

# Upgrade with Minimal Downtime

## *Data Guard Transient Logical Standby*

by

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# Who am I

- Working as Senior Database Administrator at
  - [Wellcome Trust Sanger Institute](#)
- 10+ years of experience in Oracle (8-11gr2)
- 5+ years of experience in MySQL, SQL Server
- Recently started blogging
  - [www.dbakalyan.wordpress.com](http://www.dbakalyan.wordpress.com)
  - You can reach me on [dba\\_kkk@yahoo.co.uk](mailto:dba_kkk@yahoo.co.uk)

# Wellcome Trust Sanger Institute



- One of the leading genomics centres in the world
- Located in Hinxton, south of Cambridge, UK
- Founded in 1993 by the [Wellcome Trust](#) and the UK [Medical Research Council \(MRC\)](#)
- Primarily funded by the Wellcome Trust
- The institute is named after Dr Fred Sanger – The double Nobel prize-winning biochemist
- Responsible for the completion of 1/3 of the human genome

- Current computational capacity of 16k cores:
  - 12k cores on blade format
  - 4k cores in racked servers
- Current usable storage capacity 16 Petabytes:
  - Estimated growth 3 Petabytes/year
- Data shared globally across the world with many scientific research institutes



# Database Layout

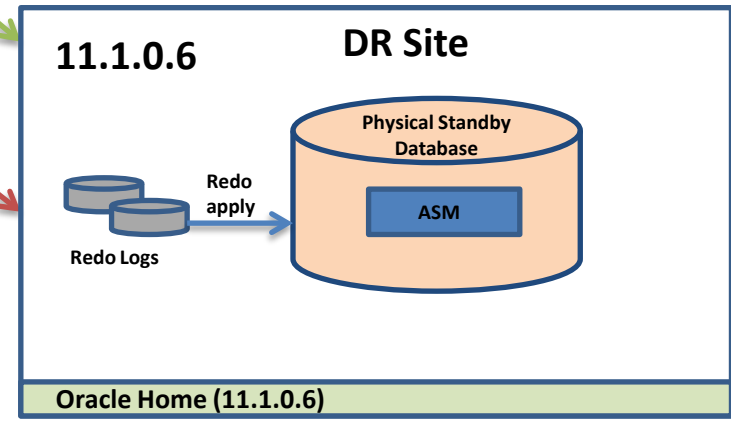
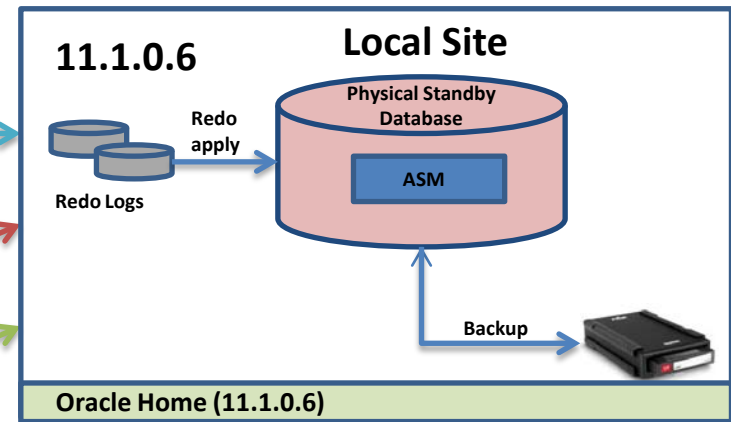
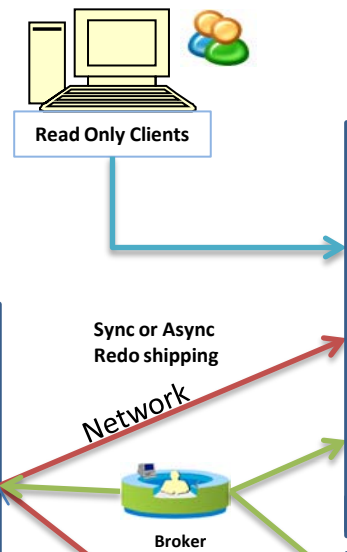
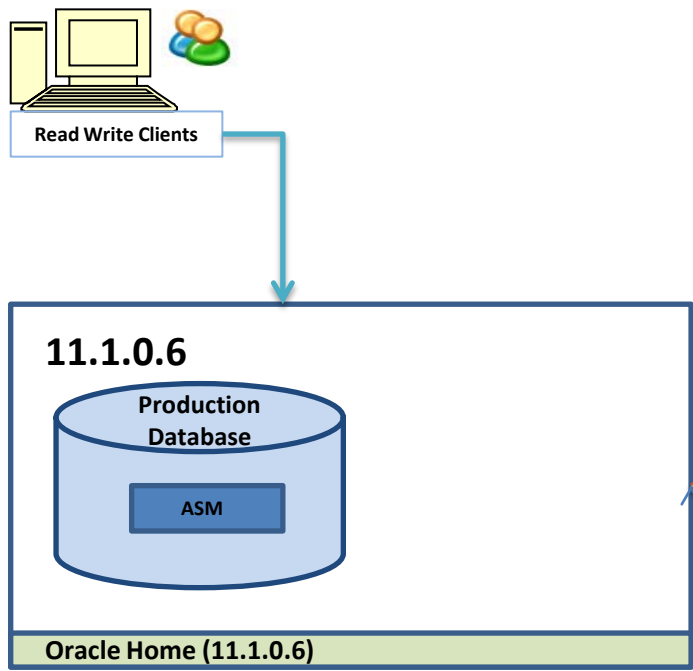
- Primary database (300G)
  - ASM
  - 2 Physical standbys (local and remote)
- **Local standby** is within same site as of the primary but placed in a different quadrant of the datacentre
- **DR standby** is 10 miles away from the Primary with dedicated private 10Gb/s WAN to DR datacentre

# Upgrade Process

- Upgraded database from 11.1.0.6 to 11.2.0.3 using Transient Logical standby
  - Down time reduced by 98%
- Upgrade process is split into 2 phases:
  - Phase 1 (Upgrade Primary Database)
  - Phase 2 (Upgrade Standbys & Switchback)

# Phase - 1

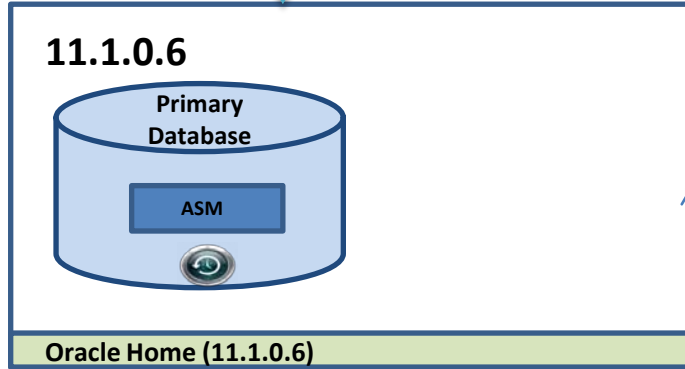
Upgrade Primary Database



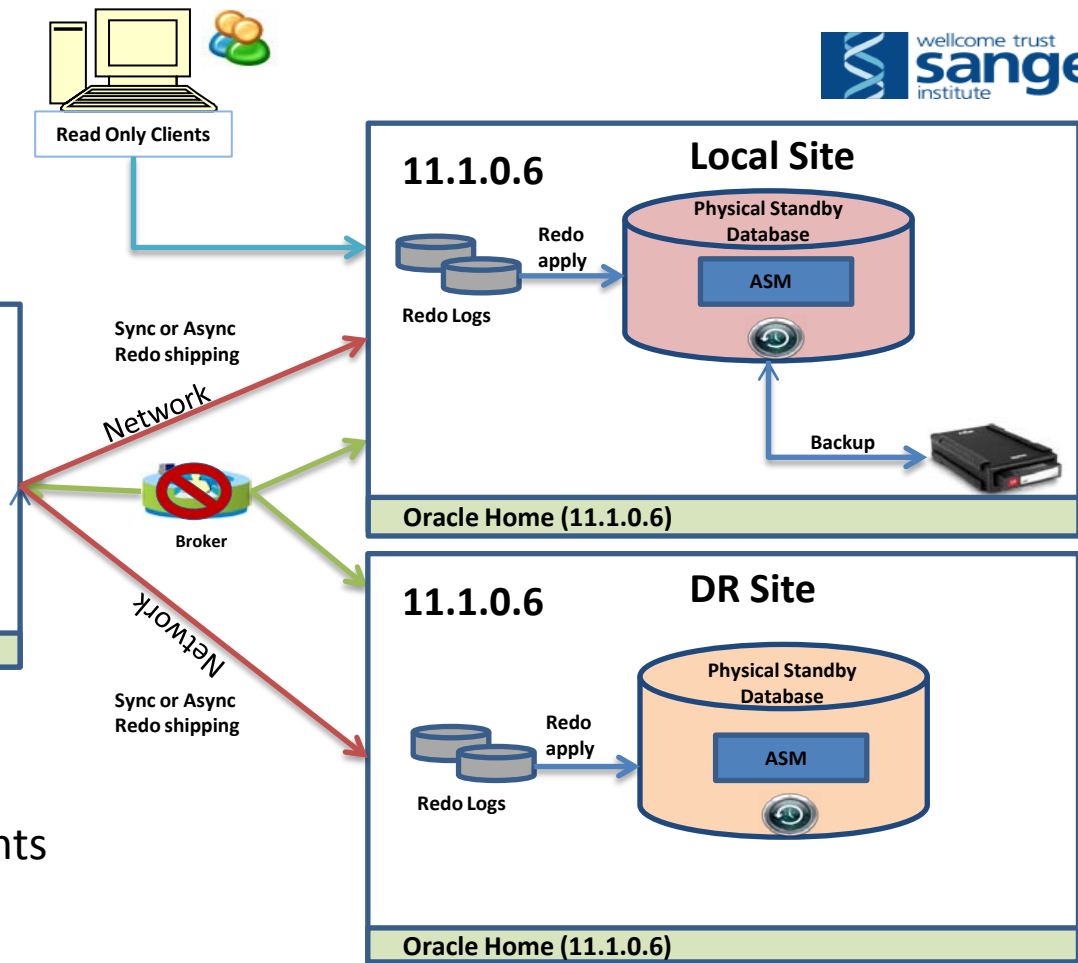


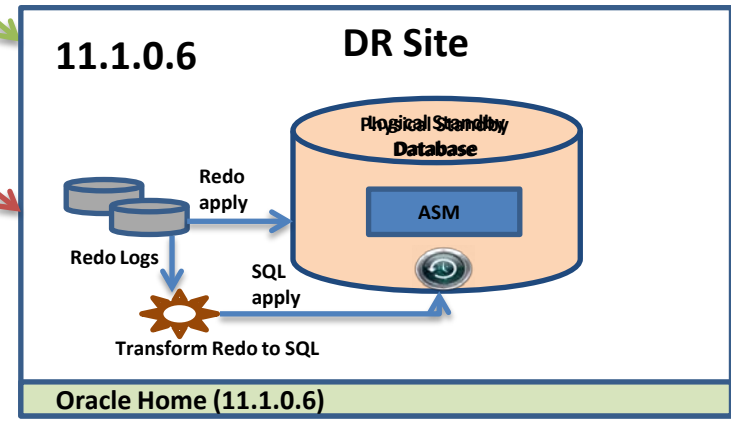
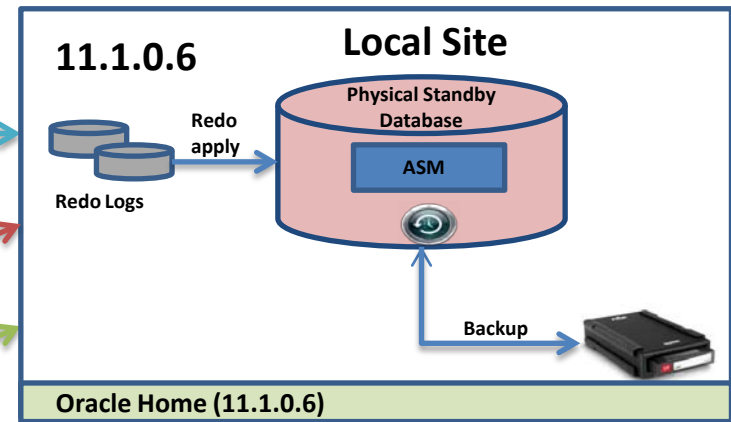
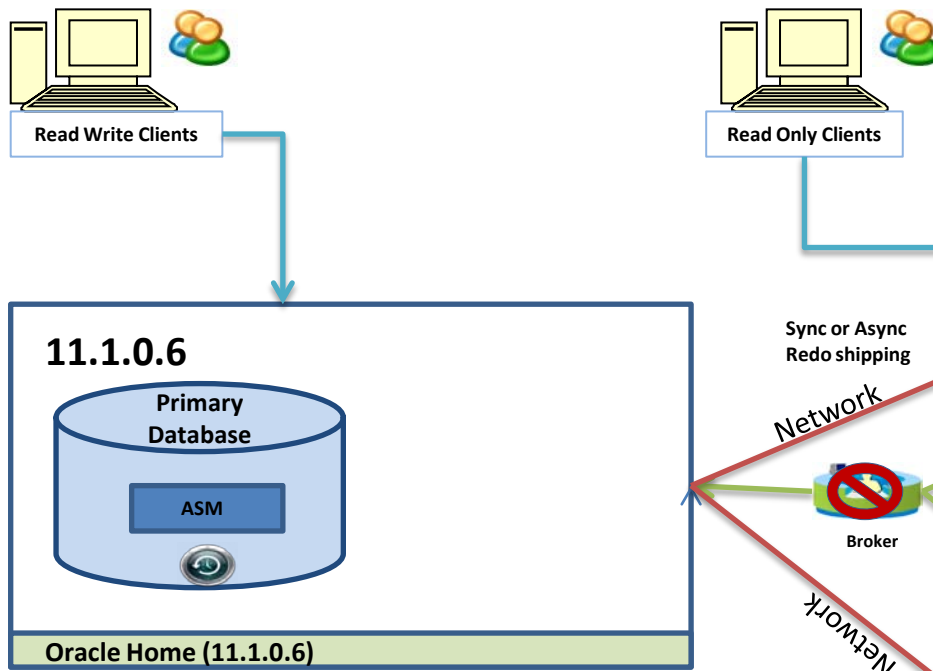
# Upgrade Pre-requisites

- Disable Data Guard Broker
- Protection level must be either **Maximum availability** or **Maximum performance**
- Ensure Flashback is enabled on all databases in the Data Guard configuration
- Create guaranteed restore points
- Parameter “compatible” must be set to same on all the databases

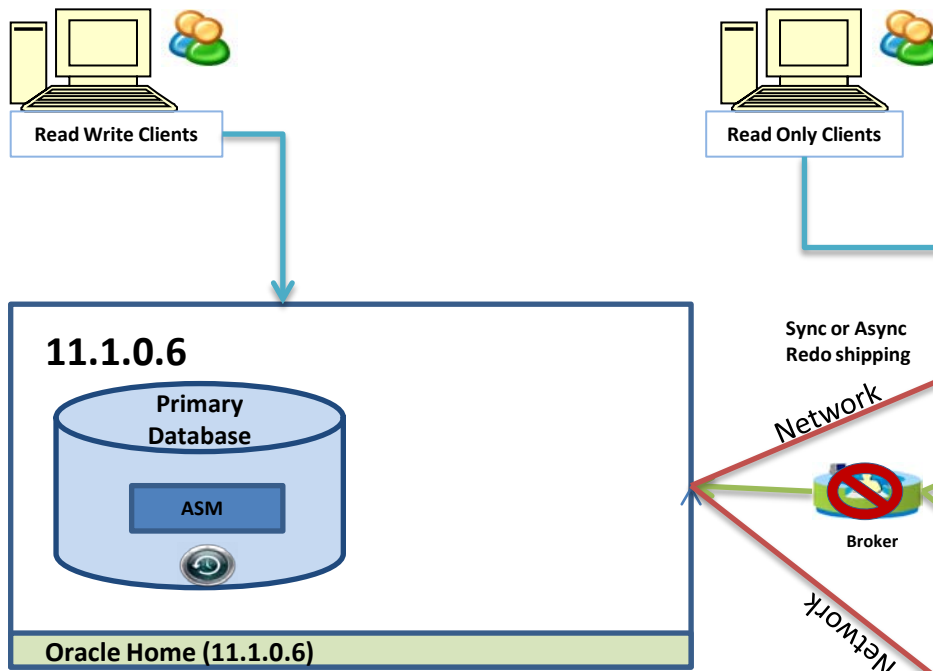


- Disable Broker
- Enable Flashback
- Create Guaranteed Restore points

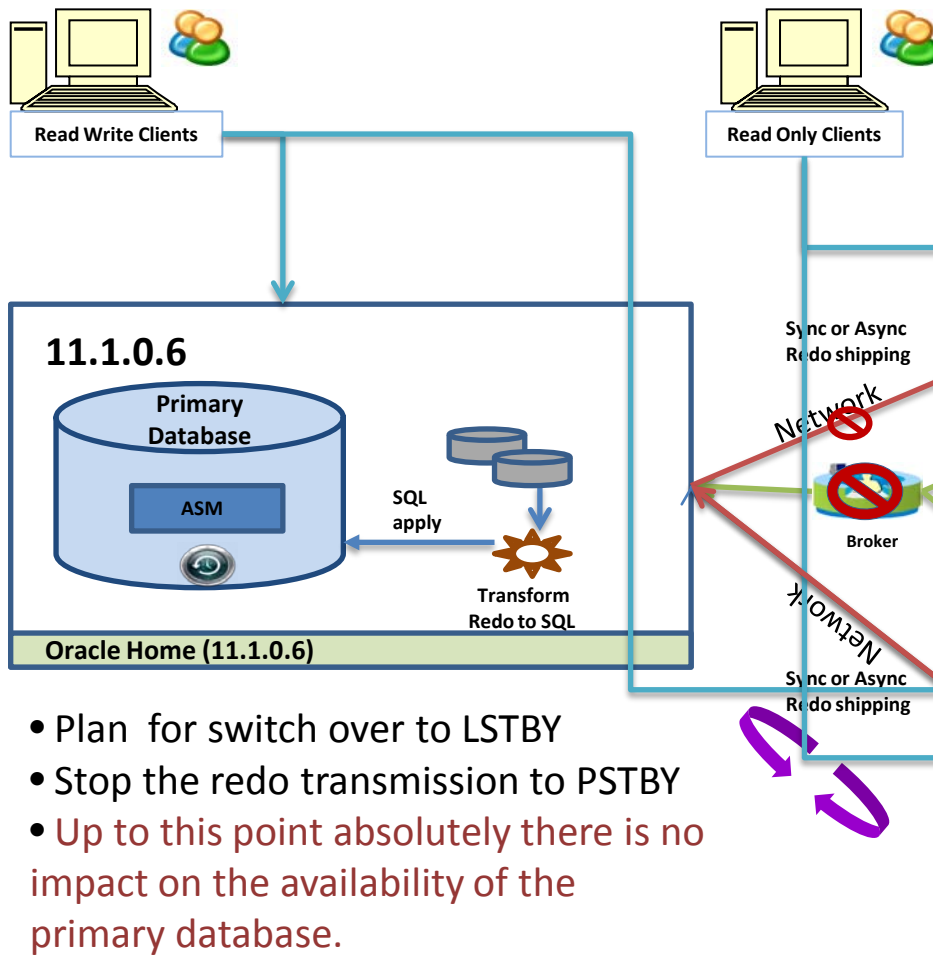




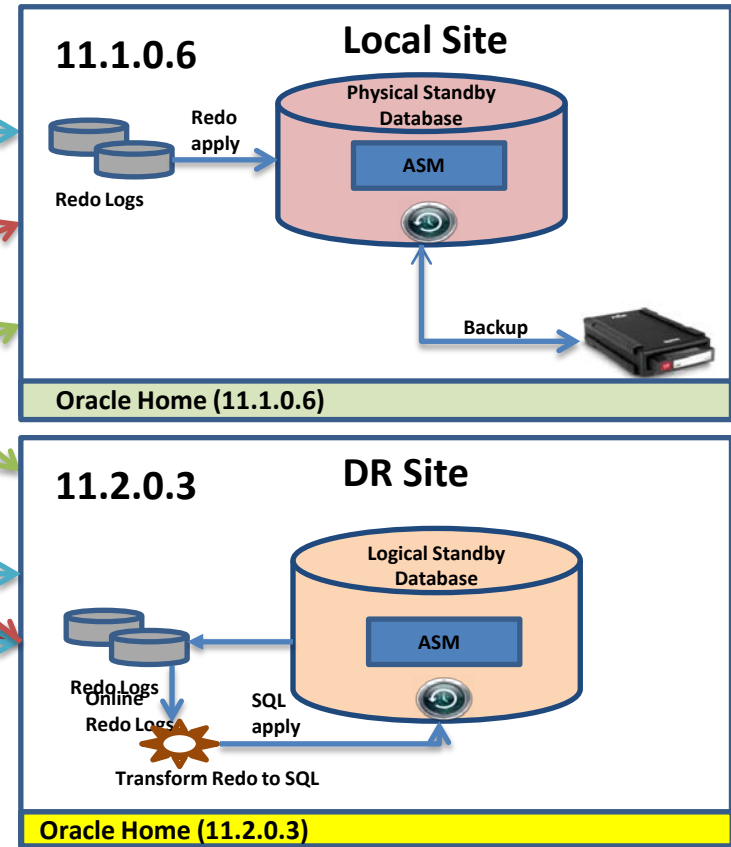
- Convert the DR physical standby to Transient Logical Standby
- Check if Logical standby is in sync



- Install new version of Oracle database Software
- Upgrade the LSTBY using DBUA from the new ORACLE HOME
- After successful upgrade check if LSTBY is in sync again

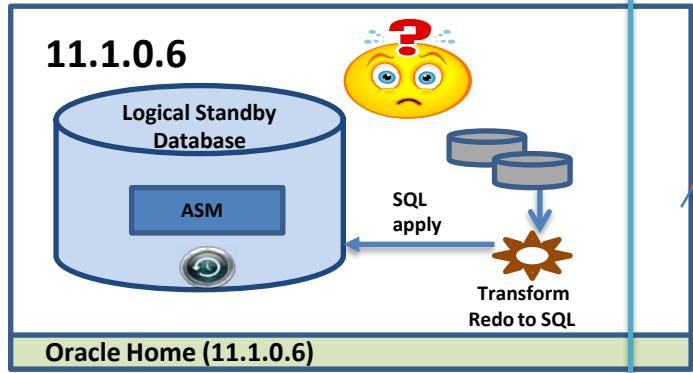


- Plan for switch over to LSTBY
- Stop the redo transmission to PSTBY
- Up to this point absolutely there is no impact on the availability of the primary database.
- Switch over
- Re-point the clients, services

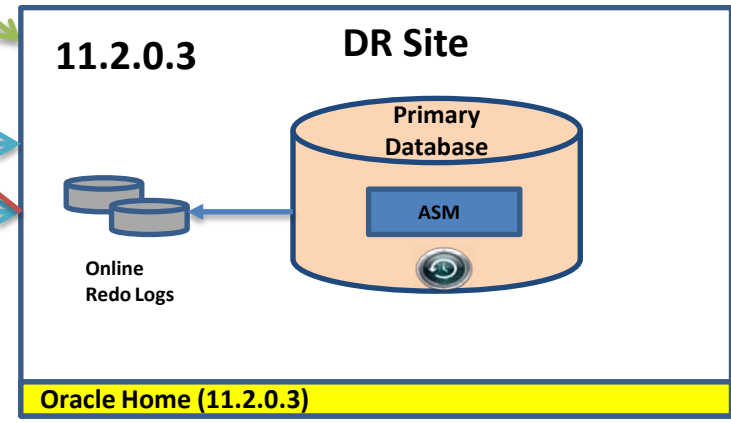
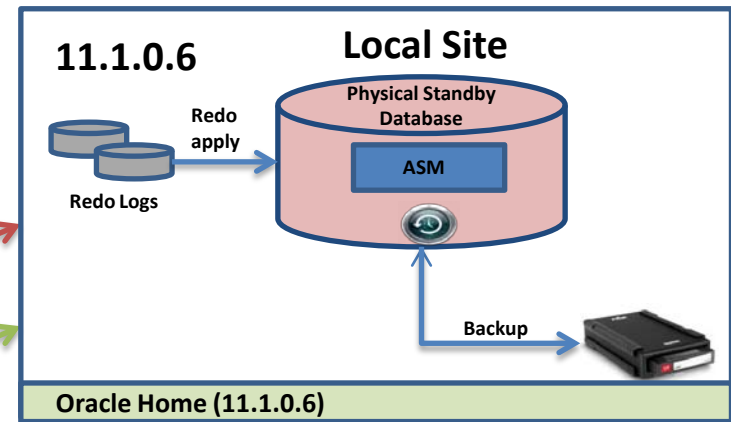
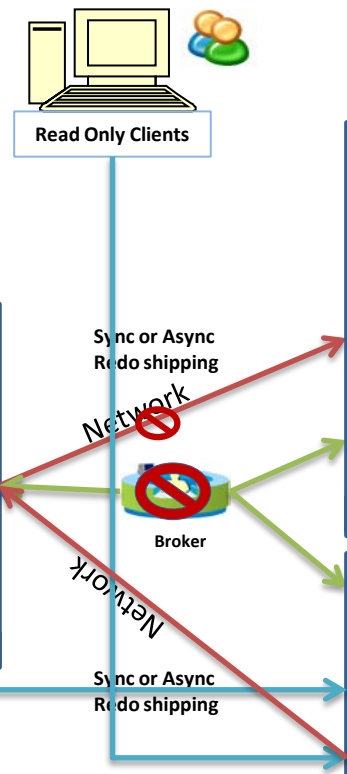


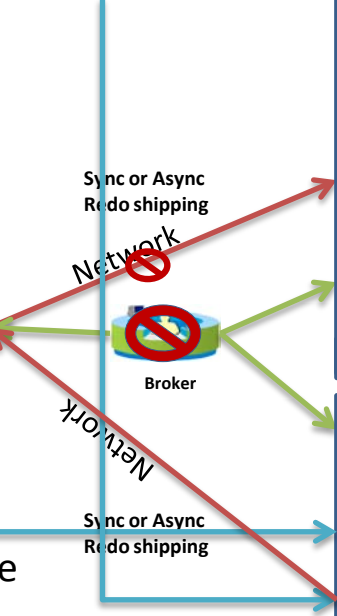
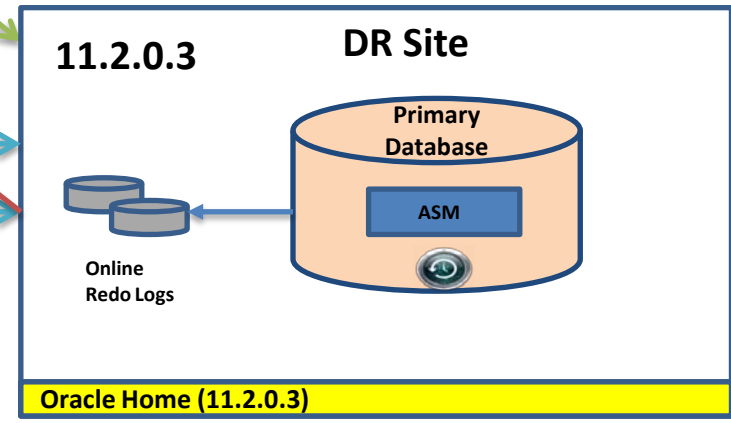
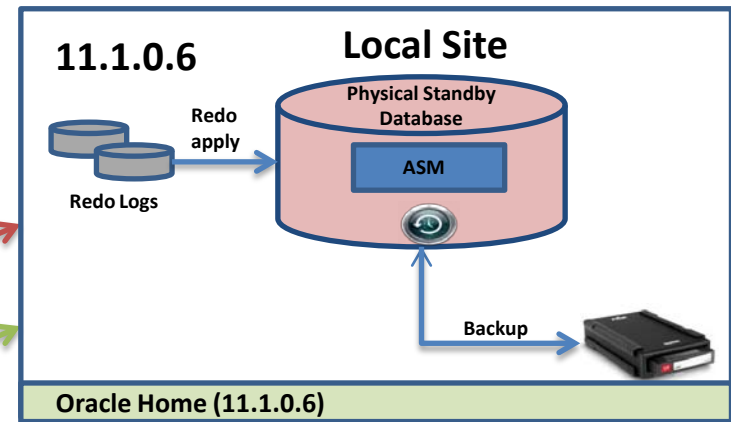
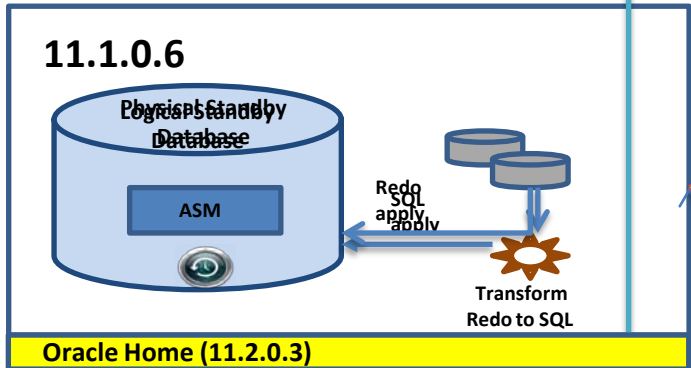
# Phase - 2

Upgrade Standbys & Switch Back



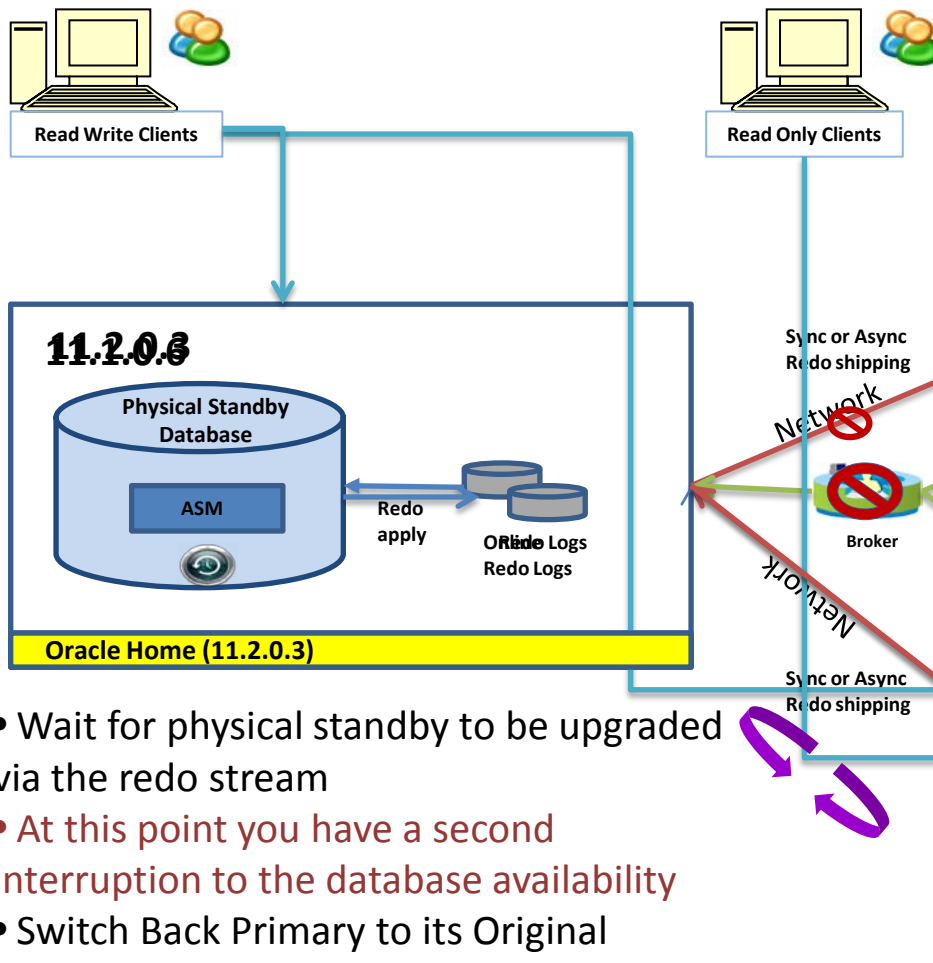
- LSTBY (previous Primary) is in a Transient state
- It is Running lower version than primary
- Cannot understand/apply changes received from the higher version of primary database
- Cannot provide disaster recovery





- Flashback LSTBY to guaranteed restore point and shut down
- Install new oracle version
- Mount database from new home and convert LSTBY to PSTBY
- When Redo Apply starts, it registers a new incarnation from the primary database





Read Write Clients

Read Only Clients

**11.2.0.3**

Physical Standby Database

ASM

Redo apply

Oracle Logs

Redo Logs

Oracle Home (11.2.0.3)

**11.1.0.6**

Local Site

Physical Standby Database

ASM

Redo apply

Redo Logs

Backup

Oracle Home (11.1.0.6)

**11.2.0.3**

DR Site

Primary Database

ASM

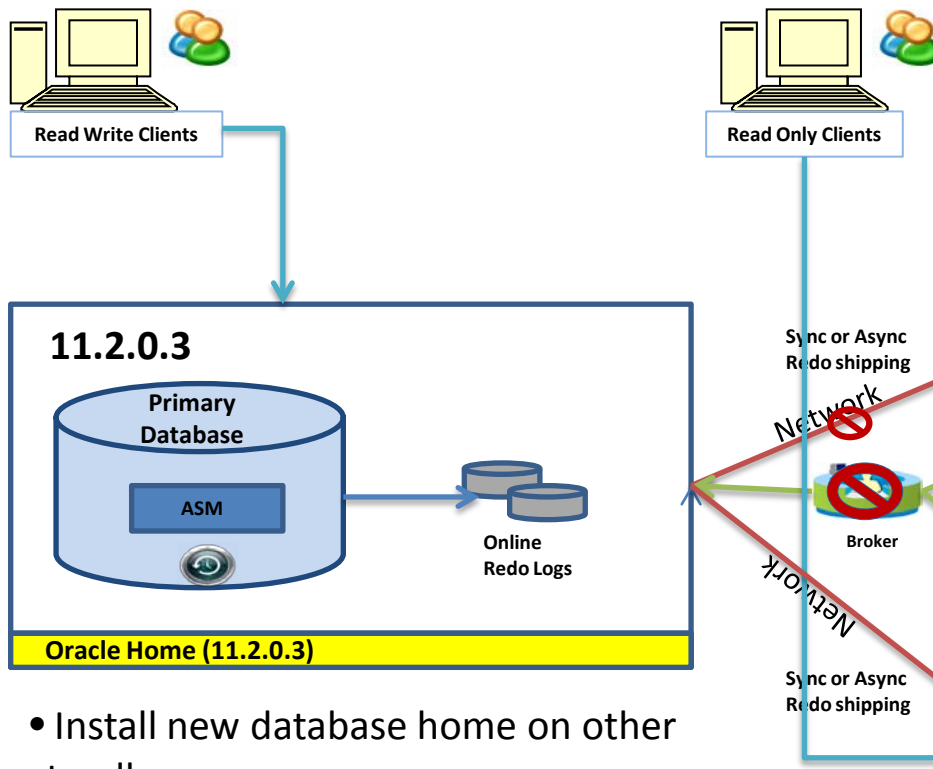
Redo apply

Oracle Logs

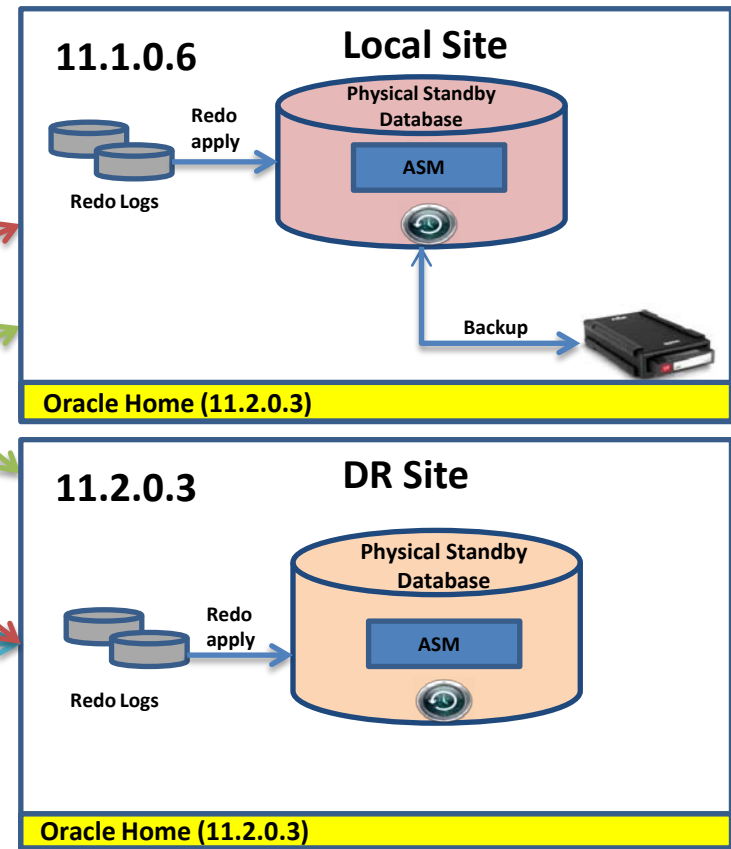
Redo Logs

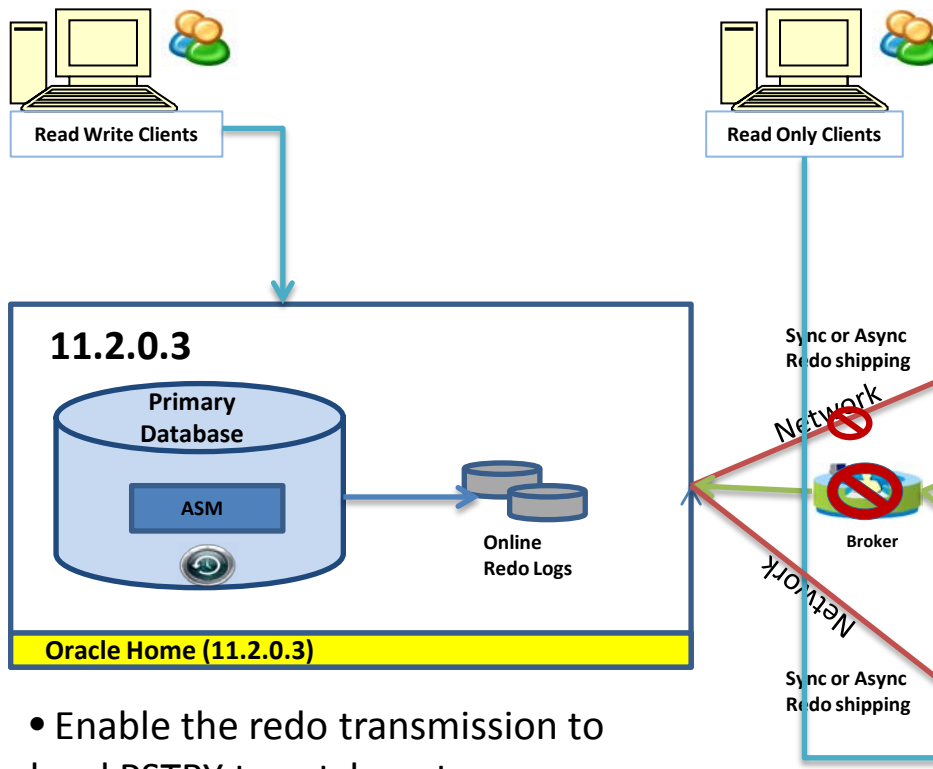
Oracle Home (11.2.0.3)

- Wait for physical standby to be upgraded via the redo stream
- At this point you have a second interruption to the database availability
- Switch Back Primary to its Original location
- Re-point the clients accordingly



- Install new database home on other standbys
- Mount PSTBY from new home
- Flashback database to guaranteed restore point





**11.2.0.3**

Primary Database

ASM

Online Redo Logs

Oracle Home (11.2.0.3)

**11.2.0.8**

Local Site

Physical Standby Database

ASM

Redo Logs

Redo apply

Backup

Oracle Home (11.2.0.3)

**11.2.0.3**

DR Site

Physical Standby Database

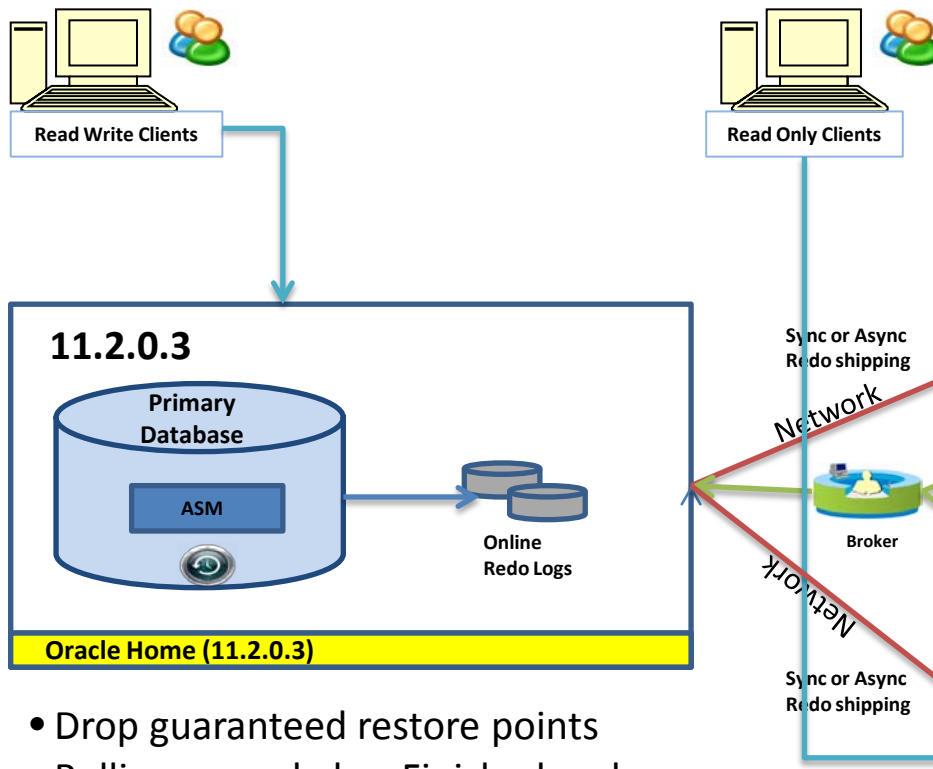
ASM

Redo Logs

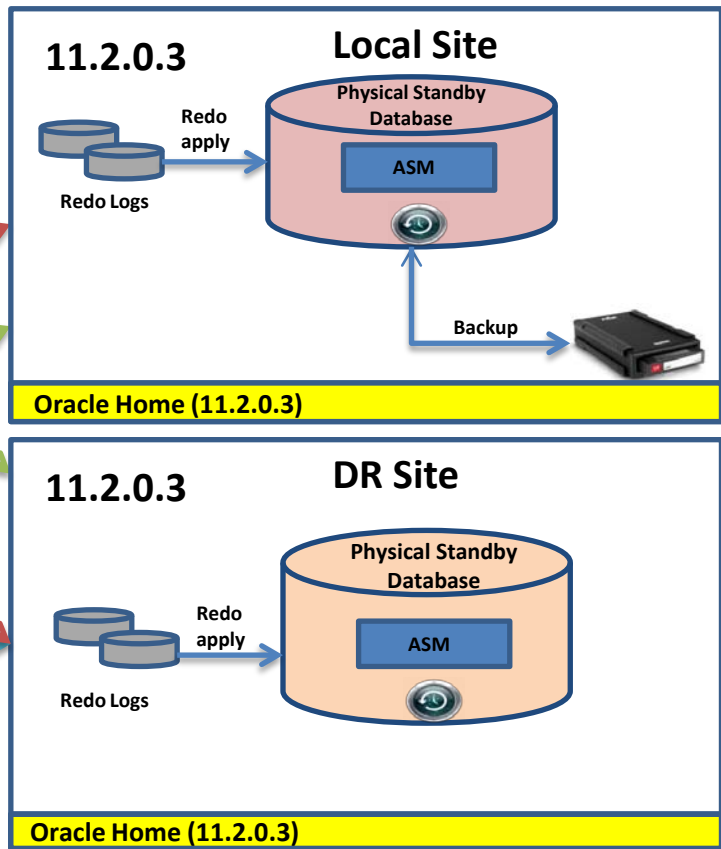
Redo apply

Oracle Home (11.2.0.3)

- Enable the redo transmission to local PSTBY to catch up to new incarnation
- PSTBY will be upgraded via redo stream
- Enable Broker



- Drop guaranteed restore points
- Rolling upgrade has Finished and databases are back in the original positions
- With very minimal interruptions



# Pros & Cons

## Regular /Conventional Upgrade

- Upgrade using DBUA/CLI (50mins)
- Upgrade using datapump - Complete Down time required for exports, scp & imports (approx 3 hrs)
  - Manually recreate standbys after the upgrade
- Errors at any stage can increase down time

## Rolling Upgrade using Transient LSTBY

- Down time is required for only switchover (reduced by 98% - 5mins)
- Standbys are automatically upgraded
- Fail safe options at each step
- Down time is independent of database size

# Caveats

- Need to upgrade grid/ASM before the database upgrade
- Need to manually update the OCR (srvctl) registries
- If Upgrading from 11gR1 to 11gR2 then move the database spfile from \$OH/dbs to ASM - if not, DBUA will fail
- If the “compatible” parameter is changed after LSTBY upgrade  
- database cannot be rolled back
- To change the “compatible” parameter after the upgrade  
- another downtime is needed

# References

- <http://www.oracle.com/technetwork/database/features/availability/maa-wp-11g-transientlogicalrollingu-1-131927.pdf>
- <http://www.oracle.com/technetwork/database/features/availability/maa-wp-11g-upgrades-made-easy-131972.pdf>