



**ORACLE**  
DATABASE **11<sup>g</sup>**

# Data Replication Overview、 Compare & Integrate

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Acoug Meeting

# 日程

- Replication on the homogeneous platform
  - Data Guard
- Replication cross the heterogeneous platform
  - Active Data Guard
  - Stream
  - Oracle Data Integrator
  - Goldengate
- Compare
- Integrate

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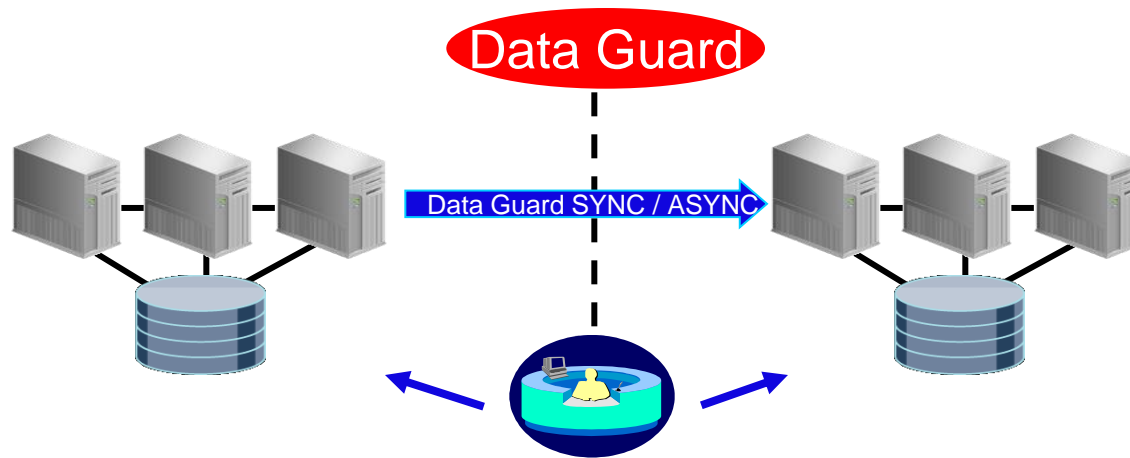
# Oracle 容灾可以避免数据损失



ORACLE

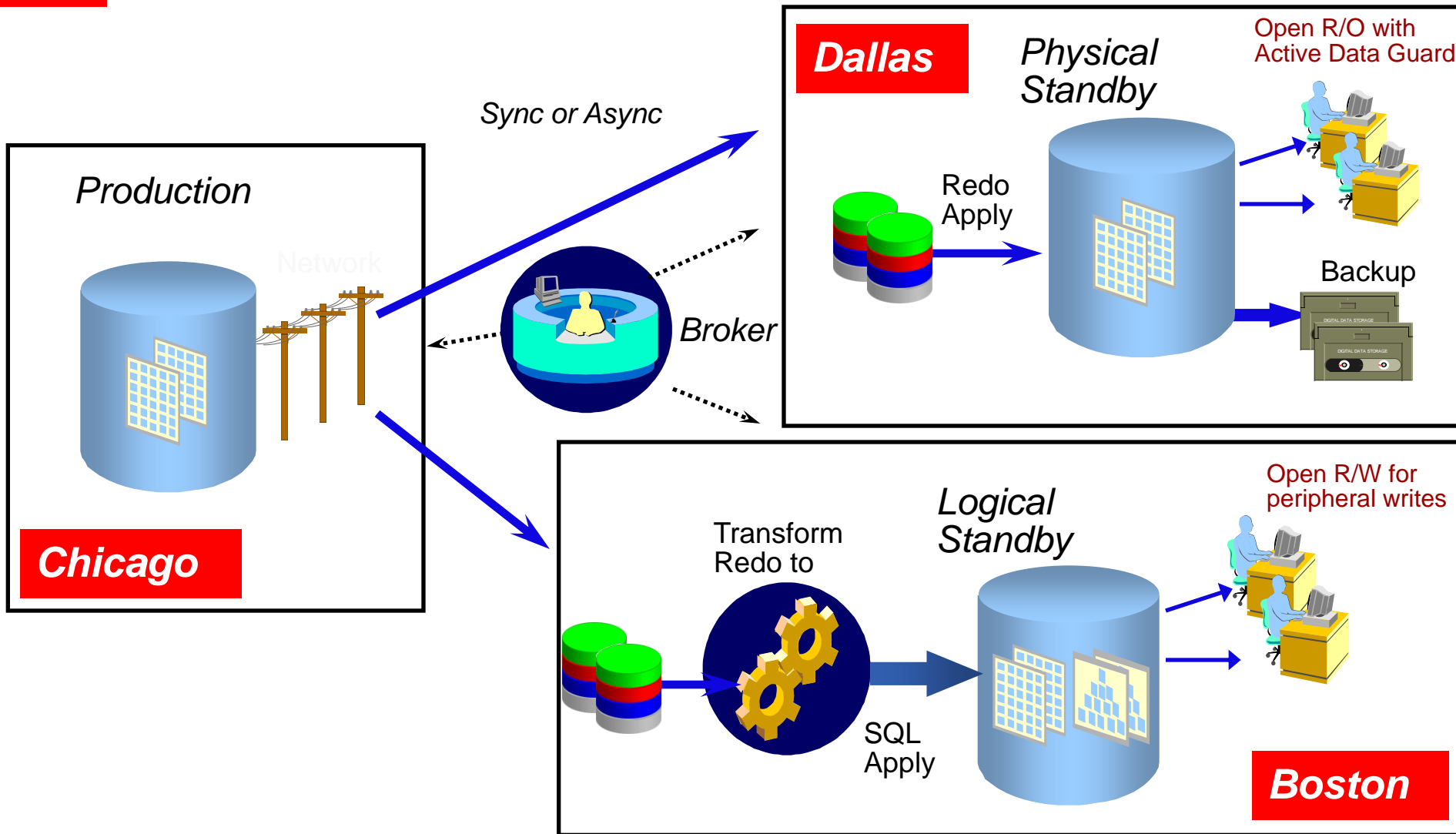
# What is Oracle Data Guard?

**Best Data Protection and Availability for Oracle Databases**

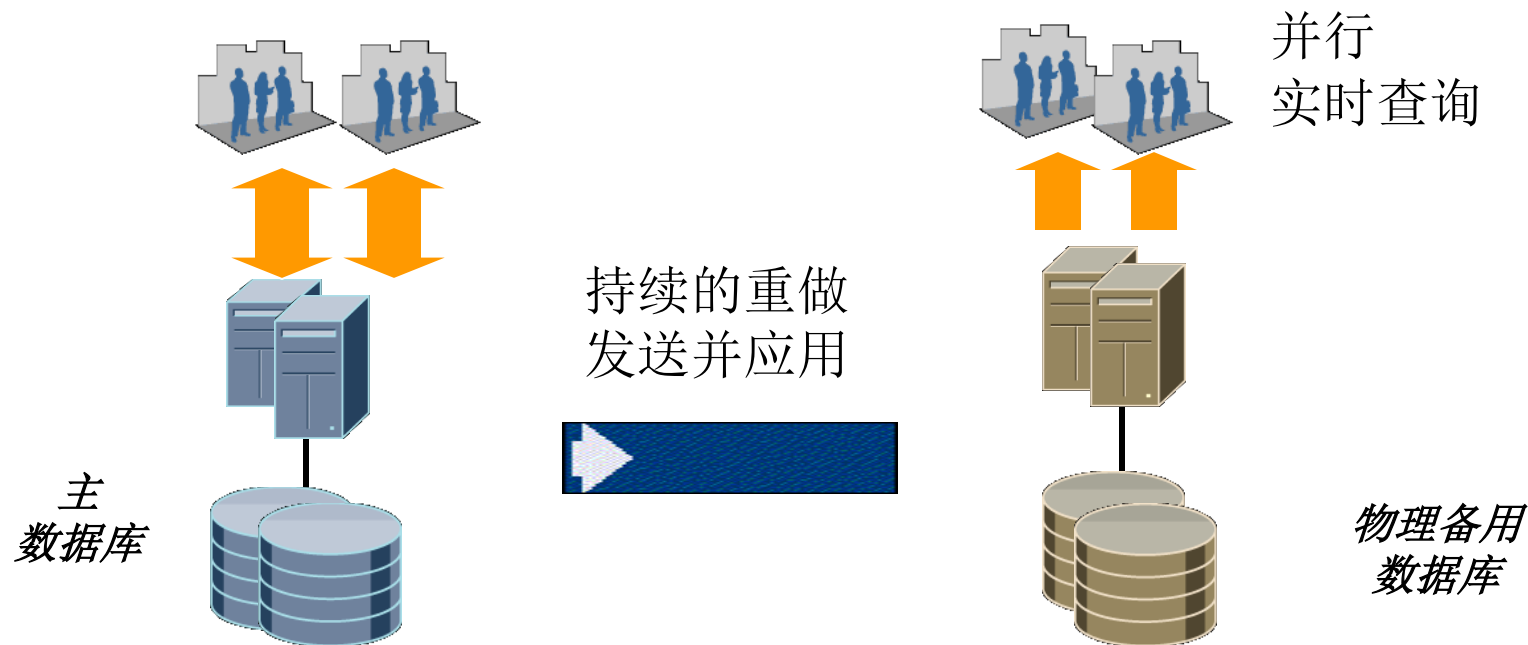


- Creates a live copy of your data
- Zero data loss and seconds to failover
- Data Guard redo shipping is designed to prevent corruptions from the standby database
- If a data failure occurs on the primary database, failover to the good copy of the data on the standby

# Oracle Data Guard Architecture



# What is Active Data Guard?



- 物理备用数据库上的只读查询与重做应用并行
  - 在主/备用数据库上支持 RAC
  - 查询通过事务方式查看一致的结果
- 处理所有数据类型, very fast, operationally simple

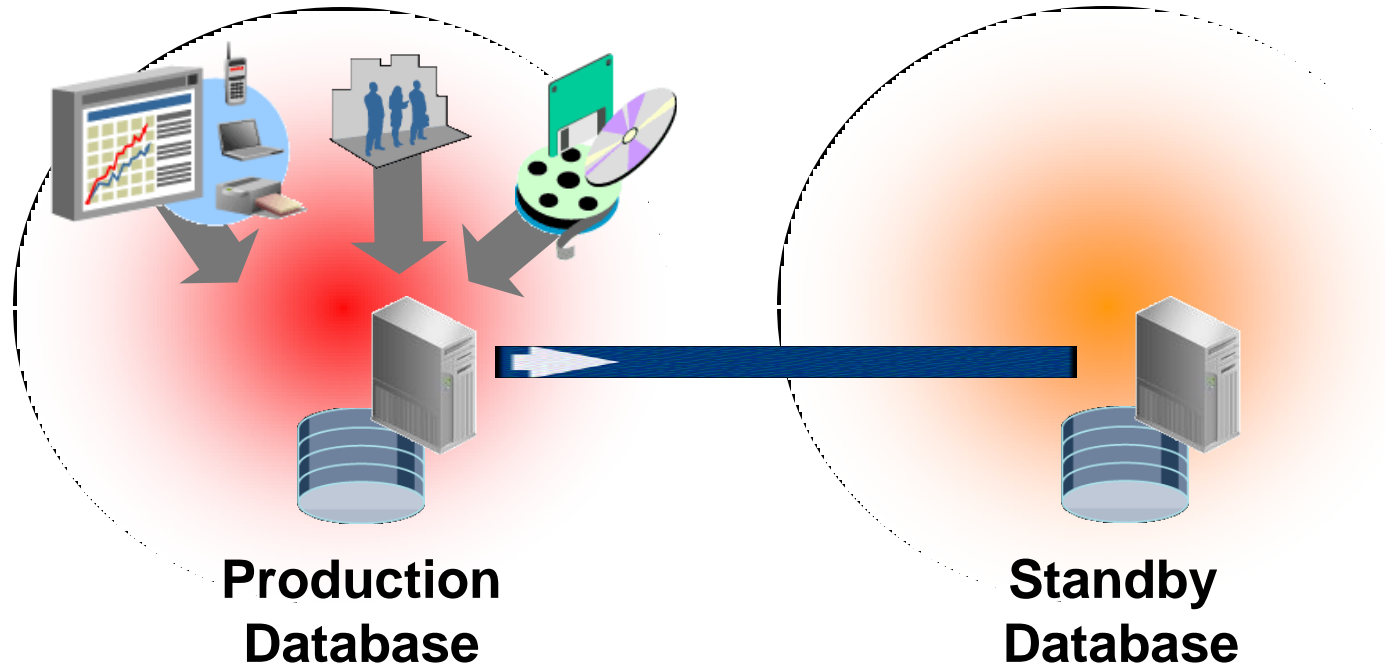
# Active Data Guard 创建方法

- 首选，取消管理备用数据库恢复：
- SQL> alter database recover managed standby database cancel;  
Database altered.
- 然后以只读方式打开数据库：
- SQL> alter database open read only; Database altered.
- 到这一步为止，过程与 11g 以前的版本相同。现在，11g 特性将显示其优势：以只读模式打开备用数据库时，您可以重新开始管理恢复进程。
- SQL> alter database recover managed standby database disconnect;  
Database altered.



# Traditional Physical Standby Databases

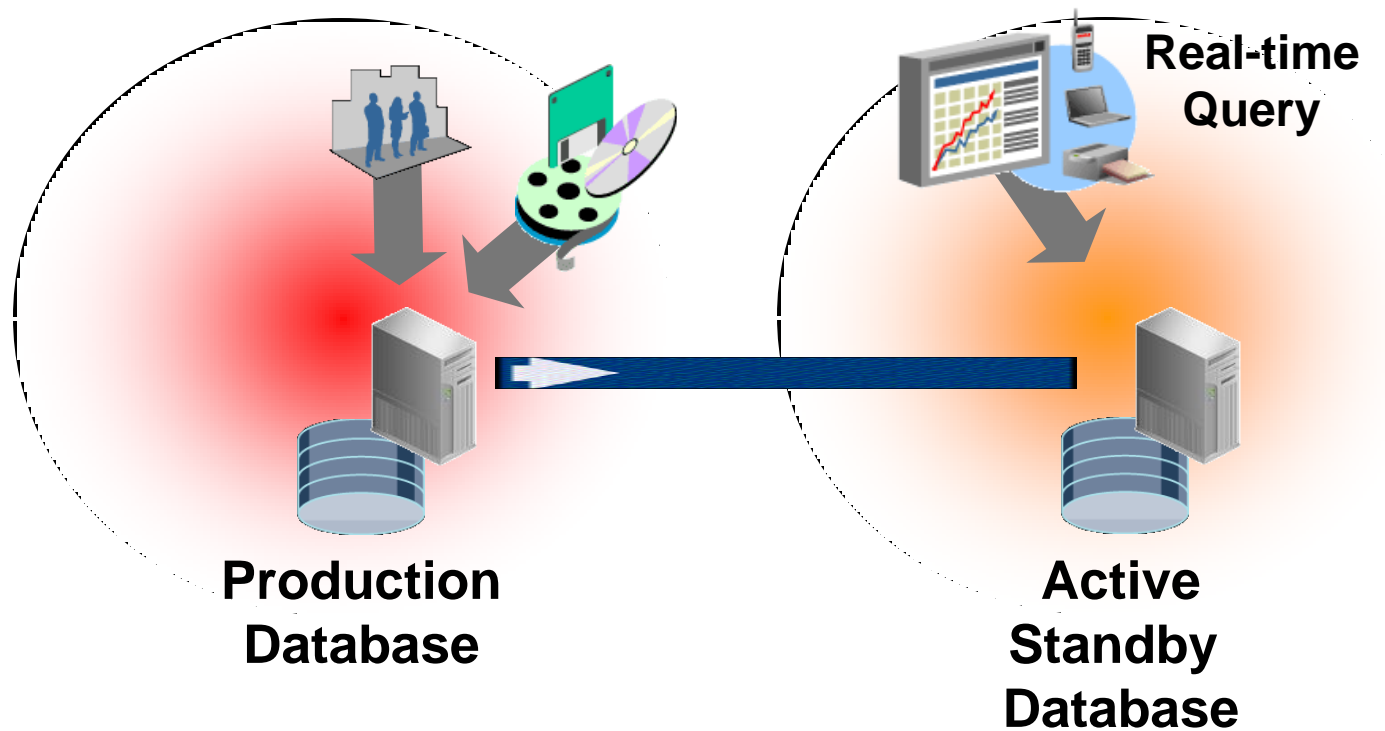
Investment in Disaster Recovery only



- Applications, backups, reports run on production only

# **NEW! - Active Data Guard Option**

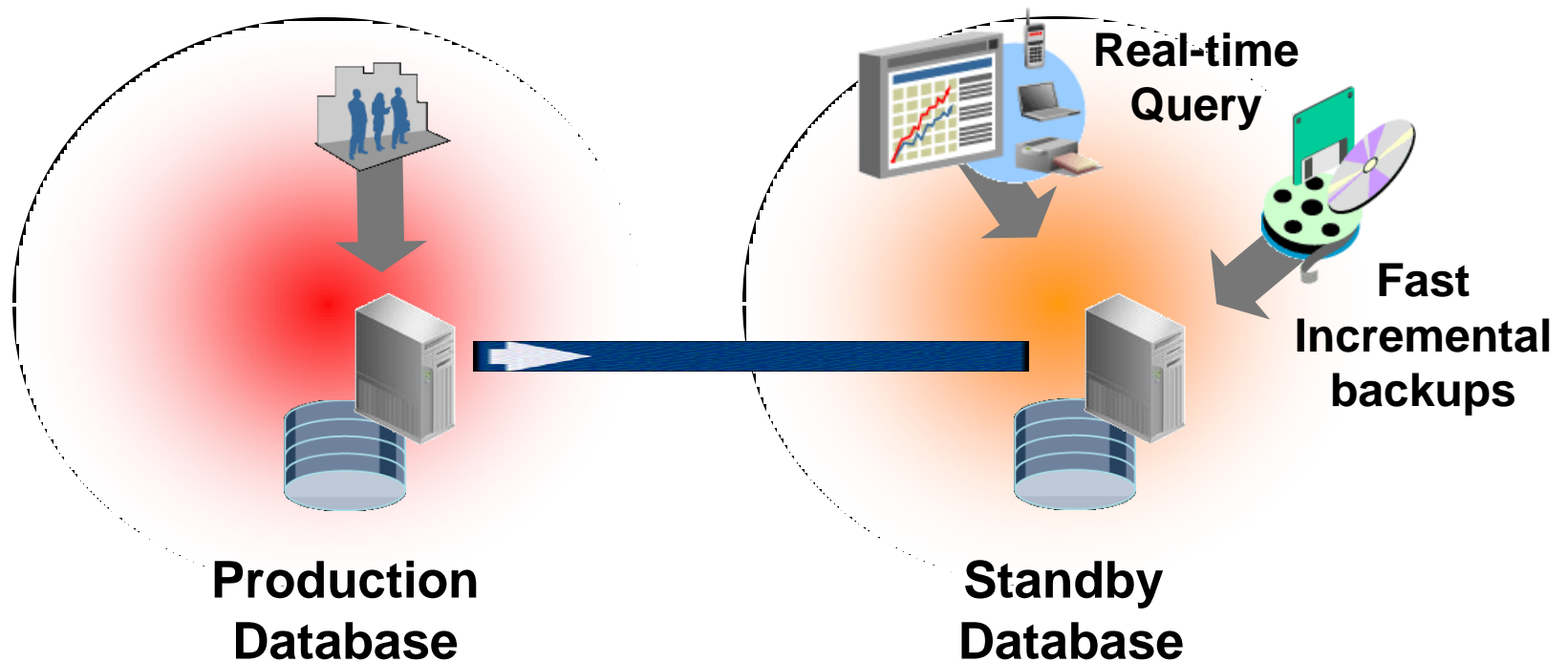
**Offload read-only queries and reporting to standby**



- Simultaneously available in read and recovery mode
- **EASY BUTTON** included

# Bonus Feature in Active Data Guard

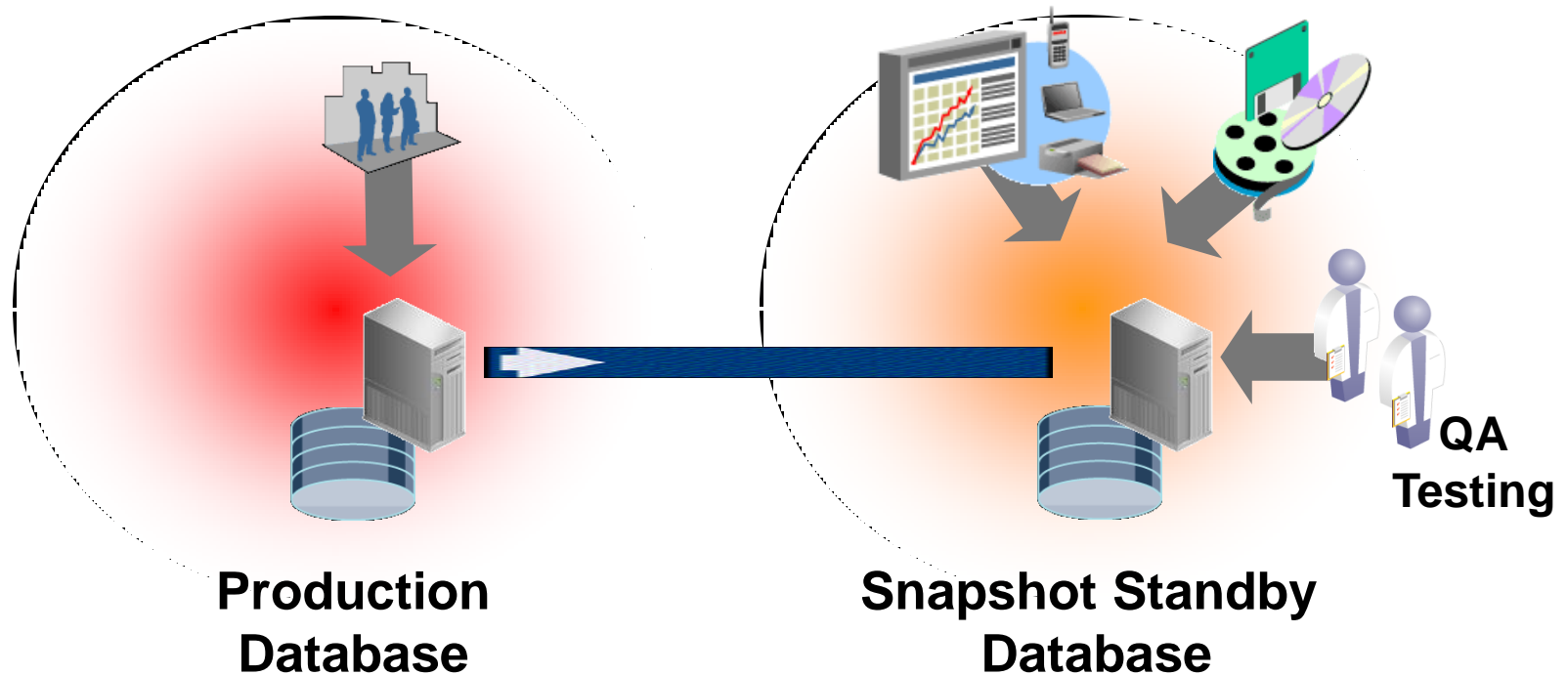
**Offload fast incremental backups to standby**



- Use RMAN block change tracking on standby database
- Fast incremental backups complete 20x faster

# Bonus Data Guard 11g Feature

## Snapshot Standby for Pre-Production Testing



- Standby open read-write while testing – then resync
- **EASY BUTTON** included – data is always safe

# What's different between DG and ADG?

## Data Guard vs Active Data Guard

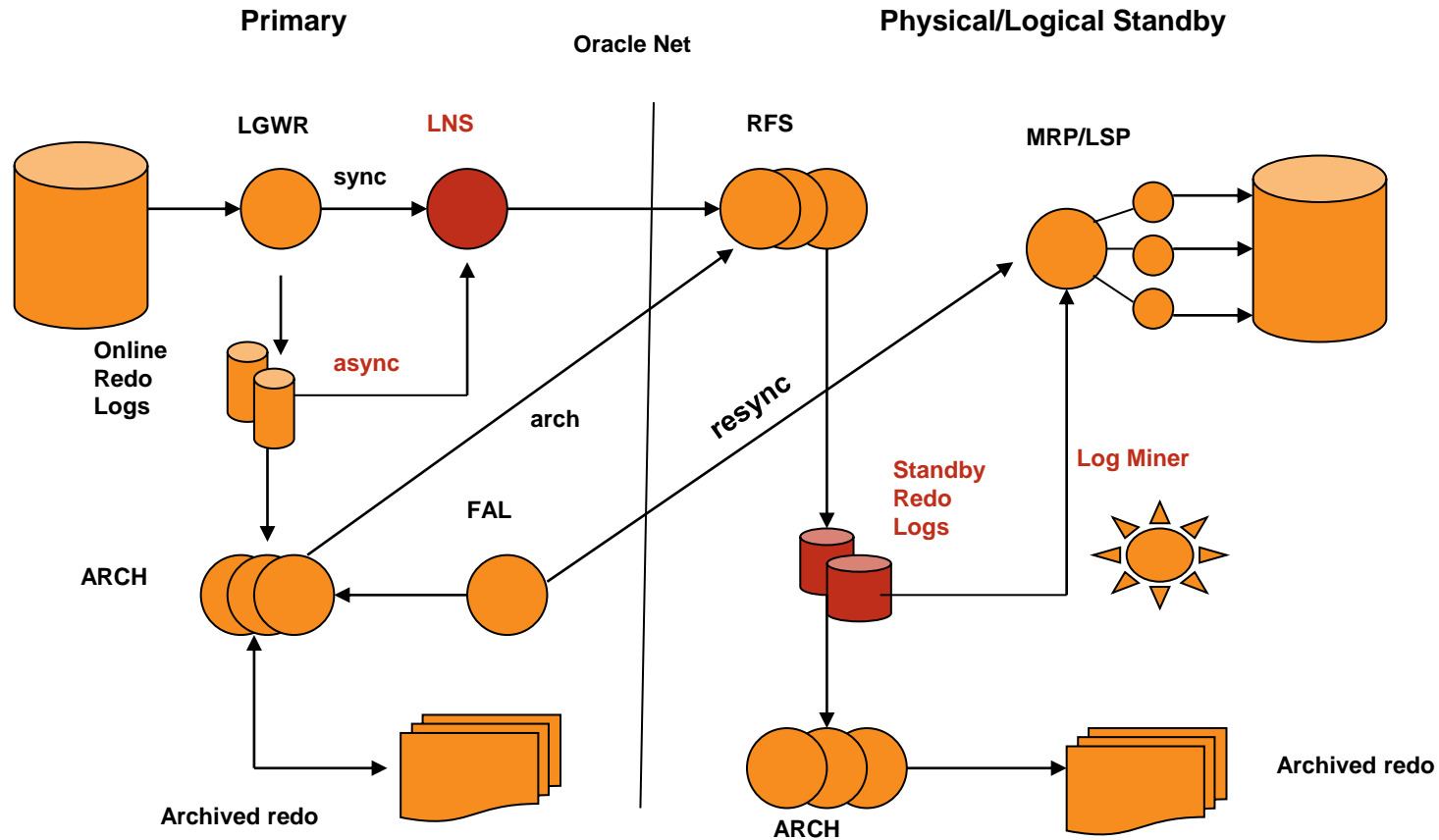
### Data Guard 11g

- Stop redo apply at 8am
- Open read-only for queries
- By 4pm, data is 8 hours old
- Any failover will be delayed due to backlog of data that must be applied

### Active Data Guard Option

- Redo apply is always on
- Always open read only
- Queries and reports always see latest data
- Failover is immediate when needed, standby database always up-to-date

# Data Guard Process 10GR2 Architecture



# Summary replication of DG

Replication condition	Data Guard	Active Data Guard
跨平台或者服务器CPU位数(32/64bit)		Only windows and Linux
跨Oracle版本或Non-Oracle 数据库	Only Logical Standby	11.1.0 later
对象级的复制	DB Level	DB Level
对主库性能影响	LGWR or ARCH	LGWR or ARCH
网络性能	SQLNet	SQLNet
复制拷贝的方式	Block Identity copy/SQL apply (logical standby)	Block Identity copy
可访问性	Physical standby inaccessible/ Logical standby all replicated tables are read-only	read-only
Switchover/Failover	support	support

# What is Oracle GoldenGate

*Oracle GoldenGate provides **low-impact** capture, routing, transformation, and delivery of transactional data across **heterogeneous** environments in **real time***

## Key Differentiators:

### Performance

Non-intrusive, low-impact, sub-second latency

### Flexible and Extensible

Open, modular architecture - Supports heterogeneous sources and targets

### Reliable

Maintains transactional integrity - Resilient against interruptions and failures



# How Oracle GoldenGate Works

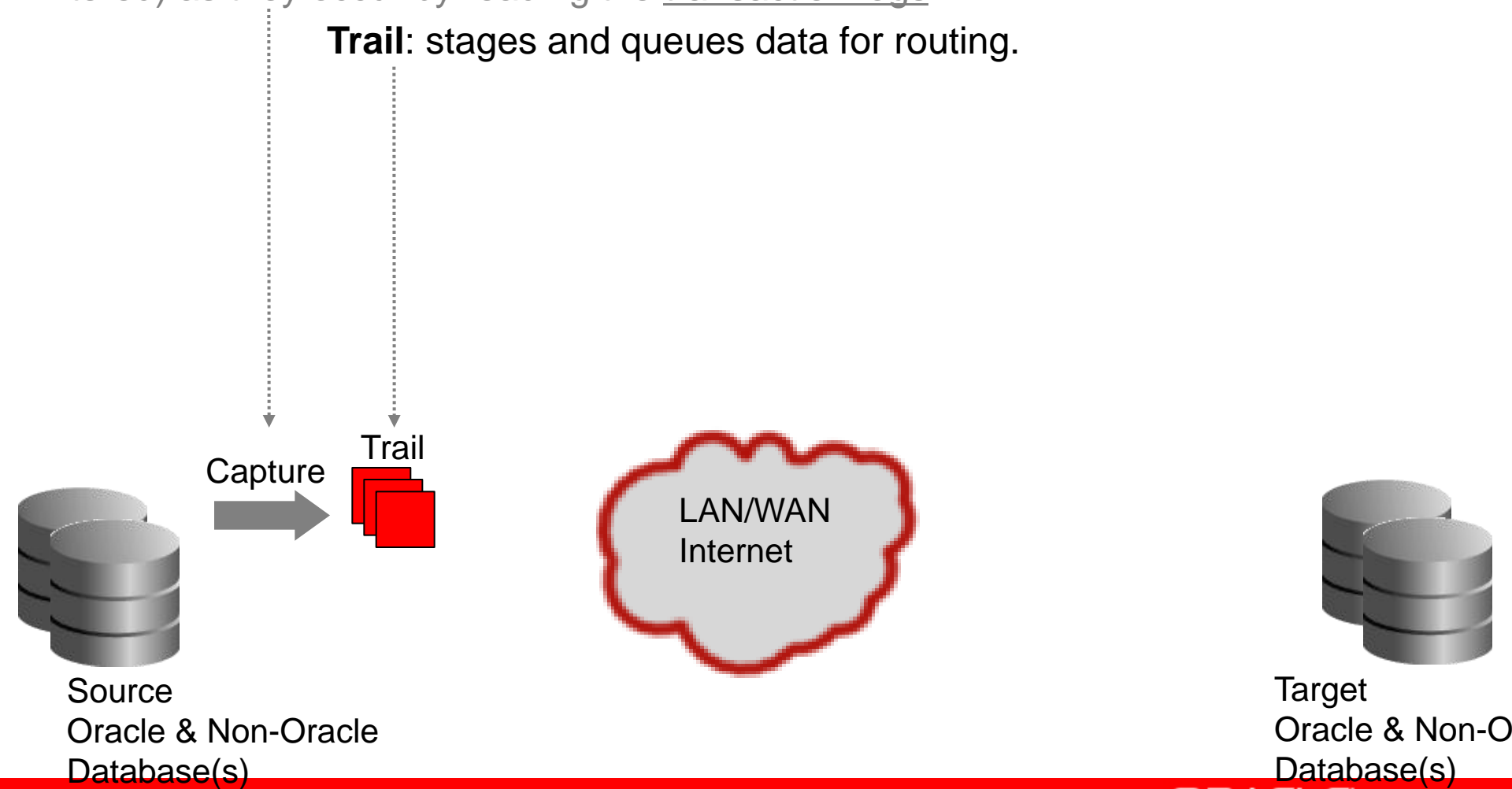
**Capture:** committed transactions are captured (and can be filtered) as they occur by reading the transaction logs.



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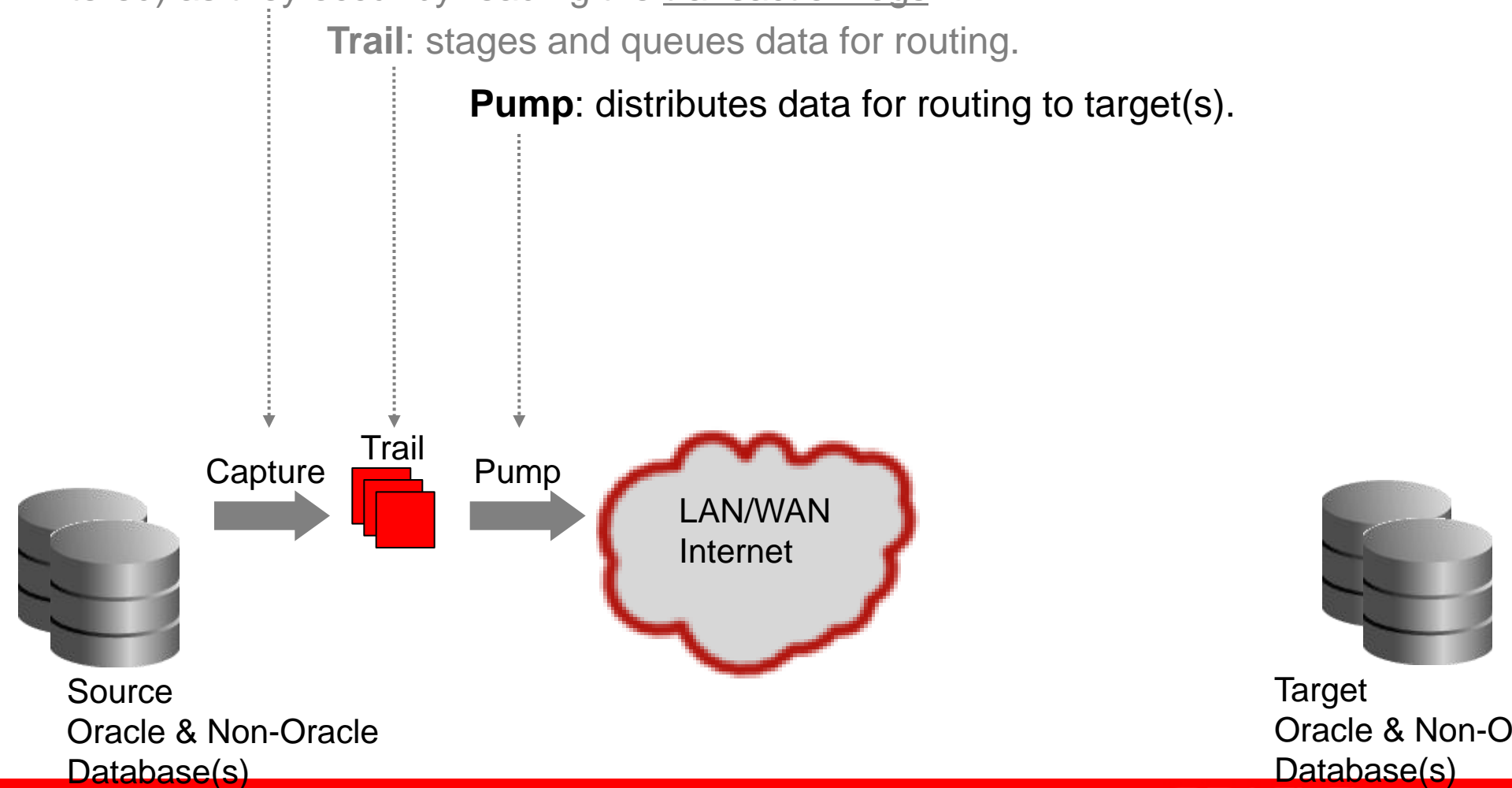


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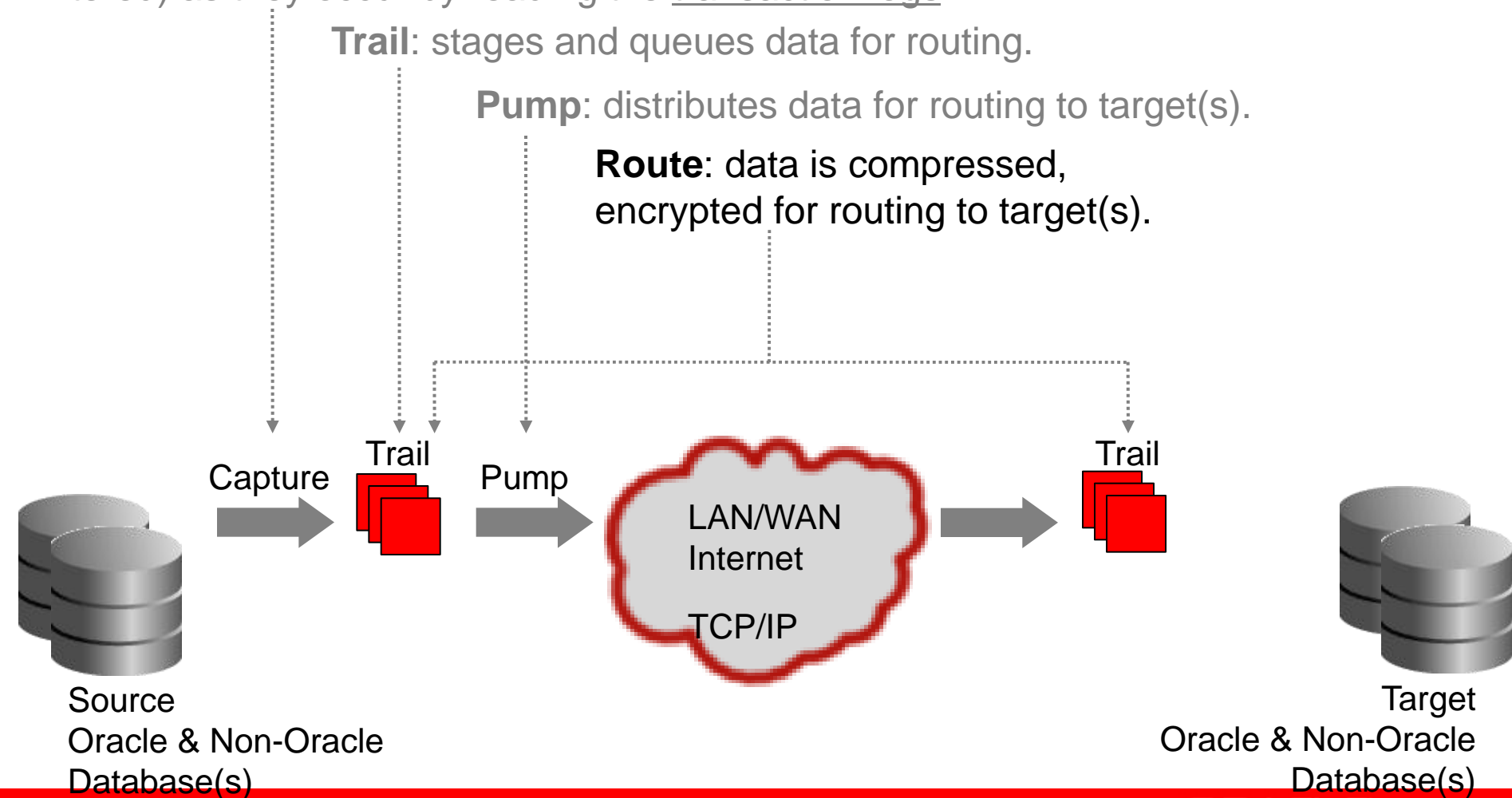
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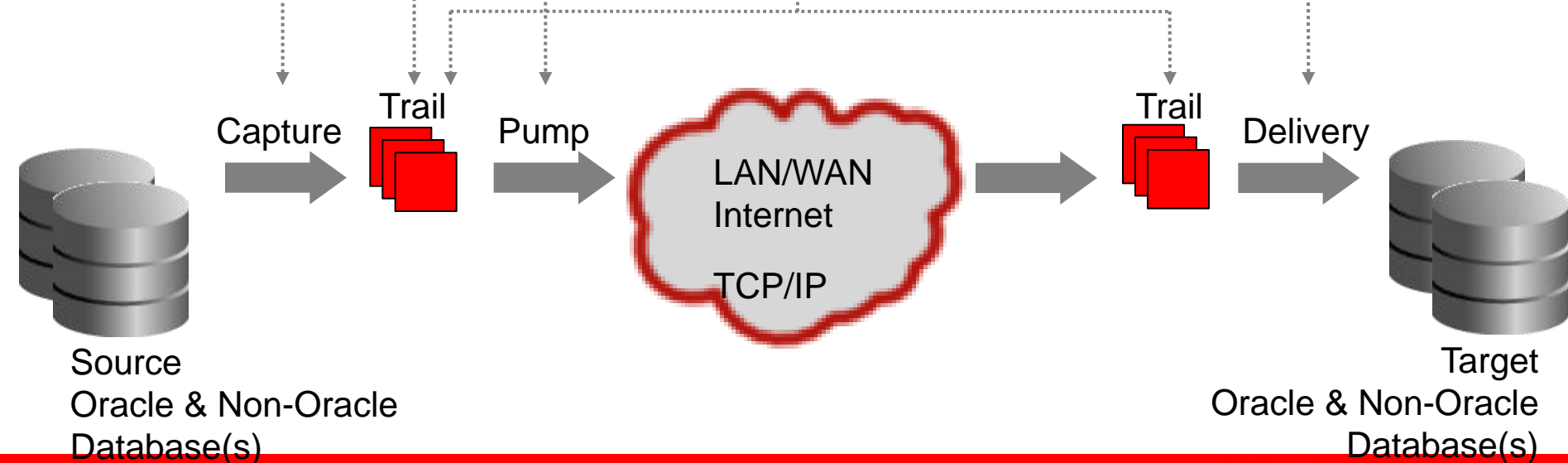
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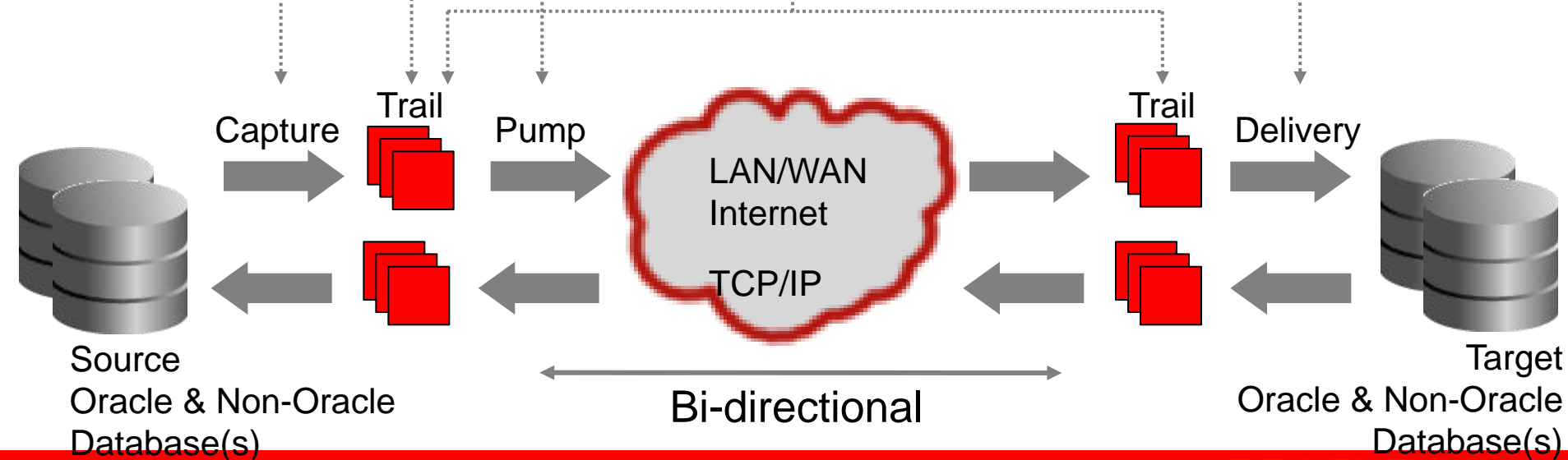
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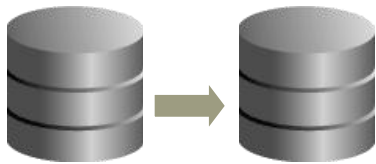
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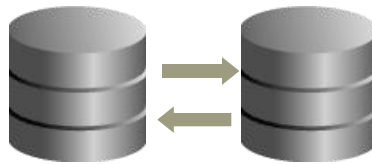


# Oracle GoldenGate Topologies

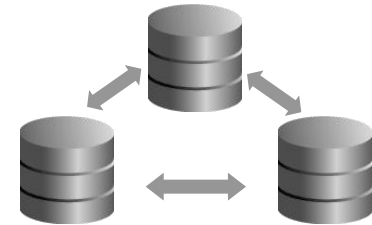
**Unidirectional**  
Query Offloading



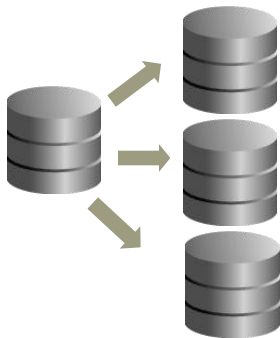
**Bi-Directional**  
Live Standby or  
Active-Active



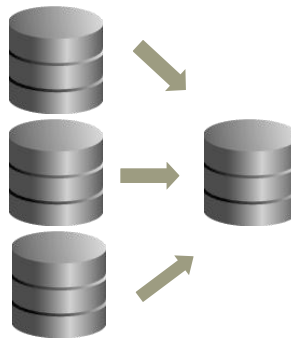
**Peer-to-Peer**  
Load Balancing,  
Multi-Master



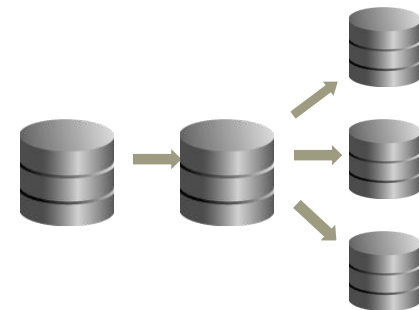
**Broadcast**  
Data Distribution



**Integration/Consolidation**  
Data Warehouse

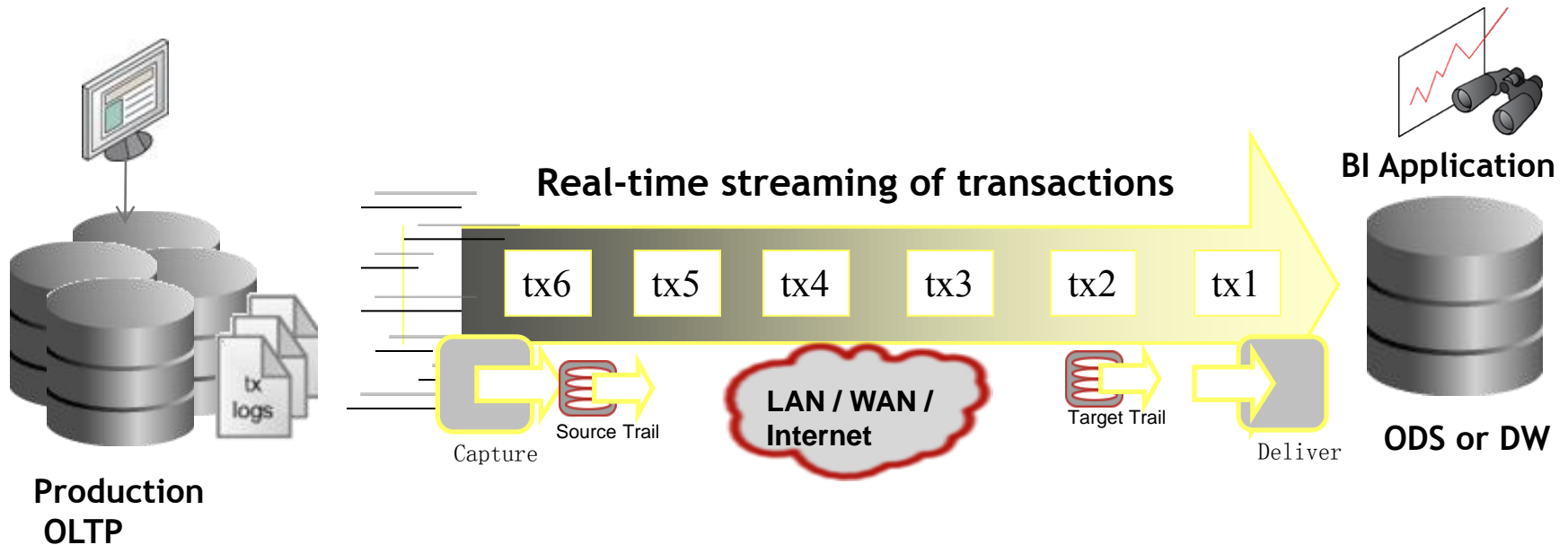


**Cascading**  
Data Marts



# Real-Time Data Acquisition with Oracle GoldenGate

Continuous change data feeds to DW or ODS



- **Sub-second data latency**
- **Minimal overhead and no batch windows**
- **Read-consistent changed data with referential integrity**
- **Complete data recoverability via Trail files**



# Oracle GoldenGate Heterogeneity

Databases	O/S and Platforms
<b>Capture:</b> <ul style="list-style-type: none"><li>▪ Oracle</li><li>▪ DB2</li><li>▪ MySQL</li><li>▪ Microsoft SQL Server</li><li>▪ Sybase ASE</li><li>▪ Teradata</li><li>▪ Enscribe</li><li>▪ SQL/MP</li><li>▪ SQL/MX</li></ul> <b>Delivery:</b> <ul style="list-style-type: none"><li>▪ All listed above, plus:</li><li>▪ MySQL, TimesTen, Netezza, Greenplum, HP Neoview and any ODBC compatible databases</li><li>▪ ETL products</li><li>▪ JMS messaging systems</li></ul>	Windows 2000, 2003, XP, 2008 Linux Sun Solaris HP NonStop HP-UX HP TRU64 HP OpenVMS IBM AIX IBM z/OS

# Oracle GoldenGate Advantages

## Movement

- Speed
  - Subsecond Latency
- Volume
  - Thousands of TPS
- Log-based Capture
- Native, Local Apply
- Efficient IO and Bandwidth Usage
- Bidirectional
- Group Transactions
- Bulk Operations
- Compression
- One-to-Many, Many-to-One
- Cascade

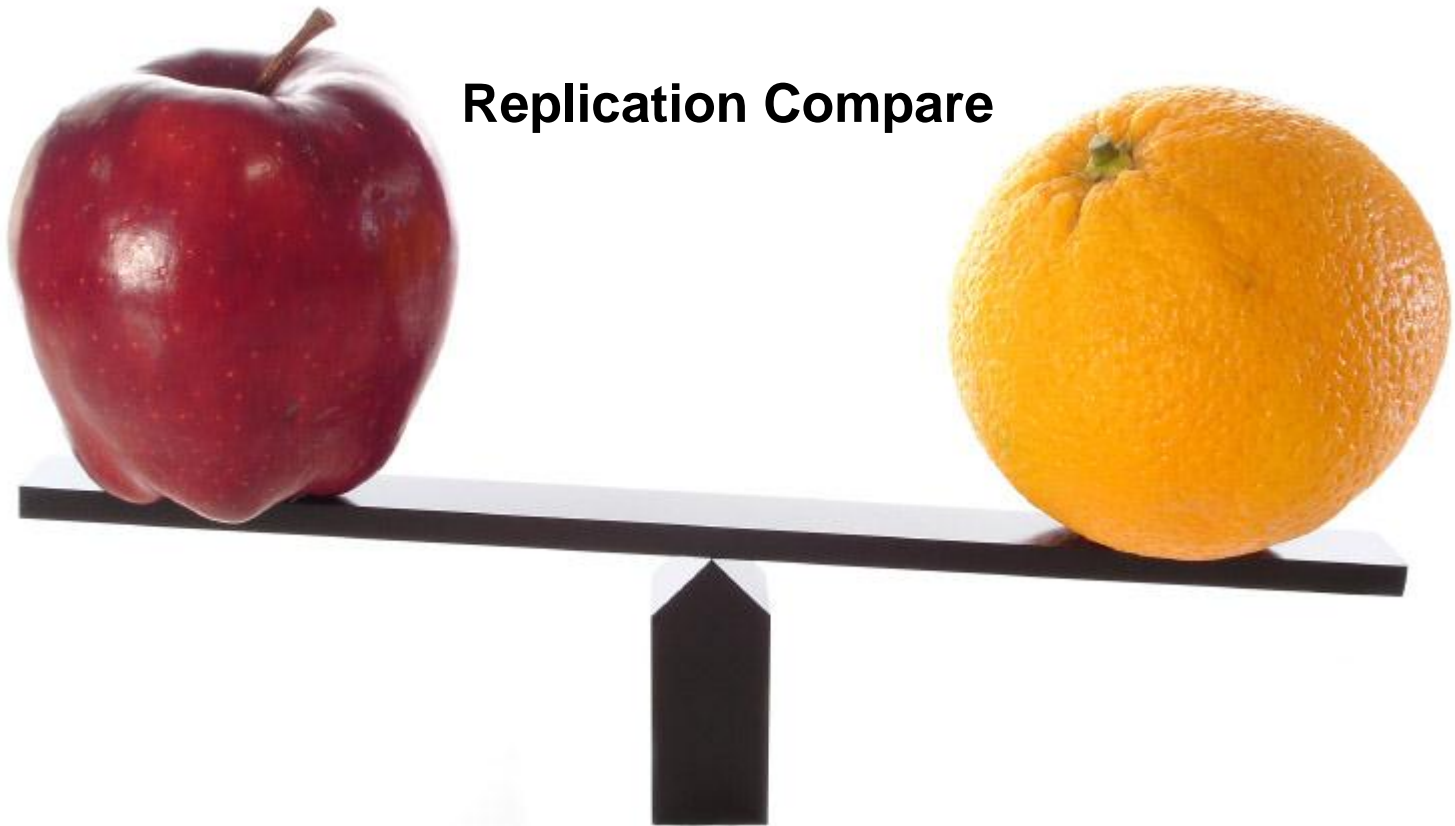
## Management

- Transaction Integrity
- Transparent Capture
- Guaranteed Delivery
- Conflict Detection, Resolution
- Dynamic Rollback
- Incremental TDM
- Initial Data Load
- GUI-based Monitoring and Configuration
- Proactive Alerts
- Encryption
- Real-Time Deferred or Batch
- Event Markers

## Integration

- Heterogeneous Data Sources
- Mapping
- Transformation
- Enrichment
- Decoupled Architecture
- Table, Row, Column Filtering
- XML, ASCII, SQL Formats
- Queue Interface
- Stored Procedures
- User Exits
- ETL Integration
- Java/JMS Integration

## Replication Compare



# Oracle Data Guard

- 解决高可用性和故障切换的问题
  - 备库不能提供查询, 不能做主库
  - 在主库正常状态, 不能做主库
  - 如果要使用备库, 不能实现零宕机迁移
- 代码规则限制
  - 仅能设置30个目标
  - 必须是同平台、同OS、同数据库版本
    - 11g 允许不同的CPU架构、OS (windows & Linux)
  - 不能跨32/64 bit 平台
    - 11g 允许 OS 32/64 bit or Oracle Database 32/64 bit
- 表必须在相同的Schema下面
  - DBA不能有选择性的复制
- Switchover 可能要求Primary Database 重启或重新mount
- 不必要的停机时间
- Failover 可能要求备库重启
  - 不必要的停机时间
  - 与RAC数据库不完全兼容

**ACTIVE DATA GUARD**

# Oracle Data Guard

- 占用比较高的资源
  - 通过Oracle\*Net传输redo data – 网络资源占用比较高
  - Massive protocol
  - 没有数据压缩
    - 11g COMPRESSION=ENABLE
- failover时间比较长
  - 必须等待所有日志被应用– delayed startup
    - USING CURRENT LOGFILE
- Log corruption = disaster
  - 不能倒退事务
  - 不能过滤所选择的事务
  - 有限地基于时间的恢复
- Patches/upgrades 要求停机
  - 不必要停机时间
    - ALTER DATABASE RECOVER TO LOGICAL STANDBY KEEP IDENTITY; 11g available
- 不能把事务拆分、不能把SQL合并
- 没有转换能力
- 不支持输出文件格式
  - No output formats like XML, SQL or text

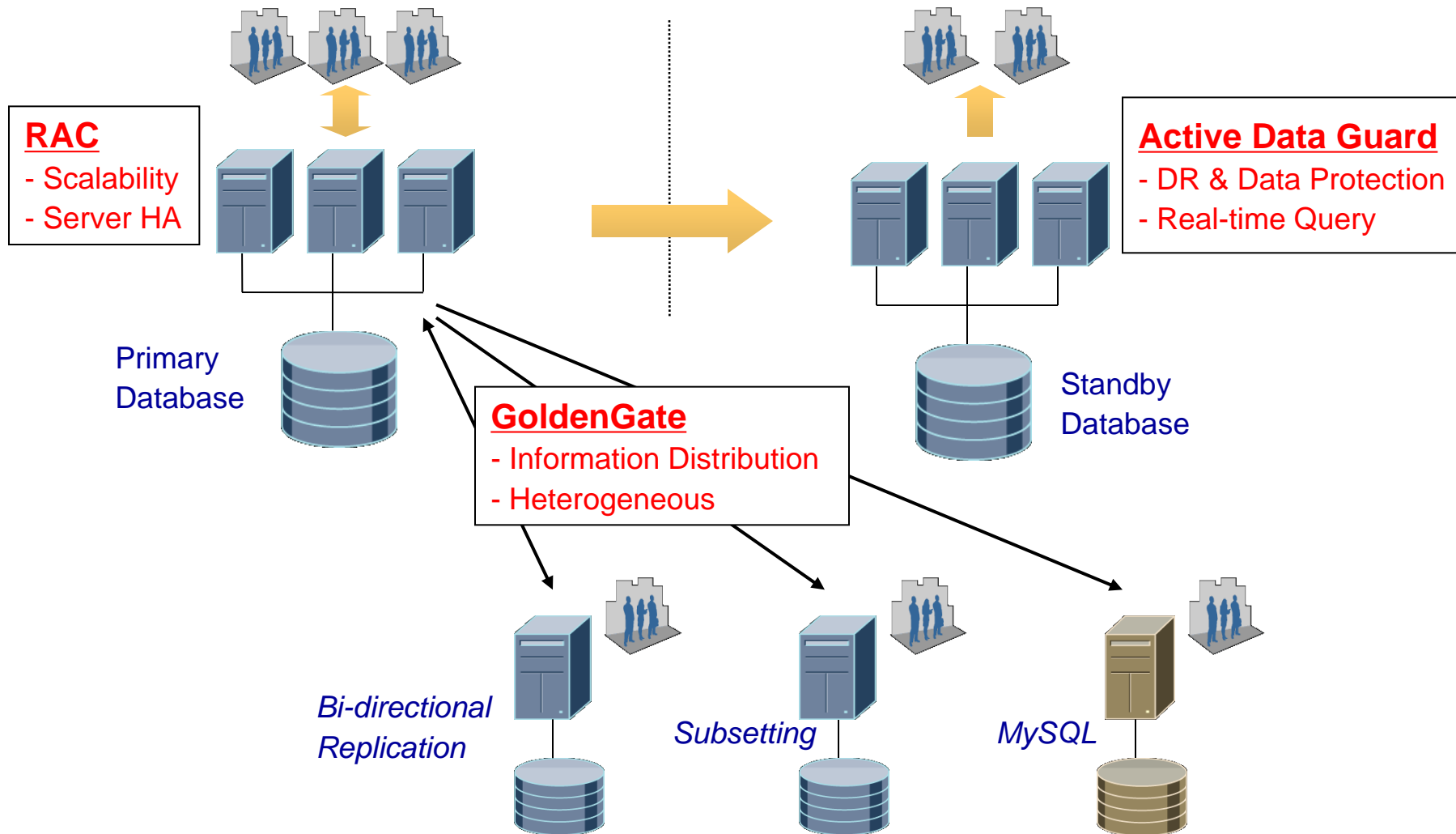
# High Availability for Oracle Database

## When to Use Active Data Guard vs. GoldenGate

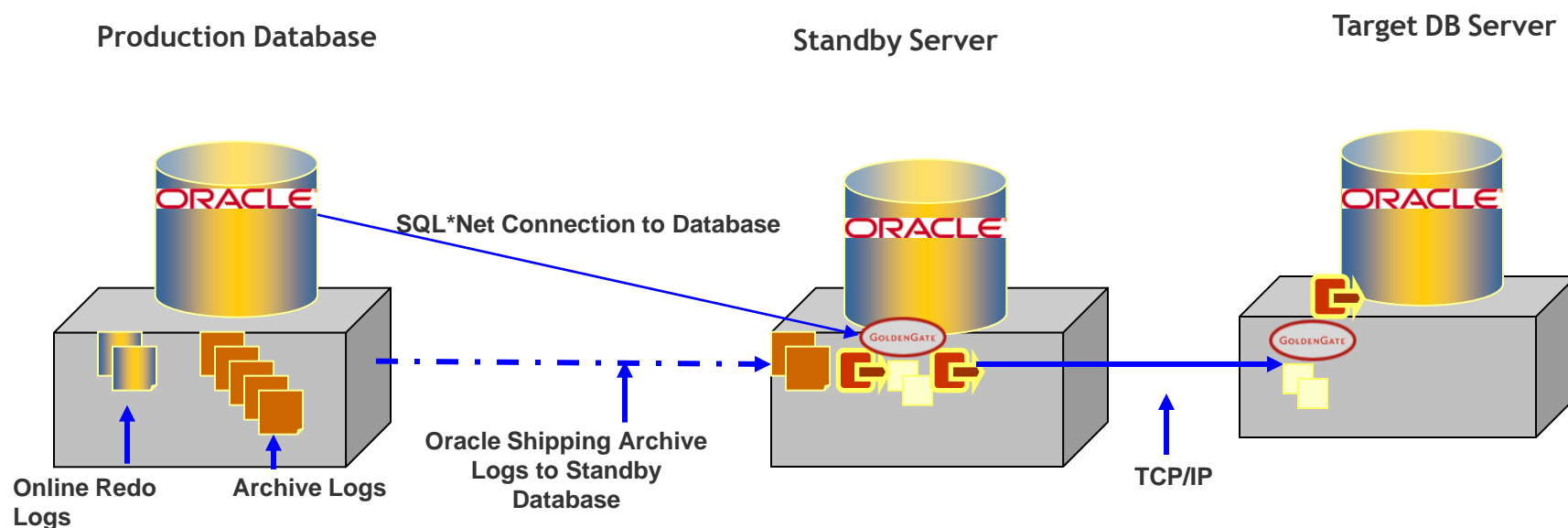
- Disaster Recovery / Data Protection
  - Active Data Guard: simple full Oracle Database protection
    - ✓ High-performance, simple, drop-in solution for HA and DR, readable at standby
    - ✓ Zero data loss, integrated data corruption protection, switchover / failover
    - ✓ DR for all data types & apps including packaged apps that can't be changed
- Information Distribution, Flexible HA
  - GoldenGate: heterogeneous, active-active, migrations
    - ✓ Heterogeneous replication, transformations, subsetting, multiple topologies
    - ✓ All sites fully active (read/write): avoid or manage conflicts at application level
    - ✓ Enable minimal downtime app migrations with 2<sup>nd</sup> database copy

# Powerful Combination!






## Integrated HA, DR and Active-Active Replication



# GoldenGate Capture From DR/Standby



## Secondary Server Components

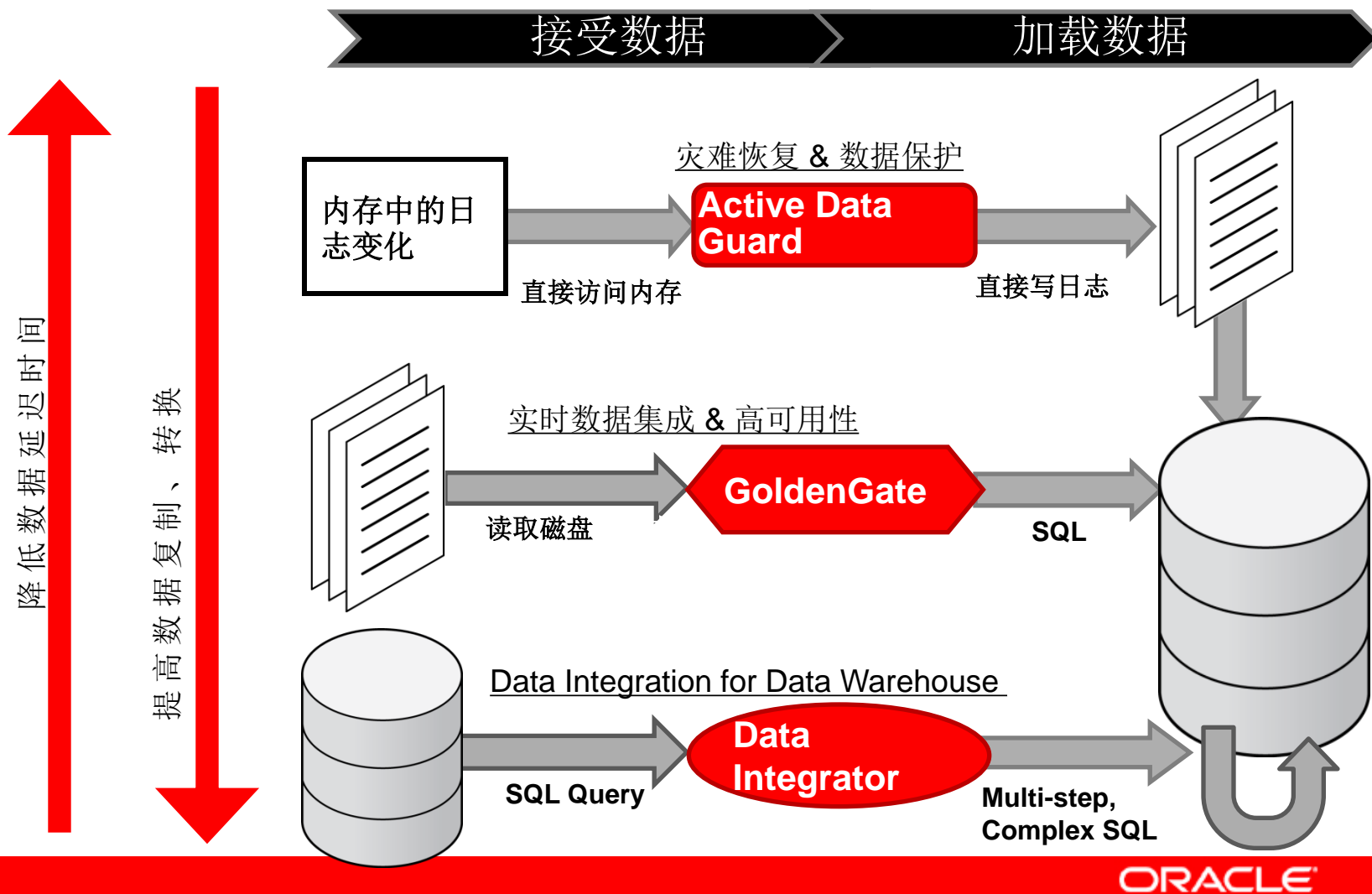
-  Archive Logs
-  GoldenGate Extract/Pump Processes - Secondary Server
-  GoldenGate Trail Files
-  GoldenGate Apply Processes - Target DB Server
-  Flat File Output (Optional)

Goldengate software home  
GoldenGate trail files  
Archive Logs Destination on Standby



# Oracle Products for Data Replication

对比它们工作原理



# Questions



# Zero-Downtime Oracle Database Upgrades to 11g

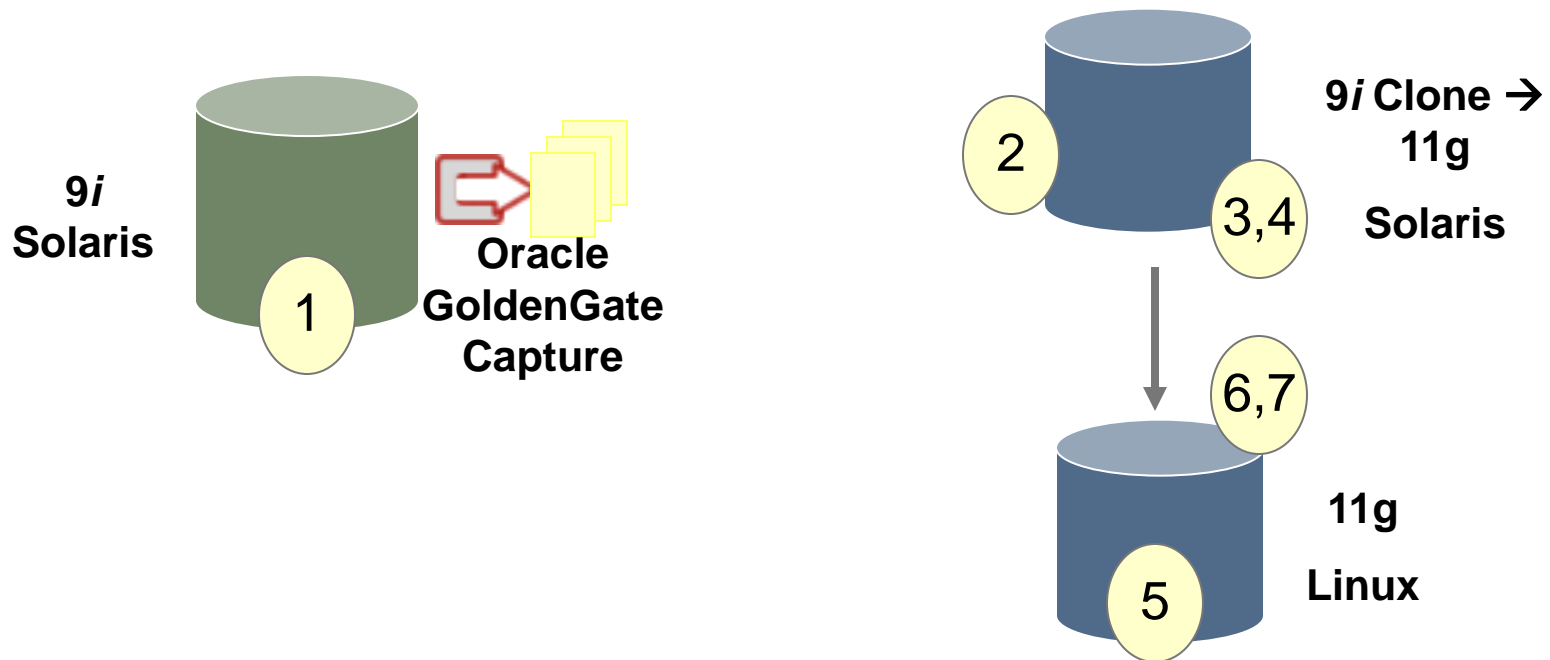
- Move to Oracle Database 11g without interrupting business operations
- Leverage new functionalities of Oracle Database 11g sooner than later
- Minimize risks with failback option

# Zero Downtime Oracle Upgrade Example: 9i → 11g Cross-Platform



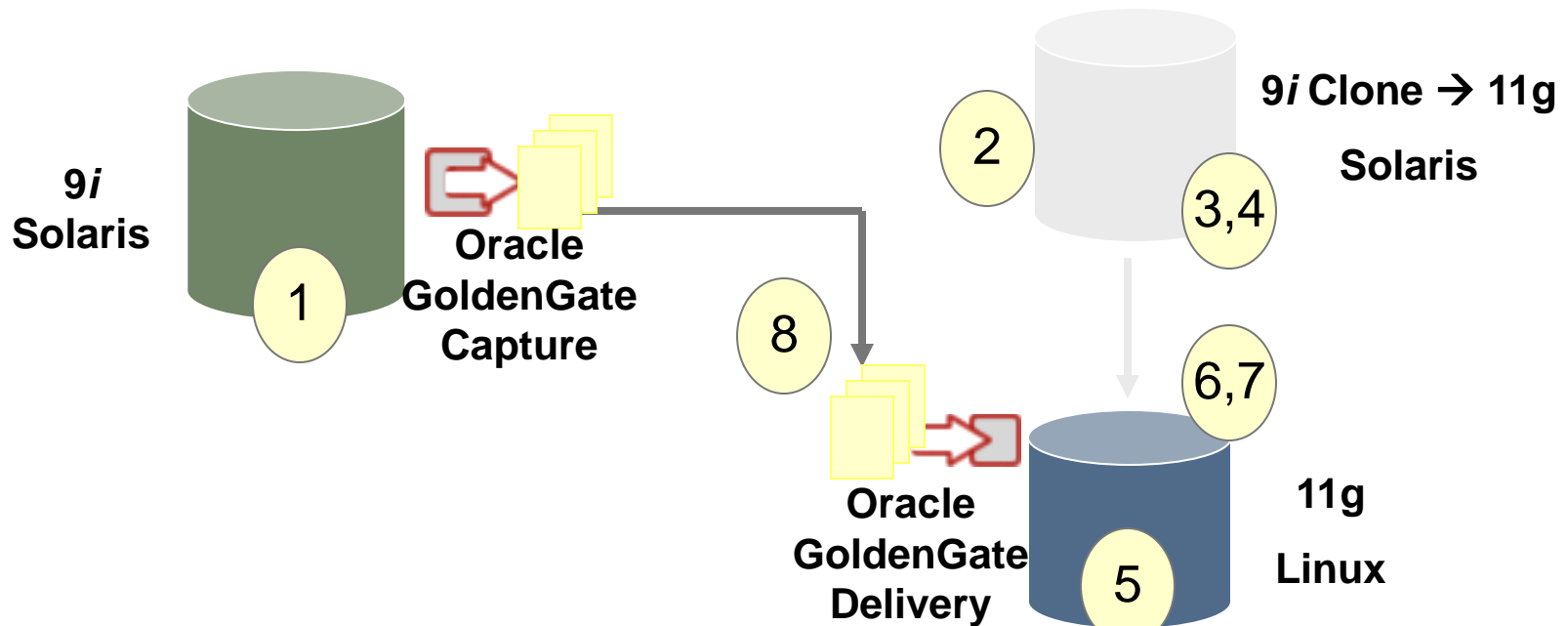
1. Start Oracle GoldenGate Capture module
2. Set up Clone database, then upgrade to 11g
3. Cross platform transportable tablespaces metadata export
4. Use a full database NOROWS export (Views, Packages, etc)

# Zero Downtime Oracle Upgrade Example: 9i → 11g Cross-Platform



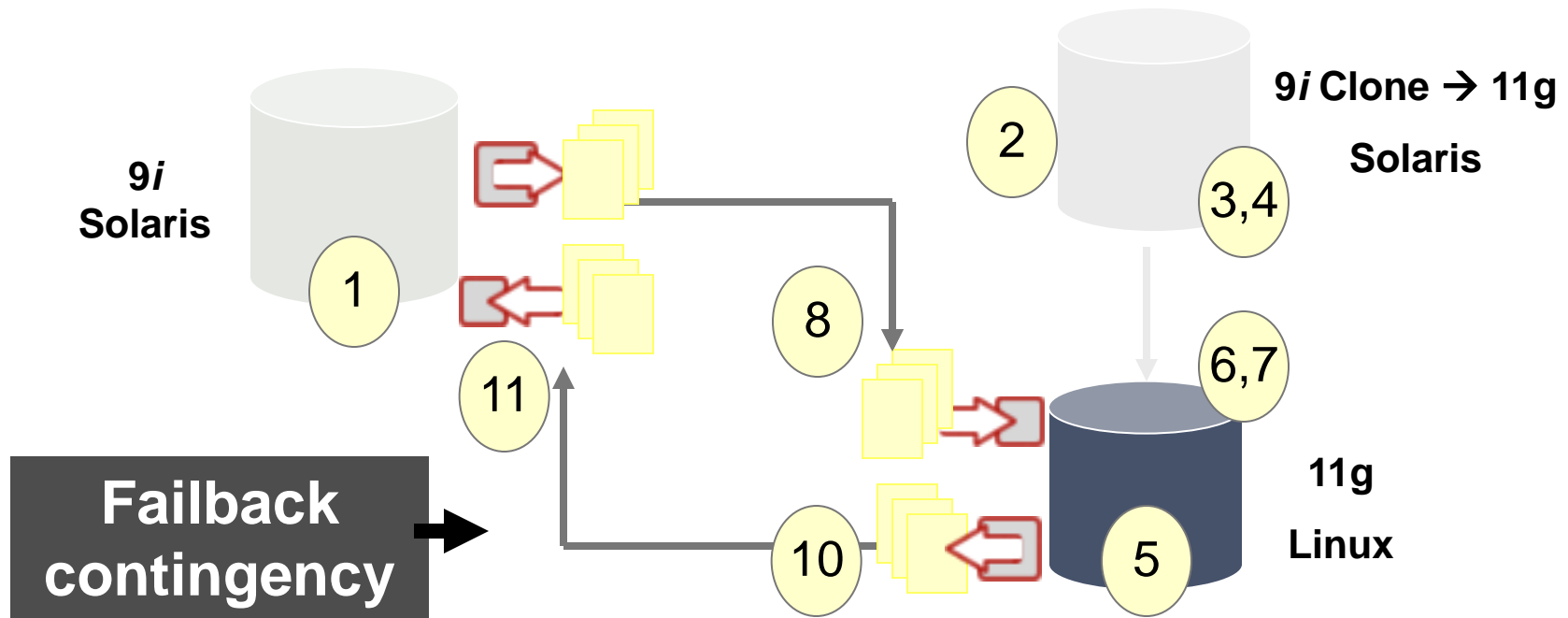
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5. Set up a new 11g vanilla target
6. Cross platform transportable tablespaces metadata import
7. Full import with IGNORE option

## Zero Downtime Oracle Upgrade Example: 9i → 11g Cross-Platform



1. Start Oracle GoldenGate Capture module
2. Set up Clone database, then upgrade to 11g
3. Cross platform transportable tablespaces metadata export
4. Use a full database NOLOGS export (Views, Packages, etc)
5. Set up a new 11g vanilla target
6. Cross platform transportable tablespaces metadata import
7. Full import with IGNORE option
8. **Start Oracle GoldenGate Delivery module at target**
9. **\*\*SWITCHOVER\*\*** (not depicted)

# Zero Downtime Oracle Upgrade Example: 9i → 11g Cross-Platform



Additional steps:

- Start Oracle GoldenGate's Capture at 11g
- Start Oracle GoldenGate's Delivery process 9i (old source)