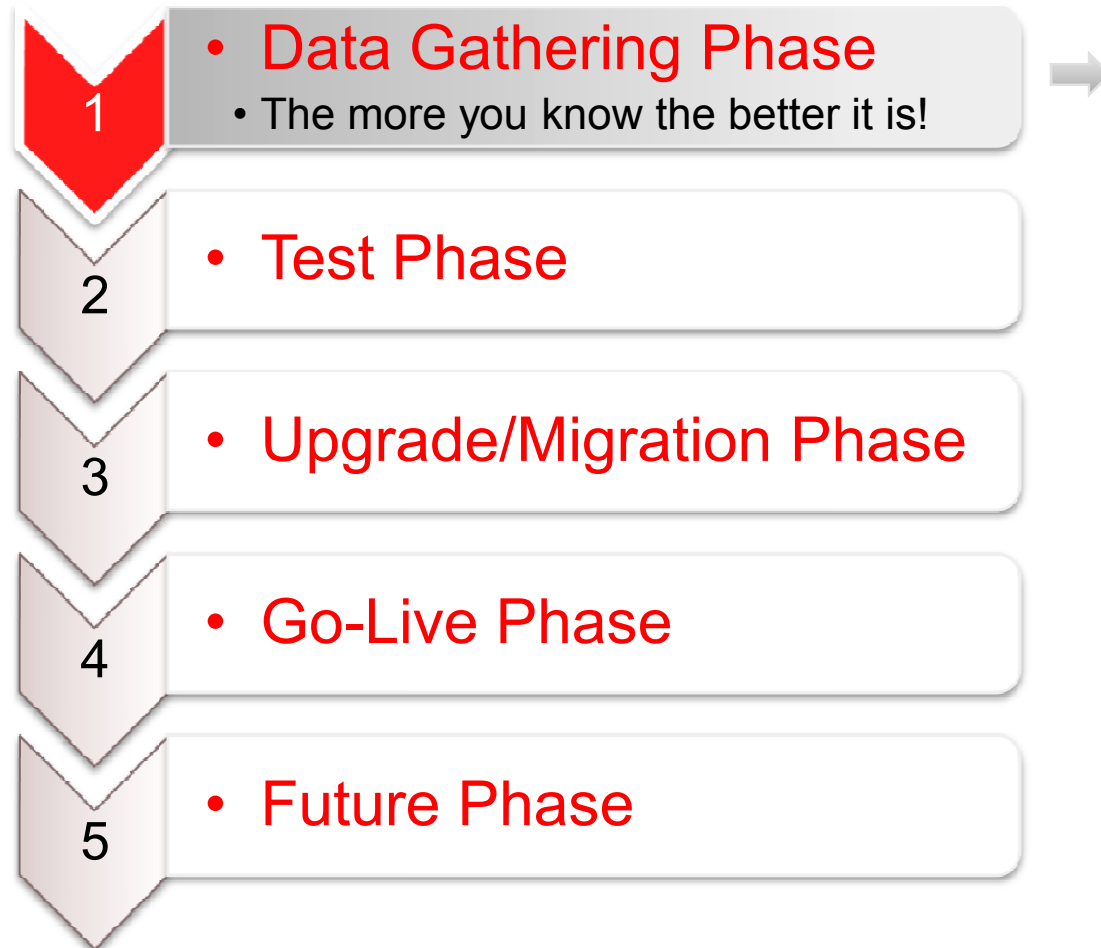


Project Approach?

- **Plan** your upgrades **as early as possible**
- Application **testing** is important
- Have **valid test systems**
- Think about the **fallback** ... before you start!
- Try to **streamline**
- **Talk to us** (Oracle) to avoid pitfalls
 - Get our Best Practice slides 😊

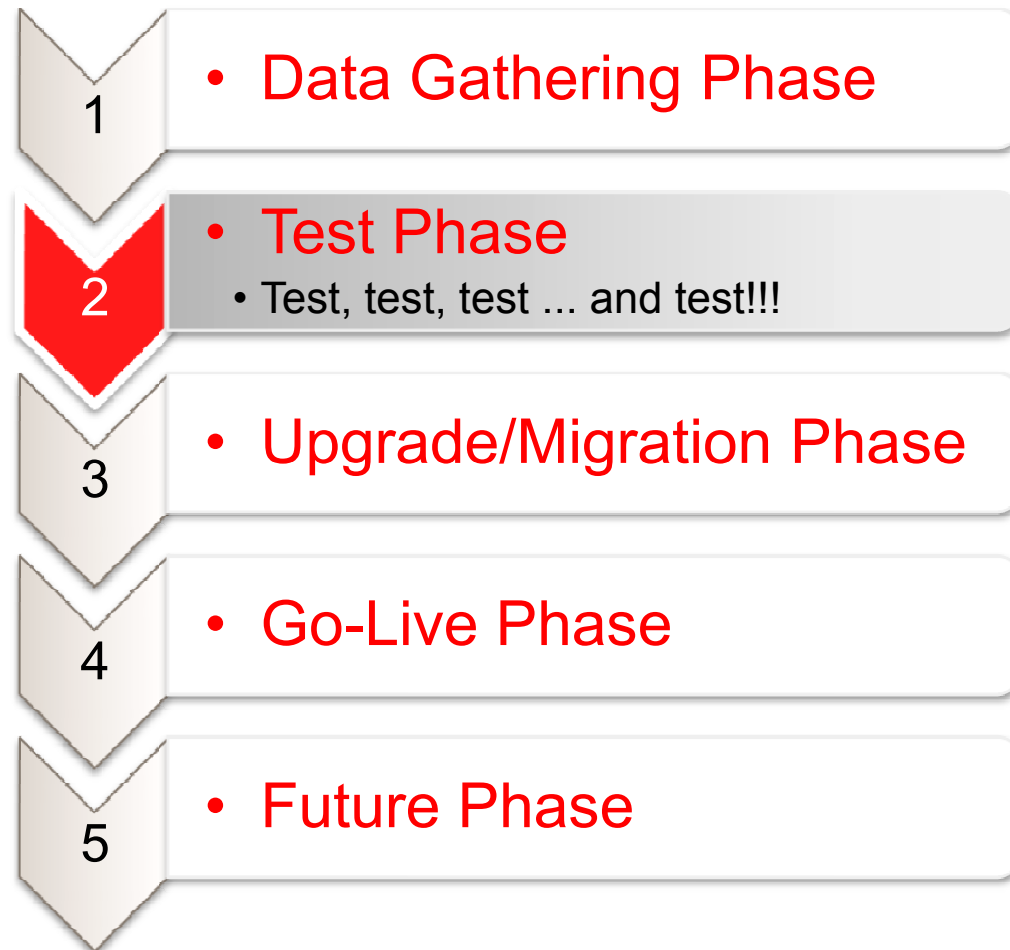


Project Phases



- **Application:**
 - Owner?
 - Version?
 - Dependencies?
 - Certification?
 - Timeframe?
 - Test budget?
- **Database:**
 - Owner?
 - Exact version and patches?
 - Size?
 - Downtime?
 - Dependencies?
 - Gateways?
 - Operating system version?

Project Phases



- 1:1 test systems?
- Documentation?
- Network bandwidth?
- Performance data from PROD?
- Testing tools: RAT?
- Batches, long-ops?
- Multiple successful test runs?
- Performance protection?
- Be open to late patches/PSUs!
- Fallback strategy tested?

Network Bandwidth

Interface	Netto Data Volumne	Theoretical Transfer Throughput	Real World Transfer Throughput
100 Mbit Ethernet	11 MB/sec	40 GB/hour	<30 GB/hour
1 Gbit Ethernet	110 MB/sec	400 GB/hour	<300 GB/hour
10 Gbit Ethernet	1100 MB/sec	4000 GB/hour	<3000 GB/hour
Infiniband IB 4xQDR	4000 MB/sec	14400 GB/hour	<11000 GB/hour

General Test Guidelines



Upgrade/Migration Process

Post-Upgrade Functionality

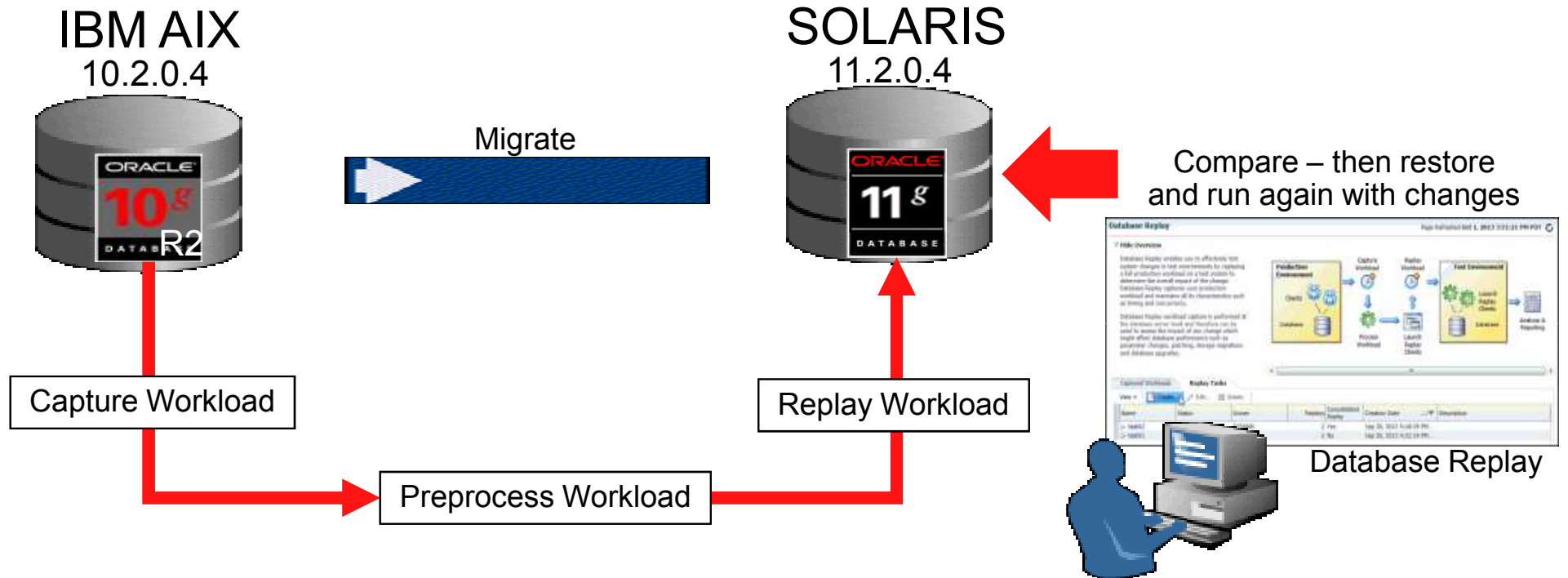
Post-Upgrade Performance

Prod Load

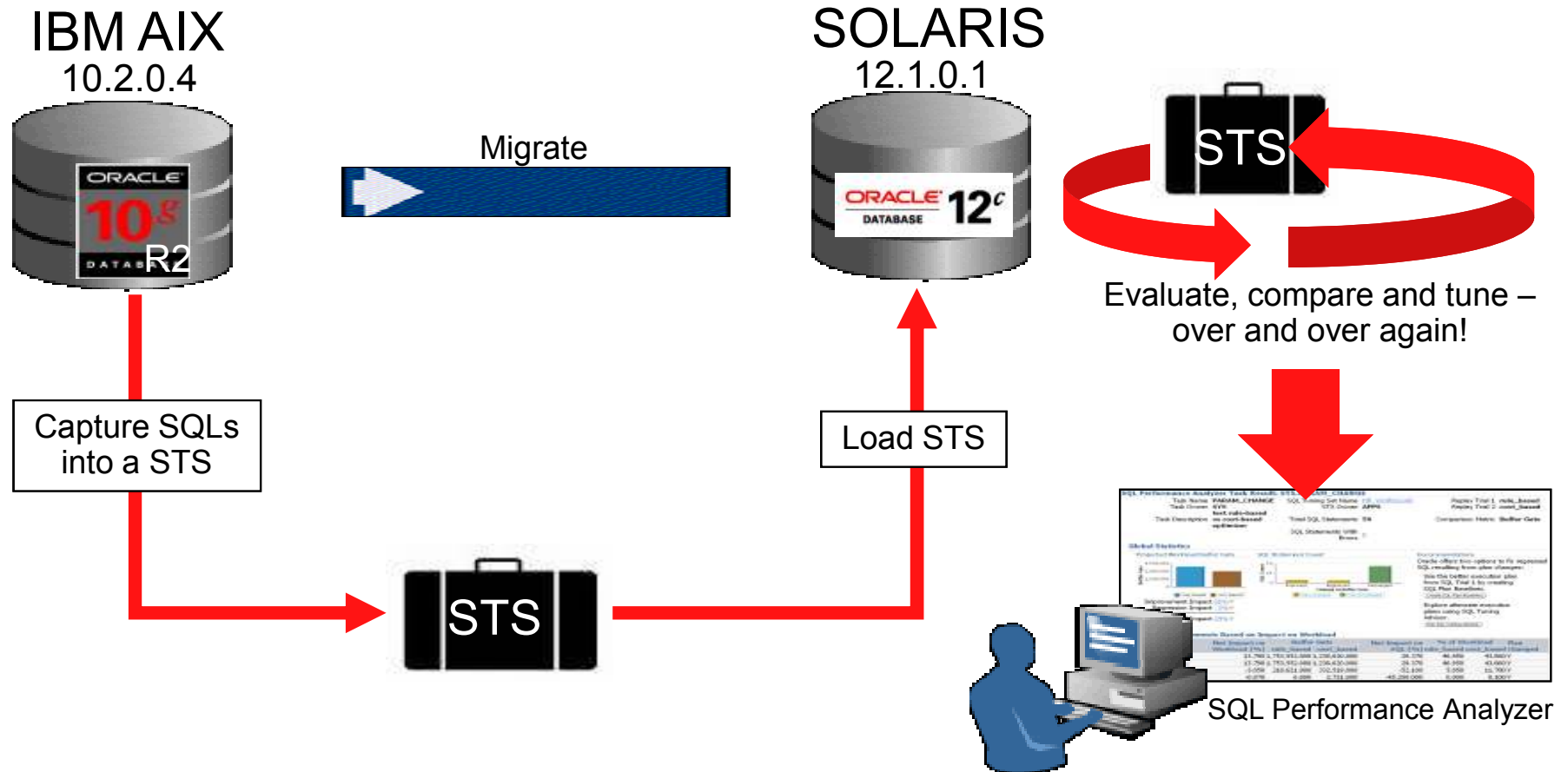


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Database Replay



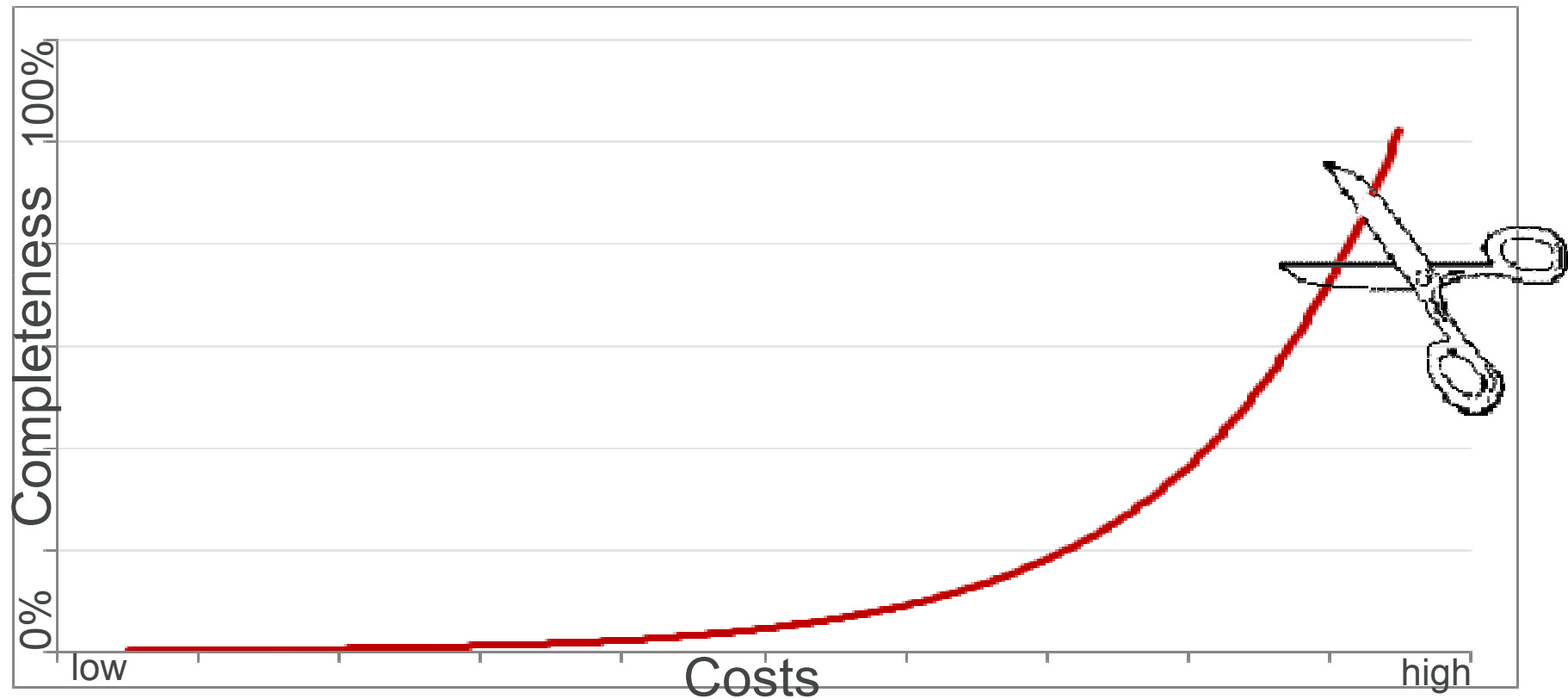
SQL Performance Analyzer



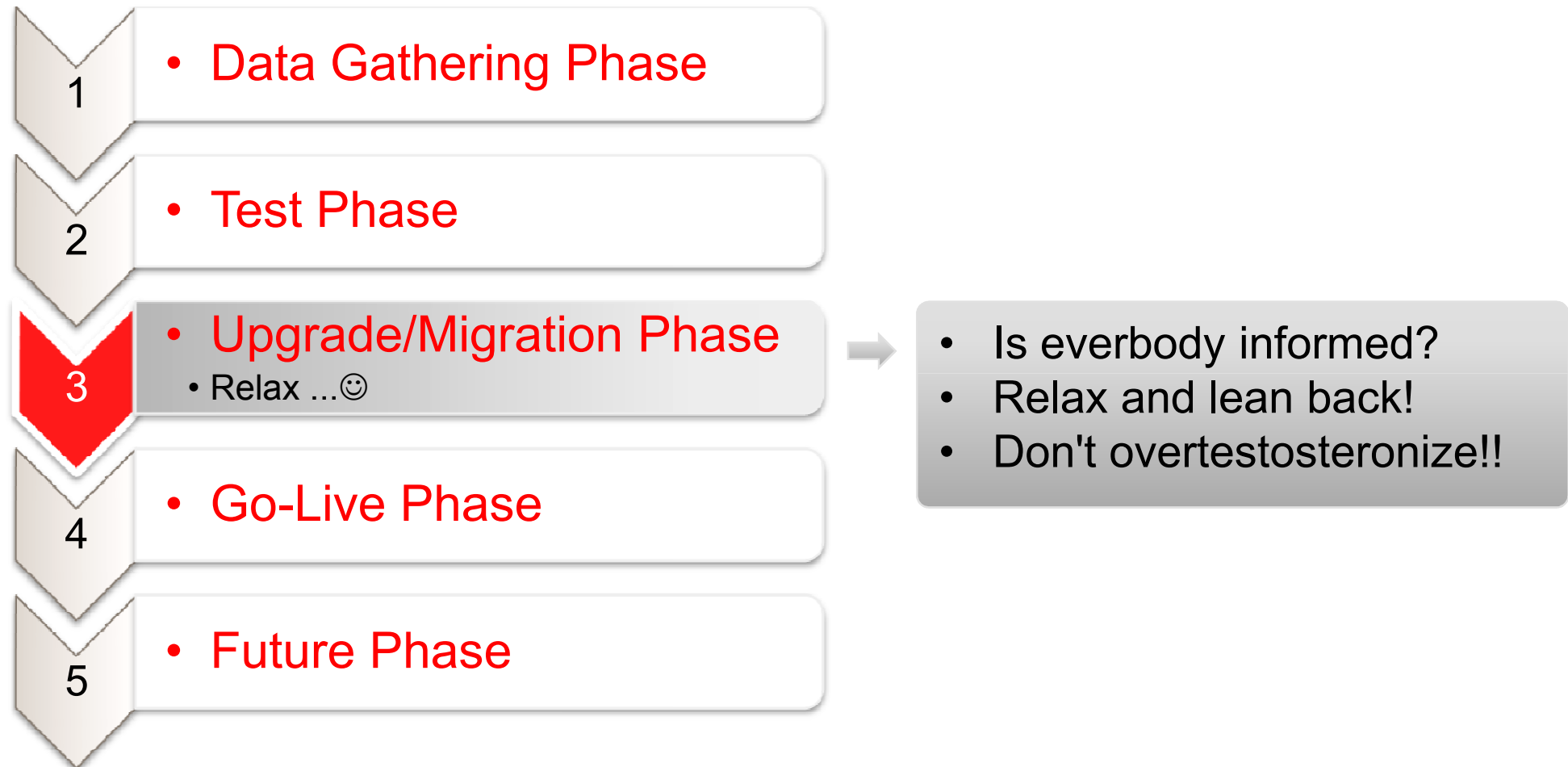
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Testing Effort

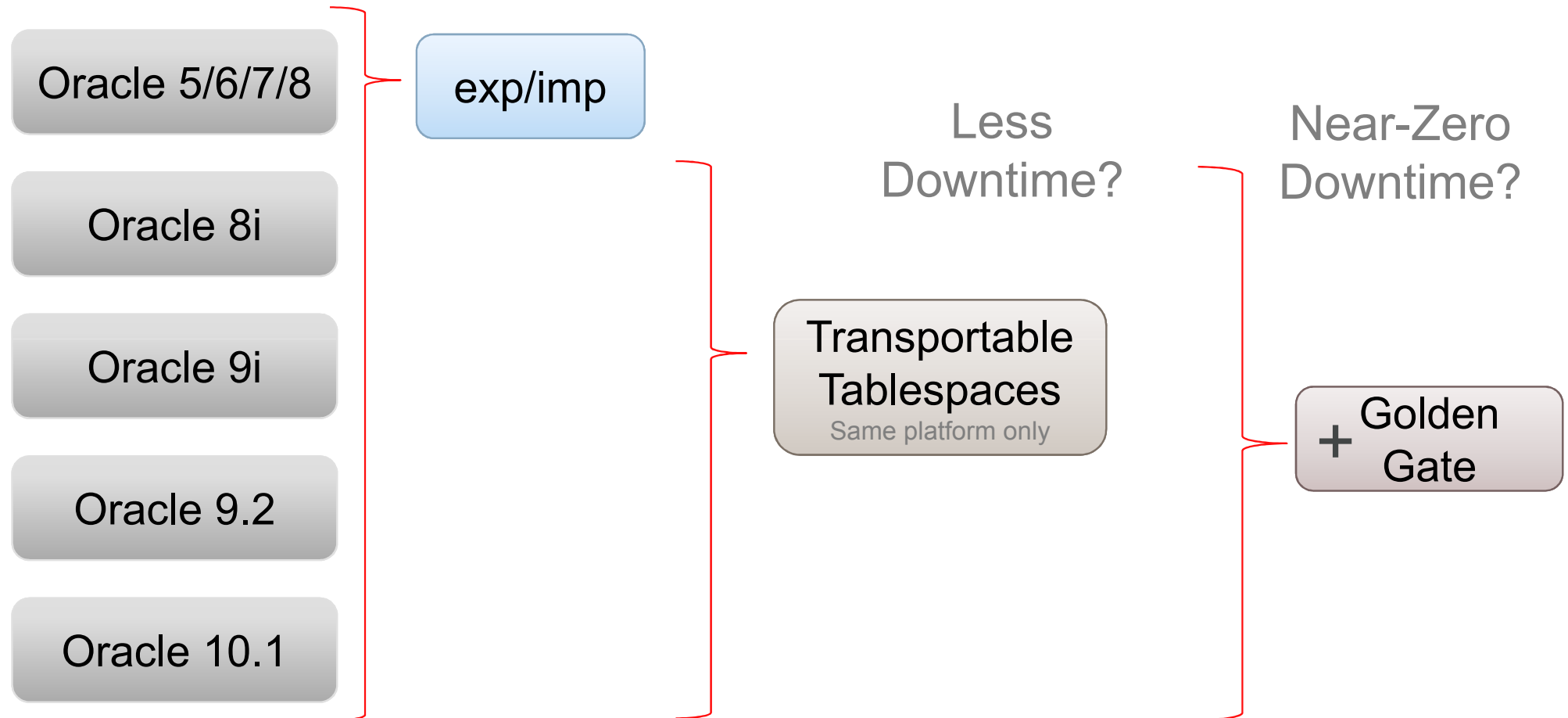
- Relation between test completeness and costs



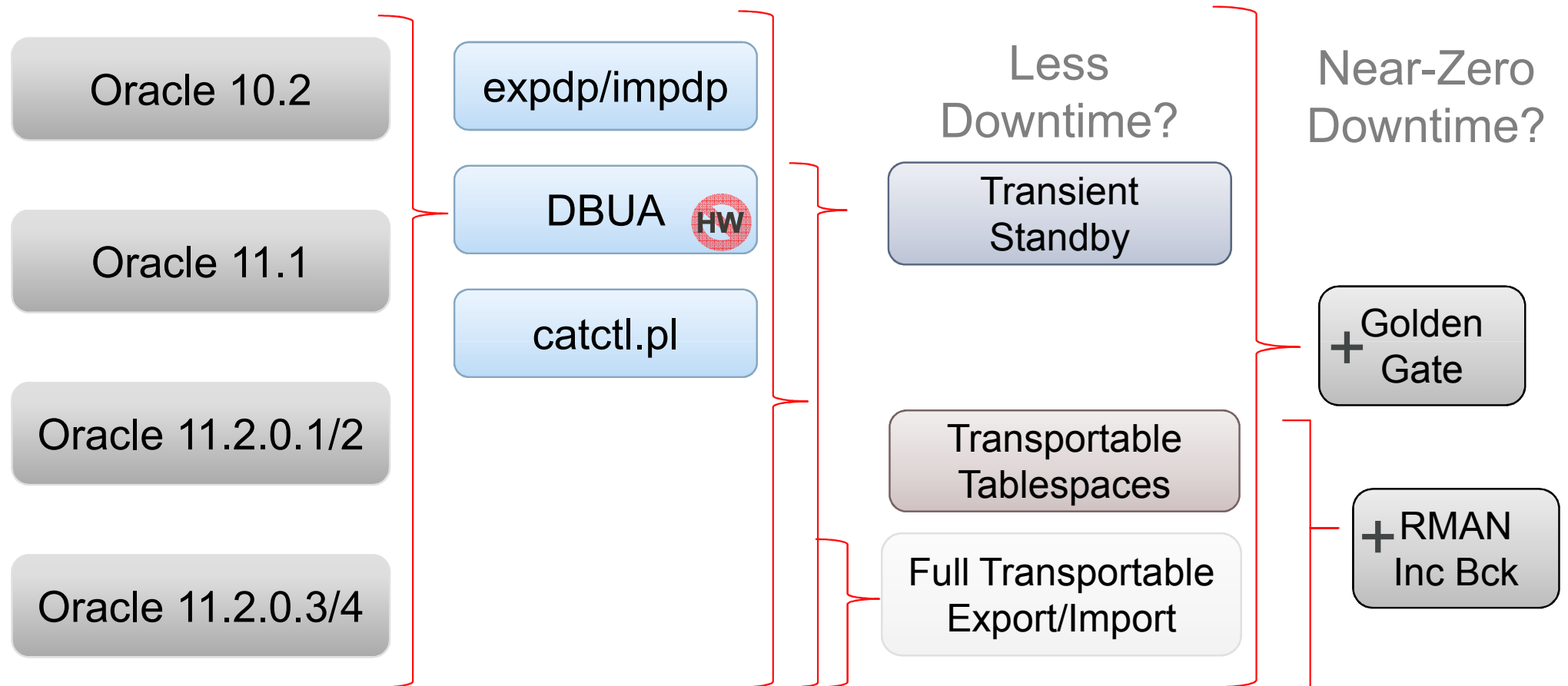
Project Phases



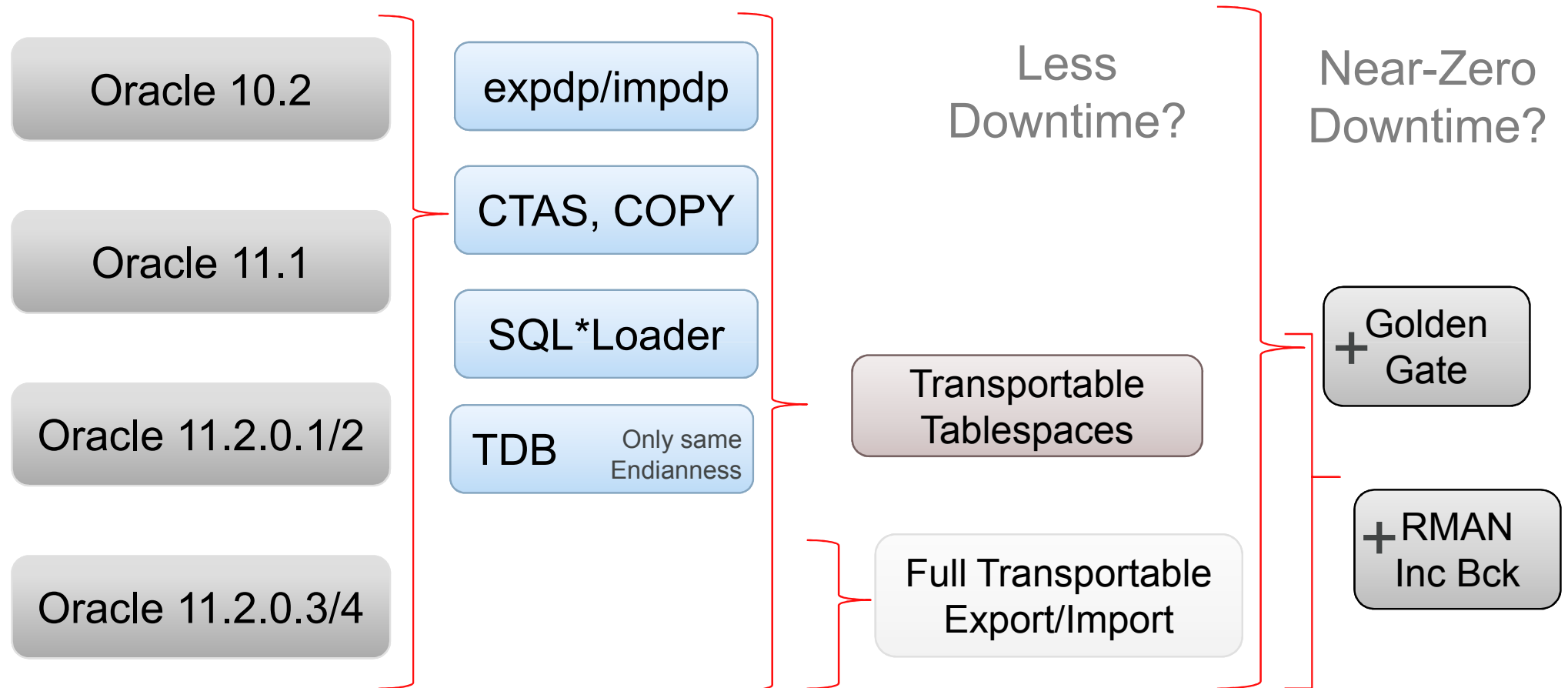
Upgrade/Migrate **Older** Oracle Releases



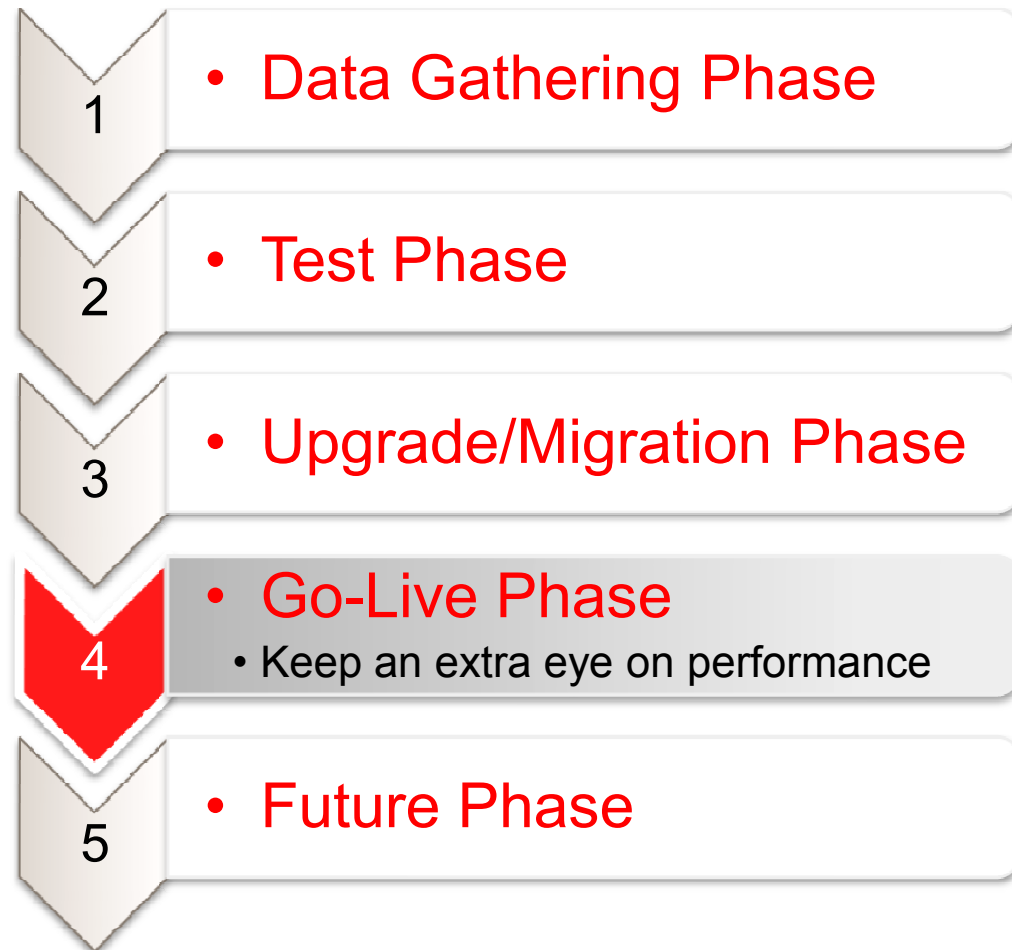
Upgrade Options to Oracle Database 12c



Migration Options to Oracle Database 12c

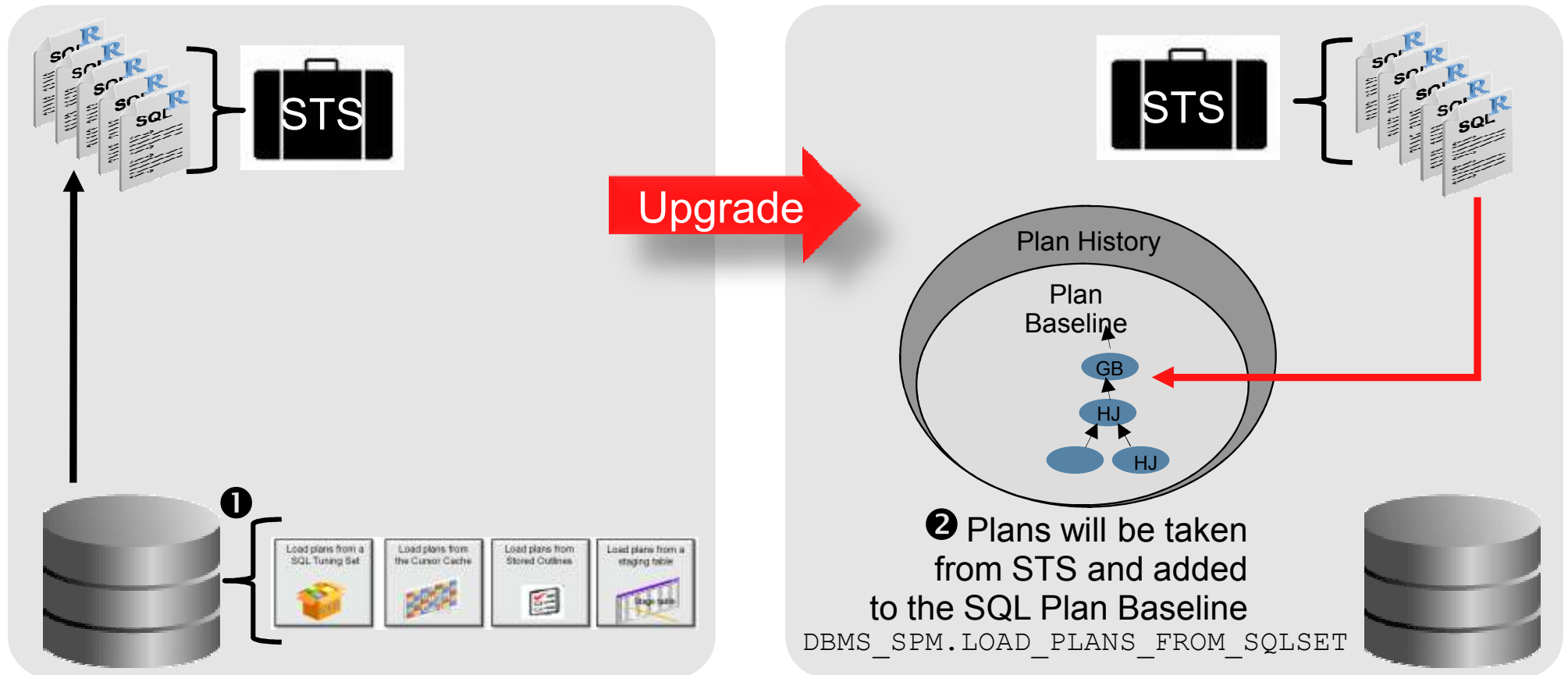


Project Phases

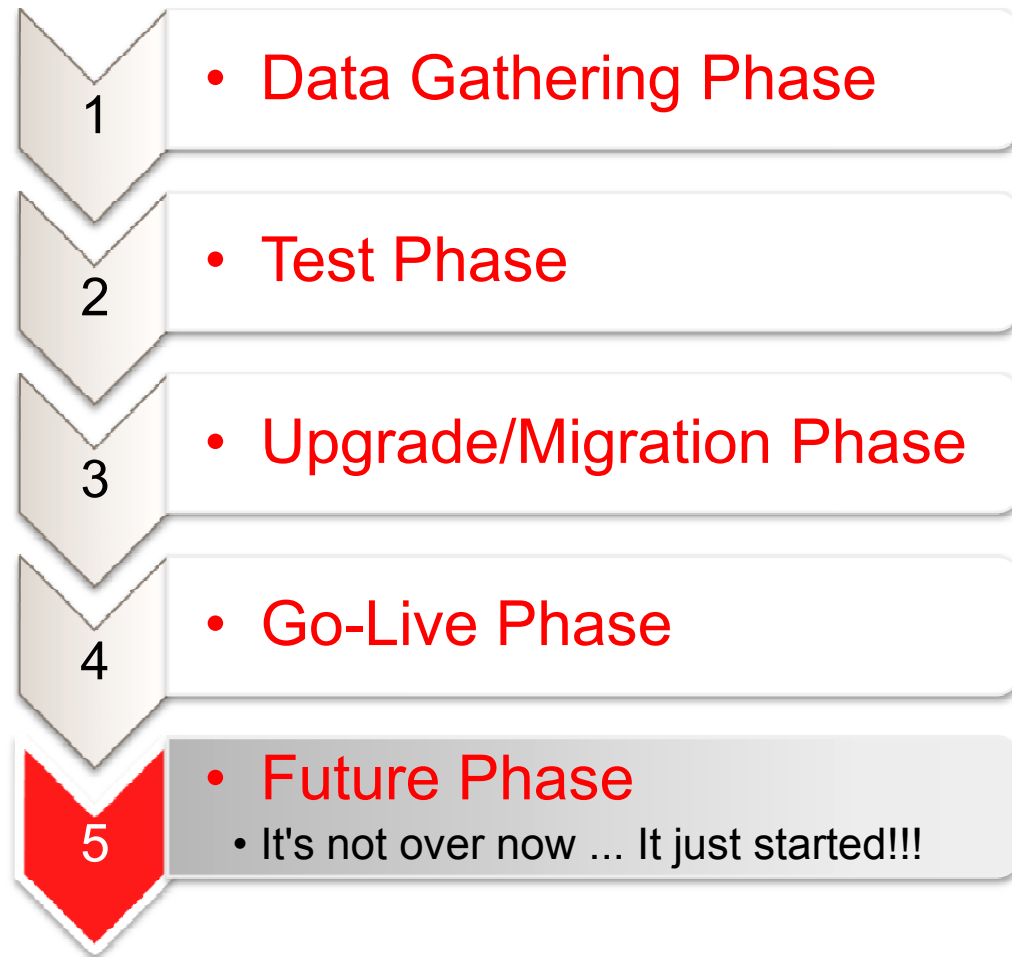


- Monitor performance behaviour
- Any issues?
 - Use collected data from pre-upgrade to fix issue
 - Open an SR with Support

SPM – Plan Stability using Plan Capture



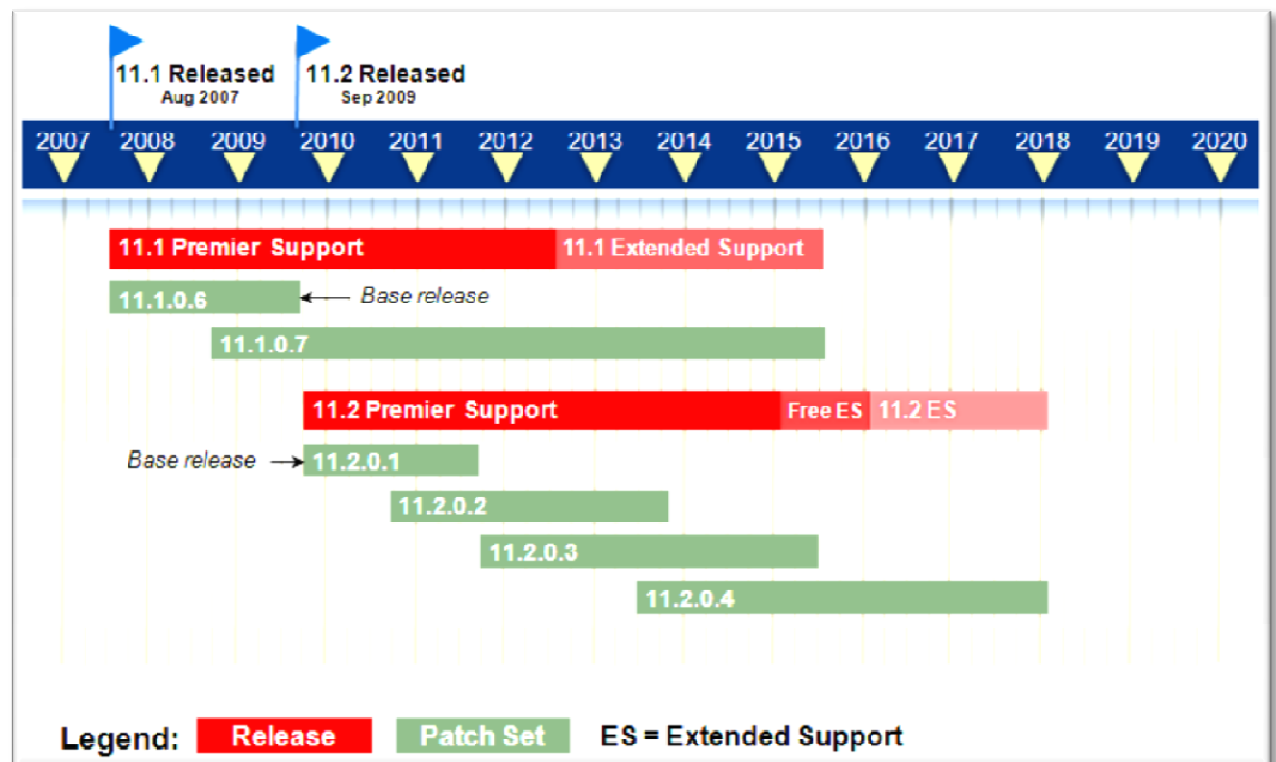
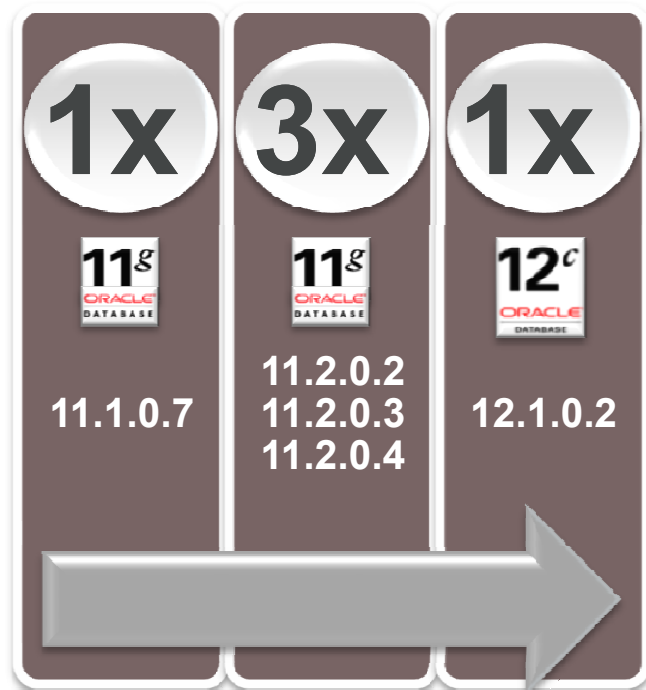
Project Phases



- Don't lean back – it just started!
- Patching strategy?
 - Next available PSU?
 - Next available patch set?
 - When will be the next upgrade?
- Adopt useful new features
 - Many features come for free

Waiting for next Patch Set?

- Release Schedule of Current Database Releases [Note.742060.1](#)



Recommended Patches: **PSUs**

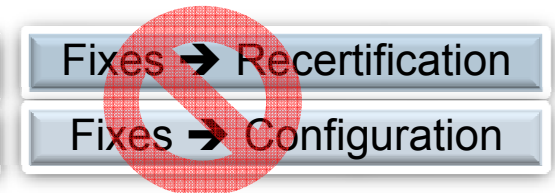
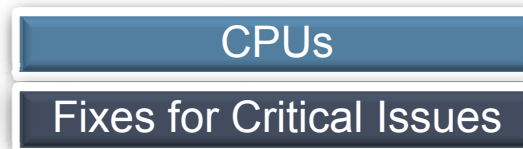
- **Always** install the **latest PSU** as soon as possible

- Most important Notes:



[Note:854428.1](#): Introduction to Database PSU
[Note:1227443.1](#): PSU Known Issues

- PSU contents:



- PSU characteristics:



- PSU schedule – **4x**:



14-JAN-2014 / 15-APR-2014 / 15-JUL-2014 / 14-OCT-2014

Hitchhiker's Guide to Oracle Database Upgrades

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Upgrade to Oracle Database 12c

		Oracle 7.3.4	Oracle 8.0.6	Oracle 8.1.7.4	Oracle ≥9.0.1.4	Oracle 9.2.0.8	Oracle 10.1.0.5	Oracle 10.2.0.5	Oracle 11.1.0.7	Oracle ≥11.2.0.2	Oracle 12.1.0.1
Oracle 7.3 (GA: 1996)		7.3.4				9.2.0.8				≥11.2.0.2	
Oracle 8.0 (GA: 1997)			8.0.6			9.2.0.8				≥11.2.0.2	
Oracle 8.1 (GA: 1998)				8.1.7.4				10.2.0.5			
Oracle 9.0 (GA: 2001)					9.0.1.4			10.2.0.5			
Oracle 9.2 (GA: Jul 2002)						9.2.0.8				≥11.2.0.2	
Oracle 10.1 (GA: Jan 2004)							10.1.0.5			≥11.2.0.2	
Oracle 10.2 (GA: Jul 2005)								10.2.0.5			DIRECT
Oracle 11.1 (GA: Aug 2007)									11.1.0.7		DIRECT
Oracle 11.2 (GA: Sep 2009)										≥11.2.0.2	DIRECT
Oracle 12.1 (GA: Jun 2013)											

Please note: This graph will apply to database upgrades only!

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Upgrade SQL Automation

New Pre-Upgrade Script

- `preupgrd.sql`
- Executes pre-upgrade checks
- Runs in source environment
- Generates fixup scripts
 - `preupgrade_fixups.sql`
 - `postupgrade_fixups.sql`
- MOS [Note:884522.1](#)

```
*****
Fixup:      PURGE_RECYCLEBIN
Description: Check that recycle bin is empty
*****
Fixup Succeeded
*****

*****
[Pre-Upgrade Recommendations]
*****

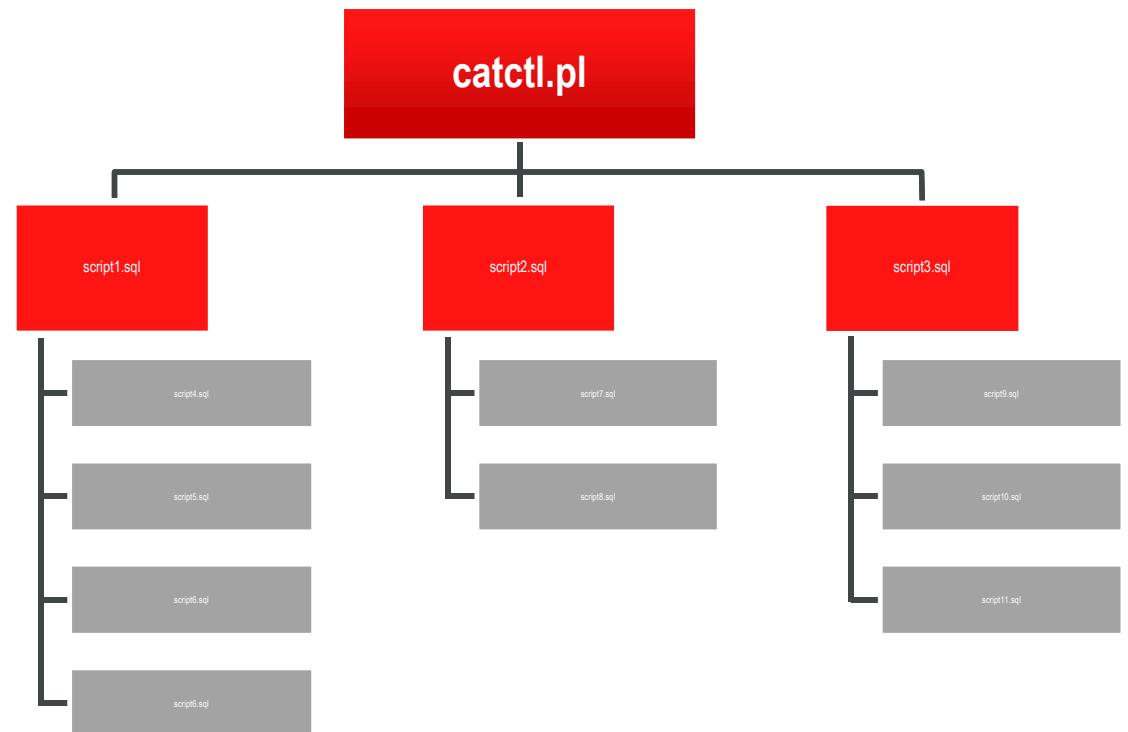
*****
***** Dictionary Statistics *****
*****

Please gather dictionary statistics 24 hours prior to
upgrading the database.
To gather dictionary statistics execute the following command
while connected as SYSDBA:
    EXECUTE dbms_stats.gather_dictionary_stats;
```

Faster Upgrade – Less Downtime

New Parallel Upgrade

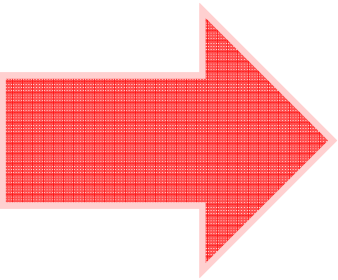
- `catctl.pl`
- Runs database upgrade in parallel
- Up to 40% faster upgrade
- Used and proven by selected Oracle Database 11g customers



Faster Upgrade – Less Downtime

New Parallel Upgrade

```
$> $ORACLE_HOME/perl/bin/perl catctl.pl -n 8 catupgrd.sql
```



Parallel	Phase #:	34	Files:	14	Time:	113s
Restart	Phase #:	35	Files:	1	Time:	0s
Parallel	Phase #:	36	Files:	11	Time:	19s
Restart	Phase #:	37	Files:	1	Time:	0s
Serial	Phase #:	38	Files:	1	Time:	8s
Restart	Phase #:	39	Files:	1	Time:	0s
Serial	Phase #:	40	Files:	1	Time:	10s
Serial	Phase #:	41	Files:	1	Time:	3s
Restart	Phase #:	42	Files:	1	Time:	0s
Parallel	Phase #:	43	Files:	2	Time:	411s
Restart	Phase #:	44	Files:	1	Time:	1s
Serial	Phase #:	45	Files:	2	Time:	510s
Restart	Phase #:	46	Files:	1	Time:	1s
Parallel	Phase #:	47	Files:	2	Time:	35s
Restart	Phase #:	48	Files:	1	Time:	0s
Serial	Phase #:	49	Files:	1	Time:	3s
Serial	Phase #:	50	Files:	1	Time:	313s
Grand Total Time:						2468s



“The new parallel upgrade script promises to drastically reduce downtime due to planned maintenance. We saw a 37% improvement over the previous upgrade process in our environment.”

Harald Stefan

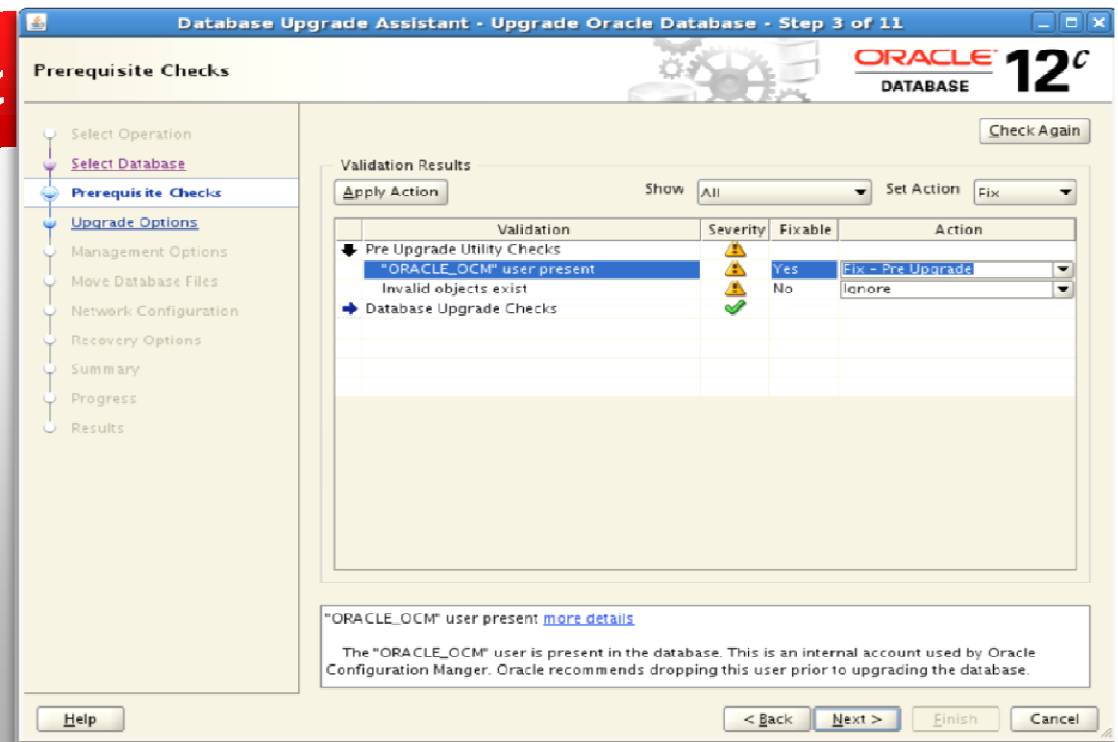
Leiter Datenbanken
Payback GmbH

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Simplified Upgrade

Database Upgrade Assistant

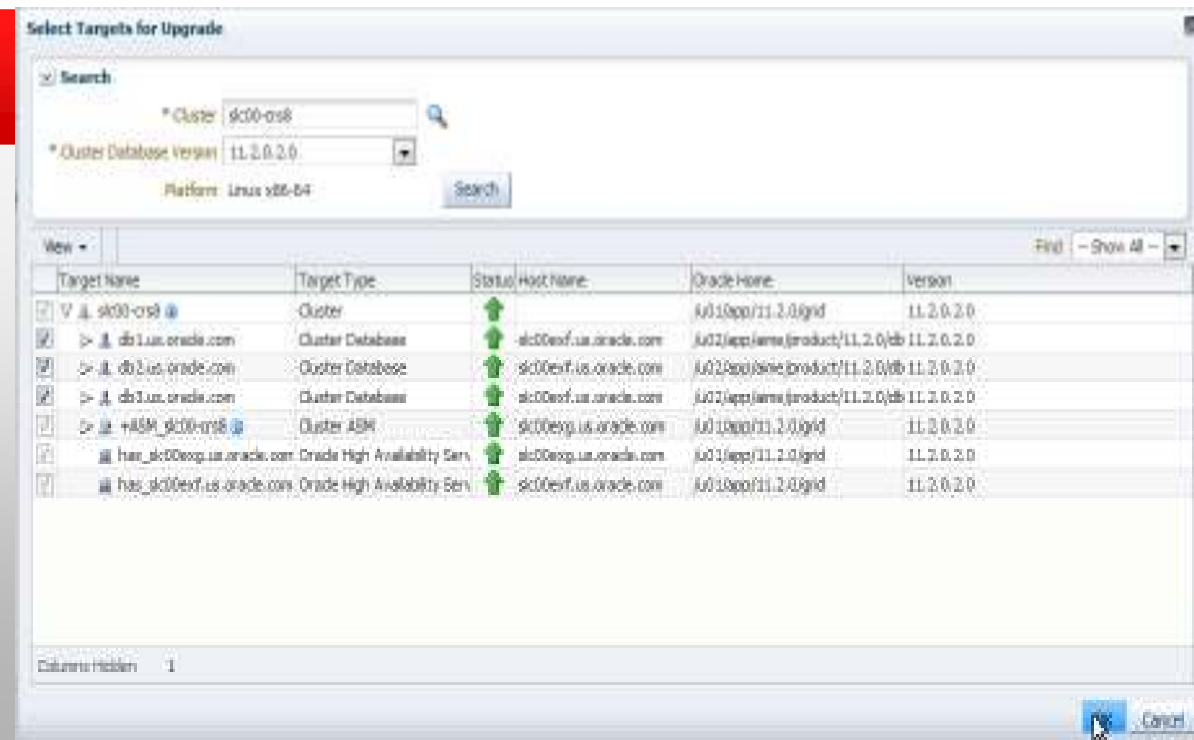
- Pre-Upgrade Automation
- Parallel Upgrade
- RMAN Integration
- Guaranteed Restore Points
- Activity and Alert Log



Enterprise Manager Mass and RAC Upgrades

EM Cloud Control

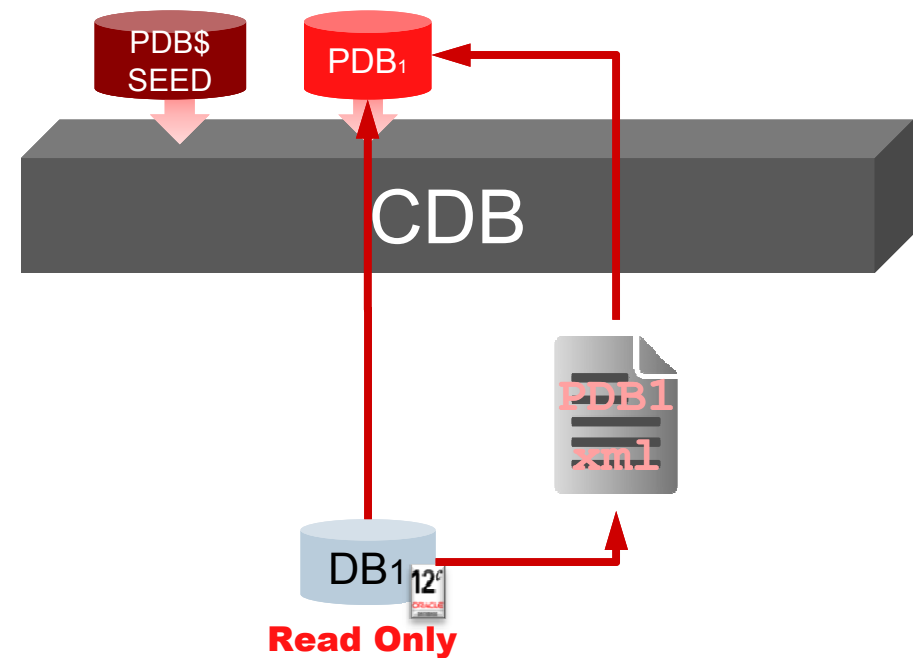
- Mass Upgrades
- Grid Infrastructure Upgrades
- RAC Database Upgrades
- Standby Database Upgrades



Upgrade and Plug Into Oracle Multitenant

Upgrade into Multitenant

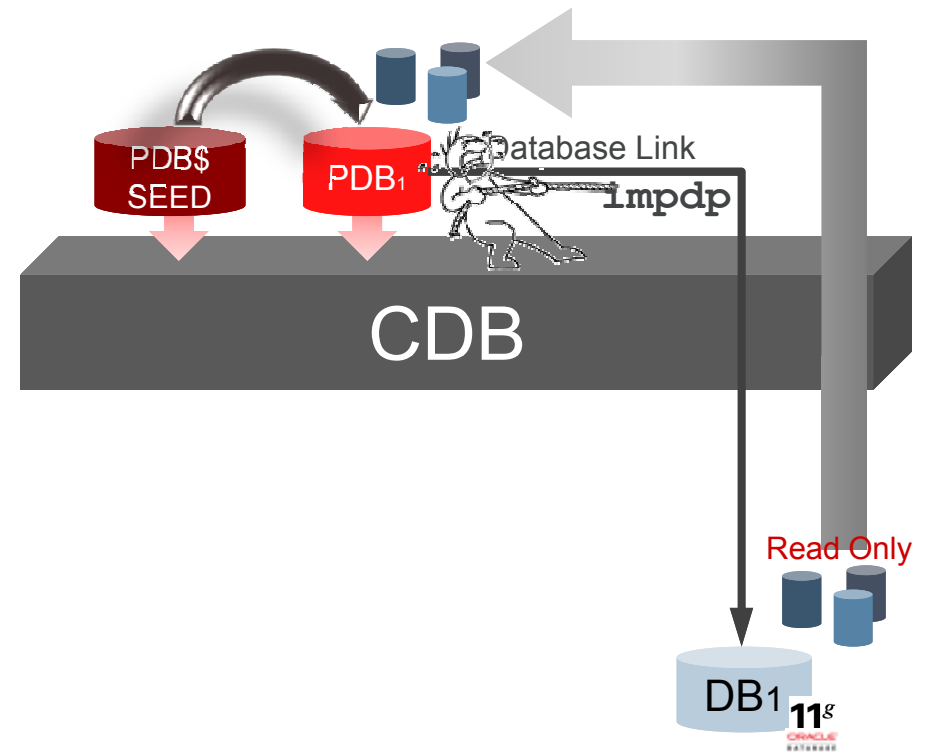
- Database upgrade
- Create XML description file
- Shutdown and Plugin
- Sanity operations



Migrate with Full Transportable Export

Migrate with FTE

- Combining:
 - Transportable Tablespaces with
 - Data Pump taking care of all meta information with optional
 - RMAN incremental backups to decrease downtime
- This works:
 - Cross platform
 - With or without Oracle Multitenant
 - Source can be Oracle 11.2.0.3/4
 - Target must be at least Oracle 12.1.0.1



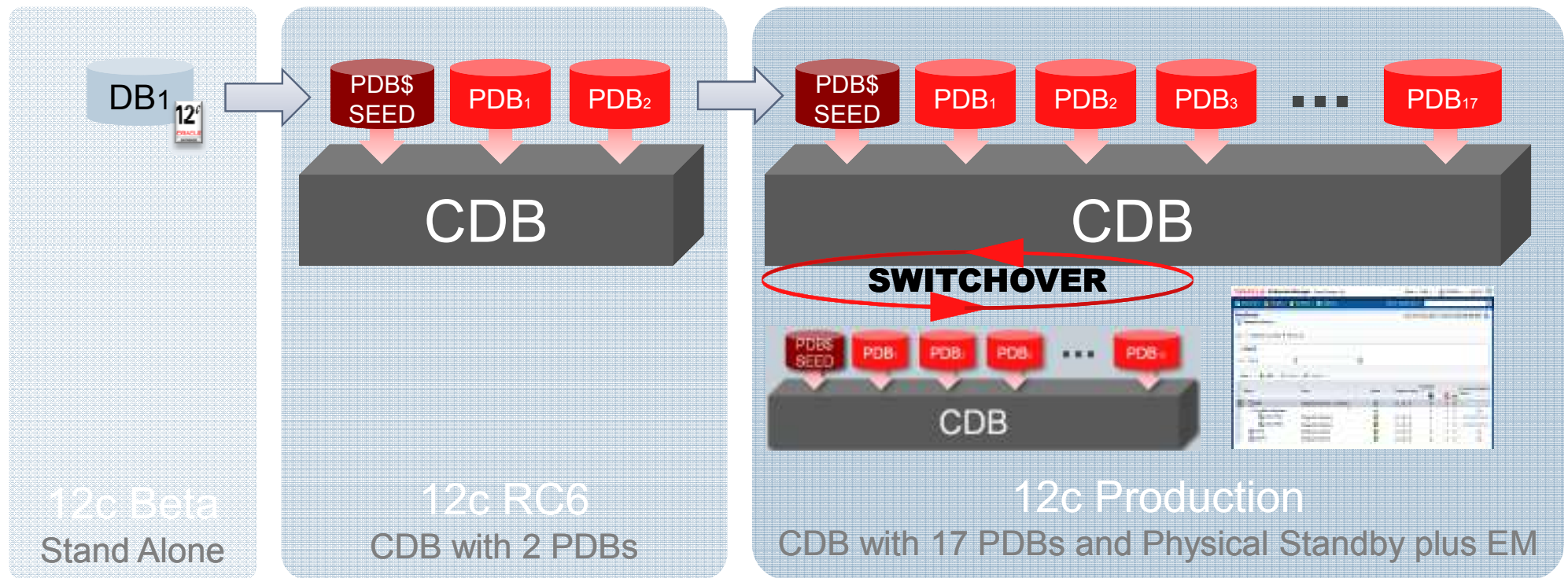
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Real World Customer Experience

- @Oracle – Production Environment



Real World Customer Experience

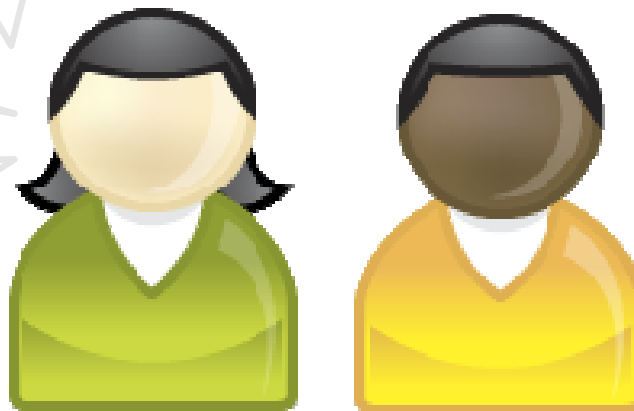
*"A bit more work
regarding monitoring but
a lot of improvements"*

*" If we talk
about whether a
DBA life is much
easier I think its
a **mixed bag**"*

*"If seen as 15 different
databases I don't think I
would have configured
them on this cluster. But as
deployment of **15 PDBs**
within one container it has
been made possible"*

"It is very stable"

*"Issues may get to
you now at once"*



*" I am definitely
**impressed with the
quality and stability side**"*

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Hitchhiker's Guide to Oracle Database Upgrades

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- The Real World
- **Wrap Up**



Resources

- Download slides as PDF from:
 - <http://blogs.oracle.com/UPGRADE>
- Full Day Upgrade Workshop in Oslo:
 - Registration:
<http://eventreg.oracle.com/profile/web/index.cfm?PKWebID=0x705481765&source=EMEA FM13033369MPP059>
 - May 20, 2014 



NOW!
ORACLE[Sessions, Workshops, Projects ...](#)

[Main](#) | [Next page >](#)

Aug 29, 2013

Focus on Database Upgrade at OpenWorld 2013

Posted on Aug 29, 2013

Heading to [Oracle OpenWorld](#) in September, you might be overwhelmed by the sheer number of sessions throughout the week. For those with an interest in database upgrade, I have prepared a [Focus on Database Upgrade](#) document that lays out the sessions, demos, and hands-on lab for this area. The following listing thus far (**NOTE: the list of sessions could change, so click the document link at the start of OOW for the most current listing**).




GENERAL SESSIONS

Session Title	Time	Location	ID
General Session: Oracle Database 12c—Preparing for Clouds and Big Data	10:45 AM - 11:45 AM	Moscone North - Hall D	GEN8229

Presented by Mendelsohn, Oracle

REFERENCE SESSIONS

Aug 23, 2013

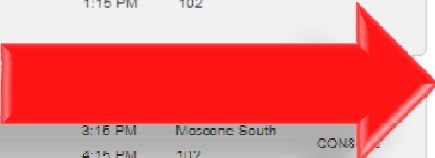
Session Title	Time	Location	ID
Solidating Databases with Oracle Database 12c	12:15 PM - 1:15 PM	Moscone South - 102	CON8707

Presented by Lewellyn, Oracle and Wheeler, Oracle

Session Title	Time	Location	ID
Different Ways to Upgrade, Migrate, Consolidate with Oracle Database 12c	3:15 PM - 4:15 PM	Moscone South - 102	CON8708

Presented by Dietrich, Oracle and Swonger, Oracle

Taoliiaferri, Oracle



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Slides Download Center

- [Upgrade, Migrate & Consolidate with Oracle Database 12c - Refreshed 23-JUL-2013](#)
- [Upgrade & Migrate to Oracle Database 12c \(final update: 8-JAN-2014\)](#)
- [Migrate/Consolidate with Oracle Database 12c](#)

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