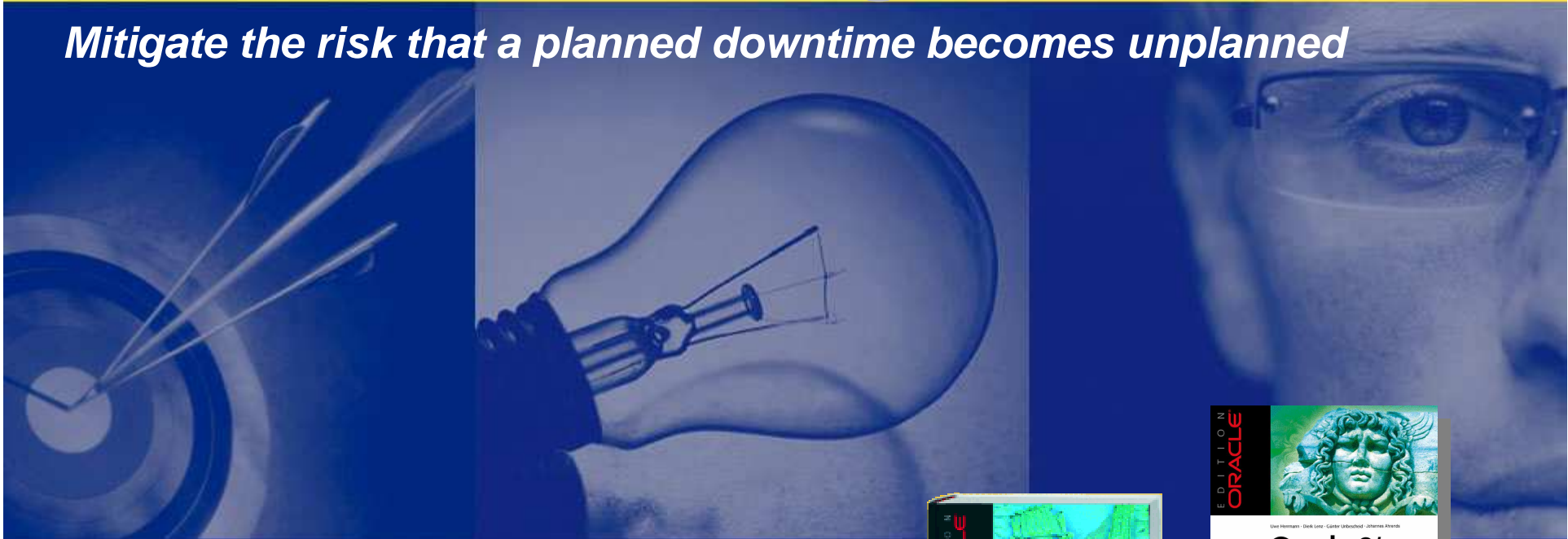


# Minimal downtime migration



*Mitigate the risk that a planned downtime becomes unplanned*



**Johannes Ahrends**  
**Technical Director ADM Presales**  
**Quest Software GmbH**

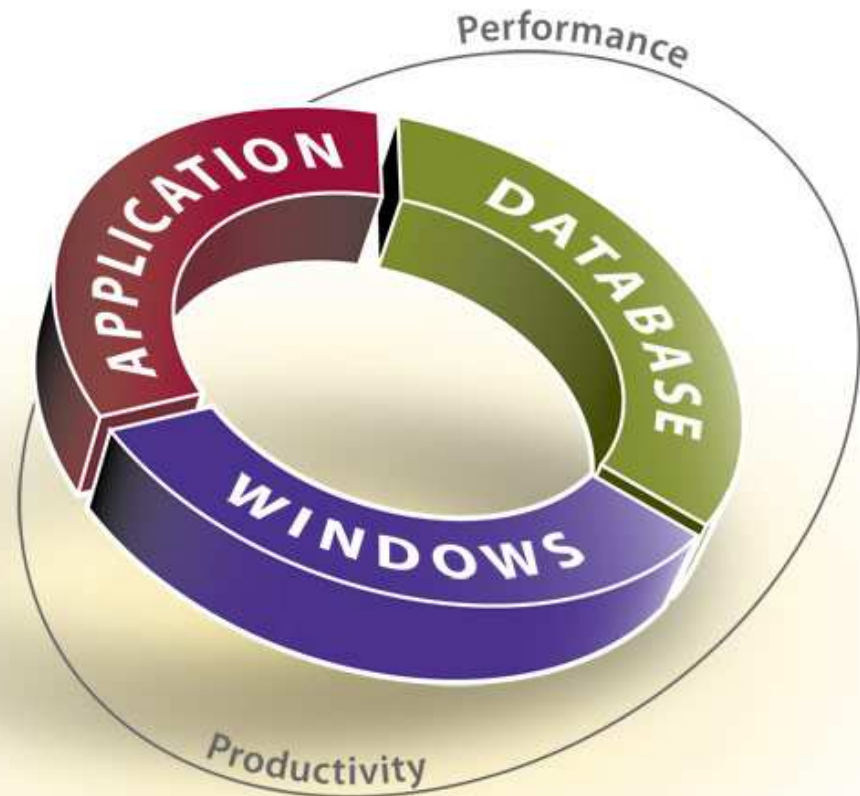


# Agenda

- **Quest Software**
- **What does High Availability mean?**
- **High Availability Solutions**
  - Real Application Clusters
  - Physical Standby
  - Logical Standby
  - SharePlex
- **Planned downtime**
- **Optimal preparation**
- **Example**

# Quest Solutions for Enterprise IT

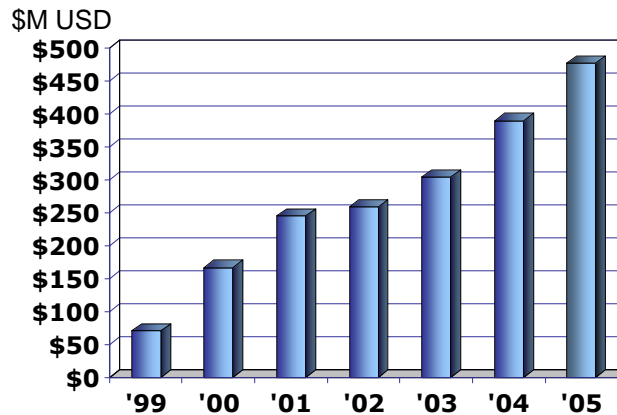
Quest Software develops innovative products that help customers get more performance and productivity from their applications, databases, and Windows infrastructure.



# Strength and Leadership

## Consistent annual growth

- \$476 M in '05 Revenues
- Nasdaq: QSFT
- 2,800+ employees
- Customers
  - 18,000+ worldwide
  - 75% of the Fortune 500



## Analysts rank us #1

### Gartner

Application Management Software  
Gartner Dataquest, 2005

### IDC

Distributed Database Management Facilities Software  
IDC, 2005

### FORRESTER

Windows Server Management  
Forrester Research, 2004

## Strong industry partnerships





# What does High Availability mean?

**High availability** is a system design protocol and associated implementation that ensures a certain absolute degree of operational continuity during a given measurement period.

Availability refers to the ability of the user community to access the system, whether to submit new work, update or alter existing work, or collect the results of previous work. If a user cannot access the system, it is said to be unavailable. Generally, the term downtime is used to refer to periods when a system is unavailable.

(Source: Wikipedia)

# Availability Environment Classification

AEC	Name	Availability (%)	Downtime per Year
0	Conventional	90,0	36,5 days
1	High Reliable	99,9	8,8 hours
<b>2</b>	<b>High Available</b>	<b>99,99</b>	<b>52,6 minutes</b>
3	Fault Resilient	99,999	5,3 Minuten
4	Fault Tolerant	99,9999	32 Seconds
5	Disaster Resistant	99,99999	3 Seconds

(Source: Wikipedia)



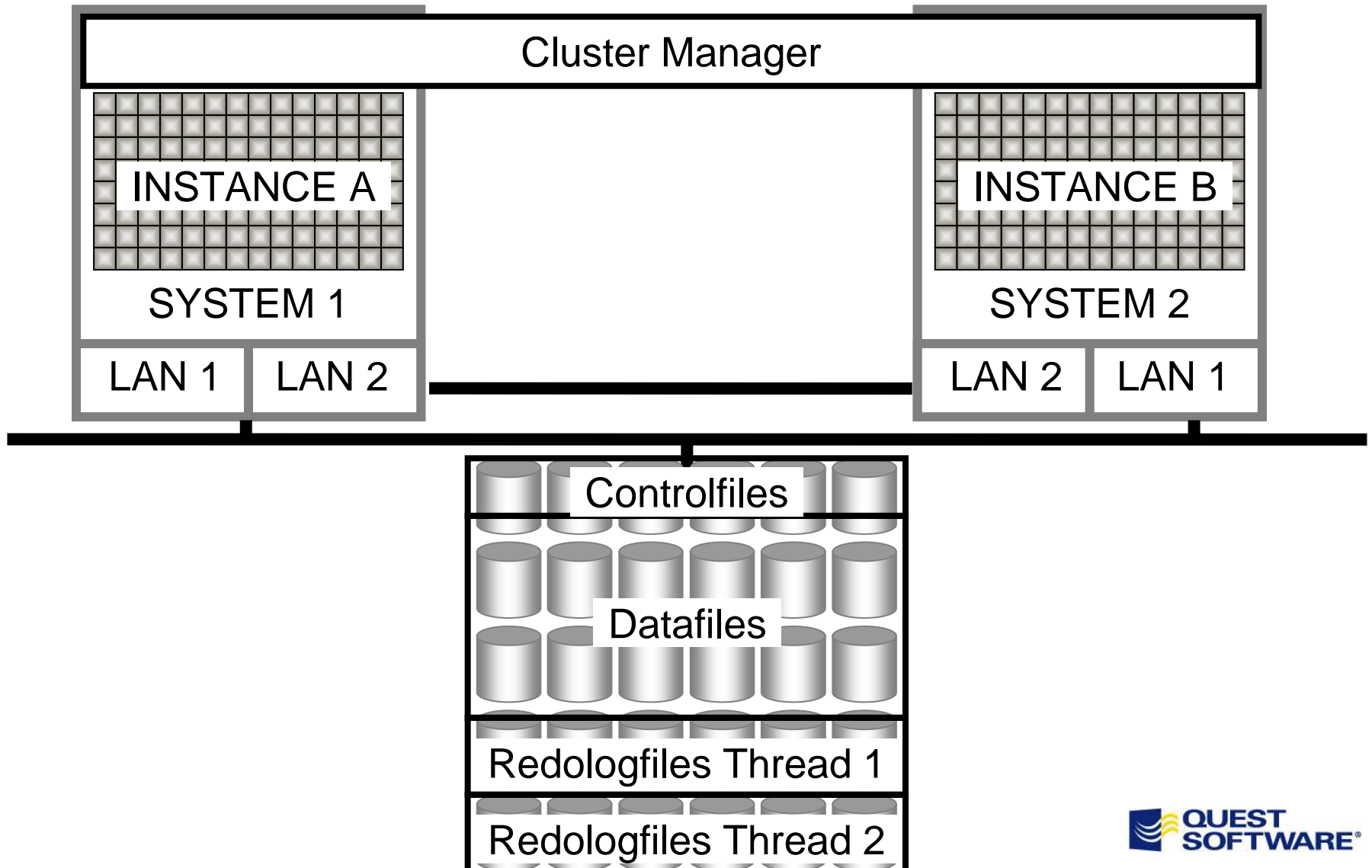
# High Availability solutions

- **Real Application Clusters**
- **Data Guard physical Standby**
- **Data Guard logical Standby**
- **Streams**
- **SharePlex**

# Real Application Clusters

- **Oracle's High Availability Solution**
- **Strength**
  - Multiple Servers serve one central database
  - Transparent to the application
  - Available on all platforms
- **Weakness**
  - Database Single Point of Failure
  - Expensive
  - Complex installation and administration (special tools)
  - No rolling upgrades (Oracle promises)

# Real Application Clusters



# Data Guard – Physical Standby

- **Desaster Recovery**
  - Failover Database in Recovery Mode
- **Strength**
  - Minimum Overhead
  - Easy Installation
  - No Additional Costs
- **Weakness**
  - Similar Hard- and Software
  - Standby Database not usable
    - Can be opened Read-Only but during that time no recovery
  - No Rolling Upgrades
  - Oracle 11g
    - Open physical standby for Reading&Writing  
=> converting into logical standby

# Data Guard – Physical Standby

- **Three different Modes**

- Maximum Performance

- Production database is focus

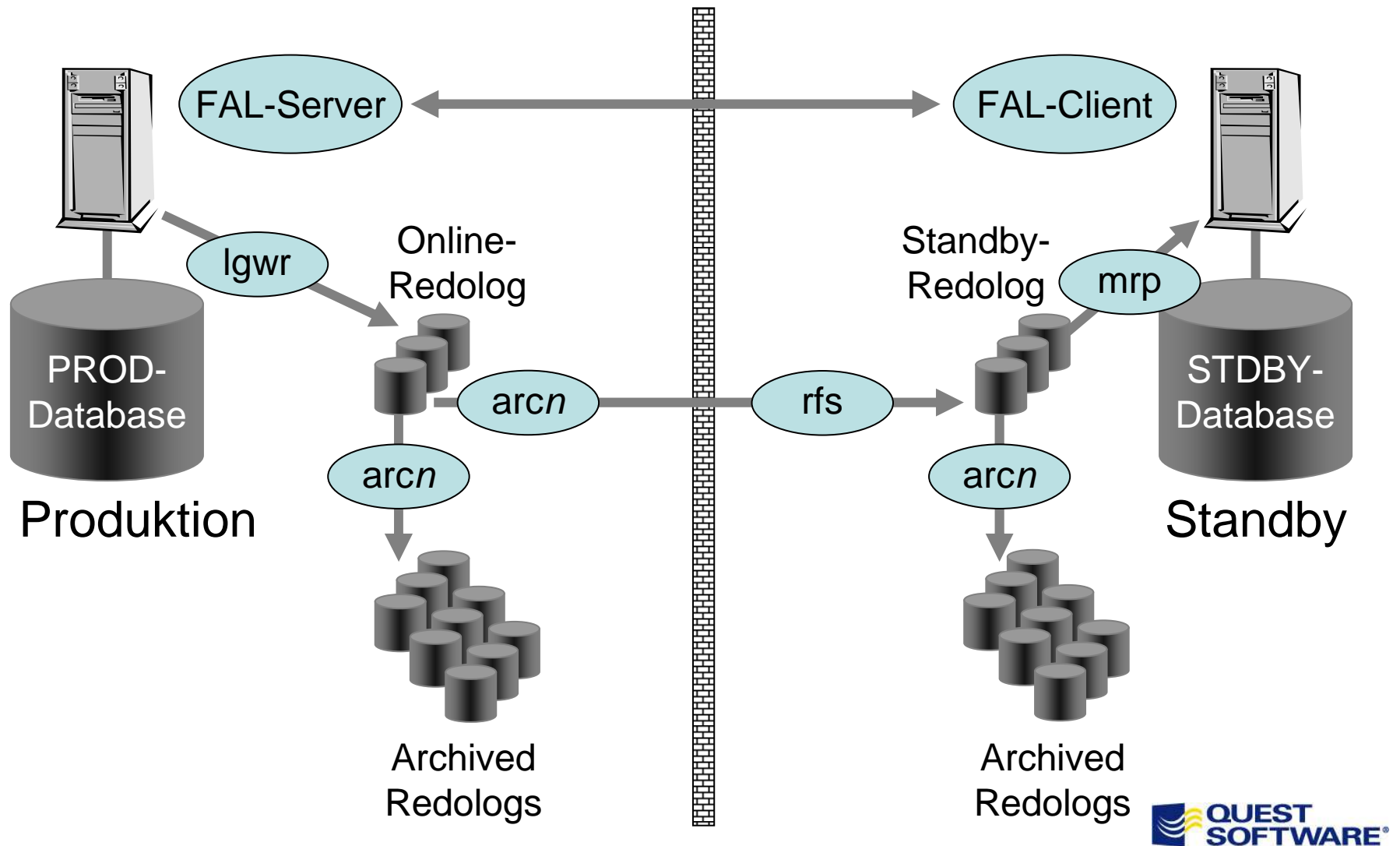
- Maximum Availability

- Chance that no data is lost

- Maximum Protection

- No transaction takes place unless it is stored in minimum two databases

# Data Guard – Physical Standby



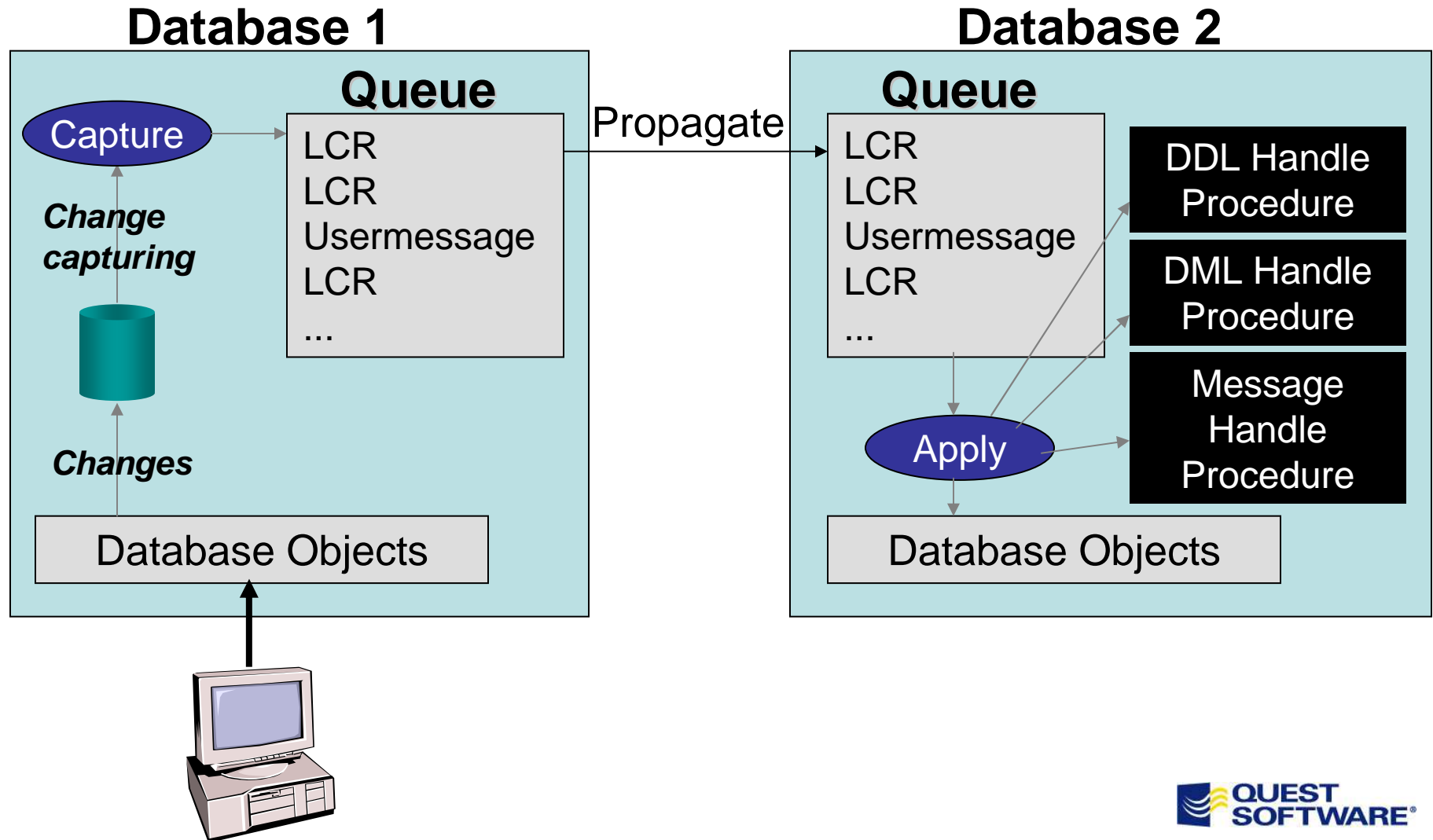
# Data Guard – Logical Standby

- **Both Database can be used**
  - Based on Oracle LogMiner
- **Strength**
  - No additional Costs
  - Rolling updates possible (min 10.0.1.3)
- **Weakness**
  - Not all datatypes supported
  - Same source for both databases
  - Similar Hard- and Software

# Oracle Streams

- **Oracle Replication Solution based on Redolog-Information**
  - Capture
  - Stage
  - Consume
- **Staging is done in the database**

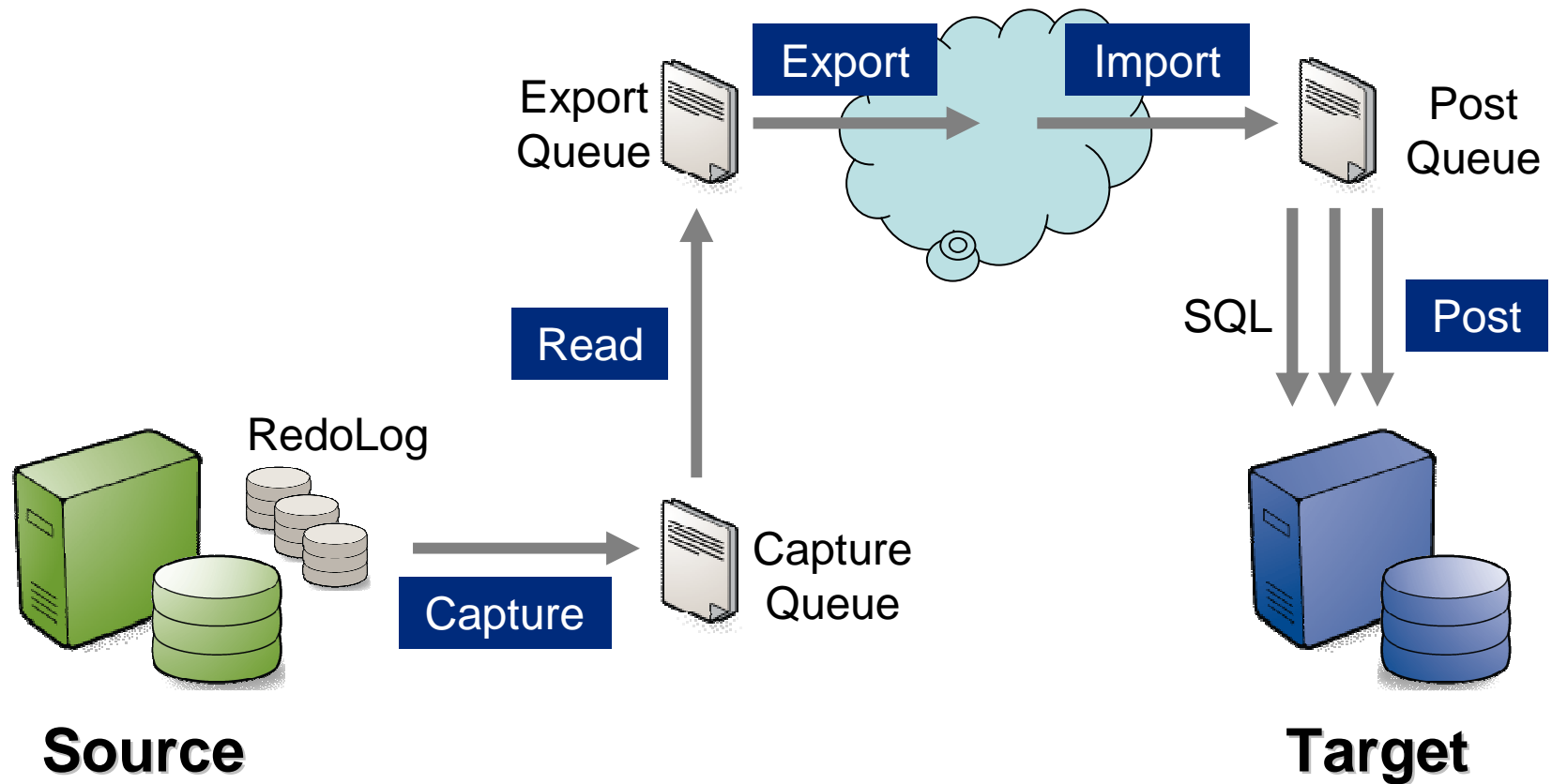
# Oracle Streams



# Quest SharePlex

- **Replication based on redolog content**
- **Source and Target database are independent**
  - Different operating systems
    - Solaris, HP/UX, AIX, Tru64, Linux, Windows)
  - Different Oracle releases (8i to 10gR2)
  - Different platforms
    - RISC, AMD, 64-bit,...
  - Different physical layouts
  - Different character sets
- **Horizontal and vertical partitioning**
- **Bidirectional replication with conflict resolution**

# Quest SharePlex Architecture



# What about Maintenance?

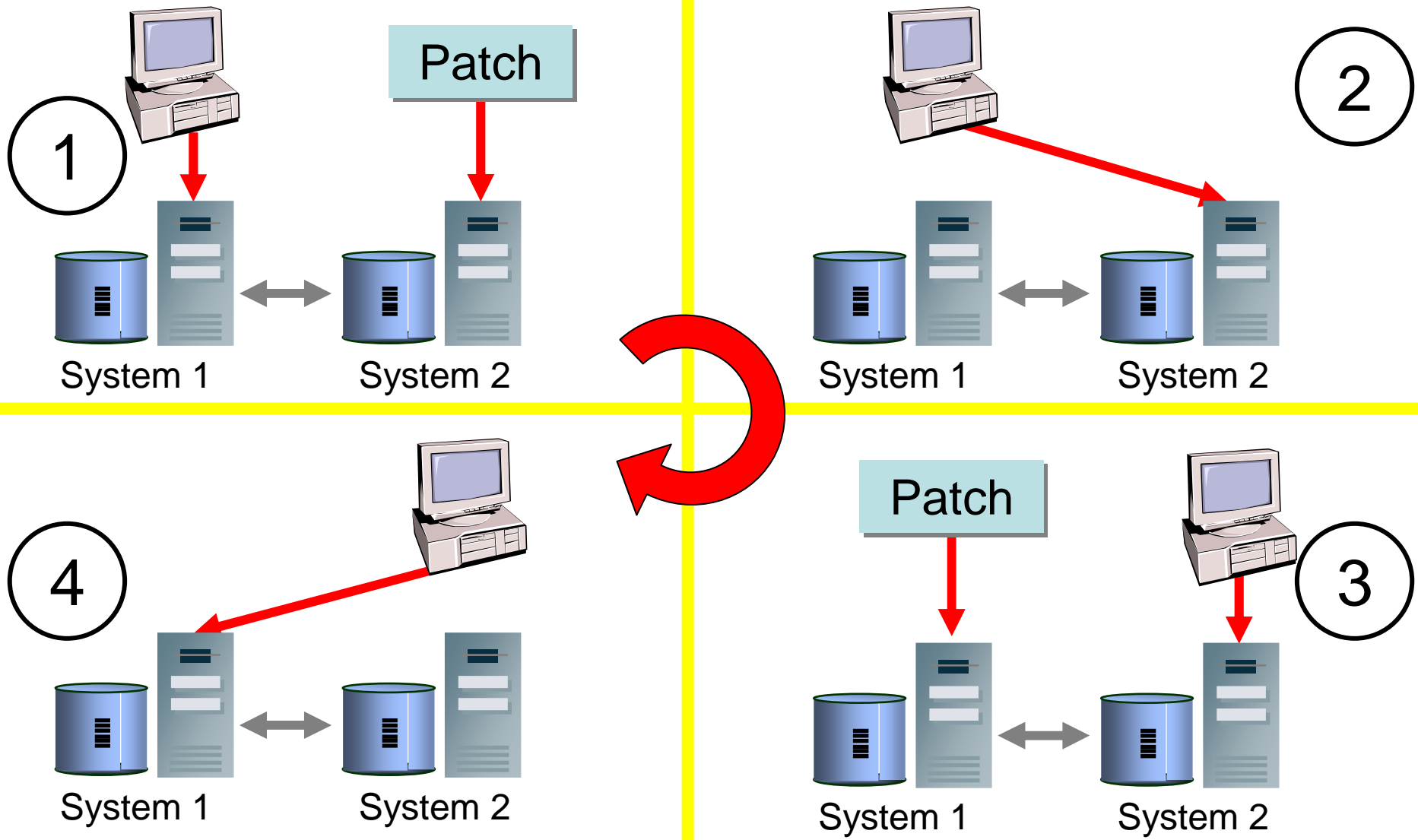
A distinction needs to be made between **planned** downtime and **unplanned** downtime. Typically, planned downtime is a result of maintenance that is disruptive to system operation and usually cannot be avoided with a currently installed system design. Planned downtime events might include patches to system software that require a reboot or system configuration changes that only take effect upon a reboot. In general, planned downtime is usually the result of some logical, management-initiated event. Unplanned downtime events typically arise from some physical event, such as a hardware failure or environmental anomaly.

(Source: Wikipedia)

# What kind of planned downtimes exists?

- **Hardware change / upgrade**
  - With or without reboot
- **OS Changes / patches**
  - With or without reboot
- **Oracle releases / patches**
  - Software only patches
  - Software and database changes
  - Changes which requires OS and / or application changes
- **Application releases / patches**
  - Client only / Application Server only
  - Changes to databases objects and applications
  - Content of database objects

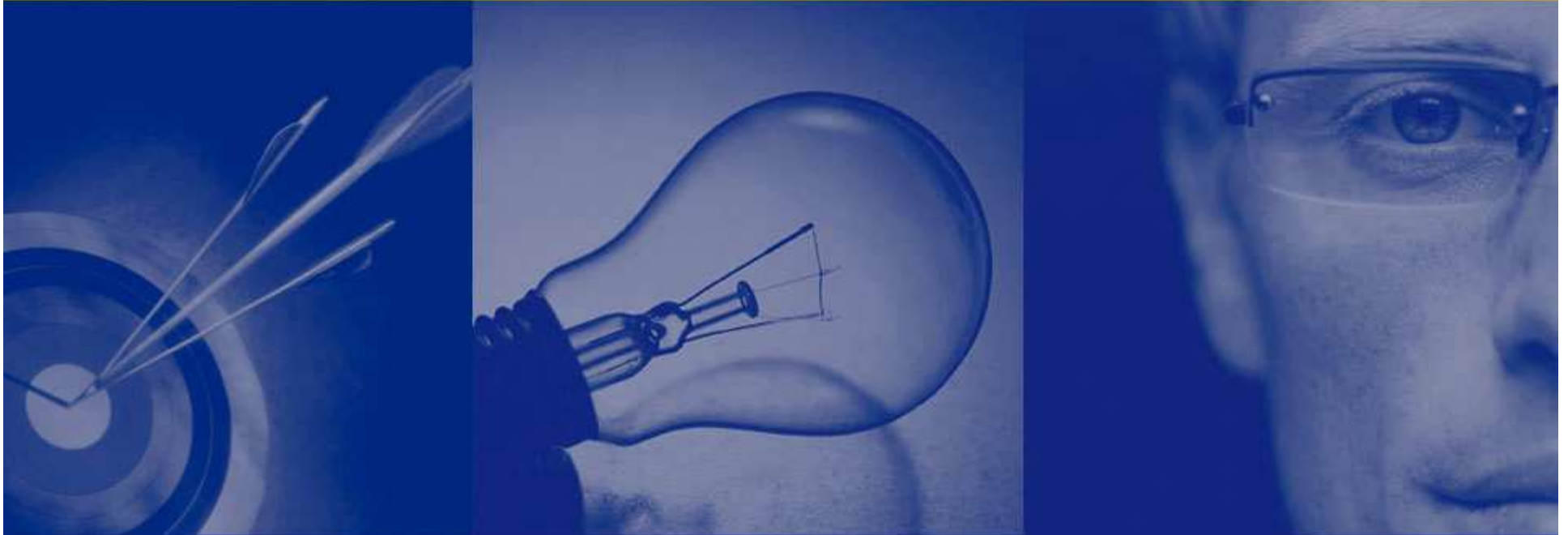
# Rolling Upgrade



# Requirements for Rolling Upgrade

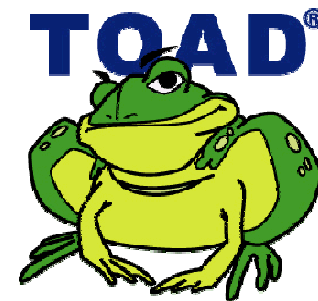
- **OS**
  - Clustertechnology
  - Replication (e.g. VizionCore for VMWares)
- **Oracle**
  - RAC (only oneoff Patches)
  - Data Guard Logical Standby (since 10.1.0.3)
  - Replication
- **Application**
  - Normally not possible without downtime
  - Critical in case of changes to the database structures

# Optimal Preparation



# Testing

- **Tests for Oracle releases and patches**
  - Setup of identical database on similar hardware
  - No Export / Import but DB-Copy (rman)
  - PL/SQL can be critical for upgrade time (utlprp)
- **Test for Application releases and patches**
  - Compare current development database with QA and production
    - E.g.: Toad Compare Functions
- **Real application testing (RAT)**
  - Test your application with real data
  - E.g. Benchmark Factory



# Not enough time for preparation ☹️

- **Application upgrade over one weekend**
- **Planned Downtime approx. 24 hours**
- **Backup of database okay**
- **Several scripts with DDL-changes**
- **Changes to tablecontent as scripts**
- **Serveral tests in a QA environment (1:1)**

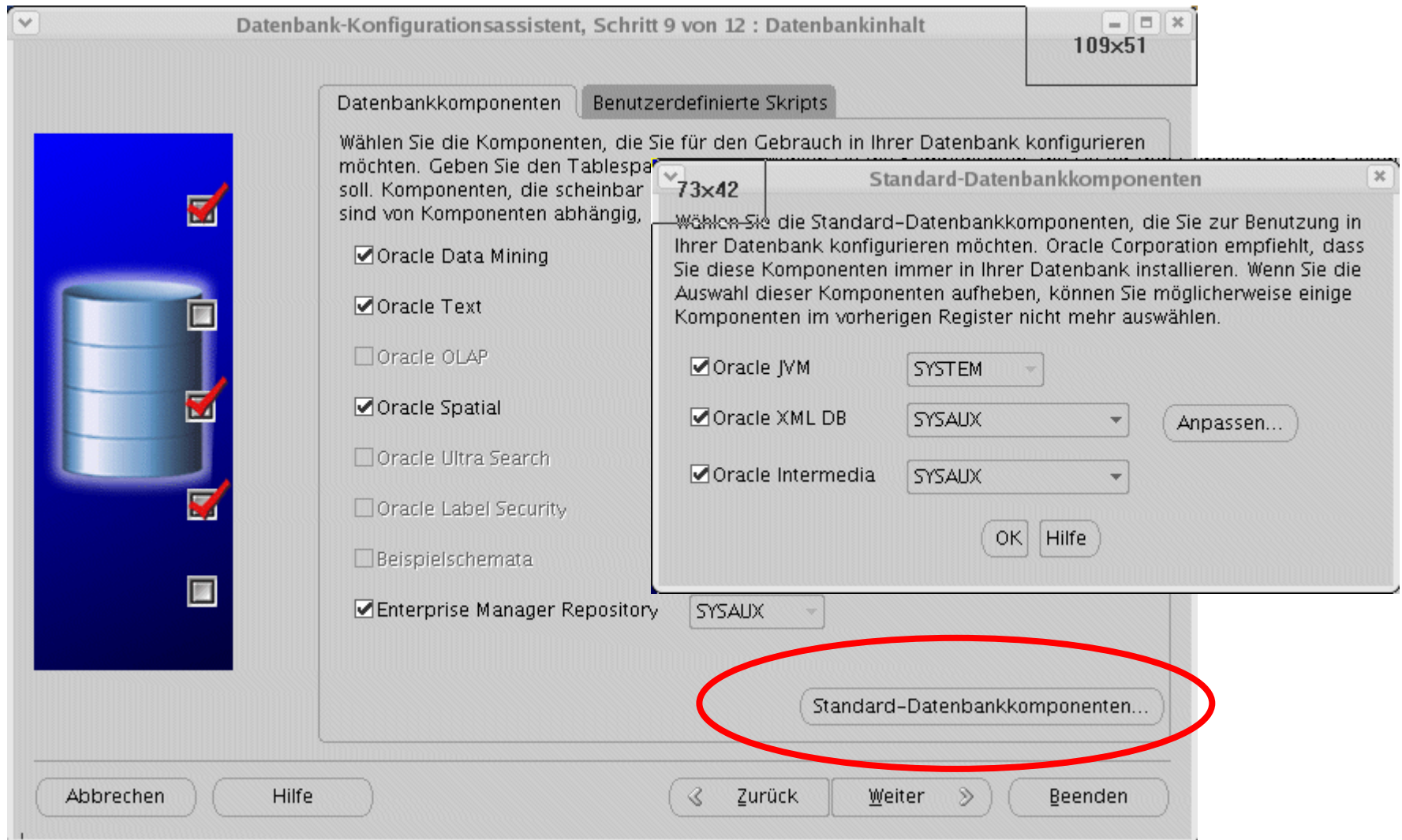
Quick Change: No indexing of NULL-values!

```
SQL> UPDATE <Tabelle>  
      SET valid_to = to_date('01.01.3000', 'DD.MM.YYYY');  
  
SQL> COMMIT;
```

# Database Upgrade Assistant - Example

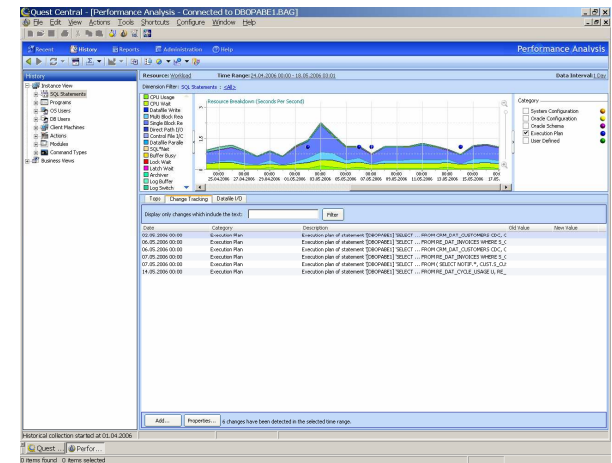
- **Resource:**
  - HP Deskpro Pentium 4 3,2 GHz
  - VmWare with 728 MB RAM
  - RedHat Linux 4.0 ES
  - SGA: 200 MB
  - Oracle 10g Release 10.2.0.1 -> 10.2.0.3
- **Software Upgrade (runInstaller.sh): 5 minutes**
  - (unfortunately now check if database is stopped!!!)
- **Database Upgrade with dbua:**
  - Basic Configuration: 15 minutes
  - Default Configuration: 35 minutes => JAVA, XML

# Do you really need this components?



# Risks

- **Application does not work properly**
  - Don't change too many components at one time
  - Plan a fallback
- **Performance problems**
  - Benchmarks
  - Historical performance view
- **Errors during upgrade procedure**
  - Create storyboard for upgrade
  - No quick changes!



```
SQL> UPDATE <table>
      SET valid_to = to_date('01.01.3000', 'DD.MM.YYYY');

SQL> COMMIT;
```

# Example: Rolling Upgrade with Shareplex

