

# From Data Guard to Sharding - HA at Oracle DB

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## Keywords

Data Guard, High Availability, Sharding, Engineered Systems, CAP

## Introduction

Data Guard is a central part of Oracle database. Data guard was published several years ago and is implemented in many projects all around the world. Since version 12c data guard got many new features. Due to parts like "Zero Data Loss" new functions are developed, performance has increased and there are many new features around logging and nologging content. The functions of active data guard were enhanced.

In the presentation you will see examples out of customer projects. The projects are focused on premise hardware and on Engineered Systems like ODA or Exadata. You can see example configurations and their pros and cons.

At the end you can see new feature out of Oracle 12.2, Sharding. When it is necessary to use sharding, why do we need data guard and what are the advantages for data guard an sharding.

## High Availability and Oracle DB

The Availability of a system is the ratio of the total uptime of a system is capable to the total time of up- and downtime of the system. The ratio for example is 99,5%. This availability is influenced by many factors like hardware, human or software errors. One main impact, if a given availability is reached, depends on planed downtimes. If planed downtimes are counted to overall downtimes it can be difficult to reach high availability rates. This calculation is different form project to project.

$$\text{Availability} = \frac{\text{Uptime}}{\text{Uptime} + \text{Downtime}}$$

Abb. 1: Availability

To increase availability systems are spread over more than one system or even over more than one data centre. The distance between data centre can vary from around 100 meters to distances like thousand. Oracle offers for this architectures different solutions. Inside one data enter Oracle RAC (Real Application Cluster) is used. If distances are increasing data guard is the right choice.

## Data guard Scenarios

If it is planned to use data guard many different scenarios can be served. Data guard is optimized to mirror data between to different database installations. The synchronise process can be synchro or asynchro. These are the 3 basic scenarios

- Physical
- Logical
- Snapshot Standby

With the physical solution all data is mirrored 1:1 to a second database. If logical data guard is chosen, it is possible to add some data in the second, standby location. A snapshot standby database is best used in scenarios that require a temporary, updatable snapshot of a physical standby database. Changes are replicated all the time, but are only applied to data files if it is needed.

With data guard you can implement different protection modes. Mostly this is discussed on physical data guards. The modes are Maximum Performance, Maximum Security and Maximum Availability.

### Data guard und 12c

With Oracle 12c several enhancements take place:

You can configure synchron/nowait even with data guard broker. With this feature in maximum availability mode transactions are finished if changes are replicated to memory on standby. The system did not need to wait until everything is wrote to (Fast Sync). Multitenent is supported and online move of data files between disk groups are possible.

In the area of active Data Guard new features like Far Sync, Database Rolling Upgrades (replaces 40+ manual step), Application Continuity, e.g. out of weblogic, is full supported.

The broker now supports features like Oracle Multitenant, Cascaded Standby Database, Active Data Guard Far Sync, Database Rolling Upgrade using Active Data Guard, and Global Data Services can be administrated. Even interesting for nologging content is recover from service.



Abb. 2: Example Far Sync

### Consistency, Availability, Partition Tolerance – CAP

If a new availability architecture is planned, the first step is to check the theoretical base. To check out the limitations of availability infrastructure take a look on CAP theorem.

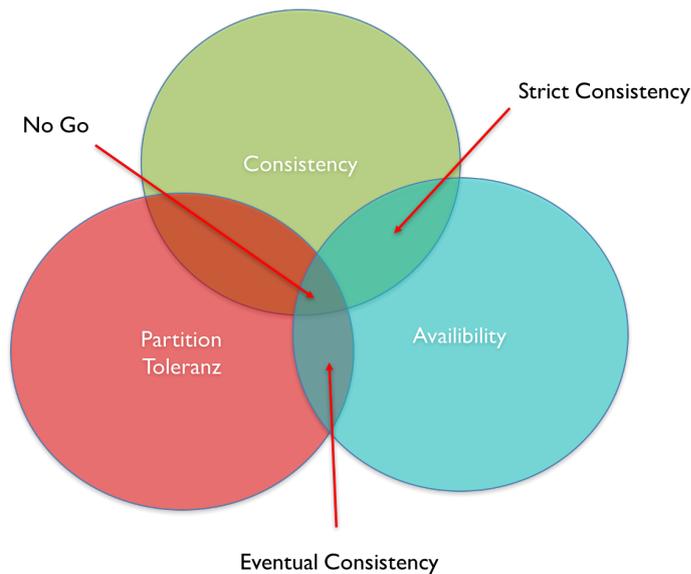


Abb. 3: CAP Theorem

In the presentation examples on the base of CAP are described. One perfect solution with maximum availability, even over data centre borders, and 100% consistency is not possible.

### Solutions out of projects

In the presentation implementation out of customer projects are described. It will be divided between Online Transactions Systems (OLTP) and Decision Support Systems, (DSS – Data ware house). With OLTP systems milestones are Zero Data Loss or maximum Availability. In the opposite to this DSS systems are implemented for optimize backup or disaster recovery processes.

You will see experiences and configurations out of projects and some hints to finish projects successful.

### Internet Apps – Data Guard and beyond

What is the solution if requirements for Availability and partition Tolerance are high? If downtimes of the whole systems are not possible? Are problems like this solved at amazon or Facebook?

One solution for this scenarios is to use shards. All shards are independent and even if one shard fails several other use can work without a disruption.

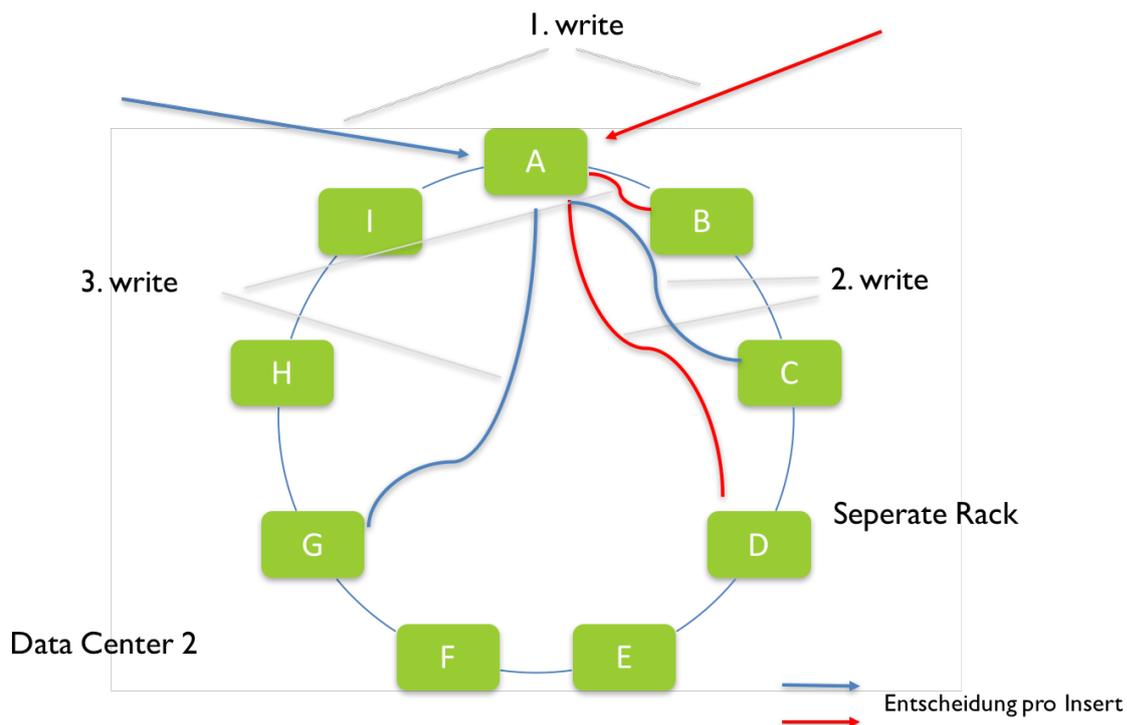


Abb.4: write data with cassandra DB

Data is written to the primary shard and replicated to one or more separate systems. On statement level you can decide, if the transaction is finished on the first write, on the quorum of writes, or if all replicas are written. If one node fails, the replica becomes the primary one, after a short time

### Sharding und Oracle

Oracle started to implement a solution like sharding in several other NoSQL data bases, too. In 12.2 it should be possible to build shards in combination with data guard. By the use of Global Data Services, a query on this data is the same as on standard tables or views. It is only a small change for developers, for Availability on global systems it is a step forward.

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