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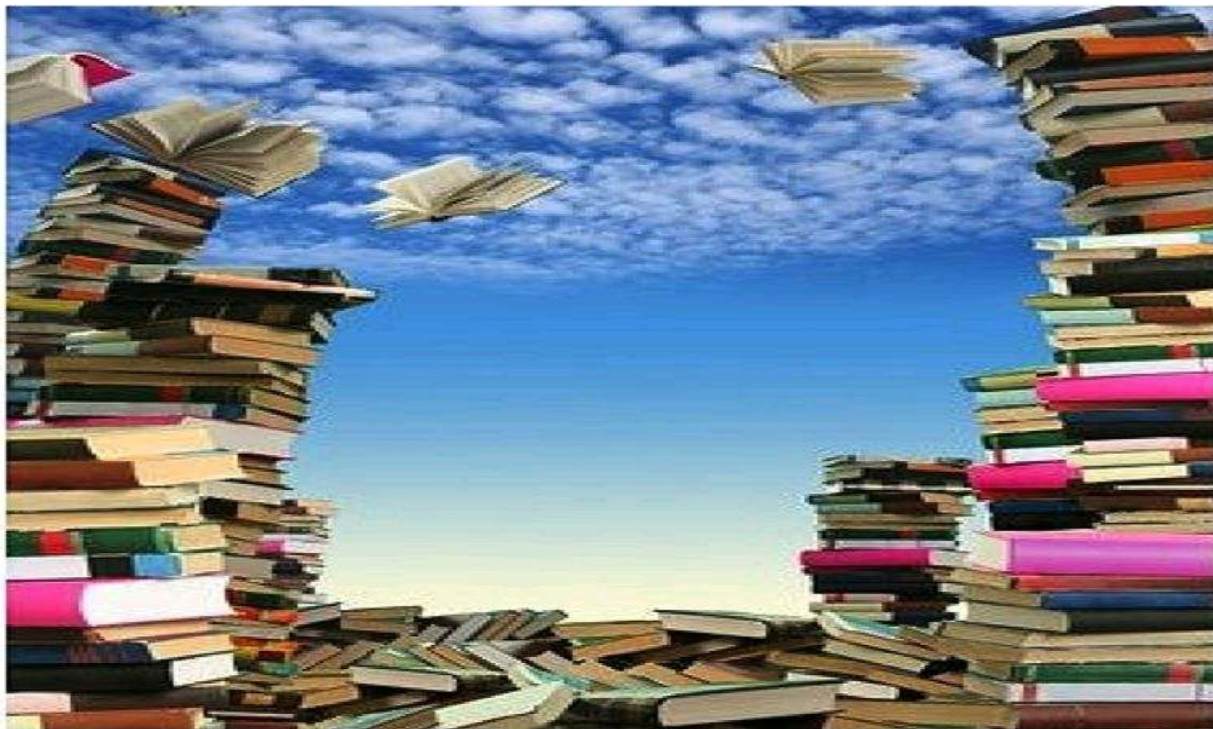


Best Practices, Methods & Alternatives for Upgrading or Migrating to Oracle Database 11g Release 2

Hieu Hoang
Solution Consultant
Oracle Vietnam

Best Practice #1

- Get all the best information!



Documentation

■ Note:785351.1 Upgrade Companion 11g Release 2

The screenshot shows the Oracle 11g Upgrade Companion web interface. At the top, there is a navigation bar with tabs for Home, Best Practices, Behavior Changes (which is selected), Patches Recommended, and Documentation. Below the navigation bar, the main heading is 'Behavior Changes'. The content area contains two paragraphs of text and a list of expandable sections.

ORACLE 11g Upgrade Companion

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

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**

OTN Upgrade Page

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

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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.

Oracle Database Webcasts

Database Upgrade Best Practices Presentation Requires Flash (July 2011)
This webcast is about the best practices for a successful upgrade to Oracle Database 11g Release 2. Frequently Asked Questions are also discussed.

Prepare, Install, and Patch Presentation Requires Flash (January 2012)
This is a webcast of the preparation steps to facilitate a successful upgrade. Installation and patching are also covered.

Oracle Database 11g Release 2 Upgrade: Upgrade Methods Requires Flash (July 2011)
This is a webcast of the various methods available to upgrade to Oracle Database 11g Release 2.

Always Relevant Topics

Oracle Database Upgrade Discussion Forum
Interactive forum containing Database Upgrade relevant information.


Mike Dietrich's Upgrade BLOG
Database Upgrade Team member Mike Dietrich maintains a BLOG relating to Database Upgrade presentation, events and topics.

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

Upgrade and Migration to Oracle Database 11.2 - Workshop Presentation (~30M)
This presentation covers a full day database upgrade and migration workshop with plenty of background information from installation and patching to various upgrade and migration techniques covering also fallback strategies, performance managements and application upgrades.

[Technical Resources](#) [Upgrade Services](#) [Oracle OpenWorld](#) [Documentation](#) [Questions & Prior Releases](#)

Upgrade Methods



More Database Downloads

- [Database Express Edition](#)
- [Database Instant Client](#)
- [Database Mobile Server](#)
- [JDBC Drivers](#)
- [SQL Developer Data Modeler](#)
- [TimesTen In-Memory Database](#)
- [VM Templates for Database](#)
- [.NET Data Access Components](#)

Popular Downloads

- [Berkeley DB](#)
- [Enterprise Manager](#)
- [Database EE and XE](#)
- [Developer VMs](#)
- [Enterprise Pack for Eclipse](#)
- [Java](#)

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Upgrade Blog: blogs.oracle.com/UPGRADE

Upgrade your Database - NOW!

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

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Recent Posts

NLS_LENGTH_SEMANTICS - Why not in the init.ora?
Upgrade Workshops in Hamburg and Cologne - Recap
Behaviour Changes Oracle 8i to 11.2 + New Features Oracle 11.2 + refreshed Upgrade and Migration Slides
Some impressions from Seoul and Beijing
Oracle 11g Database Upgrade and Migration Seminar - NYC
The best Bar on the globe is ... in Seoul/Korea
Excellent Source of Upgrade Information in Japanese
New Slides - and a discussion about Dictionary Statistics
OEL6 and RHEL6 certification
Upgrade Workshop in Sydney - Recap

[Main](#) | [Next page](#) »

Friday May 11, 2012

NLS_LENGTH_SEMANTICS - Why not in the init.ora?

By Mike Dietrich on May 11, 2012

Few days ago at the Upgrade and Migration Workshop in Hamburg when I did talk about Unicode Migrations a customer had an interesting question.

"Why does the documentation states NOT to set NLS_LENGTH_SEMANTIC parameter to CHAR in the init.ora/spfile to enable char semantics for newly build objects by default?"

Honestly I was not aware of that hint. So I did some research and tried to get an answer from the developers.

The documentation says clearly not to set that parameter permanently:

- [Oracle Database Reference on NLS_LENGTH_SEMANTICS](#)
 - **Caution:**
Oracle strongly recommends that you do NOT set the NLS_LENGTH_SEMANTICS parameter to CHAR in the instance or server parameter file. This may cause many existing installation scripts to unexpectedly create columns with character length semantics, resulting in runtime errors, including buffer overflows.
- [Oracle Database Globalization Support Guide on NLS_LENGTH_SEMANTICS](#)
 - Same warning as above - but also states:
◦ NLS_LENGTH_SEMANTICS does not apply to tables created in the SYS schema. The data dictionary always uses byte semantics. Tables owned by SYS always use byte semantics if the length qualifier BYTE or CHAR is not specified in the table creation DDL.

And my colleague from Poland, **Sergiusz Wolicki** did reply (as always) very quickly (thanks!!!):

"The warning is general as the problem may affect Oracle data dictionary scripts for schemas such as SYSTEM, CTXSYS, ORDSYS, XDB, SYSMAN, Oracle

About



Mike Dietrich

Consulting Member of Technical Staff
Database Upgrade Development
- Oracle Corporation

Based near Munich in 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.

You'd like to contact me?
Choose either [XING](#) or [LinkedIn](#)

Slides Download Center

"New" Upgrade & Migrate to 11.2
(updated: 2-MAY-2012)

Scroll
down
to go
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Slide

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Best Practice #2

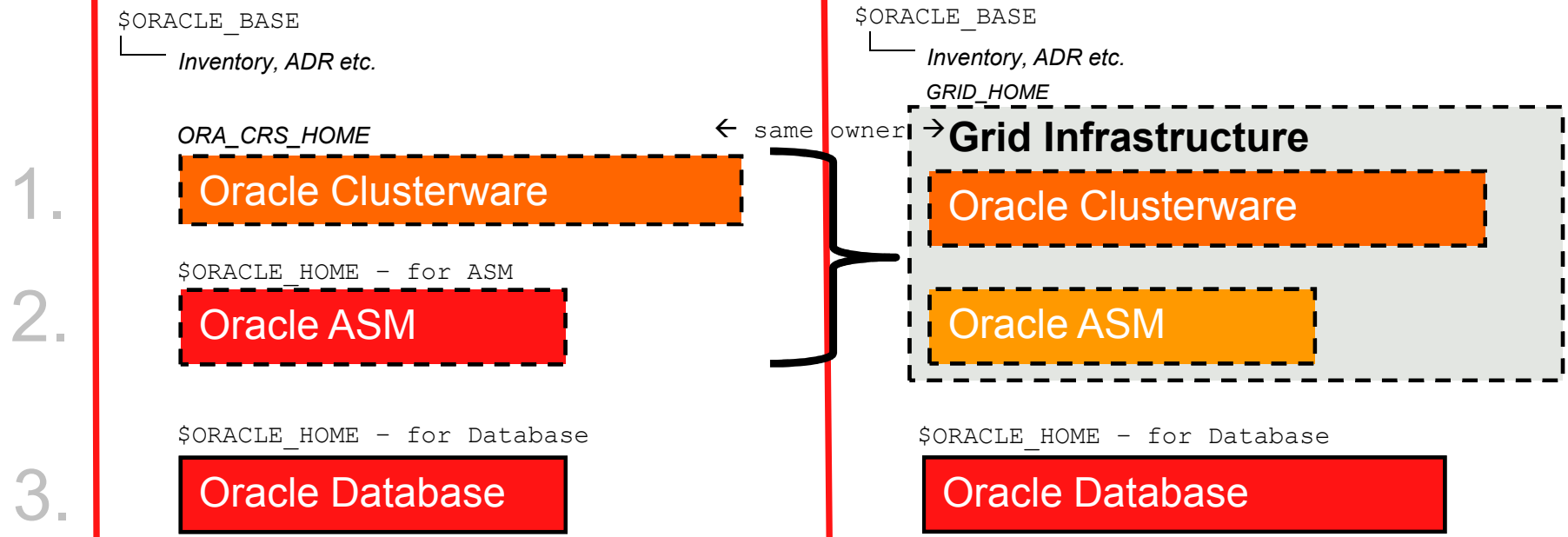
- Always upgrade Grid Infrastructure (Clusterware and ASM) First!



Grid Infrastructure Installation

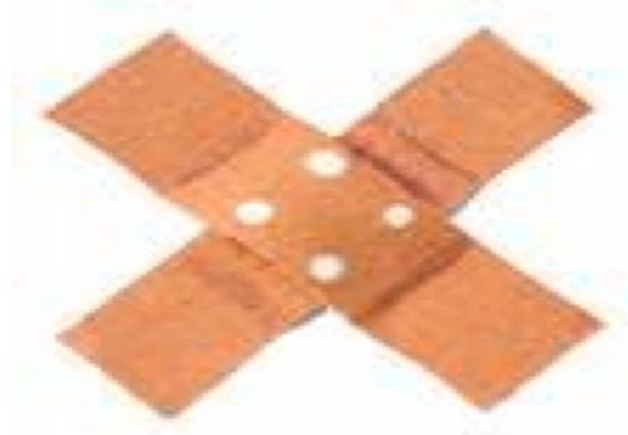
\leq 11.1.0.7

\geq 11.2.0.1



Best Practice #3

- Patch your **new** \$ORACLE_HOME **before** you upgrade




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



Apply **interim** patches for known issues



Now: Start the database upgrade!!!

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Patch Set Installation 11.2.0.3

- Download patch set 11.2.0.3 from support.oracle.com:

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Dashboard | Knowledge | Service Requests | Patches & Updates | Community | Certifications | Systems | More...

Patches & Updates

Patching Quick Links

What are Recommended Patches?

Software and Patch Search Sites

Updates by E-Delivery JD Edwards
PeopleSoft Sun

Oracle E-Business Suite

Latest R12 Packs Recommended R12 Patches
Latest 11i Packs Recommended 11i Patches

Oracle Server and Tools

[Latest Patchsets](#)

All Quick Links open in a new window
Latest Patchsets will open in a new browser window

Patch Search

Search | Saved | Recent

Patch Name, Number or Sun CR ID | Product or Family (Advanced Search)

Patch Name or Number is * Type in comma separated values
and Platform is Linux x86

Clear Save

* Required The Patch Search region is only for Oracle, Sun,

Plans

Plans Patch Requests All Plan Types

Patch	Description	Release	Updated ▾	Size
10404530	Oracle Database Family: Patchset 11.2.0.3.0 PATCH SET FOR ORACLE DATABASE SERVER	11.2.0.3.0	23-SEP-2011	5.1G
Total: 1				

Recommended Patches

■ Recommended Database Patches: [Note:756671.1](#)

Oracle Recommended Patches -- Oracle Database [ID 756671.1]

Modified 18-OCT-2011 Type ANNOUNCEMENT Status PUBLISHED

Oracle Recommended Patches -- Oracle Database

- [Target Configurations](#)
- [Patch Availability](#)
- [Current Recommended Patches](#)
 - [11.2.0.3 Current Recommended Patches](#)
 - [11.2.0.2 Current Recommended Patches](#)
 - [11.2.0.1 Current Recommended Patches](#)
 - [11.1.0.7 Current Recommended Patches](#)
 - [11.1.0.6 Current Recommended Patches](#)
 - [10.2.0.5 Current Recommended Patches](#)
 - [10.2.0.4 Current Recommended Patches](#)
 - [10.2.0.3 Current Recommended Patches](#)
- [Conflict Resolution](#)
- [On Request](#)
- [Known Issues](#)
- [References](#)

Beginning with release 10.2.0.3, Oracle releases Recommended Patches for Oracle Database. For an introduction to Recommended Patches, see [Note:756388.1](#).

Target Configurations

Recommended Patches are provided for the following target configurations:

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

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Recommended OS patches

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



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

Modified: Mar 8, 2012 Type: BULLETIN Status: PUBLISHED Priority: 1

Comments (0)

Jump to:

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[Linux on Power](#)

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[Pre-Installation Scripts](#)

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[OS Specific Commands](#)

[Change History](#)

[Note 43208.1](#) Certified Compilers

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Upgrade Planner

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Patches and Updates

Patching Quick Links

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Software and Patch Search Sites

Oracle Software Delivery Cloud JD Edwards Sun

Oracle E-Business Suite

Latest R12 Packs Recommended R12 Patches
Latest 11i Packs Recommended 11i Patches

Oracle Server and Tools

Latest Patchsets

All Quick Links open in a new window

Patch Recommendations

View by Classification Target Type Advanced

Other Recommendations 58
Security 42

All Recommendations

Upgrade Planner

Plan Name *
Target * Type in or choose from list Find
Upgrade to
Release * Select target first
Clear Show Plan
Requires collector version 10.3.2 or newer. Learn More...

Patch Search

Search Saved Searches Recent Searches

Number/Name or Bug Number (Simple) Product or Family (Advanced) Recommended Patch Advisor

Patch Name or Number is *
Exclude superseded patches
Clear Save Search

* Required For JD Edwards, see the Patching Quick Links region. Learn More...

Plans Patch Search

Plans Patch Requests

View Detail All Plan Types

Name	Status	Type	Planned Deployment	Created By
*testing psu	Successfully Anal...	Patch	Not Specified	SAMATA.MAJETY...
123456789012345678901234567890123456...	New	Patch	Not Specified	JOHN.SO@ORAC...
123456789012345678901234567890123456...	New	Upgrade	Not Specified	JOHN.SO@ORAC...
20121108: John.So: Reproduce bug 15848858	Successfully Anal...	Patch	Not Specified	JOHN.SO@ORAC...
20121108: John.So: Reproduce bug 15848858 #2	Successfully Anal...	Patch	Not Specified	JOHN.SO@ORAC...
9i211g	Successfully Anal...	Upgrade	Not Specified	Ravishankar Budd...
aa mar27 patch rec plan	Successfully Anal...	Patch	Jan 23, 2012 9:0...	Charles Liuson
aaa	New	Patch	Not Specified	Namrata Bhaktha...
aaa	Successfully Anal...	Upgrade	Not Specified	SADIA.FABER@O...
aaa test mar27 を待機す	Review Analysis	Patch	May 1, 2011 12:4...	Charles Liuson
aaaaa	Review Analysis	Upgrade	Not Specified	Macks Ningombam
csheatest	New	Upgrade	Not Specified	Cathy Shea
DB	Successfully Anal...	Patch	Not Specified	Suryateja Daita
dc	New	Upgrade	Not Specified	Diarmuid Cawley
EBS upgradeone	Successfully Anal...	Patch	Not Specified	Naresh Guntupalli

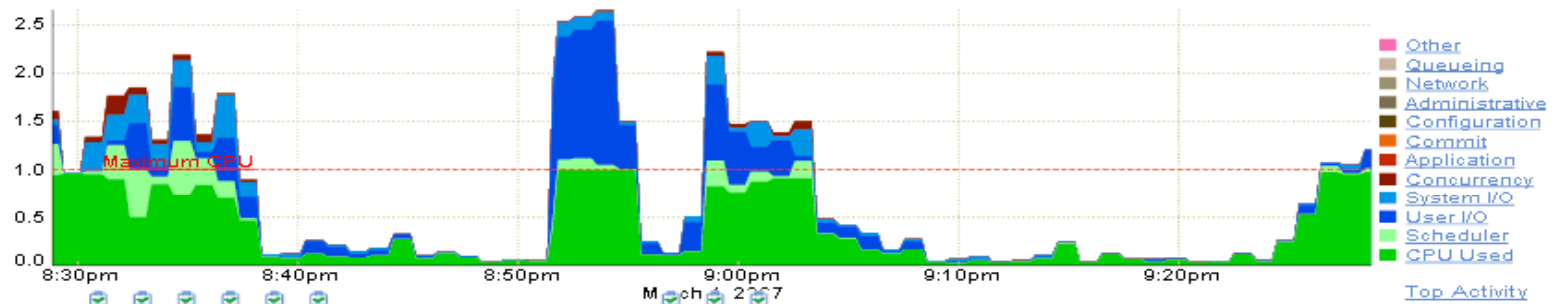
Patch Related Activity

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Best Practice #4

- Preserve performance statistics



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Best Practice #5

- Pre-upgrade **Sanity** operations



Sanity Operations: Invalid Objects

- Always check for **INVALID** objects
- SQL>

```
select unique OBJECT_NAME, OBJECT_TYPE,  
OWNER from DBA_OBJECTS where  
STATUS='INVALID';
```

 - Fix all **INVALID** objects **BEFORE** the upgrade/migration
- There should be no invalid objects in SYS and SYSTEM user schema
 - Recompile invalid objects with `utlrp.sql` before the upgrade

Sanity Operations: Duplicate Objects

- Always check for **DUPLICATE objects** in SYS/SYSTEM
- SQL>

```
select OBJECT_NAME, OBJECT_TYPE from
DBA_OBJECTS where OBJECT_NAME||OBJECT_TYPE
in (select OBJECT_NAME||OBJECT_TYPE from
DBA_OBJECTS where OWNER='SYS') and
OWNER='SYSTEM' and OBJECT_NAME not in
('AQ$_SCHEDULES_PRIMARY', 'AQ$_SCHEDULES',
'DBMS_REPCAT_AUTH');
```
- **Fix DUPLICATE objects in SYS/SYSTEM BEFORE upgrade**
- [Note:1030426.6](#) How to Clean Up Duplicate Objects Owned by SYS and SYSTEM Schema

Sanity Operations: Invalid Components

- Always check for **NON VALID components**:
- SQL>

```
select substr(COMP_ID, 1,10) compid,  
       substr(COMP_NAME,1,24) compname, STATUS,  
       VERSION from DBA_REGISTRY where  
       STATUS<>'VALID';
```
- Try to fix all **NON VALID components BEFORE** the upgrade
- If recompilation with utlrp.sql does not correct component status further diagnosis might be required:
 - [Note:472937.1](#) Information On Installed Database Components
 - [Note:753041.1](#) How to diagnose Components with NON VALID status
 - Component Cleanup: download the slides from <http://blogs.oracle.com/UPGRADE>

Sanity Operations



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

```
SQL> purge DBA_RECYCLEBIN;
```



Best Practice #6

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



Command Line Upgrade

Info

- Upgrade information script: `utlu112i.sql`
 - Run in the environment of the source database
 - **Mandatory** to run it before upgrade
 - Performs important checks including init parameters and displays warnings for obsolete and deprecated parameters, tablespace sizes, and more
 - Always download the newest version from [Note:884522.1](#)

Coming From Version	Script Build/Date	Upgrade Target Version
9.2.0 (9.2.0.8 and above), 10.1.0, 10.2.0, 11.1.0, 11.2.0.1 11.2.0.2	Build 6 May 2012	11gR2 (11.2.0.3) - utlu112i_5.sql
9.2.0 (9.2.0.8 and above), 10.1.0, 10.2.0, 11.1.0, 11.2.0.1	Build 5 May 2012	11gR2 (11.2.0.2) - utlu112i_4.sql
Use the above script when your target upgrade is 11.2.0.2. If you are planning to upgrade to 11.2.0.1, use the utlu112_1.sql script below.		
9.2.0 (9.2.0.8 and above), 10.1.0, 10.2.0, 11.1.0	Build 4 December 2010	11gR2 (11.2.0.1) - utlu112i_1.sql
9.2.0 (9.2.0.4 and above), 10.1.0, 10.2.0	Build 2 December 2010	11gR1- utlu111i.sql
8.1.7, 9.0.1, 9.2.0 (9.2.0.4 and above), 10.1.0	Build 2 December 2010	10gR2 - utlu102i.sql

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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 and necessary if datatype `TIMESTAMP WITH TIME ZONE` is used
 - TZ version of target `$ORACLE_HOME` must be greater or equal than source home

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?

```
*****
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"
```

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Command Line Upgrade

- **utlu112i.sql**: Components and options?

```
*****
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 Workspace Manager       [upgrade]  VALID
--> Oracle Label Security          [upgrade]  VALID
5 --> Oracle XML Database           [upgrade]  INVALID
--> Oracle Java Packages          [upgrade]  VALID
--> Spatial                       [upgrade]  VALID
--> Data Mining                   [upgrade]  VALID
--> Oracle Ultra Search           [upgrade]  VALID
```

- 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:753041.1](#) How to diagnose Components with NON VALID status
 - Component Cleanup: download the slides from <http://blogs.oracle.com/UPGRADE>

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Best Practice #7

- Remove "old" parameters, underscores and events from your pfile/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**

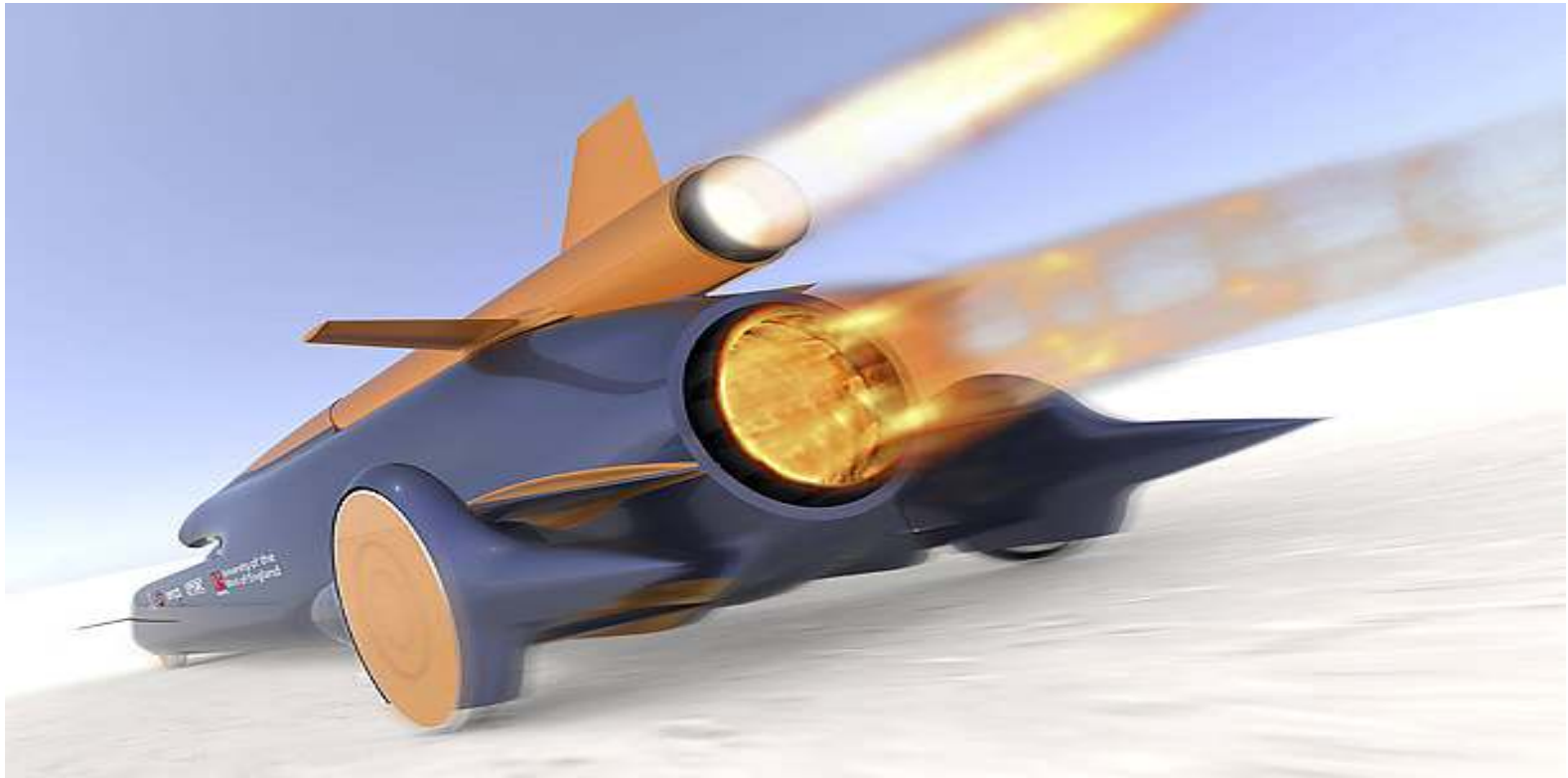
Unset
underscores
and events

**Upgrade time:
7 minutes!!**

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Best Practice #8

- Speed up your upgrade



Upgrade Duration

- Run time of `catupgrd.sql` is mainly dependent on:
 - Hardware capability
 - Number of installed components and database options
 - Example: same database in the same VM environment

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**

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Speed Up Your Upgrade

- Upgrade duration can be decreased by: (1/3)

1. Create Dictionary statistics **the night before** the downtime window

- Before Oracle 10g:

```
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!!)

- Since Oracle 10g:

```
SQL> exec DBMS_STATS.GATHER_DICTIONARY_STATS;
```

- *If you have created fresh dictionary stats right before the upgrade you might set this parameter to suppress stats creation during the upgrade:*

```
_optim_dict_stats_at_db_cr_upg=FALSE
```

Speed Up Your Upgrade

- Upgrade duration can be decreased by: (2/3)

2. Truncate or populate AUD\$ in SYS/SYSTEM if it has many entries:

- Depending on the actual number of rows in AUD\$ this might save several hours of upgrade downtime in extreme cases with millions of audit records
- Only if you are able to purge audit records:

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

- For source database ≥10g, pre-populate new columns to eliminate downtime
 - See [MOS Note: 1329590.1](#) for a script to populate missing entries

3. Upgrade APEX separately, before the DB upgrade

- Only needed if APEX (previously HTMLDB) is already installed in the database
- Especially if APEX hosts larger applications the APEX upgrade may take several minutes
- [MOS Note:1088970.1](#): Master Note for Oracle APEX Upgrade

Best Practice #9

- **After** the upgrade ...



Post Upgrade

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

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

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

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

Post Upgrade

- Create **fixed table statistics**

- Directly after `catuppst.sql` has finished
 - This will speed up processing for recompilation with `utlrp.sql`

```
SQL> exec DBMS_STATS.GATHER_FIXED_OBJECTS_STATS;
```

- See [Note:798257.1](#) for more detailed information on gathering fixed object statistics
- **Real world example:**
EBS 11i database upgrade from 9.2 to 11.2
 - Recompilation time for ~120,000 invalid objects
 - Compared timings without and with fixed object stats
 - **Result: 17% speed up!!**
- Create fixed table statistics again after a week during a regular production workload
- This task should be done only a few times per year

Post Upgrade - SPFILE

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

```
SQL> create pfile='/tmp/initDB.ora' from spfile;
```

<< Now edit init.ora with any editor >>

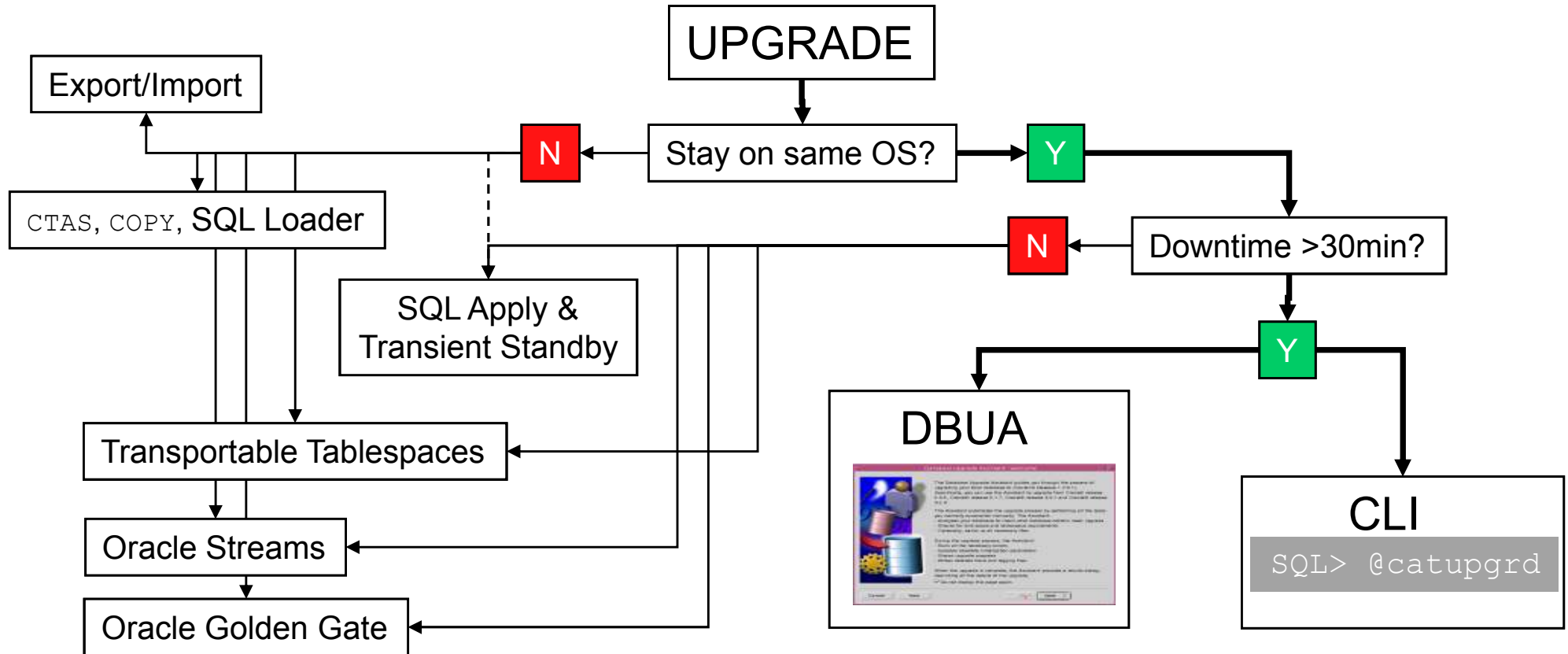
```
SQL> startup force pfile=/tmp/initDB.ora
```

```
SQL> create spfile from pfile;
```

- Parameter can be changed by:

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

Best Practice #10: Choose the Right Method



The Best Upgrade/Migration Method

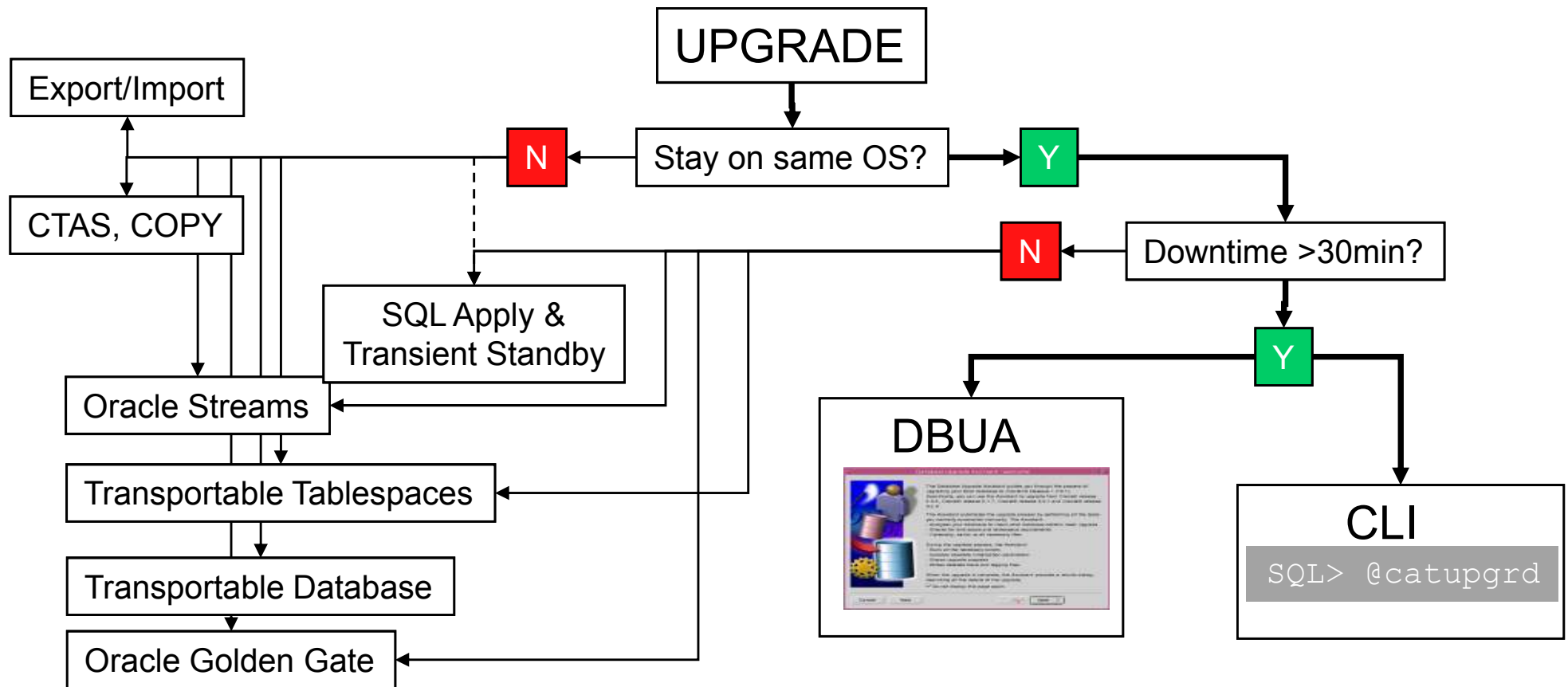
- Depends on:
 - Source and destination version
 - Source and destination OS
 - Downtime/availability requirements
 - Volume of data to be moved
 - Upgrading in place vs. Migrating to new hardware
 - Licensed options
 - Current or planned feature usage
 - Desire to make changes to database structure
- Upgrade Methods white paper and presentation:
 - www.oracle.com/technetwork/products/upgrade/11gr2-upgrade-methods-wp-2011-486336.pdf
 - www.oracle.com/technetwork/products/upgrade/upgrade-11-2-methods-173002.pdf

Agenda

- Regular Upgrade Methods
- Post Upgrade Tasks
- Upgrade Alternatives
- Summary



Upgrade Paths



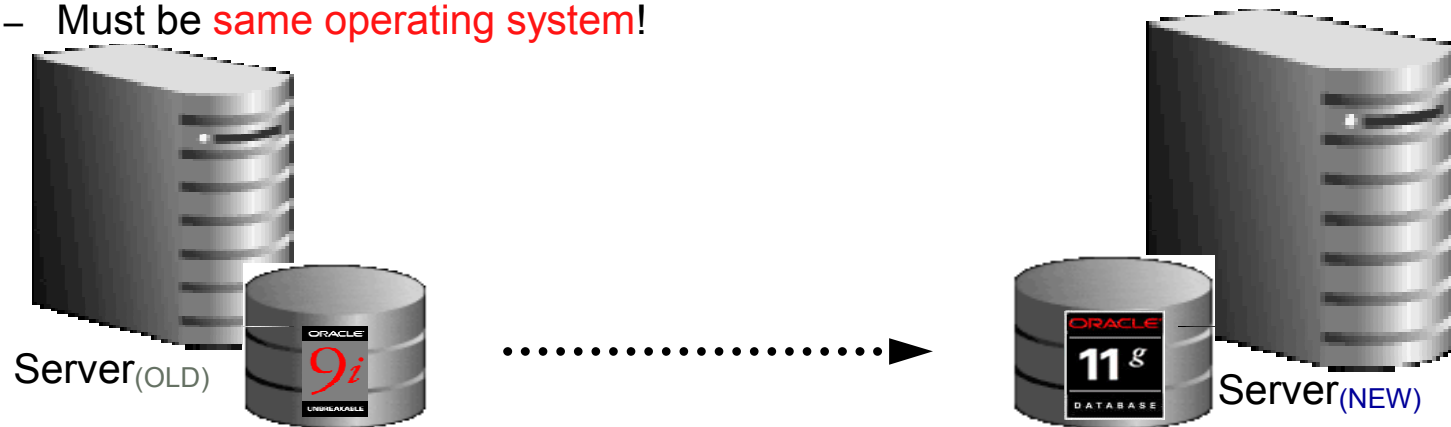
Database Upgrade Assistant (GUI)



- 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->SE/EE upgrade
 - Patchset upgrades
 - Logs: `$ORACLE_HOME/cfgtoollogs/dbua`
 - Documentation:
 - Oracle® Database Upgrade Guide
http://download.oracle.com/docs/cd/E11882_01/server.112/e17222/toc.htm
- Limitations:
 - Only usable if upgrading in place, without moving to new system
 - Cannot be restarted if upgrade is interrupted

Command Line Upgrade

- Typical scenario: e.g. changing to a new server
 - Must be **same operating system!**



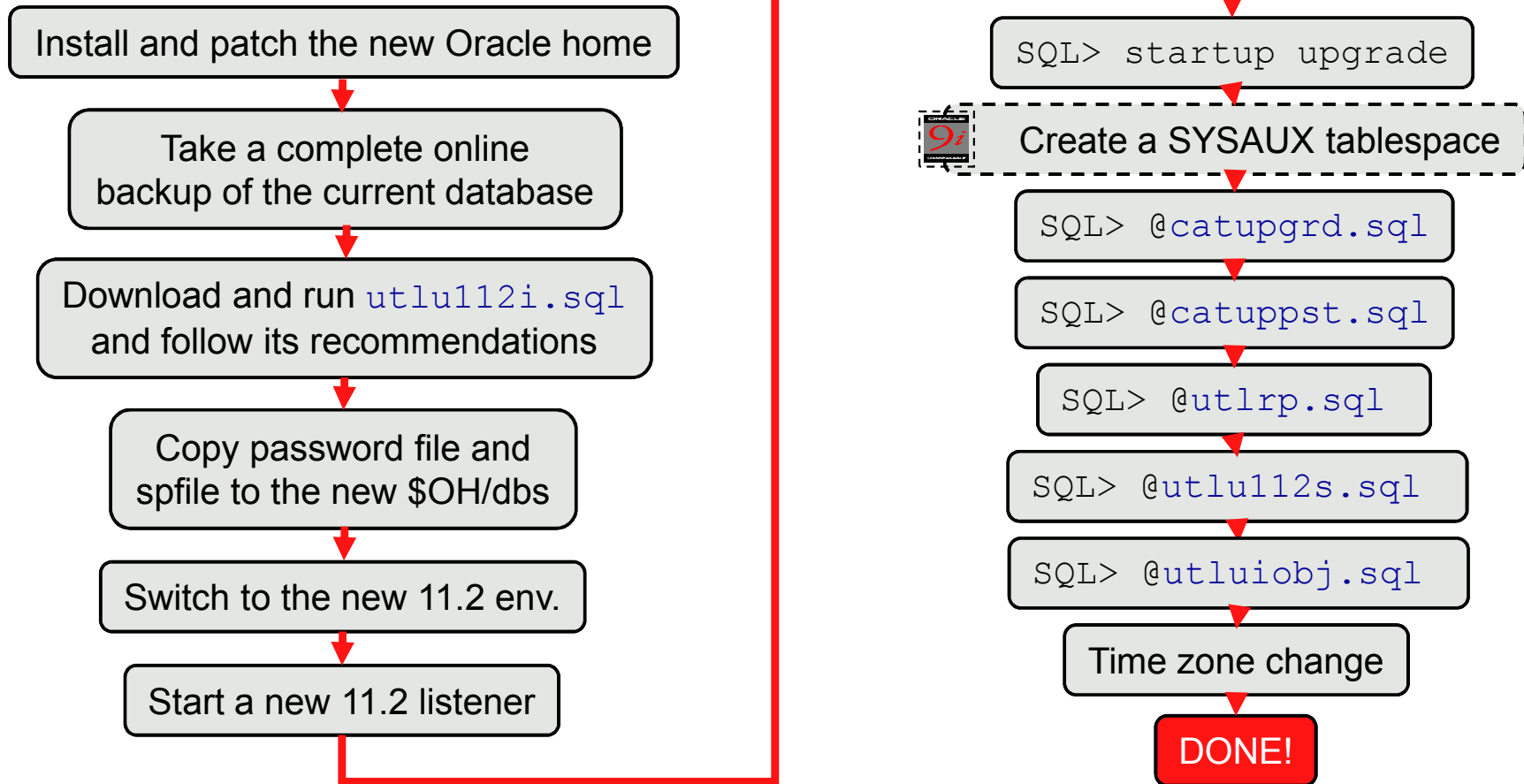
- 1) Install Oracle11g software
- 2) Copy `utlu112i.sql`

- 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

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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
 - ...and more

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Agenda

- Regular Upgrade Methods
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- Summary



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 will simply 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;
```

- Parameters can be changed by:

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

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Post Upgrade Task – time zone

Only in 11g Release 2

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

```
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

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Gather Workload Statistics

Best Practice

- Gather **system statistics** during a regular workload period – otherwise inappropriate 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	
...		

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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 MMON may cause too much CPU load

- Guidelines

- Create fixed table statistics a week after upgrade
- Gather fixed table statistics during a normal workload period
- This task should be done only a few times per year

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Agenda

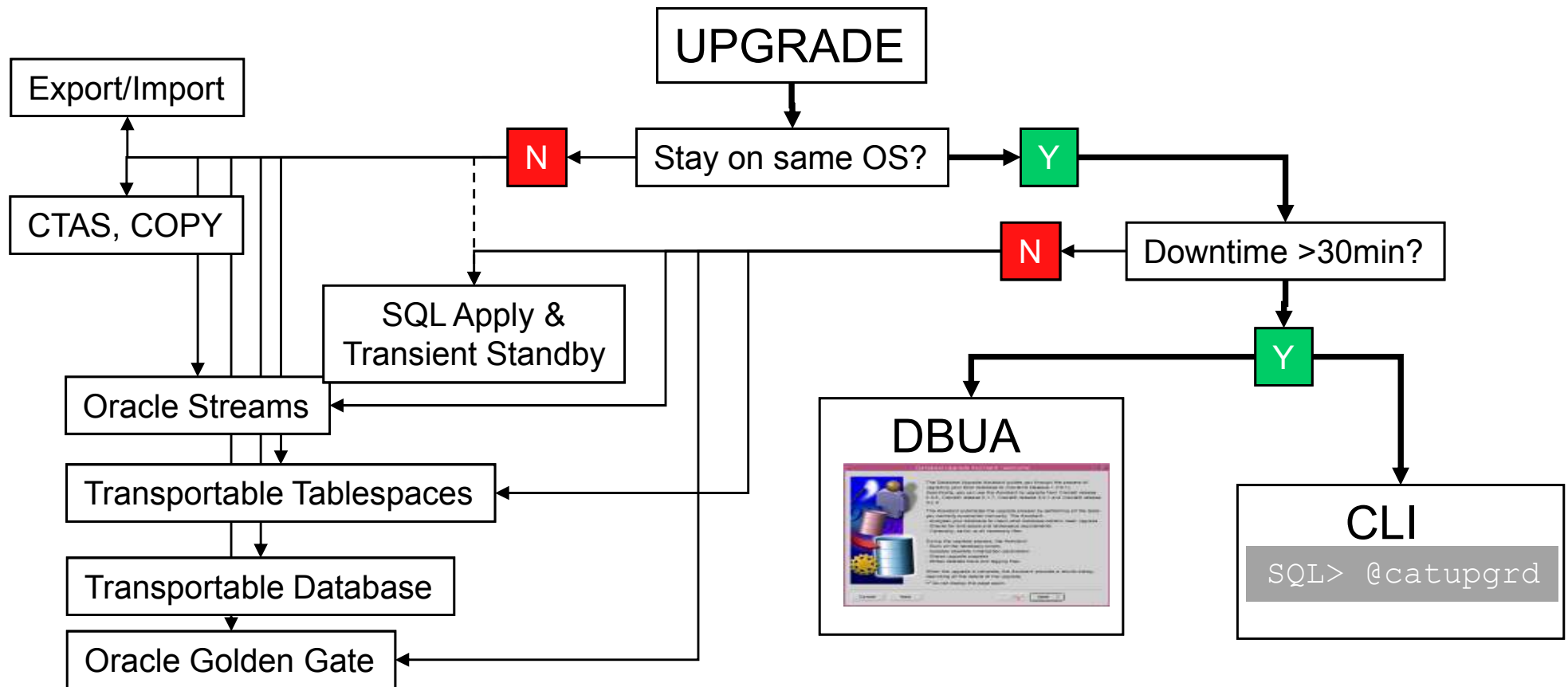
- Regular Upgrade Methods
- Post Upgrade Tasks
- Upgrade Alternatives
- Summary



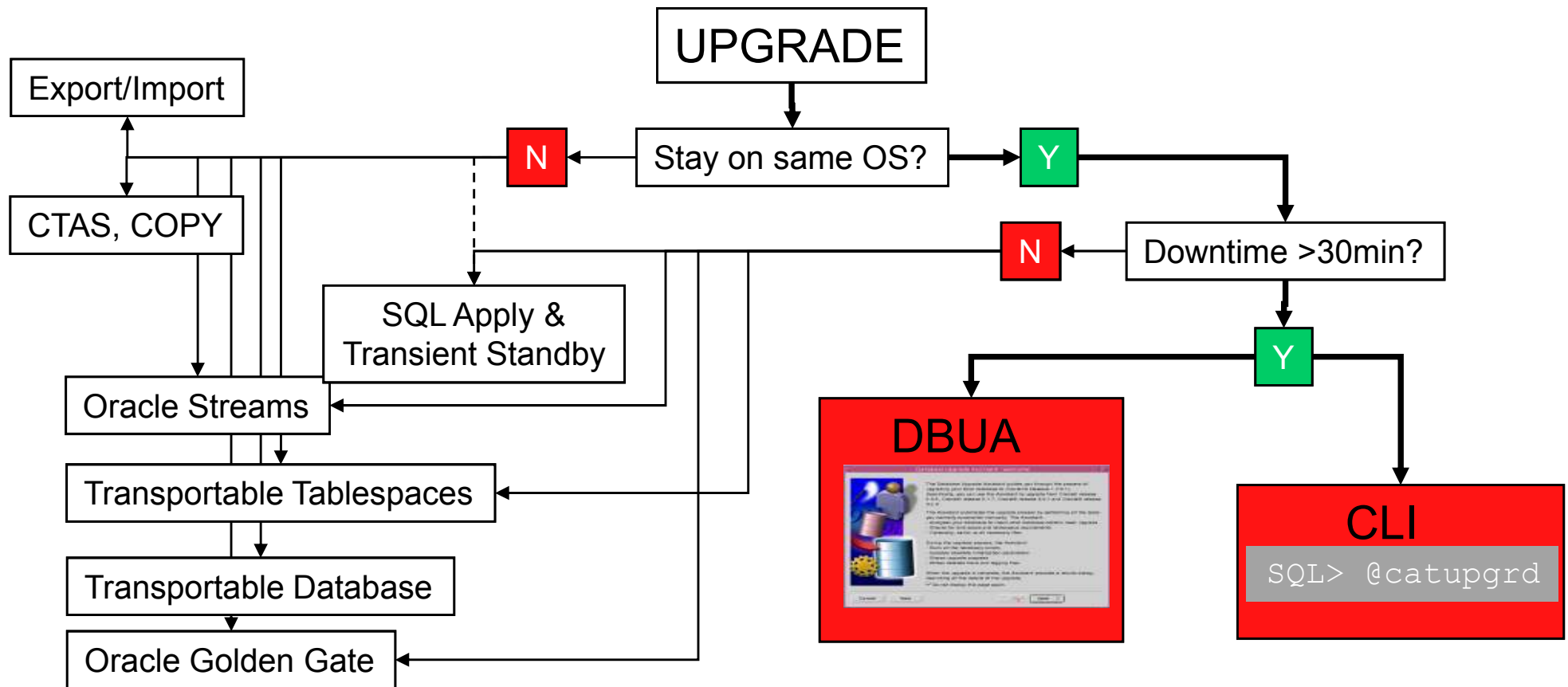
Upgrade Alternatives

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

Upgrade Paths



Upgrade Paths



"Regular" Database Upgrade

- Upgrade duration is mainly dependent on the number of installed components
 - Completes usually in 30-90 minutes
 - No difference between DBUA and command line upgrade
 - This is **not a recommendation** to deinstall any components!!!

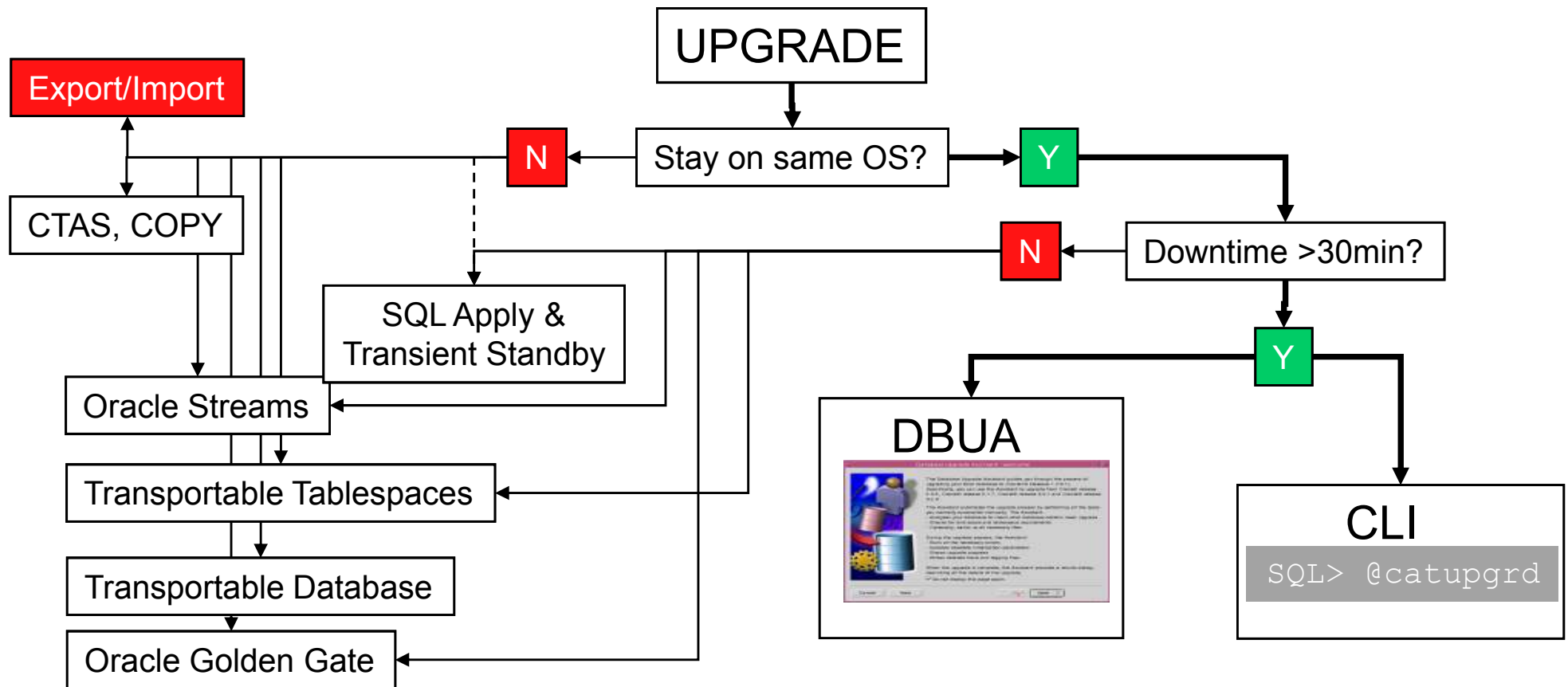
Component	HH:MM:SS
Oracle Server	00:16:17
JSERVER JAVA Virtual Machine	00:05:19
Oracle Workspace Manager	00:01:01
Oracle Enterprise Manager	00:10:13
Oracle XDK	00:00:48
Oracle Text	00:00:58
Oracle XML Database	00:04:09
Oracle Database Java Packages	00:00:33
Oracle Multimedia	00:07:43
Oracle Expression 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

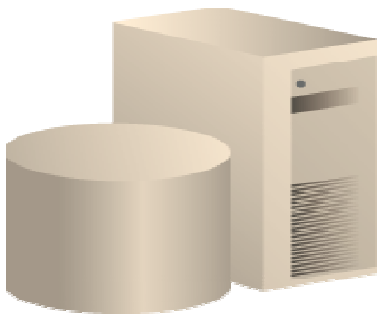
Total Upgrade Time: **00:30:47**

Upgrade Paths



Export/Import: Original exp/imp

- 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



▶ \$ **exp** FULL=Y ▶

Dump File Transfer

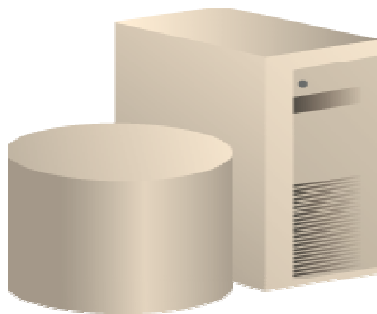
▶ \$ **imp** FULL=Y ▶



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Export/Import: Data Pump expdp/impdp

- The “new” faster export-import, available starting with 10.1
 - As of 10.2, handles everything except for XMLSCHEMA types
 - As of 11.1, handles all data types
- Powerful concept:
 - PARALLEL export and import of data (single-threaded for metadata)
 - EXCLUDE & INCLUDE (For examples see [Note:341733.1](#))
 - COMPRESS=ALL starting in 11.1
(Advanced Compression Option)



▶ \$ **expdp** FULL=Y ▶

Dump File Transfer

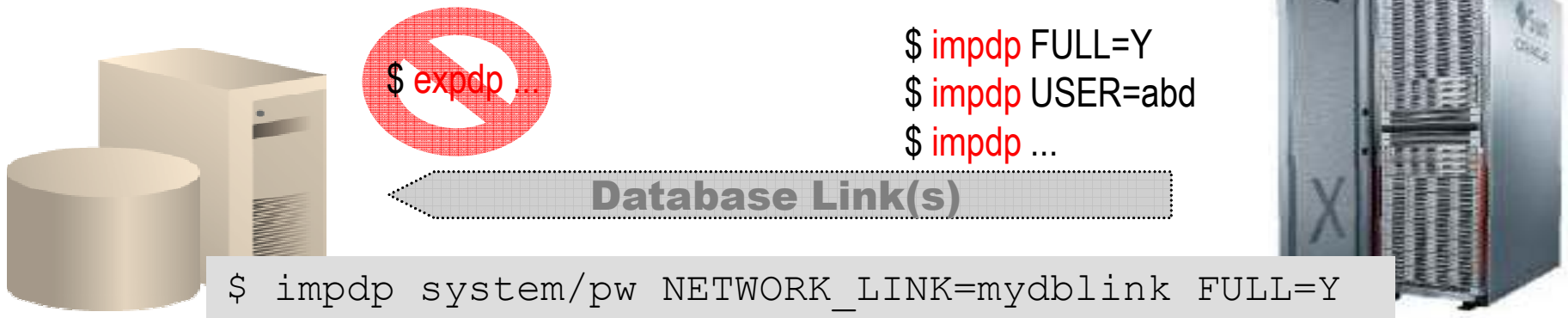
▶ \$ **impdp** FULL=Y ▶



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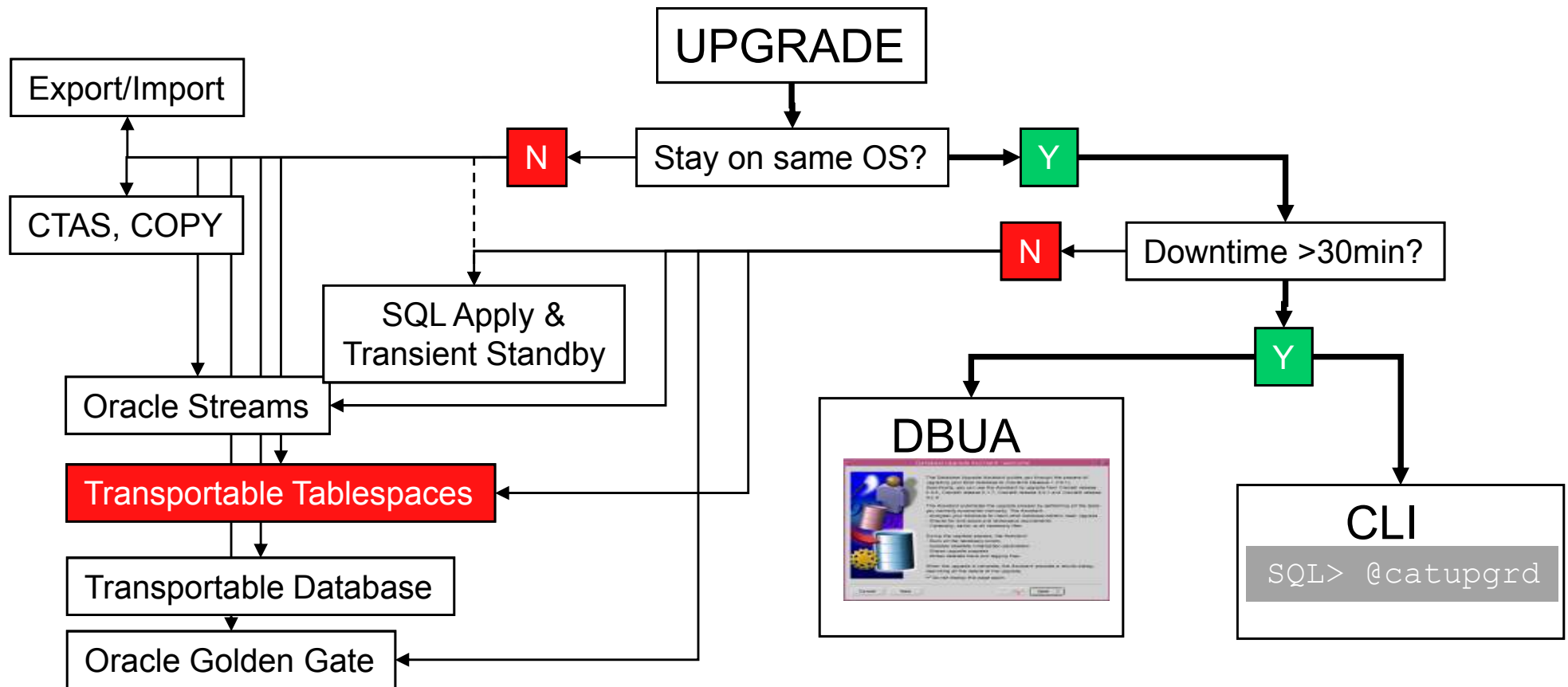
Export/Import: Data Pump Network Mode

- Direct import from source to target over a database link
 - Parameter: NETWORK_LINK
 - Run only `impdp` on the target system - **no expdp necessary**
 - No dumpfile needed: no disk I/O, no file transfer needed
- Restriction of DB Links
 - Does not work with LONG/LONG RAW and object types with nested tables



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Upgrade Paths



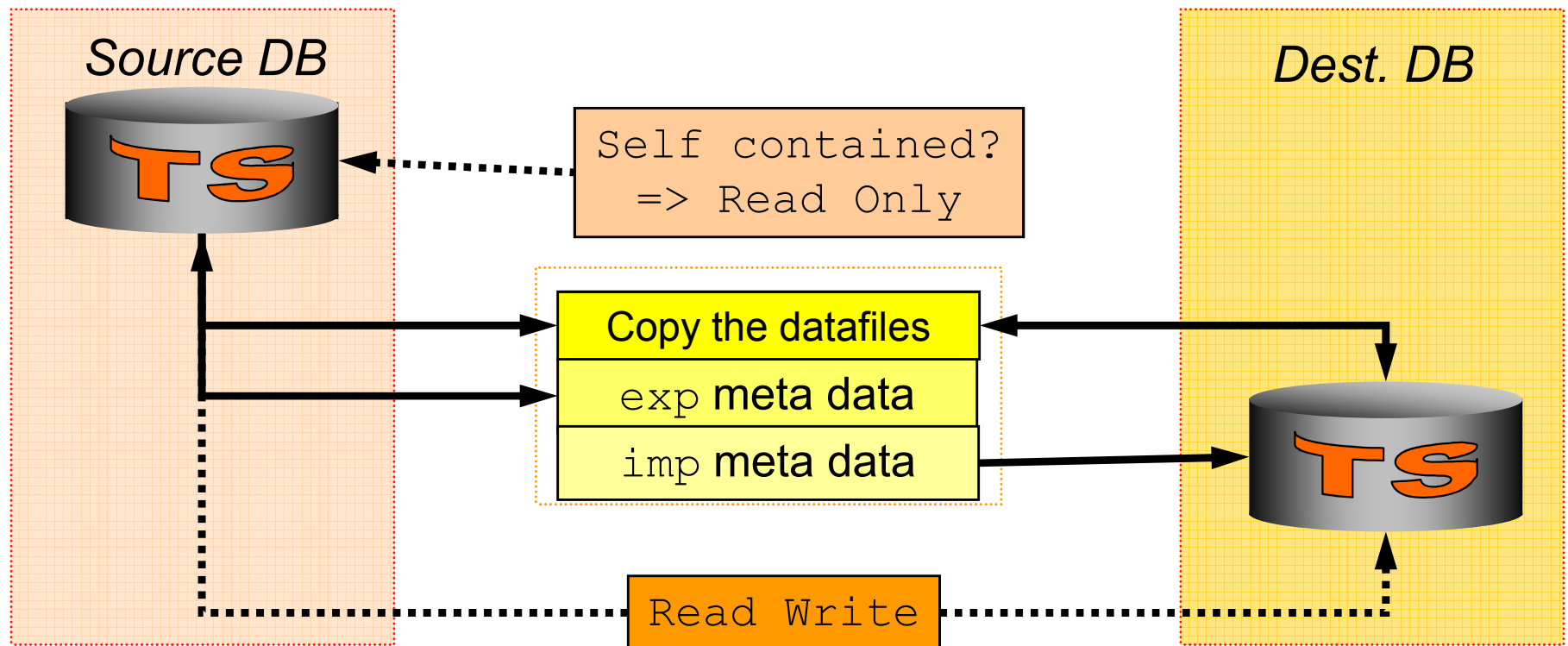
Transportable Tablespaces

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

Transportable Tablespaces

- General TTS concept

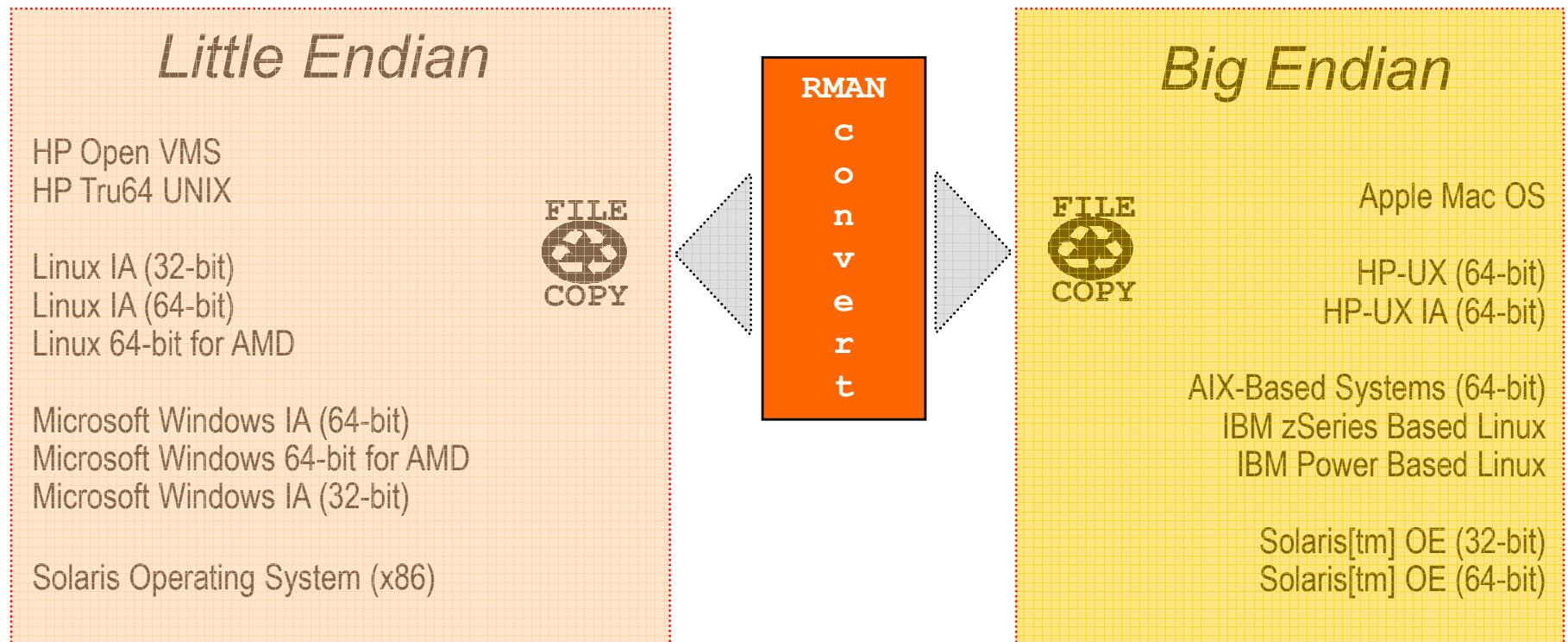
- Feature available since Oracle 8i



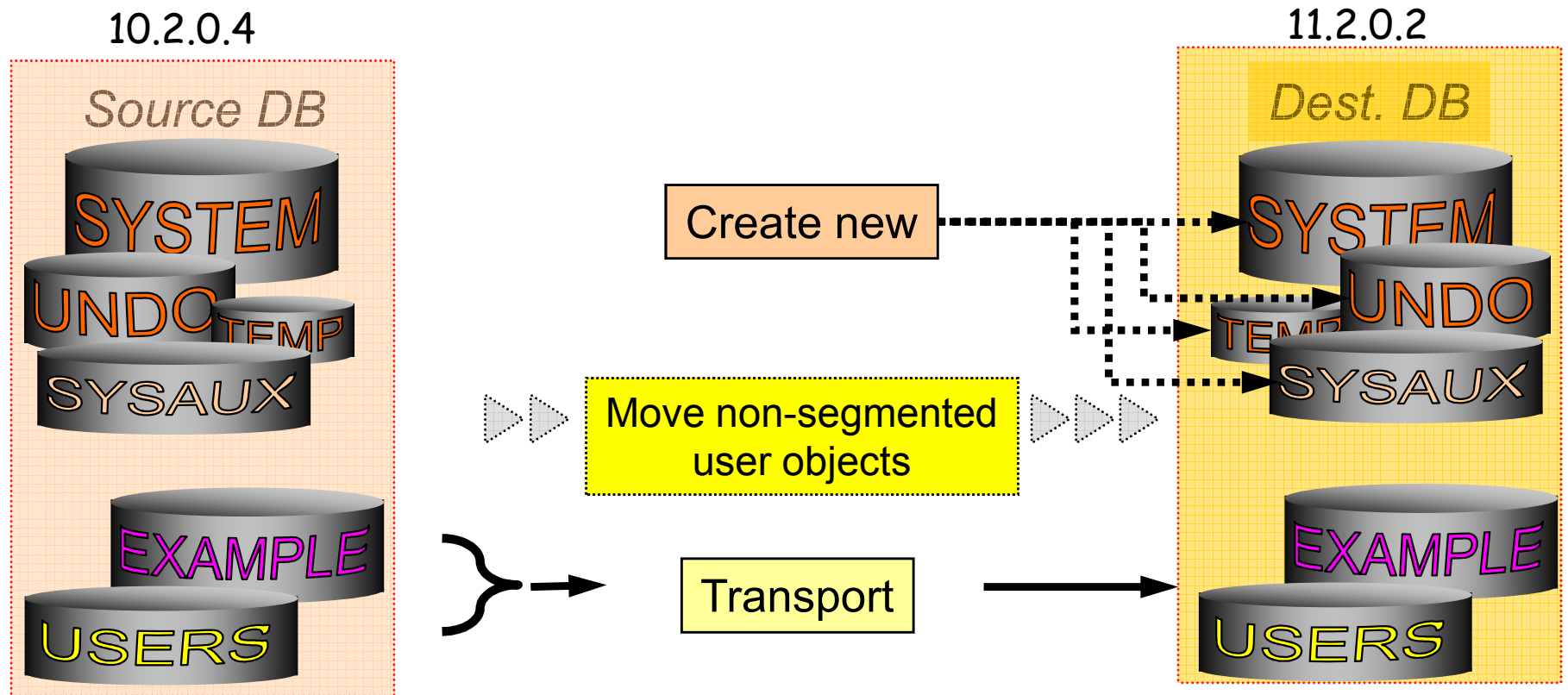
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Transportable Tablespaces

- TTS x-platform (v\$transportable_platform):



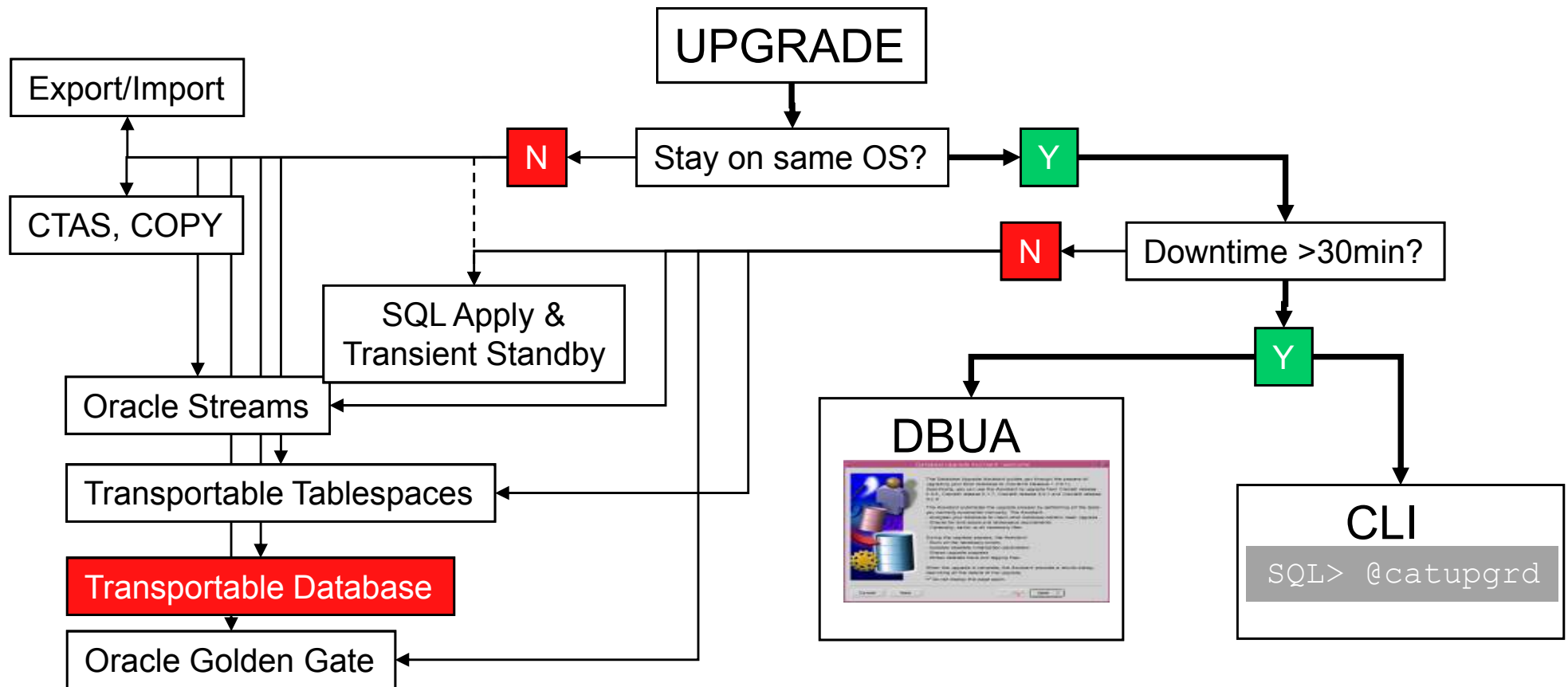
Transportable Tablespaces



Possible options

- Non-segmented objects - 3 possible ways
 - The "brutal" way
 - 8i/9i: exp/imp with ROWS=N
 - 10g/11g: expdp/impdp CONTENT=METADATA_ONLY
 - The "smart" way
 - Generate scripts
 - String concatenation with || ...
 - DBMS_METADATA
 - The "very smart" way
 - RMAN clone (DUPLICATE) with SKIP TABLESPACES option
 - In any case: Take extra care on sequence's start values!!

Upgrade Paths



RMAN Transportable Database

- Feature since Oracle Database 10g Release 2
 - Migration tool, but not **does not perform an upgrade**
 - Automates RMAN steps for system/platform migration
 - Database must be switched to READ ONLY mode
 - Cross-platform, but unfortunately **not** cross-Endian!!!
 - 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 within 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

**RMAN Convert must
take place on
source or target
system**

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

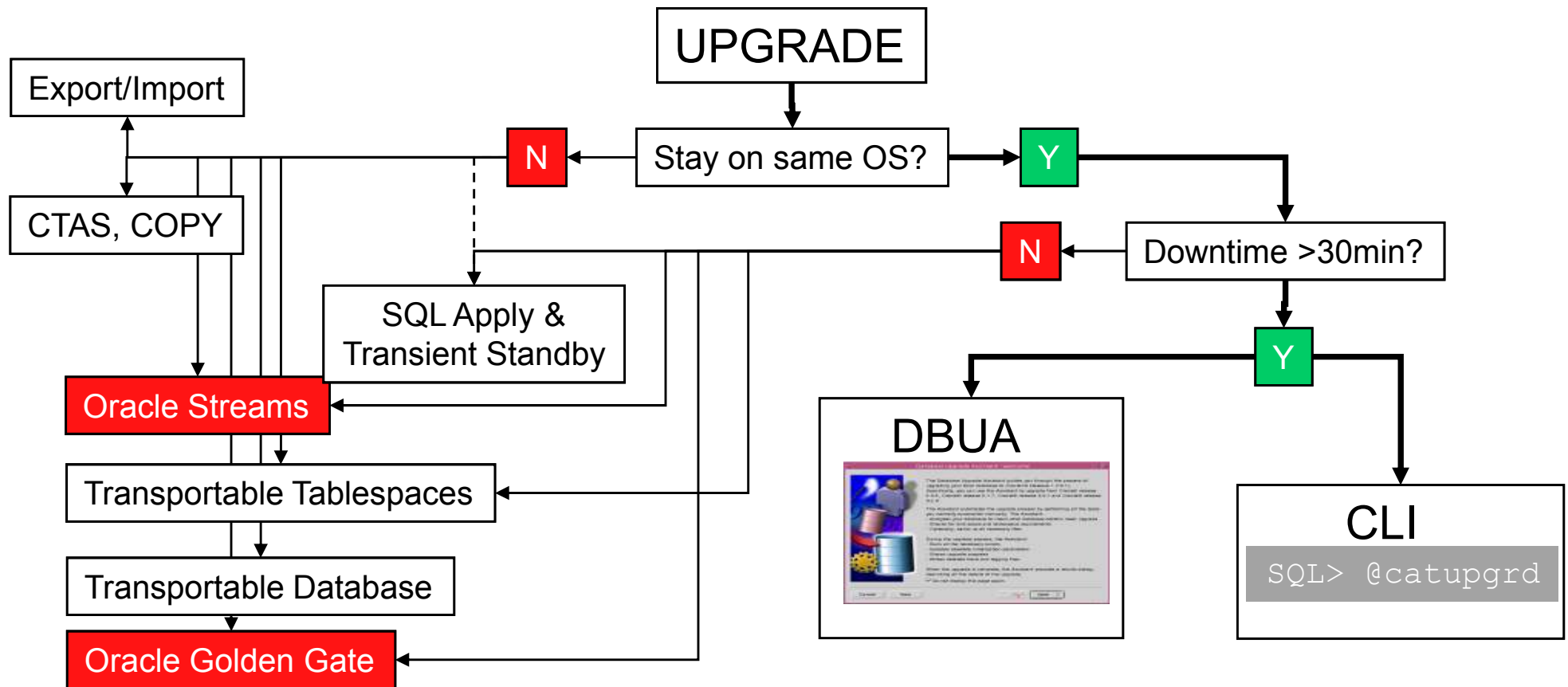
Solaris[tm] OE (32-bit)
Solaris[tm] OE (64-bit)

RMAN

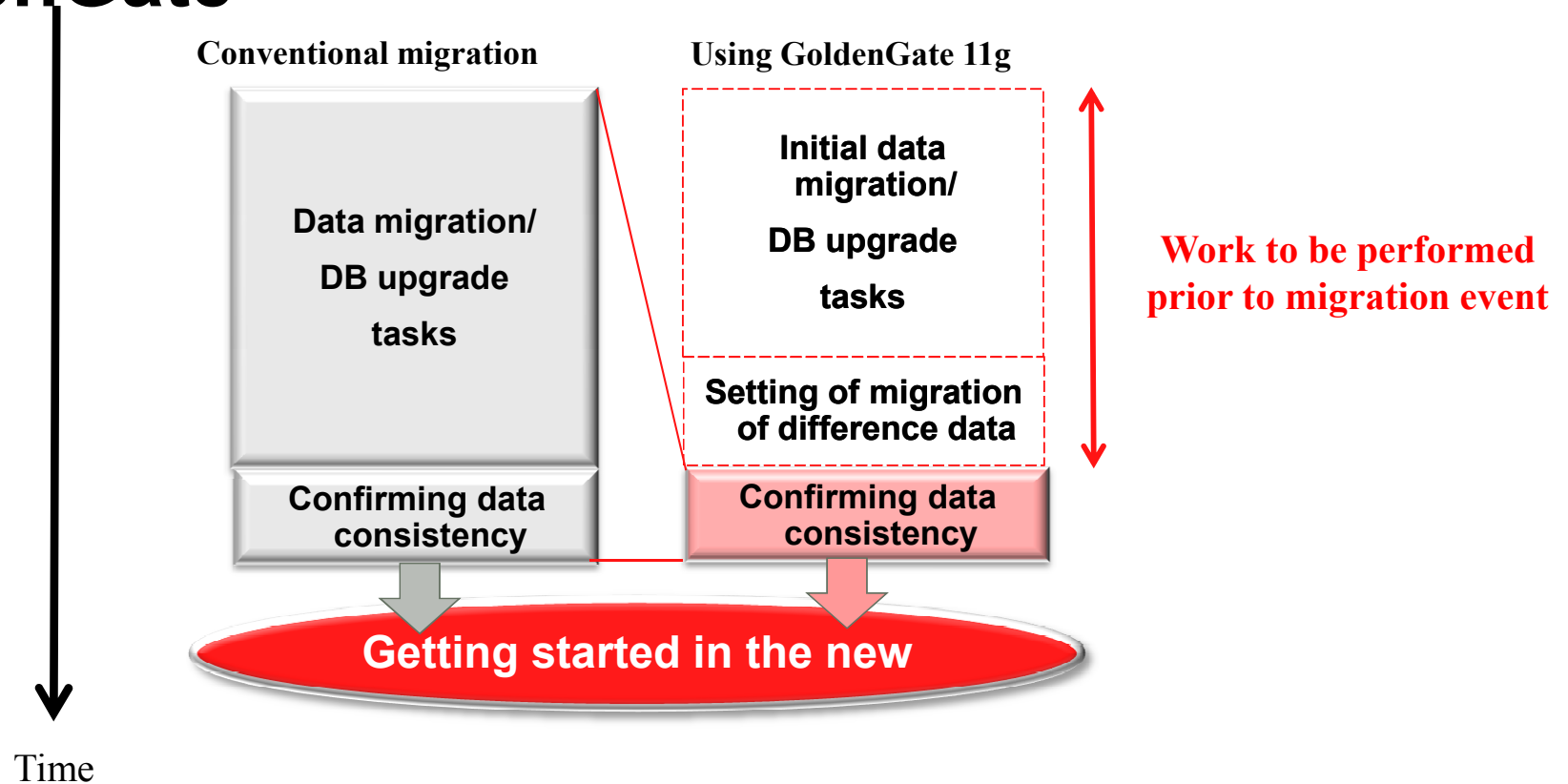
c
o
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Upgrade Paths

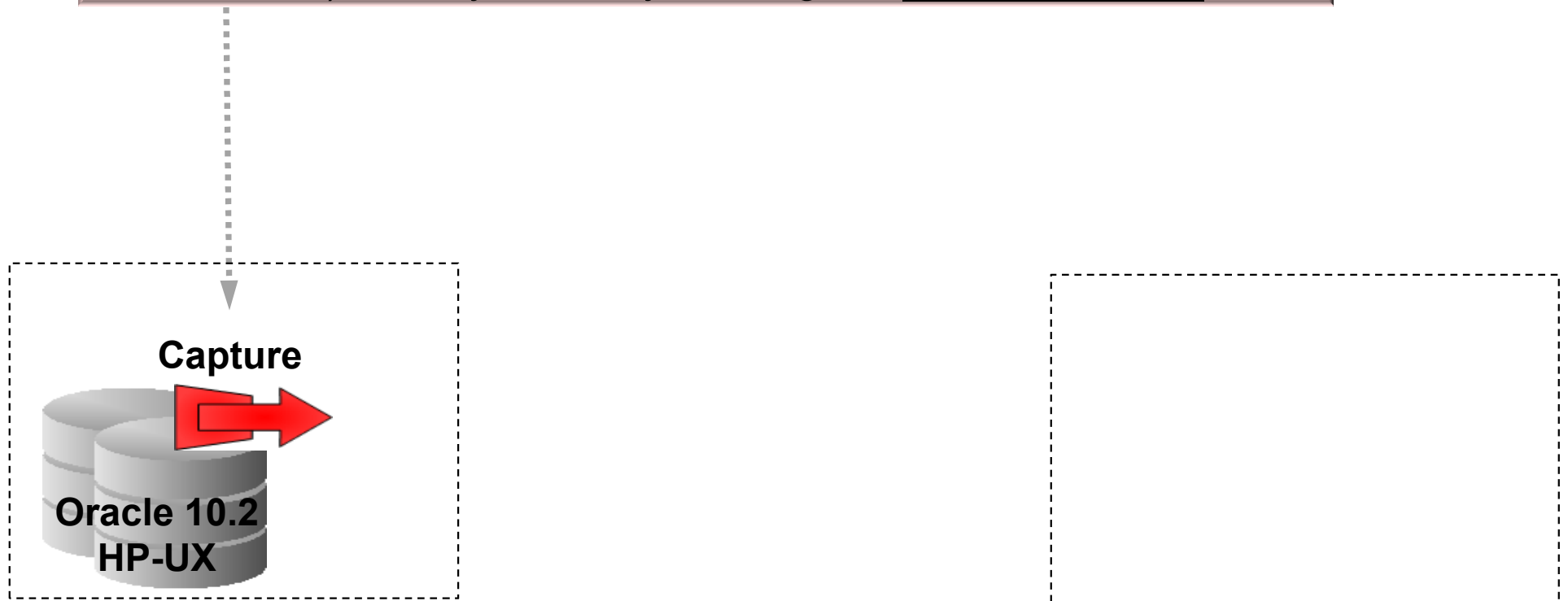


Difference Conventional Migration vs. Oracle GoldenGate



How Oracle GoldenGate Works

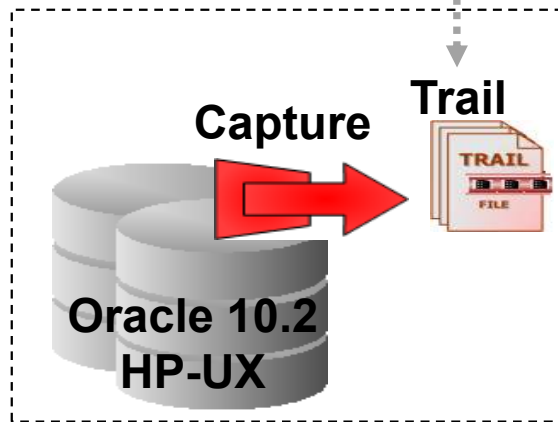
Capture: committed transactions are captured (and can be filtered) as they occur by reading the transaction logs.



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How Oracle GoldenGate Works

Trail: stages and queues data for routing.

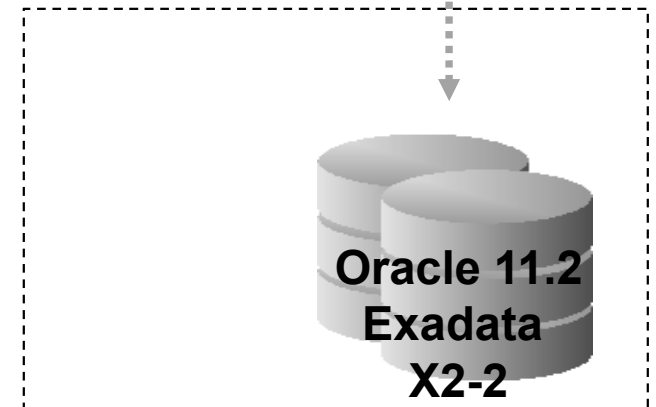
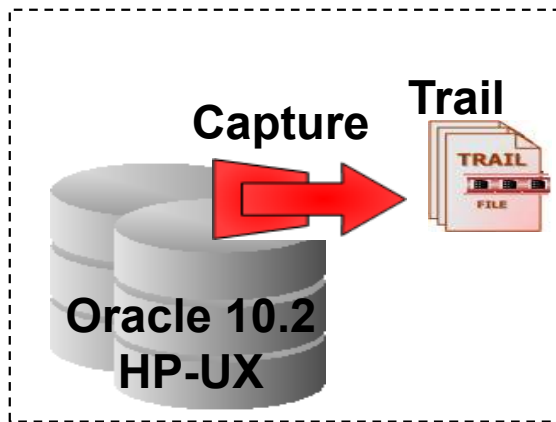


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How Oracle GoldenGate Works

Build up the target database with:

- Transportable Tablespaces x-Platform
- Export/Import with Data Pump



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How Oracle GoldenGate Works

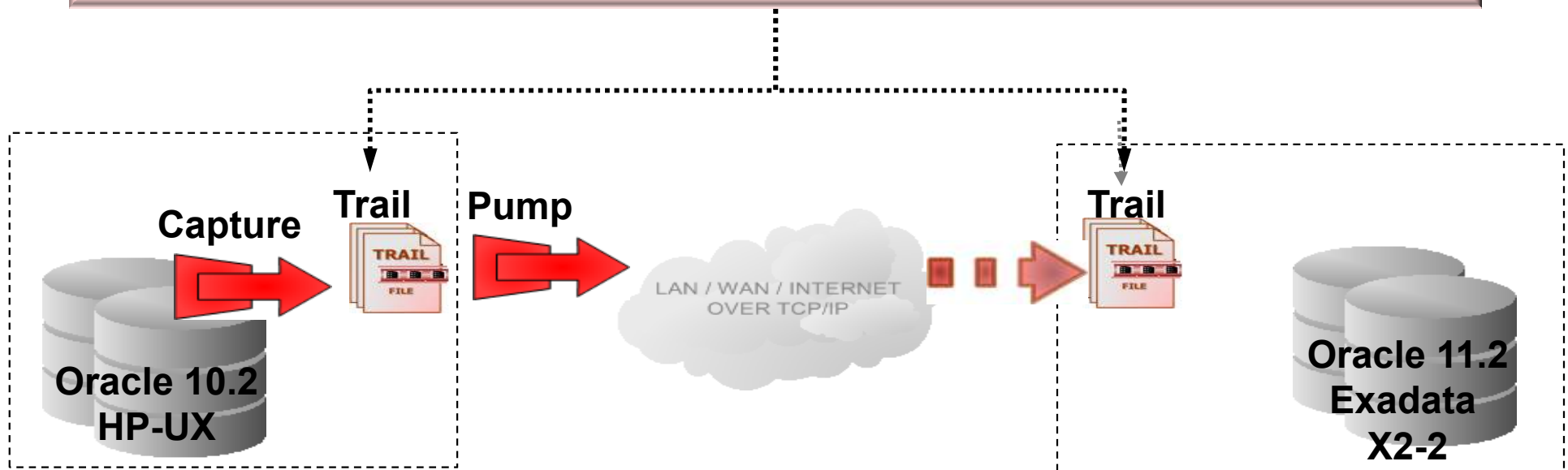
Pump: distributes data for routing to target(s)



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How Oracle GoldenGate Works

Route: data is compressed, encrypted for routing to target(s)



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How Oracle GoldenGate Works

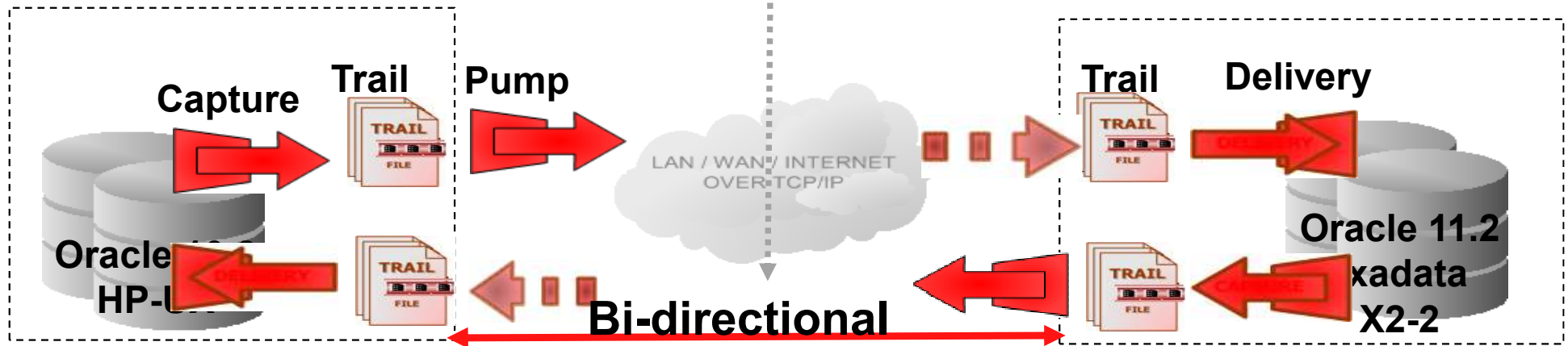
Delivery: applies data with transaction integrity, transforming the data as required.



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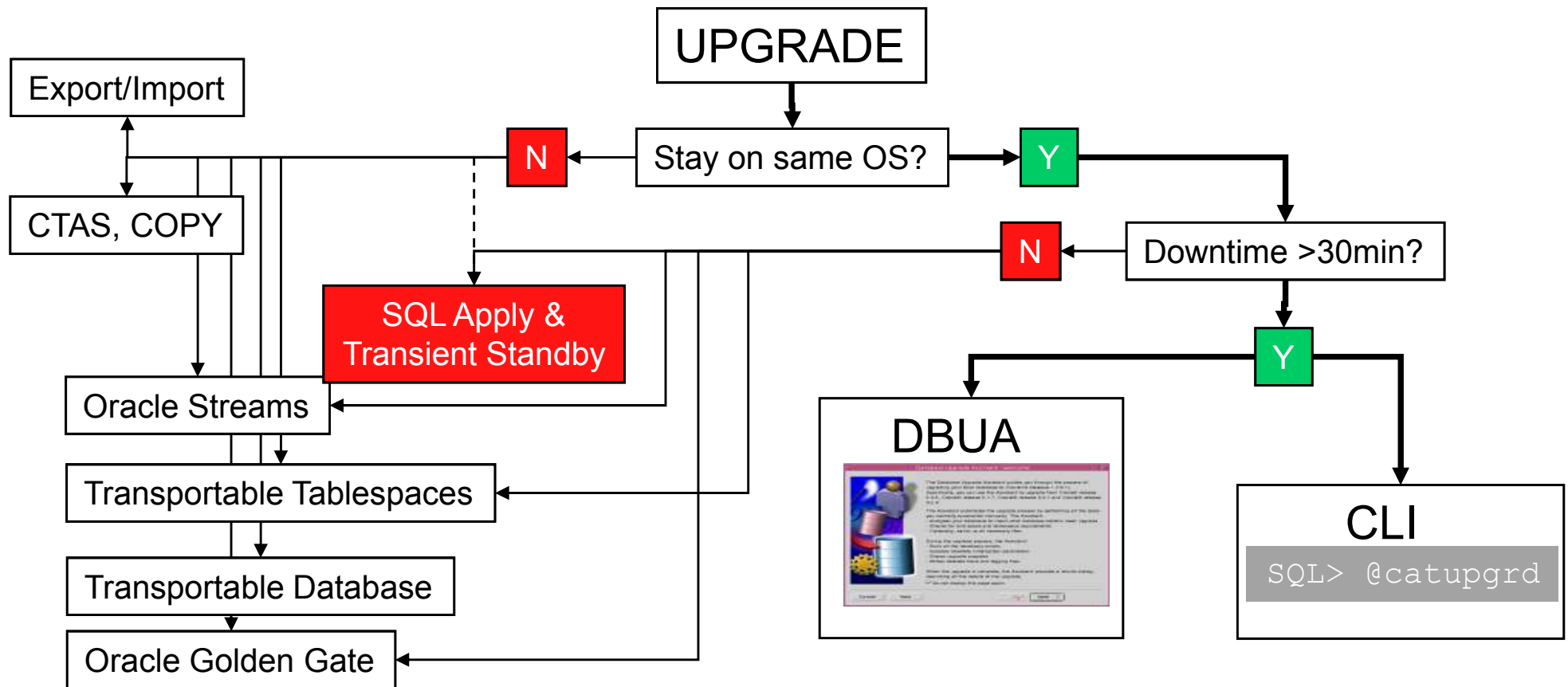
How Oracle GoldenGate Works

Golden Gate works **bidirectional** -
from higher to lower release as well!



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Upgrade Paths

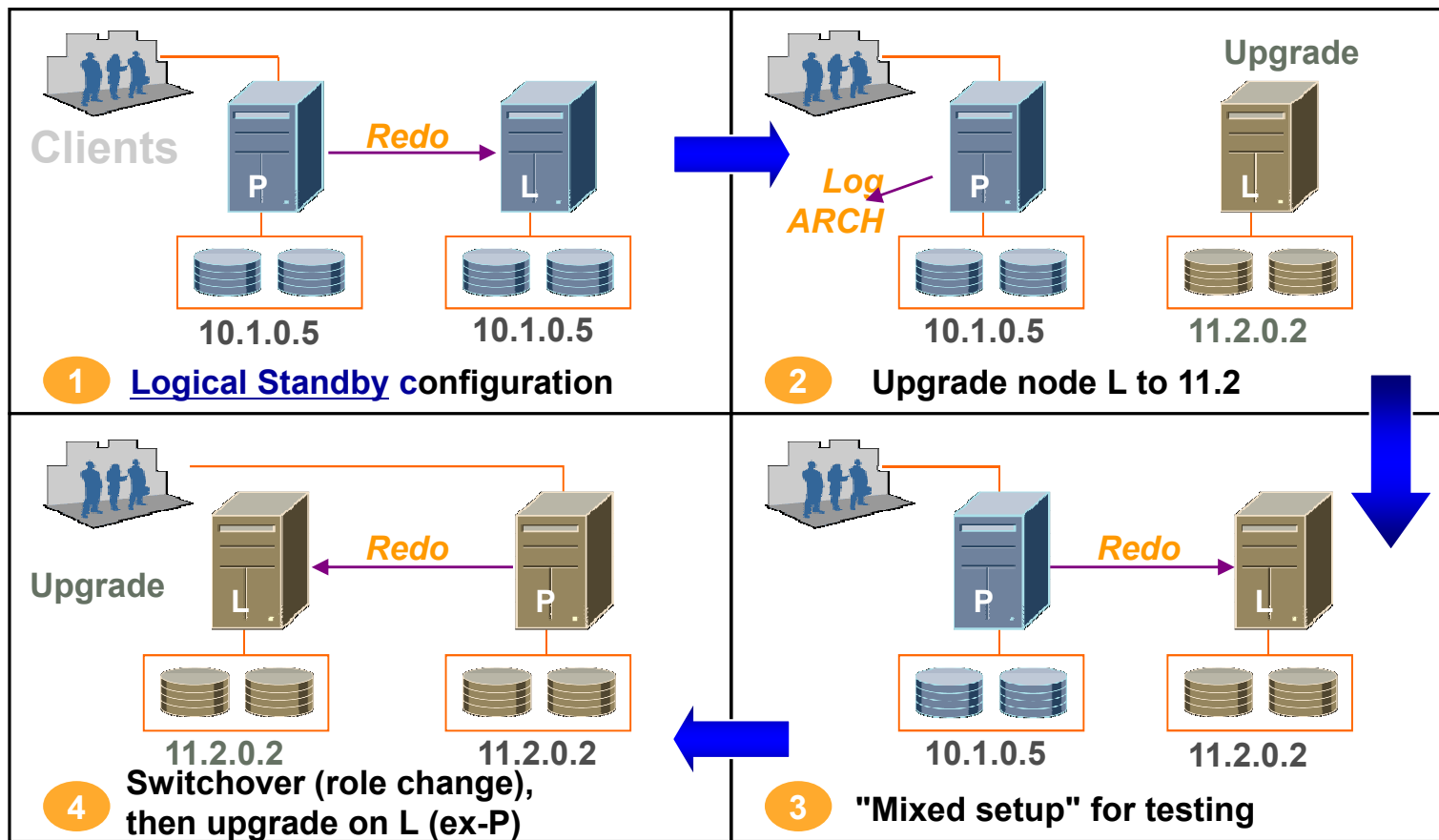


Logical Standby with Oracle Data Guard

- 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:
 - Usually no OS change possible
 - » Exceptions: see [MOS Note: 1085687.1](#)
 - Logminer has known restrictions
 - » Data type support
 - » Performance



Logical Standby with Oracle Data Guard

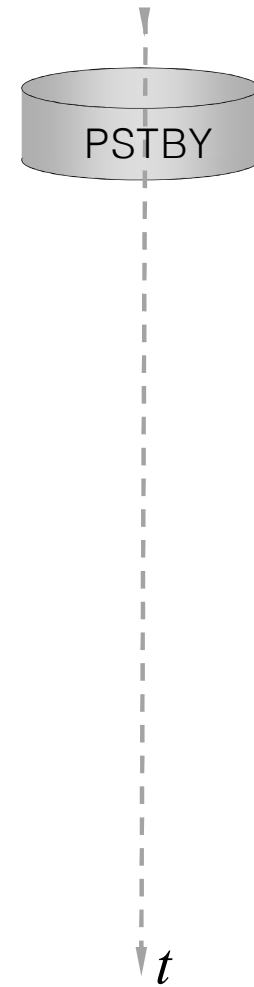
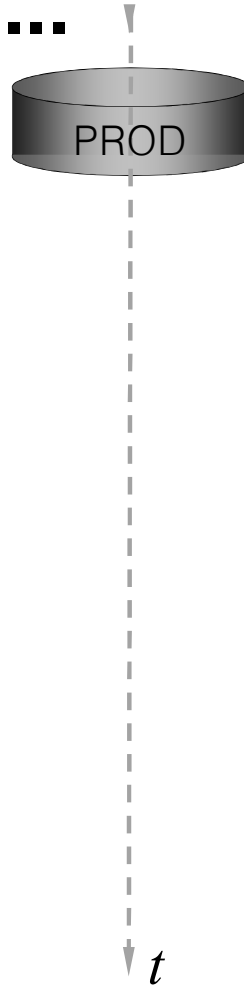


Transient Logical Standby

- 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

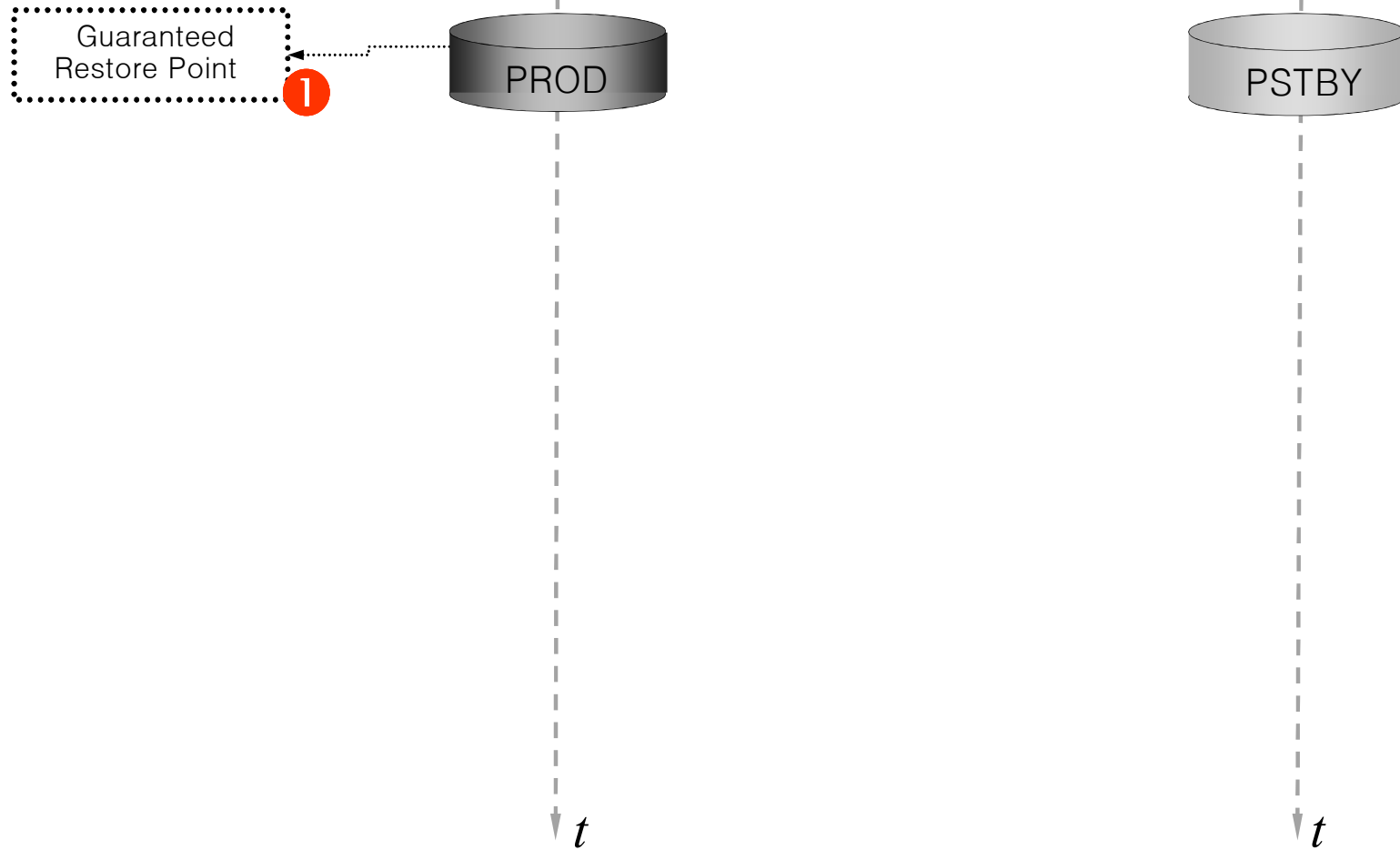
Rolling ...



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2

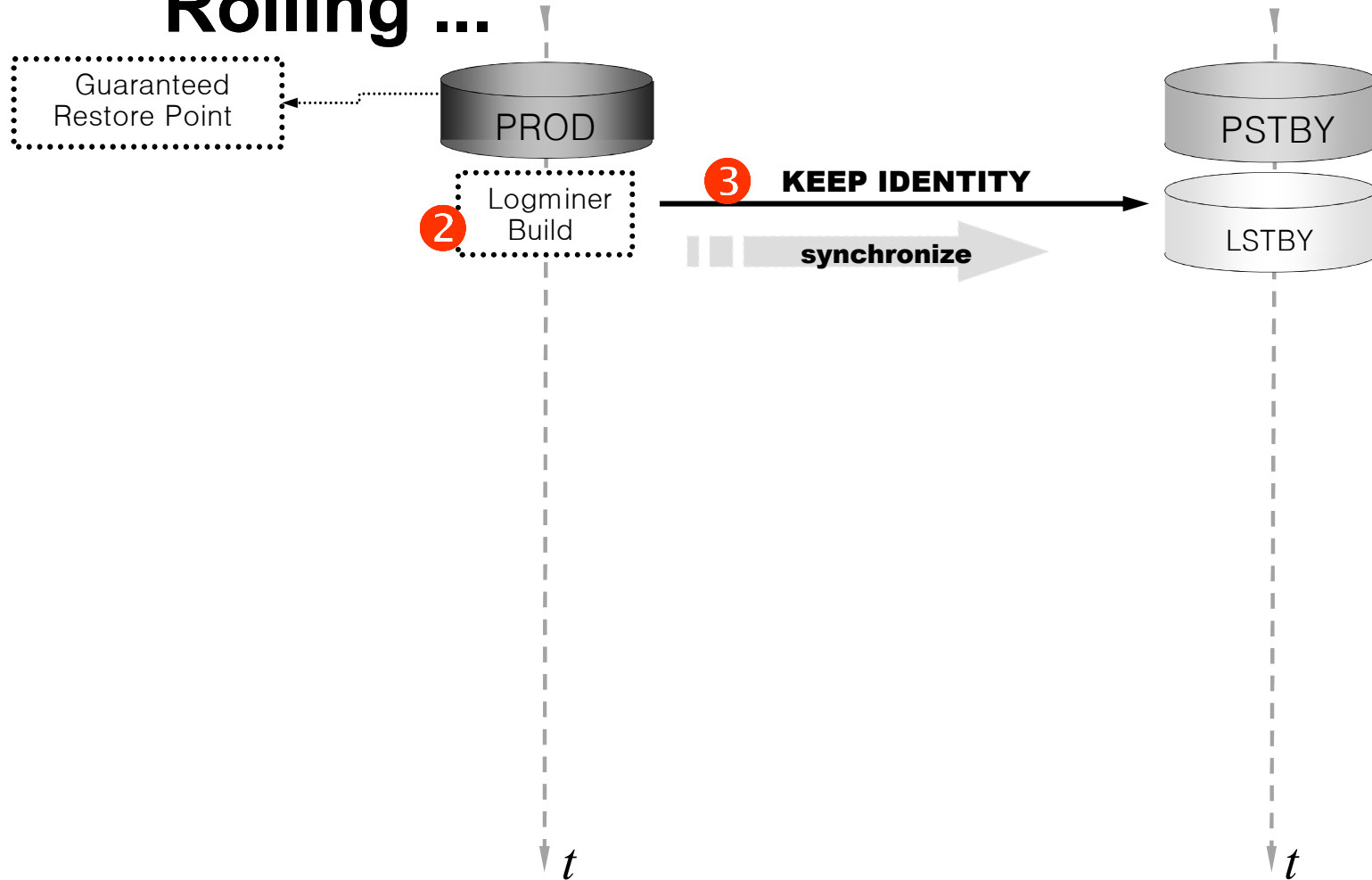
Rolling ...



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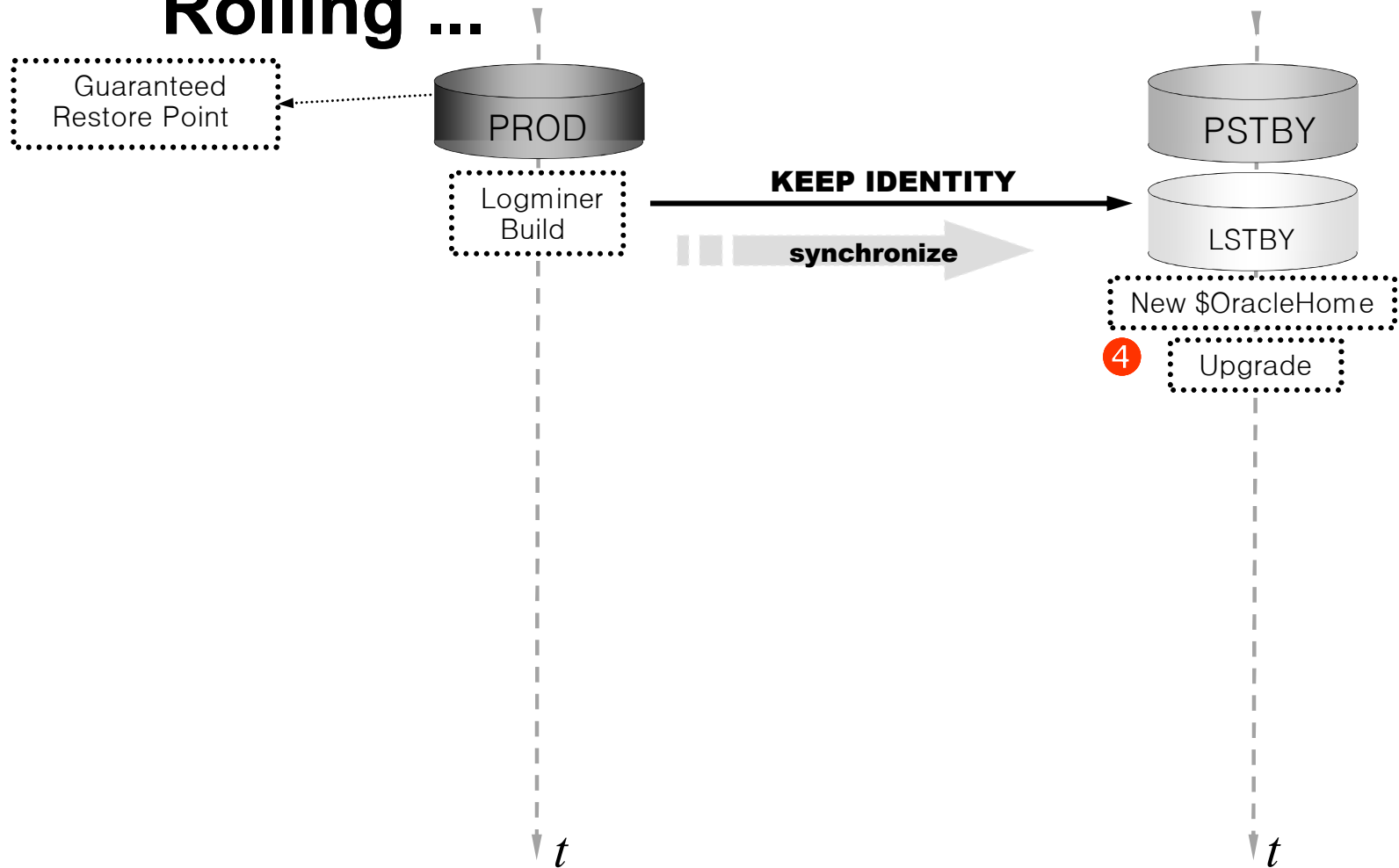
3

Rolling ...



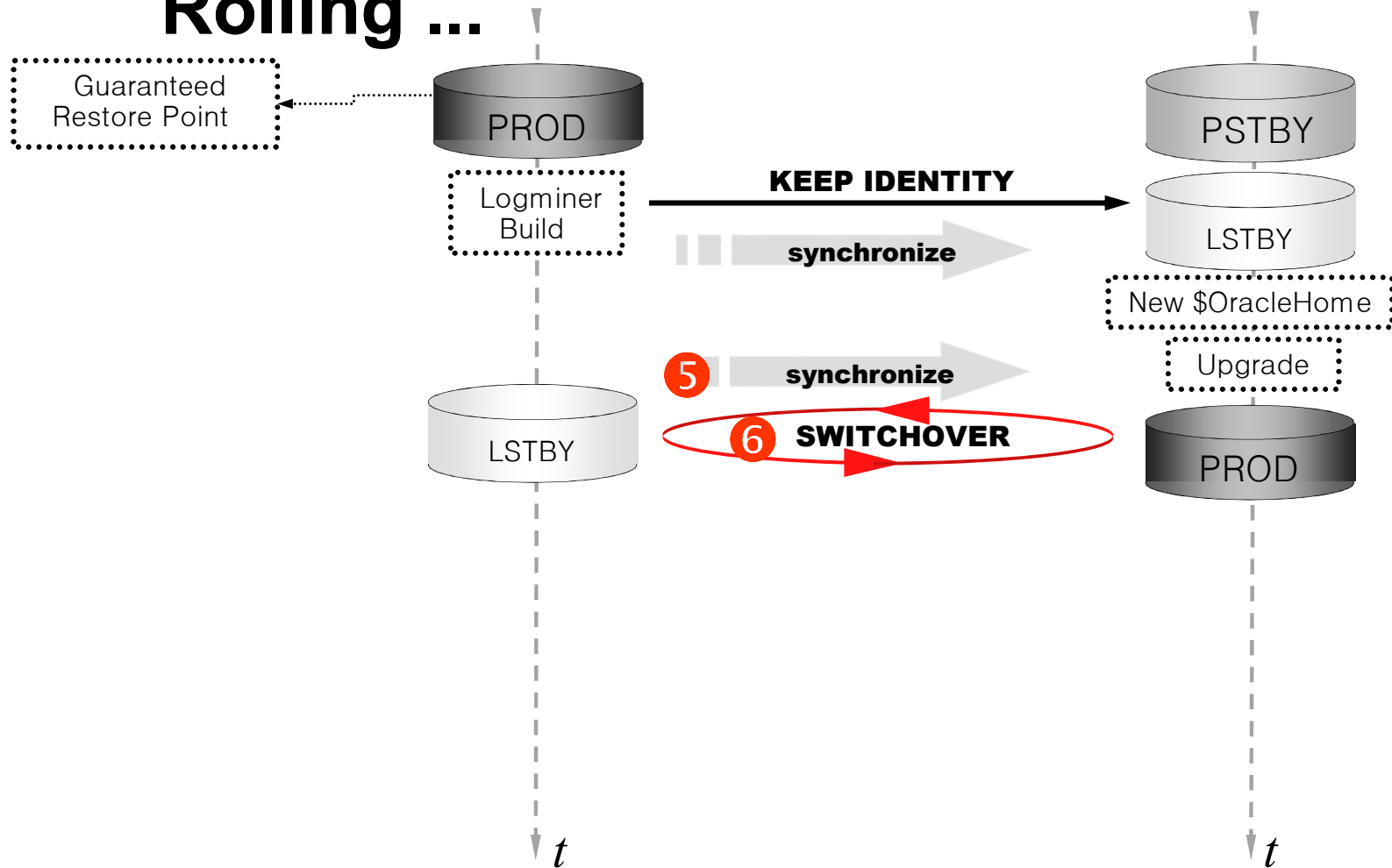
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Rolling ...



5

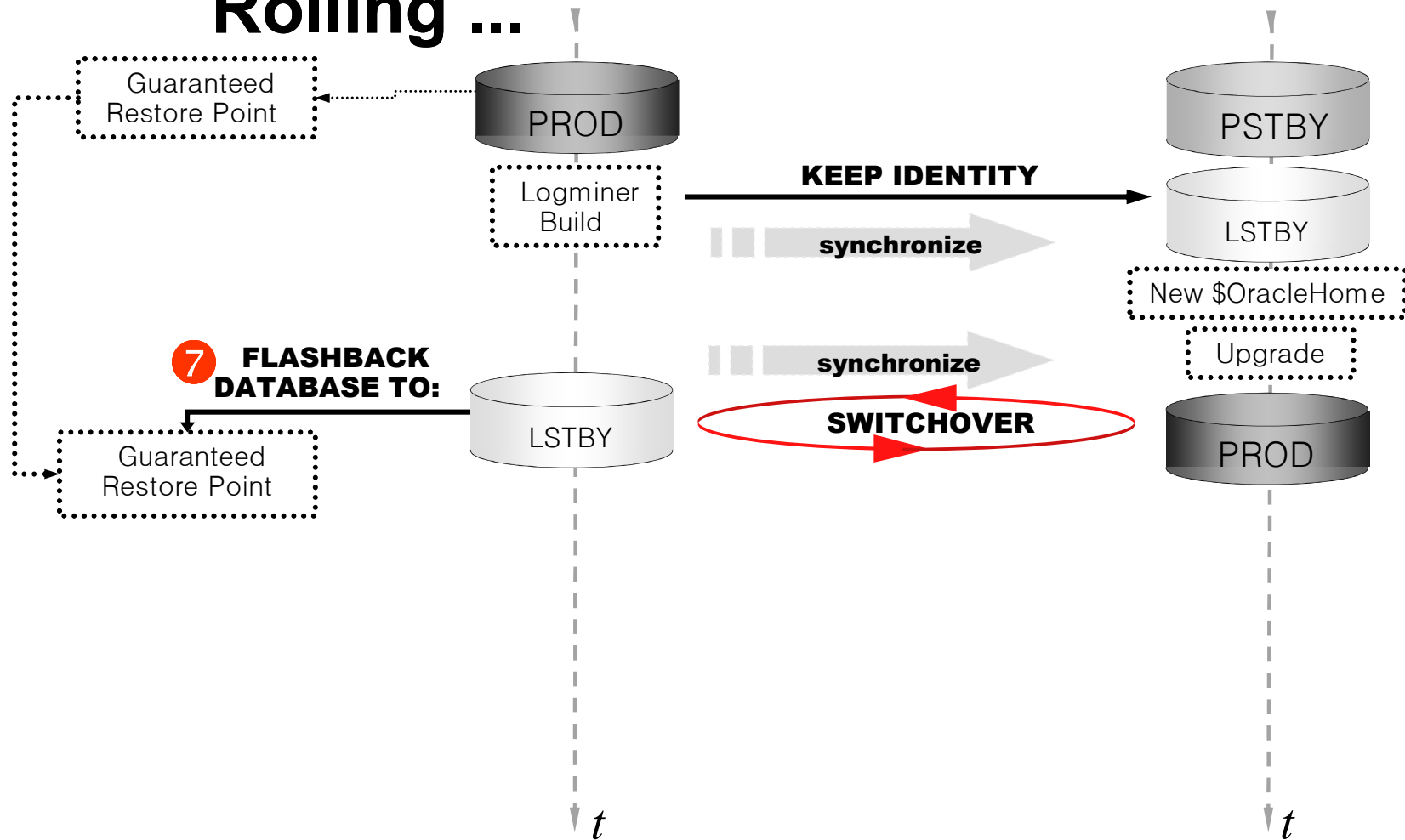
Rolling ...



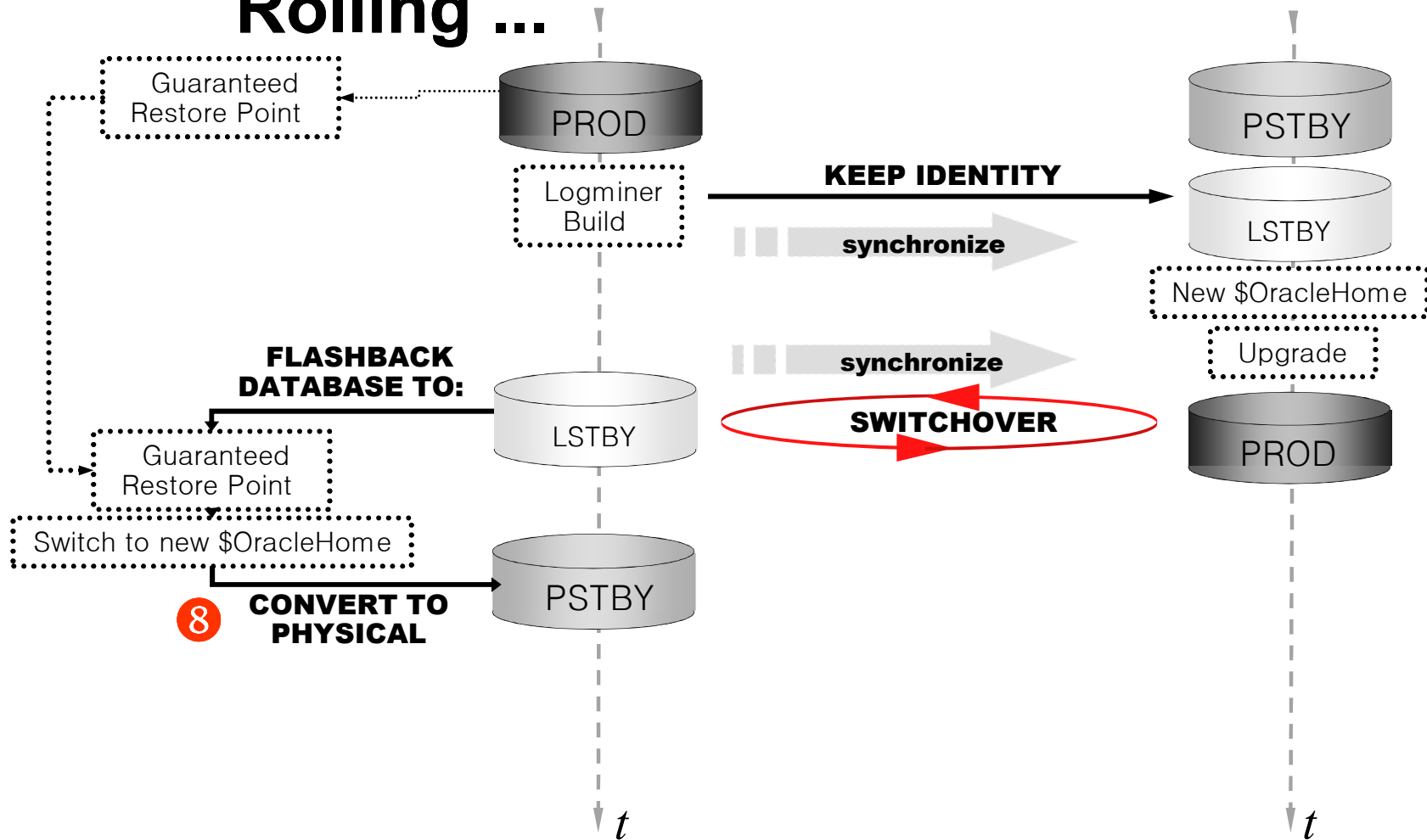
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6

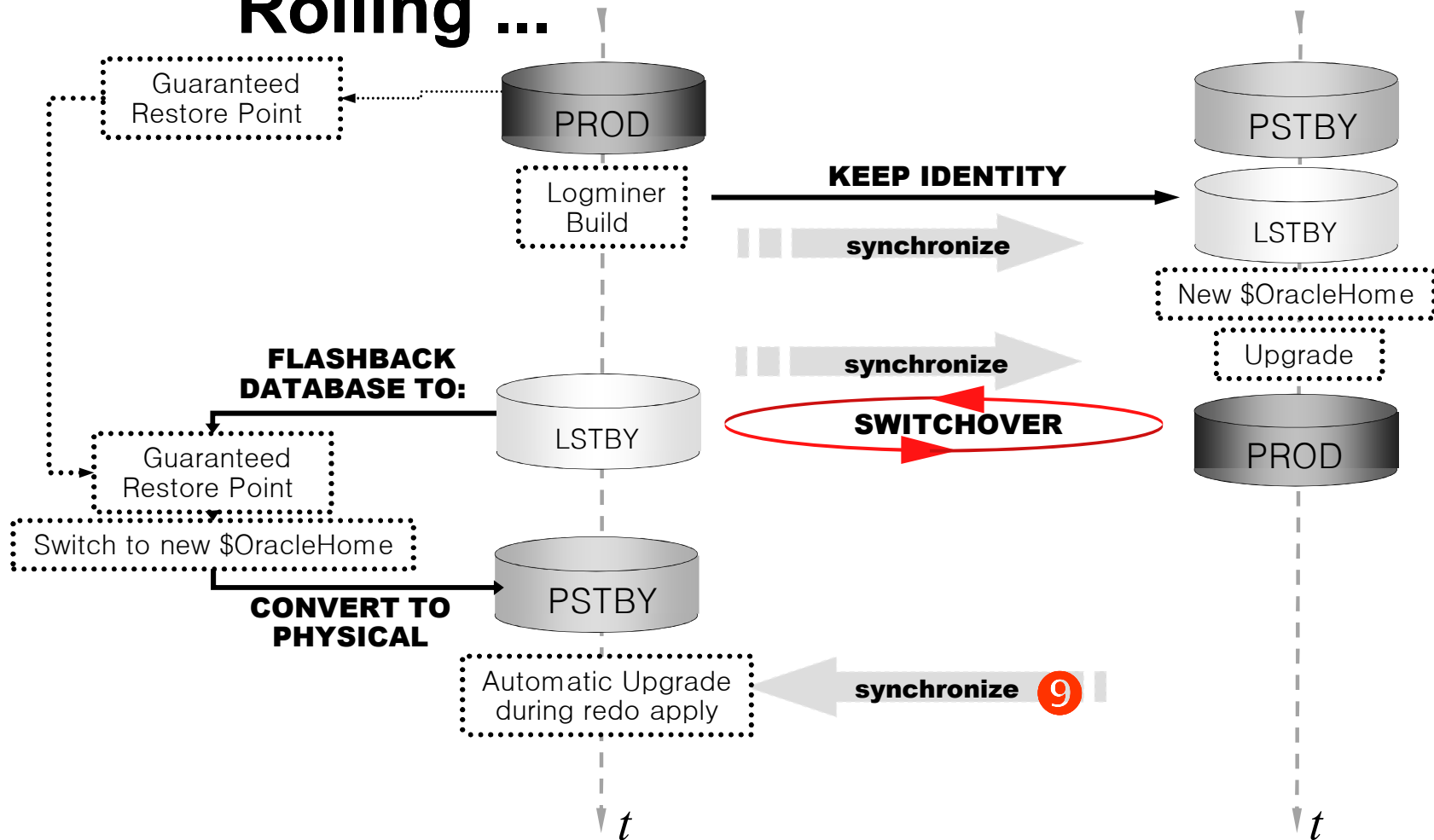
Rolling ...



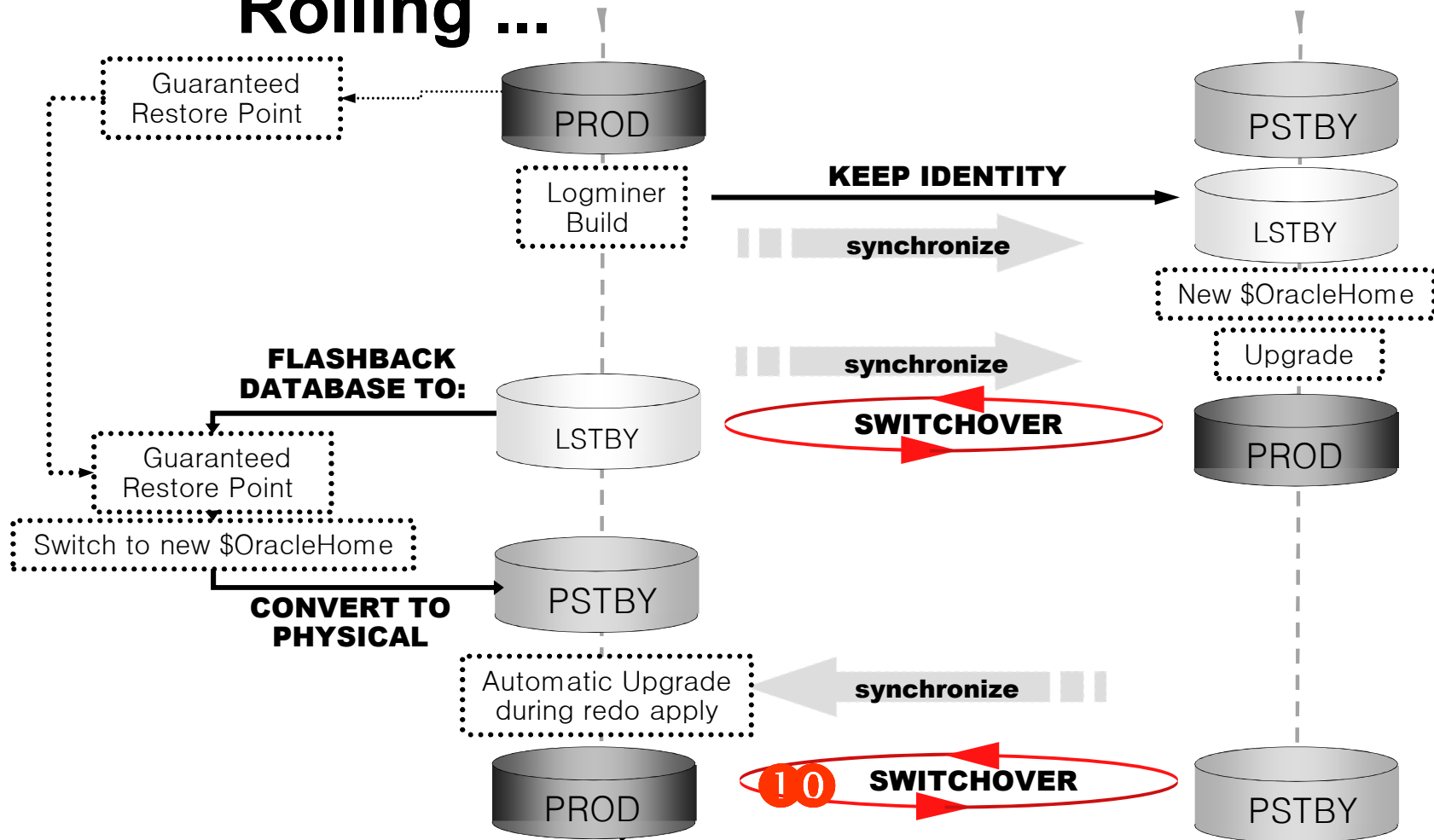
Rolling ...



Rolling ...



Rolling ...



Agenda

- Regular Upgrade Methods
- Post Upgrade Tasks
- Upgrade Alternatives
- Summary



When to Choose the DBUA



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

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

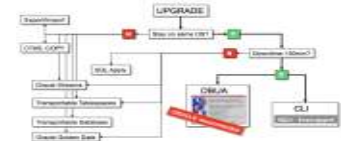
When to Choose Command-Line

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

- Consideration
 - Cannot migrate to a different operating system architecture
 - More manual steps required
 - Potential for errors due to typos, missed details

When to Choose an Alternative Method

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



Upgrade Summary

- Choosing an upgrade method depends on:
 - Database environment
 - Amount of downtime that is acceptable
 - DBA's knowledge and tolerance for complexity
- If possible, using the DBUA is the recommended method for simplicity and ease-of-use
- Always create an online backup with RMAN
- Please remember:
Upgrade has never been easier - but you still have to test!!!
- 11g R2 is a stable database release so go for it!

Hardware and Software

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Engineered to Work Together

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