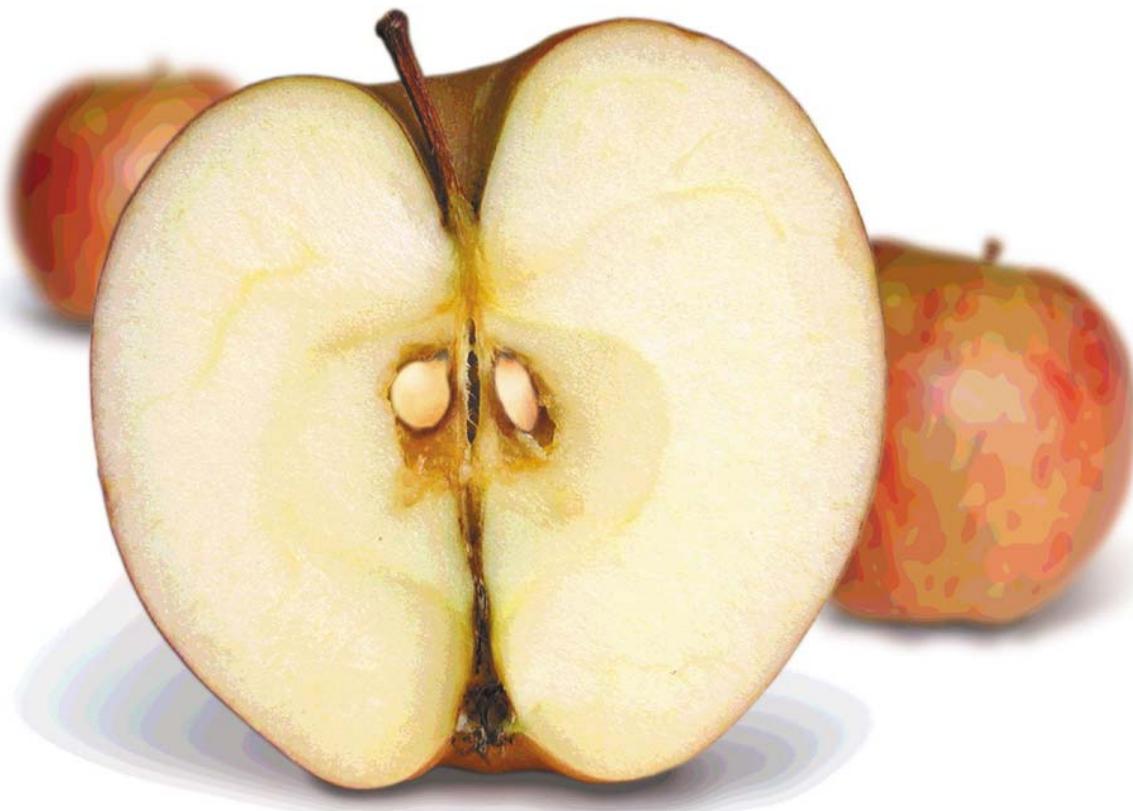




Data Guard – Fast-Start Failover



DOAG Regio Stuttgart – 18.05.2006

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makes **IT** easier.



Data Guard and Maximum Availability

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- > Introduction
- > Concept / Architecture
- > Flashback & Reinstate
- > Fast-Start Failover
- > Core Messages

Agenda

Know-how
We know how

The Data Guard Manager



- > Data Guard is part of Enterprise Edition (no special option), it includes all functionality 'to manage Standby Databases'
- > The Data Guard Broker Framework (applications and language) facilitates the following tasks of Data Guard
 - » Setup and configuration
 - » Monitoring/control of Redo Log transport- and log apply services
 - » Core operating tasks (Switchover, Failover,Reinstate, Fast-Start Failover, etc.)
- > Standard Edition doesn't contain Data Guard features like
 - » Automated log-transport or
 - » Managed Recovery Modus
- > There is a Trivadis package implementing the basic Data Guard functionality ☺

Data Guard Fast-Start Failover

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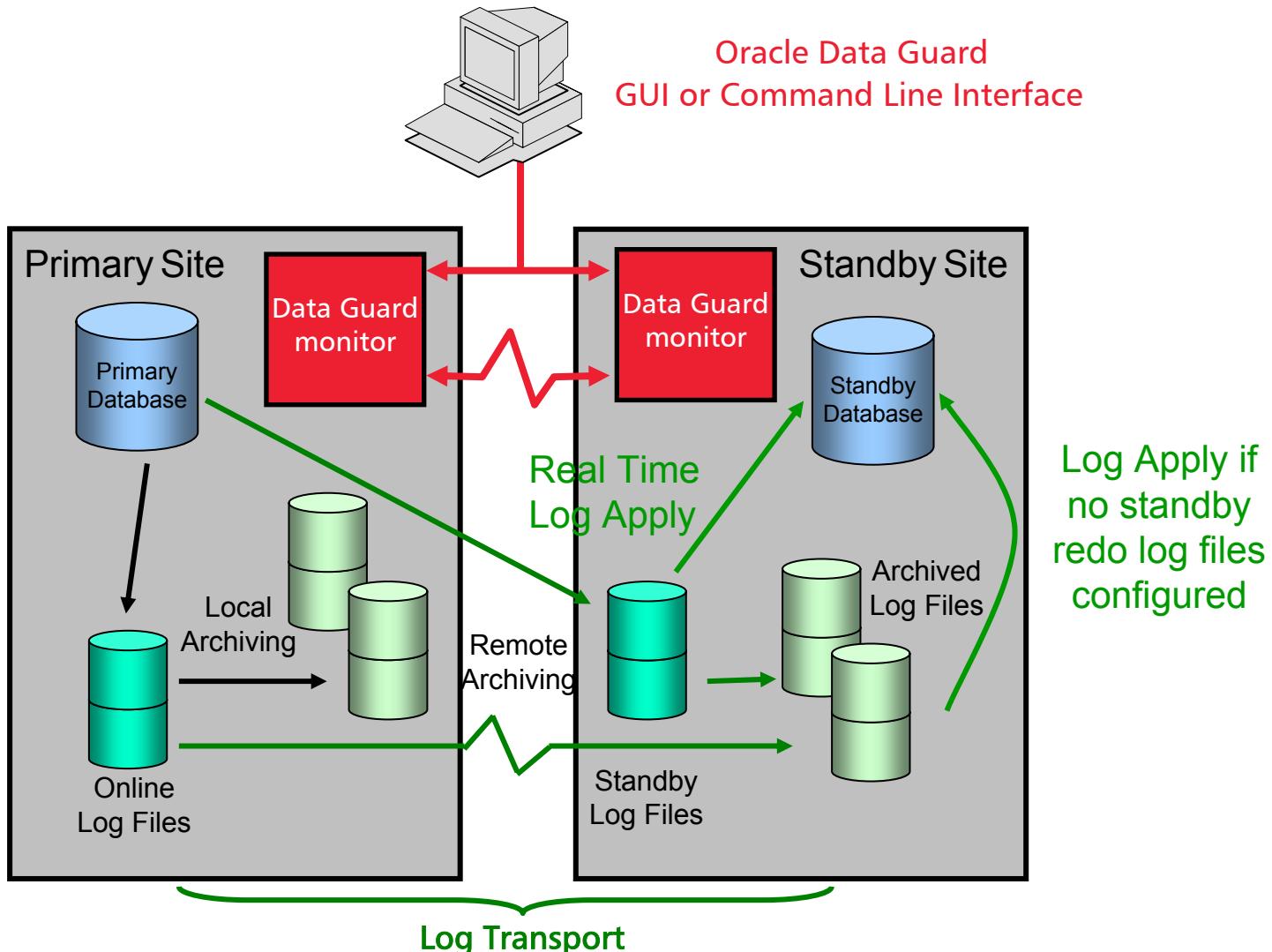


- > Introduction
- > Concept / Architecture
- > Flashback & Reinstate
- > Fast-Start Failover
- > Miscellaneous
- > Core Messages

Agenda

Know-how
We know how

Dataguard Broker Framework



Data Loss Protection Modes



- > **Maximum Performance**: less performance impact to the primary database, asynchronous redo transfer
- > **Maximum Availability**: highest possible level of data protection without compromising the availability of the primary database, synchronous redo transfer when the standby database is up
- > **Maximum Protection**: this protection mode ensures that the primary database and at least one standby database are always synchronous

```
DGMGRl> EDIT CONFIGURATION SET PROTECTION MODE AS MAXAVAILABILITY;
```

Data Guard and Maximum Availability

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- > Core Messages

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Know-how
We know how

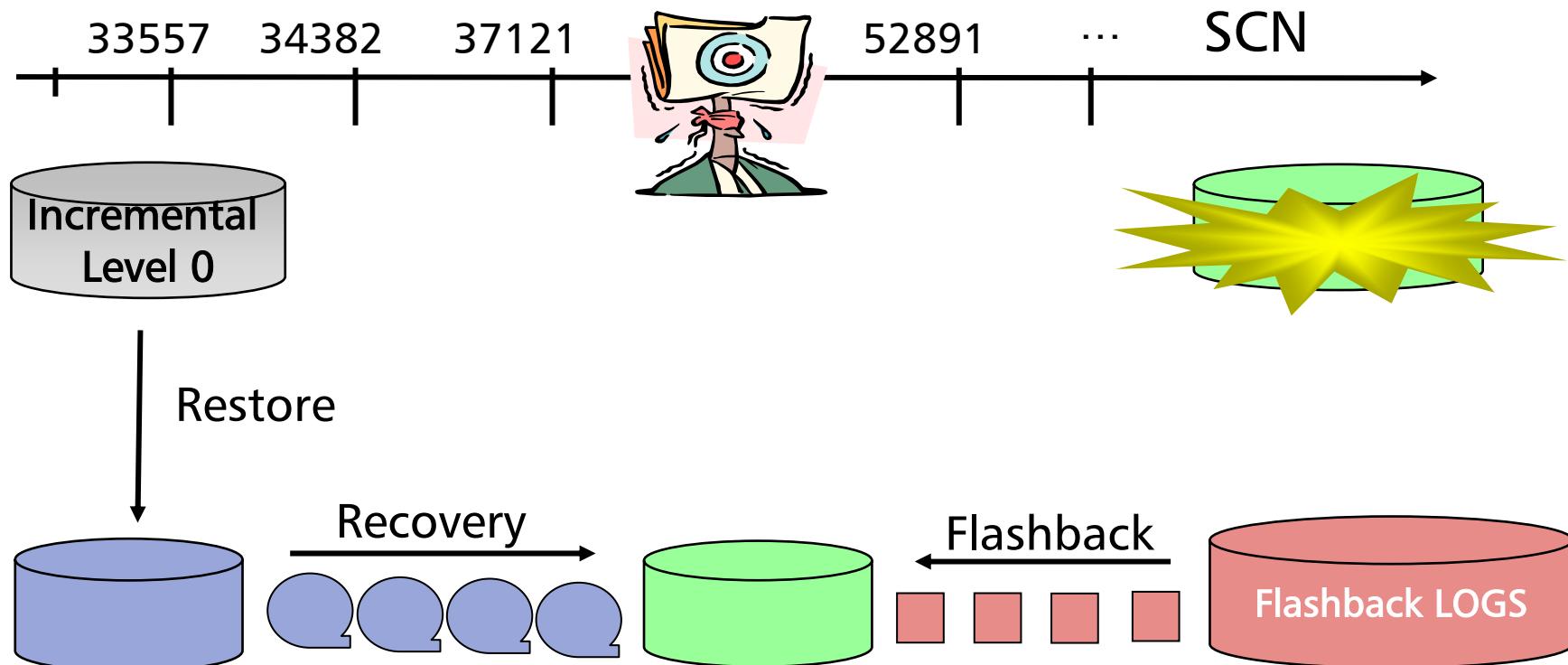
Why Flashback?



- > ASM is nice...
 - » but the real value is leveraged together with RAC
- > Flashback database is nice...
 - » but the real value is leveraged in a Data Guard Environment
 - » Almost all real cool features provided with 10g Data Guard need Flashback Database!

Concept: Flashback Database

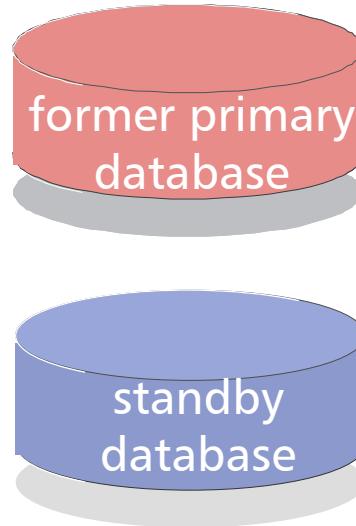
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Concept of Database Reinstate (1)



Failover



What about the former primary database?

> prior to 10g

- » backup from the new primary database
- » duplicate with backup
- » recreate standby database

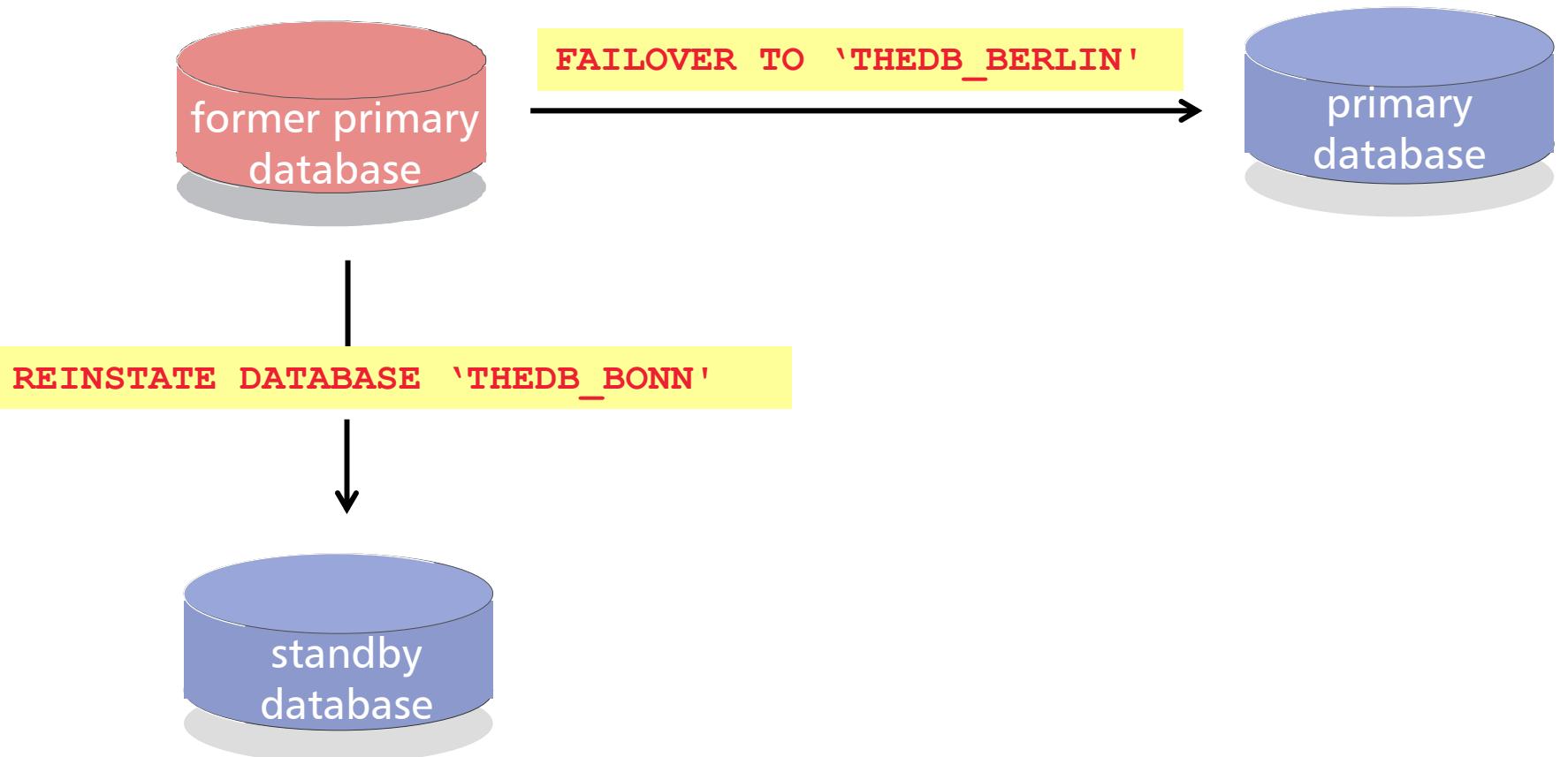
> from 10g

- » reinstate database



Concept of Database Reinstate (2)

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Data Guard and Maximum Availability

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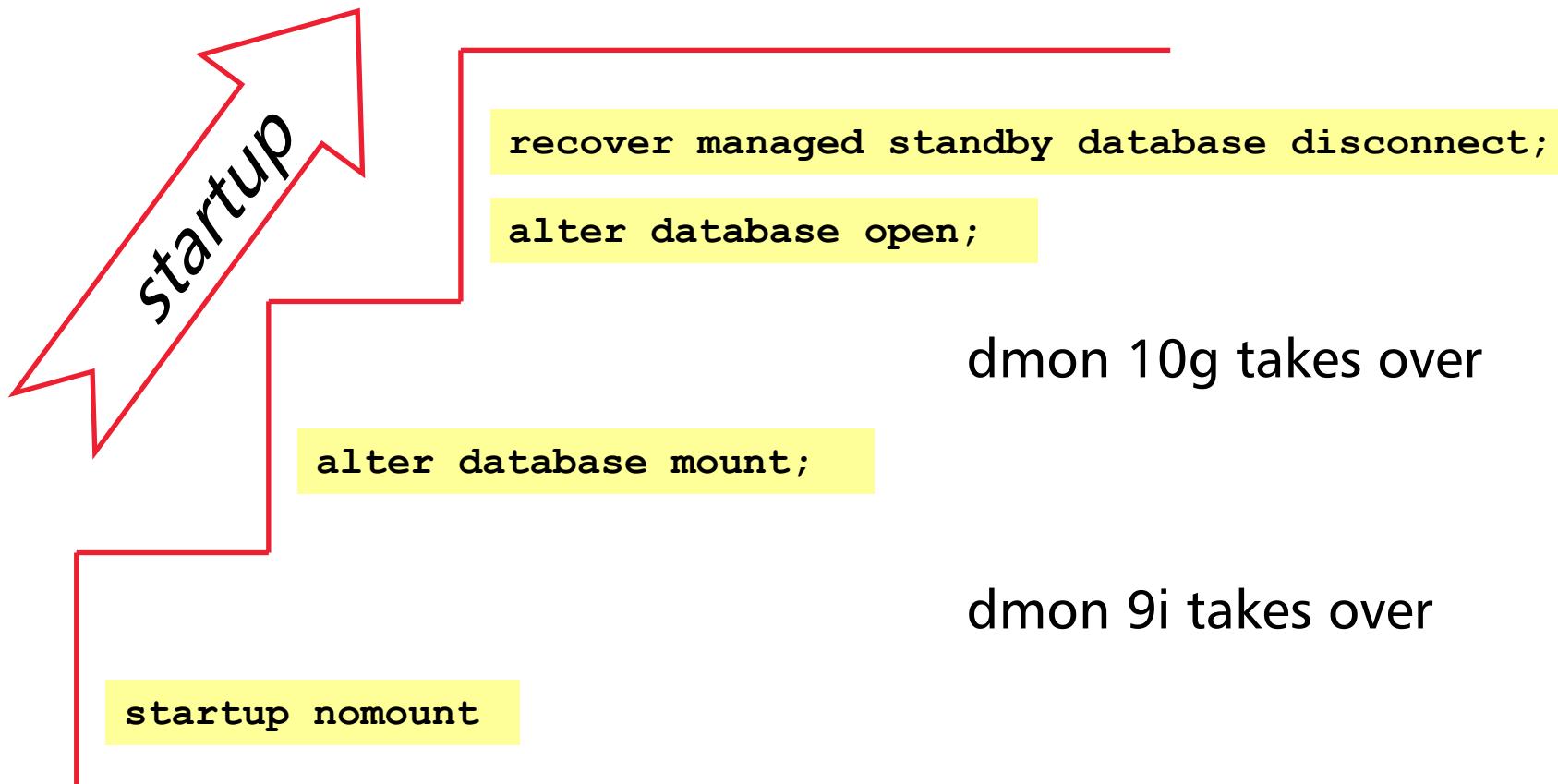
- > Introduction
- > Concept / Architecture
- > Flashback & Reinstate
- > Fast-Start Failover
- > Core Messages

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Know-how
We know how

Physical Standby: Startup Behavior 10g versus 9i

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Physical Standby – Startup Issue (1)

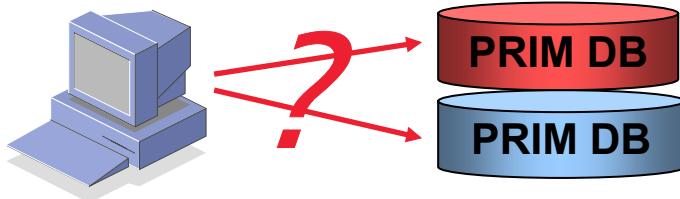
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- > What is the biggest problem in a cluster?



Split Brain!

- > What is the biggest problem in a Data Guard environment?



More than one primary!

- > How can this happen? Primary re-availability after standby activation

Physical Standby – Startup Issue (2)

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- > Automatic database startup as part of system startup
 - » 2 primary databases possible after standby has been activated
- > Manual database startup after system boot
 - » No issue after activation of standby, because manual intervention is necessary anyway
 - » Requires additional attention after every system startup
- > Is there a better solution?



Physical Standby – Activation Issue

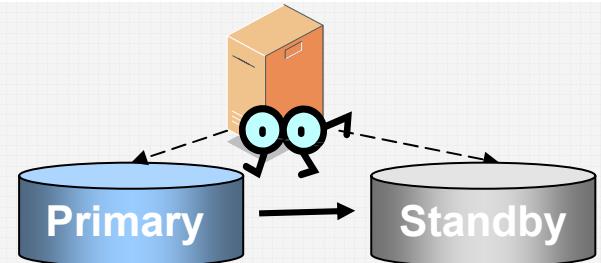


- > Main criticism of standby databases: too much manual action
- > Manual intervention is required for a failover
 - » Need some administrative checks before to validate the status of the standby database, e.g. if all redo are applied
 - » More downtime 😞
- > Manual intervention to recreate a new standby database
 - » No HA until the setup of the new standby is finished
- > How can this be addressed? **Fast-Start Failover**

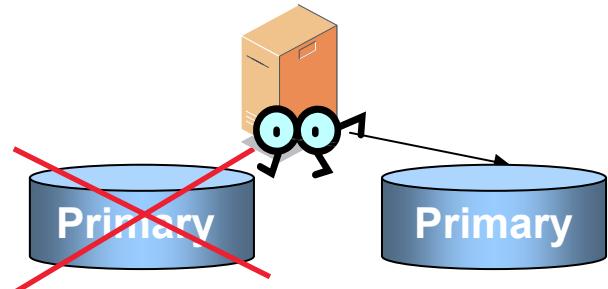
Concept

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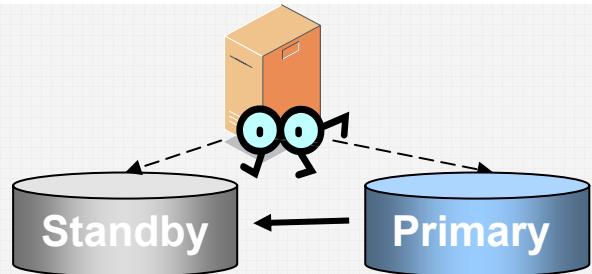
1. Observed Data Guard environment



2. Fast-Start-Failover (automatic)



3. Reinstate (automatic)



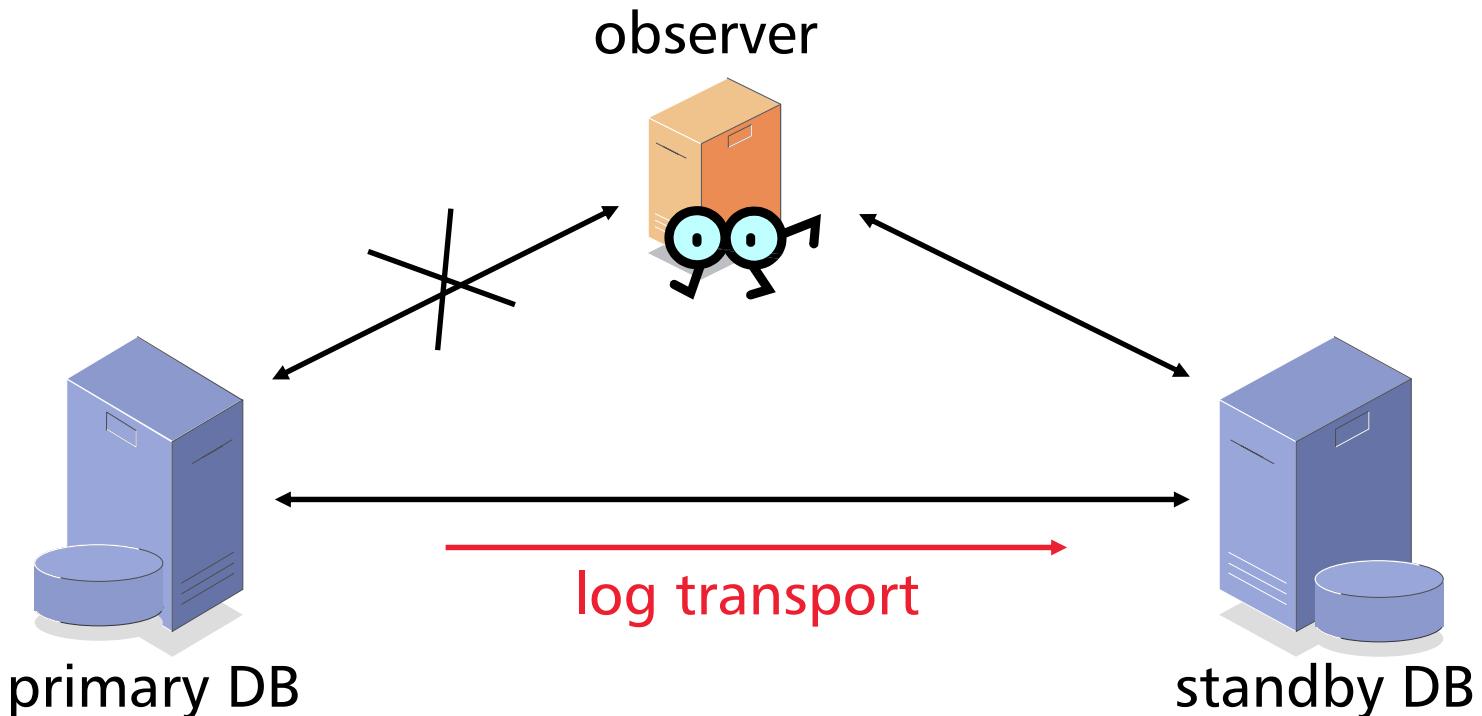
When is a Fast-Start Failover triggered?



- > Primary site failure
 - » Server crash or server shutdown (without database shutdown)
- > Primary database failure
 - » Instance failure (last running instance if RAC)
 - » Shutdown abort (but not with normal or immediate)
 - » Data file is taken offline
- > Network failure (special case)
 - » Documentation of when and when not automatic activation will happen is quite large. Read and test carefully. We will show one case.

Network Failure (1)

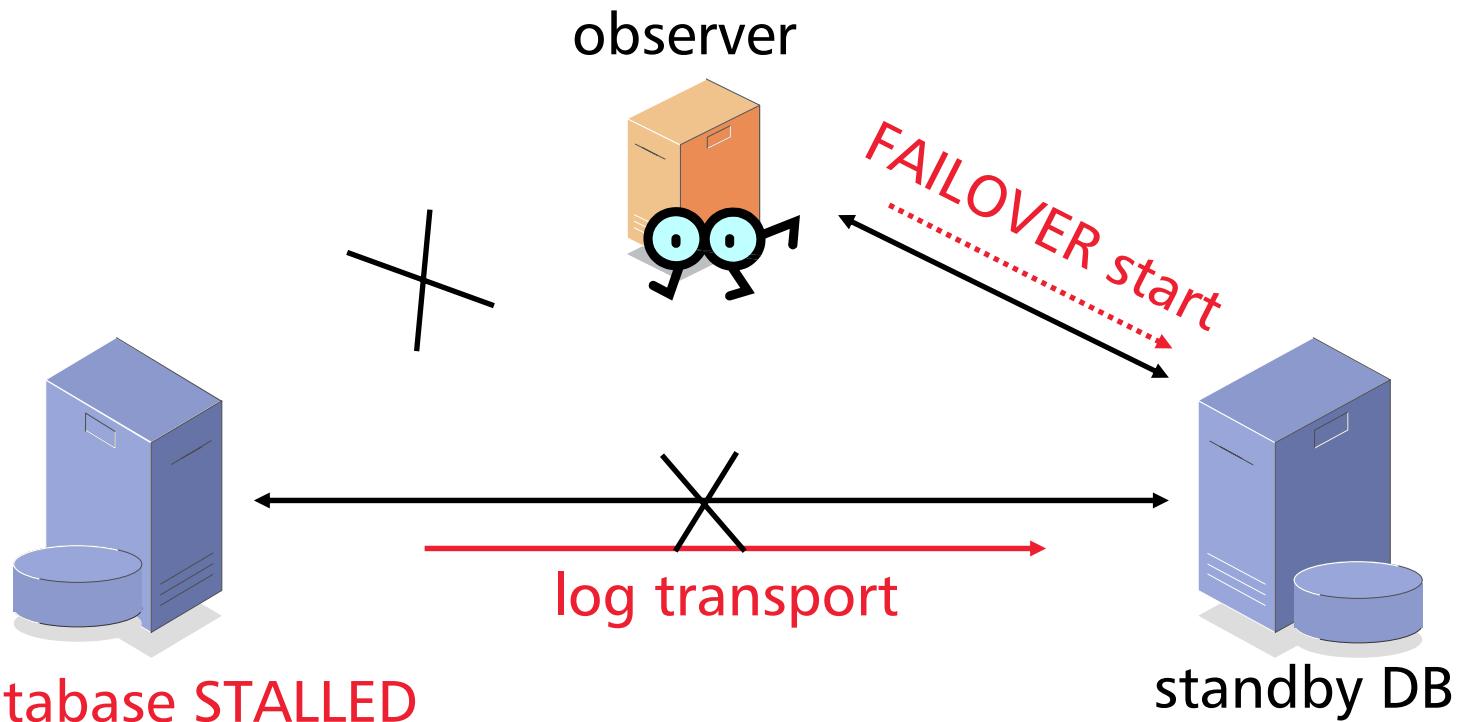
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```
Select fs_failover_status,fs_failover_observer_present  
from v$database; ---on primary site  
FS_FAILOVER_STATUS      FS_FAILOVER_OBSERVER_PRESENT  
-----  
SYNCHRONIZED           NO
```

Network Failure (2)

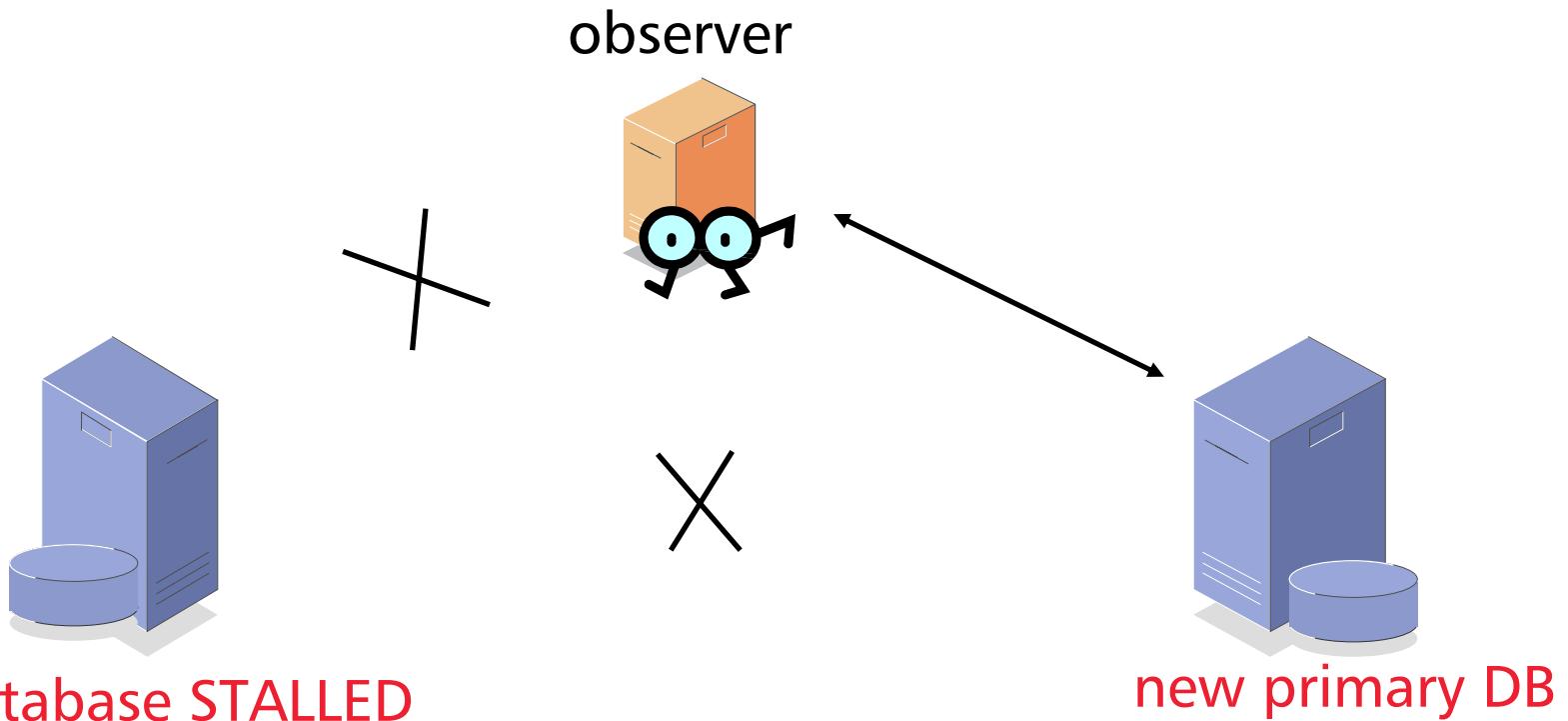
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```
Select fs_failover_status,fs_failover_observer_present  
from v$database; ---on primary site  
FS_FAILOVER_STATUS      FS_FAILOVER_OBSERVER_PRESENT  
-----  
STALLED                  NO
```

Network Failure (3)

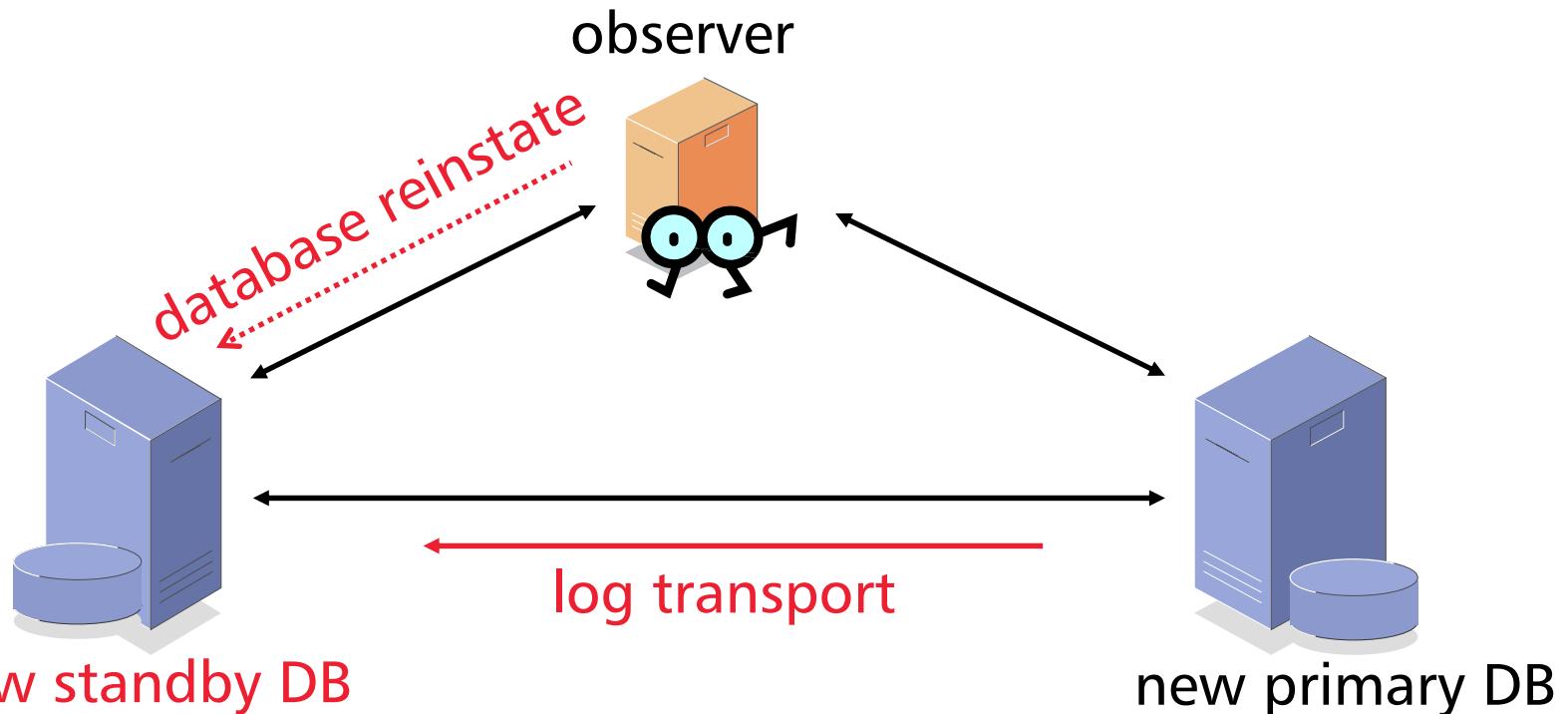
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```
Select fs_failover_status,fs_failover_observer_present  
from v$database; ---on new primary site  
  
FS_FAILOVER_STATUS      FS_FAILOVER_OBSERVER_PRESENT  
-----  
REINSTATE REQUIRED      YES
```

Network Failure (4)

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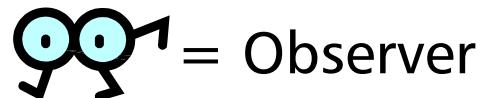


```
Select fs_failover_status,fs_failover_observer_present  
from v$database; --on primary site and standby site  
FS_FAILOVER_STATUS      FS_FAILOVER_OBSERVER_PRESENT  
-----  
SYNCHRONIZED           YES
```

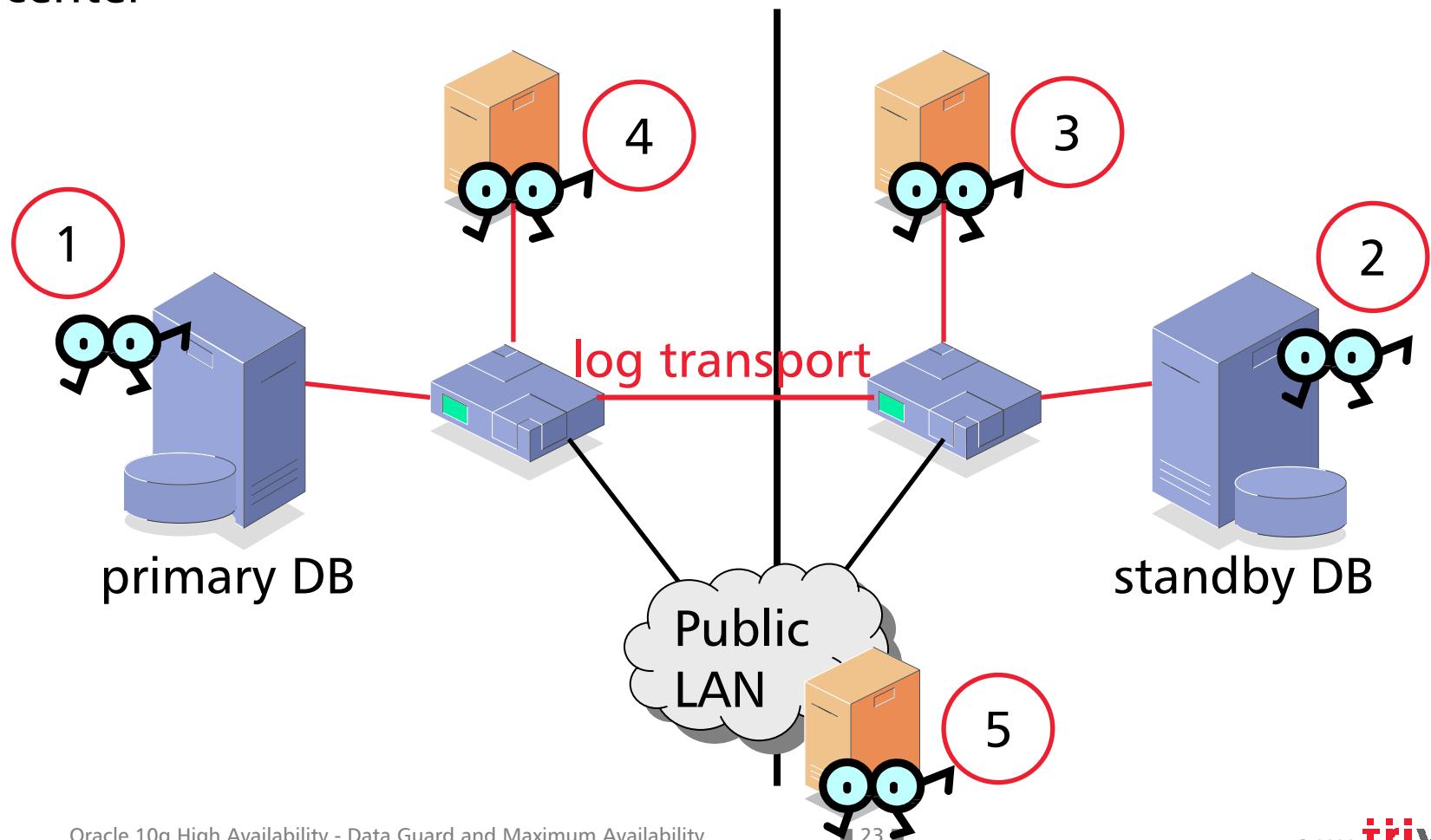
Observer location?



Main computing center



Standby computing center



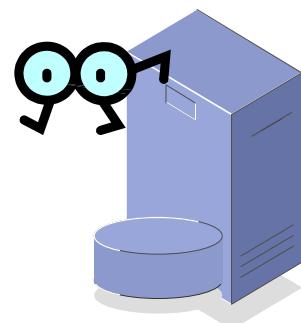


Observer location ...



- > Not really an option ☹
- > Reason
 - » no prevention from system crash!
- > Consequence
 - » additional observer machine is necessary!

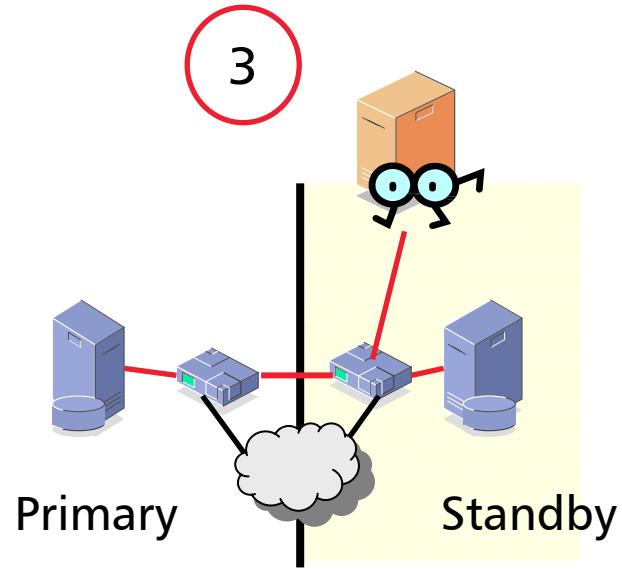
primary / standby DB

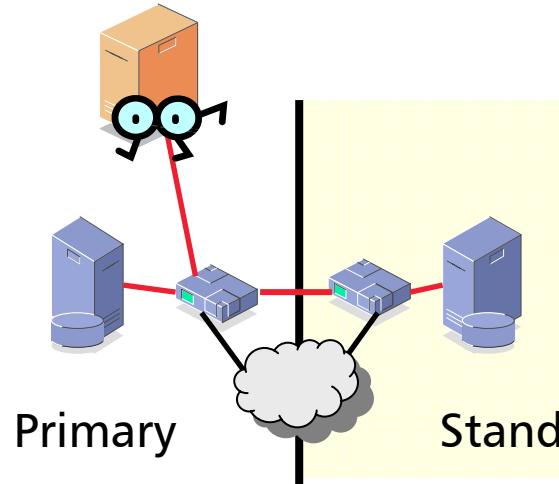


Observer location ...



- > Close (same fire prevention area) to the Standby Database
- > Advantages
 - » scenario - complete failing main computing center – will be addressed
- > Disadvantages
 - » primary database will be heavily dependent from the network
 - » therefore unnecessary failover events are possible





Observer location ...

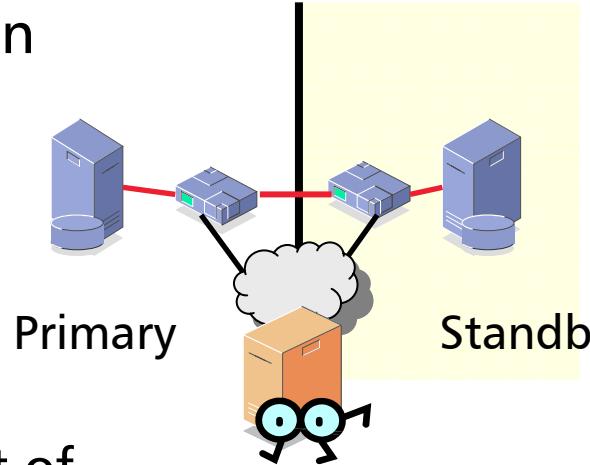


- > Close (same fire prevention area) to the primary database
- > Advantages
 - » Fast-start-failover works in most important error situations
 - Instance crash, media failure, database file offline ...
 - » primary database is not that much dependent on the network
 - » no unnecessary activations due to networking issues
- > Disadvantages
 - » loss of the whole main computing center is not addressed

Observer location ...



- > Third computing center / somewhere within the public LAN
- > Advantages
 - » basically all error scenarios addressed
- > Disadvantages
 - » Observer is separated from a network point of view
 - Therefore the observer itself is more dependent on the network
 - » most companies do not operate 3 computing centers
 - » running the observer on some PC or whatsoever in the public LAN means reduced availability



Observer location ...

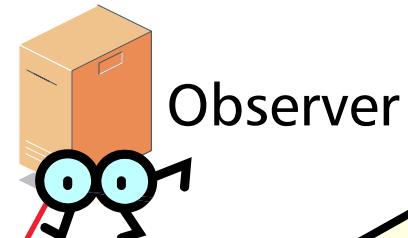
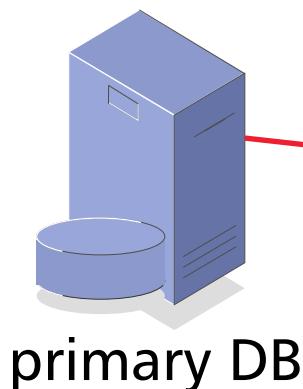


- > Consequences
 - » Fast-start-failover is not an appropriate solution to overcome the loss of a whole computing center. It is not a failover cluster!
 - » After switchover, setup 4 turns into setup 3 and vice versa
Exception: the observer is switched somehow as well
 - » In many real life situations (no 3 computation centers) option 4 will be the best choice (tradeoff)

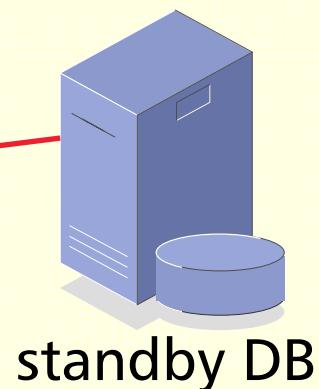
Observer location – The compromise

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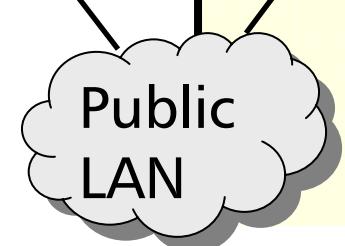
main
computing
center



log transport



standby
computing
center



Observer - Requirements



- > Observer machine and configuration
- > Special entry in Data Guard Broker configuration
- > Maximum Availability Mode (mandatory)
 - » but: special startup behaviour
 - » but: primary stalls in certain situations
- > Flashback database must be activated

Observer - Data Guard additional Configuration



- > Not much to configure, but much to describe (see manual)

```
edit database 'THEDB_BONN'  
  set property FastStartFailoverTarget = 'THEDB_BERLIN';  
edit database 'THEDB_BERLIN'  
  set property FastStartFailoverTarget = 'THEDB_BONN';  
edit configuration  
  set property FastStartFailoverThreshold = 15;  
enable fast_start failover;
```

- > Fast-Start Failover is a feature of Oracle Data Guard, and can't run without a Data Guard Broker configuration!

Observer – Configuration



- » Start of Observer

```
connect sys@THEDB_BONN  
start observer
```

- » Better write a shell script with background execution, "start observer" does not terminate,
 - use the logfile option

```
dgmgrl -logfile /u00/app/oracle/local/dba/log/observer.log  
sys@THEDB_BONN "start observer"
```

- » Change name of the observer binary file, this file is created in the working directory where you start the observer fsfo.dat. With the parameter 'FILE' you can change the file name descriptor, but not the location ☹

```
Start observer file=fsfo_<DG_configuration_name>.dat
```

Demo: Fast Start Failover



1. Configure Fast_Start Failover
2. Start Observer with connect to primary
3. Shutdown abort on the primary database THEDB_BONN
4. Wait until Fast_Start occurs on THEDB_BERLIN
5. Restart the old primary THEDB_BONN
6. Verify that observer reinstates database THEDB_BONN



Conclusion (1)

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- + Prevention of "Split Brain" due to accidental startup of former primary database
- + Reduced downtime through automatic activation of the standby database
- + It is a small step for the DBA, but a giant leap from an availability point of view
 - + It is easy to configure
 - + The necessary checks are automatically done before a failover is started



Conclusion (2)



- + A failover solution without a shared disk system
 - + with additional advantages (enhanced data availability)
 - + and even reduced failover time compared to HA cluster
- Many technical prerequisites (Flashback database, special Maximum Availability Mode)
- No automatic failover to a second standby database possible

Data Guard and Maximum Availability



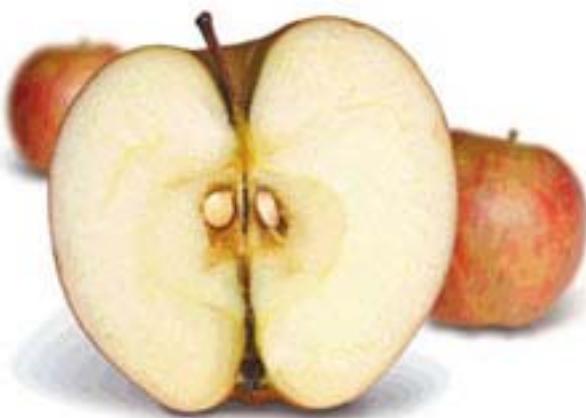
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Know-how
We know how

Data Guard and Maximum Availability - Core messages...

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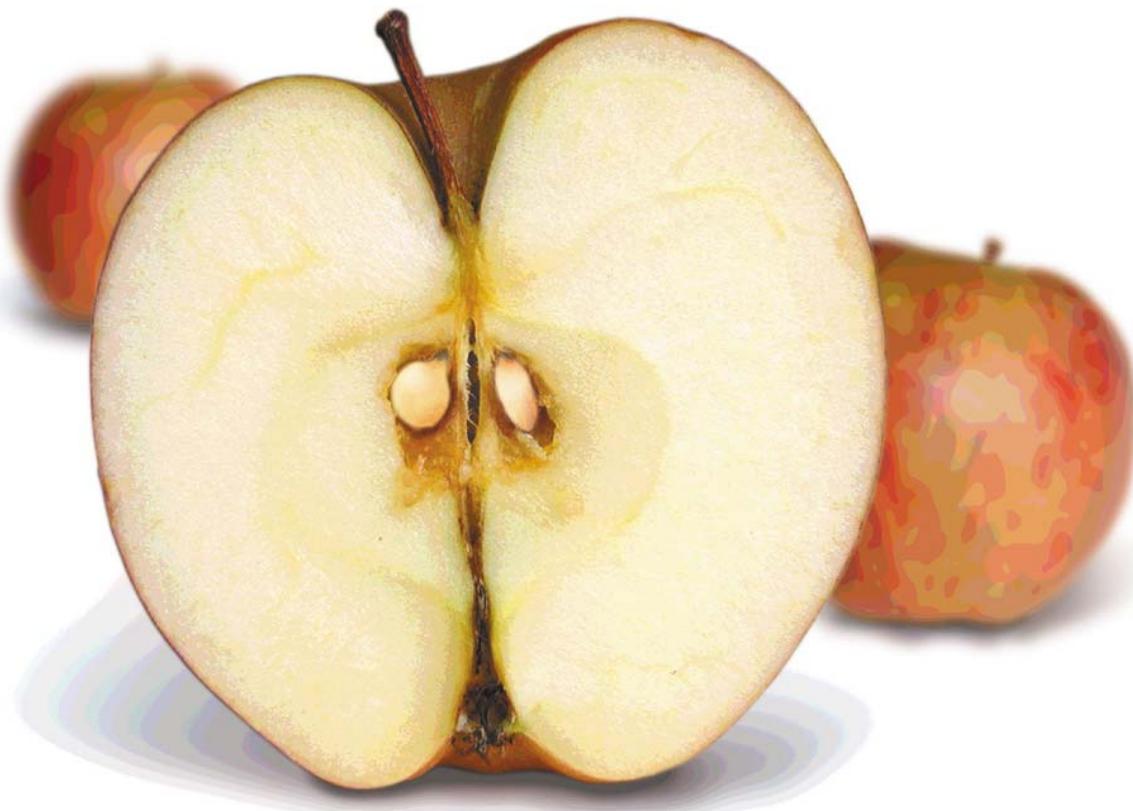
- > Data Guard 10g
 - » Flashback makes the difference
- > Fast-Start Failover
 - » Protection from 2 primary databases due to inadvertend restart of failed primary database
 - » Rather easy implementation / configuration
 - » Reinstate database – even automatically
 - » Very short failover times

> by Trivadis

At the core it's
about data.



Data Guard – Fast-Start Failover



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