



ORACLE®

Real-time database replication

Ugo Pollio – Sales Consulting and Business Development
Oracle EMEA Data Integration Solutions

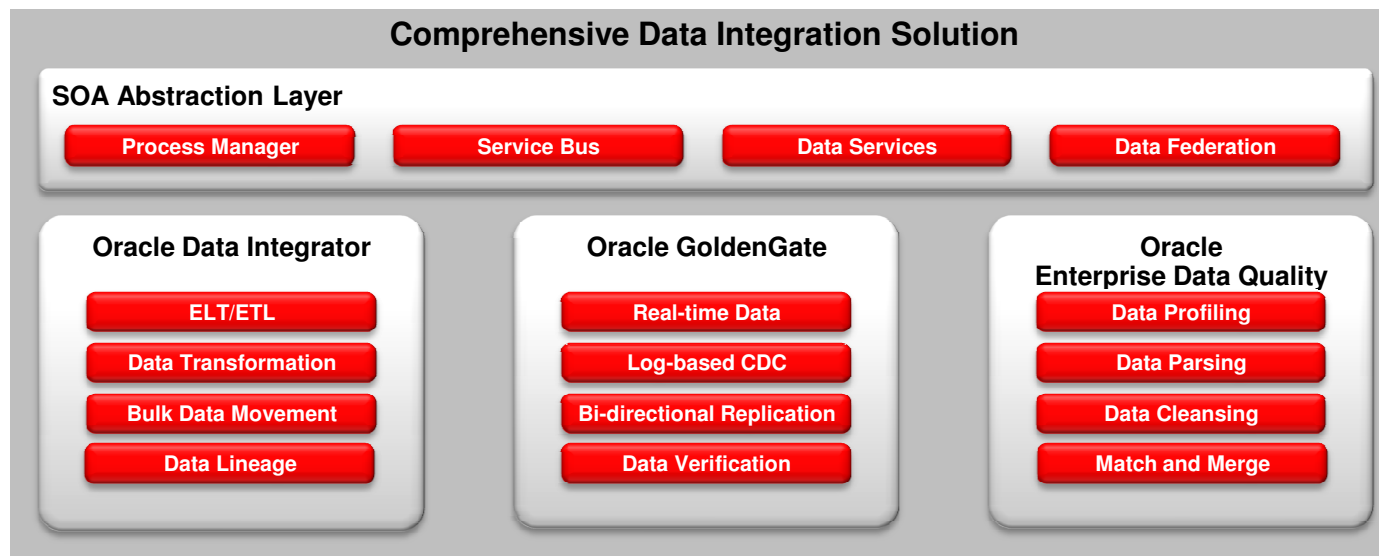
Program Agenda

- Introduction to Real Time Data Propagation
- Technology Overview
- Continuous Availability
- Q&A



Oracle Data Integration Solution

Best-in-class Heterogeneous Platform for Data Integration



Storage



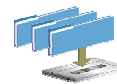
Data Warehouse/
Data Mart



OLTP
System



OLAP Cube



Flat Files



Web 2.0



Web and Event
Services, SOA

Requirement for Real-Time Data

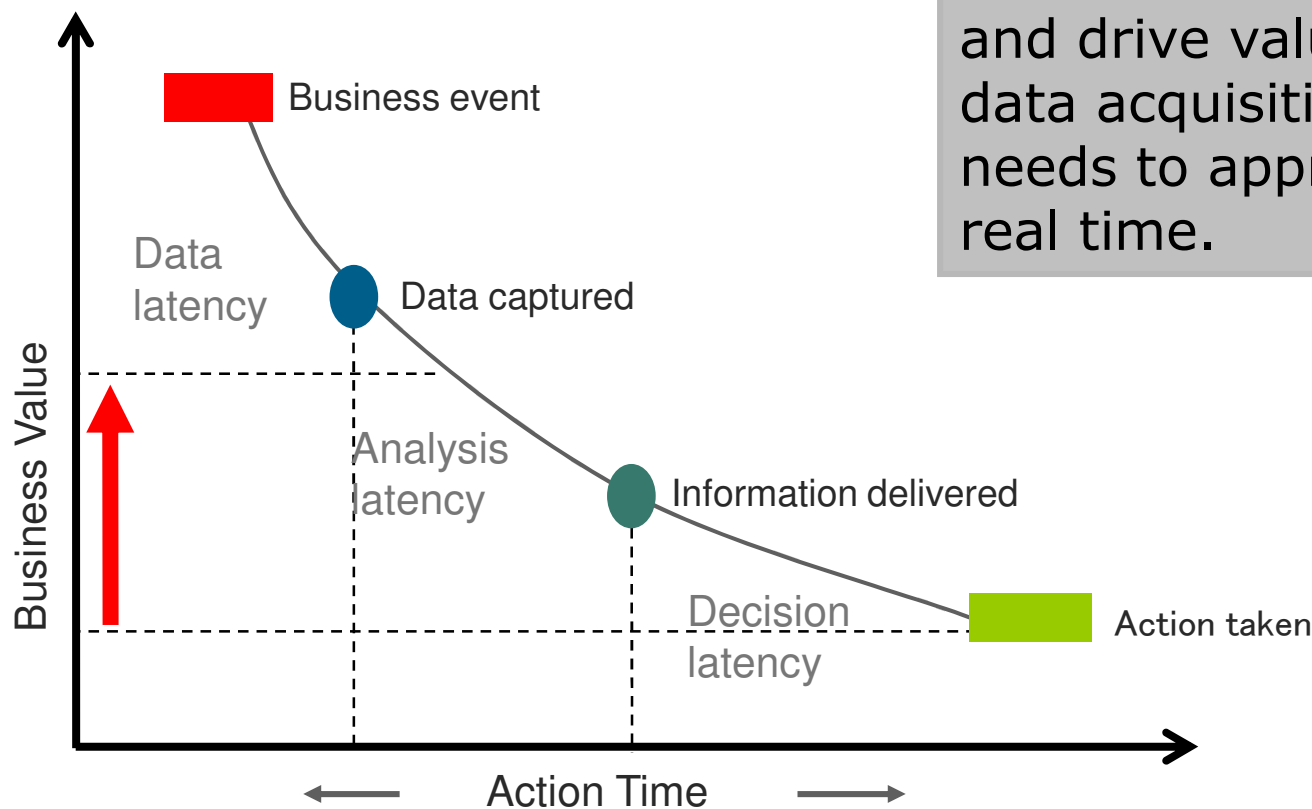
Businesses increasingly demand low-latency data

“Many organizations still struggle with data integration, especially dealing with real-time data. In the data integration world, real time most often means near-real time or right time, but business requirements have dramatically changed to minutes and often seconds, even as data volumes double every 18 months.”

- Forrester Research, Inc., Forrester TechRadar™: Enterprise Data Integration, Q1 2010, February 2010.

Increasing the Value of Enterprise Information

3 Key Components



To reduce latency and drive value, data acquisition needs to approach real time.

Oracle GoldenGate Differentiators



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

Performance

- Sub-second latency for data movement
- Low-impact capture, routing, transformation, and delivery of transactional data

Flexible & Extendable

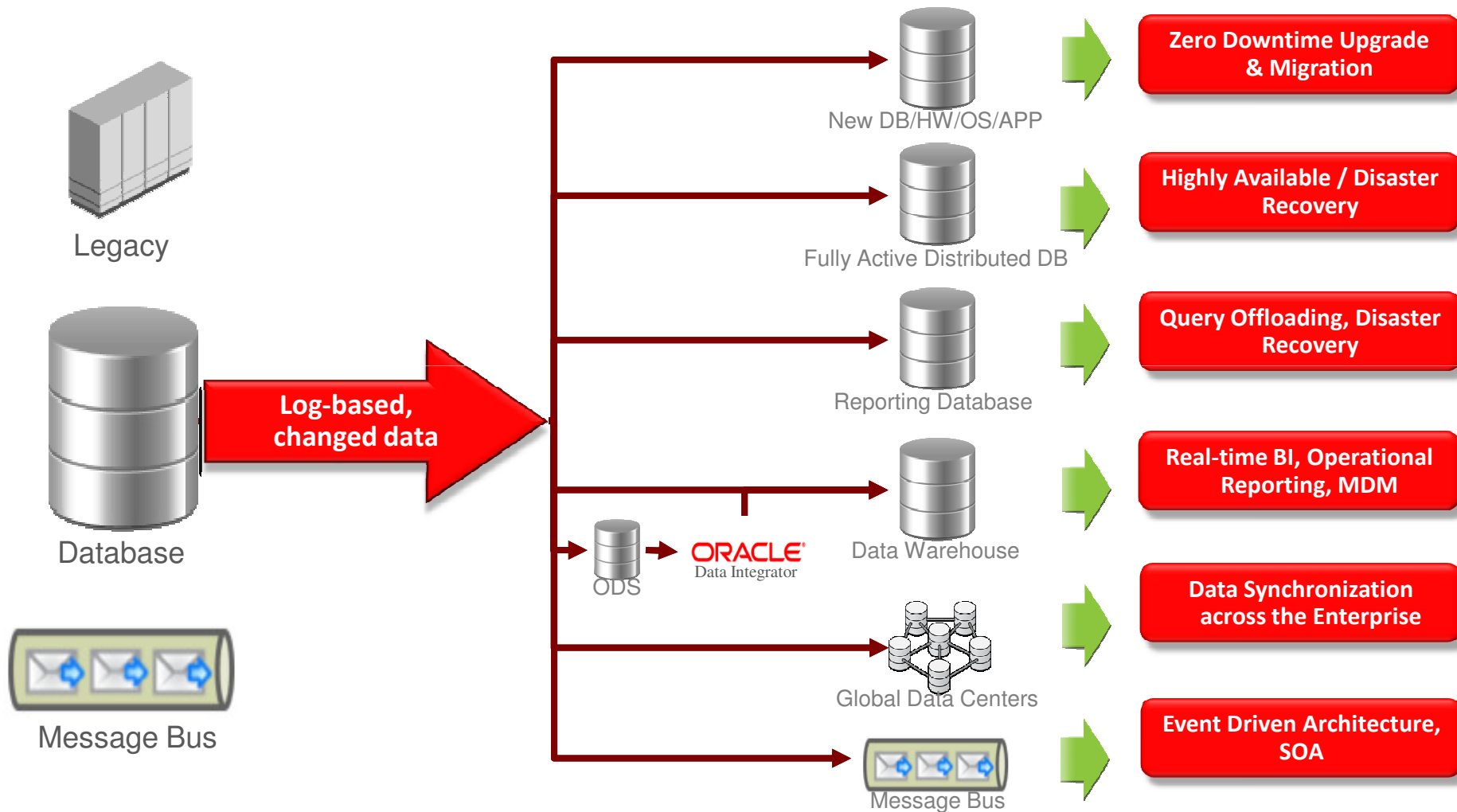
- Open, modular architecture
- Supports heterogeneous sources and targets
- Agile and adaptable to modern data integration architectures

Reliable

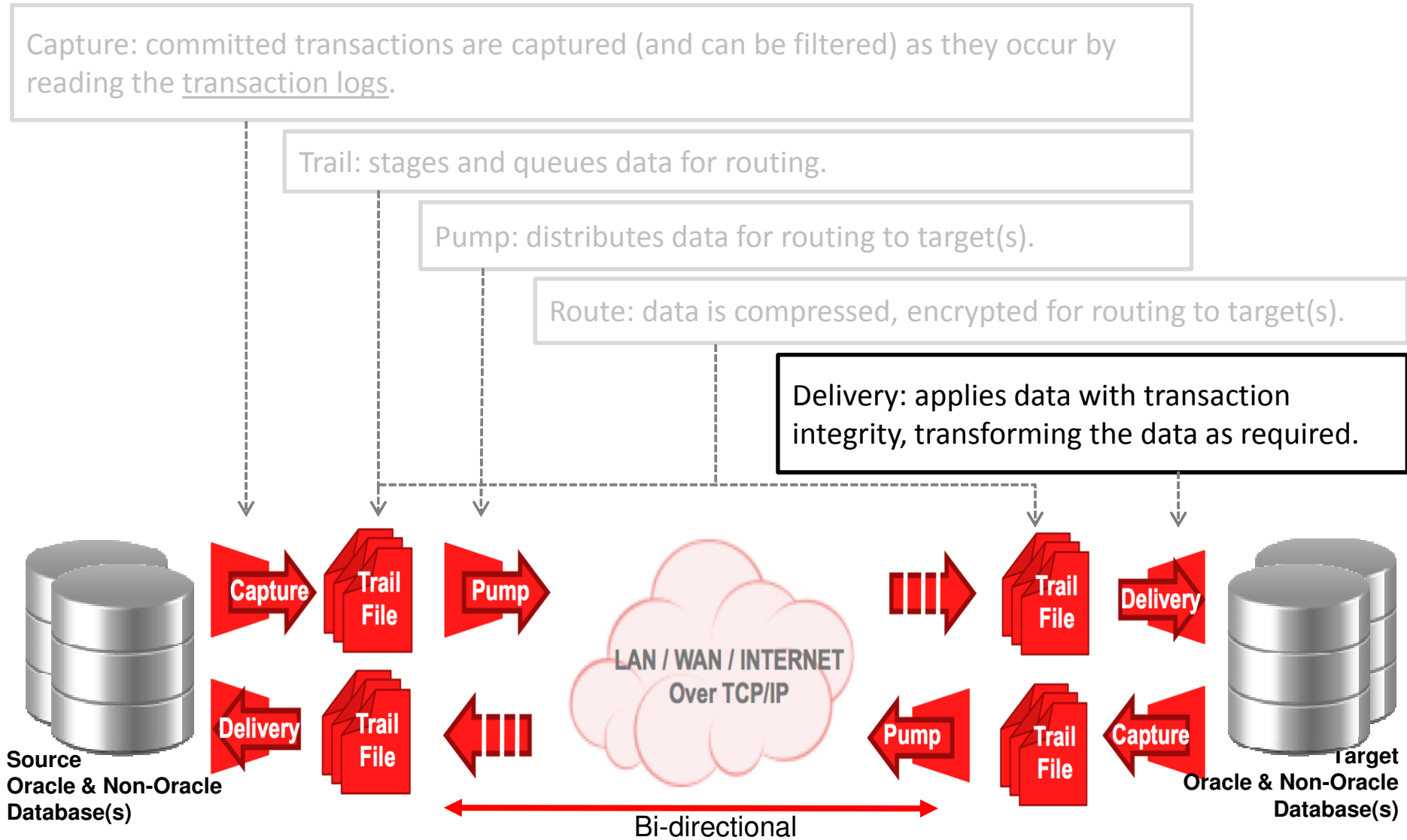
- Maintains transactional integrity
- Resilient against interruptions and failures
- Fast Recovery after process interruptions.

Oracle GoldenGate 11g

Low-Impact Real-Time Data Integration & Transactional Replication

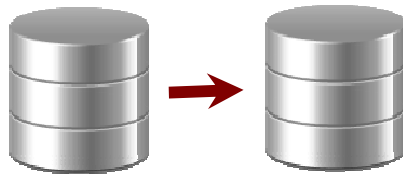


How Oracle GoldenGate Works

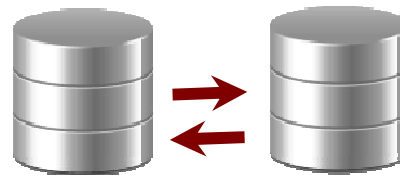


Oracle GoldenGate Differentiator: Flexibility 16

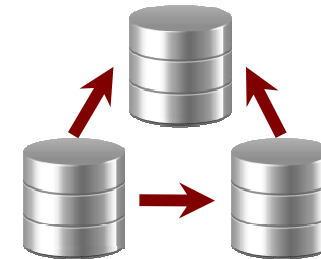
Unidirectional
Query Offloading
Zero-Downtime Migration



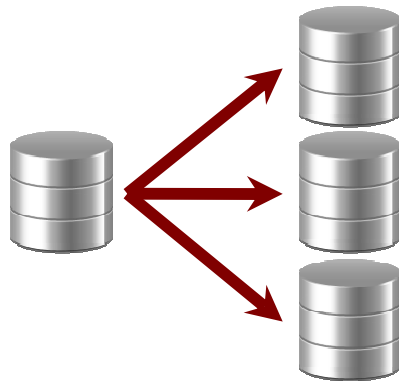
Bi-Directional
Hot Standby or
Active-Active for HA



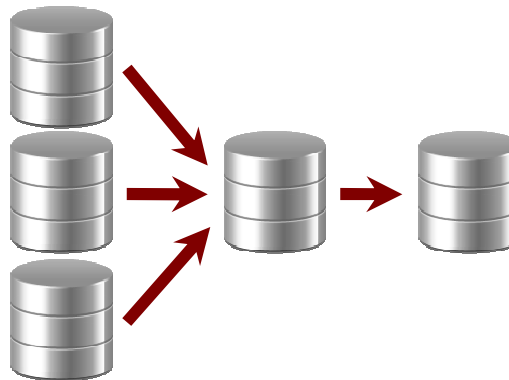
Peer-to-Peer
Load Balancing
Multi-Master



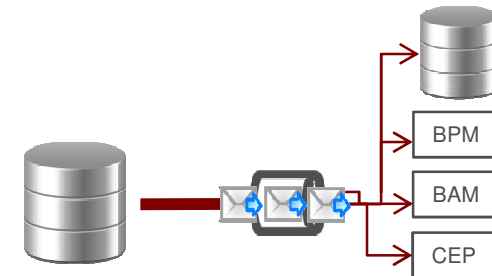
Broadcast
Data Distribution



Integration/Consolidation
Data Warehouse



Data Distribution
via Messaging



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Differentiator: Performance and Scalability



GoldenGate Capture

- Log-based change data capture
 - High volume
 - Low overhead
- Decoupled architecture
 - Multiple capture processes may be used to scale, but generally not required
 - Possible to split “hot” tables into a separate capture process
- Filtering and compression
 - Unnecessary change data is discarded immediately
 - Updates and deletes are “compressed” by default
 - Before images are discarded by default

Differentiator: Performance and Scalability

GoldenGate Delivery

- Decoupled architecture
 - Multiple delivery processes may be used to scale
 - Possible to split “hot” tables into a separate delivery process
 - Possible for multiple delivery processes to split the work for a single table
- Transaction grouping
 - Small transactions are grouped by default to reduce commit overhead
- Record batching
 - Records are batched by table and operation within a single SQL execution
 - Automatic reordering of batches



Differentiator: Transaction Integrity

- Transaction boundaries
 - Recorded in GoldenGate trail file
 - Transactions ordered in commit sequence
 - Boundaries adjusted automatically due to record filtering or trail splits
- Transaction integrity
 - Checkpointing and recovery are based on transaction boundaries
 - Original commit sequence is maintained by the delivery process



Differentiator: Reliability



- Decoupled architecture
 - Individual processes can be restarted automatically
 - Tolerance to network outages (configurable)
- Recovery
 - Recovery ensures that no operations are skipped or duplicated after failure of any kind
 - Recovery of the Capture process is more involved than recovery the Delivery process
 - Although GoldenGate processes are completely decoupled, the Delivery process must be aware of a recovery performed by the Capture process or pump

Oracle GoldenGate 11g Overview



EXPANDED HETEROGENEITY

- Log-based capture for MSFT SQL Server 2008, IBM DB2 9.7, MySQL
- Subscription to JMS messaging systems/service bus
- Delivery to IBM DB2 for I


TIGHTER INTEGRATION WITH ORACLE

- Database
 - Direct data loads and expanded data type support
 - Certification for Oracle Exadata
- Applications
 - Real-time reporting solution for Oracle applications and zero downtime application upgrade for JD Edwards
 - Integration with Oracle Data Integrator Enterprise Edition

ENHANCED PERFORMANCE

- Faster recovery after process interruptions for long running transactions
- Improved tracing to identify bottlenecks and tune for higher performance

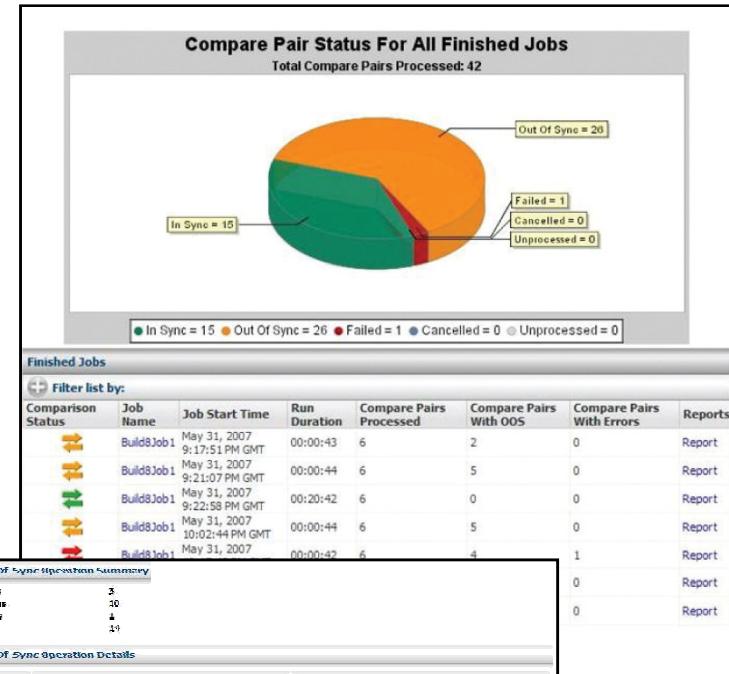
Oracle GoldenGate 11g Supported Platforms

Databases	O/S and Platforms
<p>Oracle GoldenGate Capture:</p> <ul style="list-style-type: none">▪ Oracle▪ DB2 LUW▪ DB2 z/OS▪ Microsoft SQL Server▪ Sybase ASE▪ Teradata▪ Enscribe▪ SQL/MP & SQL/MX▪ MySQL▪ JMS message queues▪ C-tree <p>Oracle GoldenGate Delivery:</p> <ul style="list-style-type: none">▪ All listed above, plus: ▪ TimesTen, IBM System I, Netezza & Greenplum▪ ETL product	<p>Linux</p> <p>Sun Solaris</p> <p>Windows</p> <p>HP NonStop</p> <p>HP-UX</p> <p>IBM AIX</p> <p>IBM z Series</p> <p>zLinux</p> <p>AS/400</p> <p>iSeries</p>

Oracle GoldenGate Veridata – Data Comparison without Downtime



- A high-speed, low impact data comparison solution
 - Identifies and reports data discrepancies between heterogeneous databases without interrupting their availability
- Benefits:
 - Reduce financial/legal risk exposure
 - Speed and simplify IT work in comparing data sources
 - No disruption to business systems
 - Improved failover to backup systems
 - Confident decision-making and reporting



Out of Sync Operation Summary

Operation	Count
Inserts	3
Updates	10
Deletes	4
Total	17

Out of Sync Operation Details

Operation	Source	Target
Update	EMPLOYEE_ID float 102	EMPLOYEE_ID float 102
	FIRST_NAME byte Alex	FIRST_NAME byte Alexander
	LAST_NAME byte Hurnold	LAST_NAME byte Hurnold
	EMAIL byte AL.HURNOLD	EMAIL byte ALHURNOLD
	PHONE_NUMBER byte 550-123-1987	PHONE_NUMBER byte 550-123-1987
	HIRE_DATE byte 1990-01-03 00:00:00	HIRE_DATE byte 1990-01-03 00:00:00
	JOB_ID byte IT_PROG	JOB_ID byte IT_PROG
Insert/Update	SALARY float 9000	SALARY float 9000
	COMMISSION_PCT float 102	COMMISSION_PCT float
	MANAGER_ID float 102	MANAGER_ID float 102
	DEPARTMENT_ID float 60	DEPARTMENT_ID float 60
	EMPLOYEE_ID float 102	EMPLOYEE_ID float 102
	FIRST_NAME byte Peter	FIRST_NAME byte Peter
	LAST_NAME byte Venew	LAST_NAME byte Venew
Update	EMAIL byte PEARCES	EMAIL byte PEARCES
	PHONE_NUMBER byte 550-123-1987	PHONE_NUMBER byte 550-123-1987
	HIRE_DATE byte 1990-07-09 00:00:00	HIRE_DATE byte 1990-07-09 00:00:00
	JOB_ID byte IT_CLERK	JOB_ID byte IT_CLERK
	SALARY float 2800	SALARY float 2800
	COMMISSION_PCT float	COMMISSION_PCT float
	MANAGER_ID float 121	MANAGER_ID float 121
DEPARTMENT_ID float 60	DEPARTMENT_ID float 60	
Update	EMPLOYEE_ID float 188	EMPLOYEE_ID float 188
	FIRST_NAME byte Lee	FIRST_NAME byte Lee
	LAST_NAME byte Deoran	LAST_NAME byte Deoran
	EMAIL byte LOEDRN	EMAIL byte LOEDRN
	PHONE_NUMBER byte 515-121-2002	PHONE_NUMBER byte 515-121-2002
	HIRE_DATE byte 1997-02-11 00:00:00	HIRE_DATE byte 1997-02-11 00:00:00
	JOB_ID byte SA_REP	JOB_ID byte SA_REP
SALARY float 11000	SALARY float 11000	
COMMISSION_PCT float .25	COMMISSION_PCT float .25	

Oracle Management Pack for OGG

Complete Visibility (1 / 2): Director



1. Oracle GoldenGate Director:
Has basic configuration, management, monitoring, and alerting. Based on legacy pull infrastructure. Works on legacy GoldenGate instances.

The screenshot displays the GoldenGate Director 1.0 interface. The top section shows a data flow diagram for a 'DirectorBackup' test. The diagram includes components like 'Data Source LocalOracle', 'Capture: DIRBKUP LocalOracle', 'Map for DIRBKUP Trail...', 'Delivery: DIRREP LocalOdbc', and 'Delivery: SCNDEL LocalOdbc'. The bottom section shows a log table with columns for Level, Source, Process, Type, Date/Time, and Message.

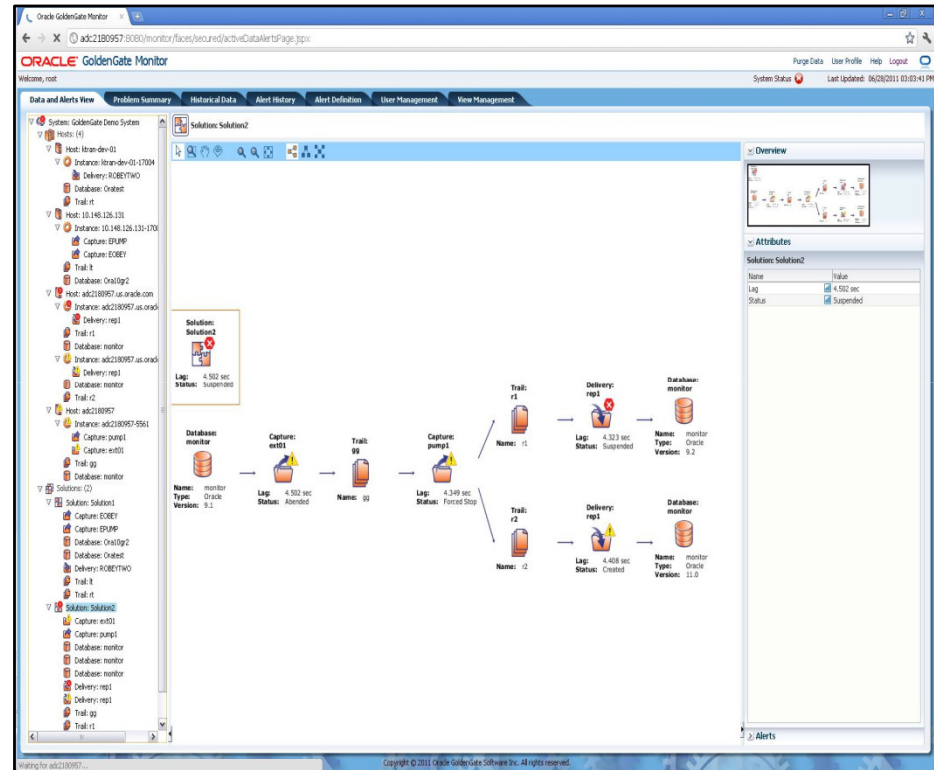
Level	Source	Process	Type	Date/Time	Message
INFO	LocalOdbc	port 8324	SERVER	2005-05-17 11:50:21	GoldenGate Collector, port 8324
INFO	LocalOdbc	port 8324	SERVER	2005-05-17 11:50:16	GoldenGate Collector, port 8324
INFO	LocalOdbc	MANAGER	MANAGER	2005-05-17 11:50:16	GoldenGate Manager for ODBC
INFO	LocalOdbc	MANAGER	MANAGER	2005-05-17 11:50:16	GoldenGate Manager for ODBC
INFO	LocalOdbc	MANAGER	MANAGER	2005-05-17 11:50:16	GoldenGate Manager for ODBC
INFO	LocalOracle	DIRBKUP	EXTRACT	2005-05-17 11:50:16	GoldenGate Capture for Oracle
ERROR	LocalOdbc	DIRREP	REPLICAT	2005-05-17 11:50:12	GoldenGate Delivery for ODBC
ERROR	LocalOdbc	DIRREP	REPLICAT	2005-05-17 11:50:12	GoldenGate Delivery for ODBC
WARN	LocalOdbc	DIRREP	REPLICAT	2005-05-17 11:50:12	GoldenGate Delivery for ODBC
WARN	LocalOdbc	DIRREP	REPLICAT	2005-05-17 11:50:12	GoldenGate Delivery for ODBC
INFO	LocalOracle	DIRBKUP	EXTRACT	2005-05-17 11:50:12	GoldenGate Capture for Oracle
INFO	LocalOdbc	DIRREP	REPLICAT	2005-05-17 11:50:11	GoldenGate Delivery for ODBC
INFO	LocalOdbc	MANAGER	MANAGER	2005-05-17 11:50:11	GoldenGate Manager for ODBC
INFO	LocalOdbc	GGSCI	GGSCI	2005-05-17 11:50:11	GoldenGate Command Interpreter

Oracle Management Pack for OGG

Complete Visibility (2 / 2): Monitor



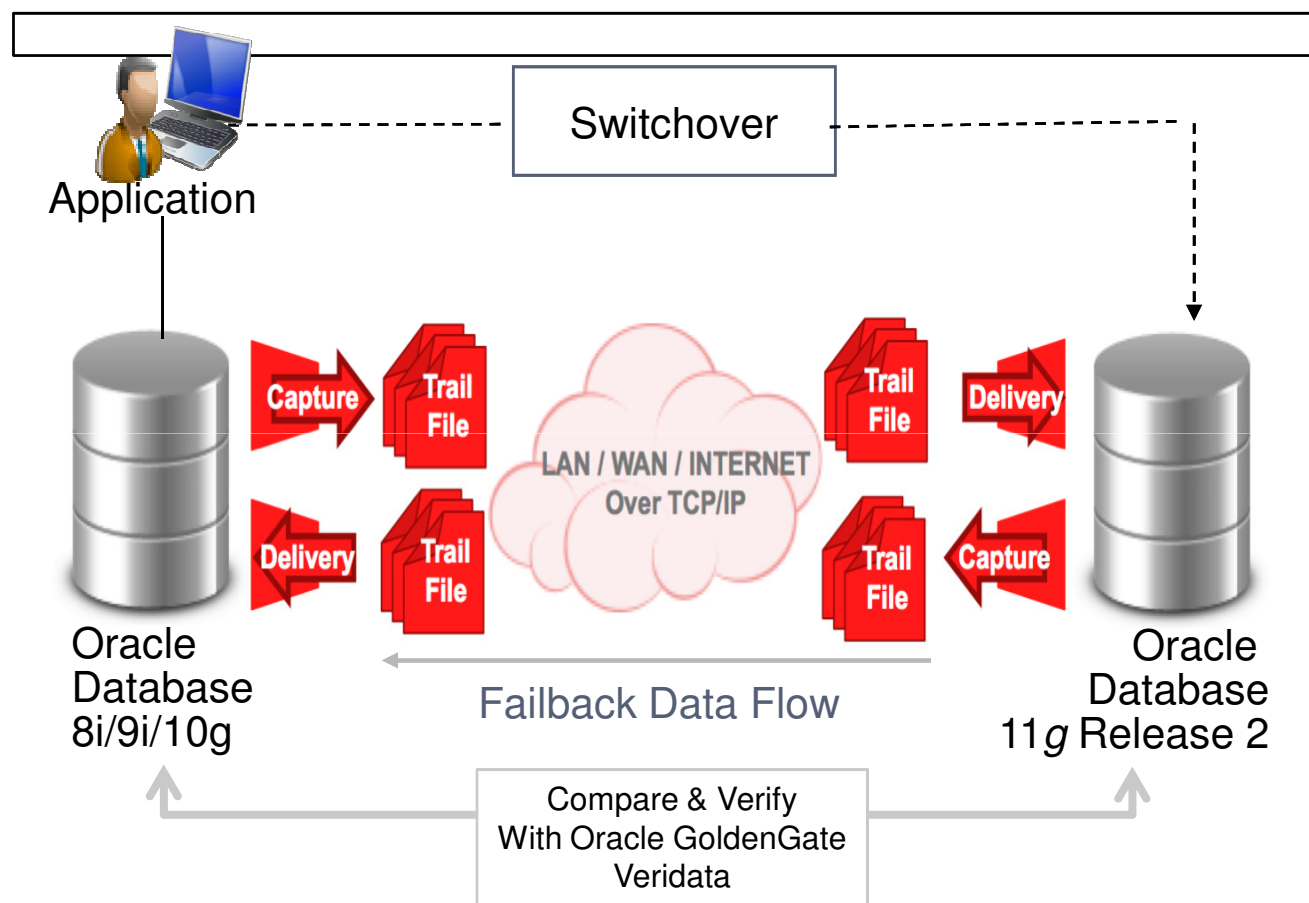
- Oracle GoldenGate Monitor:
Has advanced monitoring, alerting (SNMP support), lag graphs, and historical repository. Based on new agent infrastructure, which will be the foundation for all future integration projects. Supports OGG 11.1.1.1.1+



Eliminate Downtime During Upgrades to Oracle 11g R2

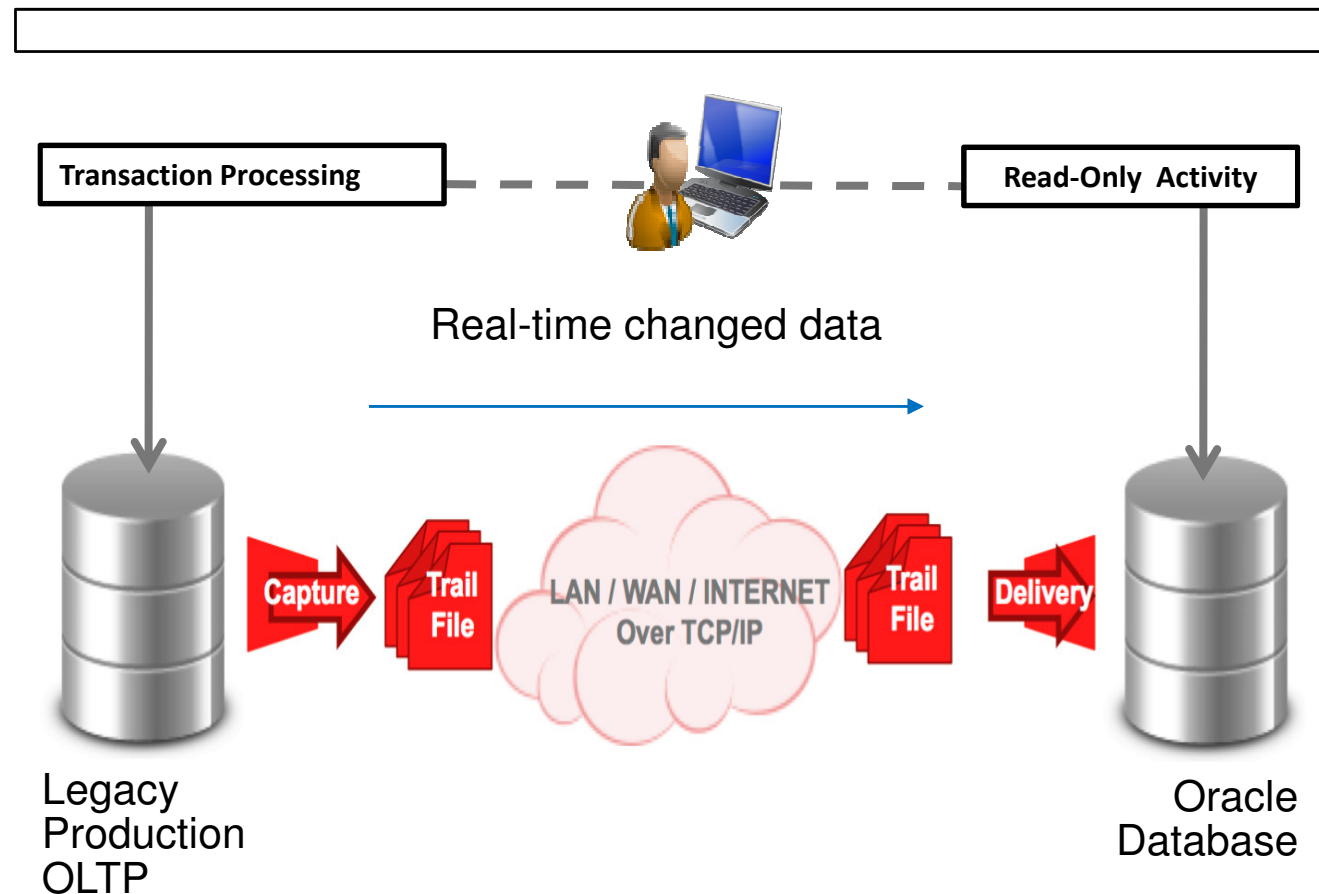


- Zero database downtime for upgrades from 8i, 9i, 10g to 11g
- Leverage new features of Oracle Database 11g without impacting business operations
- Minimize risks with failback option



Improve Production System Performance and Lower Costs

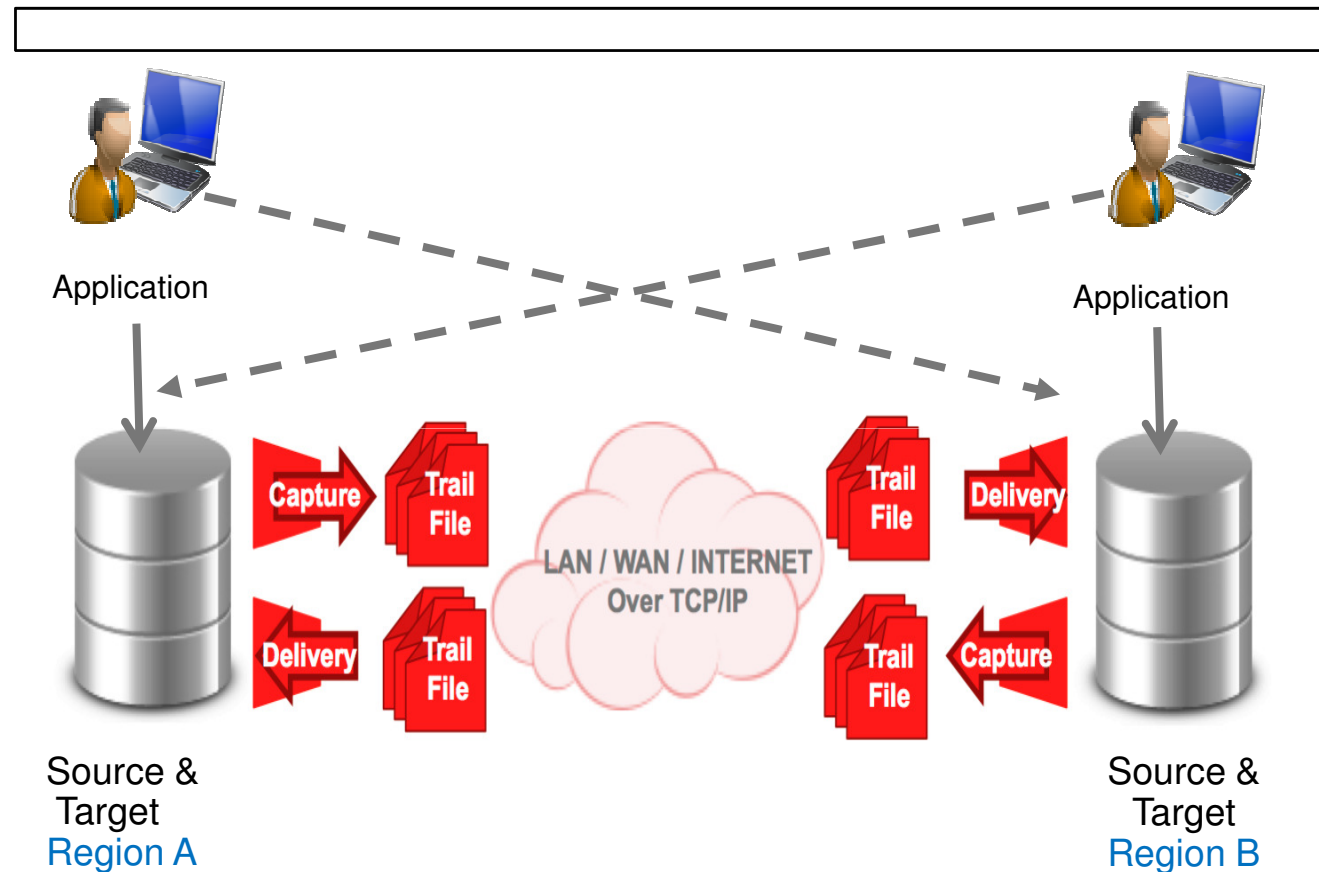
- Off-load queries from production systems in Active-Active or Heterogeneous configurations
 - E.g. different OS, database version, database
 - E.g. legacy system query off-load



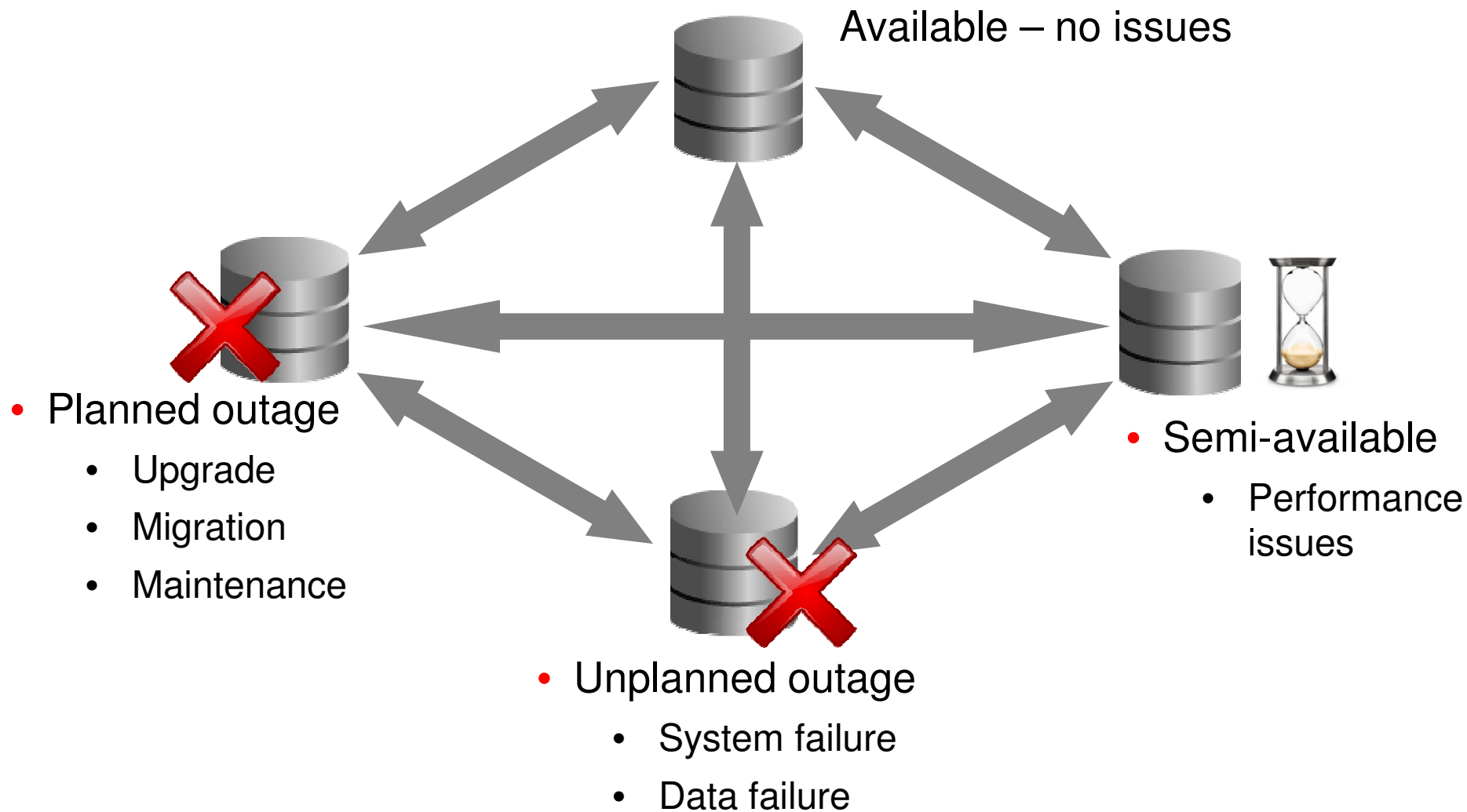
Increase ROI on Existing Servers & Synchronize Data Across Globe



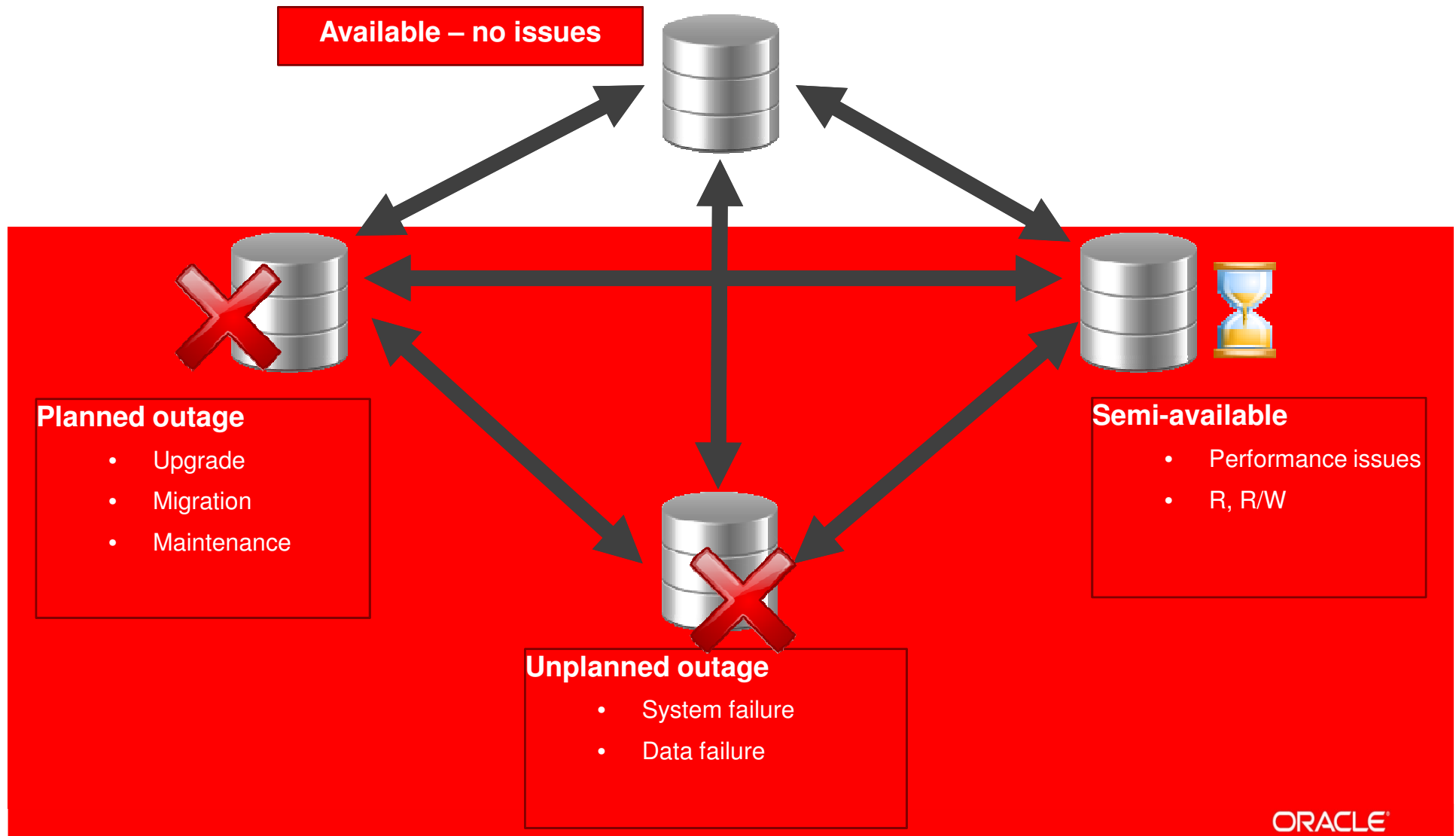
- Utilize secondary systems for transactions
- Enable continuous availability during unplanned and planned outages
- Synchronize data across data centers around the globe



The four states of availability

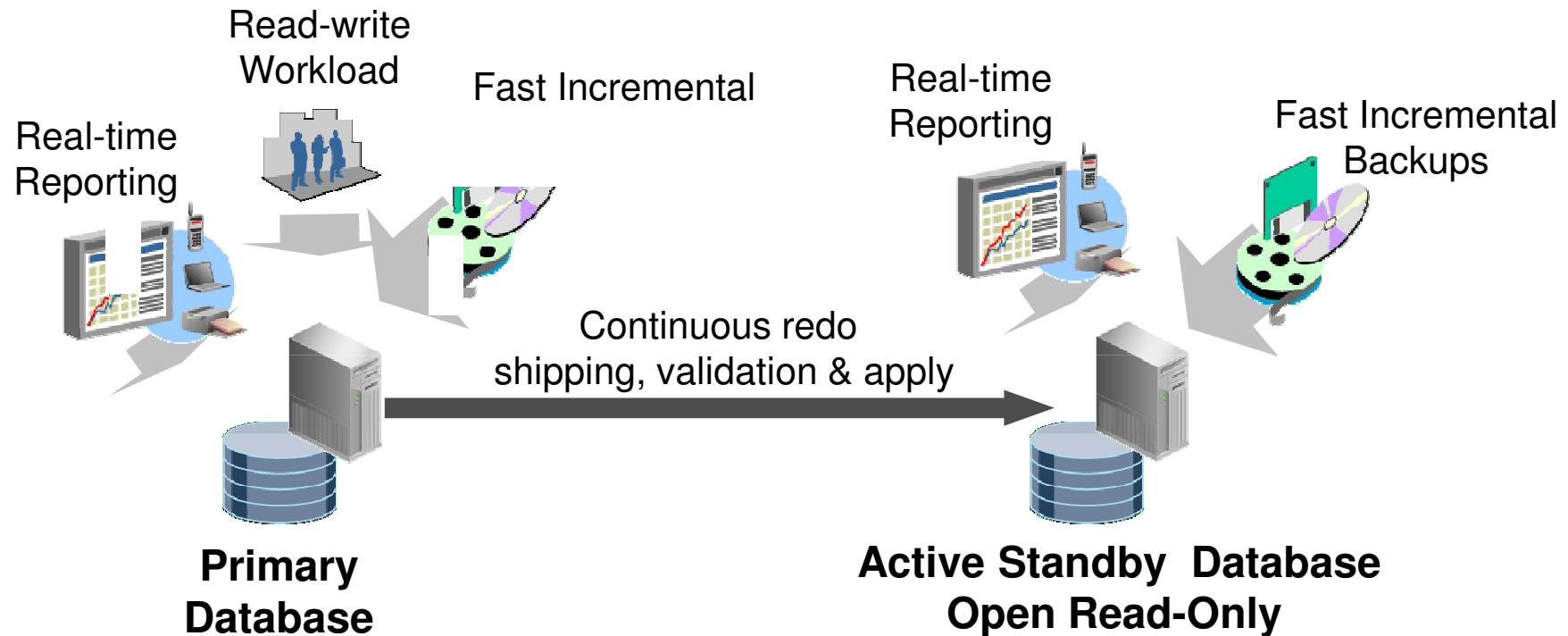


Eliminate All Downtime for Continuous Availability



Active Data Guard 11g – Database Option

Use Disaster Recovery System to Offload Primary

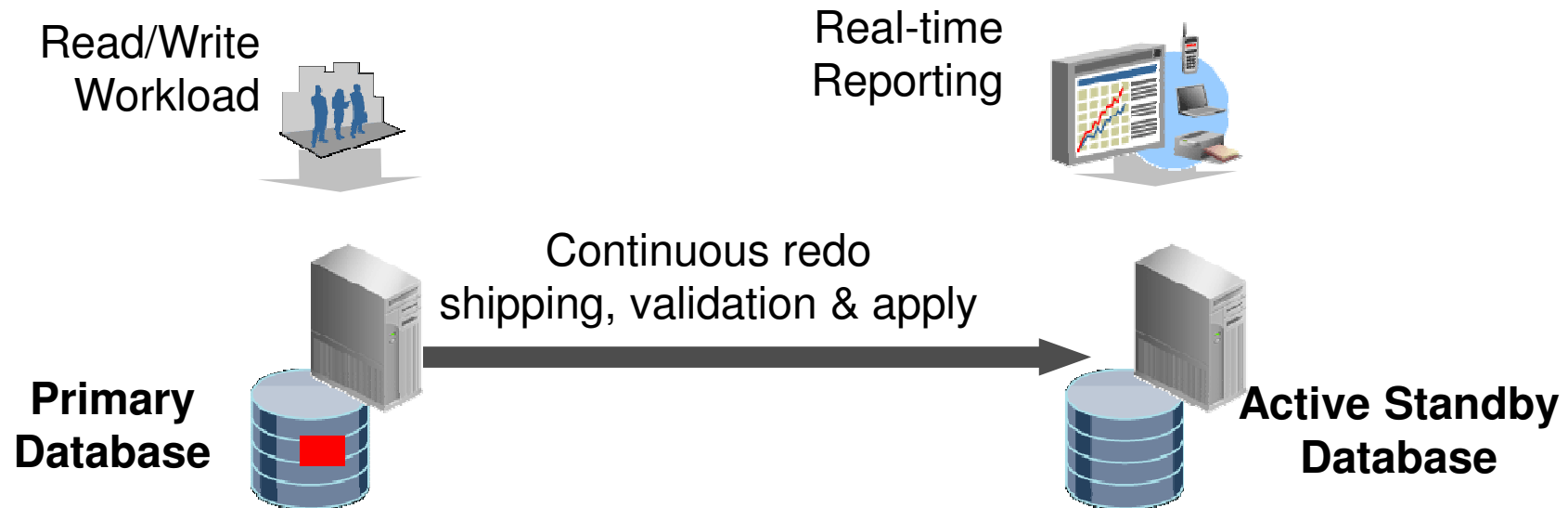


Always active – use standby for queries, reports, backups
Automatic repair of corrupt blocks – transparent to application

Active Data Guard - Improve Availability

Detect and Repair Corrupt Blocks

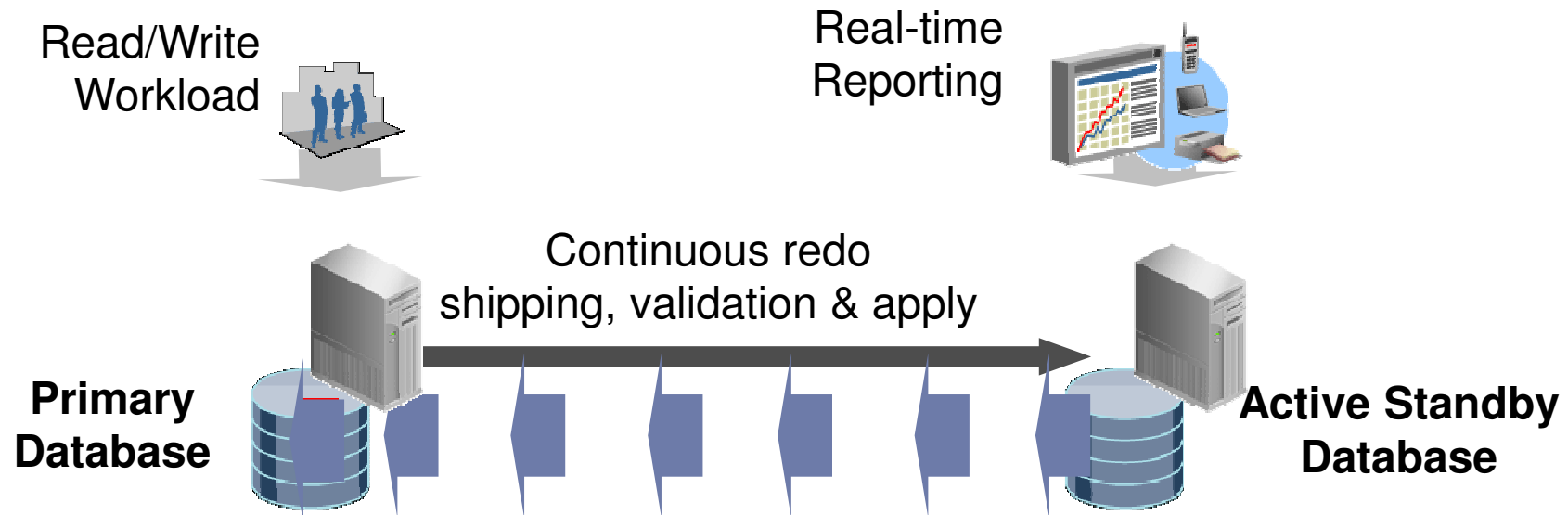
- Automatic detection and repair of corrupt blocks
 - Transparent to the user and application



Active Data Guard - Improve Availability

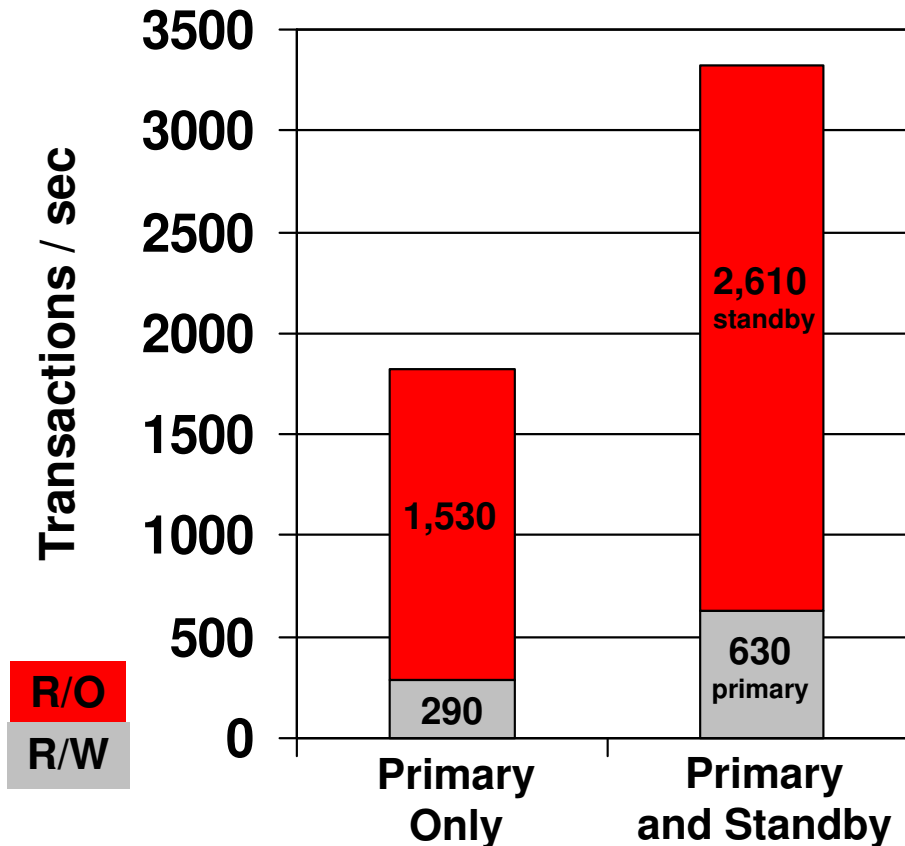
Detect and Repair Corrupt Blocks

- Automatic detection and repair of corrupt blocks
 - Transparent to the user and application



Active Data Guard: Improve Performance

For all Workloads



- Double read-write throughput
- 70% increase in read-only throughput
- Eliminate contention between read-write and read-only workload



Differences

Active Data Guard & GoldenGate

Active Data Guard

- Ship from memory
- SYNC or ASYNC
- Simple one way replication
- Standby open read-only
- Zero I/O overhead, near-zero primary performance impact
- Standby database is exact physical replica
- No data type or other restrictions
- Integrated with Oracle kernel

GoldenGate

- Read and ship from redo logs
- ASYNC only
- Advanced, multimaster replication*
- Target open read-write
- I/O overhead and capture processing on primary
- Replica is logical copy maintained using SQL
- Data type and other restrictions
- External to Oracle Database

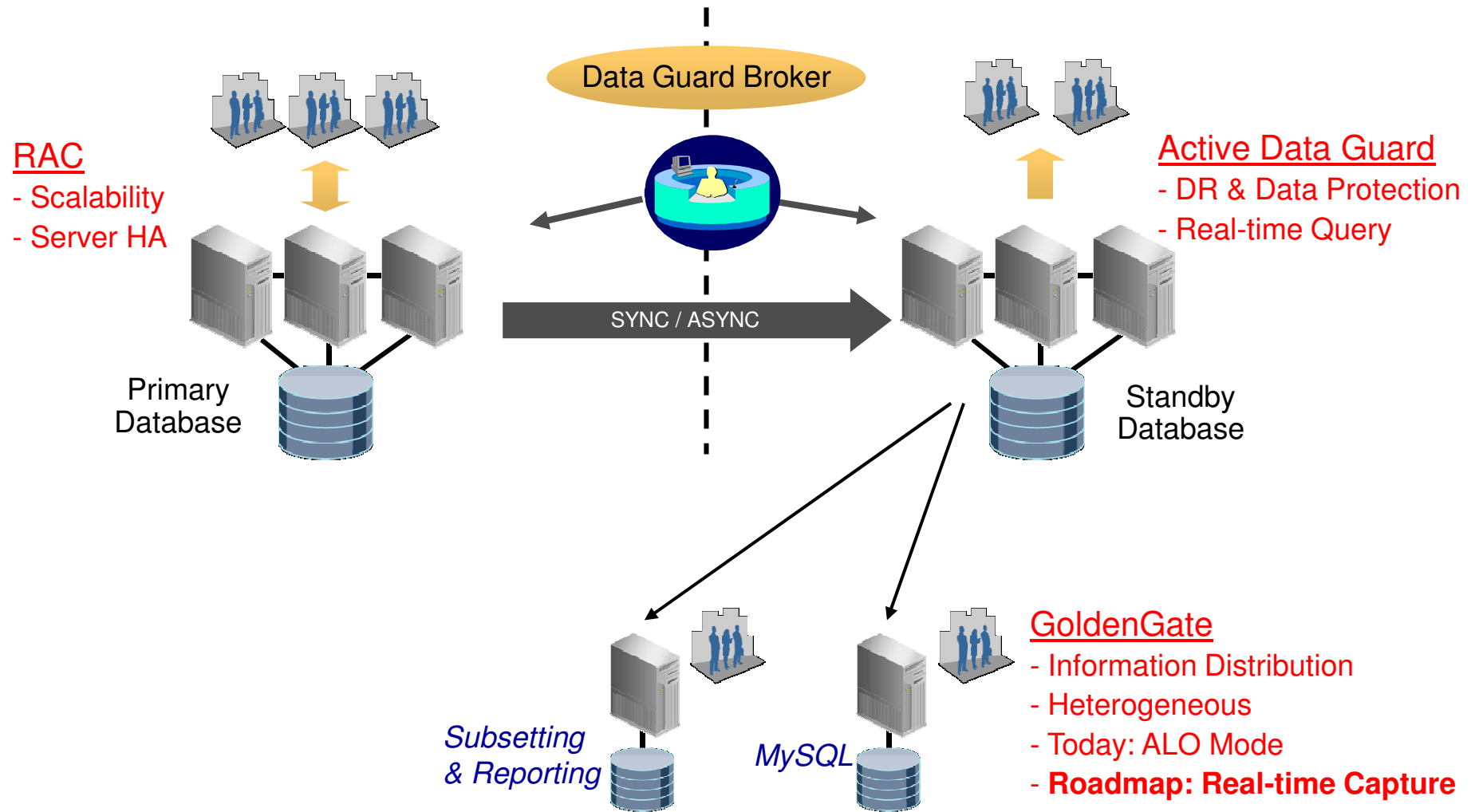
* when conflicts can be avoided or resolved

Oracle Replication Technologies

Numerous Replication Requirements

Replication Requirement	Active Data Guard	GoldenGate
Data protection / data availability / DR	✓	
Database rolling upgrades	✓	✓
Cross platform migrations	✓	✓
Zero downtime application upgrades		✓
Active/Active multimaster		✓
Data integration		✓
Many-to-one replication		✓
Replicate data subsets, transformations		✓

Complete Production Off-load





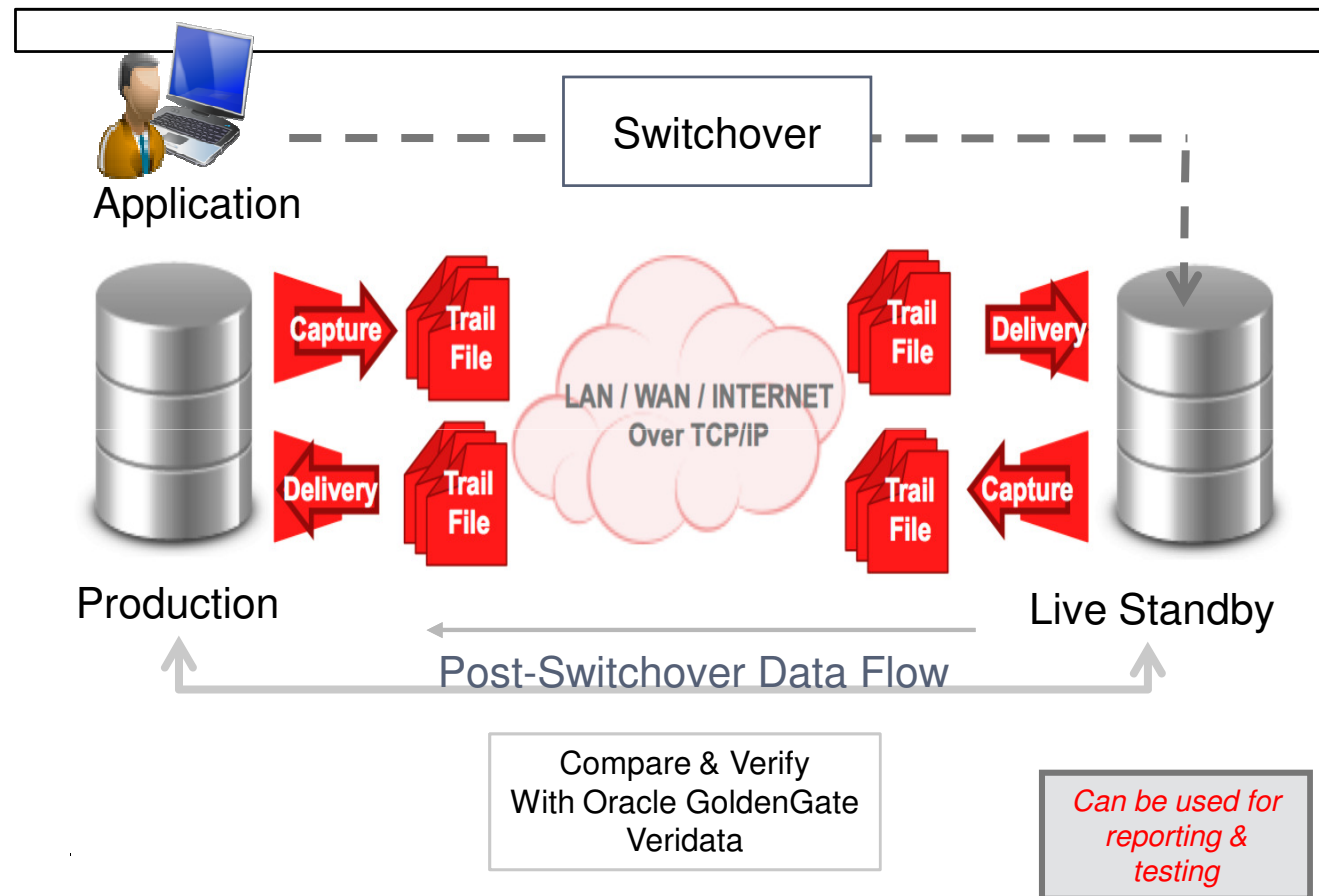
Oracle GoldenGate for Continuous Availability



- Zero Downtime Upgrades, Migrations and Maintenance
 - Migration from non-Oracle databases to Oracle 11gR2 & Exadata
 - Upgrade Oracle Database 8i, 9i, 10g to 11gR2
 - Upgrade/Migrate Database Server/OS
 - Perform Database Maintenance
 - Application Upgrade (Siebel CRM and JD Edwards)
- Disaster Recovery for Non-Oracle Databases and Cross- Oracle Database versions
- Continuous Availability via Active-Active Databases
- Offloading Queries from Legacy Systems to Oracle Databases for Maximized Performance

Eliminate unplanned downtime with Active Data Guard & GoldenGate

- Active Data Guard for disaster recovery and data protection for:
 - Oracle-to-Oracle
- Oracle GoldenGate for disaster recovery and data protection for:
 - Non-Oracle platforms
 - Active-Active
 - Cross-OS and Oracle database version requirements



Availability – the true cost of Downtime

Where milliseconds = dollars

- Tangible costs**

- Revenue
- Employee productivity
- Recovery efforts
- Regulatory penalties

- Intangible costs**

- Brand
- Trust
- Customer satisfaction
- Loyalty

Industry	Revenue / Hour	Revenue / Employee Hour
Energy	\$2,817,846	\$569.20
Telecommunications	\$2,066,245	\$186.98
Banking and Finance	\$1,245,468	\$605.42
Information Technology	\$1,344,461	\$184.03
Insurance	\$1,202,444	\$370.92
Retail	\$1,107,274	\$244.37
Transportation	\$668,586	\$107.78
Utilities	\$643,250	\$380.94
Healthcare	\$636,030	\$142.58
Hospitality and Travel	\$330,654	\$38.62

Differentiating HA/DR Technologies

Popular Solutions



Roll Forward / File Protection

- Conventional Backup/Recovery
- RAID
 - multiple hard disks behaving as a single large fast drive
- Snapshots
 - Point-in-time pictures of data

High Availability and Disaster Recovery

- Physical replication at storage, host or network level
- Built-in, change-level database replication
- Heterogeneous, transactional data replication w/ Oracle GoldenGate

Advantages of Oracle GoldenGate Architecture

Reduced Overhead and TCO

- Captures once, delivers to many targets for different uses
- Non-invasive, log-based capture
- Moves only committed data, reduces bandwidth needs

High Performance with Reliability

- Subsecond latency even with high data volumes
- Preserves transaction integrity
- Ensures data recoverability

Flexibility and Ease of Use

- Provides decoupled, modular architecture
- Supports heterogeneous sources and targets, and different latency needs
- Coexists and integrates with ELT/ETL and messaging solutions

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Oracle's Data Integration blog

blogs.oracle.com/dataintegration

Oracle.com/goto/dataintegration

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Note:

- This presentation is used internally to help sales and SC's understand how to position/upsell Oracle Active Data Guard and Oracle GoldenGate. Most slides are suitable for external consumption - internal only slides are marked as such in the footer of the slide. If you do not see internal-only in the footer of a slide, then slide is good for public consumption.